BUILDING OUR FUTURE

MARCH 15 **2023**

DEMAND-SIDE MANAGEMENT

2022 ANNUAL REPORT

SUPPLEMENT 2: **EVALUATION**

IDAHO POWER®

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EVALUATION AND RESEARCH SUMMARY

Idaho Power considers program evaluation an essential component of its demand-side management (DSM) operational activities. The company contracts with third-party contractors to conduct impact, process, and other evaluations on a scheduled and as-required basis. Third-party contracts are generally awarded using a competitive bid process managed by Idaho Power's Corporate Services. In some cases, research and analysis is conducted internally and managed by Idaho Power's Research and Analysis team within the Customer Relations and Energy Efficiency (CR&EE) department.

Idaho Power uses industry-standard protocols for its internal and external evaluation efforts, including the *National Action Plan for Energy Efficiency—Model Energy Efficiency Program Impact Evaluation Guide*, the *California Evaluation Framework*, the *International Performance Measurement and Verification Protocol* (IPMVP), the *Database for Energy Efficiency Resources*, and the Regional Technical Forum's (RTF) evaluation protocols.

The company also supports regional and national studies to promote the ongoing validation of energy savings and demand reduction, and the efficient management of its programs. Idaho Power considers primary and secondary research, potential assessments, impact and process evaluations, and customer surveys as important resources in providing accurate and transparent program savings estimates. Recommendations and findings from evaluations and research are used to continuously refine and improve Idaho Power's DSM programs.

In 2021, Idaho Power contracted with ADM Associates and Tetra Tech to conduct program evaluations for the Home Energy Report (impact, ADM Associates), Commercial Energy-Savings Kits (impact and process, ADM Associates), C&I New Construction (impact and process, Tetra Tech), and C&I Retrofits (impact and process, Tetra Tech) programs.

Idaho Power also contracted with Applied Energy Group to conduct an Energy Efficiency Potential Study and a Demand Response Potential Study for Idaho Power's service area. Due to the size of these reports, they are not included in this Supplement 2, but can be accessed by a link found in the Other Reports section.

AM Conservation Group conducted a program summary analysis of Student Energy Efficiency Kits and Commercial Energy Savings Kits programs. Harris Utilities conducted a summary analysis for the Home Energy Report Program. The company also conducted internal analyses for the A/C Cool Credit, Flex Peak, and Irrigation Peak Rewards programs.

Throughout 2022, Idaho Power administered several surveys regarding energy efficiency programs to measure customer satisfaction. Some surveys were administered by a third-party contractor; other surveys were administered by Idaho Power either through traditional paper and electronic surveys or through the company's online Empowered Community. An evaluation schedule and final reports from all evaluations, research, and surveys listed above are included in this *Demand-Side Management 2022 Annual Report*, *Supplement 2: Evaluation.*

EVALUATION PLAN

Energy Efficiency 2010–2023 Program Evaluation Plans

Program Evaluation Schedule	2023	2022	2021	2020	2019	2018	2017
Residential Energy Efficiency Programs							
Educational Distributions				I/P			
Energy House Calls					I/P		
Heating & Cooling Efficiency Program			I/P				I/P
Home Energy Audit	I/P						I
Home Energy Reports		I		P			
Multifamily Energy Savings Program						I/P	
Rebate Advantage				I			
Residential New Construction Program	I				I/P		
Shade Tree Project	I				O	O	
Weatherization Assistance for Qualified Customers	O			O			
Weatherization Solutions for Eligible Customers	O			O			
Commercial/Industrial Energy Efficiency Programs							
Commercial Energy-Saving Kits		I/P					
Custom Projects			I/P			I	P
New Construction		I/P			I		P
Retrofits		I/P			I		P
Small Business Direct Install	I		P				
Irrigation Energy Efficiency Programs							
Irrigation Efficiency Rewards	I			I/P			
Demand-Response Programs							
A/C Cool Credit	O	O	I	O	I	O	O
Flex Peak Program	O	O	I/O	O	O	O	O
Irrigation Peak Rewards	O	O	I/O	O	O	O	O

Evaluation Type: I = Impact, P = Process, O = Other

Program not yet in existence:

Program Evaluation Schedule	2016	2015[1]	2014	2013	2012	2011	2010
Residential Energy Efficiency Programs							
Educational Distributions							
Energy House Calls						I	P
Heating & Cooling Efficiency Program				P	I		P
Home Energy Audit			P				
Home Energy Reports							
Multifamily Energy Savings Program							
Rebate Advantage	I/P					I	
Residential Energy Efficiency Education Initiative	O						P
Residential New Construction Program							
Shade Tree Project			P				
Weatherization Assistance for Qualified Customers			O	P	I		
Weatherization Solutions for Eligible Customers			O	P	I		
Commercial/Industrial Energy Efficiency Programs							
Commercial Energy-Saving Kits							
Custom Projects			I/P			I	P
New Construction	I				I		P
Retrofits	I			P	I		P
Small Business Direct-Install							
Irrigation Energy Efficiency Programs							
Irrigation Efficiency Rewards	I/P		P/O	P/I			P
Demand-Response Programs							
A/C Cool Credit	I	I	O		P	O	
Flex Peak Program	I/O	I/O		P/O		O	
Irrigation Peak Rewards	O	I/O	I/O	O		O	

Evaluation Type: I = Impact, P = Process, O = Other

Program not yet in existence:

[1] Energy efficiency programs evaluated in 2015 have since been combined with another program or eliminated

ENERGY EFFICIENCY ADVISORY GROUP NOTES

The following pages include notes from EEAG meetings held on February 9, May 4, August 11, and November 17, 2022.

Energy Efficiency Advisory Group (EEAG)

February 09, 2022

Present:

Anna Kim – Public Utilities Commission of Oregon
Alexa Sakolsky-Basquill – Office of Energy & Mineral Resources
Ben Otto – Idaho Conservation League
Connie Aschenbrenner – Idaho Power
Diego Rivas – Northwest Energy Coalition
Don Strickler – Simplot
Donn English – Idaho Public Utilities Commission
Evie Scrivner – Community Action Partnership
Kevin Keyt – Idaho Public Utilities Commission
Quentin Nesbitt – Idaho Power
Sid Erwin – Idaho Irrigation Pumpers Association
Taylor Thomas – Idaho Public Utilities Commission
Tina Jayaweera – Northwest Power & Conservation Council
Wil Gehl – City of Boise

Not Present:

Jim Hall – WaFd Bank
Kacia Brockman – Public Utilities Commission of Oregon
Marissa Warren – Office of Energy & Mineral Resources
Nick Saven – Public Utilities Commission of Oregon

Guest and Presenters*:

Andee Morton – Idaho Power
Andrea Simmonsen – Idaho Power
Annie Meyer* – Idaho Power
Becky Arte Howell – Idaho Power
Billie McWinn* - Idaho Power
Chad Severson – Idaho Power
Callie Freeman – Idaho Power
Chellie Jensen* - Idaho Power
Cheryl Paoli – Idaho Power
Chris Pollow – Idaho Power
Curtis Willis – Idaho Power
Dahl Bietz- Idaho Power
Denise Humphreys – Idaho Power
Jeff Rigby – Idaho Power
Kathy Yi – Idaho Power
Krista West – Idaho Power
Melissa Thom – Idaho Power
Michelle Toney – Idaho Power
Mindi Shodeen – Idaho Power
Quentin Nesbitt* – Idaho Power
Rito Reynoso – Metro Community Services
Rosemary Curtin – Facilitator
Shelley Martin – Idaho Power
Sheree Wilhite – Idaho Power
Theresa Drake – Idaho Power
Todd Greenwell – Idaho Power
Tonja Dyke – Idaho Power
Zack Thompson – Idaho Power

Note Takers:

Michelle Toney (Idaho Power) and Kathy Yi (Idaho Power)

Meeting Facilitator: Rosemary Curtin
Virtual WEBEX Meeting Convened at 9:32 a.m. – Rosemary Curtin

Rosemary opened the meeting.

New EEAG member introduction: Evie Scrivner, CEO Community Action Partnership Association of Idaho (CAPAI)

Quentin Nesbitt went over the agenda for today's meeting. There were no questions or comments on the November meeting notes.

9:39 a.m. Announcements

Connie provided regulatory updates. She highlighted the positive order received in the 2020 DSM prudence case and the Commission's comments specifically acknowledging EEAG's ongoing participation.

Connie also provided a Demand Response (DR) filing update. The Oregon PUC approved the modifications, and the Company expects an Idaho PUC decision in the coming weeks.

There were no questions or comments.

9:45 a.m.-2021 Financials & Savings – Quentin

Quentin presented preliminary year to date expenses on the Rider and Preliminary savings for all programs. The preliminary savings are down due to COVID. All DR programs are impacted by supply chain and labor issues making participation difficult. Equipment is hard to find/ship and with the new construction in Idaho, contractors are being pushed towards new construction instead of retrofitting old equipment. Quentin also provided an update on the evaluation efforts.

One member asked about DR program modifications and mentioned that they thought the Flex Peak program was the lowest cost per MW of savings of the three DR programs. Quentin answered that it has the highest incentive but is lower overall cost per kW because the program has the least administrative cost as there are no devices in the field. Therefore, there is not a need for maintenance or monitoring, unlike the Irrigation and A/C Cool Credit program where there are direct load control devices on customer equipment that need to be installed and maintained.

Another member asked about the process for evaluations when a program changes. Quentin responded that the company tries to do a process evaluation if there are significant changes on a program the next year and Idaho Power strives to do impact and process evaluations approximately every 3-5 years. For the DR programs the company does internal impact evaluations every year using the same methods as prior third-party evaluations, and in some cases the same calculation tools our evaluators created for their evaluation of the DR program.

9:57 a.m.-Residential Programs – Billie McWinn

Billie presented the annual savings by program. She compared the savings and participation from 2020 to 2021 and stated that the reduction in year-over-year savings was mostly due to lighting and that COVID had very little impact on overall residential portfolio savings.

Billie provided an answer to an EEAG member's question from the November meeting about how the company handles code changes in relation to the Residential New Construction program. She shared that residential code updates went into effect in 2021. Program parameters and savings didn't change immediately to allow for homes that were already in the program pipeline. Program changes were implemented for projects rated after August of 2021, and builders were given ample notice. One member mentioned it would be good to see when this program is next evaluated and what builders did differently under the new code versus the old. Quentin reindicated an impact evaluation for the residential new construction program is planned for 2023.

A member said builders don't see the savings, but it would be good to share that with the buyer. Billie responded that builders now receive a certificate for their participation in the program and the home gets a sticker showing the home was built more efficiently than code. One member mentioned that many homes are being built, and a bill is being proposed to set energy conservation codes back to 2018 levels. Still, there is not enough demand from consumers for energy efficient homes. The member questioned what the company can do to educate the buyer to demand a more efficient home.

Billie provided a Multifamily Savings Program update and reminded EEAG that the company would be holding virtual meetings to discuss cost-effectiveness options going forward, and that EEAG members were invited to attend. Billie provided a lighting update, highlighting the new buydown program that was launched in late December 2021. One member asked if the program was reaching corner stores like dollar stores, as low-income customers are being pushed to dollar stores where incandescent bulbs are sold. Billie responded that grocery and corner stores would be eligible for bulbs and fixtures.

Billie provided an update that in 2022 Welcome Kits will consist of four LED bulbs at 11 lumen/watt, and two LED night light fixtures.

Billie presented a proposed plan to end the Energy House Calls (EHC) program and move the cost-effective measure – duct sealing – into the Heating and Cooling Efficiency (HCE) program. Though manufactured homes aren't eligible in HCE currently, the company plans to open the eligibility up to manufactured homes in order to transition the duct sealing measure from EHC to HCE mid-year 2022.

One member questioned if there were potential savings for single and multi-family. Billie responded that the duct sealing measure is available for other home types through HCE. One member added that allowing the duct sealing measure in the HCE program was good but concerned that low-income customers have a more challenging time coming up with the out-of-pocket costs to participate.

Billie gave an overview of the Idaho WAQC program carry-over balance. She shared the company had explored the mitigation options that were brought up at the last meeting and highlighted the company's plan to focus on re-weatherizing homes that were less than 14 years old, in order to replace old HVAC systems with heat pumps. There was additional discussion about the 85/15 split, ideas to create a pipeline for HP installers, and questions about the need to put an end date of 2025 on the proposal.

11:14 a.m. Break

11:20 a.m.-Meeting Reconvened – C&I&I Programs – Chellie Jensen

Chellie presented the top ten highlights for the 2021 Year in Review, including program updates, savings, milestones, and staff changes. Chellie is excited to have Jeff, Andee, and Curtis join the Commercial, Industrial and Irrigation team. Chellie reviewed the total program savings for multiple years with a reminder of how some programs can have large swings, depending on the duration of the construction schedules and complexity of the project. The programs are on par with years prior to 2019. In 2019, retrofits and custom projects both had a big year. Looking at 2020, custom had an all-time highest savings due to a few large mega projects.

Chellie went through individual program performance for New Construction, Retrofits, and Custom and highlighted historical savings and participation for each. Chellie provided an update regarding the Small Business Direct Install (SBDI) which had 591 project installs from the programs start.

Chellie explained that Simplot invited the company to participate in an Energy and Sustainability Scan to support them in reaching their sustainability and energy efficiency goals. The site visit consisted of talking with personnel about equipment, operations, and improvement ideas. The company shared incentives, and future cohort participation then summarized energy-saving metrics and possible incentives to the customer.

One Member commented on the energy scan. They appreciate Idaho Power's support of the activity.

Chellie discussed the Commercial Energy Saving Kits, including the number of kits distributed in 2021. The new simplified kits are being finalized, and the company anticipates availability by mid-summer.

Chellie provided an update on SEM Cohorts**.** She thanked the EEAG members for their feedback in the November meeting and mentioned that the company is in the process of designing an industrial wastewater cohort and is gauging customer interest.

Chellie went through the Irrigation Efficiency program performance and highlighted historical savings and participation. One member questioned the Irrigation Menu program. They said pressure regulators seem to wear out faster than anything and mentioned the company might look at offering incentives for just the worn-out pressure regulators rather than the whole package. Quentin responded that the program had been that way in the past but when the Regional Technical Forum (RTF) reviewed the savings, they determined that the research did not support a way to keep the savings broken apart and separated for each item.

11:48 a.m. Lunch

1:02 p.m.-Meeting Reconvened – Marketing – Annie Meyer

Annie presented the Marketing Overview. She discussed the fall residential campaigns which ran on all major channels. Annie then talked about the company's marketing tactics – Sweepstakes and newsletters, including promotions on social media, email, My Account, and the homepage.

My Account recently re-vamped, and the company anticipates a higher visitor count. Annie points out My Account is excellent for marketing because the audience is already engaging with the company online. Pop-ups are currently for Heating/Cooling.

Annie went over what is new in 2022. The company will start delving into podcast advertising as things become more digital. She discussed continuing paid segments with KTVB and the addition of seasonal bill inserts and emails with relevant tips. Looking for sponsorships with smaller colleges and other opportunities.

On the Commercial/Industrial Annie discussed some changes in the irrigation efficiency print ad (bold text) and menu form updates (easier to read).

The My Account pop-up ads will promote the Retrofits program. Working on case studies for the webpages as well as customer testimonials. There will be a Chambers of Commerce newsletter ad for Eastern region and Boise metro chamber mailing list.

One member asked about what sponsorships for schools might look like. Annie mentioned it would be similar to College of Southern Idaho where they have a banner in the gym advertising energy efficiency.

1:15 p.m.-Wrap-up/Open Discussion – All

No questions, just a comment about how the peak rewards program is coming through the Idaho Public Utility Commission.

Good meeting, thanks. I think we have gotten into the routine of doing these virtual pretty well, so thanks, everyone.

Great meeting. One question regarding marketing with My account popups. The website has more options of 'read more' and 'no thanks.' Do we track the clicks? Annie answered that the company tracks the clicks on the webpage.

Glad to be a part of the meeting. Shoutout to the marketing team. I feel like there's good visibility out there. I feel like I see Idaho Power everywhere. Glad to be part of the backend.

Thank you for the meeting today. Good information. I am looking forward to seeing a transition from suspended work and getting through the waitlists for the residential programs.

Good meeting. Just a reminder that we all know EE is important, but in the big picture, we tend to hear a lot about solar or greenhouse gas. Whatever we save, we don't have to build new resources. The basis of everything is energy efficiency.

I couldn't agree more with what the member just said. I appreciate the presentations everyone put together.

1:45 p.m.-Meeting Adjourned

Energy Efficiency Advisory Group (EEAG)
May 4, 2022

Present:

Anna Kim – Public Utilities Commission of Oregon
Alexa Sakolsky-Basquill – Office of Energy & Mineral Resources
Ben Otto – Idaho Conservation League
Connie Aschenbrenner – Idaho Power
Diego Rivas – Northwest Energy Coalition
Don Strickler – Simplot
Donn English – Idaho Public Utilities Commission
Kevin Keyt – Idaho Public Utilities Commission
Nick Saven – Idaho Public Utilities Commission
Quentin Nesbitt – Idaho Power
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Wil Gehl – City of Boise

Not Present:

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Jim Hall – WaFd Bank
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Annie Meyer – Idaho Power
Becky Arte Howell – Idaho Power
Billie McWinn* - Idaho Power
Chad Severson – Idaho Power
Cassie Koerner – Boise State
Chellie Jensen* - Idaho Power
Curtis Willis – Idaho Power
Dahl Bietz- Idaho Power
Denise Humphreys – Idaho Power
Eli Morris – Applied Energy Group
Fuong Nguyen – Applied Energy Group
Grace Wroblewski – Applied Energy Group
Heide Caswell – Oregon Public Utilities Commission
Jared Hansen* – Idaho Power
Jim Swier – Micron
Julie Rosendic – Idaho Power
Kathleen Araujo – Boise State
Kathy Yi* – Idaho Power
Kim Herb – Oregon Public Utilities Commission
Kimberly Bakalars* – Tetra Tech
Krista West – Idaho Power
Laura Conilogue – Idaho Dep of Commerce
Mark Bergum* – Tetra Tech
Melissa Thom* – Idaho Power
Michelle Toney – Idaho Power
Mindi Shodeen – Idaho Power
Neil Grigsby* – AEG
Quentin Nesbitt* – Idaho Power
Ray Short – Idaho Power
Robert Ferguson – Verizon
Rosemary Curtin – Facilitator
Shelley Martin – Idaho Power
Stephanie Wicks – St. Lukes (SLHS)
Theresa Drake – Idaho Power
Todd Greenwell – Idaho Power
Zack Thompson – Idaho Power

Note Takers:

Michelle Toney (Idaho Power) with Kathy Yi (Idaho Power)

Meeting Facilitator: Rosemary Curtin

Virtual Webex Meeting Convened at 9:32 a.m.

Rosemary opened the meeting. There were no questions or comments on the February meeting notes.

9:35 a.m. Announcements

Quentin went over agenda, who will present, and presentations subject matter.

Quentin highlighted the company filed annual DSM report with IPUC and OPUC on March 15th. Also, since the last meeting, the company received approval from both IPUC and OPUC on changes to the Demand Response programs.

9:43 AM-2021 Financials & Savings – Quentin Nesbitt

Quentin provided preliminary first Quarter financials and savings (Jan-March). Advised the NEEA evaluation is part of the IPUC 2021 prudence order, and the company is working with Avista. Quentin went over the Evaluation Schedule for all program evaluations.

9:49 AM-Residential End Use Study – Kathy Yi

Kathy presented the End Use Study: a self-reported survey to better understand residential customers and their usage by profiling various characteristics. Kathy presented high-level results and talked about survey responses. She noted the study results are utilized for the energy efficiency potential study.

One member said, one problem with all surveys, there is a bias demographic (higher income) that is more inclined to respond than others. Does the company's vendor do anything to mitigate that? Kathy responded that the company sent population and census data to vendor. The company has past survey results to see if trends are in line with what we've seen in the past. The member said, it's good you use census as a data point. Any differences between mail and email? Kathy responded there is no difference - no bias. Vendor keeping an eye on it. Survey is not opinion based, helps reduce bias a little.

One member asked, if the resistance heating is referencing electric resistant furnace or zonal? It was confirmed that it includes electric central furnace, baseboard, ceiling cables, wall heaters and radiant heat.

One member asked if we compared customers that use a heat pump for heat and those that had a heat pump for cooling. Is there a good correlation there? It was followed up that electric resistance heating is defined as electric resistance central furnace, baseboards, ceiling cables, wall heaters, and other electric zonal units.

A member is wondering if a central furnace is gas or electric? Kathy responded it can be broken to that detail. The member then asked if there's a difference between stove or fireplace? Kathy explained that it depends if supplemental natural gas is used.

Another member said, I lived in a home for a long time with two pellet stoves. How prevalent is that? It's not the same as climate zone or market. Where would it fall within these definitions? Kathy said because this is a self-reported survey, the fuel type is up to the person to choose. The member said it could potentially be listed as a stove or fireplace. Kathy reminded everyone the survey questions referenced, "What Fuel" and "What System."

10:27 AM-Residential Programs – Billie McWinn

Billie presented residential program specific updates, participation, and savings. She explained program impacts, supply chain constraints, and increased costs. Billie shared that the Energy House Calls program is no longer cost-effective and the company has a transition plan (the program will end). Billie also discussed Multi-Family and reminded everyone that the cost-effectiveness has a bleak outlook, and that the company is looking at other ways to offer energy efficiency measures to the multi-family sector. Billie reviewed the WAQC budget carry over plan to file with the commission to adjust program rules. Billie presented BRIO updates. She explained the details of the two ductless heat pumps campaigns, and customer outreach. Billie then showed an example letter sent out to customers then provided an update on the potential Marketplace programs noting that the company and vendor are still in negotiations.

One member asked about the supply chain with regards to Welcome Kits. Billie commented that the cost of materials has gone up and the Program Specialist added that product has been held in port longer than expected.

One member encourages the company to engage with the RTF if there are new measures for the multi-family program. It's important to put in a request with the RTF for those measures.

10:53 AM-Break 5 mins

11:05 AM-Marketing – Melissa Thom

Melissa introduced Julie Rosandick Marketing Specialist who is replacing Tracey Burtch.

Melissa presented the residential spring marketing campaigns. She discussed the company is using all major channels, new platforms, and target markets. Melissa presented the June Connections, showcasing an energy efficiency success story shared by a local Twin Falls couple. The annual energy efficiency guide goes out in June, and each of the demand response programs marketing materials have been updated. Melissa said the energy@work newsletter highlights the Irrigation Peak Rewards and Flex Peak programs. There were no questions.

11:10 PM-C&I&I Programs – Chellie Jensen

Chellie introduced new Program Specialists, Ray Short & Jonathan Guynes and presented an update on activities the company is doing to promote the DR programs. Chellie provided an update on enrollment for Flex Peak and for Irrigation Peak Rewards.

One member asked about repeat customers in the Flex Peak program. What are the changes and impact particulars? Chellie answered there are 134-136 participants. Some leave, some drop off. We did receive some inquiries from new customers. We are about where we've been in the past few years, but we are trying to get a higher enrollment.

Another member commented that shifting the timing to later during the day and extending the season – going to Sept 15th. The member is concerned about those unable to or won't participate. Said the numbers are good for reenrollment but will have to see how it plays out this year. The member said that it looks like numbers are really close to where we've been, and this is encouraging. Chellie said we're excited to see the results as we get near June 15th.

One member asked about when the enrollment ends. Chellie said we asked that enrollment goes through June 15th. We want resources in place. Ag Reps are calling those who haven't got their enrollment papers in. What we're seeing is normal for this time of the year.

Chellie presented the first Quarter program performance for Commercial, Industrial and Irrigation Programs. She compared each program to the total projects and savings since 2013 and discussed supply chain issues. She discussed the company's ideas and recommendations to address participation issues and asked for ideas from EEAG.

One member asked about the difference between SBDI and Retrofits. Chellie explained that SBDI is aimed at small businesses that use 24,999kWh or less per year. The contractor targets customers in this range, performs an assessment, then changes out the lights on site. Customers don't have to go out and get bids, it is at no cost for the assessment and the installation for the target customer such as small mom & pops. It's a win-win for them and they are not spending extra time to learn the "art of possible." Retrofits are primarily marketed by trade allies. There's a lighting tool used and customers or trade allies indicate the existing and the proposed fixtures and the project cost and the incentive is populated. The potential exists that some measures could get up to 100% of the project cost, and is based on savings and equipment. Very simple, but SBDI is mostly a lighting concierge service for the smallest of our customer base.

Chellie highlighted Micron's Earth Day celebration and the history between Micron and the company. A Micron representative spoke about their appreciation for the company's support and the great collaborative effort. The representative said Micron has been in the area for more than 40 years. They have a good budget to upgrade equipment and doing lots of remodeling to old buildings to replace old systems. Micron does have supply chain issues. It takes 15 to 30 weeks to get larger equipment. They are putting in orders much earlier than normal, due to long lead times. The representative said Micron is participating with Flex Peak, but their overall loads are just so big sometimes it doesn't show.

Chellie also highlighted the City of Boise street lighting project that will be completed in September 2023. She discussed the benefits of LEDs, the MWh per year saved, safety, and the controls technology. A representative of the City of Boise is excited to partner with Idaho Power. Residents have been liking the changes. The City of Boise is looking forward to getting the project completed. They are looking into DR programs as well. They appreciate the company meeting them at City Hall to do the check presentation.

11:50 PM-Lunch Break

1:06 PM-Meeting Reconvened Rosemary and Quentin

Per Quentin's request, Rosemary introduced those who joined after lunch and that IRPAC members were specifically invited to this portion of the meeting.

1:10 PM-T&D Benefits – Jared Hansen

Jared presented T&D Benefits starting with the deferral methodology explaining what makes up the energy efficiency value. He gave a T&D deferral example showing energy efficiency measures can bring down anticipated high demand that is triggering upgrades before the peak. Jared discussed the old methodology through the IRP time frame. He demonstrated the life span of an energy efficiency measure and went over the company's approach, deferral value, and iterative process.

One member said while the NWPCC council methodology is slightly different, the numbers are close to what they got. The member asked if the company is discounting over 20 years. Jared said all project costs are adjusted to current dollars and the savings occur for the deferral in the project start.

Another member questioned, depending on the savings in question, in a world with supply chain issues and inflation, would those factors persist here (do those factors impact this analysis). Jared replied that some of the forecast period is in the supply chain issue timeframe. But impacts are built into those near-term years. The member asked if a transformer cost $800,000 and there is a 2% annual inflation, is that put into any of the savings at risk? Jared said we calibrated cost of capital and used an inflation rate that was a composite of a number of years. Not as drastic as what we're seeing right now because the analysis is a longer-term look. The member questioned if T&D values are represented together is it a composite of two different numbers, or can T&D be broken out, are they calculated the same? Jared answered that they are separate numbers. Three categories (called T&D deferral) are substation, transmission, and distribution deferral. Most savings from T&D are from the distribution side. Transmission is more difficult to defer. Not as many projects and harder to quantify.

One member asked if you look at energy efficiency forecasts, is it always a load reduction or shifting? Jared said that energy efficiency measures are load decreasing. With DR, we see more of a shift. We do separate out load reduction and energy efficiency reduction. The member said in instances you're trying to defer that installation of substation. Is there a way to account the risk of future growth that otherwise would be a greenfield opportunity and increase installation cost? Jared answered that there are risks like the one you mentioned. We didn't attempt to quantify for those in this analysis. The member inquired about load shifting. Anticipating same approach if demand was shifted instead of reduction, how would you compensate a surprising alteration potential that creates another challenge for the network (would the company use a similar approach if looking at load shifting through demand response)? Jared said it could because the company tends to give attention to local peak need (DR) versus targeted system need and there could be consequences. Not part of the scope of what we're doing here.

Another member asked, are you proposing this in the 2023 IRP as current method? Jared replied that $6.73 is an input to the potential study that will be presented after today. Energy efficiency forecast is a decrement in load we must meet. The member said it seems like a big change from the previous methodology. Is there a reason we're now doing this instead of before? Jared said one member pushed him toward this before and was right. At the time, it was just a methodology change we didn't implement until this year. We didn't know the impact of the change. All this feeds into the IRP. That is why an invite was sent to IRPAC as well, to determine the needs on the system. Yes, we would be proposing the T&D deferral value would affect the IRP. The member asked, will you also be presenting this change to IRPAC? Jared answered that he is not planning on presenting but welcomes feedback. The member will follow up.

1:33 PM-Energy Efficiency Potential Study Introduction – Quentin Nesbit

Quentin introduced the two topics the Applied Energy Group (AEG) will be presenting. He went over the timeline and the purpose of the energy efficiency potential study. There were no questions.

1:38 PM-Energy Efficiency Potential Study – AEG – Neil Grigsby, Eli Morris, & Fuong Nguyen

Neil introduced the Applied Energy Group (AEG) and the team presenting. He presented the study objectives and noted that numbers shown are draft numbers for potential savings, and that the commercial, irrigation, and industrial are close and that they are still working on residential.

Eli presented the AEG's methodology, showing data collections and gave an overview of their modeling approach.

One member commented that for the 2021 power plan, they are moving away from calculating achievable potential as a max of 85% of economic potential. Are you using that assumption in this analysis? Fuong answered that achievability is based upon measure level. We have incorporated the 2021 power plan updates. Some achievable rates may be larger for measures in which increased standards a present and would hope to get near 100% of the economic potential as achievable potential.

Another member asks, did you do any different analysis based on change in building code? Our code is lower than others around us. Eli replied, we didn't model what the code would look like. We model the current building code. We don't speculate on what a new building code would look like. Councils' achievability assumptions do include some information on this, but we don't forecast codes or understand what things would look like if there were potential new code changes. If a code is improved, it would reduce savings, but it is not included in this study.

2:02 PM-Demand Response (DR) – Quentin Nesbitt

Quentin presented the introduction to the Demand Response Potential Study. He went over the timeline for the completion of the study and how will fit into IRP timeline. Quentin briefly described the company's DR programs. He reviewed the history and discussed the modifications recently approved by both commissions.

2:11 PM-Demand Response Potential Study – AEG – Maggie Buffum

Maggie presented AEG's approach to the DR potential study and mentioned they will be starting with the NWPCC DR assessment assumptions. She explained overall approach and noted the study will be specific to the company's service territory taking into account that the Idaho Power is summer peaking which is different than the rest of the NWPCC region. Therefore, it's necessary to review and modify some of the council's assumptions. She shared council assumptions on DR resource and costs.

One member commented that in the 2021 IRP, the company limited DR to 20 MW additions. Will that occur in the 2023 IRP? Quentin answered that we have not yet determined how the possible capacity additions will be modeled. We will see what the potential study shows and make some judgement calls on how to grow the programs or add potential programs. There will be some assumptions with ramp rates that could replace the '20 MW rule' that we put in place in the 2021 IRP.

Another member commented about not seeing DVR on this. Was it included as part of the study? Eli answered that it wasn't because it is not a demand side program. Maggie said they planned to look at only things on the customer side of the meter. Quentin added we have been testing and piloting DVR. The member added that there is value with DVR and recommends the company keep exploring opportunities.

One member asked if A/C load control and bring your own thermostat are two separate programs? Quentin answered it's something we have contemplated in past. There are some issues with overlap and switches being abandoned going to thermostats. This impacts overall cost effectiveness. I anticipate if we add thermostats, we will try to keep it under the A/C Cool Credit umbrella. We do believe there are substantial differences in how the programs run and the results you get between the two. AEG will be evaluating overlap, technical, and customer issues. The member then asked what is your AMI situation for your customers? Quentin answered over 99% of customers have AMI hourly interval data. The member said it helps when you think about cost. Quentin replied that is correct.

One member had a comment geared towards Jared. One of the things we worked really hard on is to account for the interaction of energy efficiency and demand response in the total NWPCC plan. Have we thought about how to do this here? Smart thermostats are an energy efficiency measure but has demand response potential as well. Heat pump water heaters as well. Getting this integration was difficult and it was not necessarily done perfectly. How are we trying to think about this? Jerad said the brief answer is we need to continue thinking about this. Energy efficiency will reduce demand in the plan. Demand response will be able to act as it naturally would for the most part. It will be built into the IRP. The member said they will follow up later with Jared.

Another member has a question about irrigation. Seeing patterns of climate change and drought, how would this impact demand response? Will it impact irrigators when temperatures are high where they would be unwilling or unable to reduce water use? Quentin said drought is something that irrigators certainly have delt with. It's not that uncommon. If farmers don't have much water, they will change crops and grow something different. That can impact our program especially later in the year. Quentin also noted that if irrigation load is down, the system load will be down as well, and there will be less potential need for DR.

2:34 PM-Break 10 mins

2:41 PM-Customer Evaluations – Tetra Tech Kimberly Bakalars & Mark Bergum

Quentin introduced Kimberly and Mark.

Kimberly presented the evaluation of 2020 custom projects for commercial and industrial efficiency program. She discussed the difference between impact and process focus then provided some background information. Kimberly went over the methodology objectives along with a follow up from previous evaluations. She reviewed impact and process steps and said the company does a great job with communicating to customers and documenting the program, resulting in good relationships. This also adds to the company's high satisfaction ratings. She also noted that customers appreciate the company's staff, and commented customers noted that incentive estimates were close to the actual final incentives.

Mark presented the impact results and recommendations stating the importance of maintaining long-term focus on cohort projects. He discussed sophisticated systems-based energy efficiency is delivered above the standard equipment improvements. He noted projects implemented with the support of the company's programs may not have occurred otherwise because customers would likely be unable to design the improvements, coordinate efforts of installation and operation and obtain engineering calculations of savings without the support from the program. Mark provided the recommendation that a consumption analysis approach for savings could be something the company look at. In his opinion the approach could provide energy savings from projects without complicated engineering reports to determine the impact of each project. There were no questions or comments.

3:15 PM-Wrap-up/Open Discussion

Rosemary asked each member if there were any questions or comments.

Very informative thank you.

No thanks. Rosemary great meeting I enjoyed everything. Amazing to see the progress over the years.

Good meeting. As far as Tech Tetra, I'll echo everything said about IPC building relationships and being trusted. It is crucial. Our incentives are about what we expect them to be and fosters our future participation. Eco industrial. One idea: we have goals for energy, water, and carbon reduction. Might it be worth figuring out metric tons co2 equivalent was also avoided with that energy savings.

Thanks very much no questions / comments.

I will echo the members thoughts on program. I think you should track the co2 equivalent. For us, it was 44,000 metric tons of co2 that was avoided in our number.

Look forward to seeing results from DR potential study and how it will impact 2023 IRP. Interested to see 2022 summer performance for demand response programs.

I really liked today's meeting and the presentations. The guests and presenters did great. Thank you.

Rosemary reminded everyone that the next meeting is Thursday, August 11th at 9:30 A.M.

3:30 PM-Adjourn

Energy Efficiency Advisory Group (EEAG)
August 11, 2022

Present:

Alexa Bouvier – Office of Energy & Mineral Resources
Aly Bean – Idaho Conservation League
Anna Kim – Public Utility Commission of Oregon
Connie Aschenbrenner – Idaho Power
Diego Rivas – Northwest Energy Coalition
Don Strickler – Simplot
Donn English – Idaho Public Utilities Commission
Evie Scrivner – Community Action Partnership
Jason Talford – Idaho Public Utilities Commission
Kevin Keyt – Idaho Public Utilities Commission
Laura Conilogue – Idaho Public Utilities Commission
Nick Sayen –Public Utility Commission of Oregon
Quentin Nesbitt – Idaho Power
Sid Erwin – Idaho Irrigation Pumpers Association
Taylor Thomas – Idaho Public Utilities Commission
Tina Jayaweera – Northwest Power & Conservation Council
Wil Gehl – City of Boise

Not Present:

Jim Hall – WaFd Bank
Marissa Warren – Office of Energy & Mineral Recourses

Guests and Presenters*:

Andrea Simmonsen – Idaho Power
Annie Meyer* – Idaho Power
Becky Arte Howell – Idaho Power
Billie McWinn* - Idaho Power
Chad Severson – Idaho Power
Chad Ihrig – Google Nest
Chellie Jensen* - Idaho Power
Curtis Willis – Idaho Power
Dahl Bietz- Idaho Power
Denise Humphreys – Idaho Power
Gavin Hamilton – Idaho Power
Jeff Rigby* – Idaho Power
Julie Rosandick – Idaho Power
Kathy Yi* – Idaho Power
Kevin Kitz – KitzWorks Llc
Melissa Thom – Idaho Power
Michelle Toney – Idaho Power
Mindi Shodeen – Idaho Power
Ray Short – Idaho Power
Rosemary Curtin – Facilitator
Shelley Martin – Idaho Power
Theresa Drake – Idaho Power
Tracey Burtch* – Idaho Power
Todd Greenwell – Idaho Power
Tracey Burtch* – Idaho Power
Zack Thompson – Idaho Power

Note Takers:

Michelle Toney and Kathy Yi – Idaho Power

Meeting Facilitator: Rosemary Curtin

Virtual Webex Meeting Convened at 9:32 a.m.

Rosemary convened the meeting and led introductions.

9:37 AM-Announcements

Quentin reviewed the agenda. There were no questions or comments about the May 2022 meeting notes or the August agenda.

9:40 AM-2022 Financials & Savings – Quentin Nesbitt

Quentin presented DSM savings and costs by sector and program from January through June 2022. He also provided an overview of the program evaluation schedule. In addition, Quentin mentioned the company has sent out an RFP for selecting contractors for the 2023 evaluations.

One member had a question about the "Other Evaluation" category specifically mentioning the DR programs and whether the company is doing Impact Evaluations. Quentin said DR evaluations are done every year and include the impact of the program and that the reports are included in Appendix 2 of the annual DSM report. The "Other Category" is to indicate it wasn't done by a third party.

9:55 AM-Cost Effectiveness – Kathy Yi

Kathy presented the DSM program's cost-effectiveness (by sector) with a deeper dive on some specific programs. She provided an update on the Heating & Cooling Efficiency (HCE), and a refresher on how lower savings for Ductless and Air Source Heat Pumps (HP) are impacting the programs cost-effectiveness. Kathy reviewed the new 2023 federal standard for Air Source HPs and impacts on the program, then went over the company's next steps. She discussed the changes in lighting and the impacts to efficiency potential due to the Energy Independence and Security Act (EISA) and the Department of Energy's (DOE) 2019 final rule.

Discussion and Questions:

<u>Small Business Direct Install (SBDI) program</u>

One member asked about what makes SBDI more cost-effective from the Total Resource Cost (TRC) perspective and specifically why the benefit is higher under that test. Kathy said the TRC includes an additional 10% conservation benefit as well as non-energy benefits. The member then asked if Idaho Power is expecting SBDI to be borderline cost-effective because of increased costs and whether we expect higher savings due to the larger population of small businesses in the treasure valley, mentioning that is seems the economies of scale would improve with larger populations. Kathy said it's hard to predict, but that cost effectiveness is more affected by the type of lights being replaced more than the total overall number.

Another member questioned if it's possible to continue the SBDI program because small business is a class of customers that are harder to reach. Getting guaranteed savings with direct installs is a huge benefit. Quentin commented that this program was designed to roll across the service area before March 2023. All small business customers have had at least one chance to participate.

One member asked about the SBDI details including the top three costs that rose faster than expected and identify then breakdown a few problematic areas. Kathy said she doesn't have the specific breakdown of costs. Quentin said that we contract with a third-party vendor therefore, we don't see the specific costs, but they are saying they're experiencing cost issues and will not be able to renew the contract at the current price.

Another member asked what the average cost of an SBDI install is. Kathy answered that she's only looked at the total numbers and hasn't looked at the per-project numbers yet.

<u>Residential Heating & Cooling Efficiency</u>

One member said the RTF found HPs installation practices are very impactful on savings. Some are installed in homes with gas heat, to supplement cooling, which results in low or negative savings. It seems the company requires the minimum HSPF standard for air source HPs for an incentive. Kathy said this is correct and electric heat is required and the incentive is based on the higher HSPF. The new standards change the baseline, so we claim less savings. Another member stated they see this as a factor in the C&I space as well.

A guest asked if the company would consider smart thermostats in conjunction with a hybrid heat pump with gas backup system. Billie proposed the Program Specialist and guest connect outside the EEAG forum for a detailed discussion about program strategies for HPs and smart thermostats.

<u>Lighting</u>

One member asked about the programs affected by the EISA, when the contract with the lighting vendor ends, and whether the types of bulbs can be updated mid-contract. Kathy said our current residential lighting by down ends this year and added that Chellie would present on some commercial program impacts also.

There was a question about if the savings is higher with LED fixtures versus a screw-in LED. Kathy answered that the company does have fixtures in the programs, but it is an area that isn't fully transformed yet. We could potentially offer incentives but if we don't have a specific Buy-Down program, it could impact how we can offer an incentive. We may be able to offer incentives through the new Marketplace Program.

10:40 AM-Break 10 mins

10:50 AM-Residential Programs – Billie McWinn

Billie presented an overview of the programs in terms of savings and participation, noting she will be seeking feedback for the Lighting Buy-Down program. Billie then showed program updates on Multifamily Savings, Welcome Kits, Lighting Buy-Down, Home Energy Reports (HER), AC Cool Credit DR program (ACCC), and the Marketplace.

Discussion & Questions:

Welcome Kits

One member asked if the company could include thermostatic shower valves (TSV) in the Welcome Kits. Billie said the kits go to all customers and the savings from TSVs can only be claimed if the customer has an electric water heater. Denise added TSVs are expensive. Another question was if there is anything in the student kits that could be incorporated. Denise provided an overview of the kit's contents and said the savings are minimal, but we are exploring ideas with the vendor.

Another member asked if the energy efficiency tips can be added to the kits. Denise said the education flip book includes that information, and the book is updated annually to reflect any program or other changes.

One member had a question about the packaging being adjusted for kits in 2023. Denise responded that the box is going to change but that does not reduce the shipping costs. We are exploring options for other shippers at a lower cost.

Another member asked if the company tracks the participation in other energy savings programs from customers that receive Welcome Kits. Billie said we don't have direct tracking in place. The member asked if there was a follow-up survey about possible changes in usage. Denise said new customers wouldn't see that change because there is no comparison of historic bills.

Lighting Buy-Down

One member questioned if the Buy-Down Program is cost-effective. Billie said yes. The member pointed out a clean break at the end of 2022 may be more straightforward because while there are potential saving opportunities into 2023, it could get messy in terms of evaluating the programs cost effectiveness.

Another member commented, retailers may try to exhaust their inventory of cheaper inefficient bulbs, it makes sense to try to counteract that and continue the program into 2023. Perhaps reducing the Buy-Down amount could potentially give the lower income customers a glide path to help with the higher cost without the buydown.

There was another question about other utilities or co-ops in Idaho and where they are targeting lighting incentives beyond 2022. Billie said our vendor does run other programs in the region and we engage with them.

Another member said that if the Buy-Down Program is cost-effective, they would prefer continuing it into 2023, because in rural areas, there are smaller businesses and high inflation over the past several months.

HER Program

One member said they received their HER report and asked if changes in weather are accounted for in the savings. Denise said comparisons are from the same area that experience the same weather.

Another member asked if the HER is an opt-out program, and whether there has been a decline in participation. Billie confirmed it is an opt-out program and affirmed that participation decreases over time is due to attrition. The member asked if there's an attempt to backfill those participants. Billie said the treatment and control groups must start at the same point to be able to make a comparison. Denise added, at the start of the program, all residential customers with adequate meter history were included in the participant pool. The company continues to monitor customer eligibility, but currently, there's not enough residential customers meeting the criteria to create a new treatment and control group.

AC Cool Credit DR program

One member asked if Idaho Power is considering a Bring-Your-Own Thermostat (BYOT) program. Billie said we are monitoring that. The member also asked if the company would stop using the switch if it added a BYOT program. Billie advised no, because the current switch option is a cost that is already invested. Billie also added that a BYOT program would require a considerable investment in the control interface for our load-serving operations.

Another member asked about the cost per switch and the current Smart Thermostat incentive. The company responded that the cost of the switch is $165, which is based on buying in volume, and the Idaho Power incentive for a Smart Thermostat in the H&C Efficiency program is $75.

Marketplace

One member asked about how local smaller retailers participate in Marketplace. Mindi said the Marketplace tool can provide a list of the local stores that carry the product. However, retailers that want to list what their daily price for products are, would need to provide a file of all product model numbers and prices daily.

11:35 AM-Marketing – Annie Meyer

Annie provided marketing updates for all sectors highlighting residential A/C Cool Credit, smart summer contest, EE awareness campaigns, and commercial and industrial EE incentives.

One member suggested the Marketplace timing to be up and running prior to Black Friday/Cyber Monday/holiday season and mentioned Idaho Power could leverage those retailer/OEM promotions. Melissa responded yes, that is our hope to get it going by then.

12:00 PM-Lunch Break 1 HR

1:00 PM-My Account – Tracey Burtch

Tracey's presentation covered the My Account default view for homes and businesses, showing daily use with temperatures and how to use the features. She also demonstrated the ease of adding information to the home profile and the information and tips My Account will provide in the savings center. Tracey then showed how customers could sign up for alerts. There were no questions or comments.

1:12 PM-C&I&I Programs – Chellie Jensen

Chellie provided year-to-date savings and participation for the commercial, industrial, and irrigation programs. She also highlighted the 2022 DR participation compared to 2021 and showed the event days so far this season.

Discussion & Questions:

Irrigation Program

One member wanted to know what drove the program reduction in participation. Chellie said Ag Reps found many reasons for the change in participation, but we expect to know more post-season. The member added, there was a higher loss of MW than sites. Chellie said we did lose large MW participants but gained a lot of smaller ones. Quentin added the reduction in participation was related to the impact of the program changes.

Energy Efficiency Savings

One member asked if there is a good pipeline of projects for the programs. Chellie said we have a good pipeline for Custom Projects, not as good for Retrofits and pretty good for New Construction. For the New Construction program, it's been difficult to get architects and engineers to engage. There is a lumpiness in savings, but if you look at the second half of last year, it's the same rate of savings as the first half of this year. It doesn't look like we'll get to 2021 total savings level, but we could get a few large projects in 2022 that would change things.

Another member inquired if the 2022 numbers should be read as YTD or only Q2. Chellie said the numbers reflect the first half of the year (YTD).

Commercial Savings Kits

One member asked about the measure life on the LEDs. Kathy said this was the estimate of how long the previous life would last. She explained how the company settled on the savings claimed and added that a third-party is currently evaluating. The member inquired about the exit signs and aerators. Kathy said they have different measure lives.

2:00 PM-Engaging With C&I Customers – Jeff Rigby

Jeff discussed the company's engagement with large power customers through the company's Key Account Energy Advisors (KAEA). He presented the number of Idaho Power KAEAs, their role, the type of support they provide, and how they help find opportunities for energy efficiency and to influence customer participation in the company's energy efficiency programs. Jeff also gave examples of EE projects that KAEAs helped with.

Discussion & Questions:

One member asked if the company has Tribal Governments or Reservations in the service area and would those be considered Key Accounts. Jeff said we have one in the Pocatello area, but to be a Key Account, and have an assigned KAEA, depends on if the business falls into the 1 MW or greater demand. The member added, is there any specialized outreach to those entities that might be harder to get involved in these programs. Jeff said that we are consistent across the board with our Key Accounts, but we could be missing other program opportunities. Connie added, we do have a lot of engagement with our cities and have a team who maintains those close relationships. The member stated the question is more about the tribal territories than cities. Connie added that we do have engagement with local tribal communities.

2:25 PM-Wrap-up/Open Discussion – All

Rosemary reminded the group that the next EEAG meeting was November 17th.

Quentin provided an update on some of the responses from the members regarding meeting preference (in person or virtual) but would like to hear from the rest of the group.

Rosemary then gave each member an opportunity to ask questions or to make their final comments.

Members comments:

Appreciate it today. All the discussions and responses to my questions. Nothing to add, but thanks for everybody's time.

No final questions. Thank you for entertaining my questions that I had.

No additional comments for me. Thank you for the informative and enjoyable meeting. I appreciate it.

Thanks everyone. No final questions. Just know it's challenging times and I appreciate everybody working hard and trying to get through it and moving forward. So, thank you.

I do want to thank you for the presentations today. Very informative and some changes going on due to the lighting. Appreciate active management. Thank you.

I believe you answered all my questions. It was very informative, and you were specific about everything.

Quentin added that he very much appreciates the time each member takes out of their day to help us.

3:00 PM-Adjourn

Energy Efficiency Advisory Group (EEAG)
November 17, 2022

Present

Alexa Bouvier – Office of Energy & Mineral Resources
Brad Heusinkveld – Idaho Conservation League
Connie Aschenbrenner – Idaho Power
Diego Rivas – Northwest Energy Coalition
Don Strickler – Simplot
Evie Scrivner – Community Action Partnership
Jim Hall – WaFd Bank
Quentin Nesbitt – Idaho Power
Sid Erwin – Idaho Irrigation Pumpers Association
Taylor Thomas – Idaho Public Utilities Commission
Tina Jayaweera – Northwest Power & Conservation Council
Wil Gehl – City of Boise

Not Present:

Anna Kim – Public Utility Commission of Oregon
Donn English – Idaho Public Utilities Commission
Marissa Warren – Office of Energy & Mineral Resources

Guests and Presenters*:

Andrea Simmonsen – Idaho Power
Annie Meyer – Idaho Power
Becky Arte Howell – Idaho Power
Billie McWinn* - Idaho Power
Chellie Jensen* - Idaho Power
Curtis Willis – Idaho Power
Dahl Bietz – Idaho Power
Denise Humphreys – Idaho Power
Eli Morris – Applied Energy Group
Eric Shierman - PUC of Oregon
Jason Talford – Idaho Public Utilities Commission
Jared Hansen – Idaho Power
Jeff Rigby – Idaho Power
Jordan Prassinos – Idaho Power
Julie Rosandick* – Idaho Power
Kathy Yi* – Idaho Power
Kevin Keyt – Idaho Public Utilities Commission
Kimberly Loskot – Idaho Public Utilities Commission
Krista West – Idaho Power
Laura Conilogue – Idaho Public Utilities Commission
Landon Barber – Idaho Power
Maggie Buffum – Applied Energy Group
Michelle Toney – Idaho Power
Mindi Shodeen – Idaho Power
Nathan Black – Idaho Power
Nick Sayen –Public Utility Commission of Oregon
Rosemary Curtin – Facilitator
Shelley Martin – Idaho Power
Theresa Drake – Idaho Power
Todd Greenwell – Idaho Power
Zack Thompson – Idaho Power

Note Takers: Michelle Toney and Kathy Yi – Idaho Power

Meeting Facilitator: Rosemary Curtin

Virtual Webex Meeting Convened at 9:33 a.m.

Rosemary convened the meeting and led introductions.

9:35 AM-Announcements

Quentin went over the agenda. There were no questions or comments about the August 2022 meeting notes or the November agenda. He introduced the newest member to EEAG, Brad Heusinkveld (representing ICL). Quentin added the February 2023 meeting will likely be in person and that the plan for the remaining 2023 meetings will be virtual.

Connie shared that the IPUC approved the prudence request for 2021 expenses and acknowledged the EEAG contributions to the success of Idaho Power's programs.

9:40 AM-2022 Financials & Savings – Quentin Nesbitt

Quentin presented the DSM savings and costs by sector and program from January through September 2022. He also provided an overview of the program evaluation plans and specific evaluations to be done in 2023 then asked for any feedback.

Questions & Comments:

One member asked if the company is going to separate out expenses from the carryover funding for HVAC systems from normal WAQC expenses in our reporting, noting it would be helpful for those to be separated out. Billie said those costs will be broken out in the annual report.

9:52 AM-Cost Effectiveness – Kathy Yi

Kathy presented the DSM program's cost-effectiveness (by sector) with a deeper dive on some specific programs. Kathy went into detail on Commercial Energy Saving Kits (ESK) and discussed several anticipated changes to the savings assumptions in programs such as Green Motors Rewinds, Heating & Cooling Efficiency, Shade Tree, and Weatherization programs. Kathy presented the Energy Independence & Security Act (EISA) timeline and standards then highlighted those programs that would be affected by EISA with a deeper dive on Student Kits and C&I Retrofits.

Discussion and Questions:

<u>Lighting</u>

One member asked if one of the purposes of evaluations is to compare measure weightings to the Technical Reference Manual (TRM) and whether those weightings are adjusted after the evaluation. Kathy said the evaluators do check the TRM numbers but she's unsure if they check the underlying weightings. Kathy indicated she would follow up directly after the meeting. Kathy followed up with the member through email after the meeting saying that the weightings for YTD numbers show some building types of weights are close to what we currently have in the TRM (retail and office for example), and other building types seem off (manufacturing and schools for example) and could still be experiencing lingering impacts from COVID. Also noting weightings mostly impact the HVAC measures and we don't have many HVAC projects that come through, most projects are lighting which is a straightforward calculation. She also noted that rechecking the weightings with multiple years of data to absorb and any COVID impacts will be on our to-do list when we update the TRM or have our next program evaluation.

Avoided Costs

One member asked how avoided costs are decreasing despite a recent filing showing increasing forecast prices for natural gas. Kathy said she is not familiar with the filing, but avoided costs are based on the company's Integrated Resource Plan (IRP) and forecasted gas prices are part of the avoided costs. She added that it is important not to make program changes too quick, however, if a program is not cost-effective for a particular year, then the company might factor in other considerations. Quentin added it is the company's practice to use acknowledged IRPs and if we see a program not cost-effective but know an update will increase the avoided costs, we will consider that before we make changes.

There was a question about the major driver of the avoided costs flattening out in the IRP. Quentin explained that the high-level reason is the impact of renewable resources. Another member agreed and added that the avoided costs that Kathy presented are annualized costs, but the shorter-term costs and load shapes are starting to change with the growth of certain renewables. The member used the California Duck Curve example to demonstrate the stress on the system due to the evening ramp.

EISA

One member asked for clarification about the July 1st enforcement date. Kathy said enforcement is progressive, expected by July 1st, but compliance can't be predicted. The member asked how the commercial kits will be cost-effective in 2023 compared to 2022. Kathy said she is waiting for the final result of the evaluation to determine the kit savings for 2022, but the new kit vendor had a late start with the new design and there have been fixed costs incurred this year which is why it won't be cost-effective this year. The evaluator recommended updating the savings using survey results. This could lead to 2023 being cost-effective if future survey results show higher installation rates.

Another member asked what assumptions are made for future savings and if they are strictly based on the life of the bulb. Kathy said the measure is based on the life of the bulb but because of the new standards, at some point when people replace them, they will have no choice but to get an efficient bulb anyway.

Home Energy Reports

One member asked about the Home Energy Reports one-year program life. Kathy explained that HERs have a one-year life because we send reports every year and claim annual savings. At some point, the program will end, and we will stop sending out reports. However, research shows that savings will continue to persist after customers stop receiving the reports. These savings are not reflected in the one-year life view.

10:35 AM-Break 10 mins

10:46 AM-Residential Programs – Billie McWinn

Billie presented the overall health of the residential programs in terms of YTD savings. She discussed program impacts from EISA and the Shade Tree program changes.

Discussion & Questions:

There was a question about the saving goals for each year and whether the company achieved its goal in 2021. Billie said savings are broken down by program then by the sector and she is presenting only the residential portfolio. Quentin added our goals are set based on the Energy Efficiency Potential Study and the company achieved its total savings goal in 2021.

Lighting Buy Down

One member asked how the company knows what bulbs are in the stores. Billie said that the program specialist monitors the stores. The member suggested the company also look at the NEEA shelf study.

Welcome Kits

One member asked what will occur after July in the welcome kits. Billie said that we anticipate the kits will contain two lightbulbs and two nightlights but will not claim savings for the lightbulbs beyond July. Funds will be associated with the Education Initiative.

Another member asked why showerheads were removed from the kits. Kathy said the welcome kits had only lighting and noted it was the Energy Saving Kits that had showerheads for customers with electric water heaters. Billie added that the company is always looking for new energy-saving widgets to include. The member added, with electrification, the company may want to look at other measures.

Multifamily

One member asked if the company has already started to close the Multifamily program. Billie said the program ends December 31st and the vendors have been notified.

Shade Tree

One member commented that the smaller trees will grow into the same size as the larger trees and asked how the company accounts for that longer measure and how will the company differentiate the lifespan of the trees (when they finish growing). Kathy said we adjusted the calculator out one year and the evaluation and audit will help us figure out what happened to those trees. She explained how contractors go out and look at the trees based on the customers program application that has a map of where the trees are located. If the trees aren't where the customer said, the auditors go back and recalculate. They will then gather all the data and come up with the new savings.

11:00 AM-C&I&I Programs – Chellie Jensen

Chellie provided year-to-date updates (preliminary) participation and savings numbers, changes, and challenges, for the commercial, industrial, and irrigation programs. Chellie discussed the Small Business Direct Install challenges, reminding EEAG that the program ends in March. She discussed the Custom Project pipeline, the Industrial Wastewater Cohort, and the Find and Fix program. She then noted that some industrial training is back in person, but we are also offering hybrid training. There were no questions or comments.

11:26 AM-Marketing – Julie Rosandick

Julie provided an overview of Program Marketing, she discussed the DR thank you letters, postcards and print materials, Shade Tree, the contest results, College of Idaho signage, Fall Energy Efficiency residential campaign and the marketing campaign of "Joulie and Wattson" retiring. She showed the new Commercial ESK and Custom Projects flyers. Julie also discussed the latest Energy @Work newsletter for C&I customers.

Discussion & Questions:

Demand Response Marketing

One member highly encourages the company to have the VP or president sign the Irrigation Peak Rewards thank you letters to show how grateful the company is for DR participation. Julie said the company will consider the request. The member asked if there will be more marketing to irrigators. Julie said we will look at other marketing ideas and would like to collaborate further outside of EEAG.

Changes in Programs

One member asked how the marketing materials reflect changes within the programs. Julie said the marketing materials are reviewed by each program specialist with each program change. Annie added that the Corporate Communications and Customer Relations & Energy Efficiency groups frequently meet to discuss program changes. Quentin clarified that in some situations a direct letter is sent to all potential participants, depending on the type of change and how it may affect participation. It is the company's intent to give customers time to respond to program changes. Finally, Chellie added that on the commercial side, we also use our field staff the Key Account Energy Advisors and Energy Advisors to connect with customers directly.

11:39 AM-Lunch 1 Hour

1:00 PM-2022 DR Season Results – Billie McWinn – Chellie Jensen

Billie presented the residential A/C Cool Credit Demand Response (DR) program, discussing participants, enrollment levels, and 2022 event results.

Chellie presented the C&I Flex Peak and Irrigation Peak Rewards DR programs event results. Chellie highlighted some of our marketing and customer engagement on these programs.

Discussion & Questions:

A/C Cool Credit

One member asked why the projected participation declined. Billie said this is just a predictive model from Excel looking at historical numbers. It's purely based on the last four-year trend and not any other insight.

Another member asked if the company reaches out to customers who no longer participate and find out why they opted out. Billie said the drop out number is small in comparison to the attrition due to customers moving out of homes. Generally, there are only small amounts of opt outs per event because the program tends to be one where customers sign-up and forget. When people move, they sometimes come back to the program, but that occurs most common when they move into a house with the switch already installed. She noted there are many participants who may move out of the area or into a home that may not be eligible as there are limiting factors that prevent them from participating.

The member also asked if the company is considering thermostat-based rather than a switch-based program. Regarding a thermostat Program, Billie said that the company has been meeting with vendors and getting price quotes. Quentin will also cover this subject in the next presentation.

Another member asked if the capacity in the program has been close to what it's been in the past. Billie said at one point we had almost double the number of participants we have, and that program capacity is completely dependent on the number of participants we have enrolled.

Irrigation

One member asked how the later-hour option called Group D is broken out. Chellie said Groups A, B, and C are broken out by region. Group D is the latter option, meaning we can call events up until 11 pm which offers a higher variable incentive, so a participant could be in any region. The member then asked if the company has considered breaking out groups by crop. Quentin explained we have considered that in the past, however that can be complicated. If groups were set by crops, it would have to change every year by site (depending on what the customer planted) and it is not uncommon for one system to irrigate multiple crop types. Quentin also pointed out that it is up to the farmer to consider their crop when looking at whether to participate in the program.

Another member asked about the breakdown between manual and automatic participants. Quentin responded that the number of manual customers is small, approximately 20 customers on 40 sites, however the load is a significant portion of the program at around 60MW of potential reduction. The DSM annual report will have the participation information in detail. The member asked if there are issues with manual participants. Chellie responded that they participate well and have a high realization rate during events.

One member requested clarification about the minimum number of events and asked if the program is economically dispatched. Quentin said there are multiple factors considered for dispatching and market price is one but not the purpose of the program. The main purpose is peak capacity. The minimum number of events also enables the program to regularly test its capabilities. We still have a minimum of three events, but the difference is that the variable payment doesn't kick in until the fifth event. Our Load Serving Operations group ultimately decides when the program is used, however the Customer Relations and Energy Efficiency department also advises on event timing. The main purpose of the program is for when there aren't other options for resources including the open market.

Another member requested clarification about the event times for the groups and if those events would have been possible prior to the program parameter changes this year. Chellie explained many events went to 10 pm which is new, and Group D had the potential to go to 11 pm. The member then asked if the late option has sites with automatic restart switches and if we track specifically why those customers are willing to participate in the late evening hours. Quentin said we have not asked for that information, but know it is dependent on the customers willingness or ability to go out and turn their systems back on and how easy or hard it is for them to do that, so we know automation has a lot to do with it.

Flex Peak

One member asked about the July event that was called and then later canceled. Chellie said that this did not impact customer participation for the remainder of the season, but we are aware it can negatively affect some customers, she added that the company having the ability to cancel events is an important feature as system conditions can sometimes change quickly.

One member asked if the later hours were a hurdle for the commercial/industrial customers. Another member responded that for their company there wasn't any negative feedback or issues. However, they had heard from the farm side of their company, when there's a late irrigation event, they still need to check pumps to ensure they come back on. That does cause overtime for the labor, so some fields have been opted out of participating in the program.

1:38 PM-DR Potential Study & EE Potential Study – AEG – Quentin Nesbitt

Quentin presented the potential study results for both DR and Energy Efficiency (EE). He discussed how the company utilizes the studies in its IRP. Quentin introduced AEG, hired to complete the studies, and said Eli Morris and Maggie Buffum from AEG were available to answer detailed questions on the studies.

Discussion & Questions:

One member asked about the assumptions and costs used to model the pricing-based DR programs. Quentin answered that this includes the fixed and variable costs, software, admin, and incentives. We look at the differential of the rate as being an incentive and include that in the costs.

Another member asked if the study accounts for the overlap in A/C switches and a Bring Your Own Thermostat (BYOT) program. Quentin answered that AEG did account for this, and in their study gave priority to the switches but recognized that there are customers that would not participate in A/C but would participate in BYOT. The member then asked if the BYOT overlapped other EE opportunities or measures. Eli answered that they did model the assumption that smart thermostats would grow over time, but they did not model the cost coincidence between EE/DR. The member asked if the $92 for the BYOT program is a fixed cost. Quentin said it is an all-inclusive cost and includes software, incentives, and the cost that Idaho Power would have to incur to go through a third-party vendor to get access to the thermostats. All costs are gathered up and the $92 is levelized over the life of the program. Eli added, it's levelized over a 20-year period.

One member asked if the DR program estimated costs included fixed costs underlying adoption of each program. Quentin answered that all aspects of each of the program's costs are estimated, including startup, vendor costs, and customer incentive costs. The member then asked if sunk costs of the DR programs are already accounted for. Quentin responded that those costs are not included, only estimated costs going forward are included.

Another member asked if the study looked at DR as a flexible resource. Jared said the company is modeling DR differently than in the past and asked for clarification on what aspect of flexibility is being referred to. The member said mostly due to significant ramping and the duck curve. Jared answered that the primary point of analysis surrounds the timing of the net peak. The member then asked why the grid enabled water heater is so expensive. Eli responded that this is due to the underlying assumptions and that there are high fixed costs being spread over a small number of units.

A guest asked how the costs are impacted by the assumption of how many events are called per season. Quentin answered depends on the program design. Our existing programs have fixed incentives, and then a variable incentive for our C&I and irrigation program after the 4th event. The costs assume full use of the programs. The guest then asked if this includes more costs than a supply side resource shown in the IRP information. Jared said that it depends on the data in the IRP, but that capacity and operating costs are considered in the IRP. Jared also said the more cost-effective supply side resources tend to be closer to the $50 per kW range but added that it is not always a perfect comparison from the numbers alone due to inherent differences in operating characteristics and timing availability of each resource.

2:14 PM-Wrap-up/Open Discussion – All

Quentin discussed future meetings. Our current plan for 2023 is one in person and three virtual meetings and stated that the plan is to have the February meeting in person, but we will continue to evaluate. He noted that we will send out a Doodle poll in December to narrow down the dates for 2023.

Rosemary asked everyone if there were any comments or further questions.

There we no further questions or comments.

2:16 PM-Adjourn

NEEA MARKET EFFECTS EVALUATIONS

Report Title	Sector	Analysis Performed By	Study Manager
2018 Washington State Energy Code Energy Savings Analysis for Nonresidential Buildings	Commercial	NORESCO	NEEA
Advanced Water Heating Specification	Residential	NEEA	NEEA
Analysis of Expanded Efficiency Parameters for Very High Efficiency DOAS	Commercial	Red Car Analytics	NEEA
Building Commissioning—2021 Long Term Monitoring and Tracking Report	Commercial	The Cadmus Group	NEEA
Commercial Boilers Standard Evaluation	Commercial	Michaels Energy	NEEA
Commercial HPWH Qualified Products List	Commercial	NEEA	NEEA
CTA-2045 Water Heater Demonstration Project	Residential	BPA	NEEA
Demand Response of Residential HVAC	Residential	Cadeo Group	NEEA
Efficient Rooftop Unit Tiers Market Research	Commercial	D + R International	NEEA
Energy Savings from Efficient Rooftop Units in Heating Dominated Climates	Commercial	Cadeo Group and Big Ladder Software	NEEA
ENERGY STAR Top-Load Clothes Washer Naturally Occurring Baseline Review	Residential	Apex Analytics	NEEA
Extended Motor Products Pump and Circulator Manufacturers' Representative Pilot: Market Test Assessment	Commercial	Johnson Consulting Group	NEEA
Extended Motor Products Regional Market Share Study	Commercial	ADM Associates	NEEA
Gas-Fired Rooftop Unit Efficiency Testing Task 3 Report	Commercial	NRCan	NEEA
Green Motor Rewinds—2021 Long-Term Monitoring and Tracking Report	Commercial	The Cadmus Group	NEEA
Heat Pump and Air Conditioner Efficiency Ratings: Why Metrics Matter	Residential	Bruce Harley Energy Consulting	NEEA
Heat Pump Water Heater Benefit/Cost Model Review	Residential	Larson Energy Research	NEEA
Heat Pump Water Heaters in Small Spaces Lab Testing: “The Amazing Shrinking Room”	Residential	Larson Energy Research and Cascade Engineering Services	NEEA
High-Performance Windows Market Characterization Study	Residential and Commercial	Cadeo Group	NEEA
NEEA 2023 Operations Plan	Residential and Commercial	NEEA	NEEA
NEEA Q1 2022 Codes and Standards Newsletter	Residential and Commercial	NEEA	NEEA
NEEA Q1 2022 Market Progress Report	Residential and Commercial	NEEA	NEEA
NEEA Q1 2022 Quarterly Report	Residential and Commercial	NEEA	NEEA
NEEA Q2 2022 Codes and Standards Newsletter	Residential and Commercial	NEEA	NEEA
NEEA Q2 2022 Market Progress Report	Residential and Commercial	NEEA	NEEA
NEEA Q2 2022 Quarterly Report	Residential and Commercial	NEEA	NEEA

Report Title	Sector	Analysis Performed By	Study Manager
NEEA Q3 2022 Codes Standards and New Construction Newsletter	Residential and Commercial	NEEA	NEEA
NEEA Q3 2022 Market Progress Report	Residential and Commercial	NEEA	NEEA
NEEA Q3 2022 Quarterly Report	Residential and Commercial	NEEA	NEEA
NEEA Q4 2021 Codes and Standards Newsletter	Residential and Commercial	NEEA	NEEA
NEEA Q4 2021 Quarterly Report	Residential and Commercial	NEEA	NEEA
NEEA Washington Energy Code Study—Frequently Asked Questions	Residential and Commercial	TRC	NEEA
Northwest Heat Pump Water Heater Market Progress Evaluation Report #6	Residential	NMR Group	NEEA
Perfect Pairings? Testing the Energy Efficiency of Matched Washer-Dryer Sets	Residential	Kannah Consulting	NEEA
Plug-In Heat Pump Water Heaters: An Early Look to 120-Volt Products	Residential	Larson Energy Research and Cascade Engineering Services	NEEA
Power Drive System Retrofit Opportunities in the Northwest	Commercial	Cadeo Group	NEEA
Pricing Research for Efficient Water Heaters	Residential	Lieberman Research Group and ILLUME Advising	NEEA
Pump Energy Rating Label Awareness and Use Study	Commercial	Johnson Consulting Group	NEEA
Q1 2022 Emerging Technology Newsletter	Residential and Commercial	NEEA	NEEA
Q1 2022 Market Research and Evaluation Newsletter	Residential and Commercial	NEEA	NEEA
Q2 2022 Emerging Technology Newsletter	Residential and Commercial	NEEA	NEEA
Q2 2022 Market Research and Evaluations Newsletter	Residential and Commercial	NEEA	NEEA
Q3 2022 Emerging Technology Newsletter	Residential and Commercial	NEEA	NEEA
Q3 2022 Market Research and Evaluation Newsletter	Residential and Commercial	NEEA	NEEA
Q4 2021 Emerging Technology Newsletter	Residential and Commercial	NEEA	NEEA
Q4 2022 Market Research and Evaluation Newsletter	Residential and Commercial	NEEA	NEEA
RBSA 2022 Webinar #4 Slides	Residential	Evergreen Economics	NEEA
RBSA 2022 Webinar #5 Slides	Residential	NEEA	NEEA
RBSA 2022 Webinar #6 Slides	Residential	Evergreen Economics	NEEA
Refrigerator and Freezer Influence Assessment and Baseline Review	Residential	Apex Analytics	NEEA
Residential Heat Pump Water Heater Qualified Products List	Residential	NEEA	NEEA
Residential HVAC Contractor Market Research	Residential	Lieberman Research	NEEA

Report Title	Sector	Analysis Performed By	Study Manager
Review of Market Share Forecast and Key Assumptions for Efficient Rooftop Units	Commercial	Cadeo Group	NEEA
Review of Market Share Forecast and Key Assumptions for VHE DOAS	Commercial	The Cadmus Group	NEEA
Room Air Conditioners: ENERGY STAR Most Efficient Influence Evaluation and Baseline Assumptions Review	Residential	TRC Engineers	NEEA
Study of Influences on Northwest Variable Speed Heat Pump Adoption	Residential and Commercial	Lieberman Research Group	NEEA
Summary of Field Evaluation of Non-Glass Interior Secondary Window Attachments	Commercial	Pacific Northwest National Laboratory	NEEA
Televisions: ENERGY STAR Version 9 Specification Influence Assessment and Baseline Assumptions Review	Residential	TRC Engineers	NEEA
Uninterruptible Power Supplies Standard Evaluation	Commercial	Michaels Energy	NEEA
Variable Speed Heat Pump Product Assessment and Analysis	Residential	Center for Energy and Environment	NEEA
Variable Speed Heat Pumps – Technical Best Practices Gap Analysis	Residential	TRC Engineers	NEEA
VHE DOAS Commercial Building Decision Makers Market Research	Commercial	Hayden + Tanner	NEEA
Washington 2015 Commercial Construction Code Evaluation Study	Commercial	Cadmus	NEEA
Washington Residential Post-Code Market Research Report	Residential	TRC Engineers	NEEA

Titles appearing in blue are links to the online versions of the reports. A PDF of this supplement can be found at idahopower.com/ways-to-save/energy-efficiency-program-reports/.

INTEGRATED DESIGN LAB

Report Title	Sector	Analysis Performed By	Study Manager	Study/Evaluation Type
2022 Task 1: Foundational Services—Summary of Projects	Commercial	IDL	Idaho Power	Assistance and Education
2022 Task 2: Lunch and Learn—Summary of Effort and Outcomes	Commercial	IDL	Idaho Power	Training and Education
2022 Task 3: BSUG—Summary of Effort and Outcomes	Commercial	IDL	Idaho Power	Training and Education
2022 Task 4: New Construction Verifications—Summary of Projects	Commercial	IDL	Idaho Power	Verifications
2022 Task 5: Energy Resource Library—Summary of Effort and Outcomes	Commercial	IDL	Idaho Power	Assistance and Education
2022 Task 6: Power over Ethernet—Demonstration Project	Commercial	IDL	Idaho Power	Research
2022 Task 7: LLLC Workshop—Summary of Effort and Outcomes	Commercial	IDL	Idaho Power	Assistance and Education
2022 Task 8: Digital Design Tools—Summary of Effort and Outcomes	Commercial	IDL	Idaho Power	Assistance and Education

2022 Task 1: Foundational Services

Summary of Projects

Idaho Power Company External Year-End Report

December 31, 2022

Prepared for:
Idaho Power Company

Author:
Damon Woods

Report Number: 2022_001-01

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While the recommendations in this report have been reviewed for technical accuracy and are believed to be reasonably accurate, the findings are estimates and actual results may vary. All energy savings and cost estimates included in the report are for informational purposes only and are not to be construed as design documents or as guarantees of energy or cost savings. The user of this report, or any information contained in this report, should independently evaluate any information, advice, or direction provided in this report.

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Acronyms and Abbreviations

AIA	American Institute of Architects
ASHRAE	American Society of Heating, Refrigeration, and Air-conditioning Engineers
DOAS	Dedicated Outdoor Air System
EMS	Energy Management System
EUI	Energy Use Intensity [kBtu/ft^2/yr]
HVAC	Heating Ventilation and Air Conditioning
IDL	Integrated Design Lab
IPC	Idaho Power Company
IR	Infrared
LED	Light Emitting Diode
LEED	Leadership in Energy and Environmental Design
NEEA	Northwest Energy Efficiency Alliance
RTU	Rooftop Unit
UI	University of Idaho
UVGI	Ultraviolet Germicidal Irradiation
VAV	Variable Air Volume
VRF	Variable Refrigerant Flow

1. Introduction

The University of Idaho Integrated Design Lab (UI-IDL) provided technical design assistance in 2022 for energy efficiency building projects through the Foundational Services task. This program, supported by Idaho Power (IPC), offered three phases of assistance from which customers could choose. A marketing flyer shown in Figure 1 outlines the three phases. Phase I includes projects with budgets less than $2,000, Phase II is limited to projects from $2,000 to $4,000, and Phase III is any project with a budget greater than $4,000.

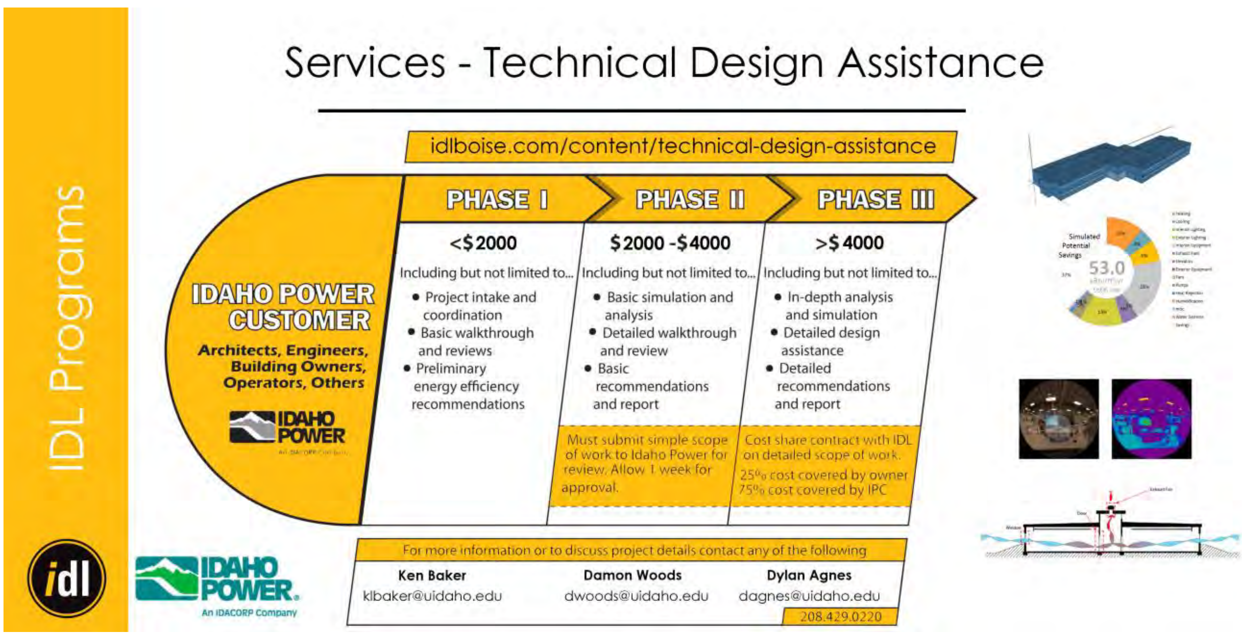

Figure 1: Foundational Services Flyer Outlining Phases

Information on the Foundational Services program was provided at each Lunch and Learn and BSUG presentation. Advertising for the program was also offered over the course of the year to local government officials, developers, and the architects and engineers who interacted with IDL.

2. Project Summary

The IDL worked on over 16 Foundational Service projects in 2022. Projects ranged from commercial to municipal and the IDL worked with both architecture and engineering firms within Idaho Power Service territory. Most project intake came through a phone call or email to the IDL. A tab is also available on the IDL website for people to submit requests for technical support through the foundational services program.

Projects consisted of email responses, personal trainings, technical reports, and memos. In total, there were twelve Phase I projects, three Phase II projects, and one Phase III project. The full list of projects is shown in Table 1 below.

Table 1: Summary of 2022 Foundational Services Projects

Project Type	Phas	Notes	Retro/N	Ft^2	Location
Warehouse	1	Design charette for VRF retrofit	Retro	21,000	Ada County
Industrial	2	Daylighting analysis training	New	40,000	Ada County
Office	2	Energy modeling tool analysis	New	3,500	Ada County
Municipal	1	Load diversification	New	32,000	Ada County
Software	1	Code compliance	New	??	Canyon County
Military	3	Training on energy audits and strategic energy management	Retro	30,000	Ada County
Grocery	1	Modeling assistance for baseline	New	NA	Ada County
Recreation	2	Insulation and pump vfd option research	New	30,000	Ada County
Data Center	1	Natural ventilation method exploration	New	500	Ada County
Software	1	Assistance on energy modeling workflow		NA	Ada County
Charity	1	Envelope and operational savings investigation forfacility	Retro	3000	Gem County
Warehouse	1	Skylight spacing strategies for particular products	New	NA	Ada County
Small Business	1	Incentive option review for SMB (small to mid-size businesses)	New	NA	Ada County
Charity	1	Analysis of cooling bills and IAQ	Retro	70,000	Ada County
Mixed Use	1	Researching insulation performance in cold climates	New	NA	Blaine County
Rooftop HVAC	1	Review of IAQ savings calculation method	Retro	NA	Blaine County

2022 Task 2: Lunch and Learn

Summary of Effort and Outcomes

Idaho Power Company External Year-End Report

December 31, 2022

Prepared for:
Idaho Power Company

Authors:
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Report Number: 2022_002-01

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ACRONYMS AND ABBREVIATIONS

AIA	American Institute of Architects
Arch	Architect(ure)
ASHRAE	American Society of Heating, Refrigeration, and Air-Conditioning Engineers
BCGCC	Boise Green Building Code
BESF	Building Energy Simulation Forum (Energy Trust of Oregon)
Bldg.	Building
BOMA	Building Owners and Managers Association
CSI	Construction Specifications Institute
Cx	Customer Experience
DOE	Department of Energy
Elec.	Electrical
EUI	Energy Use Intensity
GSHP	Ground Source Heat Pump
HVAC	Heating, Ventilation, and Air Conditioning
IBOA	Intermountain Building Operators Association
IBPSA	International Building Performance Simulation Association
IDL	Integrated Design Lab
IECC	International Energy Conservation Code
IES	Illuminating Engineering Society
IPC	Idaho Power Company
LEED	Leadership in Energy & Environmental Design
LED	Light Emitting Diode
M&V	Measurement and Verification
Mech.	Mechanical
Mgmt.	Management
NCARB	National Council of Architectural Registration Boards
PoE	Power over Ethernet
TBD	To Be Determined
UI	University of Idaho
USGBC	U.S. Green Building Council

1. 2022 SUMMARY AND CUMULATIVE ANALYSIS

Table 1: 2022 Lunch and Learn Summary

	Date	Title	Presenter	Group / Location	Attendees
1	08/31	LEED V4.1 Daylighting Credits – In Person	Dylan Agnes	A1	7
2	09/14	The Future of Lighting Controls – In Person	Dylan Agnes	A1	7
3	09/15	High Performance Classrooms – In Person	Damon Woods	A2	7
4	09/20	Dedicated Outdoor Air Systems (DOAS) Integration – In Person	Damon Woods	E1	5
5	09/28	The Future of Lighting Controls – In Person	Dylan Agnes	E2	10
6	09/29	Daylighting Multipliers – In Person	Dylan Agnes	A3	9
7	09/30	LLLC Training Trial Run – In Person	Dylan Agnes	OL	4
8	10/05	LLLC Training – In Person	Dylan Agnes	OL	10
9	10/06	The Future of Lighting Controls – In Person	Dylan Agnes	A2	7
10	10/18	ASHRAE 36 High Performance Sequences of Operation for HVAC Systems – In Person	Damon Woods	E1	6
11	10/21	LED Technology Impact on Savings and Efficiency – In Person	Dylan Agnes	AO1	7
12	10/28	Ultraviolet Germicidal Irradiation – In Person/Webinar	Damon Woods	AO1	8
13	11/10	Luminaire Level Lighting Controls – In Person	Dylan Agnes	A3	7
14	11/17	Thermal Energy Storage Systems – In Person	Damon Woods	AO2	6
15	-	-	-	-	-
16	-	-	-	-	-
17	-	-	-	-	-
18	-	-	-	-	-
19	-	-	-	-	-
20	-	-	-	-	-
				Total Attendees	100

Table 1 on the previous page summarizes all Lunch and Learn presentations given in 2022. The statistics in this section are cumulative for the 14 presentations. At each presentation participants were asked to sign in and fill out an evaluation form. Presentations were judged on a scale of 1 to 5, (see table 2). All lunch and learn presentations given in 2022 were in-person presentations and scheduling for lectures did not begin until mid-August.

Table 2: Evaluation Form Scale

Evaluation	1	2	3	4	5
In general, today's presentation was:	Not Useful		Somewhat Useful		Very Useful
The content of the presentation was:	Too Basic		About Right		Too Advanced
Please rate the following parts of the presentation: Organization, Clarity, Opportunity for Questions, Instructor's Knowledge of Subject Matter, and Delivery of Presentation	Needs Improvement		Good		Excellent

Table 3: Overall Attendance Breakdown

Architect:	49	Electrician:	0
Engineer:	15	Contractor:	0
Mech. Engineer:	0	Other:	18
Elec. Engineer:	8	None Specified:	10
Total (In-Person):	100		

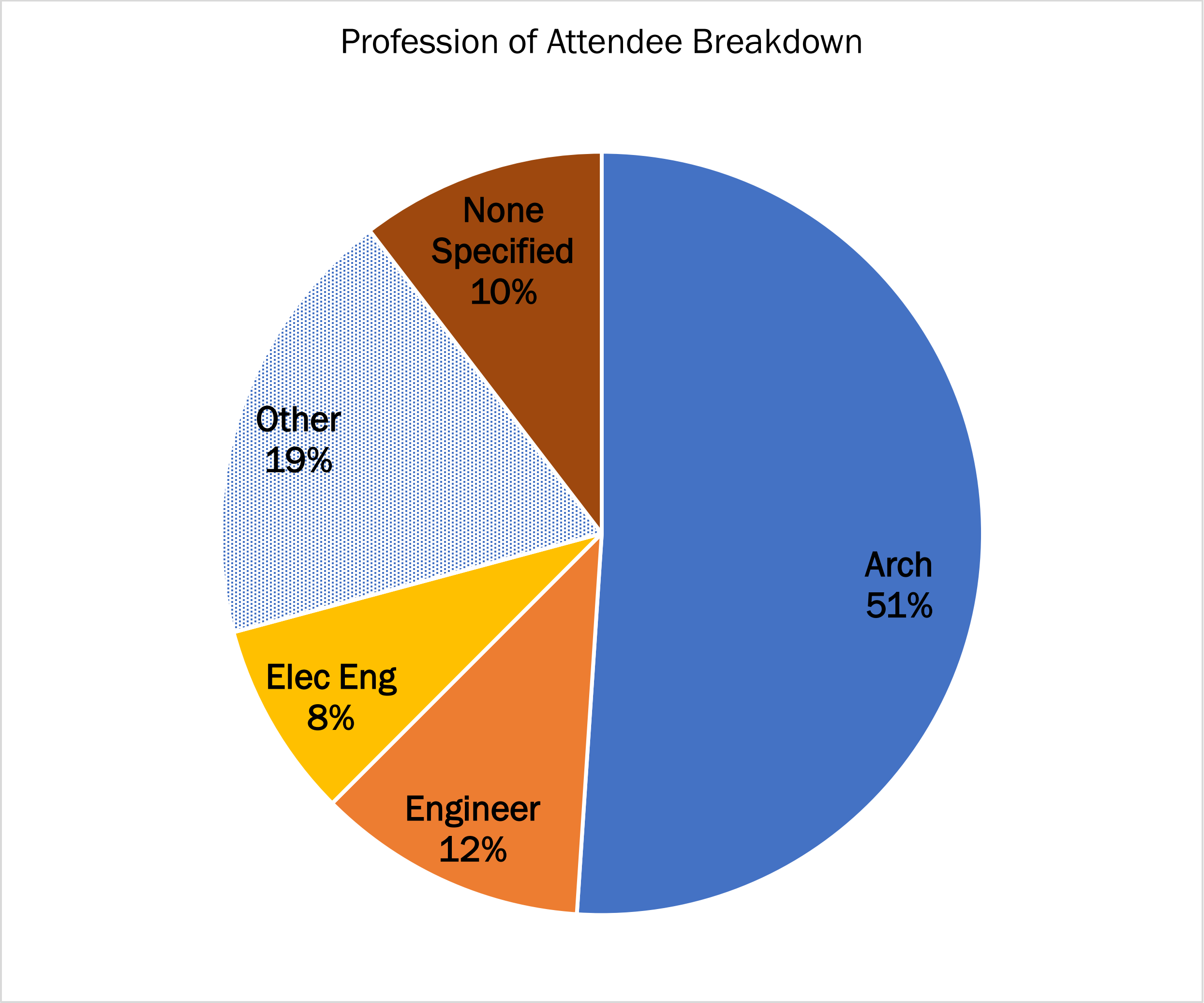

Figure 1: Attendee Profession

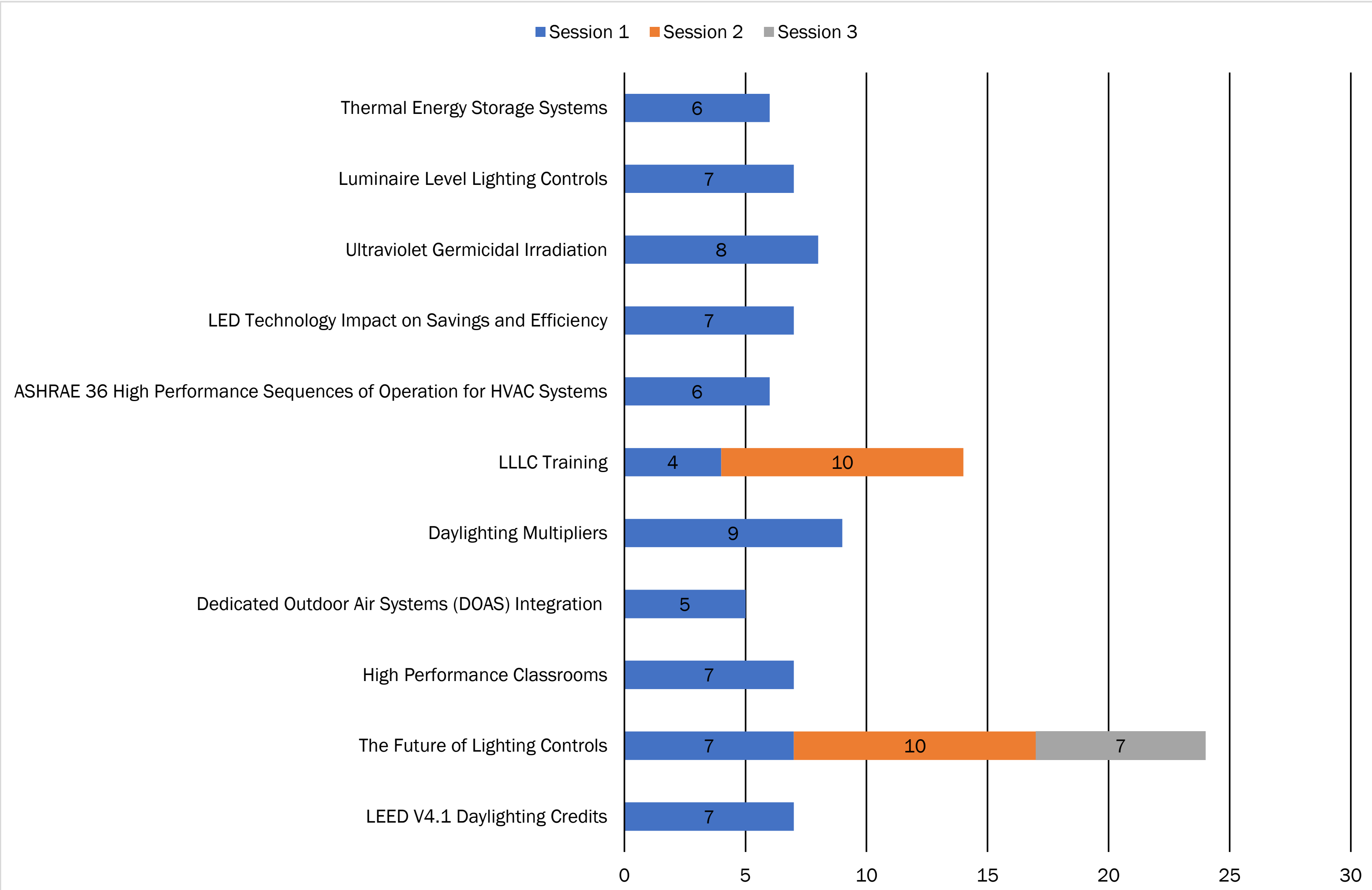

Figure 2: Attendee Count by Title and Number per Session

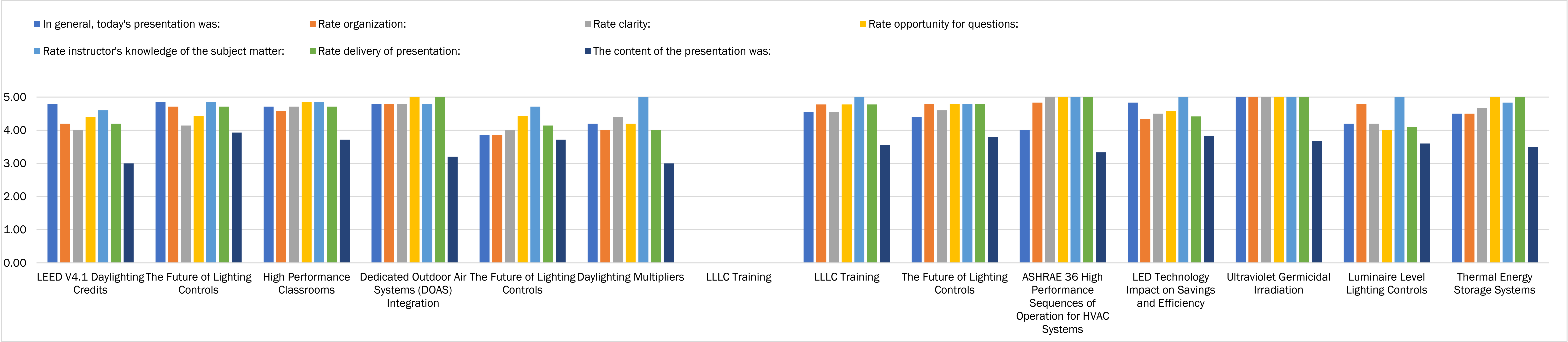

Figure 3: Average Evaluations by Session Title

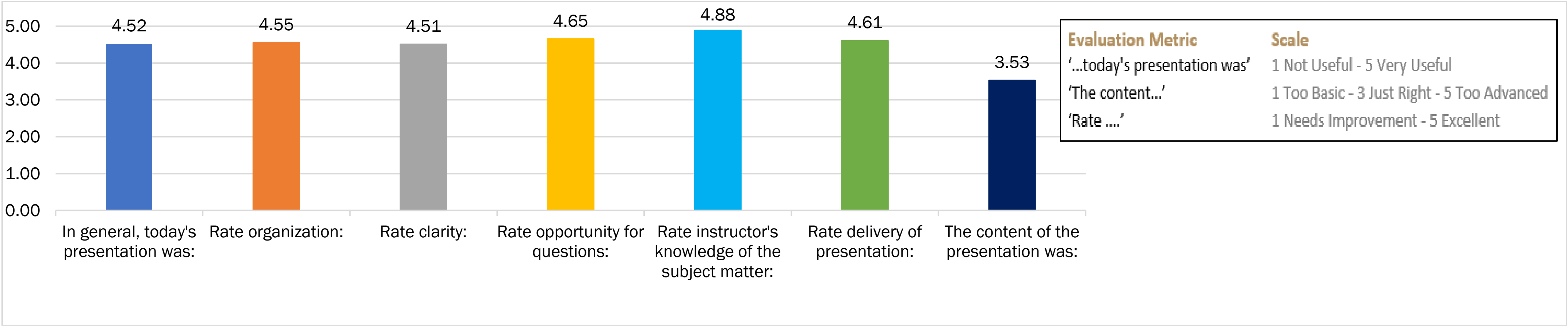

Figure 4: Overall Averages of Evaluations for all Sessions

2. SESSION SUMMARIES

After each lunch and learn session, an evaluation form was handed out to participants. The feedback will be used to improve future sessions. The feedback received from participants is generally constructive criticism used to keep sessions updated but also to propose future potential topics and questions to the Integrated Design Lab.

2.1 SESSION 1: LEED V4.1 DAYLIGHTING CREDITS (08/31/2022)

Title: LEED V4.1 Daylighting Credits

Description: LEED Daylighting credits are one of the most difficult to achieve and requires an early investment for validation. However, investigating daylight opportunities for a project will assist in other aspects of energy efficiency, such as, estimating heating and cooling loads or integrating a building's control systems. As such, any time spent in the early design phase investigating if a project should invest in daylighting is applicable to facets of energy efficient design that is often required for LEED projects. In this lecture we will discuss the changes from LEED V4 to V4.1 Daylighting Credits, which options work best for project types, incorporating early energy/simulation modeling into the design process, and how to run a cost-benefit analysis to determine if you should invest in daylighting.

Presentation Info:

Date:	08/31/22
Location:	A1 – Boise, ID
Presenter:	Dylan Agnes

Attendance:

Architect:	4	Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other:	3
Elec. Engineer:		None Specified:	
Total (In-Person):	7		

2.2 SESSION 2: THE FUTURE OF LIGHTING CONTROLS (09/14/2022)

Title: The Future of Lighting Controls

Description: Although LEDs have shown, they are a big game changer in the commercial lighting realm; lower lighting power density is not the only area of value when considering lighting. We can further increase savings from these highly efficient lighting systems by introducing control systems that collect data and user input to create an evolving feedback loop that seeks peak system operation. While LLLC's (Luminaire Level Lighting

Control) use this feature, they still use the same infrastructure as the lighting and control system that have come before it, which can be a limitation for expanding the systems efficiency and integration to other building systems. We believe the internet of things (IoT) will change the lighting and controls industry, providing an excellent medium for an integrated, multi-service IoT platform. Why? Where there are people, there are lights; where there are people, there will also be the need for connectivity. New and connected lighting controls provide a means to deliver valuable IoT services and increased energy savings.

Presentation Info:

Date:	09/14/22
Location:	A1 – Boise, ID
Presenter:	Dylan Agnes

Attendance:

Architect:	3	Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other*:	4
Elec. Engineer:		None Specified:	
Total (In-person):	**7**		

2.3 SESSION 3: HIGH PERFORMANCE CLASSROOMS (09/15/2022)

Title: High Performance Classrooms

Description: Student enrollment in Ada County is projected to grow by 1,000 students per year for the next ten years and at least six capital projects are planned in the West Ada District alone to meet this demand. This session will cover a variety of issues facing the design of an efficient, healthy, and productive classroom environment. A quick look at the state of the last 50 years of school design will give an introduction to the problems faced by designers. This session will highlight several case studies of high performance schools in the Northwest to address daylighting, natural ventilation, and integration of mechanical systems. Each passive strategy will be addressed in detail with regional examples and performance research.

Presentation Info:

Date:	09/15/22
Location:	A2 – Boise, ID
Presenter:	Damon Woods

Attendance:

Architect:	4	Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other*:	
Elec. Engineer:		None Specified:	3
Total (In-Person):	**7**		

2.4 SESSION 4: DEDICATED OUTDOOR AIR SYSTEMS (DOAS) INTEGRATION (09/20/2022)

Title: Dedicated Outdoor Air Systems (DOAS) Integration

Description: In an effort to operate buildings in the most energy efficient manner, we are designing building envelopes to be as airtight as possible with as little outside air as allowable. In this presentation the following issues are addressed: significance of IAQ to human health and productivity, the link between IAQ and building energy demands, and efficient technologies for optimizing IAQ.

Presentation Info:

Date:	09/20/22
Location:	E1 – Boise, ID
Presenter:	Damon Woods

Attendance:

Architect:		Electrician:	
Engineer:	5	Contractor:	
Mech. Engineer:		Other*:	3
Elec. Engineer:		None Specified:	
Total (In-Person):	**5**		

2.5 SESSION 5: THE FUTURE OF LIGHTING CONTROLS (09/28/2022)

Title: The Future of Lighting Controls

Description: Although LEDs have shown, they are a big game changer in the commercial lighting realm; lower lighting power density is not the only area of value when considering lighting. We can further increase savings from these highly efficient lighting systems by introducing control systems that collect data and user input to create an evolving feedback loop that seeks peak system operation. While LLLC's (Luminaire Level Lighting Control) use this feature, they still use the same infrastructure as the lighting and control system that have come before it, which can be a limitation for expanding the systems efficiency and integration to other building systems. We believe the internet of things (IoT) will change the lighting and controls industry, providing an excellent medium for an integrated, multi-service IoT platform. Why? Where there are people, there are lights; where there are people, there will also be the need for connectivity. New and connected lighting controls provide a means to deliver valuable IoT services and increased energy savings.

Presentation Info:

Date:	09/28/22
Location:	E2 – Meridian, ID
Presenter:	Dylan Agnes

Attendance:

Architect:		Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other*:	2
Elec. Engineer:	8	None Specified:	
Total (In-Person):	10		

2.6 SESSION 6: DAYLIGHTING MULTIPLIERS (09/29/2022)

Title: Daylighting Multipliers

Description: This session will explore the role that daylighting multipliers are used when trying to increase the efficiency of daylighting or daylight harvesting in a building, such as, light shelves, manufactured glazing, and material specification. Furthermore, we will explore the rate of return, the ranges of efficiency, and appropriate uses between daylighting strategies and multipliers.

Presentation Info:

Date:	09/29/22
Location:	A3 - Boise, ID
Presenter:	Dylan Agnes

Attendance:

Architect:	9	Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other:	
Elec. Engineer:		None Specified:	
Total (In-Person):	9		

2.7 SESSION 7: LLLC TRAINING TRIAL RUN (09/30/2022)

Title: LLLC Training Trial Run

Description: LLLCs have sensors and controls within individual fixtures that enable them to be controlled remotely or on a case-by-case basis. Remote control allows users to adjust the programming criteria or illumination levels without replacing the fixtures. In conventional lighting systems, lighting zones are defined as a collective unit and thus are centrally controlled. LLLCs however, incorporate sensors into each fixture, such as occupancy, daylight, temperature or receive/broadcast signals. Each fixture has the potential to become a semi-autonomous zone that is capable of responding to small changes in the area under each fixture. Furthermore, individual fixtures can communicate with other fixtures, using wireless or infrared signals, to share data for an even greater potential to increase energy savings and user satisfaction. Some LLLCs can be connected by gateway to transfer information collected. This data is analyzed, usually through manufacturer's software, to provide a user interface different from a typical text editor. From there users are able to identify trends in occupancy and lighting energy consumption that can then be used to refine the building schedules for occupancy and lighting and, if applicable, for the buildings' HVAC schedule programming.

Presentation Info:

Date:	09/30/22
Location:	OL - Boise, ID
Presenter:	Dylan Agnes

Attendance:

Architect:		Electrician:	
Engineer:	4	Contractor:	
Mech. Engineer:		Other:	
Elec. Engineer:		None Specified:	
Total (In-Person):	**4**		

2.8 SESSION 8: LLLC TRAINING (10/05/2022)

Title: LLLC Training

Description: LLLCs have sensors and controls within individual fixtures that enable them to be controlled remotely or on a case-by-case basis. Remote control allows users to adjust the programming criteria or illumination levels without replacing the fixtures. In conventional lighting systems, lighting zones are defined as a collective unit and thus are centrally controlled. LLLCs however, incorporate sensors into each fixture, such as occupancy, daylight, temperature or receive/broadcast signals. Each fixture has the potential to become a semi-autonomous zone that is capable of responding to small changes in the area under each fixture. Furthermore, individual fixtures can communicate with other fixtures, using wireless or infrared signals, to share data for an even greater potential to increase energy savings and user satisfaction. Some LLLCs can be connected by gateway to transfer information collected. This data is analyzed, usually through manufacturer's software, to provide a user interface different from a typical text editor. From there users are able to identify trends in occupancy and lighting energy consumption that can then be used to refine the building schedules for occupancy and lighting and, if applicable, for the buildings' HVAC schedule programming.

Presentation Info:

Date:	10/05/22
Location:	OL – Boise, ID
Presenter:	Dylan Agnes

Attendance:

Architect:	3	Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other:	7
Elec. Engineer:		None Specified:	
Total (In-Person):	**10**		

2.9 SESSION 9: THE FUTURE OF LIGHTING CONTROLS (10/06/2022)

Title: The Future of Lighting Controls

Description: Although LEDs have shown, they are a big game changer in the commercial lighting realm; lower lighting power density is not the only area of value when considering lighting. We can further increase savings from these highly efficient lighting systems by introducing control systems that collect data and user input to create an evolving feedback loop that seeks peak system operation. While LLLC's (Luminaire Level Lighting Control) use this feature, they still use the same infrastructure as the lighting and control system that have come before it, which can be a limitation for expanding the systems efficiency and integration to other building systems. We believe the internet of things (IoT) will change the lighting and controls industry, providing an excellent medium for an integrated, multi-service IoT platform. Why? Where there are people, there are lights; where there are people, there will also be the need for connectivity. New and connected lighting controls provide a means to deliver valuable IoT services and increased energy savings.

Presentation Info:

Date:	10/06/22
Location:	A2 – Boise, ID
Presenter:	Dylan Agnes

Attendance:

Architect:	5	Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other:	2
Elec. Engineer:		None Specified:	
Total (In-Person):	7		

2.10 SESSION 10: ASHRAE 36 HIGH PERFORMANCE SEQUENCES OF OPERATION FOR HVAC SYSTEMS (10/18/2022)

Title: ASHRAE 36 High Performance Sequences of Operation for HVAC Systems

Description: The best equipment can still run terribly if it's not controlled well – like a sports car in the hands of a clueless driver. Don't let that happen to your design. Get the latest guidelines on sequences of operation for common HVAC sequences. Take advantage of Idaho Power's incentives on HVAC energy management controls. Get a refresher proper start-up and shut down sequences for air handling units including VAVs, rooftop units, and heat pumps. Ensure that controls are in compliance with indoor air quality standards for ASHRAE 62.1 compliance and COVID mitigation. Participants will learn functional tests they can perform that can confirm that proper sequences are in place.

Presentation Info:

Date:	10/18/22
Location:	E1 – Boise, ID
Presenter:	Damon Woods

Attendance:

Architect:		Electrician:	
Engineer:	6	Contractor:	
Mech. Engineer:		Other:	
Elec. Engineer:		None Specified:	
Total (In-Person):	**6**		

2.11 SESSION 11: LED TECHNOLOGY IMPACT ON SAVINGS AND EFFICIENCY (10/21/2022)

Title: LED Technology Impact on Savings and Efficiency

Description: We will examine the effect LED technology has had on energy savings, control strategies, and future implications with continued efficient lighting technology. As lighting technology becomes more efficient it will adjust codes, incentives from utilities, and energy efficiency standards. More importantly, it will change the cost benefit analysis regarding lighting, control strategies, and occupant comfort. The LED revolution for lighting is not done and, in this lecture, we will discuss the current state of LEDs as well as the direction we are going and what we might find when we arrive.

Presentation Info:

Date:	10/21/22
Location:	A01 – Boise, ID
Presenter:	Dylan Agnes

Attendance:

Architect:	6	Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other:	
Elec. Engineer:		None Specified:	1
Total (In-Person):	**7**		

2.12 SESSION 12: ULTRAVIOLET GERMICIDAL IRRADIATION (10/28/2022)

Title: Ultraviolet Germicidal Irradiation

Description: With the arrival of COVID, there has been a surge of interest in Ultra Violet Germicidal Irradiation. During our research, the IDL found that UV systems can actually save on operational costs by reducing fan energy. Attendees will learn about the different UV technologies available, the strength needed to kill pathogens in air streams, and how to minimize the energy used to run these systems. This lecture will draw from leading researchers such as William Bahnfleth, who chaired ASHRAE's Epidemic Task Force. By installing UVGI systems in front of cooling coils, these can help prevent microbial growth and ensure better airflow throughout the building. With building occupants increasingly mindful of airborne contaminates, it's important for architects and engineers to be aware of these systems and how they can be integrated into a building.

Presentation Info:

Date:	10/28/22
Location:	A01 – Boise, ID
Presenter:	Damon Woods

Attendance:

Architect:	8	Electrician:
Engineer:		Contractor:
Mech. Engineer:		Other*:
Elec. Engineer:		None Specified:
Total (In-Person):	**8**	

2.13 SESSION 13: LUMINAIRE LEVEL LIGHTING CONTROLS (11/10/2022)

Title: Luminaire Level Lighting Controls

Description: LLLCs have sensors and controls within individual fixtures that enable them to be controlled remotely or on a case-by-case basis. Remote control allows users to adjust the programming criteria or illumination levels without replacing the fixtures. In conventional lighting systems, lighting zones are defined as a collective unit and thus are centrally controlled. LLLCs however, incorporate sensors into each fixture, such as occupancy, daylight, temperature or receive/broadcast signals. Each fixture has the potential to become a semi-autonomous zone that is capable of responding to small changes in the area under each fixture. Furthermore, individual fixtures can communicate with other fixtures, using wireless or infrared signals, to share data for an even greater potential to increase energy savings and user satisfaction. Some LLLCs can be connected by gateway to transfer information collected. This data is analyzed, usually through manufacturer's software, to provide a user interface different from a typical text editor. From there users are able to identify trends in occupancy and lighting energy consumption that can then be used to refine the building schedules for occupancy and lighting and, if applicable, for the buildings' HVAC schedule programming.

Presentation Info:

Date:	11/10/22
Location:	A3 – Boise, ID
Presenter:	Dylan Agnes

Attendance:

Architect:	7	Electrician:
Engineer:		Contractor:
Mech. Engineer:		Other:
Elec. Engineer:		None Specified:
Total (In-Person):	**7**	

2.14 SESSION 14: THERMAL ENERGY STORAGE SYSTEMS (11/17/2022)

Title: Thermal Energy Storage Systems

Description: Thermal Energy Storage Systems (TES) are gaining popularity as a way to mitigate peak energy use. This lecture will explore the use of things like ice-storage and ponds to minimize chiller and boiler use. This technology can be paired with ground-source heat pumps, radiant systems, and natural ventilation. Idaho typically has large temperature swings between the high and low temperatures (sometimes up to 30 F), which makes our state especially suited to shifting when heating and cooling equipment should operate. By understanding more about TES, engineers and architects alike can design unique configurations that can increase efficiency and enhance resiliency in their buildings.

Presentation Info:

Date:	11/17/22
Location:	AO2 – Pocatello , ID
Presenter:	Damon Woods

Attendance:

Architect:	4	Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other:	
Elec. Engineer:		None Specified:	2
Total (In-Person):	6		

3. FUTURE WORK

Feedback was gathered from the 76 Lunch and Learn evaluations received throughout 2022. The comments from these were valuable in defining possible future Lunch and Learn topics.

4. APPENDICES

APPENDIX A: SESSION SUMMARIES

At the conclusion of each lunch and learn session, an evaluation form was requested from each participant. The feedback will be used to improve future sessions. Below are summaries of session information, attendance counts, and the feedback received from the evaluation forms. It should be noted that comments recorded from evaluations have not been edited in most cases, many appear exactly how the participant entered them online or how they were interpreted for translation from hand-written forms.

4.1.1 SESSION 1: LEED V4.1 DAYLIGHTING CREDITS (08/31/2022)

Title: LEED V4.1 Daylighting Credits

Description: LEED Daylighting credits are one of the most difficult to achieve and requires an early investment for validation. However, investigating daylight opportunities for a project will assist in other aspects of energy efficiency, such as, estimating heating and cooling loads or integrating a building's control systems. As such, any time spent in the early design phase investigating if a project should invest in daylighting is applicable to facets of energy efficient design that is often required for LEED projects. In this lecture we will discuss the changes from LEED V4 to V4.1 Daylighting Credits, which options work best for project types, incorporating early energy/simulation modeling into the design process, and how to run a cost-benefit analysis to determine if you should invest in daylighting.

Presentation Info:

Date:	08/31/22
Location:	A1 – Boise, ID
Presenter:	Dylan Agnes

Attendance:

Architect:	4	Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other:	3
Elec. Engineer:		None Specified:	
Total (In-Person):	7		

Evaluations:

		Scale
In general, today's presentation was:	**4.8**	1 Not Useful - 5 Very Useful
Rate organization:	**4.2**	1 Needs Improvement - 5 Excellent
Rate clarity:	**4.0**	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	**4.4**	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	**4.6**	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	**4.2**	1 Needs Improvement - 5 Excellent
The content of the presentation was:	**3.0**	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments:

Attendee suggested improvements for the instructor:

- More visuals
- Nice Presentation

What attendees found most valuable:

- Case study (x3) at the end helped wrap together the presentation as a whole.
- Explanation of the new LEED V4.1 vs v4 updates
- LEED requirement, Insight, and how we run sims in house.

Professional associations of which attendees are members:

- ASID, AIA, USGBC

Other types of training attendees would find useful

- Walkthrough for benchmarking buildings models. Work flows for integrating energy analysis into projects.
- Insight

4.1.2 SESSION 2: THE FUTURE OF LIGHTING CONTROLS (09/14/2022)

Title: The Future of Lighting Controls

Description: Although LEDs have shown, they are a big game changer in the commercial lighting realm; lower lighting power density is not the only area of value when considering lighting. We can further increase savings from these highly efficient lighting systems by introducing control systems that collect data and user input to create an evolving feedback loop that seeks peak system operation. While LLLC’s (Luminaire Level Lighting Control) use this feature, they still use the same infrastructure as the lighting and control system that have come before it, which can be a limitation for expanding the systems efficiency and integration to other building systems. We believe the internet of things (IoT) will change the lighting and controls industry, providing an excellent medium for an integrated, multi-service IoT platform. Why? Where there are people, there are lights; where there are people, there will also be the need for connectivity. New and connected lighting controls provide a means to deliver valuable IoT services and increased energy savings.

Presentation Info:

Date:	09/14/22
Location:	A1 – Boise, ID
Presenter:	Dylan Agnes

Attendance:

Architect:	3	Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other*:	4
Elec. Engineer:		None Specified:	
Total (In-Person):	7		

Evaluations: No evaluations were collected due to technical difficulties with the ZOOM platform.		**Scale**
In general, today's presentation was:	4.9	1 Not Useful - 5 Very Useful
Rate organization:	4.7	1 Needs Improvement - 5 Excellent
Rate clarity:	4.1	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	4.4	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	4.9	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	4.7	1 Needs Improvement - 5 Excellent
The content of the presentation was:	3.9	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments:

Attendee suggested improvements for the instructor:

- None, great job!
- Great job!
- Case study
- Less technical nomenclature

What attendees found most valuable:

- Extensive knowledge well explained
- Integration and information for new technology
- Examples of real life situations
- The flexibility of lighting and power
- Learning about systems
- Direct user scenarios – showing usability

Professional associations of which attendees are members:

- ASID, USGBC, AIA, ICBO

Other types of training attendees would find useful

- Everything

4.1.3 SESSION 3: HIGH PERFORMANCE CLASSROOMS (09/15/2022)

Title: High Performance Classrooms

Description: Student enrollment in Ada County is projected to grow by 1,000 students per year for the next ten years and at least six capital projects are planned in the West Ada District alone to meet this demand. This session will cover a variety of issues facing the design of an efficient, healthy, and productive classroom environment. A quick look at the state of the last 50 years of school design will give an introduction to the problems faced by designers. This session will highlight several case studies of high performance schools in the Northwest to address daylighting, natural ventilation, and integration of mechanical systems. Each passive strategy will be addressed in detail with regional examples and performance research.

Presentation Info:

Date:	09/15/22
Location:	A2 – Boise, ID
Presenter:	Damon Woods

Attendance:

Architect:	4	Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other*:	
Elec. Engineer:		None Specified:	3
Total (In-Person):	7		

Evaluations: No evaluations were collected for this webinar.

		Scale
In general, today's presentation was:	**4.7**	1 Not Useful - 5 Very Useful
Rate organization:	**4.6**	1 Needs Improvement - 5 Excellent
Rate clarity:	**4.7**	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	**4.9**	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	**4.9**	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	**4.7**	1 Needs Improvement - 5 Excellent
The content of the presentation was:	**3.7**	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments:

Attendee suggested improvements for the instructor:

- Great job!
- Brief uniform example of all elements together

What attendees found most valuable:

- All of it, well done – thank you
- Outside air issues
- CO2 information and combined effect of systems
- Good presentation overall
- Great overall view

Professional associations of which attendees are members:

- AIA

Other types of training attendees would find useful

- UVGI
- HVAC
- Outdoor air intake, passive systems

4.1.4 SESSION 4: DEDICATED OUTDOOR AIR SYSTEMS (DOAS) INTEGRATION (09/20/2022)

Title: Dedicated Outdoor Air Systems (DOAS) Integration

Description: In an effort to operate buildings in the most energy efficient manner, we are designing building envelopes to be as airtight as possible with as little outside air as allowable. In this presentation the following issues are addressed: significance of IAQ to human health and productivity, the link between IAQ and building energy demands, and efficient technologies for optimizing IAQ.

Presentation Info:

Date:	09/20/22
Location:	E1 – Boise, ID
Presenter:	Damon Woods

Attendance:

Architect:		Electrician:	
Engineer:	5	Contractor:	
Mech. Engineer:		Other*:	
Elec. Engineer:		None Specified:	
Total (In-Person):	5		

Evaluations:		**Scale**
In general, today's presentation was:	4.8	1 Not Useful - 5 Very Useful
Rate organization:	4.8	1 Needs Improvement - 5 Excellent
Rate clarity:	4.8	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	5.0	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	4.8	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	5.0	1 Needs Improvement - 5 Excellent
The content of the presentation was:	3.2	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments:

Attendee suggested improvements for the instructor:

- None

What attendees found most valuable:

- Independent opinions – not a manufacturer Rep.
- Information on DOAS was good
- Economics

Professional associations of which attendees are members:

- ASHRAE, ASME

Other types of training attendees would find useful

- None

4.1.5 SESSION 5: THE FUTURE OF LIGHTING CONTROLS (09/28/2022)

Title: The Future of Lighting Controls

Description: Although LEDs have shown, they are a big game changer in the commercial lighting realm; lower lighting power density is not the only area of value when considering lighting. We can further increase savings from these highly efficient lighting systems by introducing control systems that collect data and user input to create an evolving feedback loop that seeks peak system operation. While LLLC's (Luminaire Level Lighting Control) use this feature, they still use the same infrastructure as the lighting and control system that have come before it, which can be a limitation for expanding the systems efficiency and integration to other building systems. We believe the internet of things (IoT) will change the lighting and controls industry, providing an excellent medium for an integrated, multi-service IoT platform. Why? Where there are people, there are lights; where there are people, there will also be the need for connectivity. New and connected lighting controls provide a means to deliver valuable IoT services and increased energy savings.

Presentation Info:

Date:	09/28/22
Location:	E2 – Meridian, ID
Presenter:	Dylan Agnes

Attendance:

Architect:		Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other*:	2
Elec. Engineer:	8	None Specified:	
Total (In-Person):	**10**		

Evaluations:

		Scale
In general, today's presentation was:	**3.9**	1 Not Useful - 5 Very Useful

Rate organization:	**3.9**	1 Needs Improvement - 5 Excellent
Rate clarity:	**4.0**	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	**4.4**	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	**4.7**	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	**4.1**	1 Needs Improvement - 5 Excellent
The content of the presentation was:	**3.7**	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments:

Attendee suggested improvements for the instructor:

- Real world example are always great
- Lots of acronyms, but he did explain them. Hadn't heard of a lot of them.
- Would like to know more about cost and installation

What attendees found most valuable:

- Future outlook
- Discussion about how there are used or could be
- PoE talks, power is what I do, so cool new info for me
- Good information on the future product to come and capabilities of future controls
- PoE information/potential

Professional associations of which attendees are members:

- NCQLP, IEEE

Other types of training attendees would find useful

- Incentive program updates
- Lighting controls, occupancy sensors, time switches
- Incentive program updates
- Cost comparisons

4.1.6 SESSION 6: DAYLIGHTING MULTIPLIERS (09/29/2022)

Title: Daylighting Multipliers

Description: This session will explore the role that daylighting multipliers are used when trying to increase the efficiency of daylighting or daylight harvesting in a building, such as, light shelves, manufactured glazing, and material specification. Furthermore, we will explore the rate of return, the ranges of efficiency, and appropriate uses between daylighting strategies and multipliers.

Presentation Info:

Date:	09/29/22
Location:	A3 - Boise, ID
Presenter:	Dylan Agnes

Attendance:

Architect:	9	Electrician:	

Engineer:	Contractor:
Mech. Engineer:	Other:
Elec. Engineer:	None Specified:

Total (In-Person): 9

Evaluations:

		Scale
In general, today's presentation was:	**4.2**	1 Not Useful - 5 Very Useful
Rate organization:	**4.0**	1 Needs Improvement - 5 Excellent
Rate clarity:	**4.4**	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	**4.2**	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	**5.0**	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	**4.0**	1 Needs Improvement - 5 Excellent
The content of the presentation was:	**3.0**	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments:

Attendee suggested improvements for the instructor:

- As a former teacher, I would suggest opportunities to check participants understanding of presentation

What attendees found most valuable:

- Interaction available between us and IDL

Professional associations of which attendees are members:

- AIA

Other types of training attendees would find useful

- Case studies

4.1.7 SESSION 7: LLLC TRAINING TRIAL RUN (09/30/2022)

Title: LLLC Training Trial Run

Description: LLLCs have sensors and controls within individual fixtures that enable them to be controlled remotely or on a case-by-case basis. Remote control allows users to adjust the programming criteria or illumination levels without replacing the fixtures. In conventional lighting systems, lighting zones are defined as a collective unit and thus are centrally controlled. LLLCs however, incorporate sensors into each fixture, such as occupancy, daylight, temperature or receive/broadcast signals. Each fixture has the potential to become a semi-autonomous zone that is capable of responding to small changes in the area under each fixture. Furthermore, individual fixtures can communicate with other fixtures, using wireless or infrared signals, to share data for an even greater potential to increase energy savings and user satisfaction. Some LLLCs can be connected by gateway to transfer information collected. This data is analyzed, usually through manufacturer's software, to provide a user interface different from a typical text editor. From there users are able to identify trends in occupancy and lighting energy consumption that can then be used to refine the building schedules for occupancy and lighting and, if applicable, for the buildings' HVAC schedule programming.

Presentation Info:

Date:	09/30/22
Location:	OL - Boise, ID
Presenter:	Dylan Agnes

Attendance:

Architect:		Electrician:	
Engineer:	4	Contractor:	
Mech. Engineer:		Other:	
Elec. Engineer:		None Specified:	
Total (In-Person):	**4**		

Evaluations:		**Scale**
In general, today's presentation was:	0.0	1 Not Useful - 5 Very Useful
Rate organization:	0.0	1 Needs Improvement - 5 Excellent
Rate clarity:	0.0	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	0.0	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	0.0	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	0.0	1 Needs Improvement - 5 Excellent
The content of the presentation was:	0.0	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments: No formal evaluations were collected for this lecture since it was a practice run. During the practice run, the group actively provided feedback that was implemented into the presentation for improvement.

4.1.8 SESSION 8: LLLC TRAINING (10/05/2022)

Title: LLLC Training

Description: LLLCs have sensors and controls within individual fixtures that enable them to be controlled remotely or on a case-by-case basis. Remote control allows users to adjust the programming criteria or illumination levels without replacing the fixtures. In conventional lighting systems, lighting zones are defined as a collective unit and thus are centrally controlled. LLLCs however, incorporate sensors into each fixture, such as occupancy, daylight, temperature or receive/broadcast signals. Each fixture has the potential to become a semi-autonomous zone that is capable of responding to small changes in the area under each fixture. Furthermore, individual fixtures can communicate with other fixtures, using wireless or infrared signals, to share data for an even greater potential to increase energy savings and user satisfaction. Some LLLCs can be connected by gateway to transfer information collected. This data is analyzed, usually through manufacturer's software, to provide a user interface different from a typical text editor. From there users are able to identify trends in occupancy and lighting energy consumption that can then be used to refine the building schedules for occupancy and lighting and, if applicable, for the buildings' HVAC schedule programming.

Presentation Info:

Date:	10/05/25
Location:	OL – Boise, ID

Presenter:	Dylan Agnes		

Attendance:

Architect:	3	Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other:	7
Elec. Engineer:		None Specified:	
Total (In-Person):	10		

Evaluations:		**Scale**
In general, today's presentation was:	4.6	1 Not Useful - 5 Very Useful
Rate organization:	4.8	1 Needs Improvement - 5 Excellent
Rate clarity:	4.6	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	4.8	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	5.0	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	4.8	1 Needs Improvement - 5 Excellent
The content of the presentation was:	3.6	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments:

Attendee suggested improvements for the instructor:

- Very good presentation
- None needed
- Good presentation, possibly slow down a bit
- Tad monotone, get excited

What attendees found most valuable:

- Explanation on occupancy and vacancy settings
- System capability
- Opportunity for future trainings
- I learned more about smart buildings and integration of lighting systems

Professional associations of which attendees are members:

- BOC, NCQLP, IES

Other types of training attendees would find useful

- None

4.1.9 SESSION 9: THE FUTURE OF LIGHTING CONTROLS (10/06/2022)

Title: The Future of Lighting Controls

Description: Although LEDs have shown, they are a big game changer in the commercial lighting realm; lower lighting power density is not the only area of value when considering lighting. We can further increase savings from these highly efficient lighting systems by introducing control systems that collect data and user input to create an evolving feedback loop that seeks peak system operation. While LLLC's (Luminaire Level Lighting Control) use this feature, they still use the same infrastructure as the lighting and control system that have come before it, which can be a limitation for expanding the systems efficiency and integration to other building systems. We believe the internet of things (IoT) will change the lighting and controls industry, providing an excellent medium for an integrated, multi-service IoT platform. Why? Where there are people, there are lights; where there are people, there will also be the need for connectivity. New and connected lighting controls provide a means to deliver valuable IoT services and increased energy savings.

Presentation Info:

Date:	10/06/22
Location:	A2 – Boise, ID
Presenter:	Dylan Agnes

Attendance:

Architect:	5	Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other:	2
Elec. Engineer:		None Specified:	
Total (In-Person):	7		

Evaluations:

		Scale
In general, today's presentation was:	4.4	1 Not Useful - 5 Very Useful
Rate organization:	4.8	1 Needs Improvement - 5 Excellent
Rate clarity:	4.6	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	4.8	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	4.8	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	4.8	1 Needs Improvement - 5 Excellent
The content of the presentation was:	3.8	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments:

Attendee suggested improvements for the instructor:

- None

What attendees found most valuable:

- I thought everything was super interesting especially since I have smart lights in my house
- Education on what to expect in future development of lighting controls
- New technologies
- Technology usage in everyday environment

Professional associations of which attendees are members:

- AIA, Living Building

Other types of training attendees would find useful

- Taking this idea to the exterior/environment for safety purposes
- More technology based subjects like this presentation

4.1.10 SESSION 10: ASHRAE 36 HIGH PERFORMANCE SEQUENCES OF OPERATION FOR HVAC SYSTEMS (10/18/2022)

Title: ASHRAE 36 High Performance Sequences of Operation for HVAC Systems

Description: The best equipment can still run terribly if it's not controlled well – like a sports car in the hands of a clueless driver. Don't let that happen to your design. Get the latest guidelines on sequences of operation for common HVAC sequences. Take advantage of Idaho Power's incentives on HVAC energy management controls. Get a refresher proper start-up and shut down sequences for air handling units including VAVs, rooftop units, and heat pumps. Ensure that controls are in compliance with indoor air quality standards for ASHRAE 62.1 compliance and COVID mitigation. Participants will learn functional tests they can perform that can confirm that proper sequences are in place.

Presentation Info:

Date:	10/18/22
Location:	E1 – Boise, ID
Presenter:	Damon Woods

Attendance:

Architect:		Electrician:	
Engineer:	6	Contractor:	
Mech. Engineer:		Other:	
Elec. Engineer:		None Specified:	
Total (In-Person):	6		

Evaluations:

		Scale
In general, today's presentation was:	4.0	1 Not Useful - 5 Very Useful
Rate organization:	4.8	1 Needs Improvement - 5 Excellent
Rate clarity:	5.0	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	5.0	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	5.0	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	5.0	1 Needs Improvement - 5 Excellent
The content of the presentation was:	3.3	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments:

Attendee suggested improvements for the instructor:

- More content

What attendees found most valuable:

- Chatting about projects
- Experiences in the industry

Professional associations of which attendees are members:

- ASHRAE, ASME

Other types of training attendees would find useful

- None

4.1.11 SESSION 11:LED TECHNOLOGY IMPACT ON SAVNIGS AND EFFICIENCY (10/21/2022)

Title: LED Technology Impact on Savings and Efficiency

Description: We will examine the effect LED technology has had on energy savings, control strategies, and future implications with continued efficient lighting technology. As lighting technology becomes more efficient it will adjust codes, incentives from utilities, and energy efficiency standards. More importantly, it will change the cost benefit analysis regarding lighting, control strategies, and occupant comfort. The LED revolution for lighting is not done and, in this lecture, we will discuss the current state of LEDs as well as the direction we are going and what we might find when we arrive.

Presentation Info:

Date:	10/21/22
Location:	A01 – Boise, ID
Presenter:	Dylan Agnes

Attendance:

Architect:	6	Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other:	
Elec. Engineer:		None Specified:	1
Total (In-Person):	7		

Evaluations:

		Scale
In general, today's presentation was:	4.8	1 Not Useful - 5 Very Useful
Rate organization:	4.3	1 Needs Improvement - 5 Excellent
Rate clarity:	4.5	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	4.6	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	5.0	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	4.4	1 Needs Improvement - 5 Excellent
The content of the presentation was:	3.8	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments:

Attendee suggested improvements for the instructor:

- Take more time in lecture for questions
- 50 mins of information that can be expanded into a day of information
- It would be interesting to see the energy difference between 1 and 2 daylight sensors
- Yellow is difficult to read on screen
- More picture please

What attendees found most valuable:

- The future of commercial application for smart lighting systems
- Future of coming attractions
- Comparisons between LED and Fluorescents
- Predicting the future

Professional associations of which attendees are members:

- AIA, ICC, NCARB, LEED, NCIDQ

Other types of training attendees would find useful

- Again, too much information condensed into one presentation, break it up into more presentations
- How to implement PoE into building design

4.1.12 SESSION 12: ULTRAVIOLET GERMICIDAL IRRADIATION (10/28/2022)

Title: Ultraviolet Germicidal irradiation

Description: With the arrival of COVID, there has been a surge of interest in Ultra Violet Germicidal Irradiation. During our research, the IDL found that UV systems can actually save on operational costs by reducing fan energy. Attendees will learn about the different UV technologies available, the strength needed to kill pathogens in air streams, and how to minimize the energy used to run these systems. This lecture will draw from leading researchers such as William Bahnfleth, who chaired ASHRAE's Epidemic Task Force. By installing UVGI systems in front of cooling coils, these can help prevent microbial growth and ensure better airflow throughout the building. With building occupants increasingly mindful of airborne contaminates, it's important for architects and engineers to be aware of these systems and how they can be integrated into a building.

Presentation Info:

Date:	10/28/22
Location:	A01 – Boise, ID
Presenter:	Damon Woods

Attendance:

Architect:	8	Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other*:	
Elec. Engineer:		None Specified:	
Total (In-Person):	**8**		

Evaluations: No evaluation were handed out

		Scale
In general, today's presentation was:	5.0	1 Not Useful - 5 Very Useful
Rate organization:	5.0	1 Needs Improvement - 5 Excellent
Rate clarity:	5.0	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	5.0	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	5.0	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	5.0	1 Needs Improvement - 5 Excellent
The content of the presentation was:	3.7	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments:

Attendee suggested improvements for the instructor:

- None, just right

What attendees found most valuable:

- Great information on a topic I wasn't familiar with
- Topic – Timely
- Effectiveness of system

Professional associations of which attendees are members:

- AIA, LEED

Other types of training attendees would find useful

- Keep bringing them on!

4.1.13 SESSION 13: LUMINAIRE LEVEL LIGHTING CONTROLS (11/10/2022)

Title: Luminaire Level Lighting Controls

Description: LLLCs have sensors and controls within individual fixtures that enable them to be controlled remotely or on a case-by-case basis. Remote control allows users to adjust the programming criteria or illumination levels without replacing the fixtures. In conventional lighting systems, lighting zones are defined as a collective unit and thus are centrally controlled. LLLCs however, incorporate sensors into each fixture, such as occupancy, daylight, temperature or receive/broadcast signals. Each fixture has the potential to become a semi-autonomous zone that is capable of responding to small changes in the area under each fixture. Furthermore, individual fixtures can communicate with other fixtures, using wireless or infrared signals, to share data for an even greater potential to increase energy savings and user satisfaction. Some LLLCs can be connected by gateway to transfer information collected. This data is analyzed, usually through manufacturer's software, to provide a user interface different from a typical text editor. From there users are able to identify trends in occupancy and lighting energy consumption that can then be used to refine the building schedules for occupancy and lighting and, if applicable, for the buildings' HVAC schedule programming.

Presentation Info:

Date:	11/10/22
Location:	A3 – Boise, ID
Presenter:	Dylan Agnes

Attendance:

Architect:	7	Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other:	
Elec. Engineer:		None Specified:	
Total (In-Person):	7		

Evaluations: No evaluations were handed out

		Scale
In general, today's presentation was:	4.2	1 Not Useful - 5 Very Useful
Rate organization:	4.8	1 Needs Improvement - 5 Excellent
Rate clarity:	4.2	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	4.0	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	5.0	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	4.1	1 Needs Improvement - 5 Excellent
The content of the presentation was:	3.6	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments:

Attendee suggested improvements for the instructor:

- Need learning objectives upfront. Hard to understand why jumping into NLC vs LLLC until several slides in
- Give away item (Swag)/Local examples of the system being presented
- More visuals

What attendees found most valuable:

- The example of lights on/off dimmed in a cubicle/open office/hallway vs daylight
- Explanation of LLLCs – How to use and best use them. The breakdown using graphics that makes the info easier to absorb
- Pros and cons between different lighting systems

Professional associations of which attendees are members:

- ULI Idaho

Other types of training attendees would find useful

- None

4.1.14 SESSION 14: THERMAL ENERGY STORAGE SYSTEMS (11/17/2022)

Title: Thermal Energy Storage Systems

Description: Thermal Energy Storage Systems (TES) are gaining popularity as a way to mitigate peak energy use. This lecture will explore the use of things like ice-storage and ponds to minimize chiller and boiler use. This technology can be paired with ground-source heat pumps, radiant systems, and natural ventilation. Idaho typically has large temperature swings between the high and low temperatures (sometimes up to 30 F), which makes our state especially suited to shifting when heating and cooling equipment should operate. By understanding more about TES, engineers and architects alike can design unique configurations that can increase efficiency and enhance resiliency in their buildings.

Presentation Info:

Date:	11/17/22
Location:	AO2 – Pocatello, ID
Presenter:	Damon Woods

Attendance:

Architect:	4	Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other:	
Elec. Engineer:		None Specified:	2
Total (In-Person):	6		

Evaluations:

		Scale
In general, today's presentation was:	4.5	1 Not Useful - 5 Very Useful
Rate organization:	4.5	1 Needs Improvement - 5 Excellent
Rate clarity:	4.7	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	5.0	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	4.8	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	5.0	1 Needs Improvement - 5 Excellent
The content of the presentation was:	3.5	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments:

Attendee suggested improvements for the instructor:

- None

What attendees found most valuable:

- Thinking about different options
- Opportunities for geothermal systems and combined systems
- Better understanding of the concept

Professional associations of which attendees are members:

- AIA, NCARB

Other types of training attendees would find useful

- Passive solar heating

APPENDIX B: LUNCH AND LEARN 2022 TOPICS OFFERED

High Performance Classrooms (Topic 2001)

Student enrollment in Ada County is projected to grow by 1,000 students per year for the next ten years and at least six capital projects are planned in the West Ada District alone to meet this demand. This session will cover a variety of issues facing the design of an efficient, healthy, and productive classroom environment. A quick look at the state over the last 50 years of school design will introduce the problems faced by designers. This session will highlight several case studies of high-performance schools in the Northwest to address daylighting, natural ventilation, and integration of mechanical systems. Each passive strategy will be addressed in detail with regional examples and performance research.

Dedicated Outdoor Air Systems (DOAS) Integration (Topic 1703)

In an effort to operate buildings in the most energy efficient manner, we are designing building envelopes to be as airtight as possible with as little outside air as allowable. In this presentation the following issues are addressed: significance of IAQ to human health and productivity, the link between IAQ and building energy demands, and efficient technologies for optimizing IAQ.

Ultraviolet Germicidal Air Irradiation (Topic 2203)

With the arrival of COVID, there has been a surge of interest in Ultra Violet Germicidal Irradiation. During our research, the IDL found that UV systems can actually save on operational costs by reducing fan energy. Attendees will learn about the different UV technologies available, the strength needed to kill pathogens in air streams, and how to minimize the energy used to run these systems. This lecture will draw from leading researchers such as William Bahnfleth, who chaired ASHRAE's Epidemic Task Force. By installing UVGI systems in front of cooling coils, these can help prevent microbial growth and ensure better airflow throughout the building. With building occupants increasingly mindful of airborne contaminates, it's important for architects and engineers to be aware of these systems and how they can be integrated into a building.

Thermal Energy Storage Systems (Topic 22202)

Thermal Energy Storage Systems (TES) are gaining popularity as a way to mitigate peak energy use. This lecture will explore the use of things like ice-storage and ponds to minimize chiller and boiler use. This technology can be paired with ground-source heat pumps, radiant systems, and natural ventilation. Idaho typically has large temperature swings between the high and low temperatures (sometimes up to 30 F), which makes our state especially suited to shifting when heating and cooling equipment should operate. By understanding more about TES, engineers and architects alike can design unique configurations that can increase efficiency and enhance resiliency in their buildings.

LED Technology's Impact on Savings and Efficiency (Topic 2201)

We will examine the effect LED technology has had on energy savings, control strategies, and future implications with continued efficient lighting technology. As lighting technology becomes more efficient it will adjust codes, incentives from utilities, and energy efficiency standards. More importantly, it will change the cost benefit analysis regarding lighting, control strategies, and occupant comfort. The LED revolution for lighting is not done and, in this lecture, we will discuss the current state of LEDs as well as the direction we are going and what we might find when we arrive.

OpenStudio – Parametric Analysis Tool (Topic 2002)

This session will cover the parametric analysis tool (PAT) within OpenStudio. PAT removes the need to hand edit each model to try out different architectural design, energy efficiency measures, or mechanical systems. Participants will learn the fundamental concepts of measure writing for OpenStudio, simulation parameters, running a simulation with PAT, and how firms can utilize this feature to inform early design decisions in regards to building performance.

Daylighting Multipliers – Increasing Daylight Harvesting Efficiency (Topic 2003)

This session will cover the role that daylighting multipliers play when trying to increase the efficiency of daylight harvesting in a building through design applications, such as, light shelves, manufactured glazing, and material specification. Participants will learn about the rate of return and energy efficiency cost effectiveness for daylighting strategies, building form, location, and multipliers. The class will explain how the layers of daylighting/electric lighting strategies and control systems and how they add or subtract to the overall efficiency of the design.

Future of Lighting Controls (Topic 1901)

Although LEDs have shown, they are a big game changer in the commercial lighting realm; lower lighting power density is not the only area of value when considering lighting. We can further increase savings from these highly efficient lighting systems by introducing control systems that collect data and user input to create an evolving feedback loop that seeks peak system operation. While LLLC's (Luminaire Level Lighting Control) use this feature, they still use the same infrastructure as the lighting and control system that have come before it, which can be a limitation for expanding the systems efficiency and integration to other building systems. We believe the internet of things (IoT) will change the lighting and controls industry, providing an excellent medium for an integrated, multi-service IoT platform. Why? Where there are people, there are lights; where there are people, there will also be the need for connectivity. New and connected lighting controls provide a means to deliver valuable IoT services and increased energy savings.

The Architects' Business Case for Energy Performance Modeling (Topic 1902)

Most of us think of energy modeling as an engineering exercise. The truth is that more models and simulations are performed, and to better result, if the architect understands when and how to support the process and how to utilize the output.   A building energy model can provide the architect an iterative process to increase the real-world effectiveness of energy systems within a building. This session will explore the value-add of energy modeling from the architect's perspective, providing a business case for more active involvement in advocation for energy performance modeling.

Luminaire Level Lighting Controls (LLLCs) (Topic 1904)

LLLCs have sensors and controls within individual fixtures that enable them to be controlled remotely or on a case-by-case basis. Remote control allows users to adjust the programming criteria or illumination levels without replacing the fixtures. In conventional lighting systems, lighting zones are defined as a collective unit and thus are centrally controlled. LLLCs however, incorporate sensors into each fixture, such as occupancy, daylight, temperature or receive/broadcast signals. Each fixture has the potential to become a semi-autonomous zone that is capable of responding to small changes in the area under each fixture. Furthermore, individual fixtures can communicate with other fixtures, using wireless or infrared signals, to share data for an even greater potential to increase energy savings and user satisfaction. Some LLLCs can be connected by gateway to transfer information collected. This data is analyzed, usually through manufacturer's software, to provide a user interface different from a typical text editor. From there users are able to identify trends in occupancy and lighting energy consumption that can then be used to refine the building schedules for occupancy and lighting and, if applicable, for the buildings' HVAC schedule programming.

LEED V4.1 Daylighting Credits (Topic 2101)

LEED Daylighting credits are one of the most difficult to achieve and requires an early investment for validation. However, investigating daylight opportunities for a project will assist in other aspects of energy efficiency, such as, estimating heating and cooling loads or integrating a building's control systems. As such, any time spent in the early design phase investigating if a project should invest in daylighting is applicable to facets of energy efficient design that is often required for LEED projects. In this lecture we will discuss the changes from LEED V4 to V4.1 Daylighting Credits, which options work best for project types, incorporating early energy/simulation modeling into the design process, and how to run a cost-benefit analysis to determine if you should invest in daylighting.

ASHRAE Standard 209 – Energy Simulation-Aided Design (Topic 2102)

Learn about ASHRAE's recommendations for energy simulation aided design. This lecture will cover methods of integrating modeling into the design process to meet aggressive energy savings targets. Learn how to implement load-reducing modeling cycles early in the design process. Quantify the energy impact of design decisions in real time. And, use post-occupancy modeling to enhance building performance. Whether trying to achieve LEED, tax credits, or efficiency incentives, energy modeling can help improve the bottom line for both designers and clients.

ASHRAE Standard 36 – High Performance Sequences of Operation for HVAC Systems (Topic 2103)

The best equipment can still run terribly if it's not controlled well – like a sports car in the hands of a clueless driver. Don't let that happen to your design. Get the latest guidelines on sequences of operation for common HVAC sequences. Take advantage of Idaho Power's incentives on HVAC energy management controls. Get a refresher proper start-up and shut down sequences for air handling units including VAVs, rooftop units, and heat pumps. Ensure that controls are in compliance with indoor air quality standards for ASHRAE 62.1 compliance and COVID mitigation. Participants will learn functional tests they can perform that can confirm that proper sequences are in place.

2022 Task 3: BSUG
Summary of Effort and Outcomes
Idaho Power Company External Year-End Report

December 31, 2022

Prepared for:
Idaho Power Company

Author:
Dylan Agnes

Report Number: 2022_003-01

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Author:
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Prepared for:
Idaho Power Company

Contract Number:
IPC KIT #8112

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DISCLAIMER

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TABLE OF CONTENTS

1. Acronyms and Abbreviations

AIA	American Institute of Architects
App	Application
ARUP	London based multi-discipline firm
ASHRAE	American Society of Heating, Refrigeration, and Air-Conditioning Engineers
BCVTP	Building Controls Virtual Test-Bed
BEMP	Building Energy Modeling Professional
BESF	Building Energy Simulation Forum (Energy Trust of Oregon)
BIM	Building Information Modeling
BOMA	Building Owners and Managers Association
BSME	Bachelor of Science in Mechanical Engineering
BSUG	Building Simulation Users' Group
CBECS	Commercial Building Energy Consumption Survey
Comm	Commercial
Elec.	Electrical
HePESC	Heat Pump Energy Savings Calculator
HVAC	Heating, Ventilation, and Air Conditioning
IBPSA	International Building Performance Simulation Association
IDL	Integrated Design Lab
IPC	Idaho Power Company
LBNL	Lawrence Berkeley National Laboratory
LEED	Leadership in Energy & Environmental Design
LLLC	Luminaire Level Lighting Control
M. Arch	Masters of Architecture
ME	Mechanical Engineer(ing)
Mech.	Mechanical
MEP	Mechanical, Electrical, and Plumbing
MS Arch	Masters of Science Architecture
NCARB	National Council of Architectural Registration Boards
RDA	Revit Daylighting Analysis
TMY	Typical Meteorological Year
UDC	Urban Design Center
UI	University of Idaho
USGBC	U.S. Green Building Council

2. Introduction

The 2022 Idaho Power scope of work for the Building Simulation Users' Group (BSUG) task included planning, organization and hosting of six meetings, recording attendance and evaluations, archiving video of the presentations, and maintaining the BSUG 2.0 on the IDL website which can be found here: (http://www.idlboise.com/content/bsug-20).

3. 2022 Summary and Cumulative Analysis

In 2022, six sessions were coordinated and hosted. Sessions are summarized below with details in the following sections.

Table 1: Overall Summary of Sessions

				RSVPs		Attendees	
Date	**Title**	**Presenter**	**Presenter Company**	**In-person**	**Online**	**In-person**	**Online**
3/30	Indoor Air Quality Impact Modeling	Kelsey Ramsey	IDL	-	22	-	22
4/27	Decarbonized Building and District Energy Systems	Michael Wetter	LBNL	-	71	-	29
5/25	Embodied Carbon, Whole Building Life Cycle Assessment, and Energy Efficiency	Victoria Herrero-Garcia	AE	-	60	-	30
8/24	Benchmarking Building, Energy Star, and DDX	Dylan Agnes	IDL	12	44	13	9
9/21	Energy Codes in Idaho	Panel	ASHRAE	-	-	71	13
10/26	Creating an Efficient Workflow to Design a Day-lit, Glare-free, Energy efficient Building	Marco Aguirre	Cove	11	34	8	-
				23	**231**	**92**	**103**
				254		**195**	

2022 Attendance

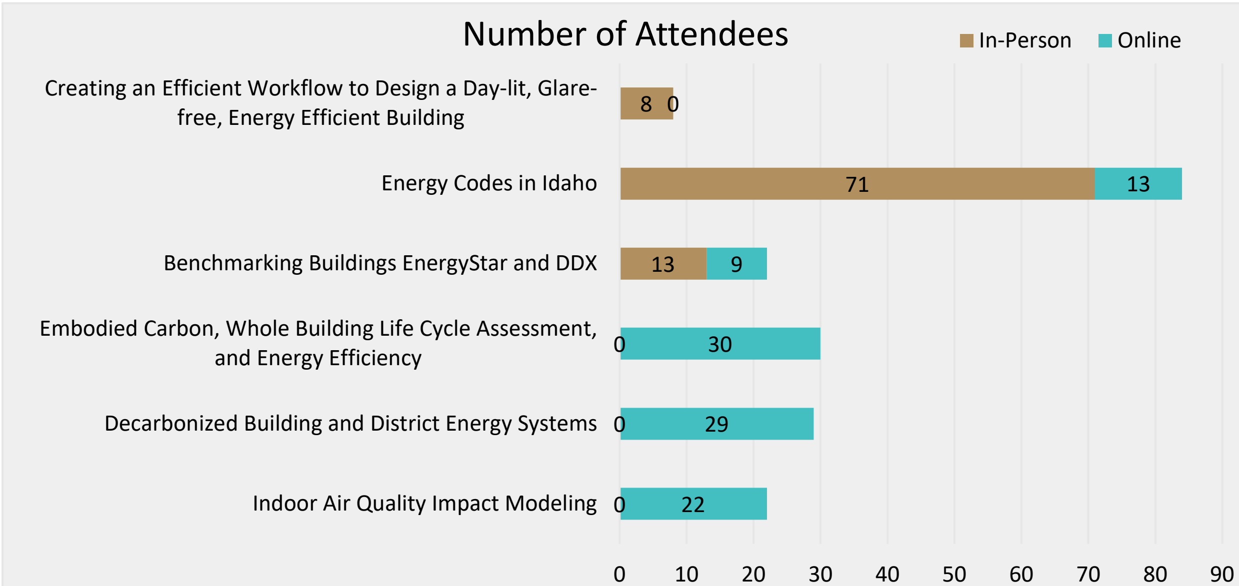


Figure 1: Attendee Count by Session and Type

Table 2: Overall Attendance Breakdown

Architect:	16	Electrician:	0
Engineer:	23	Contractor:	0
Mech. Engineer:	2	Other:	154
Elec. Engineer:	0	None Specified:	0
Total (In-Person):	**92**		
Total (Online):	**103**		
Total (Combined):	**195**		

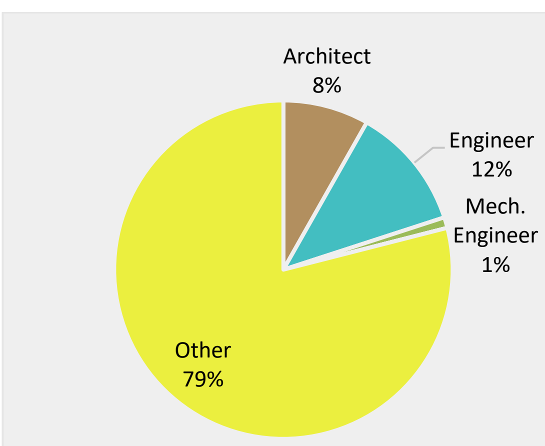


Figure 2: Attendee Profession Breakdown

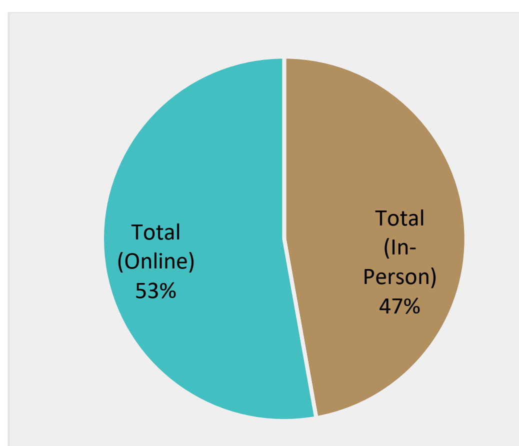


Figure 3: Attendee Type Breakdown

2022 Evaluations

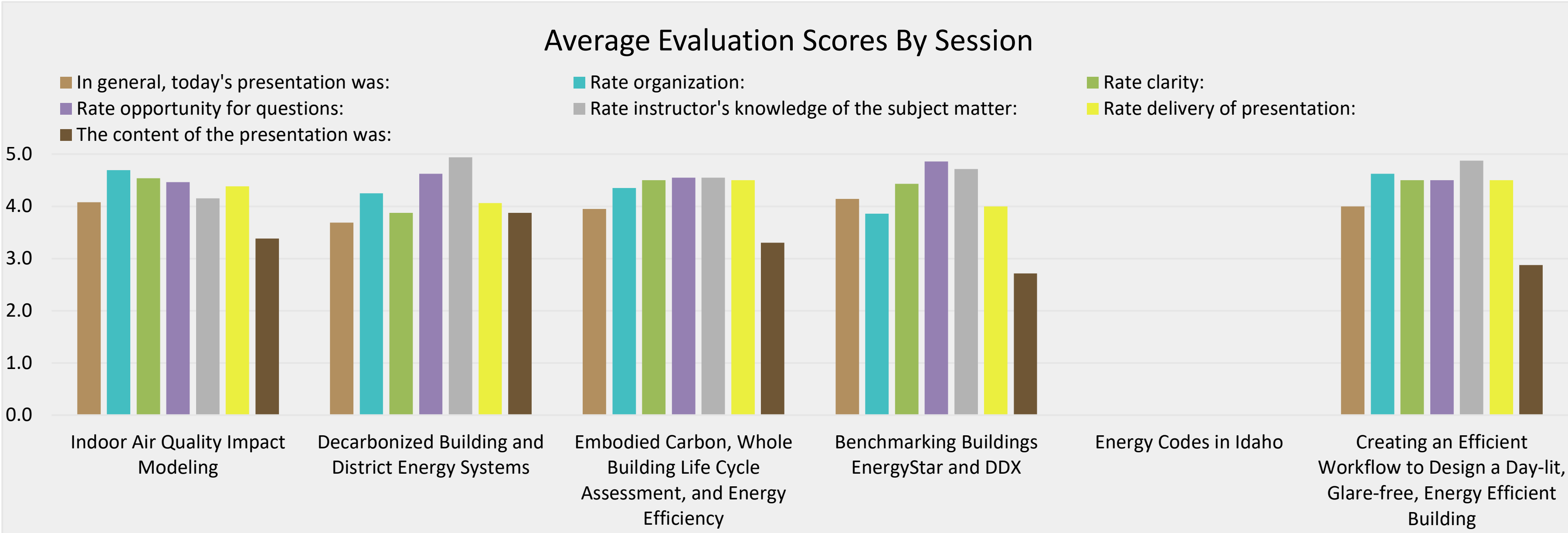
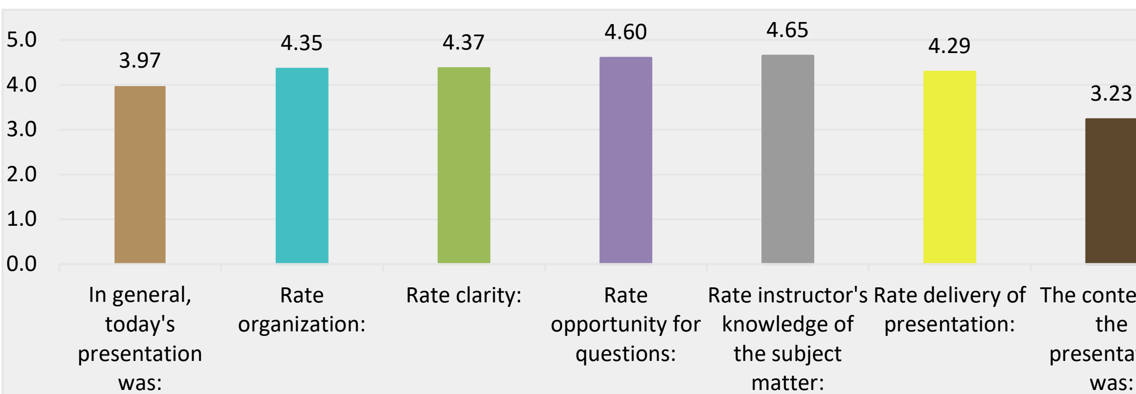


Figure 4: Average Evaluations by Session



Evaluation Metric	Scale
'...today's presentation was'	1 Not Useful - 5 Very Useful
'The content...'	1 Too Basic - 3 Just Right - 5 Too Advanced
'Rate ....'	1 Needs Improvement - 5 Excellent

Figure 5: Average Evaluation Scores for All Sessions

4. Session Summaries

Session 1: Indoor Air Quality Impact Modeling (3/30/22)

Title: Indoor Air Quality Impact Modeling

Date: 03/30/22

Description: COVID-19 has brought the issue of indoor air quality to the forefront of building science. Virus mitigation strategies range in effectiveness, efficiency, and costs depending on the building type, use types, and local climate. Using Open Studio and Energy+, the IDL examined the energy and cost impacts of six different mitigation strategies for commercial buildings in the Treasure Valley.

Presenter: Kelsey Ramsey

Attendance:

Architect:	2	Electrician:	
Engineer:	6	Contractor:	
Mech. Engineer:		Other*:	5
Elec. Engineer:		None Specified:	9
Total (In-Person):	**0**		
Total (Online):	**22**		
*If 'Other' was noted:	Principal, Building Surveyor, Project Consultant, PhD Student		

Session 2: Decarbonized Building and District Energy Systems (04/27/22)

Title: Decarbonized Building and District Energy Systems

Date: 04/27/22

Description: Due to demands caused by climate change, the energy sector is undergoing a rapid transition. Energy systems for buildings and communities need to become decarbonized, grid-responsive/efficient, resilient, and adaptive to changes in usage, technology options, and markets. This leads to increased complexity in their design and operation. Fortunately, new energy systems provide an opportunity to integrate and optimize renewables and storage across multiple prosumers and energy carriers. New system architectures and control challenges emerge, as do new requirements on design flows that can manage the increased complexity. After laying out these challenges, we will present recent progress on new generation computational tools for building and district energy and control systems. We will also present new tool chains that allow for rapid system-level prototyping, model-based design flow and digitization, ranging from design to installation and operation. We will close with a discussion about what foundation should be built to meet design and operation challenges of decarbonized energy efficient systems.

Presenter: Michael Wetter

Attendance:

Architect:	1	Contractor:	
Mech. Engineer:	3	Other*:	6
Elec. Engineer:		None Specified:	19
Total (In-Person):	**0**		
Total (Online):	**29**		
*If 'Other' was noted:	Director of Energy and Utilities, Student, Building System Analyst, Professor Emeritus		

Session 3: Embodied Carbon, Whole Building Life Cycle Assessment, and Energy Efficiency (05/25/22)

Title: Embodied Carbon, Whole Building Life Cycle Assessment, and Energy Efficiency

Date: 05/25/22

Description: The built industry has focused its efforts on measuring and reducing operational carbon emissions, carbon emissions related to materials used in our projects is gaining relevance; measuring, understanding, and reducing these emissions should be a key addition to all design practices. This presentation will cover general embodied carbon concepts, Whole-Building Life-Cycle Assessment (WBLCA) tools to quantity embodied carbon in buildings, and tools for all disciplines to start the conversations.

Presenter: Victoria Herrero-Garcia

Attendance:

Architect:	4	Electrician:	
Engineer:	5	Contractor:	
Mech. Engineer:	2	Other*:	4
Elec. Engineer:		None Specified:	15
Total (In-Person):	**0**		
Total (Online):	**30**		
*If 'Other' was noted:	Designer, Systems Analyst, PhD Student, Director of Building and Grounds		

Session 4: Benchmarking Buildings, EnergyStar, and DDX (08/24/22)

Title: Benchmarking Buildings, EnergyStar, and DDX

Date: 08/24/22

Description: Benchmarking is a method for measuring a building's energy efficiency by comparing its energy use to other buildings with similar functions (commercial office, school, warehouse, etc…). Benchmarking allows owners to take a snapshot of how their building is performing currently in regards to energy consumption and then compare the performance to other buildings to infer if improvements can be made. In addition, software developed by the Government or organizations, AIA and AHSRAE, can be used to further evaluate a building's performance. Software, such as, EnergyStar's Portfolio Manager will assist with tracking a building, sharing information, performing data analysis, setting goals, and meeting those goals.

Presenter: Dylan Agnes

Attendance:

Architect:	7	Electrician:	
Engineer:	5	Contractor:	
Mech. Engineer:	2	Other*:	1
Elec. Engineer:		None Specified:	9
Total (In-Person):	**13**		
Total (Online):	**9**		
*If 'Other' was noted:	Interior Design		

Session 5: Energy Codes in Idaho (09/21/22)

Title: Energy Codes in Idaho

Date: 09/21/22

Description: The energy code and its value to Idahoans is under great discussion and debate in recent months as the Idaho Division of Occupational and Professional Licenses has brought all codes under full review in response to the Governor's Executive Order for Zero-Based Rulemaking. As rule makers engage with the public through these discussions, questions arise about what value an energy code, or specific sections therein, bring to a state like Idaho and its local communities. The discussion will be moderated by Dan Russell, PE.

- Do the measures captured in the energy code actually save building owners money?
- Are the measures cost-effective?

- Do energy code measures offer any life safety, health or environmental quality benefits?
- Are energy code measures enforceable?
- Does the energy code pose an undue burden on those financing building construction?
- Does the energy code benefit any stakeholders in a uniquely positive way?
- How does the energy code or lack of one impact the local electric utility demand and associated payer rates?
- Can the energy code be feasibly diced up into sections or individual measures such that there is a middle ground between retaining the full energy code and eliminating it all together?
- If so, what specific measures are best candidates for meeting this middle ground?

Many of these questions and possibly questions you have will be discussed by this industry panel. We believe this is an extremely timely topic for our Society, our Chapter and our Idaho community. Please register today to join us and we encourage you to submit 1 or 2 questions during the registration process that you would like to be considered for inclusion in the question set for the panel.

Presenters: Michael Hyde, Patrick Sullivan, Mike Jones, Damon Woods, Bob Tikker

Attendance:

Architect:		Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other*:	
Elec. Engineer:		None Specified:	84
Total (In-Person):	**71**		
Total (Online):	**13**		
*If 'Other' was noted:			

Session 6: Creating an Efficient Workflow to Design a Day-lit, Glare Free, Energy Efficient Building (10/26/22)

Title: Creating an Efficient Workflow to Design a Day-lit, Glare Free, Energy Efficient

Date: 10/26/22

Description: In this webinar, we will look at typical challenges that prevent the adoption of internal sustainability approaches as well as the business benefits of standardizing a sustainability workflow. We will learn how to use data-driven design to balance sustainability and cost and how platforms like cove.tool are integrating new technologies to help design teams win more projects and stay ahead of the conversation. By the end, attendees will have a new understanding of putting together an analysis checklist and how to reach their performance targets.

Presenter: Marco Aguirre

Attendance:

Architect:	2	Electrician:	
Engineer:	4	Contractor:	
Mech. Engineer:		Other*:	2
Elec. Engineer:		None Specified:	
Total (In-Person):	**8**		
Total (Online):	**0**		
*If 'Other' was noted:	Student		

5. Website Maintenance and Statistics

The Google site "BSUG 2.0" was retired in 2020 and has been integrated into the new idlboise.com website. Each month, details about the upcoming presentations were posted to the 'EVENTS and NEWS' pages. These pages also included links to both webinar and in-person registration. Monthly emails linked to these pages as well as directly to the registration sites are sent out to users subscribed to our mailing list. If the monthly session included a webinar recording, the video was edited and posted to the YouTube channel with a link from the BSUG 2.0 video archive. The IDL developed a blog section within the BSUG content where we post on past topics, emerging technologies, and simulation software workflows.

6. Other Activities and Suggestions for Future Improvements

We saw an increase in average attendance for each session this year as well as overall attendance from 2021. While we are happy that we have increased our attendance despite the webinar format, it should be noted that attendance for the treasure valley is still down. Attendance this year was successful for the BSUG task with 6 sessions completed and 195 total attendees – 92 in-person and 103 online. Feedback was provided by attendees via the ZOOM platform by conducting polls at the end of lecture, or when the Q&A portion started. We received 64 responses with a response rate of 33% in 2022. The ZOOM platform does not allow participants to give written comments as a form of feedback for polling. Comments moving forward will be limited to in-person evaluations.

A round table meeting was held on December 7th, 2022 to provide feedback on topics presented this year as well as suggestions for 2023 lecture topics. The feedback is summarized below. In addition, we have an online survey for participants who attend via webinar to also provide feedback. The results of the online survey will be presented in the 2023 kick off meeting.

- Benchmarking building case studies (Warehouse, Office, School)
- An emerging technology
- Quality control measures/manage building upgrades
- Grasshopper pollination tool
- Project Stasio (data visualization)
- Warehouse efficient design and practices
- BetterBricks software
- ASHRAE join session (standard assumption inputs)

7. APPENDICES

Appendix A: BSUG 2022 Evaluations

Summaries of evaluations for each of the 6 sessions are recorded below. It should be noted that comments typically collected with evaluation are unavailable due to restriction from the ZOOM platform.

Session 1 (03/30/22): Indoor Air Quality Impact Modeling

Presentation Info:

Date:	03/30/22
Location:	Online Webinar
Presenter:	Kelsey Ramsey – IDL

Attendance:

Architect:	2	Electrician:	
Engineer:	6	Contractor:	
Mech. Engineer:		Other*:	5
Elec. Engineer:		None Specified:	9
Total (In-Person):			
Total (Online):	**22**		
*If 'Other' was noted:	Principal, Building Surveyor, Project Consultant, PhD Student		

Evaluations:		Scale
In general, today's presentation was:	**4.1**	1 Not Useful - 5 Very Useful
Rate organization:	**4.7**	1 Needs Improvement - 5 Excellent
Rate clarity:	**4.5**	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	**4.5**	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	**4.2**	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	**4.4**	1 Needs Improvement - 5 Excellent
The content of the presentation was:	**3.4**	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments: No comments were made on evaluations collected.

Session 2 (04/27/21): Decarbonized Building and District Energy Systems

Presentation Info:

Date:	04/27/2022
Location:	Online Webinar
Presenter:	Michael Wetter – LBNL

Attendance:

Architect:	1	Electrician:	
Engineer:	3	Contractor:	
Mech. Engineer:		Other*:	6
Elec. Engineer:		None Specified:	19
Total (In-Person):			
Total (Online):	**29**		
*If 'Other' was noted:	Director of Energy and Utilities, Student, Professor Emeritus, Building Systems Analyst		

Evaluations:

		Scale
In general, today's presentation was:	**3.7**	1 Not Useful - 5 Very Useful
Rate organization:	**4.3**	1 Needs Improvement - 5 Excellent
Rate clarity:	**3.9**	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	**4.6**	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	**4.9**	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	**4.1**	1 Needs Improvement - 5 Excellent
The content of the presentation was:	**3.9**	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments: No comments were made on evaluations collected.

Session 3 (05/25/22): Embodied Carbon, Whole Building Life Cycle Assessment, and Energy Efficiency

Presentation Info:

Date:	05/25/2022
Location:	Online Webinar
Presenter:	Victoria Herrero-Garcia – AE

Attendance:

Architect:	4	Electrician:	
Engineer:	5	Contractor:	
Mech. Engineer:	2	Other*:	4
Elec. Engineer:		None Specified:	15
Total (In-Person):	**0**		
Total (Online):	**30**		

*If 'Other' was noted:	Designer, Systems Analyst, PhD Student, Director of Buildings and Grounds

Evaluations:

		Scale
In general, today's presentation was:	**4.0**	1 Not Useful - 5 Very Useful
Rate organization:	**4.4**	1 Needs Improvement - 5 Excellent
Rate clarity:	**4.5**	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	**4.6**	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	**4.6**	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	**4.5**	1 Needs Improvement - 5 Excellent
The content of the presentation was:	**3.3**	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments: No comments were made on evaluations collected.

Session 4 (08/24/22): Benchmarking Buildings, EnergyStar, and DDX

Presentation Info:

Date:	08/24/2022
Location:	IDL
Presenter:	Dylan Agnes – IDL

Attendance:

Architect:	7	Electrician:	
Engineer:	5	Contractor:	
Mech. Engineer:		Other*:	1
Elec. Engineer:		None Specified:	9
Total (In-Person):	**13**		
Total (Online):	**9**		
*If 'Other' was noted:	Interior Design		

Evaluations:

		Scale
In general, today's presentation was:	**4.1**	1 Not Useful - 5 Very Useful
Rate organization:	**3.9**	1 Needs Improvement - 5 Excellent
Rate clarity:	**4.4**	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	**4.9**	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	**4.7**	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	**4.0**	1 Needs Improvement - 5 Excellent
The content of the presentation was:	**2.7**	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments: No comments were made on evaluations collected.

Session 5 (09/21/22): Energy Codes in Idaho

Presentation Info:

Date:	09/21/2022
Location:	The Creative Space
Presenters:	Michael Hyde, Patrick Sullivan, Mike Jones, Damon Woods, Bob Tikker – ASHRAE Panel

Attendance:

Architect:		Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other*:	
Elec. Engineer:		None Specified:	84
Total (In-Person):	**71**		
Total (Online):	**13**		
*If 'Other' was noted:			

Evaluations: No evaluations were collected

		Scale
In general, today's presentation was:	**0.0**	1 Not Useful - 5 Very Useful
Rate organization:	**0.0**	1 Needs Improvement - 5 Excellent
Rate clarity:	**0.0**	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	**0.0**	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	**0.0**	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	**0.0**	1 Needs Improvement - 5 Excellent
The content of the presentation was:	**0.0**	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments: No comments were made on evaluations collected.

Session 6 (10/26/22): Creating an Efficient Workflow to Design a Day-lit, Glare-free, Energy Efficient Building

Presentation Info:

Date:	10/26/2022
Location:	IDL
Presenter:	Marco Aguirre – Cove

Attendance:

Architect:	2	Electrician:	
Engineer:	4	Contractor:	
Mech. Engineer:		Other*:	2
Elec. Engineer:		None Specified:	
Total (In-Person):	**8**		
Total (Online):	**0**		

*If 'Other' was noted: Student

Evaluations:

		Scale
In general, today's presentation was:	**4.0**	1 Not Useful - 5 Very Useful
Rate organization:	**4.6**	1 Needs Improvement - 5 Excellent
Rate clarity:	**4.5**	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	**4.5**	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	**4.9**	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	**4.5**	1 Needs Improvement - 5 Excellent
The content of the presentation was:	**2.9**	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments: No comments were made on evaluations collected.

2022 Task 4: New Construction Verifications

Summary of Projects

Idaho Power Company External Year-End Report

December 31, 2022

Prepared for:
Idaho Power Company

Author:
Dylan Agnes

Report Number: 2022_004-01

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Prepared by:
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Damon Woods

Authors:
Dylan Agnes

Prepared for:
Idaho Power Company

Contract Number:
IPC KIT #8112

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DISCLAIMER

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Table of Contents

Acronyms and Abbreviations

AC	Air Conditioning
NCV	New Construction Verification
HVAC	Heating, Ventilation, and Air Conditioning
IDL	Integrated Design Lab
IPC	Idaho Power Company
UI	University of Idaho
VRF	Variable Refrigerant Flow
HP	Heat Pump

1. Introduction

The University of Idaho Integrated Design Lab (UI-IDL) had two roles for the New Construction Verification (NCV) task in 2022. The primary role is to conduct on-site verification reports for approximately 10% of projects that participated in Idaho Power Company's (IPC) New Construction Program. The verified projects were randomly selected from the projects paid in 2022, and at least four projects were required to be outside the Boise/Meridian/Eagle/Kuna area. The purpose of the project reviews and on site verifications is to assist IPC in program quality assurance. The on site verification also looks to capture any inconsistences between the final application and what was installed on site. The secondary role is to review the photo controls design and function for every project whose application included incentive L3: Daylight Photo Controls within the New Construction Program. Once each review was concluded, a letter of support for the incentive was submitted to Idaho Power. The review and letter provides IPC the information needed to pay the L3 incentive and quality of design through the inclusion of additional design and commissioning recommendations.

2. 2022 New Construction Verification Projects

The UI-IDL completed eight New Construction Verification projects in 2022. A detailed report for each project was submitted to IPC, including claimed and actual installation for each specific incentive the project applied for. All of the projects reviewed in 2022 were finalized and paid in 2022. One project resides under the 2016 program, three projects reside under the 2018 program format, and the rest reside under the 2021 program format. The specific incentives for this program are outlined in Tables 1, 2, and 3.

Table 1: 2016 New Construction Program Specific Incentives

Lighting	L1	Interior Light Load Reduction
	L2	Exterior Light Load Reduction
	L3	Daylight Photo Controls
	L4	Occupancy Sensors
	L5	High Efficiency Exit Signs
Air Conditioning	A1	Efficient Air-Cooled AC & Heat Pump Units
	A2	Efficient VRF Units
	A3	Efficient Chillers
	A4	Air Side Economizers
	A5	Direct Evaporative Coolers
	A6	Evaporative Pre-coolers on Air-cooled Condensers
Building Shell	B1	Reflective Roof Treatment
Controls	C1	Energy Management Control System
	C2	Guest Room Energy Management System
	C3	HVAC Variable Speed Drives
	C4	Kitchen Hood Variable Speed Drives
	C5	Onion/Potato Shed Ventilation Variable Speed Drives
Appliances with Electric Water Heating	W1	Efficient Laundry Machines
	D1	EnergyStar Undercounter Dishwashers
	D2	EnergyStar Commercial Dishwasher
Refrigeration	R1	Head Pressure Controls
	R2	Floating Suction Controls
	R3	Efficient Condensers
Other	P1	Smart Strip Power Strips

Table 2: 2018 New Construction Program Specific Incentives

Lighting	L1	Interior Light Load Reduction
	L2	Exterior Light Load Reduction
	L3	Daylight Photo Controls
	L4	Occupancy Sensors
	L5	High Efficiency Exit Signs
Air Conditioning	A1	Efficient Air-Cooled AC & Heat Pump Units
	A2	Efficient VRF Units
	A3	Efficient Chillers
	A4	Air Side Economizers
	A5	Direct Evaporative Coolers
	A6	High-Volume Low-Speed Fan
Building Shell	B1	Reflective Roof Treatment
Controls	C1	Energy Management Control System
	C2	Guest Room Energy Management System
	C3	HVAC Variable Speed Drives
	C4	Kitchen Hood Variable Speed Drives
	C5	Onion/Potato Shed Ventilation Variable Speed Drives
	C6	Dairy Vacuum Pump Variable Speed Drives
	C7	Wall or Engine-Block Heater Controls
Appliances with Electric Water Heating	W1	Efficient Laundry Machines
	D1	EnergyStar Undercounter Dishwashers
	D2	EnergyStar Commercial Dishwasher
Refrigeration	R1	Head Pressure Controls
	R2	Floating Suction Controls
	R3	Efficient Condensers
	R4	Refrigerator and Freezer Strip Curtains
	R5	Automatic High-Speed Doors
Office Equipment	P1	Smart Strip Power Strips
Compressed Air Equipment	CA1	Air Compressor VSDs
	CA2	No-Loss Condensate Drain
	CA3	Low-Pressure Drop Filter
	CA4	Cycling Refrigerated Compressed Air Dryer
	CA5	Efficient Compressed Air Nozzle

Table 3: 2021 New Construction Program Specific Incentives

Lighting	L1	Interior Light Load Reduction
	L2	Exterior Light Load Reduction
	L3	Luminaire Level Lighting Controls (LLLC)
	L4	Occupancy Sensors
	L5	High Efficiency Exit Signs
Air Conditioning	A1	Efficient Air-Cooled AC & Heat Pump Units
	A2	Efficient VRF Units
	A3	Efficient Chillers
	A4	Economizers
	A5	Direct & Indirect Evaporative Coolers
	A6	High-Volume Low-Speed Fan
	A7	Evaporative Pre-Coolers on Air-cooled Condensers
Building Shell	B1	Reflective Roof Treatment
Controls	C1	Energy Management Control System
	C2	Guest Room Energy Management System
	C3	HVAC Variable Speed Drives
	C4	Kitchen Hood Variable Speed Drives
	C5	Onion/Potato Shed Ventilation Variable Speed Drives
	C6	Dairy Vacuum Pump Variable Speed Drives
	C7	Dairy Milk Transfer Pump Variable Speed Drives
Appliances with Electric Water Heating	W1	Efficient Laundry Machines
	I1	Efficient Ice Machines
	E1	Circulating Generator Block Heaters
	E2	High Efficiency Battery Chargers
	E3	Wall or Engine Block Heater Controls
Refrigeration	R1	Efficient Condensers
	R2	Automatic High-speed Doors
	R3	Evaporative Pre-coolers on Air-cooled Condensers
Compressed Air Equipment	CA1	Air Compressor VSDs
	CA2	No-Loss Condensate Drain
	CA3	Low-Pressure Drop Filter
	CA4	Cycling Refrigerated Compressed Air Dryer
	CA5	Efficient Compressed Air Nozzle

Table 4 summarizes the eight projects and respective qualified incentive measures which were verified by UI-IDL. For the projects listed, more than 50% were located outside the capital service area.

Table 4: Project Summary

IPC Project #	Facility Description	Location	Incentive Measures	UI-IDL Site-Visit Date
16-347	Medical (Non-Hospital)	Nampa, ID	L1, L2	05/19/22
18-507	School – Elementary	Nampa, ID	C1	07/27/22
18-508	School – Elementary	Nampa, ID	C1	07/27/22
18-542	College/University	Nampa, ID	CA1, CA2, CA3, CA4	04/26/22
21-080	Other	Garden City, ID	L1, L2	07/22/22 & 08/02/22
21-086	Warehouse	Meridian, ID	L2	09/27/22
21-149	Industrial Plant – 3 Shift	Boise, ID	L1	10/17/22
21-205	Office <20,000 sf	Boise, ID	L1	12/15/22

3. 2022 Photo Controls Review Projects

In 2022, the UI-IDL received zero inquiries regarding the New Construction photo controls incentive review.

2022 Task 5: Energy Resource Library

Summary of Effort and Outcomes

Idaho Power Company External Year-End Report

December 31, 2022

Prepared for:
Idaho Power Company

Authors:
Dylan Agnes

Report Number: 2022_005-05

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IDL Director:
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Prepared for:
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Acronyms and Abbreviations

AC	Air Conditioning
AIA	American Institute of Architects
AHU	Air Handling Unit
Amp	Ampere
ASHRAE	American Society of Heating, Refrigeration, and Air-Conditioning Engineers
BOMA	Building Owners and Managers Association
BSU	Boise State University
CO2	Carbon Dioxide
CT	Current Transducer
Cx	Commissioning
DCV	Demand Control Ventilation
EE	Energy Efficiency
EEM(s)	Energy Efficiency Measure(s)
fc	Foot-Candle
HVAC	Heating, Ventilation, and Air Conditioning
IAC	Industrial Assessment Center
IBOA	Intermountain Building Operators Association
IDL	Integrated Design Lab
Int.	International
IPC	Idaho Power Company
kW	Kilowatt
kWh	Kilowatt-Hour
M&V	Measurement and Verification
OSA	Outside Air
PG&E	Pacific Gas and Electric Company
PPM	Parts Per Million
RPM	Rotations Per Minute
RTU	Rooftop Unit
ERL	Energy Resource Library
TPS	Third Party Service
UI	University of Idaho
USGBC	U.S. Green Building Council
Verif.	Verification
VOC	Volatile Organic Compound
3P	Third Party

1. Introduction

The Energy Resource Library (ERL) is a resource supported by Idaho Power Company (IPC) and managed by the University of Idaho Integrated Design Lab (UI-IDL). The ERL at the UI-IDL is modeled after the Lending Library at the Pacific Energy Center, which is supported by Pacific Gas and Electric (PG&E).

The primary goal of the ERL is to help customers with energy efficiency (EE) needs, through the use of sensors and loggers deployed in buildings of various types. Loans are provided to individuals or businesses at no charge to the customer. Over 900 individual pieces of equipment are available for loan through the ERL. The equipment is focused on measuring parameters to quantify key factors related to building and equipment energy use, and factors which can affect worker productivity.

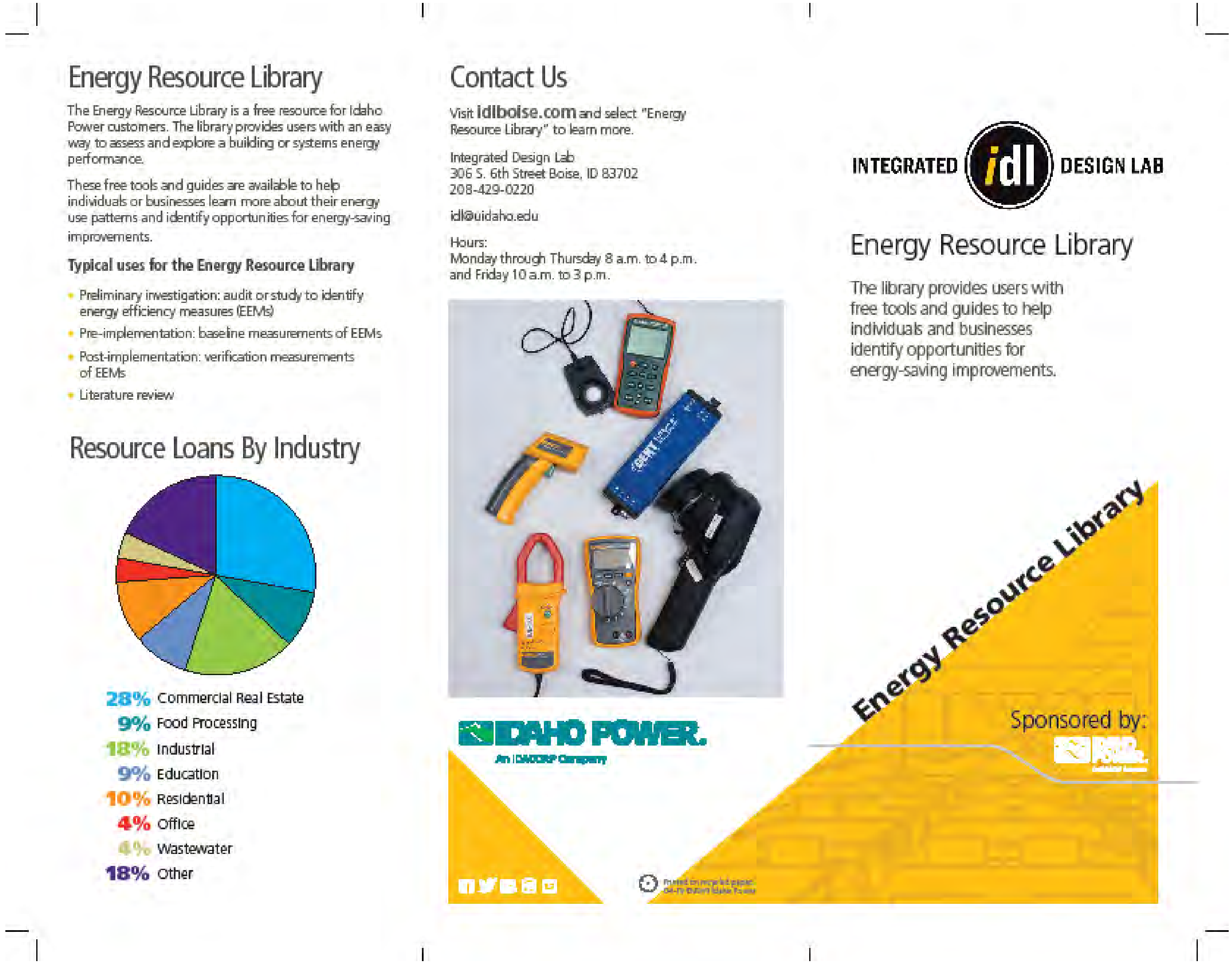
The loan process is started when a customer creates a user account. Then the user has access to submit a resource questionnaire and fill out a form describing their intent and project information. Customers can also add tools to their “cart” and complete a checkout process if they don’t require the IDL assistance. When completing a resource questionnaire or the checkout process, the customer includes basic background information, project and data measurement requirements, and goals. When a request is submitted, UI-IDL staff members are alerted of a request via email. The customer and a staff member communicate to verify and finalize equipment needs. An approval email is sent and tools are picked up at the UI-IDL or shipped at the customer’s expense.

2. Marketing

Marketing for the ERL was done at various UI-IDL and IPC activities throughout 2022, as well as on the idlboise.com website. The flyer layout was retired during 2019 and replaced with a brochure format. The brochure for the ERL, Figure 1 and 2, reflects the changes to the ERL overall structure for checking out tools and new categories/organization. In addition, a catalog was created that contains the full directory of tools available for check out as well as information about other Idaho Power sponsored programs. It has been distributed at various lectures so firms would have an on-hand reference for the ERL, but also, has been made available as a pdf for download and viewing on the idlboise.com website. You can find the catalog here: http://www.idlboise.com/content/erl-catalog-2022

The ERL was promoted in presentations given by the UI-IDL staff, including the Lunch and Learn series and lectures to professional organizations such as the American Institute of Architects (AIA), ASHRAE, and the City of Boise.

The ERL flyer and program slides direct potential users to the ERL website for more information about the library. The main UI-IDL website hosts the ERL portal where customers can submit a resource questionnaire for assistance or a request for specific tools, all online. In 2022, the ERL home page had 2,768 visitors. Changes and progress on the ERL homepage can be found in Appendix B. (http://www.idlboise.com/about-erl)



Energy Resource Library

The Energy Resource Library is a free resource for Idaho Power customers. The library provides users with an easy way to assess and explore a building or systems energy performance.

These free tools and guides are available to help individuals or businesses learn more about their energy use patterns and identify opportunities for energy-saving improvements.

Typical uses for the Energy Resource Library

- Preliminary investigation: audit or study to identify energy efficiency measures (EEMs)
- Pre-implementation: baseline measurements of EEMs
- Post-implementation: verification measurements of EEMs
- Literature review

Resource Loans By Industry

28% Commercial Real Estate
9% Food Processing
18% Industrial
9% Education
10% Residential
4% Office
4% Wastewater
18% Other

Contact Us

Visit **idlboise.com** and select "Energy Resource Library" to learn more.

Integrated Design Lab
306 S. 6th Street Boise, ID 83702
208-429-0220

idl@uidaho.edu

Hours:
Monday through Thursday 8 a.m. to 4 p.m.
and Friday 10 a.m. to 3 p.m.

IDAHO POWER.
An IDACORP Company

INTEGRATED idl DESIGN LAB

Energy Resource Library

The library provides users with free tools and guides to help individuals and businesses identify opportunities for energy-saving improvements.

Energy Resource Library

Sponsored by:

FIGURE 1: ERL BROCHURE FRONT

Resource Categories

Flow Meters

Flow meters measure the velocity of a fluid with ultrasound to calculate flow rate of liquids or suspended solids traveling through a pipe by attaching to the outside. Flow data allows you to see the loads and demands on the associated system, and helps identify operational and control issues.

Data Loggers

Collecting data over an extended period of time is essential for tracking performance of a building, space or system to identify trends or anomalies. Data loggers are portable and have built in sensors that can measure and record temperatures, light levels, electrical current and more.

Current Transformers (CT)

CT's are typically used to measure alternating current. They can be easily and safely installed by slipping over electrical power wiring without interrupting service. When used in conjunction with a voltage meter, power (kW) and energy (kWh) can be calculated for a variety of applications.

Guides

A variety of guides are available to provide a better understanding of building systems and their performance, as well as the standards and codes that govern those energy performance criteria (i.e., ASHRAE handbooks and standards).

Other

Other resource categories include light, air, energy, sound, temperature and more. A complete listing of tools, guides, literature and instructions is available at idlboise.com/erl.

How to use the Energy Resource Library

First, if you do not already have one, you will need to create an account at idlboise.com. After you have an account, fill out the loan request form with the information about the location and type of project you are working on. You do not need to know what specific tools you will need. Simply describe the information you want to collect and the IDL will make sure you have the appropriate resources for your project.

If you require a tutorial or need to know how to use a specific tool, contact the IDL to set up an appointment.

Loan Request Status

You will receive the following email updates with the status of your resource loan.

Pending

Your loan request has been received and is being reviewed by the IDL. Please note that all requests require one business day for processing.

Additional Review (if applicable)

If there is a problem or clarification is needed, the IDL will contact you for additional information to accurately fulfill your request.

Approved

Once your loan request is approved, an approval email will be sent, and the resource may be picked up from the Integrated Design Lab. To request a specific pick-up time, email the IDL or mention it in the note section of the loan request form. Please note, if resources are to be shipped, the customer is responsible for all shipping charges.

Your resource loan will typically be provided in an Idaho Power mesh bag unless the tool has its own housing/storage case.

You will also receive a printed copy of your loan request form. Please save this as it's required when you return the resources.

Completed

When you are done with your resources, please return or ship them to the Integrated Design Lab at 306 S. 6th Street Boise, ID 83702. Please include your printed loan request form so that the IDL can process your return in a timely manner.

Figure 2: ERL Brochure Back

3. New Tools & Tool Calibration Plan

In 2022, sixty-nine new tools were added to the ERL to replace old data logging models, current transformers, and air quality sensors to fill gaps in tool kits, and add accessories for kits.

Equipment in the tool loan program typically has a guaranteed calibration period between 1 and 3 years from the manufacturer. While many items may remain within recommended tolerances for years after the guaranteed calibration period ends, verifying the item is properly calibrated after initial and subsequent periods is recommended. Calibration services are available on most tools, sometimes from the manufacturer, and from certified calibration services nationwide.

Third party (3P), certified tool calibration is ideal, but an extensive 3P calibration program would be expensive. Based on research and pricing from quotes, formal calibration would be cost prohibitive for much of the library tools. In several cases, cost of calibration can exceed 30% or more of the item's original cost. As a certified calibration is typically only valid for 1-2 years, an alternative measurement and verification plan for most sensors and loggers is recommended. The management of the ERL has been adapted to integrate the measurement and verification method of calibration. However, a few exceptions to this must be made on a case by case basis to allow for factory calibration of items that cannot be compared or tested in any other way. An example of one item in this category would be the Shortridge Digital Manometer or the Air-Data Multimeter which would have to be recalibrated by the manufacturer.

The IDL performs the following to ensure items are within specified calibration tolerances:

1. Equipment is cross-checked against new equipment of the same type for accuracy in a test situation where data is logged. The IDL cross-checks older items against multiple newer items at the end of each calibration period (i.e. every two years) to ensure readings are within specified tolerances.
2. Those items found to be out of tolerance will be assessed for factory re-calibration or replacement.

Calibration tracking has been added to the inventory spreadsheet, which allows the IDL to determine which items are due for calibration testing. Updates to calibration and references to testing data is maintained in the inventory spreadsheet and has been expanded to include tool use, quotes, and budget estimates.

4. 2022 Summary of Loans

In 2022, loan requests totaled 18 with 16 loans completed, 2 loans are on-going. The first quarter had the highest volume of loans at 7 total. Loans were made to 7 different locations and 6 unique users and 2 new ERL users. A wide range of tools were borrowed, as listed in Figure 8. The majority of tools were borrowed for principle investigations or audits, although loans were also made for determining baselines before EEMs were implemented. Tools were borrowed to verify these EEMs as well.

Due to Covid-19 and the associated restrictions there was a decrease in loans over the past year and a half. Continuing into 2023, IDL is devoting resources to market the ERL to potential users in order to return to normal frequency of use. More details about the ERL marketing strategy can be found in the 2023 scope of work.

Table 1 and the following figures outline the usage analysis for ERL in 2022.

TABLE 1: PROJECT AND LOAN SUMMARY

	Request Date	Location		Project	Type of Loan	# of Tools Loaned
1	1/27/2022	Garden City	ID	Student	Identify EEMs	3
2	2/10/2022	Boise	ID	University 1	Identify EEMs	7
3	2/16/2022	Boise	ID	Student	Identify EEMs	2
4	2/17/2022	Boise	ID	University 1	Identify EEMs	10
5	3/7/2022	Boise	ID	Utility 4	Identify EEMs	2
6	3/16/2022	Boise	ID	University 1	Identify EEMs	20
7	3/30/2022	Nampa	ID	Utility 4	Audit	5
8	5/12/2022	Meridian	ID	Company 24	Identify EEMs	1
9	5/26/2022	Boise	ID	Company 12	Audit	1
10	7/22/2022	Boise	ID	Utility 1	Identify EEMs	2
11	9/1/2022	Boise	ID	University 1	Identify EEMs	2
12	9/9/2022	Boise	ID	Student	Identify EEMs	3
13	9/12/2022	Boise	ID	Company 24	Identify EEMs	1
14	9/13/2022	Boise	ID	University 1	Identify EEMs	2
15	10/25/2022	Boise	ID	Utility 1	Identify EEMs	2
16	12/6/2022	Boise	ID	Company 30	Audit	1

17	12/12/2022	Boise	ID	University 1	Audit	13
18	12/12/2022	Boise	ID	Company 65	Audit	1

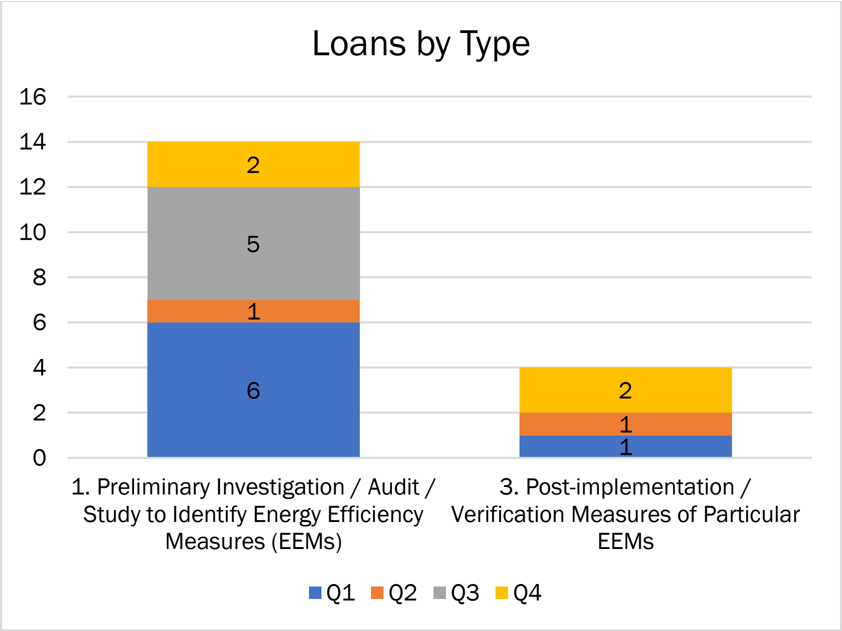


FIGURE 3: LOANS BY TYPE

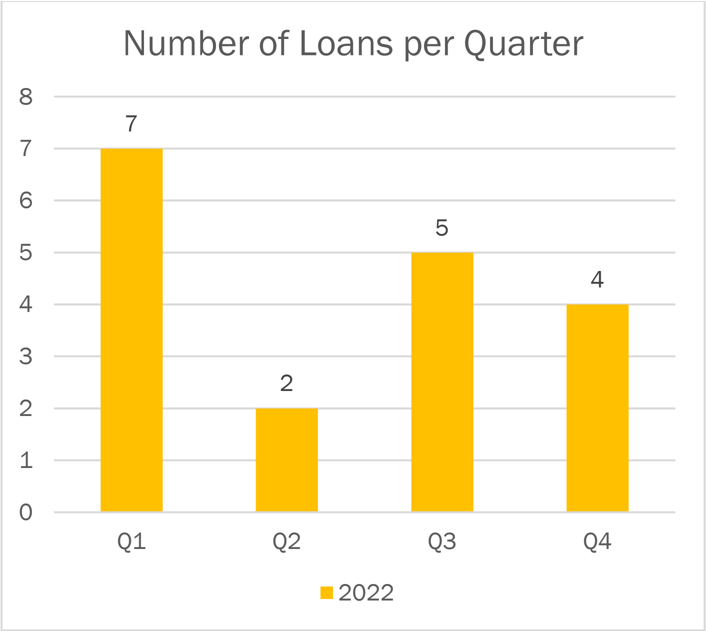


FIGURE 4: NUMBER OF LOANS PER QUARTER

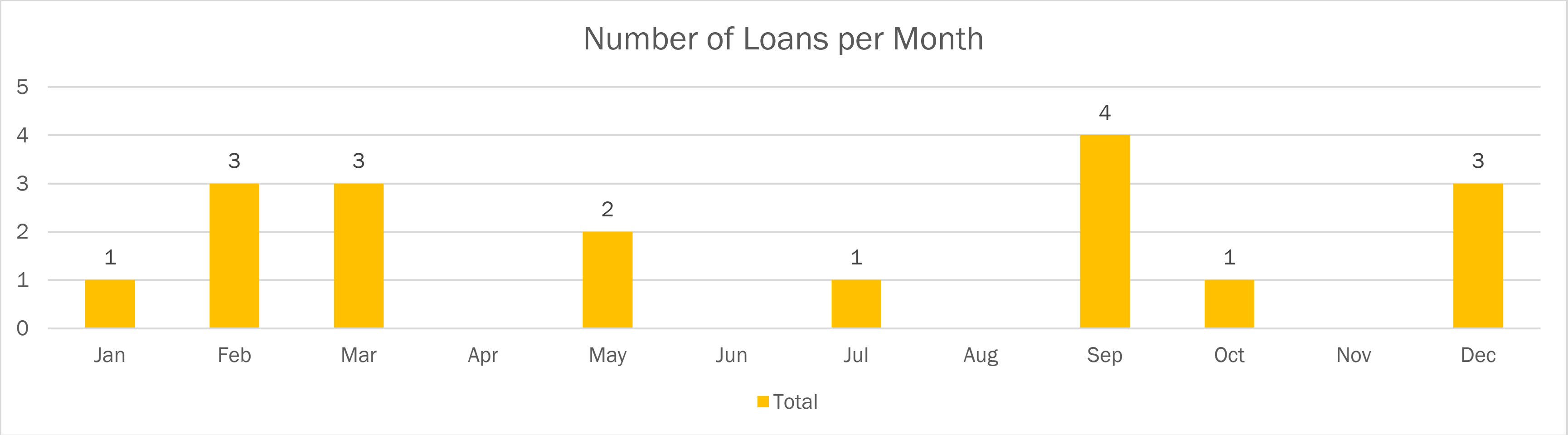


FIGURE 5: NUMBER OF LOANS PER MONTH

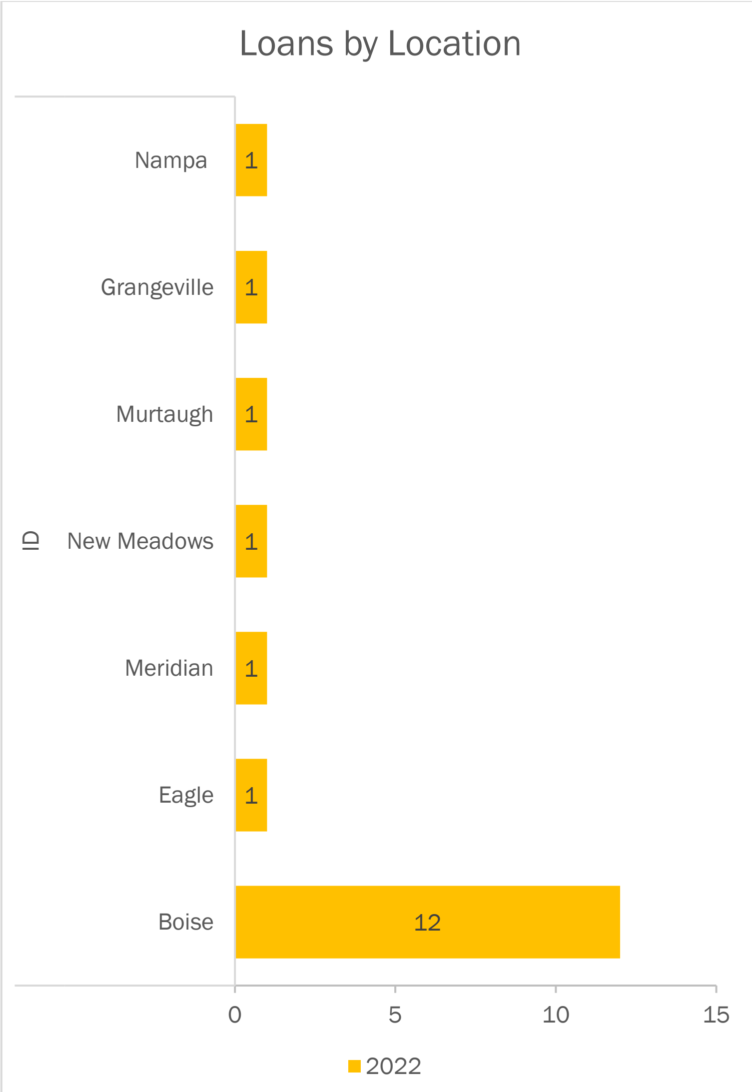


FIGURE 6: NUMBER OF LOANS BY LOCATION

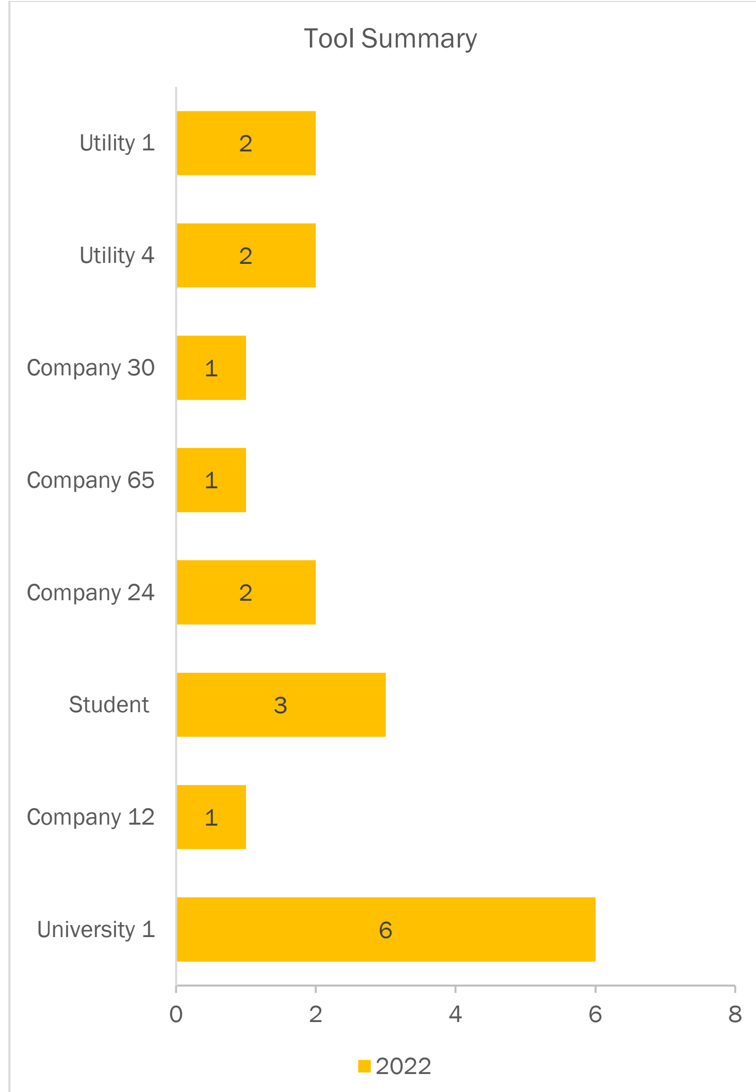


FIGURE 7: NUMBER OF LOANS BY USER

TOTAL TOOLS LOANED: **43**	Q1=49	Q2=2	Q3=10	Q4=4

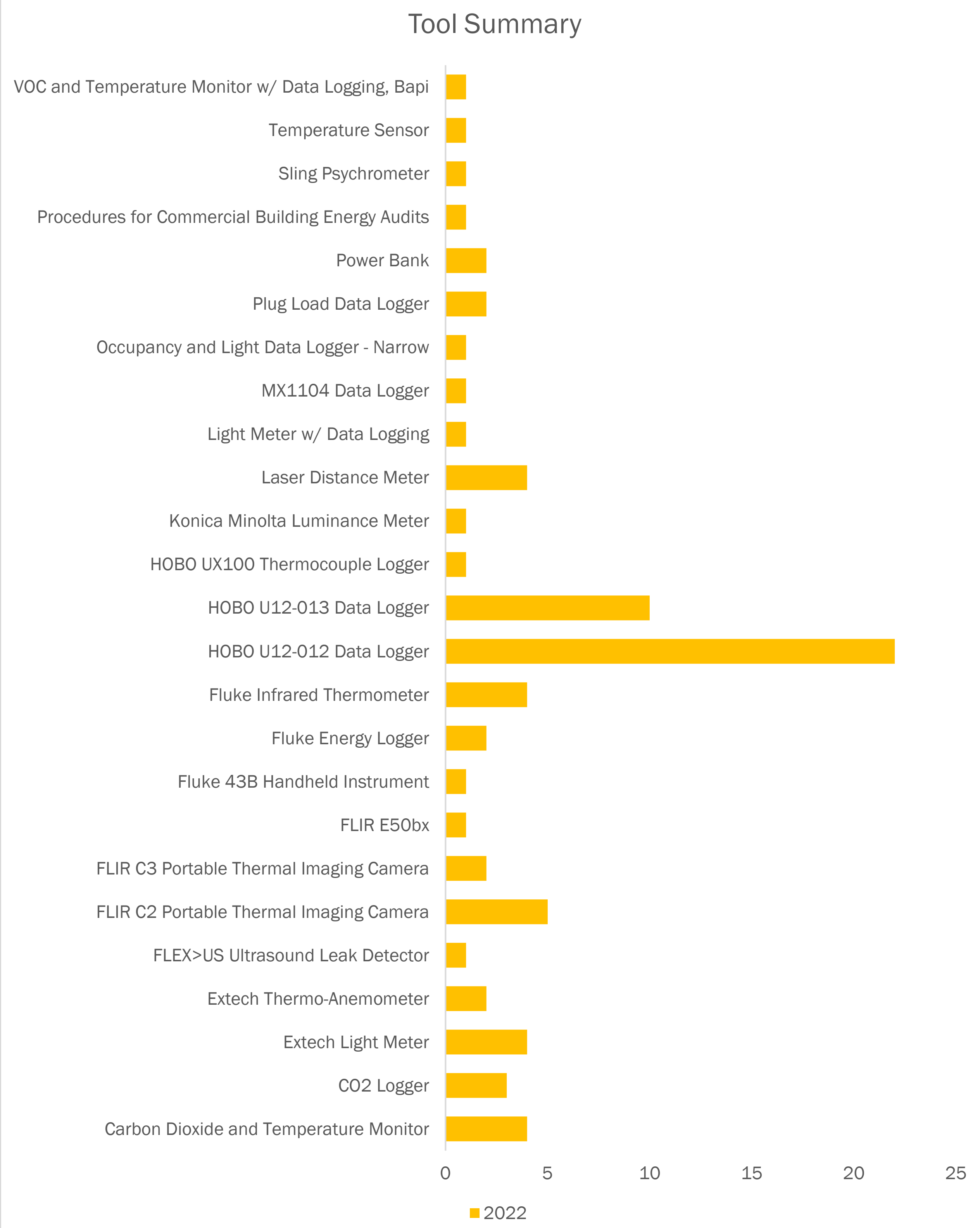


FIGURE 8: SUMMARY OF TOOLS LOANED

5. Appendices

APPENDIX A: Equipment List

The equipment in the library is tracked via excel, website, and in ERL Catalog. The website inventory is organized through several webpages but a complete listing can be found here: http://www.idlboise.com/erl

In addition, the ERL Catalog can be found on the idlboise.com website and is available for download here: http://www.idlboise.com/content/erl-catalog-2022

APPENDIX B: Website Progress

The majority of work has shifted to maintenance for website development.

2022 Task 6: Power over Ethernet

Demonstration Project

Idaho Power Company External Year-End Report

December 31, 2022

Prepared for:
Idaho Power Company

Author:
Damon Woods

Report Number: 2022_001-06

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Acronyms and Abbreviations

BSUG	Building Simulation User's Group
IDL	Integrated Design Lab
IP	Internet Protocol
IPC	Idaho Power Company
LED	Light Emitting Diode
LLLC	Luminaire-Level Lighting Controls
PoE	Power over Ethernet
NEEA	Northwest Energy Efficiency Alliance

1. Introduction

The University of Idaho Integrated Design Lab (UI-IDL) worked to identify a site in Idaho Power territory that is installing Power-over-Ethernet (PoE) lighting. PoE can be configured to work with many low-wattage LEDs and can be addressed by Internet Protocol (IP) for individual control. The PoE infrastructure also increases safety and flexibility by using low-wattage cables that do not require an electrician to re-wire. The IDL intended to function as an independent third party to assess the savings potential of PoE versus high-voltage LED and LLLC combinations.

2. Project Summary

The IDL worked on a literature review of the technology and how it compares to conventional lighting. The results were turned into a blog post hosted on the IDL's Building Simulation User's Group (BSUG) website. This is included in the appendix.

The IDL met with several facility managers and reached out to architects, engineers, and consultants to find a suitable case study site. While one local management company was open to the idea, it is believed that the out-of-pocket costs and electrician's time were a barrier. The implementation project remains unlikely to move forward without supplemental funding to cover the cost of installation. A new municipal facility located in Ada County (currently in the design stage) is including PoE within their bid set. If the bid comes back favorably from the construction management team, then PoE may be installed at this facility in 2023. The CEO of a regional PoE company is also looking to enter the Idaho market and will contact the IDL if any projects come to fruition.

Since no case study was found in 2022, only 15% of the budget was used to cover meetings, outreach, and the literature review. If IDL becomes aware of a suitable project for a case study in the future, the lab will coordinate with Idaho Power on a potential scope of work.

3. Appendix

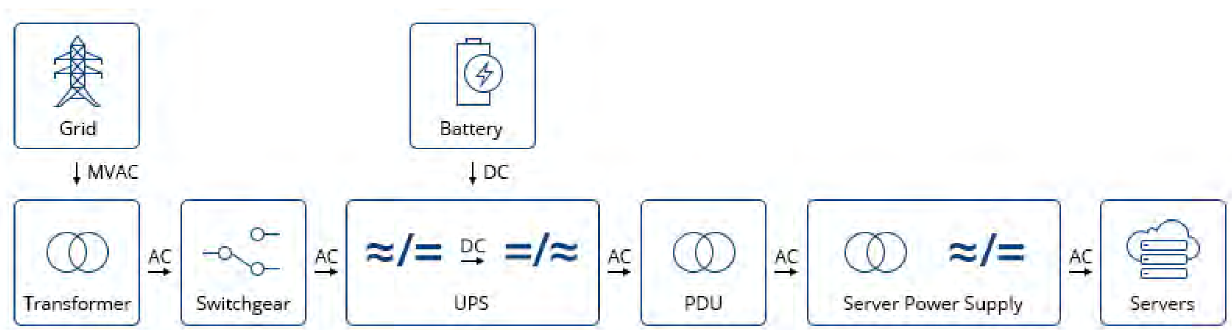
PoE Lighting, The Foundation for Smart Buildings

What is PoE Lighting? PoE refers to Power over Ethernet, which is a widely used technology that most of us are accustomed to. Typically, the applications that use power over ethernet are VOIP phones, IP cameras, and wireless access points. The general definition of power over ethernet lighting is lighting systems that are “smart”. While that sounds cool, saying that my lights have the potential to be smart doesn’t really explain anything. A “smart building” is a simple way of saying that the building applications are all connected through an IOT software (Internet of Things), and PoE is a type of hardware that fits into an IOT infrastructure. What does this mean and how does this make buildings “smart”? Well, let’s jump down the rabbit hole of PoE Lighting and learn about it.

AC vs DC

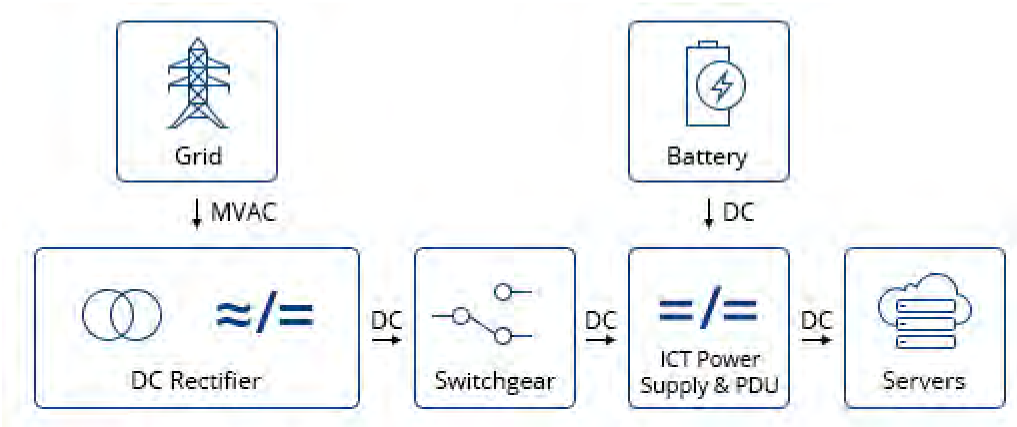
To begin, a brief history of AC/DC is necessary. AC stands for alternating current, while DC stands for direct current. DC was the type of power that was used by Edison. It is current that runs in one direction, the way power moves in a battery, and doesn’t convert easily into higher or lower voltages. AC, on the other hand, was used by Tesla and reverses in direction multiple times per second and is easily converted to higher or lower voltages.

AC Power



(Source: FS Community)

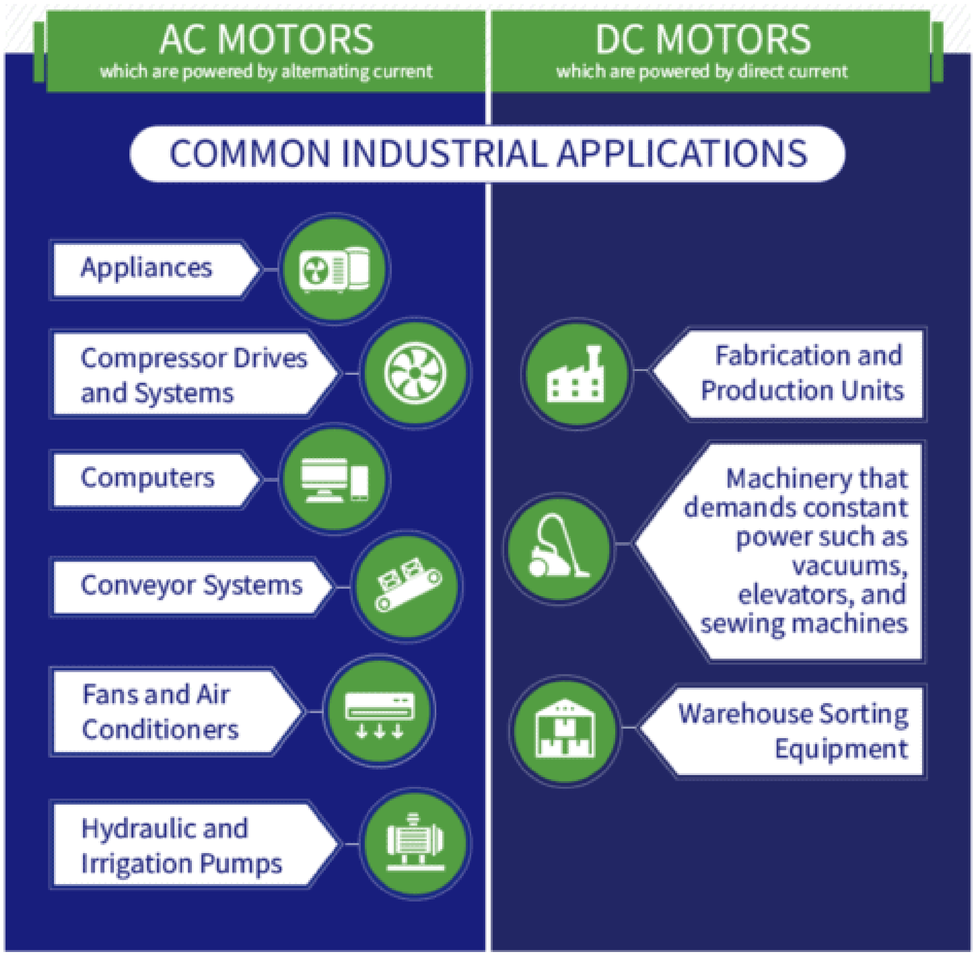
DC Power



(Source: FS Community)

During the late 1800s, a rivalry between Tesla and Edison took place. Edison had acquired a patent on DC power and began to discredit the AC technology that Tesla was working on as too dangerous to use. He most likely knew that AC was a more efficient way to transport energy but was stuck with his DC patent. In 1893, the Chicago World's Fair sent out a bid to determine who would get to power the fair. The power company General Electric, using Edison's DC, bid that they could power the fair for $554,000. George Westinghouse, using Tesla's AC, bid that he could do it for $399,000 and ultimately got the contract. The attention from the fair led to Westinghouse, who had licensed Tesla's AC patent, creating a contract with the Niagara Falls Power Company to generate power for the city of Buffalo in 1896.

What follows is the use of alternating current to power household appliances like refrigerators, ovens, and dishwashers. Though DC is more stable and is generally safer to transport over long distances, typically our power grids operate in AC. Even though it may seem like AC has the upper hand, much of our new technology uses DC power: electric vehicles, computers, and LED lights to name a few. But since power grids handle energy in AC form, converters are needed to transform the AC from the grid into usable DC that powers our machines. Because of this need of conversion, DC tends to require more infrastructure within a building. Most rectifiers/converters are 90-95% efficient, but that means there is a loss of power during the conversion process.



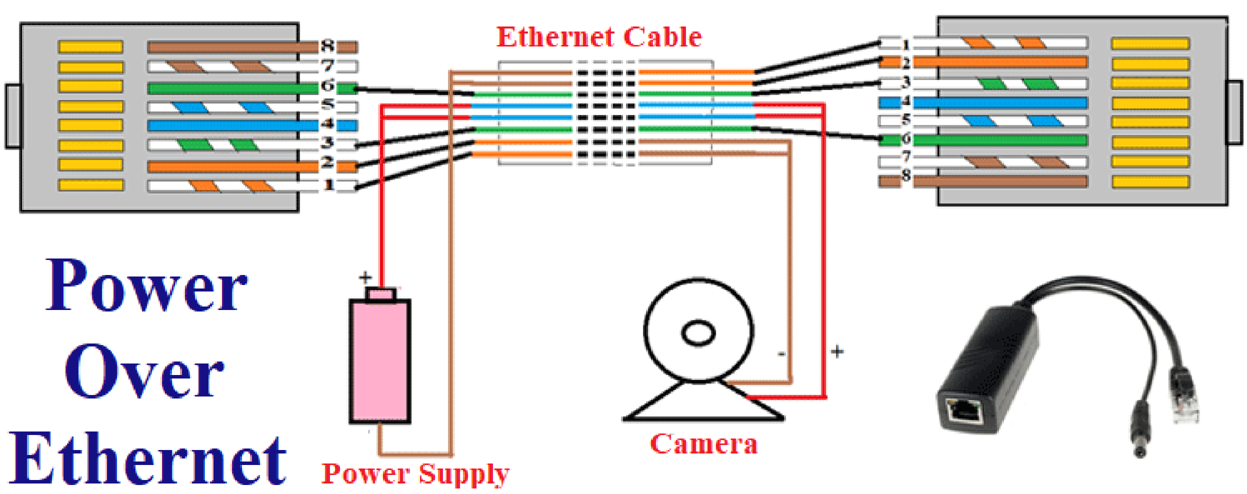
(Source: Gainesville Industrial Electric)

To transport this energy, we have electrical grids that are made up of power lines that can be high or low voltage lines depending on location and intended use. The same is true for distribution power in buildings but at a much smaller scale (I like to think of this a micro electrical grid). Common methods of distributing power in a building are raceway and conductors, busways, or cable assemblies. However, in the past decade a new method has emerged using ethernet cables and has been coined Power over Ethernet or PoE.

Ethernet

Ethernet came about when Robert Metcalfe was asked to create a local network that would allow a personal workstation to connect with the first laser printer. The solution needed to be able to connect hundreds of computers and run fast enough to keep up with the printer. Metcalfe ended up using a coaxial cable and termed it the ethernet cable for its lightning-fast transmission. It was coined after the archaic physics term "luminiferous ether" which described the medium light traveled through.

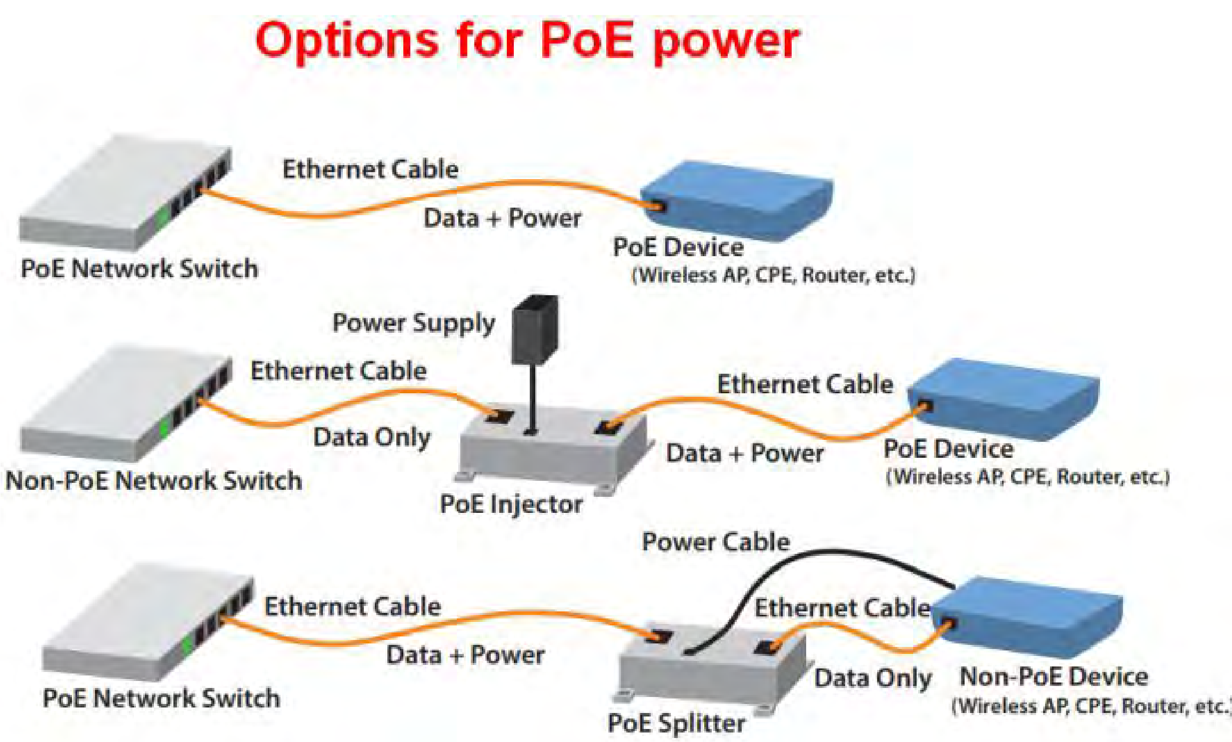
In the beginning, ethernet was used within closed local network as a way to carry packets of information from computer to computer at 3 megabits per second. This one of several examples of early information technology devices and connecting them via a network by which using packets of data lead to the standardization of information technology languages. After many iterations, wire types, and a patent, ethernet became popular commercially and eventually the standard for data transfer. In 2000, ethernet advanced even more when Cisco developed a version of ethernet that was able to deliver not only data, but power, to phone handsets. It mimicked the way a traditional landline operated and could support 48 volts of DC power, thus allowing one line for a broader range of devices and including a mechanism that protected devices that were not supported by PoE. Overall, PoE had the superior ability to transfer power, the bonus of improved safety, and reduced the number of cables needed which cut down on installation costs. As the commercial markets and industry came to depend on networks of ITDs to efficiently run their operations security concerns began to rise. PoE offered the market a method to power devices and deliver data, thereby, allowing for the option to create a closed network for increased security. Developments to increase the amount of power that could be carried using PoE facilitated the transition of building security infrastructure, such as, cameras and door locks, to utilize PoE. Today, ethernet cables can carry 100 megabits of data per second and can support up to 90 watts.



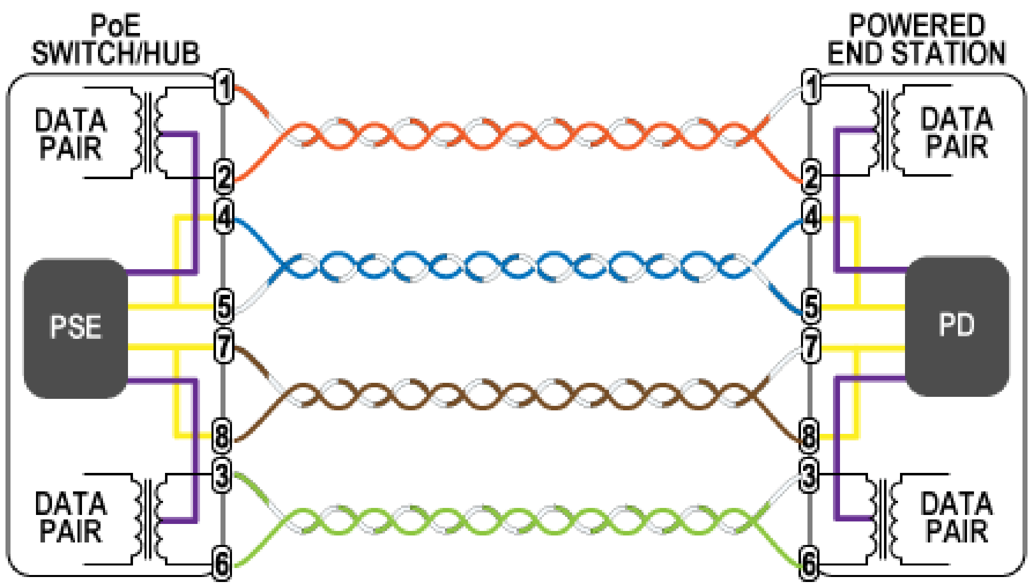
(Source: Circuit Digest)

PoE Hubs


Gigabit PoE Injector Hub
inLine
PWR
PoE
DATA IN
DATA+PWR OUT


Options for PoE power
Ethernet Cable
Data + Power
PoE Network Switch
PoE Device
(Wireless AP, CPE, Router, etc.)
Power Supply
Ethernet Cable
Data Only
Non-PoE Network Switch
PoE Injector
Ethernet Cable
Data + Power
PoE Device
(Wireless AP, CPE, Router, etc.)
Power Cable
Ethernet Cable
Data + Power
PoE Network Switch
PoE Splitter
Ethernet Cable
Data Only
Non-PoE Device
(Wireless AP, CPE, Router, etc.)

You may be asking, "How does PoE actually work?" Basically, a piece of equipment called power sourcing equipment (PSE) supplies DC voltage over ethernet cables to another connected device that's called a powered device (PD). This connection allows for devices to be powered without a local power source or a separate cable for power.



(Source: Vorp Energy)

Lighting and PoE

Now we ask the question: what if a light fixture could be treated like information technology device? With the ability to deliver power and information over the same wire, would it be possible to connect and power a light fixture through a network? Before we answer that question, let's review how we have traditionally powered lights and where they are today.

Contrary to popular belief, Thomas Edison did not invent the first light bulb. In fact, many scientists were experimenting with electric light over 70 years before Edison joined the stage. In 1802 Humphry Davy created light while experimenting with carbon and an electric battery. Now, this was not anything like the modern bulb and didn't produce light for very long. Other inventors dabbled in glowing wires over the next few decades, but the next step in lighting technology was in 1840 when Warren de la Rue used a vacuum tube to pass electric current through a platinum wire. While this lasted longer than any previous glowing wire and was effective, the platinum was expensive, and his design couldn't be mass produced.

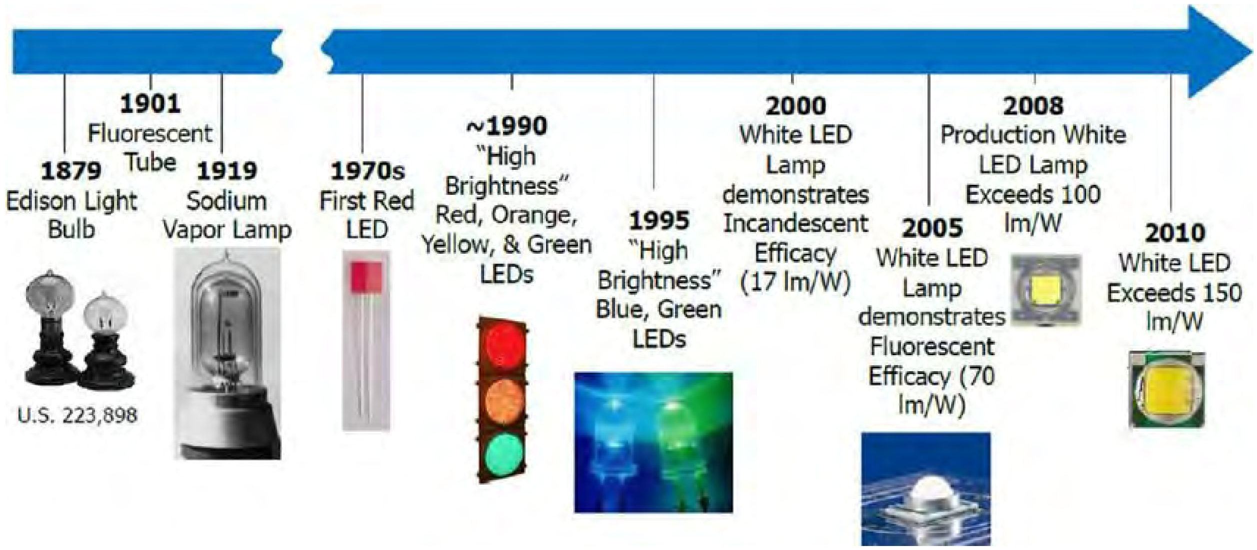
Then, in the 1870s a working light bulb as we recognize it was developed by Joseph Swan, a physicist. This model used carbonized paper filaments and an evacuated bulb but had issues with the vacuum seal and had a short lifetime. In 1874, Henry Woodward and Matthew Evans patented a model that used a similar design as Swan. Woodward and Evans' model had nitrogen filed glass cylinders and different sizes of carbon rods between the electrodes. The two tried to commercialize their patent but failed, which brings us to the illustrious Edison. The Woodward and Evans patent was then sold to Edison in 1879. And this is where our aforementioned discussion of AC versus DC and Edison versus Tesla comes into play. Since the battle of currents, we have developed a few types of light bulbs including fluorescent, incandescent, mercury vapor, HID, neon, and most recently LED.

LED LUMENS TO WATTS CONVERSION CHART

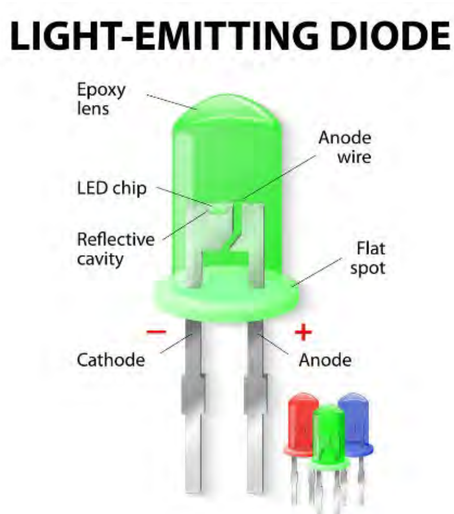
BRIGHTNESS IN LUMENS	200+	400+	700+	900+	1300+
STANDARD	25W	40W	60W	75W	100W
HALOGEN	18W	28W	42W	53W	70W
CFL	6W	9W	12W	15W	20W
LED	4W	6W	10W	13W	18W

(Source: Home Depot)

LEDs are unique in that they are not technically light bulbs as we know from history. They are actually semiconductors that emit visible light. LEDs, or a light emitting diode, is a diode that contains an anode that passes electricity to a cathode, this transfer of current produces visible light. LEDs behave more like a battery than a traditional light bulb. When considering the voltage of light bulbs, a typical light bulb requires about 110 volts to operate. Some fluorescent bulbs are made to be low voltage, only requiring 12-24 volts. LEDs on the other hand, only take between 1.8 and 3.3 volts, depending on the color and type. Since PoE typically refers to power transfer in watts, let's convert bulb voltage to wattage: normal bulbs are anywhere from 40-100 watts, low voltage fluorescent bulbs are about 15 watts, and LEDs are typically only 2-10 watts.



(Source: ResearchGate)



(Source: Science ABC)

Since they require an extremely low voltage and wattage, LEDs are an ideal candidate for use in a PoE system, allowing then to be classified as an information technology device for its applications. We have already established that PoE can support up to 90W of power, meaning that PoE would be able to power a system of LEDs. We have already touched on how AC and DC differ, and which type of electronics use which type of power. For normal lighting situations, multiple wires, transformers, and hardware are needed to convert power from the grid to power that is used in lighting. When installing or modifying lighting, an electrician is needed because of the intensity of the wiring. This makes it expensive and time consuming to change lighting design.

PoE infrastructure moves the power conversion and control system upstream to a single unit which makes it safer to change or redesign without an electrician. This also means that each lighting fixture would generate less heat, since no conversion is taking place at the fixture itself, which would allow for a heat sink with a smaller volume. In addition, new materials would be able to be tested as a heat sink which may have not been suitable for lighting before. Lastly, PoE infrastructure uses less wiring which results in a cheaper installation, but also has the potential to make installation easier for electricians which further reduces the cost of installation. The manufacturing of LEDs has the potential to be more efficient and cost effective, since less materials are needed for PoE lighting. New features could also be added if LEDs used PoE.

One important hardware component of PoE lighting is LLLC, or Luminaire-Level Lighting Controls. An LLLC is the ability to have embedded sensor during manufacturing, such as, occupancy and ambient light sensors, incorporated into each light fixture. The sensors allow for flexible lighting controls that respond to changing conditions under each fixture. Depending on how many people are inside a room or how much daylight enters the building, the lighting levels will conform accordingly. Pairing with the LLLC allows us to extend the network hardware as well as connect that hardware to our network software for management. More commonly, networks are connected wirelessly using a hub or gateway which allow the input of data from users to be transmitted to the hardware for the desired output or the lighting system responding to users' commands. Having lighting systems connected with PoE and wireless gateways allows for the utilization of the security and dependability of a closed network while simultaneously giving use the potential to expand or contract our network.

Ultimately, if a building's lighting system is connected to PoE, the lights are deployed in a grid (or microgrid), for commercial applications, throughout the building and each fixture becomes capable of sending and receiving data. This is beneficial since lights are unique in that they are in every building regardless of its age, use, or location. Using commercial lighting as a grid for a central network for buildings would allow for a PoE system that could act as a data highway or backbone for network infrastructure for all the control systems in the building. If this backbone were put in place, it would create a network throughout the entire building, which would mean that other control systems could utilize or be controlled with it. This is what would be called a "smart" environment monitoring system which is where the term "smart building" comes from.

There are a couple types of systems that are used to monitor a building's network. The two main categories of systems are passive and active environment monitoring systems. A passive system looks at the performance of the network as a whole and pulls data from the history of network use. An active system analyzes the network in real time and generates data that determines the current performance.

Some notable buildings that currently use PoE lighting are DPR Construction in San Francisco, The Edge in Amsterdam, and the Burj Khalifa in Dubai. DPR Construction is the first certified Net Zero Building in San Francisco and includes PoE lighting as one of its green features. The Edge has been called the most intelligent building in the world and is ranked one of the greenest buildings as well. Almost all systems in the building are connected to the grid and it utilizes ethernet as much as possible. The LED lighting systems in this building are one of the highlights that allow it to use as little energy as possible and in the most efficient way. And finally, the Burj Khalifa's entire façade is lined with LED lights that are programed and controlled by PoE systems. This building uses ethernet in a way that not only shows off current lighting technology to the people inside the building, but to the entire city as well.

As we have seen, power over ethernet lighting is utilized in high performing and efficient buildings. But where will we see this technology used first in the US? Most likely we will see it in street grids and traffic lights. The grid networking and lighting used along streets is well suited for a transition to PoE. Some other suitable situations would be school campuses, warehouses, box retails centers, grocery stores, commercial offices, or manufacturing plants. These building types would save lots of energy and would be easily programmable since they all operate on rigid time schedules. Introducing a cohesive PoE lighting system would also provide a network that would act as a backbone for any future system updates. Power over ethernet lighting could be used as an introduction for buildings to transition to a more efficient and effective way to use energy.

Sources

https://www.energy.gov/articles/war-currents-ac-vs-dc-power

https://community.fs.com/blog/data-center-power-what-are-ac-and-dc-power-in-data-centers.html

http://ffden-2.phys.uaf.edu/webproj/212_spring_2017/Jacalyn_Morgan/1775941155590410311e3ae/applications-of-ac.html

https://www.hpe.com/us/en/insights/articles/the-birth-and-rise-of-ethernet-a-history-1706.html

https://www.cisco.com/c/en/us/solutions/enterprise-networks/what-is-power-over-ethernet.html

https://www.nvtphybridge.com/power-over-ethernet/

https://www.cisco.com/c/en/us/solutions/enterprise-networks/what-is-poe-lighting.html#~q-a

https://www.youtube.com/watch?v=zlXetcO7B38&list=PLURsSHj3SumC2qZIFDZU4xXGNfPxNVVCw&index=5&ab_channel=UIIDLChannel

https://kw-engineering.com/pros-cons-power-ethernet-lighting-dc-microgrids/

https://cc-techgroup.com/power-over-ethernet-poe-lighting/

https://www.traditionalbuilding.com/product-report/history-lighting#:~:text=In%20the%20early%201800s%2C%20the,a%20cylinder%20of%20calcium%20oxide.

https://www.bulbs.com/learning/history.aspx

https://www.wiprolighting.com/blog/how-does-power-over-ethernet-poe-lighting-work#:~:text=The%20PSE%20(power%20sourcing%20equipment,to%20the%20network%20connected%20devices.

https://lightingcontrolsassociation.org/2022/06/15/introduction-to-luminaire-level-lighting-controls/

2022 Task 7: LLLC Workshop
Summary of Effort and Outcomes
Idaho Power Company Year-End Report

December 31, 2022

Prepared for:
Idaho Power Company

Author:
Dylan Agnes

Report Number: 2022_007-01

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1. Acronyms and Abbreviations

AIA	American Institute of Architects
App	Application
ASHRAE	American Society of Heating, Refrigeration, and Air-Conditioning Engineers
CBECS	Commercial Building Energy Consumption Survey
Comm	Commercial
Elec.	Electrical
HVAC	Heating, Ventilation, and Air Conditioning
IBPSA	International Building Performance Simulation Association
IDL	Integrated Design Lab
IPC	Idaho Power Company
LBNL	Lawrence Berkeley National Laboratory
LEED	Leadership in Energy & Environmental Design
LLLC	Luminaire Level Lighting Control
M. Arch	Masters of Architecture
ME	Mechanical Engineer(ing)
Mech.	Mechanical
MEP	Mechanical, Electrical, and Plumbing
NCARB	National Council of Architectural Registration Boards
RDA	Revit Daylighting Analysis
TMY	Typical Meteorological Year
UDC	Urban Design Center
UI	University of Idaho
USGBC	U.S. Green Building Council

2. Introduction

The IDL has installed Luminaire Level Lighting Controls (LLLC's) in our open office area. These can be configured into different daylighting and occupancy zones. The UI-IDL developed a demonstration workshop for lighting designers and installers. The lab hosted designers and installers for public lectures to view and work with the lighting controls. The IDL provided attendees with impartial information about the performance of the products and how to configure the lighting controls effectively.

The 2022 Idaho Power scope of work for the LLLC Training task included planning, organizing and hosting one or two meetings, recording attendance and evaluations, production of education materials including a one-page summary and more detailed sizing report, and a one-page case study/testimonial based on their experiences with LLLC.

3. 2022 Summary and Cumulative Analysis

In 2022, two training sessions were coordinated and hosted. Sessions are summarized below with details in the following sections.

Table 1: Overall Summary of Sessions

Date	Title	Presenter	Presenter Company	RSVPs In-person	Attendees In-person
9/30	Luminaire Level Lighting Controls & Training – Trial	Dylan Agnes	IDL	4	4
10/05	Luminaire Level Lighting Controls & Training	Dylan Agnes	IDL	11	10
				15	**14**

2022 Attendance

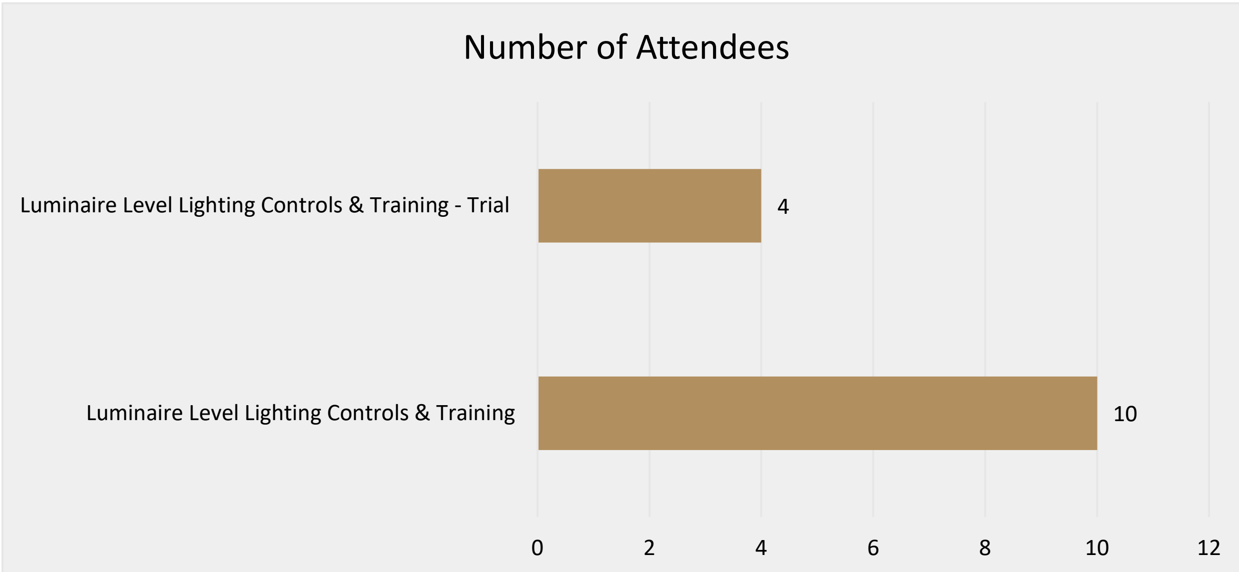


Figure 1: Attendee Count by Session and Type

Table 2: Overall Attendance Breakdown

Architect:	3	Electrician:	0
Engineer:	3	Contractor:	0
Mech. Engineer:	0	Other:	8
Elec. Engineer:	0	None Specified:	0
Total (In-Person):	**14**		
Other:	**Facility Manager, Code Specialist, Industry Representative**		

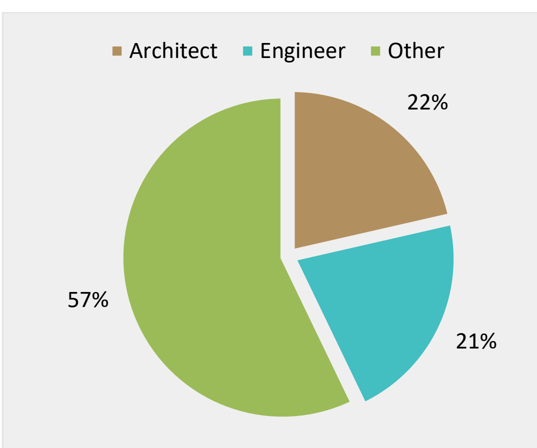


Figure 2: Attendee Profession Breakdown

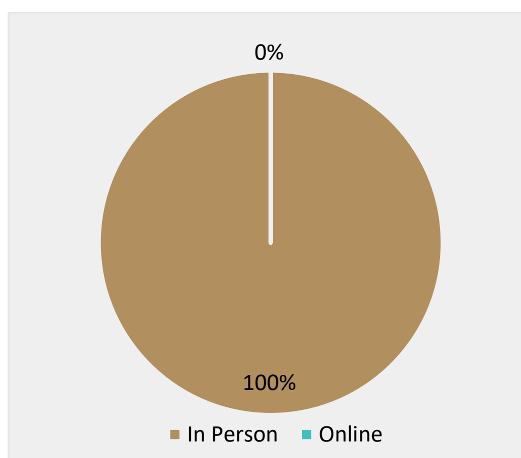
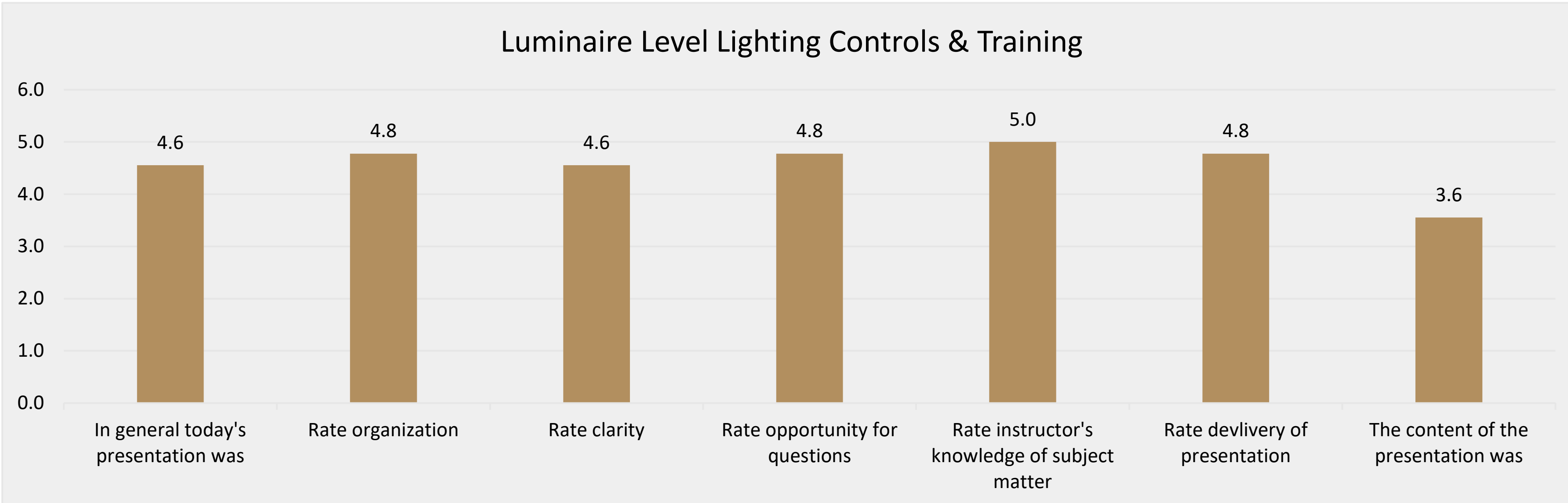


Figure 3: Attendee Type Breakdown

2022 Evaluations



Evaluation Metric	Scale
'...today's presentation was'	1 Not Useful - 5 Very Useful
'The content...'	1 Too Basic - 3 Just Right - 5 Too Advanced
'Rate ....'	1 Needs Improvement - 5 Excellent

Figure 4: Average Evaluation for 10/05 Training session

4. Session Summaries

Session 1: Luminaire Level Lighting Controls & Training – Trial (9/30/22)

Title: Luminaire Level Lighting Controls & Training

Date: 09/30/22

Description: LLLCs have sensors and controls within individual fixtures that enable them to be controlled remotely or on a case-by-case basis. Remote control allows users to adjust the programming criteria or illumination levels without replacing the fixtures. In conventional lighting systems, lighting zones are defined as a collective unit and thus are centrally controlled. LLLCs however, incorporate sensors into each fixture, such as occupancy, daylight, temperature or receive/broadcast signals. Each fixture has the potential to become a semi-autonomous zone that is capable of responding to small changes in the area under each fixture. Furthermore, individual fixtures can communicate with other fixtures, using wireless or infrared signals, to share data for an even greater potential to increase energy savings and user satisfaction. Some LLLCs can be connected by gateway to transfer information collected. This data is analyzed, usually through the manufacturer's software, to provide a user interface different from a typical text editor. From there users are able to identify trends in occupancy and lighting energy consumption that can then be used to refine the building schedules for occupancy and lighting and, if applicable, for the buildings' HVAC schedule programming.

Presenter: Dylan Agnes

Attendance:

Architect:		Electrician:	
Engineer:	2	Contractor:	
Mech. Engineer:		Other*:	2
Elec. Engineer:		None Specified:	
Total (In-Person):	**4**		

*If 'Other' was noted: Facility Manager, Utility Program Specialist

Session 2: Luminaire Level Lighting Controls & Training (10/05/22)

Title: Luminaire Level Lighting Controls & Training

Date: 10/05/22

Description: LLLCs have sensors and controls within individual fixtures that enable them to be controlled remotely or on a case-by-case basis. Remote control allows users to adjust the programming criteria or illumination levels without replacing the fixtures. In conventional lighting systems, lighting zones are defined as a collective unit and thus are centrally controlled. LLLCs however, incorporate sensors into each fixture, such as occupancy, daylight, temperature or receive/broadcast signals. Each fixture has the potential to become a semi-autonomous zone that is capable of responding to small changes in the area under each fixture. Furthermore, individual fixtures can communicate with other fixtures, using wireless or infrared signals, to share data for an even greater potential to increase energy savings and user satisfaction. Some LLLCs can be connected by gateway to transfer information collected. This data is analyzed, usually through the manufacturer's software, to provide a user interface different from a typical text editor. From there users are able to identify trends in occupancy and lighting energy consumption that can then be used to refine the building schedules for occupancy and lighting and, if applicable, for the buildings' HVAC schedule programming.

Presenter: Dylan Agnes

Attendance:

Architect:	3	Contractor:	
Engineer :		Electrician:	
Mech. Engineer:		Other*:	7
Elec. Engineer:		None Specified:	
Total (In-Person):	**10**		

*If 'Other' was noted: Facilities Manager, Industry Representative, Code Specialist

5. Educational Materials

The IDL developed a forty page booklet describing Luminaire Level Lighting Controls with the intent of explaining the upcoming technology to building owners or operators as well as professionals in the Architecture, Engineering, and Construction industry. The booklet covers a technology overview, potential impact to the industry, energy and cost, best practices or use, and common lighting terminology. The format of the booklet was organized so that a handful of topics, such as, Luminaire Level Lighting Controls, Network Lighting Controls, Network Topography, and Changing the Game are 'spreads'. Spreads, in the graphic design sense, refers to a set of pages, usually two, to be viewed together. Therefore, each of these sections can be pulled from the booklet and used separately for marketing or educational purposes. Participants in the LLLC Training were provided a copy of the LLLC Technology booklet, a workbook, and two product catalogs of the LLLCs the IDL has installed at our offices (Cooper Lighting Solutions). Moving forward the LLLC Technology booklet is available upon request and has not been added to the IDL's website.

6. Case Study/Testimonial LLLC

As of 12/31/22 there have been no documented projects that have utilized the New Construction and Major Renovation Incentive Program L3 incentive. The L3 incentive specifically deals with LLLC and pulling projects from this category would ensure that projects are within Idaho Power territory. However, the IDL was able to potentially find a candidate through the training session given on the 5th of October.

7. Appendices

Appendix A: Luminaire Level Lighting Controls & Training Evaluations

Summaries of evaluations for each of the two sessions are recorded below. It should be noted that the first session was conducted as a trial run for Idaho Power and a property management firm. Feedback for that session was documented in an informal manner and implemented during the session or immediately following the conclusion of the session.

Session 1 (09/30/22): Luminaire Level Lighting Controls & Training – Trial

Presentation Info:

Date:	09/30/22
Location:	Idaho Water Center – Boise, ID
Presenters:	Dylan Agnes – IDL

Attendance:

Architect:		Electrician:	
Engineer:	2	Contractor:	
Mech. Engineer:		Other*:	2
Elec. Engineer:		None Specified:	
Total (In-Person):	**4**		

*If 'Other' was noted: Facility Manager, Utility Program Specialist

Evaluations: No evaluations were collected.		**Scale**
In general, today's presentation was:	**0.0**	1 Not Useful - 5 Very Useful
Rate organization:	**0.0**	1 Needs Improvement - 5 Excellent
Rate clarity:	**0.0**	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	**0.0**	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	**0.0**	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	**0.0**	1 Needs Improvement - 5 Excellent
The content of the presentation was:	**0.0**	1 Too Basic - 3 Just Right - 5 Too Advanced

Session 2 (10/05/22): Luminaire Level Lighting Controls & Training

Presentation Info:

Date:	04/27/2022

Location:	Idaho Water Center – Boise, ID
Presenter:	Dylan Agnes – IDL

Attendance:

Architect:	3	Electrician:	
Engineer:		Contractor:	
Mech. Engineer:		Other*:	7
Elec. Engineer:		None Specified:	
Total (In-Person):	**10**		

*If 'Other' was noted: Facilities Manager, Code Specialist, Industry Representative

Evaluations:

		Scale
In general, today's presentation was:	**4.6**	1 Not Useful - 5 Very Useful
Rate organization:	**4.8**	1 Needs Improvement - 5 Excellent
Rate clarity:	**4.6**	1 Needs Improvement - 5 Excellent
Rate opportunity for questions:	**4.8**	1 Needs Improvement - 5 Excellent
Rate instructor's knowledge of the subject matter:	**5.0**	1 Needs Improvement - 5 Excellent
Rate delivery of presentation:	**4.8**	1 Needs Improvement - 5 Excellent
The content of the presentation was:	**3.6**	1 Too Basic - 3 Just Right - 5 Too Advanced

Comments:

Attendee Suggested Improvements for the Instructor:

- Very Good Presentation
- None Needed
- Good Presentation, Possibly slow down a bit
- Tad bit monotone, get excited!

What attendees found most valuable:

- Explanation on occupancy and vacancy settings
- System capability
- Opportunity for future trainings
- I learned more about smart buildings and integration of lighting systems
- New tech, up and coming systems

Professional Associations of Which Attendees are Members:

- AIA, BOC, NCQLP, IES

2022 Task 8: Digital Design Tools
Summary of Effort and Outcomes
Idaho Power Company Internal Year-End Report

December 31, 2022

Prepared for:
Idaho Power Company

Author:
Dylan Agnes

Report Number: 2022_003-01

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Idaho Power Company

Contract Number:
IPC KIT #V

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AIA	American Institute of Architects
App	Application
ARUP	London based multi-discipline firm
ASHRAE	American Society of Heating, Refrigeration, and Air-Conditioning Engineers
BCVTP	Building Controls Virtual Test-Bed
BEMP	Building Energy Modeling Professional
BESF	Building Energy Simulation Forum (Energy Trust of Oregon)
BIM	Building Information Modeling
BOMA	Building Owners and Managers Association
BSME	Bachelor of Science in Mechanical Engineering
BSUG	Building Simulation Users' Group
CBECS	Commercial Building Energy Consumption Survey
Comm	Commercial
Elec.	Electrical
HePESC	Heat Pump Energy Savings Calculator
HVAC	Heating, Ventilation, and Air Conditioning
IBPSA	International Building Performance Simulation Association
IDL	Integrated Design Lab
IPC	Idaho Power Company
LBNL	Lawrence Berkeley National Laboratory
LEED	Leadership in Energy & Environmental Design
LLLC	Luminaire Level Lighting Control
M. Arch	Masters of Architecture
ME	Mechanical Engineer(ing)
Mech.	Mechanical
MEP	Mechanical, Electrical, and Plumbing
MS Arch	Masters of Science Architecture
NCARB	National Council of Architectural Registration Boards
RDA	Revit Daylighting Analysis
TMY	Typical Meteorological Year
UDC	Urban Design Center
UI	University of Idaho
USGBC	U.S. Green Building Council

2. Introduction

Over the years, the Integrated Design Lab has developed several digital design tools to assist local firms. These include ventilation calculators, daylighting methodologies, thermal envelope calculators, and climate visualization assistants. These tools have been collected and hosted on the IDL website in 2021 but some require updating. IDL is working to update these tools to the latest design temperatures (which have increased over time) and link to other tools available to designers so that the IDL website can serve as a one-stop resource for local engineers and architects for early design considerations.

3. Design Tools

In 2022, twelve design tools were available for use and download. The Design Tools are summarized below.

Table 1: Design Tools

Priority	Name
High	CBECS Data Visualization Infographics
High	CBECS Micro Master v2
Medium-High	Weather Normalization
Medium-High	EnergyPlus Fan Energy Calculator
Medium-High	LM-83 Three-phase Daylight Simulation Script
Medium	Infiltration Equations & Conversions
Medium	The Climate Responsive Design Web Tool
Medium	Climate Design Resources - 1st & 2nd Generation Tool Sets
Medium	Thermal Energy Savings Tabulator (TEST)
Low	Construction Insulation Value Calculator
Low	Sustainable Design & Practice Benefits
Low	Daylight Pattern Guide

2022 Summary of Work

Design tools were assigned a priority during the initial proposal of the task. A design tool's priority determines the probability of receiving an update for the current year. In the future, a design tool's priority level will be assessed in the kick-off meeting for the project task. For 2022, high priority was assigned to two design tool: CBECS Data Visualization Infographics and CBECS Micro Master v2. Commercial Building Energy Consumption Survey (CBECS) 2018 data was expected to be released in 2020, however, the COVID-19 pandemic has continually delayed the release of data from the study. An update in August 2022 indicated that the complete study, including micro data, would be released to the public in the fourth quarter of 2022. With the highest priority given to the CBECS design tools it was agreed that the IDL would begin work on medium-high priority tools but reserve any remaining hours in case CBECS data would be released in 2022. Therefore, the majority of work conducted for this task has occurred in late November and will continue until the end of December. As of 12/14/22, we have downloaded CBECS 2018 data and are working on parsing out the data so it can be formatted for analysis as well as visualization. This will continue until the end of December with the intent of having as much data as possible be prepared for visualization work starting next year, 2023.

2022 New Design Tools

Covid Impact Modeling

Sponsored by the Idaho Power Company, the University of Idaho Integrated Design Lab (UI-IDL) developed a series of infographics to communicate how COVID-19 has brought the issue of indoor air quality to the forefront of building science. Virus mitigation strategies range in effectiveness, efficiency, and costs depending on the building type, use types, and local climate. Using Open Studio and Energy+, the IDL examined the energy and cost impacts of six different mitigation strategies for commercial buildings in the Treasure Valley.

- HEPA Induct
- HEPA Portable
- MERV
- NPBI
- Outdoor Air
- UVGI Induct
- UVGI Upper Room

4. Design Tool Summaries

CBECS Data Visualization Infographics

Priority: High

Link: http://idlboise.com/content/cbecs-data-visualization-infographics

Description: Sponsored by the Idaho Power Company, the University of Idaho Integrated Design Lab (UI-IDL) developed this series of infographics to communicate how four different building types consume energy on both a regional and national level. The data used to create them has been gathered from The Commercial Buildings Energy Consumption Survey (CBECS), which is a national-level sample survey of commercial buildings and their energy suppliers conducted quadrennially by the Energy Information Administration (EIA). The survey collects key benchmark information on U.S. commercial buildings, their characteristics, and how they consume energy. It is used by private and public stakeholders to track industry progress and gain a high-level understanding of how similar buildings compare and inform policy decisions. Architects and engineers can also use this information for goal setting and prioritizing energy efficiency measures within the integrated design process for high performance projects. These infographics make detailed consumption data per building type easily accessible to design teams without having to filter the CBECS database themselves. Information from CBECS is reported on the EIA's website in the form of summary tables, which provide tabular breakdowns of high-level energy consumption statistics based upon general building characteristics. The information is also available as public use microdata spreadsheets that can be downloaded, filtered, and organized with much more flexibility than the summary tables. These spreadsheets contain much more detailed information from the building characteristics survey in its entirety and served as the origin of information for this series of infographics.

Currently, there are five double-sided 11x17" infographics. The first is an introduction to the project and the CBECS database. The next four delve specifically into the office, retail, education and lodging building type.

Last updated: 2021

CBECS Micro Master v2

Priority: High

Link: N/A

Description: This file contains a good portion of the CBECS microdata, which can be filtered for benchmarking and goal setting functions.

Last updated: 2021

Weather Normalization

Priority: Medium-High

Link: http://www.idlboise.com/content/weather-normalization

Description: This spread sheet was created in order to aid with the processing and analysis of building energy usage. In order to operate this spread sheet you will need the following bills for each month in the period you wish to analyze:

- Natural Gas
- Electricity
- Geothermal (if applicable)

In addition, weather data for the location of project is needed. This information can be obtained from the provided link with the instructions below.

- NOAA National Weather Service
- Select the nearest data center.
- Go to the NOWData Tab and refine the location if needed.
- Under the "Product" select "Monthly Summarized Data".
- Input the desired range of years.
- Set the "variable" drop down to either CDD or HDD.
- Click go and copy data to the Data Entry tab of this file.

The sheet will automatically calculate actual and expected energy usage and create graphs that can be found in the "Output Figures" tab. More detailed analysis can be found in the "Calculated Values" and "Regression Visualization" tabs.

Last updated: 2021

EnergyPlus Fan Energy Calculator

Priority: Medium-High

Link: http://idlboise.com/content/energyplus-fan-energy-calculator

Description: This spreadsheet was created in order to aid with determining the fan inputs into EnergyPlus via equations from ASHRARE 90.1 Appendix G (for baseline systems) and fan specifications (for proposed systems). Three key inputs are needed in EnergyPlus:

- Supply Fan Total Efficiency
- Supply Fan Delta Pressure {Pa}
- Supply Fan Motor Efficiency

In order to calculate these inputs, this spreadsheet will lead you through a series of steps, depending on the system type required for your building type. The tabs of this spreadsheet are as follows:

- Introduction
- Systems 1 & 2
- Systems 3 & 4
- Systems 5 - 8
- Proposed System
- Resources

Colored cells signify inputs, outputs, links, and instructive text.

Last updated: 2021

LM-83 Three-Phase Daylight Simulation Script

Priority: Medium-High

Link: http://idlboise.com/content/lm-83-12-three-phase-daylight-simulation-script

Description: Annual simulation of dynamic/complex fenestration systems under LM-83 guidelines. This script will generate its own folder structure beyond the starting directories required, which are outlined below.

Version 1.2.0 (August 25, 2017)

Author: Alen Mahic, Ery Djunaedy (Energy Studies in Buildings Laboratory University of Oregon; Integrated Design Lab University of Idaho) This work is licensed under the Creative Commons Attribution 3.0 Unported License. To view a copy of this license, visit GPL v.3

In plain English: you are free to use this script, distribute it, make changes to it, as long as (1) you acknowledge Alen Mahic, Ery Djunaedy and the Integrated Design Lab as the original authors, and (2) you acknowledge that the script is provided as-is with absolutely no warranty, and that the authors and the University of Idaho are not liable to anything that happens or does not happen in relation to the use of this script.

Radiance 5.0+ is required.

Last updated: 2022

Infiltration Equations & Conversions

Priority: Medium

Link: http://idlboise.com/content/infiltration-equations-conversions-0

Description: A key factor in building heat gain and loss may be the infiltration rate, or the rate at which outdoor air is exchanged with conditioned interior air through the envelope. This spreadsheet tool outlines a set of simplified equations aimed at converting typical, real world infiltration measurements into metrics that can be input into EnergyPlus. In using methods outlined in the document Infiltration Modeling Guidelines for Commercial Building Energy Analysis by the Pacific Northwest National Laboratory, we were able to convert common metrics of I75 and ACH50, into ones that could be conveniently input into an Energy Plus Model (Idesign and ACHnat).

NOTE: At this time, this calculation tool does not take into account infiltration from stack pressure, only horizontal wind pressure.

Key Definitions

- ACH50-The number of complete air changes that occur within an hour when the building is pressurized at 50 Pascals. This metric is usually used in residential infiltration measurement.
- ACHnat-The number of natural air changes that occur with an hour when the building is naturally pressurized.
- I75- The infiltration flow rate of air in cubic feet per minute per square foot of exterior exposed surface area when the building is pressurized at 75 Pascals. This metric is more commonly used in commercial infiltration measurement.
- Idesign- The infiltration flow rate of air in cubic feet per minute per square foot of exterior exposed surface area when the building is naturally pressurized.

Spreadsheets

- Spreadsheets 1 and 2 can be used to convert I75 into Idesign. Spreadsheet "1. I75 to Idesign Text," explains the method and equations for the conversion. "2. I75 to Idesign Calculations," is an interactive spreadsheet that takes your project's input and provides an output that can be used in EnergyPlus.
- Spreadsheets 3 and 4 can be used to convert ACH50 into ACHnat. As in spreadsheets 1-2, "3. ACH50 to ACHnat Text," explains the method and equations for the conversion. "4. ACH50 to ACHnat Calculations," is an interactive spreadsheet that takes your project's input and provides an output that can be used in EnergyPlus.
- Spreadsheets 5 and 6 are for comparing ACH50 into Idesign metrics. As in spreadsheets 1-4, "5. Compare ACH and I Text," explains the method and equations for the conversion. "6. Compare ACH to I Calculation," is an interactive spreadsheet that takes your project's input and provides an output of comparisons between the different metrics.
- Spreadsheet 7 is a provides a reverse calculation. "7. Reverse Calcs" allows you to convert from an EnergyPlus input into I75.
- Spreadsheet 8 is a reference tab. "8. Appendix" contains useful reference charts for spreadsheets 1-7.

Last updated: 2021

The Climate Responsive Design Web Tool Sets

Priority: Medium

Link: http://idlboise.com/content/climate-responsive-design-web-tool

Description: The Climate Responsive Design web tool is designed to graphically illustrate the feasibility and potential energy benefits of several climate responsive design strategies. The tool is intended to help designers and owners make correct early decisions that will result in buildings that are more energy efficient. The output of the tool are graphic data plots designed to illustrate not only conventional climate data, such as temperature and relative humidity, but also more complex interactions of these raw weather data with building specific user input data and a rule set for various energy efficient design strategies.

The Climate Responsive Design web tool requires viewing in Firefox internet browser.

Last updated: 2021

Climate Design Resources – 1st & 2nd Generation Tool Sets

Priority: Medium

Link: http://idlboise.com/content/ui-idl-climate-design-resources-1st-2nd-generation-tool-sets

Description: The Idaho Power Company funded the University of Idaho Integrated Design Lab (UI-IDL) to produce a series of climate design resources to help assist in the conceptual and early design of passive strategies. Through their support, the UI-IDL has developed two generations of spreadsheet calculators that are capable of analyzing building loads and energy consumption impacts of a range of different design strategies over three reference cities. You can download the tools and both the 1st and 2nd generation research reports at the bottom of this webpage. The reports provide insight into the methodology of the research used to develop the tools as well as information on how to use them most effectively. Currently, there are seven different calculation spreadsheets that span across two different generations of tool development:

FIRST GENERATION TOOLS

- Heat Gain Calculations
- Cross Ventilation
- Stack Ventilation
- Night Ventilation Thermal Mass

SECOND GENERATION TOOLS

- Balance Point Calculation
- Passive Solar
- Earth Tube

Each spreadsheet contains multiple tabs and a step-by-step process that directs the user to define the critical baseline and performance parameters of the building. These factors are linked to pre-defined equations within the spreadsheet that automatically provide the peak cooling loads, cooling capacities, and describe other critical design criteria. Charts, line graphs, and other forms of graphic information also automatically populate the workspace to provide rich visual feedback to the user. The spreadsheets also contain a reference tab that consolidates a myriad of textbook, code, and other sources needed to complete the step-by-step instructions. Additionally, a variety of weather data, including hourly information from TMY weather files, are embedded into the calculations based upon three different reference cities within the Idaho Power Company service territory. Once each tab is filled out, the results pages of the spreadsheets contains all of the important outputs needed to evaluate how much the passive design measure can contribute to the peak loads or energy savings of the building. Changes to the building parameters are instantaneous, making the Climate Tools Package an ideal instrument used to explore different design iterations and how they might facilitate passive design strategies.

Goals

The ultimate goal of the Climate Tools Package is to reduce the loads and energy consumption of a building through passive design measures. This happens mainly by embedding, early in the design process, the analysis of the performance capabilities of different passive cooling and heating strategies. Once a performance capacity is calculated and compared against peak loads of a building, a qualitative decision can be made whether or not to pursue more detailed analysis. If certain passive strategies are proven to meet some or all of the peak load, this may warrant further development. Potential next steps could involve more advanced analysis such as building simulation to quantify annual energy savings based on actual weather data.

Last updated: 2021

Thermal Energy Savings Tabulator (TEST)

Priority: Medium

Link: http://www.idlboise.com/content/thermal-energy-savings-tabulator-test

Description: This tool aims to provide designers, engineers, and manufacturers a quick and easy way to calculate energy savings from the application of different heat pump HVAC technologies early in the design process. Specifically, the tool supports analysis of air-source heat pumps (ASHP), water-source heat pumps (WSHP), and variable refrigerant flow (VRF) systems. The spreadsheet was developed by the University of Idaho Integrated Design Lab (UI-IDL) with funding from Idaho Power Company. To learn more about the development of the tool, please visit the UI-IDL's website here - idlboise.com.

The tool provides the means for detailed input of a custom building, geometry, and program, while using pre-cooked, whole-building simulations to aid in HVAC energy calculations. The tool always compares a baseline condition to a proposed condition. The baseline condition can represent a new construction code baseline, or could be used to define an existing building.

The spreadsheets contain color coded cells that represent different functionalities. All cells, except for those that require user input, are locked to avoid confusion. However, the cells can be unlocked without a password for custom manipulation or for further insight into equations used for calculations. See below for the various cell's color-coded instructions and their specific descriptions:

Last updated: 2021

Construction Insulation Value Calculator

Priority: Low

Link: http://idlboise.com/content/construction-insulation-value-calculator

Description: This spreadsheet is designed to calculate insulation values of individual material layers and whole constructions of EnergyPlus objects.

Last updated: 2021

Sustainable Design & Practice Benefits

Priority: Low

Link: http://idlboise.com/content/sustainable-design-practice-benefits

Description: Sponsored by the Idaho Power Company, the University of Idaho Integrated Design Lab (UI-IDL) developed this series of infographics to communicate sustainable design & practice Benefits of five different building types for their bottom line impact on efficiency for each building type. Architects and engineers can also use this information to make early design decisions with compelling numbers for additional non-energy benefits of energy efficient design. Currently, there are five printable, single-sided 8.5X11" infographics describing specific benefits and strategies for Grocery, Hotel, Multi-family Housing, Office, and Retail building types.

EXPECTED BENEFITS

- Broadening the scope of sustainable design effectiveness beyond simple utility cost payback gives a more accurate picture of the financial benefits available through sustainable design
- Strategies for specific occupancy types highlight the solutions that are most effective and easiest to achieve for each unique set of needs. Efficiency tips for additional building types can be found at Idahopower.com/business
- Better information during the design phase means a more accurate prediction of a building's performance, avoiding costly changes down the road
- Readily available and easily understandable information means increased participation in efficiency programs by designers, employees, and users of a space
- Energy strategies that go beyond building design and highlight savings opportunities in day to day operation mean greater energy savings with minimal cost
- Sustainable design and responsible energy consumption can increase a user's comfort and appreciation, leading to more positive user experiences and an increase in community support and interaction
- Power companies offer financial incentives to help offset the costs of implementing sustainable design strategies. Available for new construction, retrofits, custom projects, and flex peak programs, Idaho Power helps to make it more affordable than ever to incorporate sustainable and energy-efficient design decisions into your project. Additional information on Idaho Power incentive programs can be found at Idahopower.com/business

BOTTOM LINE

Energy and cost savings attributed to efficiency measures are well documented. However, with additional opportunities to increase comfort, efficiency, community involvement, and customer satisfaction, sustainable design and practice could have an impact on your bottom line far beyond reduced utility bills.

Last updated: 2021

Daylight Pattern Guide

Priority: Low

Link: http://idlboise.com/content/cbecs-data-visualization-infographics

Description: The Daylighting Pattern Guide is the newest offering in the Advanced Buildings suite of tools and resources to help design teams create high performance commercial buildings. This no-cost, interactive design tool uses a combination of real-world built examples and advanced simulation to set the stage for substantial reductions in lighting power consumption and overall building energy use. It was developed through a partnership between New Buildings Institute (NBI), University of Idaho and University of Washington.

High quality daylighting design has the potential to increase user satisfaction and productivity and save substantial energy. However, successfully designing daylighting into buildings in a manner that supports high ratings of visual comfort while also saving energy can be a complex and challenging process.

The Daylighting Pattern Guide presents 19 prime examples of well-designed daylit spaces around the United States. Each project was photographed, physically measured and simulated using the Radiance simulation tool. Sensitivity analysis of key design variables was conducted on each project to demonstrate whether the outcome was optimized and to illustrate the impact of multiple 'alternate design decisions' on the daylighting performance.

Key daylight patterns, or variables including orientation, glazing layout, area, shading strategies, furniture layout, ceiling height, that contribute to the success or failure of a daylighting design were also identified. This information allows users to differentiate between good built examples of daylit space, the information generated by design analysis tools, and the 'rule of thumb' guidelines that designers commonly apply.

Project types included in analysis are offices, schools, libraries, laboratories, museums, industrial facilities, and recreational facilities across a diverse set of regional climates.

Last updated: 2021

5. Design Tools Maintenance

CBECS Data Visualization Infographics

None to date.

CBECS Micro Master v2

None to date.

Weather Normalization

Reviewed, cataloged, and ready for updates.

EnergyPlus Fan Energy Calculator

Reviewed, cataloged, and ready for updates.

LM-83 Three-phase Daylight Simulation Script

Reviewed, cataloged, and no updates needed.

Infiltration Equations & Conversions

None to date.

The Climate Responsive Design Web Tool

None to date.

Climate Design Resources - 1st & 2nd Generation Tool Sets

None to date.

Thermal Energy Savings Tabulator (TEST)

None to date.

Construction Insulation Value Calculator

None to date.

Sustainable Design & Practice Benefits

None to date.

Daylight Pattern Guide

None to date.

6. Design Tools Statistics

We saw a total of 2,812 visits to the home/landing page for the digital design tools (http://www.idlboise.com/content/design-tools). The table below shows the number of visits to a design tools page.

Priority	Name	Page Visits
High	CBECS Data Visualization Infographics	528
High	CBECS Micro Master v2	0
Medium-High	Weather Normalization	263
Medium-High	EnergyPlus Fan Energy Calculator	380
Medium-High	LM-83 Three-phase Daylight Simulation Script	199
Medium	Infiltration Equations & Conversions	236
Medium	The Climate Responsive Design Web Tool	487
Medium	Climate Design Resources - 1st & 2nd Generation Tool Sets	396
Medium	Thermal Energy Savings Tabulator (TEST)	227
Low	Construction Insulation Value Calculator	272
Low	Sustainable Design & Practice Benefits	316
Low	Daylight Pattern Guide	373

7. Future Work & Design Tools

Developing Guides/How-to for Design Tools

While most design tools include an introduction or instructions to assist users with using the tool we don't have any examples or tutorials they can reference. An example or tutorials would include using the tool, when to use the tool, and when not to use the tool.

Indoor Air Quality

Energy efficient indoor air quality tool that utilizes data and research accumulated through the 2021 IAQ task. This tool will have drop- down menus for baseline and proposed methods along with manual entry fields as needed to reasonably estimate kWh/yr usage and costs for the most popular configurations. The tool will utilize current IPC rate schedules to provide potential bill savings and payback years.

RESEARCH/SURVEYS

Report Title	Sector	Analysis Performed By	Study Manager	Study/Evaluation Type
2022 Flex Peak Non-Participant Survey Results	Commercial/ Industrial	Idaho Power	Idaho Power	Survey
2022 Flex Peak Participant Survey	Commercial/Industrial	Idaho Power	Idaho Power	Survey
2022 Idaho Power WAQC Customers Program Survey	Residential	Idaho Power	Idaho Power	Survey
2022 Idaho Power Weatherization Solutions for Eligible Customers Program Survey	Residential	Idaho Power	Idaho Power	Survey
2022 Peak Rewards Non-Participant Survey	Irrigation	Idaho Power	Idaho Power	Survey
2022 Peak Rewards Participant Survey	Irrigation	Idaho Power	Idaho Power	Survey
2022 Retrofits Program Survey Results	Commercial/Industrial	Idaho Power	Idaho Power	Survey
2022 SBDI Non-Respondent Follow Up Survey Results	Commercial/Industrial	Idaho Power	Idaho Power	Survey
2022 SBDI Program Customer Satisfaction Survey Reponses	Commercial/Industrial	DNV	DNV	Survey
2022 Shade Tree Program Survey Results	Residential	Idaho Power	Idaho Power	Survey

2022 Flex Peak Rewards Non Participant Survey Results

What is your role at your company?

Answer	Percent	Response
Facilities Director/Manager/Supervisor	24.00%	6
Maintenance Director/Manager/Supervisor	8.00%	2
Operations Director/Manager/Supervisor	16.00%	4
Plant Director/Manager/Supervisor	8.00%	2
Other (please specify)	44.00%	11
Total		**25**

What industry best describes your company?(If your company has multiple offices/locations, check all that apply.)

Answer	Percent	Response
Food manufacturing	18.52%	5
Grocery	0.00%	0
Office - Large	7.41%	2
Office - Small	14.81%	4
Retail	3.70%	1
School/University	14.81%	4
Warehouse	11.11%	3
Water/Wastewater	3.70%	1
Other (please specify)	25.93%	7
Total		**27**

Which best describes your reason for not participating in the Flex Peak program?(Check all that apply)

Answer	Percent	Response
Fixed incentive too small	3.70%	1
Variable incentive too small	0.00%	0
Wasn't beneficial this year	3.70%	1
Events too late in the day	3.70%	1
Too many events in the season	3.70%	1
Events too close together	0.00%	0
Negative impact to the business	29.63%	8
Did not know about the program	51.85%	14
Other (please specify)	3.70%	1
Total		**27**

How familiar are you with the Flex Peak program's incentive payment structure?

Answer	Percent	Response
Very familiar	0.00%	0
Moderately familiar	8.00%	2
Somewhat familiar	12.00%	3
Slightly familiar	16.00%	4
Not familiar at all	64.00%	16
Total		**25**

How satisfied are you with the following components in the Flex Peak program incentive payment structure?

Incentive adjustment of $2/kW per hour of nomination not met during an event

Answer	Percent	Response
Very satisfied	0.00%	0
Somewhat satisfied	0.00%	0
Neither satisfied nor dissatisfied	100.00%	5
Somewhat dissatisfied	0.00%	0
Very dissatisfied	0.00%	0
Total		**5**

Weekly fixed incentive of $3.25/kW nominated

Answer	Percent	Response
Very satisfied	0.00%	0
Somewhat satisfied	0.00%	0
Neither satisfied nor dissatisfied	100.00%	5
Somewhat dissatisfied	0.00%	0
Very dissatisfied	0.00%	0
Total		**5**

Variable payment after the 4th event of $0.20/kWh

Answer	Percent	Response
Very satisfied	0.00%	0
Somewhat satisfied	0.00%	0
Neither satisfied nor dissatisfied	100.00%	5
Somewhat dissatisfied	0.00%	0
Very dissatisfied	0.00%	0
Total		**5**

Actual load reduction calculation during an event

Answer	Percent	Response
Very satisfied	0.00%	0
Somewhat satisfied	0.00%	0
Neither satisfied nor dissatisfied	100.00%	5
Somewhat dissatisfied	0.00%	0
Very dissatisfied	0.00%	0
Total		**5**

Beyond the 2023 season, Idaho Power is exploring providing additional participation and incentive options for participants. How likely are you to enroll facilities in the Flex Peak program under the following hypothetical scenario options:

Maximum 1 event per calendar week with incentives approximately 75% lower

Answer	Percent	Response
Very likely	12.00%	3
Somewhat likely	20.00%	5
Neither likely nor unlikely	28.00%	7
Somewhat unlikely	0.00%	0
Not likely at all	40.00%	10
Total		**25**

Maximum 1 event within a 7-day consecutive period with incentives approximately 80% lower

Answer	Percent	Response
Very likely	12.00%	3
Somewhat likely	12.00%	3
Neither likely nor unlikely	36.00%	9
Somewhat unlikely	0.00%	0
Not likely at all	40.00%	10
Total		**25**

Maximum 2 events per calendar week with incentives approximately 50% lower

Answer	Percent	Response
Very likely	12.00%	3
Somewhat likely	4.00%	1
Neither likely nor unlikely	32.00%	8
Somewhat unlikely	12.00%	3
Not likely at all	40.00%	10
Total		**25**

Maximum 3 events per calendar week with incentives approximately 25% lower

Answer	Percent	Response
Very likely	12.00%	3
Somewhat likely	4.00%	1
Neither likely nor unlikely	32.00%	8
Somewhat unlikely	12.00%	3
Not likely at all	40.00%	10
Total		**25**

With current program parameters and incentive levels

Answer	Percent	Response
Very likely	12.00%	3
Somewhat likely	4.00%	1
Neither likely nor unlikely	44.00%	11
Somewhat unlikely	0.00%	0
Not likely at all	40.00%	10
Total		**25**

2022 Flex Peak Rewards Participant Survey

Are you the primary contact for your company for the Flex Peak program?

Answer	Percent	Response
Yes, I am the primary contact for the program.	72.73%	24
No, but I receive event notifications for the program.	27.27%	9
Total		**33**

What industry best describes the facility enrolled in the Flex Peak program?(If you have multiple facilities enrolled in the program, check all that apply.)

Answer	Percent	Response
Food manufacturing	14.71%	5
Grocery	0.00%	0
Office - Large	2.94%	1
Office - Small	0.00%	0
Retail	0.00%	0
School/University	14.71%	5
Warehouse	11.76%	4
Water/Wastewater	23.53%	8
Other (please specify)	32.35%	11
Total		**34**

What is the main reason you chose to participate in the Flex Peak program?

Answer	Percent	Response
Want to help reduce overall electrical usage on hot summer days	27.27%	9
Want to earn an incentive for providing demand reduction	54.55%	18
Seems like the right thing to do	9.09%	3
Need to meet a company sustainability initiative	6.06%	2
Other (Please Specify)	3.03%	1
Total		**33**

How satisfied were you with the following aspects in the Flex Peak program?

Enrollment process

Answer	Percent	Response
Very satisfied	65.63%	21
Somewhat satisfied	25.00%	8
Neither satisfied nor dissatisfied	6.25%	2
Somewhat dissatisfied	3.13%	1
Very dissatisfied	0.00%	0
Total		**32**

Event notification process

Answer	Percent	Response
Very satisfied	48.48%	16
Somewhat satisfied	39.39%	13
Neither satisfied nor dissatisfied	3.03%	1
Somewhat dissatisfied	3.03%	1
Very dissatisfied	6.06%	2
Total		**33**

Program support from Idaho Power

Answer	Percent	Response
Very satisfied	57.58%	19
Somewhat satisfied	36.36%	12
Neither satisfied nor dissatisfied	3.03%	1
Somewhat dissatisfied	3.03%	1
Very dissatisfied	0.00%	0
Total		**33**

Post event performance data

Answer	Percent	Response
Very satisfied	63.64%	21
Somewhat satisfied	24.24%	8
Neither satisfied nor dissatisfied	9.09%	3
Somewhat dissatisfied	0.00%	0
Very dissatisfied	3.03%	1
Total		**33**

Timeliness of receiving the incentive payment/bill credits

Answer	Percent	Response
Very satisfied	59.38%	19
Somewhat satisfied	25.00%	8
Neither satisfied nor dissatisfied	12.50%	4
Somewhat dissatisfied	3.13%	1
Very dissatisfied	0.00%	0
Total		**32**

How satisfied were you with the following components in the Flex Peak program's incentive payment structure?

Incentive adjustment of $2/kW per hour of nomination not met during an event

Answer	Percent	Response
Very satisfied	30.30%	10
Somewhat satisfied	21.21%	7
Neither satisfied nor dissatisfied	39.39%	13
Somewhat dissatisfied	9.09%	3
Very dissatisfied	0.00%	0
Total		**33**

Weekly fixed incentive of $3.25/kW nominated

Answer	Percent	Response
Very satisfied	30.30%	10
Somewhat satisfied	33.33%	11
Neither satisfied nor dissatisfied	36.36%	12
Somewhat dissatisfied	0.00%	0
Very dissatisfied	0.00%	0
Total		**33**

Variable payment after the 4th event of $0.20/kWh

Answer	Percent	Response
Very satisfied	30.30%	10
Somewhat satisfied	27.27%	9
Neither satisfied nor dissatisfied	36.36%	12
Somewhat dissatisfied	6.06%	2
Very dissatisfied	0.00%	0
Total		**33**

Actual load reduction calculation during an event

Answer	Percent	Response
Very satisfied	27.27%	9
Somewhat satisfied	42.42%	14
Neither satisfied nor dissatisfied	21.21%	7
Somewhat dissatisfied	9.09%	3
Very dissatisfied	0.00%	0
Total		**33**

How easy was it for your facility to meet its weekly nomination for each event this season?

Tuesday, July 26

Answer	Percent	Response
Very easy	27.27%	9
Somewhat easy	15.15%	5
Neither easy nor difficult	27.27%	9
Somewhat difficult	21.21%	7
Very difficult	9.09%	3
Total		**33**

Thursday, July 28

Answer	Percent	Response
Very easy	27.27%	9
Somewhat easy	18.18%	6
Neither easy nor difficult	27.27%	9
Somewhat difficult	18.18%	6
Very difficult	9.09%	3
Total		**33**

Monday, August 8

Answer	Percent	Response
Very easy	27.27%	9
Somewhat easy	15.15%	5
Neither easy nor difficult	21.21%	7
Somewhat difficult	24.24%	8
Very difficult	12.12%	4
Total		**33**

Wednesday, August 17

Answer	Percent	Response
Very easy	24.24%	8
Somewhat easy	18.18%	6
Neither easy nor difficult	30.30%	10
Somewhat difficult	21.21%	7
Very difficult	6.06%	2
Total		**33**

Wednesday, August 31

Answer	Percent	Response
Very easy	21.21%	7
Somewhat easy	21.21%	7
Neither easy nor difficult	30.30%	10
Somewhat difficult	21.21%	7
Very difficult	6.06%	2
Total		**33**

Friday, September 2

Answer	Percent	Response
Very easy	21.21%	7
Somewhat easy	18.18%	6
Neither easy nor difficult	27.27%	9
Somewhat difficult	21.21%	7
Very difficult	12.12%	4
Total		**33**

Tuesday, September 6

Answer	Percent	Response
Very easy	21.21%	7
Somewhat easy	18.18%	6
Neither easy nor difficult	33.33%	11
Somewhat difficult	15.15%	5
Very difficult	12.12%	4
Total		**33**

What is your facility's primary action to reduce load during an event?

Answer	Percent	Response
Shut off lights	3.03%	1
Adjust HVAC system	24.24%	8
Shut down operations	39.39%	13
Other (please specify)	33.33%	11
Total		**33**

How does your facility reduce load during an event?

Answer	Percent	Response
Individual(s) manually adjust specific system	51.52%	17
Use an automated system to adjust specific systems	18.18%	6
Use a mix of manual and automated processes to adjust specific systems	30.30%	10
Total		**33**

How easy is it for you to understand how your load reduction is calculated during events?

Answer	Percent	Response
Very easy	18.18%	6
Somewhat easy	42.42%	14
Neither easy nor difficult	24.24%	8
Somewhat difficult	12.12%	4
Very difficult	3.03%	1
Total		**33**

Overall, how satisfied are you with the Flex Peak program?

Answer	Percent	Response
Very satisfied	39.39%	13
Somewhat satisfied	36.36%	12
Neither satisfied nor dissatisfied	9.09%	3
Somewhat dissatisfied	9.09%	3
Very dissatisfied	6.06%	2
Total		**33**

How likely are you to participate in the Flex Peak program in 2023?

Answer	Percent	Response
Very likely	72.73%	24
Somewhat likely	12.12%	4
Neither likely nor unlikely	3.03%	1
Somewhat unlikely	6.06%	2
Very unlikely	6.06%	2
Total		**33**

How would you prefer to receive the auto enrollment paperwork in the future?(Check all that apply)

Answer	Percent	Response
Paper enrollment by mail	2.94%	1
Enrollment by email	61.76%	21
Online enrollment	35.29%	12
Total		**34**

What about the program would prevent you from participating in 2023?(Check all that apply)

Answer	Percent	Response
Fixed incentive too small	11.11%	1
Variable incentive too small	33.33%	3
Wasn't beneficial this year	22.22%	2
Events too late in the day	11.11%	1
Too many events in the season	0.00%	0
Events too close together	0.00%	0
Negative impact to the business	0.00%	0
Other (please specify)	22.22%	2
Total		**9**

Beyond the 2023 season, Idaho Power is exploring providing additional participation and incentive options for participants. How likely are you to enroll additional facilities in the Flex Peak program under the following hypothetical scenario options:

Maximum 1 event per calendar week with incentives approximately 75% lower

Answer	Percent	Response
Very likely	15.15%	5
Somewhat likely	12.12%	4
Neither likely nor unlikely	24.24%	8
Somewhat unlikely	27.27%	9
Not likely at all	21.21%	7
Total		**33**

Maximum 1 event within a 7-day consecutive period with incentives approximately 80% lower

Answer	Percent	Response
Very likely	15.15%	5
Somewhat likely	12.12%	4
Neither likely nor unlikely	24.24%	8
Somewhat unlikely	27.27%	9
Not likely at all	21.21%	7
Total		**33**

Maximum 2 events per calendar week with incentives approximately 50% lower

Answer	Percent	Response
Very likely	6.06%	2
Somewhat likely	15.15%	5
Neither likely nor unlikely	36.36%	12
Somewhat unlikely	15.15%	5
Not likely at all	27.27%	9
Total		**33**

Maximum 3 events per calendar week with incentives approximately 25% lower

Answer	Percent	Response
Very likely	12.12%	4
Somewhat likely	21.21%	7
Neither likely nor unlikely	21.21%	7
Somewhat unlikely	24.24%	8
Not likely at all	21.21%	7
Total		**33**

With current program parameters and incentive levels

Answer	Percent	Response
Very likely	39.39%	13
Somewhat likely	15.15%	5
Neither likely nor unlikely	24.24%	8
Somewhat unlikely	9.09%	3
Not likely at all	12.12%	4
Total		**33**

Agency/Contractor Name:		
Metro Community Services	21	18.92%
Eastern Idaho Community Action Partnership	3	2.70%
El Ada Community Action Partnership	66	59.46%
South Central Community Action Partnership	10	9.01%
Southeastern Idaho Community Action Agency	11	9.91%
Community Connection of Northeast Oregon	0	0.00%
Community in Action	0	0.00%
Total	**111**	

How did you learn about the weatherization program?		
Agency/Contractor flyer	19	16.67%
Idaho Power employee	4	3.51%
Idaho Power web site	16	14.04%
Friend or relative	55	48.25%
Letter in mail	4	3.51%
Other (Please specify)	16	14.04%
Total	**114**	

Other Option [Other (Please specify)]
by phone
EICAP Office
El Ada
El Ada
Emailed
energy assistance, Idaho Power
Family
flyer with my electric bill
found on line
Headstart Family Advocate
Heard about program
HVAC Contractor
local newspaper
My wife friend or info through ID Power
neighbor
WICAP
WICAP
YCAP

What was your primary reason for participating in the weatherization program?		
Reduce utility bills	87	48.07%
Improve comfort of home	36	19.89%
Furnace concerns	32	17.68%
Water heater concerns	5	2.76%
Improve insulation	14	7.73%
Other (please specify)	7	3.87%
Total	**181**	

Other Option [Other (please specify)]
also receive help w/bill in winter
heat pump and furnace
my AC and heater broke
my children comfort
Really makes our home look better too!
wanted to do my part to lower consumption and improve problems
windows/draft and ice build up in winter

If you received any energy efficiency equipment upgrade as part of the weatherization, how well was the equipment's operation explained to you?		
Completely	100	89.29%
Somewhat	12	10.71%
Not at all	0	0.00%
Total	**112**	

Which of the following did you learn about from the auditor or crew during the weatherization process? (Check all that apply)		
How air leaks affect energy usage	65	23.55%
How insulation affects energy usage	38	13.77%
How to program the new thermostat	42	15.22%
How to reduce the amount of hot water used	27	9.78%
How to use energy wisely	63	22.83%
How to understand what uses the most energy in my home	40	14.49%
Other (Please specify)	1	0.36%
Total	**276**	

Other Option [Other (Please specify)]
Everything they so great

Based on the information you received from the agency/contractor about energy use, how likely are you to change your habits to save energy?		
Very likely	96	82.76%
Somewhat likely	18	15.52%
Not very likely	1	0.86%
Not likely at all	1	0.86%
Total	**116**	

How much of the information about energy use have you shared with other members of your household?		
All of it	99	90.83%
Some of it	9	8.26%
None of it	1	0.92%
Total	**109**	

If you shared the energy use information with other members of your household, how likely do you think household members will change habits to save energy?		
Very likely	77	70.64%
Somewhat likely	30	27.52%
Somewhat unlikely	1	0.92%
Very unlikely	1	0.92%
Total	**109**	

What habits are you and other members of your household most likely to change to save energy? (check all that apply)		
Washing full loads of clothes	58	15.14%
Washing full loads of dishes	44	11.49%
Turning off lights when not in use	74	19.32%
Unplugging electrical equipment when not in use	57	14.88%
Turning the thermostat up in the summer	74	19.32%
Turning the thermostat down in the winter	75	19.58%
Other (please specify)	1	0.26%
Total	**383**	

Other Option [Other (please specify)]
We have no dishwasher, no washer, no dryer

How much do you think the weatherization you received will affect the comfort of your home?		
Significantly	107	92.24%
Somewhat	6	5.17%
Very little	2	1.72%
Not at all	1	0.86%
Total	**116**	

Rate the Agency/Contractor based on your interactions with them.		
Courteousness		
Excellent	114	98.28%
Good	2	1.72%
Fair	0	0.00%
Poor	0	0.00%
Total	**116**	

Professionalism		
Excellent	114	98.28%
Good	2	1.72%
Fair	0	0.00%
Poor	0	0.00%
Total	**116**	

Explanation of work to be performed on your home		
Excellent	110	97.35%
Good	3	2.65%
Fair	0	0.00%
Poor	0	0.00%
Total	**113**	

Overall experience with Agency/Contractor		
Excellent	112	98.25%
Good	2	1.75%
Fair	0	0.00%
Poor	0	0.00%
Total	**114**	

Were you aware of Idaho Power's role in the weatherization of your home?		
Yes	89	78.07%
No	25	21.93%
Total	**114**	

Overall how satisfied are you with the weatherization program you participated in?		
Very satisfied	112	98.25%
Somewhat satisfied	1	0.88%
Somewhat dissatisfied	0	0.00%
Very dissatisfied	1	0.88%
Total	**114**	

How has your opinion of Idaho Power changed as a result of its role in the weatherization program?		
Improved	110	94.83%
Stayed the same	6	5.17%
Decreased	0	0.00%
Total	**116**	

How many people, beside yourself, live in your home year-round?		
0	25	21.55%
1	22	18.97%
2	29	25.00%
3	22	18.97%
4	6	5.17%
5	7	6.03%
6 or more	5	4.31%
Total	**116**	

How long have you been an Idaho Power customer?		
Less than 1 year	3	2.59%
1-10 years	26	22.41%
11-25 years	42	36.21%
26 years or more	45	38.79%
Total	**116**	

Please select the category below that best describes your age:		
Under 25	2	1.71%
25-34	7	5.98%
35-44	21	17.95%
45-54	28	23.93%
55-64	22	18.80%
65-74	22	18.80%
75 or older	15	12.82%
Total	**117**	

Select the response below that best describes the highest level of education you have attained:		
Less than High School	15	12.93%
High School graduate or GED	58	50.00%
Some College or Technical School	23	19.83%
Associate Degree	8	6.90%
College Degree (including any graduate school or graduate degrees)	12	10.34%
Total	**116**	

Please share any other comments you may have regarding Idaho Power's weatherization programs. Thank you.
a pleasure to have the team come in and help us.
Angie hizo muy buen trabajo y estoy my agradecida con ella por toda su ayuda. Tambuen Doug y loas demas se portaron muy amables connigo.
completely satisfied
Customer declined to complete.
customer signed but didn't complete survey-cpaoli
customer signed but left survey blank-CPaoli
Did a great job. thanks kindly
estoy muy contenta con todo lo que me ayuduron para octerer esta nueva calecfacion y todo lo que me pusieron muchas gracias
Everyone is wonderful at El Ada and Elite Systems. Thank you so much.
good comments to IDAOH Power
How very nice it is to help low income seniors living on Social Security that would never be able to afford new windows or central heat and air. Thank you so much
I am thankful for the services performed by SCCAP
I am very thankful and apreciative for everything Idaho Power did. Thank you so much!
I am very thankful with everything, I have more than I ask. god bless you
I appreciate everything that Idaho Power has done for us. We don't dserve it and we are very blessed to get this service.
I have used and appreciated your help on keeping my home comfortable
I really appreciate all that was accomplished in my home to helf me conserve on electricity. The Metro team were very respectful and I feel did a great job.
I really appreciate this
I think it was Great
I think t his program is very benificial to the people that it helps. very impressed with service
I want to thank you for all of this
It's a wonderful program for families and the staff is fantastic. the guys worked above and beyond.
Loved Wayne and Dave help, courteousness, good education, explanations, efficiency. Very knowledgeable. A pleasure to have in my home. I liked everyone!
May consider more advertising (in my area)
no answers marked but signature received
no comments but received signature
no responses but received signature
no responses marked but signature received
survey signed 7/1/22
Thamk you! We are very happy and much more comfortable now.
Thank you
Thank you for helping the community, and us!
Thank you Thank you
Thank you to all involved in the process and Happy New Year!
Thank you. Your help is very much appreciated.

Thankful & will recommend to others
Thankful for the help
Thanks for 'Everything'
The team that came to work at my place were very polite and explained to me, in a way I could understand always let me know they were on there way. I always felt safe in there presence. Thank
This is a great program! Thank you so much!
This is a great team of people from the office staff to the contractors! Everyone was friendly and informitive. The qualify of work was very good and everything seemed to go smoothly. we are very impressed with everyone involved but the stand out was the window insallation, incredible attendion to detail!!
Very happy with the work and very appreciated and greateful for this program. Thank You
very nice people
very satisfied

Agency/Contractor Name:		
Metro Contractor Services	0	0.00%
Home Energy Management	19	95.00%
Savings Around Power	1	5.00%
Power Savers	0	0.00%
Energy Solutions	0	0.00%
Total	**20**	

How did you learn about the weatherization program?		
Agency/Contractor flyer	0	0.00%
Idaho Power employee	0	0.00%
Idaho Power web site	1	5.26%
Friend or relative	4	21.05%
Letter in mail	2	10.53%
Other (Please specify)	12	63.16%
Total	**19**	

Other Option [Other (Please specify)]
bill stuffer
bill stuffer
bill stuffer
bill stuffer
bill stuffer
bill stuffer
bill stuffer
bill stuffer
bill stuff
Bill Stuffer
Heard about program
My wife friend or info through ID Power

What was your primary reason for participating in the weatherization program?		
Reduce utility bills	12	63.16%
Improve comfort of home	4	21.05%
Furnace concerns	1	5.26%
Water heater concerns	0	0.00%
Improve insulation	1	5.26%
Other (please specify)	1	5.26%
Total	**19**	

Other Option [Other (please specify)]
to help conserve everyday use

If you received any energy efficiency equipment upgrade as part of the weatherization, how well was the equipment's operation explained to you?		
Completely	8	42.11%
Somewhat	1	5.26%
Not at all	10	52.63%
Total	**19**	

Which of the following did you learn about from the auditor or crew during the weatherization		
How air leaks affect energy usage	18	20.22%
How insulation affects energy usage	18	20.22%
How to program the new thermostat	5	5.62%
How to reduce the amount of hot water used	17	19.10%
How to use energy wisely	17	19.10%
How to understand what uses the most energy in my home	13	14.61%
Other (Please specify)	1	1.12%
Total	**89**	

Other Option [Other (Please specify)]
all of the above

Based on the information you received from the agency/contractor about energy use, how likely are you to change your habits to save energy?		
Very likely	15	78.95%
Somewhat likely	4	21.05%
Not very likely	0	0.00%
Not likely at all	0	0.00%
Total	**19**	

How much of the information about energy use have you shared with other members of your		
All of it	8	88.89%
Some of it	1	11.11%
None of it	0	0.00%
Total	**9**	

If you shared the energy use information with other members of your household, how likely do you think household members will change habits to save energy?		
Very likely	9	90.00%
Somewhat likely	0	0.00%
Somewhat unlikely	1	10.00%
Very unlikely	0	0.00%
Total	**10**	

What habits are you and other members of your household most likely to change to save energy? (check all that apply)		
Washing full loads of clothes	2	9.09%
Washing full loads of dishes	0	0.00%
Turning off lights when not in use	1	4.55%
Unplugging electrical equipment when not in use	9	40.91%
Turning the thermostat up in the summer	1	4.55%
Turning the thermostat down in the winter	1	4.55%
Other (please specify)	8	36.36%
Total	**22**	

Other Option [Other (please specify)]
already does these
already practice these
already does these
already does these
Does these already
client already does these
Already Does these

How much do you think the weatherization you received will affect the comfort of your home?		
Significantly	16	84.21%
Somewhat	3	15.79%
Very little	0	0.00%
Not at all	0	0.00%
Total	**19**	

Rate the Agency/Contractor based on your interactions with them.

Courteousness

Excellent	19	100.00%
Good	0	0.00%
Fair	0	0.00%
Poor	0	0.00%
Total	**19**	

Professionalism

Excellent	19	100.00%
Good	0	0.00%
Fair	0	0.00%
Poor	0	0.00%
Total	**19**	

Explanation of work to be performed on your home

Excellent	19	100.00%
Good	0	0.00%
Fair	0	0.00%
Poor	0	0.00%
Total	**19**	

Overall experience with Agency/Contractor

Excellent	19	100.00%
Good	0	0.00%
Fair	0	0.00%
Poor	0	0.00%
Total	**19**	

Were you aware of Idaho Power's role in the weatherization of your home?		
Yes	18	100.00%
No	0	0.00%
Total	**18**	

Overall how satisfied are you with the weatherization program you participated in?		
Very satisfied	18	100.00%
Somewhat satisfied	0	0.00%
Somewhat dissatisfied	0	0.00%
Very dissatisfied	0	0.00%
Total	**18**	

How has your opinion of Idaho Power changed as a result of its role in the weatherization		
Improved	15	78.95%
Stayed the same	4	21.05%
Decreased	0	0.00%
Total	**19**	

How many people, beside yourself, live in your home year-round?		
0	9	47.37%
1	7	36.84%
2	1	5.26%
3	2	10.53%
4	0	0.00%
5	0	0.00%
6 or more	0	0.00%
Total	**19**	

How long have you been an Idaho Power customer?		
Less than 1 year	0	0.00%
1-10 years	4	22.22%
11-25 years	3	16.67%
26 years or more	11	61.11%
Total	**18**	

Please select the category below that best describes your age:		
Under 25	0	0.00%
25-34	2	10.53%
35-44	1	5.26%
45-54	0	0.00%
55-64	4	21.05%
65-74	5	26.32%
75 or older	7	36.84%
Total	**19**	

Select the response below that best describes the highest level of education you have attained:		
Less than High School	1	5.26%
High School graduate or GED	7	36.84%
Some College or Technical School	7	36.84%
Associate Degree	3	15.79%
College Degree (including any graduate school or graduate degrees)	1	5.26%
Total	**19**	

2022 Peak Rewards Non Participant Survey

Are you the owner or an employee of the farm, ranch, or business?

Answer	Percent	Responses
Owner	97.66%	167
Employee	2.34%	4
Total		**171**

Have you participated in Idaho Power's Peak Rewards program in the past?

Answer	Percent	Responses
Yes	28.07%	48
No	59.65%	102
Not sure	12.28%	21
Total		**171**

Which best describes your reason for not participating in the Peak Rewards program?(Check all that apply)

Answer	Percent	Responses
Fixed incentive too small	9.56%	28
Variable incentive too small	7.51%	22
Too much risk for crops	13.65%	40
Too much trouble to coordinate (system/labor)	12.97%	38
Need more advance notification for events	7.17%	21
Don't understand the benefits of the program	11.60%	34
Too many events per week	2.73%	8
Wasn't beneficial to me	9.56%	28
Events too late in the day	6.83%	20
Other (please specify)	18.43%	54
Total		**293**

Do you recall receiving a Peak Rewards enrollment packet in the mail?

Answer	Percent	Responses
Yes	46.20%	79
No	38.01%	65
Not sure	15.79%	27
Total		**171**

How easy was it to understand the information in the Peak Rewards enrollment packet?

Answer	Percent	Responses
Very easy	32.91%	26
Somewhat easy	32.91%	26
Neither easy nor difficult	21.52%	17
Somewhat difficult	10.13%	8
Very difficult	2.53%	2
Total		**79**

How would you prefer to receive the future enrollment paperwork?

Answer	Percent	Responses
Paper enrollment by mail	45.03%	77
Online enrollment	29.82%	51
Both	25.15%	43
Total		**171**

Beyond the 2023 season, Idaho Power is exploring providing additional participation and incentive options for participants. How likely are you to enroll pump locations in the Peak Rewards program under the following hypothetical scenario options:

Maximum 1 event per calendar week with incentives approximately 75% lower

Answer	Percent	Responses
Very likely	8.77%	15
Somewhat likely	16.37%	28
Neither likely nor unlikely	21.05%	36
Somewhat unlikely	9.94%	17
Not likely at all	43.86%	75
Total		**171**

Maximum 1 event within a 7-day consecutive period with incentives approximately 80% lower

Answer	Percent	Responses
Very likely	7.02%	12
Somewhat likely	16.96%	29
Neither likely nor unlikely	22.81%	39
Somewhat unlikely	5.26%	9
Not likely at all	47.95%	82
Total		**171**

Maximum 2 events per calendar week with incentives approximately 50% lower

Answer	Percent	Responses
Very likely	4.68%	8
Somewhat likely	14.04%	24
Neither likely nor unlikely	25.73%	44
Somewhat unlikely	8.19%	14
Not likely at all	47.37%	81
Total		**171**

Maximum 3 events per calendar week with incentives approximately 25% lower

Answer	Percent	Responses
Very likely	3.51%	6
Somewhat likely	11.70%	20
Neither likely nor unlikely	26.32%	45
Somewhat unlikely	7.02%	12
Not likely at all	51.46%	88
Total		**171**

With current program parameters and incentive levels

Answer	Percent	Responses
Very likely	9.94%	17
Somewhat likely	16.96%	29
Neither likely nor unlikely	28.65%	49
Somewhat unlikely	9.94%	17
Not likely at all	34.50%	59
Total		**171**

Did you attend any of Idaho Power's irrigation workshops in the last 12 months?

Answer	Percent	Responses
Yes	8.19%	14
No	91.81%	157
Not sure	0.00%	0
Total		**171**

2022 Peak Rewards Participant Survey

Are you the owner or an employee of the participating farm, ranch, or business?

Answer	Percent	Responses
Owner	86.02%	80
Employee	13.98%	13
Total		**93**

How did you learn about the Peak Rewards program?(Check all that apply)

Answer	Percent	Responses
Idaho Power mailed enrollment packet	47.29%	61
Idaho Power workshop	18.60%	24
Idaho Power employee	10.85%	14
Idaho Power Peak Rewards advertisement	17.83%	23
Other (please specify)	5.43%	7
Total		**129**

If you have service locations not enrolled in the Peak Rewards program, what is preventing you from enrolling all of your irrigation service locations in the program? (Check all that apply)

Answer	Percent	Responses
Time of event hours	19.77%	17
Possible number of events	11.63%	10
Crop Type	17.44%	15
Irrigation system type	41.86%	36
Other (please specify)	9.30%	8
Total		**86**

The Extended Interruption Option allows for events between 3 pm and 11 pm and offers an increased variable incentive of $0.25 per event kWh. Did you select the Extended Interruption Option during enrollment for one or more of your pumps?

Answer	Percent	Responses
Yes	47.31%	44
No	34.41%	32
Not sure	18.28%	17
Total		**93**

What made you choose to participate in the Extended Interruption Option?

Answer	Percent	Responses
Increased variable incentive	68.00%	34
Later potential event time of 11 pm did not negatively impact me	22.00%	11
Other (please specify)	10.00%	5
Total		**50**

Overall, how satisfied are you with the Peak Rewards Program?

Answer	Percent	Responses
Very satisfied	33.33%	31
Somewhat satisfied	41.94%	39
Neither satisfied nor dissatisfied	6.45%	6
Somewhat dissatisfied	11.83%	11
Very dissatisfied	6.45%	6
Total		**93**

How likely are you to participate in the Peak Rewards Program in 2023 at any of your service locations?

Answer	Percent	Responses
Very likely	60.22%	56
Somewhat likely	24.73%	23
Neither likely nor unlikely	4.30%	4
Somewhat unlikely	3.23%	3
Very unlikely	7.53%	7
Total		**93**

How would you prefer to receive the future enrollment paperwork?

Answer	Percent	Responses
Paper enrollment by mail	45.57%	36
Online enrollment	16.46%	13
Both	37.97%	30
Total		**79**

Do you plan to change your participation level in the program in 2023?

Answer	Percent	Responses
I plan to increase my level of participation	7.59%	6
I plan to not change my level of participation	82.28%	65
I plan to decrease my level of participation	10.13%	8
Total		**79**

What about the program would prevent you from participating in 2023?(Check all that apply)

Answer	Percent	Responses
Fixed incentive too small	18.60%	8
Variable incentive too small	16.28%	7
Too much risk for crops	16.28%	7
Too much trouble to coordinate (system/labor)	16.28%	7
Wasn't beneficial this year	11.63%	5
Events too late in the day	13.95%	6
Other (please specify)	6.98%	3
Total		**43**

Beyond the 2023 season, Idaho Power is exploring providing additional participation and incentive options for participants. How likely are you to enroll additional pump locations in the Peak Rewards program under the following hypothetical scenario options:

Maximum 1 event per calendar week with Incentives approximately 75% lower

Answer	Percent	Responses
Very likely	5.38%	5
Somewhat likely	16.13%	15
Neither likely nor unlikely	20.43%	19
Somewhat unlikely	9.68%	9
Not likely at all	48.39%	45
Total		**93**

Maximum 1 event within a 7-day consecutive period with incentives approximately 80% lower

Answer	Percent	Responses
Very likely	6.45%	6
Somewhat likely	12.90%	12
Neither likely nor unlikely	17.20%	16
Somewhat unlikely	15.05%	14
Not likely at all	48.39%	45
Total		**93**

Maximum 2 events per calendar week with incentives approximately 50% lower

Answer	Percent	Responses
Very likely	6.45%	6
Somewhat likely	10.75%	10
Neither likely nor unlikely	19.35%	18
Somewhat unlikely	20.43%	19
Not likely at all	43.01%	40
Total		**93**

Maximum 3 events per calendar week with incentives approximately 25% lower

Answer	Percent	Responses
Very likely	2.15%	2
Somewhat likely	17.20%	16
Neither likely nor unlikely	20.43%	19
Somewhat unlikely	13.98%	13
Not likely at all	46.24%	43
Total		**93**

With current program parameters and incentive level

Answer	Percent	Responses
Very likely	37.63%	35
Somewhat likely	25.81%	24
Neither likely nor unlikely	15.05%	14
Somewhat unlikely	4.30%	4
Not likely at all	17.20%	16
Total		**93**

Did you attend any of Idaho Power's irrigation workshops in the last 12 months?

Answer	Percent	Responses
Yes	16.13%	15
No	79.57%	74
Not sure	4.30%	4
Total		**93**

2022 Retrofits Survey Results

How did you learn about the Retrofits program?

Answer	Percent	Responses
Idaho Power employee	14.47%	11
Contractor	63.16%	48
Equipment supplier	6.58%	5
Other business owner	7.89%	6
Other (please specify)	7.89%	6
Total		**76**

Overall, how satisfied are you with the Idaho Power Retrofits incentive program?

Answer	Percent	Responses
Very satisfied	82.89%	63
Somewhat satisfied	14.47%	11
Neither satisfied nor dissatisfied	1.32%	1
Somewhat dissatisfied	1.32%	1
Very dissatisfied	0.00%	0
Total		**76**

How satisfied are you with the contractor that you hired to install the equipment?

Answer	Percent	Responses
Very satisfied	89.47%	68
Somewhat satisfied	9.21%	7
Neither satisfied nor dissatisfied	1.32%	1
Somewhat dissatisfied	0.00%	0
Very dissatisfied	0.00%	0
Total		**76**

How satisfied are you with the equipment that was installed?

Answer	Percent	Responses
Very satisfied	89.47%	68
Somewhat satisfied	7.89%	6
Neither satisfied nor dissatisfied	2.63%	2
Somewhat dissatisfied	0.00%	0
Very dissatisfied	0.00%	0
Total		**76**

Would you like Idaho Power to follow up with you regarding this survey or the Retrofits program?

Answer	Percent	Responses
Yes	6.58%	5
No	93.42%	71
Total		**76**

2022 SBDI Non Respondent Follow Up Survey

Overall, how satisfied are you with the program?

Answer	Percent	Responses
Very Satisfied	89.36%	42
Somewhat Satisfied	8.51%	4
Somewhat Dissatisfied	2.13%	1
Very Dissatisfied	0.00%	0
Total		**47**

How satisfied are you with the equipment that was installed?

Answer	Percent	Responses
Very satisfied	93.62%	44
Somewhat satisfied	6.38%	3
Neither satisfied nor dissatisfied	0.00%	0
Somewhat dissatisfied	0.00%	0
Total		**47**

How satisfied are you with the customer service provided by the company installing the equipment?

Answer	Percent	Responses
Very satisfied	89.36%	42
Somewhat satisfied	6.38%	3
Neither satisfied nor dissatisfied	4.26%	2
Somewhat dissatisfied	0.00%	0
Total		**47**

Would you like Idaho Power to follow up with you regarding this survey or the Small Business Direct Install program?

Answer	Percent	Responses
Yes	10.64%	5
No	89.36%	42
Total		**47**

2022 SBDI Program Customer Satisfaction Survey Responses

Overall, how satisfied are you with the program?

	Response percent	Response total
Very satisfied	95.36%	185
Somewhat satisfied	4.12%	8
Somewhat dissatisfied	0%	0
Very dissatisfied	0.52%	1
If somewhat or very dissatisfied, why?		0

Export Graph — Statistics based on **194** respondents;

How easy was it to participate in the program?

	Response percent	Response total
Very easy	95.86%	185
Somewhat easy	3.63%	7
Somewhat difficult	0.52%	1
Very difficult	0%	0
If somewhat or very difficult, why?		1

Export Graph — Statistics based on **193** respondents;

Based on your experience with this Direct Install program, how likely are you to recommend this program to other small businesses?

	Response percent	Response total
Very likely	92.19%	177
Somewhat likely	7.81%	15
Not very likely	0%	0
Not likely at all	0%	0
If not very likely or not likely at all, why?		0

Export Graph — Statistics based on **192** respondents;

How satisfied are you with the equipment that was installed?

	Response percent	Response total
Very satisfied	94.82%	183
Somewhat satisfied	5.18%	10
Somewhat dissatisfied	0%	0
Very dissatisfied	0%	0
If somewhat or very dissatisfied, why?		0

Export Graph

Statistics based on **193** respondents;

How satisfied are you with the customer service provided by the company installing the equipment?

	Response percent	Response total
Very satisfied	91.28%	178
Somewhat satisfied	7.69%	15
Somewhat dissatisfied	1.03%	2
Very dissatisfied	0%	0
If somewhat or very dissatisfied, why?		1

Export Graph

Statistics based on **195** respondents;

How did you learn about Idaho Power's Small Business Direct Install Program?

	Response percent	Response total
Idaho Power Energy Advisor	21.81%	41
Idaho Power Customer Service	2.66%	5
Email from Idaho Power	1.06%	2
Postal Mailing from Idaho Power	36.17%	68
Vendor or Contractor	35.11%	66
Idaho Power Website	0%	0
Other Business Owner or Employee	3.19%	6

Export Graph

Statistics based on **188** respondents;

Why did you choose to participate in this program?

		Response total
		187

Statistics based on **187** respondents;

Q7 Response Breakout	
Response	**Number of Responses**
Program was free / Cost is right	58
Lighting Upgrade/Better Lighting	52
Efficiency & Savings	44
No response	18
Misc. responses	10
Participated due to letter/Outreach/WOM	8
Wanting to upgrade to LED and program helped	2
Building owner or landlord decided to participate	2

Do you have any suggestions on how Idaho Power can make this program better?

			Response total
			84

Statistics based on **84** respondents;

Q8 Response Breakout	
Response	**Number of Responses**
No improvement suggestions	55
Provide more clarity about scheduling process and improve communication on process	8
Program sounds too good to be true, very skeptical with letter and contractor who stopped by. Suggest different marketing.	2
Bring threshold of amount higher so more businesses can take part in program.	1
Look harder to install occupancy sensors in larger areas.	1

Is there other equipment you would have liked to see included in the program?

			Response total
			63

Statistics based on **63** respondents;

Q9 Response Breakout	
Response	**Number of Responses**
No/Nothing	50
Solar panels	2
Computer backup surge protector systems	1
Heat control for showers	1
Door sealing strips	1
Motion sensors	1
Dimmer switches	1
Covers for outsides of windows to prevent heat from radiation	1
Matching existing LED lights to the new install	1

How, if at all, has your opinion of Idaho Power changed since participating in this program?

		Response percent	Response total
More favorable opinion of Idaho Power		58.25%	113
No change in opinion of Idaho Power		41.75%	81
Less favorable opinion of Idaho Power		0%	0

Export Graph

Statistics based on **194** respondents;

What is it about participating in this program that has caused you to have a less favorable opinion of Idaho Power?

			Response total
			0

Statistics based on **0** respondents;

Which of the following best describes your business?

		Response percent	Response total
Agriculture, Forestry and Fishing		1.55%	3
Finance, Insurance and Real Estate		8.25%	16
Manufacturing		2.58%	5
Mining		0%	0
Public Administration		0%	0
Retail Trade		8.25%	16
Services		57.22%	111
Transportation, Communications, Electric, Gas and Sanitary Services		0%	0
Wholesale Trade		3.61%	7
Other (please specify)		18.56%	36

Export Graph

Statistics based on **194** respondents;

Please provide your email address.

			Response total
Customer Name			23
Phone Number			11

Statistics based on **27** respondents;

Please provide your email address.

			Response total
Email Address			116

Statistics based on **116** respondents;

Enter your audit ID number.

			Response total
			164

Statistics based on **164** respondents;

2022 Shade Tree Survey Results

How did you hear about Idaho Power's Shade Tree Project(Check all that apply)

Answer	Percent	Responses
Email from Idaho Power	44.74%	170
Friend or relative	29.47%	112
Neighbor	5.26%	20
Utility employee	2.63%	10
Other (please specify)	17.89%	68
Total		**380**

What was the primary reason you participated in the program?(Mark one)

Answer	Percent	Responses
Tree was free	14.09%	51
Home too warm in the summer	16.02%	58
Reduce energy bill	14.92%	54
Improve landscape/property value	17.68%	64
Wanted a tree	19.89%	72
Help the environment	14.92%	54
Other (please specify)	11.76%	9
Total		**362**

What kept you from planting a tree prior to the Shade Tree Project?(Mark one)

Answer	Percent	Responses
Lack of knowledge	16.57%	60
Cost	47.51%	172
Time	11.60%	42
Other (please specify)	24.31%	88
Total		**362**

Where would you typically purchase a new tree?(Mark one)

Answer	Percent	Responses
Garden section of a do-it-yourself/home improvement store	35.08%	127
Nursery/garden store	61.88%	224
Other (please specify)	3.04%	11
Total		**362**

How long did you spend on the online enrollment tool? (Mark one)

Answer	Percent	Responses
10 minutes or less	59.49%	210
11-20 minutes	32.29%	114
21-30 minutes	6.52%	23
31 minutes or more	1.70%	6
Total		**353**

Overall, how easy was it for you to use the online enrollment tool?

Answer	Percent	Responses
Very easy	73.31%	261
Somewhat easy	24.44%	87
Somewhat difficult	2.25%	8
Very difficult	0.00%	0
Total		**356**

Spring - How did you receive your shade tree(s) from the Shade Tree Project?

Answer	Percent	Responses
Received by mail	50.70%	108
Picked up at Boise event	10.80%	23
Picked up at Nampa event	20.19%	43
Picked up at Meridian event	18.31%	39
Don't know	0.00%	0
Total		**213**

Fall - How did you receive your shade tree(s) from the Shade Tree Project?

Answer	Percent	Responses
Received by mail	46.31%	69
Picked up at Boise event	6.71%	10
Picked up at Twin Falls event	44.30%	66
Don't know	2.68%	4
Total		**149**

How many trees did you receive from the Shade Tree Project?

Answer	Percent	Responses
One	14.64%	53
Two	85.36%	309
Total		**362**

Ordered One Tree

When did you plant your shade tree?

Answer	Percent	Responses
Same day as the tree arrival/pick up	22.64%	12
pickup 1-3 days after the tree arrival/pick up	50.94%	27
pickup 4-7 days after the tree arrival/pick up	9.43%	5
Pickup more than 1 week after the tree arrival/pick up	9.43%	5
Did not plant the trees	7.55%	4
Total		**53**

On which side of your home did you plant your shade tree?		
Answer	**Percent**	**Responses**
North	10.20%	5
South	10.20%	5
Northeast	8.16%	4
Southwest	18.37%	9
East	12.24%	6
West	28.57%	14
Southeast	4.08%	2
Northwest	8.16%	4
Total		**49**

How far from the home did you plant your shade tree?		
Answer	**Percent**	**Responses**
20 feet or less	46.94%	23
21-40 feet	42.86%	21
41-60 feet	8.16%	4
More than 60 feet	2.04%	1
Total		**49**

Ordered Two Trees

How many shade trees did you plant?		
Answer	**Percent**	**Responses**
One	4.21%	13
Two	84.79%	262
Did not plant the trees	11.00%	34
Total		**309**

Ordered Two, Planted One

When did you plant your shade tree?		
Answer	**Percent**	**Responses**
Same day as the tree arrival/pickup	7.69%	1
1-3 days after the tree arrival/pickup	46.15%	6
4-7 days after the tree arrival/pickup	7.69%	1
More than 1 week after the tree arrival/pickup	38.46%	5
Total		**13**

On which side of your home did you plant your shade tree?

Answer	Percent	Responses
North	7.69%	1
South	23.08%	3
Northeast	0.00%	0
Southwest	0.00%	0
East	23.08%	3
West	38.46%	5
Southeast	0.00%	0
Northwest	7.69%	1
Total		**13**

How far from the home did you plant your shade tree?

Answer	Percent	Responses
20 feet or less	46.15%	6
21-40 feet	53.85%	7
41-60 feet	0.00%	0
More than 60 feet	0.00%	0
Total		**13**

Ordered Two, Planted Two

When did you plant your shade tree?

Tree One

Answer	Percent	Responses
Same day as the tree arrival/pickup	16.41%	43
1-3 days after the tree arrival/pickup	52.29%	137
4-7 days after the tree arrival/pickup	17.18%	45
More than 1 week after the tree arrival/pickup	14.12%	37
Total		**262**

Tree Two

Answer	Percent	Responses
Same day as the tree arrival/pickup	15.65%	41
1-3 days after the tree arrival/pickup	49.62%	130
4-7 days after the tree arrival/pickup	19.08%	50
More than 1 week after the tree arrival/pickup	15.65%	41
Total		**262**

On which side of your home did you plant your shade tree?

Tree One

Answer	Percent	Responses
North	10.69%	28
South	12.60%	33
Northeast	3.82%	10
Southwest	15.27%	40
East	11.45%	30
West	35.88%	94
Southeast	5.73%	15
Northwest	4.58%	12
Total		**262**

Tree Two

Answer	Percent	Responses
North	6.11%	16
South	12.21%	32
Northeast	4.58%	12
Southwest	19.08%	50
East	11.83%	31
West	33.21%	87
Southeast	9.16%	24
Northwest	3.82%	10
Total		**262**

How far from the home did you plant your shade tree?

Tree One

Answer	Percent	Responses
20 feet or less	28.24%	74
21-40 feet	55.34%	145
41-60 feet	12.60%	33
More than 60 feet	3.82%	10
Total		**262**

Tree Two

Answer	Percent	Responses
20 feet or less	22.52%	59
21-40 feet	54.96%	144
41-60 feet	16.41%	43
More than 60 feet	6.11%	16
Total		**262**

Why did you not plant your tree?(Check all that apply)

Answer	Percent	Responses
Changed my mind	1.96%	1
Did not like the tree	1.96%	1
Did not have time	5.88%	3
Other (please specify)	90.20%	46
Total		**51**

How satisfied are you with the information you received on the planting and care of your shade tree?

Answer	Percent	Responses
Very satisfied	78.73%	285
Somewhat satisfied	17.40%	63
Somewhat dissatisfied	3.04%	11
Very dissatisfied	0.83%	3
Total		**362**

What information did you find most valuable?

Answer	Percent	Responses
Planting depth	48.04%	172
Circling roots	14.53%	52
Staking	8.66%	31
Watering	22.91%	82
Other (please specify)	5.87%	21
Total		**358**

How much do you agree with the following statements:

I am satisfied with Shade Tree Project delivery method

Answer	Percent	Responses
Strongly agree	58.88%	63
Somewhat agree	24.30%	26
Somewhat disagree	10.28%	11
Strongly disagree	6.54%	7
Total		**107**

I am satisfied with the Shade Tree Project pick up event

Answer	Percent	Responses
Strongly agree	85.71%	90
Somewhat agree	13.33	14
Somewhat disagree	0.95%	1
Strongly disagree	0.00%	0
Total		**105**

I am satisfied with the tree(s) I received from the Shade Tree Project

Answer	Percent	Responses
Strongly agree	64.43%	230
Somewhat agree	24.37%	87
Somewhat disagree	6.72%	24
Strongly disagree	4.48%	16
Total		**357**

It was easy to plant my shade tree(s)

Answer	Percent	Responses
Strongly agree	79.57%	257
Somewhat agree	19.20%	62
Somewhat disagree	1.24%	4
Strongly disagree	0.00%	0
Total		**323**

I would recommend the program to a friend or relative

Answer	Percent	Responses
Strongly agree	90.83%	327
Somewhat agree	7.50%	27
Somewhat disagree	0.56%	2
Strongly disagree	1.11%	4
Total		**360**

I am satisfied with my overall experience

Answer	Percent	Responses
Very likely	80.56%	290
Somewhat likely	14.72%	53
Neither likely nor unlikely	2.78%	10
Somewhat unlikely	1.94%	7
Total		**360**

May we use your name and comments?

Answer	Percent	Responses
Yes	54.97%	199
No	45.03%	163
Total		**362**

May we follow up with you?

Answer	Percent	Responses
Yes	64.82%	234
No	35.18%	127
Total		**361**

When was this residence originally built?(Select when the building was originally constructed . Not when it was remodeled, added to, or converted.)

Answer	Percent	Responses
Before 1950	8.86%	32
1950-1959	4.43%	16
1960-1969	3.60%	13
1970-1979	11.91%	43
1980-1989	5.54%	20
1990-1999	6.93%	25
2000-2009	15.24%	55
2010-2019	15.24%	55
2020-present	26.87%	97
Don't know	1.39%	5
Total		**361**

What one fuel is most often used to heat this residence?

Answer	Percent	Responses
Electricity	43.21%	156
Natural gas	42.94%	155
Propane	5.54%	20
Fuel oil	0.28%	1
Wood	6.37%	23
Other (please specify)	1.66%	6
Total		**361**

What type of air conditioning system is used at this residence? (Check all that apply)

Answer	Percent	Responses
None	3.64%	14
Central air conditioner	70.91%	273
Heat pump	16.88%	65
Individual room or window air conditioner	6.75%	26
Evaporative/swamp cooler	1.04%	4
Other (please specify)	0.78%	3
Total		**385**

Which of the following best describes your age?

Answer	Percent	Responses
Under 18	0.28%	1
18-24	0.84%	3
25-34	17.55%	63
35-44	27.02%	97
45-60	31.20%	112
Over 60	23.12%	83
Total		**359**

EVALUATIONS

Report Title	Sector	Analysis Performed By	Study Manager	Study/Evaluation Type
Idaho Power Company Commercial and Industrial Energy Efficiency Program—Retrofits 2021 Program Year Impact and Process Evaluation Results	Commercial, Industrial	Tetra Tech	Idaho Power	Impact and Process Evaluation
Idaho Power 2021 Home Energy Report Program Impact Evaluation	Residential	ADM	Idaho Power	Impact Evaluation
Impact & Process Evaluation of Idaho Power Company PY2021 Commercial Energy-Saving Kits Program	Commercial	ADM	Idaho Power	Impact and Process Evaluation
Idaho Power Company Commercial and Industrial Energy Efficiency Program—New Construction 2021 Program Year Impact and Process Evaluation Results	Commercial, Industrial	Tetra Tech	Idaho Power	Impact and Process Evaluation

Idaho Power Company

Idaho Power Company Commercial and Industrial Energy Efficiency Program – Retrofits

2021 Program Year Impact and Process Evaluation Results

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November 30, 2022

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ACKNOWLEDGEMENTS

We would like to acknowledge the many individuals who contributed to the 2021 impact and process evaluation of the Retrofits offering of the Idaho Power Commercial and Industrial Efficiency program. This evaluation effort would not have been possible without their help and support.

We would like to specifically thank Shelley Martin, Chad Severson, and Kathy Yi of Idaho Power, who provided invaluable insight into the program and operations. These individuals participated in ongoing evaluation deliverable reviews and discussions and graciously responded to follow-up questions and data and documentation requests. Tetra Tech received valuable assistance from Idaho Power Energy Advisors with scheduling verification visits.

The Tetra Tech Evaluation Team was made up of the following individuals: Kimberly Bakalars, Mark Bergum, Graham Thorbrogger, Nathan Kwan, Andrew Spista, and Laura Meyer.

1.0 EXECUTIVE SUMMARY

Tetra Tech is pleased to provide Idaho Power Company (Idaho Power) with a report for the 2022 impact and process evaluation of the 2021 Retrofits offering of the Idaho Power Commercial and Industrial Energy Efficiency Program (CIEE Program). The Idaho Power CIEE Program provides a comprehensive menu of incentives and services to facilitate the implementation of cost-effective energy-efficiency improvements for commercial and industrial customers. Incentives cover retrofits, new construction and major renovation projects, and custom incentives for cost-effective projects not covered on the menu of incentives.

This report section consists of (1) an introduction describing the program, (2) methodology, and (3) key findings and recommendations. The detailed impact results can be found in Section 3.0, with process results detailed in Section 4.0.

1.1 PROGRAM DESCRIPTION

The Retrofits (Retrofits) offering of the CIEE program provides incentives for prescriptive energy-saving retrofit measures to existing equipment or facilities. This part of the program encourages customers in Idaho and Oregon to implement energy efficiency upgrades by offering incentives on a defined list of measures. Eligible measures cover various energy-saving opportunities in lighting, HVAC, building shell, food service equipment, and other commercial measures. Customers can also apply for non-standard lighting incentives.

Customers complete the preapproval application if they are interested in receiving Retrofits incentives (if the estimated project costs are over $1,500). Application forms are specific to lighting or non-lighting measures, and customers must use the form that matches their measure type. Both forms are completed if the project includes both lighting and non-lighting equipment.

Idaho Power reviews each application and works with the customer and vendors to gather sufficient information. Licensed electrical contractors are required for most lighting project installations. Once the eligible equipment is installed, the customer completes the application process by submitting the payment application with all the necessary documentation and emailing it to Idaho Power. If the customer wants the incentive payment to go to a third party, information for the third party is required.

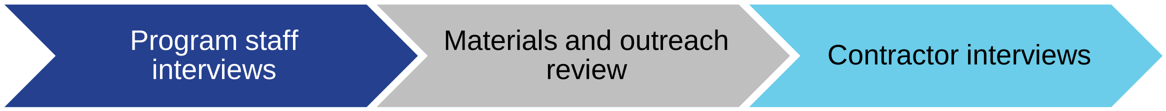
1.2 METHODOLOGY

To address the evaluation objectives, which included verifying energy impacts attributable to the 2021 program, providing estimates of realization rates, and suggesting enhancements to the savings analysis and reporting, the evaluation team conducted the impact evaluation activities shown in Figure 1.

Figure 1. Impact Evaluation Activities

Tetra Tech also conducted a process evaluation for the Retrofits offering. Figure 2 highlights the activities undertaken to address the process research objectives.

Figure 2. Process Evaluation Activities



1.3 FINDINGS AND RECOMMENDATIONS

The impact evaluation for the Retrofits offering found a successfully-run program that balances the use of prescriptive assumptions and values with the data collection from the project site. The program stays current with baseline requirements and market conditions for measures and documents their calculation methods and assumptions in template spreadsheets. During the on-site visits, the evaluation found minor adjustments to building hours of operations and lighting control systems. Still, overall, findings from the impact evaluation show the program savings calculations are accurate and well-documented. The overall realization rate for the program is 96.4 percent, as shown in Table 1.

Table 1. PY2021 Program Realization Rates

Measure type	Number of projects	MWh claimed	MWh evaluated	Program realization rate
Lighting and controls	751	19,755	18,985	96.1%
Non-lighting	36	1,426	1,426	100.0%
Total	**787**	**21,181**	**20,411**	**96.4%**

1.3.1 Impact Recommendations

The following impact recommendations are provided for Idaho Power's consideration:

Develop the exterior lighting controls savings factors. The lighting control savings claimed for projects are identical for interior and exterior controls. However, the exterior lighting controls tend to result in substantially less savings because the controls are likely to allow partial power instead of completely disconnecting the fixture like interior fixtures. A separate lighting control savings factor will account for this adjustment.

Document lighting control savings for transparency to the applicant. The lighting control savings are incorporated into the lighting tool, although the savings are hidden in the same line as the lighting equipment retrofit. The Retrofits offering can support the participant in making more informed decisions by (1) publishing the table detailing the energy savings percentage per lighting control type and (2) documenting the lighting control savings separately from the lighting equipment savings. These steps will start a conversation with participant staff about access, operation, and expectations of control systems.

Consider incorporating interactive effects into the Retrofits lighting tool. Idaho Power's current lighting tool does not incorporate interactive effects of the lighting wattage reduction on the HVAC load; this is different from the stacking effect when both lighting and HVAC are installed. A reduced lighting load reduces the internal heat gain to the building, which reduces the air conditioning and cooling load while increasing the heating load. Incorporating interactive effects into the lighting tool can more accurately report energy savings based on actual site conditions; however, the lighting application will have to collect information regarding the heating fuel and the type of air conditioning.

Consider adjusting the *anti-sweat heater* measure to differentiate between medium- and low-temperature refrigeration. The latest Technical Reference Manual (TRM) provides a single energy savings value for an anti-sweat heater for glass case doors on refrigerators (medium temperature) and freezers (low temperature). There is an assumption about the split between medium temperature and low temperature. Creating a measure for each will attribute savings more accurately to each location that installs anti-sweat heaters.

1.3.2 Process Recommendations

The Retrofits offering of the CIEE program is operating well. Contractors feel supported and informed of program requirements and changes. Idaho Power staff have acted on previous recommendations to consolidate CIEE program information, and a couple of the current recommendations are an extension of that strategy. The following process recommendations are provided for Idaho Power's consideration:

Continue to increase in-person program overview training where possible. Idaho Power has resumed scheduling face-to-face meetings with contractors after suspending them during the COVID-19 pandemic. Our conversations with contractors confirm a real appetite for resuming those meetings and trainings. Although they understand why meetings were suspended, several contractors mentioned interest in getting back to more face-to-face meetings for the interaction they provide with Idaho Power staff and other contractors.

Consider developing a consolidated contractor list across CIEE programs with substantial overlap. The New Construction Program Specialist conducts numerous outreach activities with architects and engineers. However, firms we spoke with were often unclear on which CIEE program offering they were utilizing (New Construction, Retrofits, Custom) because it was usually more than one. A consolidated list of active contractors, architects, and engineering firms may help coordinate messaging to market actors, giving them more clarity as they work with customers.

Maintaining a combined outreach list will also provide documentation in the event of staff changes and can assist with further managing outreach and engagement. Tracking could include flags for the type of contractor, date of last event attendance, and record notes on known relationships where firms are working together, such as compressed air firms working with engineering firms, lighting distributors working with installers, etc.

Consider a leave-behind brochure for contractors with all CIEE programs. There is substantial overlap in experience across programs among firms we interviewed. Idaho Power already approaches contractor and design firm conversations with a CIEE overview and leaves appropriate program-specific information for them, depending on the contractor's specialty. Also leaving behind an overview of all the CIEE programs may help the contractors and design firms better understand the different incentive options Idaho Power provides, and how they can direct customers to the most appropriate offering depending on their situation.

2.0 INTRODUCTION

2.1 PROGRAM OVERVIEW

The Retrofits offering of the Commercial and Industrial Energy Efficiency program (CIEE) provides incentives for prescriptive energy-saving retrofit measures to existing equipment or facilities.

This part of the program encourages customers in Idaho and Oregon to implement energy efficiency upgrades by offering incentives on a defined list of measures. Eligible measures cover a variety of energy-saving opportunities in lighting, HVAC, building shell, food service equipment, and other commercial measures. Customers can also apply for non-standard lighting incentives.

Customers interested in receiving Retrofits offering incentives complete the preapproval application if the estimated project costs are over $1,500. Application forms are specific to lighting or non-lighting measures, and customers must use the form that matches their measure type. Both forms are completed if the project includes both lighting and non-lighting equipment.

Complete pre-approval application

- Download lighting tool or non-lighting application and worksheets; complete applicable sections
- Gather specification sheets
- Email for Idaho Power review

Install equipment

- Must use licensed contractor for certain measures
- Inspections may occur before or after project installation

Complete payment application

- Adjust pre-approval information if needed
- Download if not preapproved and fill out
- Include specification sheets
- Email for Idaho Power review

Idaho Power reviews each application and works with the customer and vendors to gather sufficient information. Licensed electrical contractors are required for most lighting project installations. Once the eligible equipment is installed, the customer completes the application process by submitting the payment application with all required documentation and emailing it to Idaho Power. If the customer wants the incentive payment to go to a third-party, information for the third party is required.

In 2021, 787 projects were completed through the program, with a total savings of 21,181 MWh. Over 90 percent of the projects and savings are from the lighting and controls measure category. Although the non-lighting portion of the program contains various measures, it is not used by local contractors as much as the lighting component.

Table 2. PY2021 Retrofits Summary by Project Measure Type

Measure	Number of projects	MWh saved
Lighting and controls	751	19,755
Non-lighting	36	1,426
Total	**787**	**21,181**

2.2 EVALUATION ACTIVITIES

The evaluation activities conducted for the Retrofits offering are summarized in Table 3. This section also discusses research issues and the sampling strategy for desk reviews and on-site visits.

Table 3. PY2021 Retrofits Offering Evaluation Activities

Activity	Sample size	Outcome
Interviews with program delivery staff	1	Understood program design and delivery and obtained program staff perspective on program successes and challenges. We also confirmed researchable issues.
Review of program delivery and marketing materials	N/A	Reviewed materials such as marketing brochures, program manuals, outreach plans, and the program website for messaging and communication benefits.
Tracking system review	N/A	Reviewed the tracking system to determine if all necessary inputs are tracked and if reporting tools contain sufficient information for program review.
Desk reviews	30	Reviewed project documentation and calculations to assess the accuracy of savings claimed for each project. This included review of the energy savings calculations for conformance to the TRM for the version year identified.
Verification on-site visits	13	Completed visits to a sample of sites to verify the installation of incentivized measures and check assumptions used in savings calculations. The locations were matched to projects that have had a completed desk review.
Contractor interviews	11	Collected feedback from contractors working with the program, which included satisfaction and suggested improvements.

2.2.1 Evaluation Goals

The impact and process evaluation goals below were addressed through the various evaluation activities:

Impact Evaluation

- Review the tracking database to determine and verify the energy (kilowatt-hour) impacts attributable to the 2021 program.
- Complete file reviews and verify engineering calculations with 90/10 (relative error of no more than 10 percent with 90 percent confidence) confidence and precision.
- Provide credible and reliable program energy and non-energy impact estimates and ex-post realization rates attributed to the program for the 2021 program year.
- Report findings and observations and provide recommendations that enhance the effectiveness of future ex-ante savings analysis and the accurate and transparent reporting of program savings.
- Verify installation and operating conditions of equipment.

Process Evaluation

- Evaluate program design to ensure the use of industry best practices.
- Evaluate program implementation, including quality control, operational practice, and outreach.
- Review program forms, manuals, and marketing materials, and provide recommendations for improvements as needed.
- Evaluate program administration, including program oversight, staffing, management, training, documentation, and reporting.
- Understand customer and contractor barriers to participation in the program and provide recommendations to increase participation.
- Investigate how to best integrate the Custom Projects, New Construction, and Retrofits offerings.
- Identify contractor motivations for installing energy-efficient equipment and whether the program or incentive has an effect.

3.0 IMPACT EVALUATION

The following sections provide a detailed review of the impact evaluation methodology, evaluation results, and recommendations from the evaluation activities.

3.1 METHODOLOGY

The impact methodology consisted of the four primary evaluation activities shown in Figure 3. Each activity is explained in more detail below.

Figure 3. Process for Verifying Program Savings

Review Data and Conduct Sampling

The tracking system and documentation were provided to the evaluation team for review; the tracking data included a combination of information from Idaho Power and participants. The Project Applications for the Retrofits offering collected information from the program applicant, including the following:

- account information, including business name and account or meter number, installation address, and contact information;
- a project description (non-lighting);
- estimated project costs and savings (only on lighting projects);
- project timeline information (dates); and
- vendor or installer information.
- Payee information

Idaho Power logged this information and stored it in the program tracking database, CLRIS. In addition to the information above, the CLRIS database includes:

- a project ID;
- customer rate class;
- participant region and Idaho Power energy advisor;
- project type (lighting or non-lighting);
- project measure;
- application status, including interim dates of Idaho Power actions, such as application submission, payment to the participant, and final inspection;
- incentive details; and

- gross kilowatt and kilowatt-hour savings and incentives per measure.

Additional database tables are kept, which connect the project ID and information above with the measure-level information listed below. Some information is carried over, which is not represented in the list.

- premise and landlord type;
- project application unique name;
- project building type;
- non-energy benefit (NEB) value;
- units of measure for equipment quantity;
- existing equipment notes, size, and quantity with the estimated energy consumption of the baseline;
- proposed equipment notes, size, and quantity with the estimated energy consumption of the new energy-efficient equipment; and
- measure-level savings claimed and incentive.

Sampling was conducted at the project ID level using tracking data. The sample was stratified to ensure the random sample matched the evaluation goals to understand non-lighting and the lighting and controls sector. The sampling is summarized in Table 4.

Table 4. PY2021 Retrofits Sampling Summary

Sampling stratum	Total projects (total quantity)	Program kWh savings percentage	Sample projects (total quantity)	Sample kWh savings percentage
Lighting and controls	751	93.3%	21	12.4%
Non-lighting	36	6.7%	9	1.4%
Total	**787**	**100.0%**	**30**	**13.9%**

The objective of the impact evaluation was to meet the precision requirement of 90/10 (relative error of no more than 10 percent with 90 percent confidence). The sampling used a *probability proportionate to size* (PPS) approach, with the kilowatt-hour savings for each project representing its size. In this approach, every participant has a known probability of selection, but the probability is no longer equal. Instead, a participant with twice the kilowatt-hour savings as another participant has twice the likelihood of being selected. The resulting evaluated savings and realization rates should be unbiased and represent the population more efficiently (i.e., with a smaller sampling error).

In addition to the PPS sampling, Tetra Tech applied several other criteria to ensure the distribution of the projects matched the evaluation goals. The following criteria were included in the sampling:

- In the non-lighting stratum, a minimum of four projects from PY2021.
- In the lighting stratum, a minimum of two projects per Idaho Power region.

The list of sampled projects was delivered to Idaho Power. The individual project files were securely delivered to the evaluation team by an internet-based file-sharing site that required log-in access. The files delivered included:

- applications,
- lighting tool calculator (administrative version),
- measure worksheet scans for non-lighting projects,
- labor-and-materials invoices,
- equipment specification sheets and certifications,
- post-installation inspections (when available),
- photos, and
- a screenshot of the tracking system project closeout.

Complete Desk Reviews

Tetra Tech staff conducted desk reviews of the sampled project files. This engineering and documentation review was conducted to describe the project, confirm tracking data, identify key assumptions, and determine critical questions before the site verification phase.

Conduct Site Verification

Tetra Tech engineers conducted site verification visits from August 3–5 and August 8–12. Idaho Power staff were invited to attend the site visits. While on-site, Tetra Tech engineers conducted a walkthrough of the building and interviewed site representatives to verify the installation and operation of energy-efficient equipment. Parameters verified included lighting and HVAC quantities, equipment specifications, the functionality of lighting controls, and lighting operating hours. Verifying key operating assumptions and equipment performance confirms the installation and attention to the operating parameters. Finally, the evaluation inspectors asked key questions to confirm assumptions and determine satisfaction with the program process.

Verify Kilowatt-Hour Savings

The final step of the impact evaluation combined desk review and site verification information to provide quality assurance for each reviewed project, describe any revisions to project assumptions and actual conditions, and update calculations to finalize evaluated savings.

The data gathered from the site verifications was reconciled with the information from the initial desk reviews. Desk reviews and site verifications were completed for thirteen participants, and the remaining seventeen had only a desk review completed.

3.2 IMPACT REVIEW RESULTS

Overall, the evaluation found that the Retrofits offering had an impact realization rate of 96.4 percent with a relative precision of 3.0 percent at the 90 percent confidence interval. The measure category realization rates are shown in Table 5.

Table 5: PY2021 Realization Rates of Sampled Projects

Measure	Ex-ante kWh	Ex-post kWh	Realization rate
Lighting and controls	2,620,404	2,516,780	96.1%
Non-lighting	332,874	332,874	100.0%

The overall program realization rate of 96 percent is slightly lower than the 99 percent realization rate from the previous evaluation for PY2018. The realization rate decreased because the on-site verifications identified adjustments to exterior lighting controls and hours of operation of participating facilities. The variability between the DesignLights Consortium (DLC) certification wattage listed and the lighting equipment specification sheets also contributed to a slight adjustment in the realization rate.

In addition to evaluating the savings claimed, available information—including calculation protocols and the program's quality assurance—was reviewed. The Idaho Power Retrofits documentation is clear, and the application workbook is sufficient in providing clear direction and communication of project parameters from contractors to Idaho Power. Once a project is finalized, Idaho Power creates an administrative copy of the savings worksheets to incorporate adjustments to the application information and the energy savings adjustments required by the program rules.

Idaho Power's lighting tool was used to calculate savings for Retrofits lighting projects reviewed in 2021. This lighting tool allows for simplified savings calculation verifications, with dropdowns and lookup tables for many baseline lighting types, ease of defining custom facility hours of operation, and the application of control factors to incorporate installed lighting controls. The evaluation did identify that the lighting tool does not account for the interactive effects between the lower lighting wattage and the load of the HVAC system.

Documentation for lighting projects was consistent and adequate in verifying claimed energy savings, with only a few instances of missing post-inspection forms or invoices that were not itemized with lighting model numbers. The post-install inspection reports were organized and detailed to determine verified installation equipment and operations.

On-site visits of Retrofits lighting projects verified assumptions and equipment claimed. However, the operation of the lighting controls for exterior lighting (e.g., networked controls) did not match the expected operation to obtain the percentage of savings claimed by the measure. There was also minimal exterior lighting control operational knowledge from the site representatives; the evaluation team reached out to lighting contractors or suppliers to confirm the operation. In addition, the site visits identified hours of operation differences from the custom hours entered in the lighting tool for two other locations.

On-site visits of Retrofits non-lighting projects verified equipment model numbers and quantities. Documentation identifying savings calculation methodology (i.e., deemed savings values or TRM version) was not provided for the sampled projects; however, the evaluation team was able to verify the saving claimed through individual project confirmation with program staff. Increasing the documentation to verify the program rules or TRM version along with the savings calculation methodology is an opportunity for improvement.

The evaluation team found that the confirmation of proposed or installed equipment was consistent. However, Idaho Power does not use third-party verification of efficiency or lighting fixture wattages, such as DLC or Air Conditioning, Heating, and Refrigeration Insititute (AHRI). Because the evaluation team uses DLC and AHRI to determine equipment energy consumption, this resulted in some lighting savings adjustments to Retrofits projects.

3.2.1 Lighting

Lighting projects account for approximately 93 percent of the 2021 Retrofits offering savings. The sample included 21 projects with lighting only or lighting and controls components, accounting for about 91 percent of the sampled kilowatt-hours. Table 6 shows realization rates for each project, with the total realization rate for claimed lighting savings at 96 percent.

Table 6. PY2021 Retrofits Lighting Impact Results Summary

Project ID	Claimed kWh	Evaluated kWh	Realization rate
200344	171,395	170,953	99.7%
200369	14,710	12,940	88.0%
200437	267,698	268,273	100.2%
200483	191,064	191,064	100.0%
200493	98,366	98,366	100.0%
200528	138,197	136,060	98.5%
200545	132,838	127,503	96.0%
200591	24,826	25,545	102.9%
200598	110,263	102,964	93.4%
200604	14,436	13,939	96.6%
200612	10,411	10,061	96.6%
200619	215,472	212,683	98.7%
200639	485,914	422,254	86.9%
200657	314,376	300,033	95.4%
200681	35,621	35,693	100.2%
200774	2,268	2,262	99.8%
210065	19,553	19,553	100.0%
210089	13,856	9,873	71.3%
210173	63,582	56,166	88.3%
210379	291,664	297,152	101.9%
210516	3,895	3,443	88.4%
Overall	**2,620,404**	**2,516,780**	**96.1%**

The lighting energy efficiency was determined using the lighting tool, which develops comprehensive lighting retrofit savings for C&I projects. The document acts as an application collecting project description, location, installation contractor, and electrical supplier information. The form also collects detailed information about the lighting operating schedules, installed equipment specifications, and quantity. Based on the evaluation findings, there are opportunities to increase the accuracy of the claimed savings calculated, although alternatives discussed with the program staff found that the improvement was minimal compared to the effort to adjust.

The lighting equipment specification section identifies the Qualified Product List (QPL) for each lighting fixture installed, allowing for exceptions. The lighting input wattage collected is entered on the product type sheet; however, using the QPL-listed wattages is not specified. The evaluation adjusted wattages to meet the QPL listing on about half of the sampled projects. The evaluation adjusts wattages to the DLC QPL listed wattages because the third-party independent testing of individual fixture energy consumption provides consistency across lighting fixtures in the marketplace. Since the lighting input wattage increased and decreased through this adjustment, the overall impact of these adjustments is minimal at the program level.

The lighting energy saving is straightforward once the information in the application is collected. However, two components would increase the accuracy of the lighting energy savings calculation. First, the lighting retrofit has interactive effects on HVAC systems because the heat generated by the decreased wattages installed changes the building heat load, typically ranging between a three and five percent adjustment on the energy savings. Second, the addition of the lighting controls energy consumption reduction would help participants understand the overall impact of the lighting controls, make better-informed decisions about the value of the controls, and understand the scale of the attributed savings. Separating lighting control savings from the lighting equipment savings will provide marketplace support to detail the potential value of the controls.

The lighting control savings percentages were reviewed and reasonable for the installed interior lighting control systems. The exterior lighting control systems overestimated energy savings when using similar control structures. The primary reason for the variation between indoor and outdoor lighting control savings is that the exterior lighting is programmed to a partial level when the sensors consider there is no need for lighting, while the interior system will completely shut off under the same conditions. Incorporating the exterior lighting control typical operation can reduce the control savings percentage by up to 30 percent for the advanced control systems. The evaluation incorporated this adjustment to the exterior lighting Networked Area Controls and Networked LLLC Controls energy savings percentage to reduce the savings from 50 percent to 35 percent of estimated consumption.

The descriptions below detail the evaluation findings for each lighting savings adjustment.

Project ID 200344: A business replaced exterior metal halide lighting with LED lighting and networked controls. The evaluation team adjusted lighting wattages to their DLC- and ENERGY STAR®-certified values, slightly decreasing energy savings. The realization rate is nearly 100 percent.

Project ID 200369: A business replaced exterior metal halide and compact fluorescent lighting with LED lighting. The evaluation team conducted an on-site visit and found lighting controls were malfunctioning; savings for these controls were removed from the evaluation calculations, reducing energy savings. The realization rate is 88 percent.

Project ID 200437: A warehouse replaced interior fluorescent lighting, exterior metal halide lighting, and exterior halogen lighting with LED lighting. The evaluation team calculated identical energy savings for this project. The realization rate is 100 percent.

Project ID 200483: A manufacturer replaced metal halide high bay lighting with LED lighting. The evaluation team calculated identical energy savings for this project. The realization rate is 100 percent.

Project ID 200493: An educational facility replaced exterior metal halide lighting with LED lighting. The evaluation team conducted an on-site visit and confirmed all fixture types and quantities. The realization rate is 100 percent.

Project ID 200528: A business replaced exterior pulse-start HID lighting with LED lighting and dusk-to-dawn photocell controls in their parking lot. The evaluation team conducted an on-site visit and confirmed all fixture types and quantities. The fixture wattage for one model was adjusted to the DLC-certified value, slightly decreasing savings. The realization rate is 99 percent.

Project ID 200545: A warehouse and retailer replaced interior incandescent lighting, interior fluorescent lighting, and exterior metal halide lighting with LED lighting and networked controls. The evaluation team conducted an on-site visit, confirming hours of operation and controls. Also, 340 four-foot LED fixtures were found instead of the documented count of 169 eight-foot fixtures. One fixture model was not found, and other fixture wattages were updated to their DLC-certified values, reducing savings. The realization rate is 96 percent.

Project ID 200591: A business replaced interior linear fluorescent lighting with LED lighting and occupancy sensors in their parts room. The evaluation team conducted an on-site visit, confirming hours of operation, lighting quantities, and controls. Fixture wattages were updated to their DLC-certified values, increasing savings. The realization rate is 103 percent.

Project ID 200598: A business replaced exterior metal halide and compact fluorescent lighting with LED lighting and occupancy sensor controls. The evaluation team conducted an on-site visit, confirming lighting quantities. Controls could not be verified as operational, and their savings were removed from the evaluation calculations. Fixture wattages were updated to their DLC-certified values. Both adjustments decreased energy savings. The realization rate is 93 percent.

Project ID 200604: A customer replaced exterior metal halide lighting with LED lighting. The evaluation team conducted an on-site visit, confirming fixture type, but found one less fixture than claimed, decreasing savings. Fixture wattages were updated to their DLC-certified values, also decreasing savings. The realization rate is 97 percent.

Project ID 200612: A customer replaced exterior metal halide lighting with LED lighting. The evaluation team conducted an on-site visit, confirming fixture type, but foundone less fixture than claimed, decreasing savings. Fixture wattages were updated to their DLC-certified values, also decreasing savings. The realization rate is 97 percent.

Project ID 200619: A business replaced exterior metal halide lighting with LED lighting. The evaluation team updated fixture wattages to their DLC-certified values, decreasing savings. The realization rate is 99 percent.

Project ID 200639: A manufacturer replaced interior linear fluorescent lighting, exterior metal halide lighting, and exterior high-pressure sodium lighting with LED lighting. The evaluation team conducted an on-site visit, finding lighting to average 14.4 hours per day instead of the claimed 16 hours per day; this decreased savings. The realization rate is 87 percent.

Project ID 200657: A business replaced exterior HID metal halide lighting with LED lighting and networked controls. The evaluation team conducted an on-site visit, verifying lighting quantities and hours of operation. The control strategy was changed from *networked controls (LLLC)* to *multiple control strategies*, as they were in effect for approximately half of the night. Fixture wattages were updated to their DLC-certified values. Both adjustments decreased energy savings. The realization rate is 95 percent.

Project ID 200681: A customer replaced interior linear fluorescent lighting, interior metal halide lighting, and exterior metal halide lighting with LED lighting. The evaluation team adjusted fixture wattages to their DLC-certified values, slightly increasing savings. The realization rate is 100 percent.

Project ID 200774: A retailer replaced exterior metal halide lighting with LED lighting. The evaluation team adjusted fixture wattages to their DLC-certified values, slightly decreasing savings. The realization rate is 100 percent.

Project ID 210065: A warehouse replaced interior linear fluorescent lighting with LED lighting via self-installation. The evaluation team conducted an on-site visit, verifying operating hours and lighting quantities. The realization rate is 100 percent.

Project ID 210089: A facility replaced interior linear fluorescent lighting with LED lighting. The evaluation team conducted an on-site visit, verifying operating hours and sensor types. The onsite documented 106 light fixtures were installed while the claimed calculation showed 104 fixtures. The baseline fixtures removed was 97 fixtures, so this was not adjusted. Fixture wattages were updated to their DLC-certified values. These two adjustments decreased energy savings. The realization rate is 71 percent.

Project ID 210173: An academic building replaced interior linear fluorescent lighting with LED lighting. The evaluation team conducted an on-site visit. Actual annual operating hours were decreased from 5,892 to 5,053 because the schedule provided was used for approximately 45 weeks of the year. The on-stite visit identified two fewer fixtures installed than were listed in the documentation. Fixture wattages were also updated to their DLC-certified values. These three findings decreased energy savings. The realization rate is 88 percent.

Project ID 210379: A large industrial facility replaced interior linear fluorescent lighting with LED lighting. The evaluation team updated fixture wattages to their DLC-certified values, slightly increasing energy savings. The realization rate is 102 percent.

Project ID 210516: An agricultural building replaced interior incandescent lighting, exterior metal halide lighting, and external high-pressure sodium lighting with LED lighting. The evaluation team conducted an on-site visit. No pole-mounted fixtures were found, but all other fixture types and quantities were confirmed. Fixture wattages were also updated to their DLC-certified values, increasing energy savings. The realization rate is 101 percent.

3.2.2 Non-Lighting

Non-lighting projects account for seven percent of the 2021 Retrofits offering savings. The sample included nine projects which accounted for less than 12 percent of the sampled kilowatt-hours and less than 2 percent of the overall program savings. Six projects were related to HVAC and HVAC control retrofits, two projects were related to food service equipment, and one project was related to compressed air equipment. Table 7 shows that the realization rate for the savings claimed is 100 percent for the sampled projects.

Table 7: PY2021 Non-Lighting Impact Results Summary

Project ID	Claimed kWh	Evaluated kWh	Realization rate
200515	8,556	8,556	100.0%
200582	146,097	146,097	100.0%
210228	36,544	36,544	100.0%
210230	4,108	4,108	100.0%
210279	26,625	26,625	100.0%
210422	58,957	58,957	100.0%
210444	47,450	47,450	100.0%
210499	2,432	2,432	100.0%
210631	2,106	2,106	100.0%
Overall	**332,874**	**332,874**	**100.0%**

Overall, the evaluation team found that the documentation provided was adequate to justify savings claims; however, the provision of calculation sheets and equipment nameplate photos would support more robust savings verifications.

Project ID 200515: This retailer installed a new 5-ton air conditioning unit and HVAC controls (demand-controlled ventilation and economizer). The evaluation team identified identical deemed energy savings for this project. The realization rate is 100 percent.

Project ID 200582: This religious building installed HVAC controls (optimum start and optimum stop, DCV, and supply air temperature reset) on a retrofit packaged rooftop system. The evaluation team identified identical deemed energy savings for this project. The realization rate is 100 percent.

Project ID 210228: The customer installed HVAC controls (optimum start and optimum stop) on a retrofit packaged rooftop system. The evaluation team identified identical deemed energy savings for this project. The realization rate is 100 percent.

Project ID 210230: The business installed one standard electric oven and nine auto-close doors on reach-in coolers and freezers. The evaluation team identified identical deemed energy savings for the auto-close doors and convection oven. The oven was determined to be ENERGY STAR and therefore was eligible for the RTF energy savings. The realization rate is 100 percent.

Project ID 210279: This customer installed a variable frequency drive (VFD) on an HVAC fan. The evaluation team identified identical deemed energy savings for this project. The realization rate is 100 percent.

Project ID 210422: The business installed anti-sweat heater controls on coolers and freezers. The evaluation team identified identical deemed energy savings for this project. The realization rate is 100 percent.

Project ID 210444: This manufacturing facility installed a VFD on a 50 hp air compressor. The evaluation team identified identical deemed energy savings for this project. The realization rate is 100 percent.

Project ID 210499: This retailer replaced four air conditioning units. The evaluation team identified identical deemed energy savings for this project. The realization rate is 100 percent.

Project ID 210631: The business replaced three water-cooled heat pumps. The evaluation team identified identical deemed energy savings for this project, resulting in a realization rate of 100 percent.

3.3 REVIEW OF PY2018 IMPACT RECOMMENDATIONS

As part of the impact evaluation, Tetra Tech reviewed Idaho Power's progress against the recommendations made during the last impact evaluation of the 2018 program. The table below highlights Idaho Power's actions to address each of the previous impact recommendations.

Table 8. PY2018 CIEE Retrofits Program Recommendations

Category	Key findings and recommendations	PY2021 implementation	Status
Post-installation verification	Consider requiring pictures of the motor nameplate for the motor connected to VFDs.	Idaho Power is not collecting nameplate photos as part of the application. Alternate documentation was instituted because the nameplate photo was	Complete

Category	Key findings and recommendations	PY2021 implementation	Status
		deemed potentially unsafe for staff or participants. Alternate verification is in place that satisfies the evaluation team.	

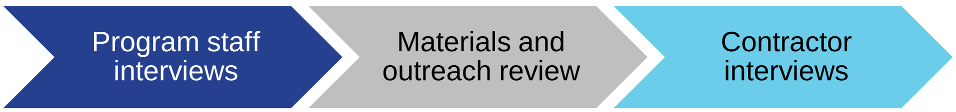
4.0 PROCESS EVALUATION

The following sections provide a detailed review of the process evaluation methodology, evaluation results, and recommendations from the evaluation activities.

4.1 METHODOLOGY

The process methodology consisted of the three primary evaluation activities shown in Figure 4. Each activity is explained below.

Figure 4. Process Evaluation Activities



Program Staff Interviews

Idaho Power staff responsible for the program delivery provided Tetra Tech staff with an overview of the program design, objectives, staffing, outreach, procedures, tracking, and achievements. Idaho Power program staff also responded to evaluation questions and provided requested materials.

Materials and Outreach Review

Tetra Tech read the *Idaho Power Commercial and Industrial Energy Efficiency Policies and Procedures Manual* dated January 2021. The program logic model developed in 2018 was also reviewed for the entire CIEE program at the time, including Retrofits, New Construction, and Custom Projects offerings.

Tetra Tech explored the Idaho Power website for energy efficiency information for businesses and any linked documentation, including applications and instructions. Idaho Power staff also provided an overarching CIEE slide deck and general CIEE brochure to facilitate discussions with customers and contractors regarding all the CIEE offerings from Idaho Power. A program-specific Retrofits brochure was also reviewed, which details the incentives and requirements for the Retrofits offering.

Contractor Interviews

Customers work with installation contractors and equipment distributors for the energy-efficiency equipment that is eligible for Retrofits offering incentives. The Program Specialist provided a list of contractors associated with projects in 2021. Tetra Tech sampled 33 companies, and the Program Specialist provided contact information. All customers with email addresses were emailed and followed up with via telephone to complete interviews with 11 contractors that could provide feedback on the Retrofits offering incentives.

4.2 PROCESS REVIEW RESULTS

Idaho Power follows program management best practices with a program manual and logic model developed for the CIEE suite of programs. Communication between Idaho Power and contractors is working well, and contractors find the application process straightforward and easy to complete for their customers.

4.2.1 Materials and Outreach Review

Policies and Procedures Manual

Tetra Tech reviewed the 2020 and 2021 versions of the *Idaho Power Commercial and Industrial Energy Efficiency Policies and Procedures Manual*. The 2020 version was updated through November 2019, and the 2021 version was updated in January 2021. Edits to the manual included slight customer eligibility changes and equipment adjustments.

The program manual includes a good overview of all CIEE offerings from Idaho Power. In addition, it offers sufficient detail for each major offering (Custom, Retrofits, and New Construction), such as preapproval and payment application processes and inspection requirements. Other commercial offerings, including Energy Assessments, Energy-Saving Kits, Flex Peak, Green Rewind, and Technical Training, are briefly described for the reader.

The Idaho Power contact information and revision history sections also benefit both internal utility and external partner and customer users. Other resources listed include approximately 25 organizations like ASHRAE, ENERGY STAR®, and Integrated Design Labs.

The primary program manual sections include the following:

1. Program Overview - including eligibility requirements
2. Program Offerings - Retrofits, New Construction, Custom Projects, Additional Offerings
3. Steps to Participate - Lighting retrofits, Non-lighting retrofits, New Construction
4. Custom Projects - steps to participate
5. Energy Efficient Assessments
6. Inspections, Measurement, and Verification
7. False Information
8. Preapproval
9. Satisfaction of Customers
10. Program Staff Contact Information
11. Commercial & Industrial Energy Efficiency Program Terms and Conditions
12. Other Resources
13. Review and Revision History

Logic Model

Our review of the CIEE logic model, developed in 2018 in response to a previous evaluation recommendation, shows that the Retrofits offering closely follows the program design and delivery steps laid out in the logic model. The major steps— (1) project identification and outreach, (2) preapproval applications, (3) Idaho Power project review, (4) project implementation, and (5) payment application—are all in line with the current program delivery as outlined in the program policies and procedures manual.

In addition, the program's short- and long-term outcomes are being realized, and measures such as certain lighting and compressed air equipment have been identified for a transition from Custom incentives to prescriptive under the Retrofits offering.

Outreach

The Retrofits offering continues to provide marketing in conjunction with all CIEE offerings. Methods such as bill inserts, newsletters, airport advertising, radio, and social media messages communicate the benefits businesses can realize through Idaho Power's energy efficiency programs.

In addition, specific activities in 2021 for Retrofits included:

- seven workshops via webinar for program trade allies and large commercial customers to inform them of program updates;
- a virtual program presentation to the local International Brotherhood of Electrical Workers (IBEW);
- a lighting controls training class via webinar for continuing education units (CEU) to trade allies and large customers;
- lighting postcards (sent to 1,400 businesses in October);
- a revision to the Retrofits brochure, splitting it into two: one specific to Idaho customers and the other for Oregon customers;
- a redesign of the Retrofits website, so customers first choose which state the project will be completed in, so they are directed to the incentives specific to that state;
- a pop-up ad placed on *My Account* in September (resulting in 2,859 views and 160 click-throughs from business customers);
- the development of a point-of-purchase display placed at the checkout counter at 60 lighting suppliers to promote lighting incentives (the displays received very positive comments from suppliers);
- emails promoting the lighting incentives were followed up with by Idaho Power Customer Solutions Advisor phone calls to customers who received the email; and
- promoting Retrofits lighting incentives to electrical contractors, electrical distributors, and energy service companies by a contracted Lighting Trade Ally Outreach Specialist.

The Idaho Power website was explored for energy efficiency information for businesses and any linked documentation, including applications and instructions. The selection of state and then Retrofits offering information was easy to follow.

Since most of the initial marketing and outreach are done as an overarching CIEE program, Idaho Power staff provided (1) the overarching CIEE slide deck and (2) the general CIEE brochure that staff use to facilitate discussions with customers and contractors regarding all CIEE offerings from Idaho Power. A program-specific Retrofits brochure was also reviewed, which details the incentives and requirements for the Retrofits offering of the CIEE program.

All slides and brochures are visually appealing and provide good information on what is offered through the CIEE program. The Retrofits brochure provides the specific information needed for customers or contractors interested in applying for incentives through the program.

4.2.2 Interview Contractors

A mix of 33 contractor firms was contacted from a list provided by Idaho Power; interviews were completed with 11 of them in August and September 2022. Three were compressed-air businesses working with engineering firms, three were electrical or lighting distributors, three were installers, and two were design firms. All primarily work with C&I customers, with little residential work.

The interviewed contractors have all worked with Idaho Power programs for several years. At least five also have experience with the Custom or New Construction offerings of the CIEE program. Most contractors work with other firms to deliver program services to customers, such as engineering firms and equipment distributors working with installation contractors.

Communication

Contractors we spoke with unanimously felt they were getting the information they needed about the Retrofits offering. Email notifications have been working well for everyone. In addition, at least five contractors mentioned having the Program Specialist's phone number and contacting her directly for assistance. Four contractors thought the pre-pandemic in-person meetings were beneficial for the information distributed at the meeting and the interaction with Idaho Power and other contractor staff.

All this outreach explains the high level of contractor awareness regarding the Retrofits offering. Although customers are not as aware of the offering, according to the contractors we spoke with, the contractors and suppliers introduce the Retrofits offering incentives to their customers during the project design phase, sales process, or service calls.

There was substantial overlap in contractor use of CIEE programs, such as Custom and New Construction options, along with Retrofits. When Idaho Power talks with contractors, they use an overview brochure that summarizes the CIEE programs, then discussions focus on specific contractor services. While contractors feel knowledgeable about the incentives available, they understand that customers are not as knowledgeable. A couple of contractors suggested that a comprehensive summary of the programs for them to share with customers may be helpful as they discuss incentive options. Once customers were aware of the Retrofits offering incentives, contractors felt that it assisted in motivating customers to purchase energy-efficient equipment.

Applications

Most suppliers and larger companies complete the application for the customer or smaller contractors they work with as a customer benefit. Only one contractor thought the $1,500 preapproval threshold was limiting and suggested a shift to $2,500. In contrast, a couple of contractors completed preapprovals for all of their projects, even if they were less than $1,500, to ensure the project would qualify the customer for an incentive.

Three of the contractors interviewed think that Idaho Power's application process is one of the easiest compared with other programs they have experienced. Most have never had an application declined, but a couple reported checks on savings compared with usage, resulting in adjustments to reported savings and incentives paid.. Idaho Power confirmed that this is a quality control check they instituted to ensure project savings on applications are less than the consumption of the business.

> ***"Their lighting tool is exceptional, they've made it very streamlined. I've worked with others and IPC's is probably the best."***

Most customers receive their incentive checks directly. However, contractors are flexible and will discount an invoice by the incentive amount if the customer prefers that option. Six of the contractors say at least 90 percent of the incentives go to customers; for two others, it was about 50 percent.

Satisfaction

Satisfaction with the Retrofits offering of the CIEE program is high. When asked how they would rate the Retrofits offering on a five-point scale, where 1 is *not at all satisfied* and 5 is *very satisfied*, eight of the contractors rated the program a 4 or 5. Nobody we spoke with was *dissatisfied*.

The contractors we spoke with had few suggestions for improving the Retrofits offering. Most feel that the program successfully serves large C&I customers with high operating hours (closer to 24/7). However, a couple of the contractors were concerned that it is more difficult to find opportunities for customers with moderate operating hours like office buildings or retail. Idaho Power staff are aware of this concern and continue investigating options for customers with fewer hours of operation that want to implement energy-efficient projects, particularly new LED fixtures.

COVID-19

COVID-19 has not had a prolonged adverse effect on the contractors we interviewed. However, there were a couple of contractors that worked with Retrofits projects in the past that retired or closed their businesses. Although there have been supply delays, contractors felt that customers are adjusting to them.

The primary disruption from the pandemic mentioned by contractors was having to work around customer meetings using virtual tools such as Webex and Zoom. Contractors prefer to meet face-to-face with customers. They also appreciated the in-person meetings and training sponsored by Idaho Power to update them on the CIEE programs. They found those meetings useful and a good source of information and interaction. All the firms felt it would be good to continue meetings to discuss program requirements and get new firms up to speed.

Idaho Power Company 2021 Home Energy Report Program Impact Evaluation

SUBMITTED TO: IDAHO POWER COMPANY

SUBMITTED ON: SEPTEMBER 26, 2022

SUBMITTED BY: ADM ASSOCIATES, INC.

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1 Executive Summary

This report is a summary of the evaluation, measurement, and verification (EM&V) effort of the 2021 program year (PY2021) Home Energy Report program for Idaho Power Company (IPC). The evaluation was administered by ADM Associates, Inc (herein referred to as the "Evaluators").

The Evaluators estimated the energy impacts of the Home Energy Report Program through a usage analysis with linear regression and statistically valid comparison groups. The Evaluators collected data for the evaluation through review of program materials, acquisition of program tracking data, and collection of historical energy consumption data. Table 1-1 summarizes the number of residential customers the Home Energy Reports were deployed to in the IPC service area since program inception. This table presents the original customer counts in each treatment and control group (group), including control customers in groups T1-T5 that were reassigned to group T6 in 2020.

Table 1-1 Summary of Idaho Power Company Home Energy Report Program

Group	Treatment Customers	Control Customers
T1	7,900	16,558
T2	5,826	5,826
T3	8,501	49,727
T4	4,101	46,191
T5	6,501	75,801
T6	108,498	14,744
Total	141,327	208,847

The Evaluators present positive and statistically significant savings estimates for all groups evaluated.

Table 1-2 provides a summary of evaluated savings of the IPC Home Energy Report program for the 2021 calendar year. The table presents the average annual household savings estimate and the program savings estimate for each group. During PY2021, the average annual household savings was 172 kWh with a total program energy savings of 18,386,281 kWh and total demand reductions of 2,275.19 kW. The Home Energy Report Program displayed a realization rate of 109.65% compared to the expected savings of 16,767,446 kWh for the 2021 program year.

Table 1-2 Summary of HER Program Savings During PY2021

Group	Weighted Treatment Customers	Average Annual Household Savings (kWh)	Total Program Savings (kWh)	Total Program Demand Reductions (kW)
T1	4,949	243.92	1,207,146	149.32
T2	4,320	297.71	1,286,194	159.09
T3	5,024	263.69	1,324,882	163.97
T4	2,356	262.99	619,579	76.68
T5	1,646	510.58	840,397	104.01
T6	88,827	147.57	13,108,083	1,622.13
Total	**107,122**	**171.64**	**18,386,281**	**2,275.19**

*The Evaluators used the weighted number of active treatment customers in 2021 to produce ex-post measure savings

1.1 Conclusions and Recommendations

The Evaluators offer the following conclusions and recommendations for consideration in planning future program cycles.

1.1.1 Conclusions

- The Evaluators estimated Home Energy Report Program savings for Idaho Power Company through usage analysis of randomized control trial (RCT) groups and matched control groups. The Evaluators also estimated demand reductions for each group. The Evaluators found positive annual savings that are statistically significant for all groups in PY2021.
- Due to low propensity for energy savings for the T5 group, the group stopped receiving reports in April 2020. Despite this, Evaluators included participants who had been a part of this group in their 2021 usage analysis. Overall savings including and excluding these T5 persistence savings are outlined below.
- The Evaluators verified 17,545,884 kWh savings for PY2021 for T1, T2, T3, T4, and T6. When including the T5 persistence savings, the Evaluators verified 18,386,281 kWh savings for PY2021. The Home Energy Report Program displayed a realization rate of 109.65% compared to the expected savings of 16,767,446 kWh for the 2021 program year.
- All evaluated groups displayed average annual electric savings between 0.99% and 5.21% of annual billed use in PY2021. Typical behavioral programs display average annual electric savings between 1% and 3%. Therefore, savings verified in PY2021 meet or exceed those typically displayed in behavioral programs. The Idaho Power Company Home Energy Report Program continues to meet or exceed typical behavioral program savings expectations for each consecutive program year.
- The T5 group stopped receiving reports in April 2020 because the program implementer did not detect statistically significant savings during the pilot period of August 2017 through December 2019. ADM conducted evaluation efforts to confirm whether this group displays statistically significant savings in the 2021 program year. For the 2021 program year evaluation of this group, an ad-hoc counterfactual group was created via propensity score matching due to

invalidity of the original RCT groups. Natural attrition may have caused the group or a portion of the group to no longer be statistically comparable in the pre-period(before the household starts receiving home energy reports) . The Evaluators employed propensity score matching using the nearest match algorithm at a one-to-one matching ratio and had a considerable pool of control customers to draw upon. The Evaluators selected a group that passed equivalency testing for all 12 pre-period months. This group was employed in regression analysis to estimate T5 group persistence savings. In order to ensure no double counting of observable savings from the regression results, the Evaluators summarize and remove other program savings from the resulting regression results, attributable to customers who also participated in IPC's Home Energy Report Program. The Evaluators estimated total other program savings as the amount of savings claimed through all other residential programs offered through Idaho Power Company. The Evaluators estimated downstream double counted savings at -81,444 kWh for PY2021. This contributed to a reduction of total program savings by 0.44%. This is in line with expectations that double counted savings range between -2% and 2% reductions to total program savings for a behavioral program. Each estimated amount was parsed by year and removed from the estimated savings from the regression results.

- The Evaluators estimated demand reductions for each group in 2021. The Evaluators verified a total of 2,275.19 kW reduction due to the Home Energy Report Program.
- The Evaluators conducted attrition analysis. The total attrition for the program since inception is 43.4% for the treatment group and 58.6% for the control group. This number is expected to be large due to the number of years the program has been deployed; T1 and T3-T5, for example, have all been deployed for over 4 years. To calculate this overall attrition, it was assumed that customers maintained their initial treatment assignment, unless they moved out after being reassigned to group 6. The Evaluators found the individual group attrition rates in 2021 to range between 0.0% and 8.7%. The T6 group displays the largest attrition of 8.4% and 8.7% for treatment and control, respectively. This may be due to the COVID-19 pandemic or group stabilization after its initiation in June 2020. That is, the T6 treatment and control groups consist of customers with household behaviors different than those of T1 through T5. The attrition rate indicates that the customers in T6 either have a naturally high attrition rate, or responded to the COVID-19 pandemic with a higher rate of moveouts than other groups.
- In 2020, IPC made the decision to stop sending reports to customers who had transitioned from the residential rate schedule (I01) to the customer generation rate schedule (I06). The Evaluators attempted to estimate incremental group savings due to the exclusion of these customers in the analysis. The Evaluators found that when the customer generation customers were removed from each of the groups, the groups no longer remained valid between treatment and control groups. Due to these findings, the Evaluators are unable to provide incremental household savings estimates with and without the customer generation rate schedule conversion customers. The Evaluators recommend that IPC continue to include these customers in the T1 through T6 groups and refrain from reallocating them to another treatment group. This will ensure that all legacy groups remain statistically valid and evaluable.
- The Evaluators explored the benchmarking flags aggregated and used by the implementer for use in the Home Energy Report messaging. Because nearly all of IPC's residential customer base

is currently designated to either a treatment or control group, the lack of household characteristics in this benchmarking dataset provide no barriers for participation in the program. The Evaluators recommend that if a group is designed for the program in the future, that the lack of benchmarking characteristics is not used as a prerequisite for participation.

1.1.2 Recommendations

- The Evaluators recommend that IPC and the implementer continue to prioritize the validity of each treatment and control group in order to maintain ability to estimate program savings. Previous changes throughout the program have resulted in maintenance of group validity due to additional steps relating to randomization, validity checks, and prioritization of statistical validity. The Evaluators recommend IPC continue such efforts to ensure future program savings are evaluable and quantifiable.
- Although the pilot phase of the program indicated that low to medium annual energy users displayed low propensity for energy savings, the Evaluators found that these users (group T5) have displayed high persistence savings in recent years. Therefore, the Evaluators recommend that IPC allow customers with low to medium annual energy use to be eligible for participation in the program for any and all future group expansions.
- The Evaluators recommend that IPC continue to include customers that have converted from I01 rate schedule to I06 rate schedule in the T1 through T6 groups and refrain from reallocating them to another treatment group. This will ensure that all legacy groups remain statistically valid and evaluable.
- The Evaluators recommend that if a group is designed for the program in the future, that the lack of benchmarking characteristics is not used as a prerequisite for participation. This will ensure that the maximum number of customers are eligible for the Home Energy Report Program and therefore the program retains higher potential for total program energy savings.

2 Home Energy Report Program

The IPC's Home Energy Report Program began providing Home Energy Reports (HERs) in 2017 to a portion of residential customers. The program was designed to provide information to residential customers intended to encourage behavioral changes that result in reduced billed energy consumption. The household receives personalized information about their own kWh consumption and comparison to a group of neighboring households energy consumption. Also included on the reports is information on other IPC energy efficiency programs to encourage additional home improvements towards reduced energy usage. This normative information on electric usage and targeted tips on energy saving behaviors is aimed to reduce the participant household's energy consumption.

Since the launch of a pilot program in August 2017 with three groups (T3-T5), the program had expanded into a total of six groups. A description of each of these groups along with their initial intervention date is outlined in Table 2-1.

Table 2-1: Summary of Idaho Power Company Home Energy Report Program Groups

Group	Description	Customer Type	Intervention Date
T1	Winter Heating Group	Customers with high winter use (electric heating) added in Year 1 of the pilot	December 2017
T2	Winter Heating Group	Customers with high winter use (electric heating) added in Year 2 of the pilot	December 2018
T3	Year-Round Group	Customers with high year-round energy use added in Year 1 of the pilot	August 2017
T4	Year-Round Group	Customers with medium year-round energy use added in Year 1 of the pilot	August 2017
T5	Year-Round Group	Customers with low year-round energy use added in Year 1 of the pilot	August 2017
T6	Expansion Group	Expansion customers based on eligibility criteria determined after the pilot	June 2020

The program employs the third-party implementation contractor, Aclara. The pilot program was renewed for a second year in August 2018 with the addition of a second winter heating group and the optimization of existing treatment customers from pilot year one. Year two of the pilot was extended from August 2019 through February 2020 to ensure continuity of treatment. Subsequently, the HER Program was expanded for 3.5 more years – through December 31, 2023. In 2020, the program was expanded from approximately 25,000 customers to over 100,000 with a calculated savings of 10,428 MWh. The HER Pilot Program transitioned into a full program when the expansion group was implemented in 2020.

Table 2-2 summarizes the size of the groups implemented in the Home Energy Report program within the IPC service area.

Table 2-2: Idaho Power Company Home Energy Report Program Group Size

Group	Treatment Group Size		Control Group Size	
	Number in Group	Number at EOY 2021	Number in Group	Number at EOY 2021
T1	7,900	5,625	16,558	7,566
T2	5,826	4,578	5,826	2,831
T3	8,501	5,948	49,727	18,455
T4	4,101	2,812	46,191	19,725
T5	6,501	5,022	75,801	75,536
T6	108,498	94,171	14,744	14,730
Total	141,327	118,156	208,847	138,843

The Evaluators estimated savings for Home Energy Report Program using a matched control group of non-participating residences in IPC's service territory. The Evaluators analyzed each of the groups treated during the 2021 program year. The results are summarized on a calendar year basis (i.e., January through December). Table 2-3 describes the evaluation period for each group and reporting period.

Table 2-3: Summary of Proposed Group Organization

Group	Intervention Date	Pre-Period	Post-Period
T1	December 2017	12/01/16 - 11/31/17	1/1/2021 to 12/31/2021
T2	December 2018	12/01/17 - 11/31/18	
T3	August 2017	08/01/16 - 07/31/17	
T4	August 2017	08/01/16 - 07/31/17	
T5	August 2017	08/01/16 - 07/31/17	
T6	June 2020	06/01/19 - 05/31/20	

2.1 Program Background

This IPC Home Energy Report Program has been a joint effort between IPC, Aclara, and Aclara's subcontractor, Uplight, since its outset in August 2017. The program was implemented by Aclara/Ecotagious from 2017 through 2019. Starting early 2020, the program has been implemented by Uplight. Throughout this program's implementation changes, DNV was employed as a third-party consultant to ensure control groups remained randomized and valid against the treatment groups.

Initially, the implementors sent bimonthly energy reports to a subset of customers, while others received seasonal energy reports (one report in each November, December, January, and February). However, due to a lack of meaningful savings benefits from bimonthly reports, beginning in February 2020, IPC made the decision to begin sending quarterly reports to all current pilot participants.

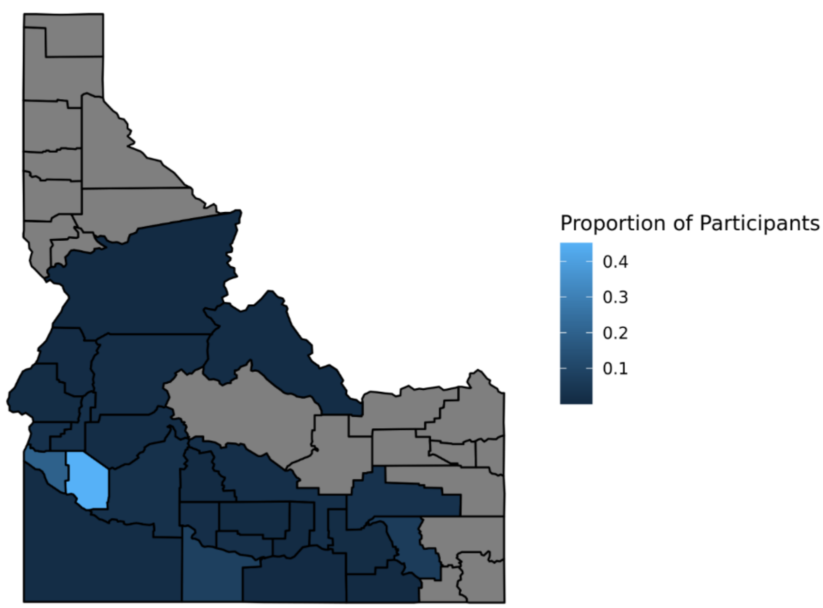
Expansion participants received bi-monthly reports between June 2020 and February 2021 and then started receiving quarterly reports from that point forward. In PY2020, most reports were delivered as printed and mailed reports (99.5%), with the remaining reports delivered via email (0.05%).

In April 2020, the T5 group stopped receiving reports due to low energy savings during the group's first two pilot years. Given that this group could have a negative impact on program wide cost-effectiveness, the implementers stopped sending reports to the group and removed treatment and control customers from eligibility for selection in future expansion groups.

The most recent expansion group is T6 which was implemented in June 2020. DNV randomly removed 75,973 customers from the treatment group's corresponding control groups (C1, C2, C3, and C4) to free them up for possible treatment in T6. DNV determined how many customers could be removed from these control groups to still maintain statistical significance in pre-period savings. This new expansion group was created after participants passed eligibility screenings. Customers included for potential selection of T6 customers were: (1) nonparticipants (customers that had never previously been selected for T or C for any group in the program) and (2) the 75,973 control group customers removed by DNV-GL. This potential pool totaled to 108,498 customers. A total of 107,088 of these customers were designated to the group T6, after completing eligibility and benchmarking screenings. The addition of this group led to a total of 125,216 treatment customers in PY2020.

Participant households in IPC's HER program spanned 24 counties and 104 unique zip codes. Each zip code had a mean of 2,700 participants, a median of 733, a minimum of 3 in 83250 and a maximum of 17,983 individuals in 83646. A map of IPC's HER service area is outlined below in Figure 2-1.

Figure 2-1 IPC HER Participants by County



2.2 Data Provided

IPC provided the following data to support the analysis:

- Daily electric usage data from January 1, 2016 – December 31, 2021, that included customer kWh usage for 271,439 participants;
- Customer mapping data that tracked intervention dates, groups, treatment statuses, evaluation removal reasons/dates, and program removal reasons/dates for all participants;
- Customer home characteristic data that included geographical data on each house like the county and zip code, basic home information including number of bedrooms, construction year, home type, and square footage, as well as binary data on home amenities including AC and electric space heating;
- Other program data that tracks yearly reported savings by program and measure for 130,694 participants.

3 Impact Evaluation Approach

This section describes the gross impact evaluation of the Home Energy Report program. The Evaluators analyzed each of the groups treated during the 2021 program years.

The Evaluators used participant and control group usage data in the pre-period (before the household starts receiving home energy reports) and in the post-period (after household starts receiving home energy reports) to estimate program impact for each group as part of the Evaluator's impact evaluation for the Home Energy Report Program, as detailed in the Uniform Methods Project (UMP) behavioral chapter by the National Renewable Energy Laboratory[1]. In addition, the Evaluators estimated joint savings from other downstream energy efficiency programs offered to IPC's residential customers.

The work effort was divided into six distinct steps:

1. Data preparation and cleaning;
2. Validity testing of remaining treatment and control groups during the baseline period;
3. Create matched ad-hoc control group via propensity score matching for groups where validity was compromised;
4. Estimate monthly and annual billed consumption differences between treatment and control groups via regression modeling;
5. Estimate and remove joint savings from other programs;
6. Estimate demand reductions; and
7. Estimate program attrition.

[1] https://www.nrel.gov/docs/fy18osti/70472.pdf

The Evaluators explored several linear regression models for the impact evaluation of the Home Energy Report program. Each approach involves panel linear regression models to estimate energy savings for the treatment group. The explored methods required monthly usage data for the program participants and a comparable counterfactual group. A designated control group was created by the Evaluators in instances where the control group as designed does not pass equivalency checks.

The following types of linear free energy relationships (LFER) models were explored during the evaluation of this program: Difference in Difference (D-in-D) with monthly controls, D-in-D with weather controls, and Post-Program Regression (PPR) models. The UMP recommends D-in-D as it uses data from the treatment and control groups during the pre- and post-period and therefore obtains more precise savings estimates. The PPR model is a panel regression model that calculates the differences between treatment and control consumption in the post-program period. However, it includes controls on lagged energy use for the same calendar month (for IPC, lagged bi-monthly) of the pre-program period to include in the model any small systematic differences in pre-treatment usage trends between the participant and control customers.

The final model specification used to present the evaluated savings is the D-in-D with monthly controls, as it displayed sufficient fitness and does not require forecasting with independent weather variables. This specification is recommended by the UMP to obtain precise savings estimates by comparing the treatment and control groups during the pre- and post-periods.

The Evaluators present savings estimates in three formats for each program year:

- Daily and annual energy savings per home
- Annual percent savings per home
- Program-level savings

3.1 Glossary of Terminology

The following section contains a glossary of terminology used throughout the report.

- **Ex-ante Savings** – Calculated savings used for program and portfolio planning purposes.
- **Ex-post Savings** – Savings estimates reported by an evaluator after the energy impact evaluation has been completed.
- **Gross Savings** – The change in energy consumption directly resulting from program-related actions taken by participants in an efficiency program, regardless of why they participated.

3.2 Step 1: Data Preparation and Cleaning

This section describes the steps the Evaluators performed to prepare data for the usage analysis. The daily usage data the Evaluators received outlined the kWh energy usage by each participant from the start of 2016 until the end of 2021. Using the unique SDP IDs (meter device locations) associated with each participant, the Evaluators merged this usage data with both the customer mapping and housing data. After producing this merged dataset, the Evaluators grouped the daily usage data into monthly buckets, tracking both the average and total usage per month. These clean monthly data were then filtered using the following criteria:

- Customer months with less than one billed day or more than the total number of days in that calendar month were excluded from analysis.
- Customer months present after a customer's move out date were excluded from analysis.
- Customer months with average daily usage greater than 200 kWh were excluded from analysis.
- Customer months with average daily usage less than 0 kWh were excluded.
- Pre-treatment data were limited to the 12 months prior to the treatment start date for each experimental group.
- Customers without at least 9 of the 12 months of pre-period data, as well as at least 9 of the 12 months of post-period data were removed from analysis.

Although energy consumption data was provided at daily intervals aggregated from hourly meter data, ADM aggregated this data into monthly format for use in this evaluation. For the remainder of the report, the Evaluators will reference the usage data as having monthly intervals. The Evaluators identified high outliers at the threshold of average daily kWh usage over 200 kWh per day. This level of consumption is unrealistic for residential households and can reasonably be categorized as the result of a reading error rather than a valid reading from a high user. The Evaluators aimed to remove error reading rather than remove high and low users, as these subgroups contribute real behaviors to the average savings estimate.

The usage data provided by IPC is summarized in the table below. Table 3-1 displays the original and final number of Home Energy Report participants and nonparticipants used in the calculation of the methodologies below.

Table 3-1 Weighted Treatment and Control Customers

Group	Original Treatment Customers	Original Control Customers	Weighted Treatment Customers 2021	Weighted Control Customers 2021
T1	7,900	16,558	4,949	1,222
T2	5,826	5,826	4,320	693
T3	8,501	49,727	5,024	2,994
T4	4,101	46,191	2,356	2,213
T5	6,501	75,801	1,646	36,480
T6	108,498	14,744	88,827	12,065
Total	**141,327**	**208,847**	**107,122**	**55,667**

After data preparation and cleaning, the Evaluators performed validity testing for all groups evaluated. The details of this step are provided in the next section.

3.3 Step 2: Validity Testing

The method for evaluation requires the counterfactual group remains statistically valid for each treatment group. Validity is tested by examining each energy consumption read in the pre-treatment period for customers in each the treatment and control group. Each calendarized monthly is tested for statistically significant differences using a simple two-tailed T-test. The evaluators performed equivalency for each month between the provided RCT treatment group and the provided RCT control group.

The Evaluators tested the validity of each RCT by completing t-tests for the average daily usage of each of the pre-period months between the remaining treatment group and remaining control. If the pre-period average daily usage rejected the null hypothesis at the 95% confidence interval for a number of the 12 pre-period months, the RCT was considered invalid.

To gather the most reliable results, it is ideal to have a RCT. However, due to changes in program implementation, the original RCT may not be feasible. For groups that do not pass equivalency testing, the Evaluators performed propensity score matching (PSM) to create a post-hoc control group comprising of participants that have not received home energy reports. The control group created undergoes equivalency testing to confirm it is statistically comparable to the treatment group in pre-period usage.

3.4 Step 3: Propensity Score Matching

Due to complications in program implementation or design (or as the result of significant participant attrition), the RCT groups may have become invalid. Regression model analyses are unable to be run on groups in which a statistically comparable control group is not defined. Therefore, in order to analyze groups that have non-equivalent counterfactual groups, a post-hoc control group is required to be created. The Evaluators created a statistically similar control group using propensity score matching (PSM), a method that allows the Evaluators to find the most similar household based on the customers' billed consumption trends in the pre-period and verified with statistical difference testing.

A propensity score is a metric that summarizes several dimensions of household characteristics into a single metric that can be used to group similar households. To create a post-hoc control group, the Evaluators compiled usage data of all control participants from all groups to compare against treatment households via quasi-experimental methods. This allowed the Evaluators to select from a large group of similar households that have not received home energy reports. With this information, the Evaluators matched the treatment group to a similar control group via seasonal pre-period usage. After matching, a t-test was conducted for each month in the pre-period to help determine the success of PSM.

After creating a PSM control group, the group undergoes the same regression modeling as the remaining statistically valid group. The regression specifications and details are summarized in the next section.

3.5 Step 4: Linear Regression Modeling

The Evaluators utilized a linear regression model that compares the treatment group and valid comparison group in a D-in-D regression model. The comparison control group used was either created during the RCT design or was the result of propensity score matching conducted by the Evaluators. This requires a successful validation test between the group's treatment and comparison group. This approach, with randomized control trial, is detailed in the UMP as a preferred method for evaluation of opt-out behavioral programs. The following sections summarize the model specification the Evaluators utilized to estimate impact savings for the program.

3.5.1 Difference-in-Difference Model Specification

The fixed-effects linear regression model specification contains customer-specific dummy variables to account for exogenous heterogeneity that cannot be explicitly controlled for and is not relevant to the estimation of program savings. The specification of customer specific effects allows the model to capture much of the baseline differences across customers while obtaining reliable estimates of the impact of the report.

The Evaluators fit a monthly fixed effects panel regression model to estimate daily consumption differences between treatment and control households in each month. The model specifications used in this analysis is described below.

Equation 3-1: Fixed-Effects Difference-in-Difference (D-in-D) Panel Regression Model Specification

$$ADC_{it} = \alpha_0 + \beta_1(Post)_{it} + \beta_2(Post \times Month)_{it} + \beta_3(Treatment \times Post)_{it} \\ + \beta_4(Treatment \times Post \times Month)_{it} + \varepsilon_{it}$$

Where,

ADC_{it} = Estimated average daily consumption (dependent variable) in home *i* during period *t*

$Post_{it}$ = Dummy variable indicating whether period *t* was in pre- or post- retrofit

$Treatment_i$ = Dummy variable indicating whether household *i* was in treatment group or control group

$Month_{it}$ = Dummy variable indicating month during period *t*

ε_{it} = Customer-level random error

α_0= The model intercept for home *i*

β_{1-4} = Coefficients determined via regression

The coefficients β_3 and β_4 represent the average change in consumption between the treatment group and the control group in the post-period. Monthly kWh savings are then taken by using the following equation:

Equation 3-2: Monthly kWh Savings

$$monthly_{savings_t} = -1 * \beta_{4t} * days_t * participants_t$$

Where:

t = a given month in the program year,

β_{1t} = the regression coefficient for the treatment effect of month t in the post-period

$days_t$ = the number of days in the given month

$participants_t$ = the number of active participants in month t

Because the regression equation predicts average daily usage as a function of the treatment effect, and the treatment indicator has been coded as "1", the regression coefficient for the treatment effect of a given month should be negative if savings occurs. Therefore, multiplying the savings calculation by -1 will correct the sign of the results.

3.6 Step 5: Double Count Savings Approach

Participants in both the treatment and control groups participate in other Idaho Power Company energy efficiency programs. The IPC HER program reports may also increase the customer's propensity to participate in other programs. This additional participation is known as uplift. The HER sent to customers includes information about other IPC incentives and programs, which may lead to customers adopting more energy efficient upgrades for their home.

When a household participates in an efficiency program because of this encouragement, the utility might count their savings twice: once in the regression-based estimate of HER program savings and again in the estimate of savings for the other energy efficiency program. Although uplift rarely displays a statistically significant difference between the treatment and control groups, the UMP recommends removing uplift from each group at the household level.

The double counted savings, whether positive or negative, are subtracted from the group's savings estimates from the regression analysis to get total verified savings. IPC's double counted savings are exclusively downstream. The following section details our proposed methodology for calculating those savings.

3.6.1 Downstream

Downstream programs traditionally track installed measures at the customer level. IPC delivered customer-level tracking data with verified savings estimates from other programs IPC offers to customers in the HER program. The Evaluators included all residential IPC programs in the double counting analysis.

The Evaluators corrected for cross-program participation that occurred after treatment began to the extent that the treatment group participated at a higher rate than the control group. The Evaluators estimated and subtracted savings from program uplift from the total program portfolio savings for each program year. The double count savings were calculated on a per-household level for each treatment group in each group as follows:

Equation 3-3 Double Count Specification

$$Double\ Counting = \left(\frac{OP\ kWh}{Household_{Treatment}} - \frac{OP\ kWh}{Household_{Control}}\right) \times \#\ Accounts_{Treatment}$$

Where,

$\frac{OP\ kWh}{Household_{Treatment}}$ = Other program kWh per household in the treatment group

$\frac{OP\ kWh}{Household_{Control}}$ = Other program kWh per household in the control group

$\#\ Accounts_{Treatment}$ = Total accounts in the treatment group

To estimate double counted program savings from downstream program uplift, the Evaluators:

1. Matched the HER program treatment and control group customers to the utility energy efficiency program tracking data by customer ID or address
2. Calculated the savings per treatment group subject from efficiency uplift as the difference between treatment and control groups in average efficiency program savings per subject
3. Multiplied that difference by the number of subjects who are in the treatment group

The Evaluators summarized and removed program uplift for each group and treatment status for each of the other residential program offerings.

3.7 Step 6: Demand Reduction Estimation

The relationship between annual usage savings and peak demand savings has not been defined for HERs. Program savings rely on hourly meter data provided by IPC. Although smart meter data (hourly usage data) are available for IPC residential customers, the data delivery method was inadequate for proper transfer of this high-resolution data. Therefore, the Evaluators utilized daily consumption data, aggregated to monthly consumption data for each customer. Thus, the resolution of billing data provided for analysis is unsuitable for the direct evaluation of peak demand savings.

However, it can be assumed that total monthly usage can be attributed to the usage of other residential components (e.g., HVAC, lighting, etc.) and that any reduction in usage is proportional to the overall usage of these components. Load factors are available for these components at an hourly resolution; thus, the Evaluators have developed a model for predicting coincident peak demand savings from component load factors from the gross energy savings calculated using the above methodology.

The demand reductions claimed through the AC Cool Credit Program displays no statistically significant differences between the treatment and control groups. Therefore, the Evaluators did not remove demand reductions claimed through the AC Cool Credit Program, as incremental kWh and kW savings are unmeasurable between the groups.

3.7.1 Normalize kWh Usage

In order to increase the generalizability of the model, the Evaluators will first normalize the kWh savings value predicted by the impact evaluation regression model into a percent savings value by dividing each month's savings by the total annual savings.

Equation 3-4 Monthly Savings Normalization Calculation

$$\%\ savings\frac{month}{year} = {kWh\ savings_m}\Big/{kWh\ savings_y}$$

Where,

m = Value for given program month m.

y = Value for given program year y.

3.7.2 Calculate Monthly Load Factors for Component Variables

The model assumes a linear relationship between the component variables and the percent savings calculated above. Because load shape information is available for residential components at an hourly resolution, the Evaluators can estimate the relationship between component load and percent savings in order to estimate total demand savings. To make sure that the model is interpretable, hourly load factors must be converted to monthly load factors. The Evaluators sourced hourly load data from the U.S. Department of Energy Open Data Catalog[2] of residential hourly load profiles. The database contains hourly load profiles for all TMY3 locations in the United States. The specific location chosen for this evaluation was the Boise International Airport.

3.7.3 Simple Regression

In order to determine the relationship between the percent savings and the component load factors, the Evaluators ran a simple linear regression. Because the model is used to predict savings from known variables, we hold the intercept constant at 0 to ensure that the majority of the variability will be explained by the component load factors. The following equation displays an example regression equation used to predict percent savings attributable to a higher resolution time period.

Equation 3-5 Percent Savings Prediction

$$\%\, Savings \frac{month}{year} = \beta_1 \times lf_{Total\ kWh}$$

Where,

lf = Load factor for each component variable of interest

$Total\ kWh$ = All end-uses combined

The regression coefficients for the above regression equation represent the relationship of each of the component variables to percent savings. Because both independent and dependent variables are calculated in units of months, the numerator of the regression weights are time invariant and can be used to estimate the percentage of savings across any unit of time of interest in a year.

[2] https://openei.org/doe-opendata/dataset/commercial-and-residential-hourly-load-profiles-for-all-tmy3-locations-in-the-united-states

3.7.4 Demand Calculation

Coincidence peak load was estimated for the total electric load by summing the total electric load over peak hours as defined by the IPC—non-weekend and non-holiday days between 1:00 p.m. and 9:00 p.m. for the months of June through August and non-weekend non-holiday days between 7:00 a.m. and 9:00 p.m. for the months of September through May[3]. The following equation illustrates the calculation for calculating the peak load factor.

Equation 3-6 Peak Load Factor Calculation

$$Peak\ Load\ Factor_x = \sum_{i=1}^{n} Hourly\ Load\ Factor_x$$

Where,

x = Component variable of interest (total electric load)

i = First peak hour for the entire annual peak period

n = Last peak hour for the entire annual peak period

Multiplying this value by the total annual savings will then generate the kWh savings that took place during the peak period, as illustrated by Equation 3-7.

Equation 3-7 Energy Savings During Peak Period

$$Peak\ kWh\ savings = Total\ kWh\ Savings\ \cdot Peak\ Load\ Factor_x$$

Dividing this value by the total number of peak hours will generate coincident peak demand savings in units of kW, as shown in Equation 3-8.

Equation 3-8 Peak Demand Savings

$$Peak\ kW\ savings = \frac{Peak\ kWh\ savings}{Anual\ Peak\ Period} \times \frac{Annual\ Peak\ Period}{Number\ of\ Peak\ Hours}$$

As with gross usage savings, the Evaluators anticipates that some participants in the treatment group will also participate in other IPC programs. The adjusted savings per month is an input for the demand savings estimation with this method. The Evaluators adjust the savings per month by weighing the HVAC measures by degree day.

[3] https://www.idahopower.com/accounts-service/understand-your-bill/pricing/idaho-pricing/time-day-plan/frequently-asked-questions/

3.8 Step 7: Attrition Analysis Approach

The tracking of treatment and control households can be affected by either move-outs or opt-outs (known collectively as 'attrition'). If a household's final bill was the end of the evaluated post-period, it is considered a move out and bills occurring after moveout will be removed from the analysis. Opt-outs, however, remain in the regression analysis, as the program savings estimated is the "intent-to-treat" savings. It remains useful to estimate attrition to gather information on persistence of savings.

The cumulative level of both treatment and control move outs over the program life by month, group, and treatment/control status for each program year was summarized by the Evaluators. This information can be useful for IPC for the potential development of future HER program groups.

4 Impact Evaluation Results

This section provides the results of each portion of the impact evaluation. The Evaluators calculated the percent savings per home by dividing the average annual energy savings estimated in the treatment group by the average annual energy consumption from the control group for each program year. That value is then adjusted for uplift from downstream measures. The program-level savings are calculated by multiplying the average annual household impact estimate by the weighted number of active program participants in the treatment group and after removing double counted savings, by program year.

4.1 Data Preparation and Cleaning

The Evaluators prepared and cleaned usage data provided by IPC. The following table represents the unique number of customers per group and treatment group throughout the usage cleaning stages.

Table 4-1 Treatment Customers by Restriction

Restriction	T1 Treatment Customers	T2 Treatment Customers	T3 Treatment Customers	T4 Treatment Customers	T5 Treatment Customers	T6 Treatment Customers
Mapping File	7,900	5,826	8,501	4,101	6,501	108,498
Merged with billing data	7,900	5,826	8,501	4,101	6,501	108,498
Remove intervention month	7,900	5,826	8,501	4,101	6,501	108,498
Subset to 12 months pre and 12 months post	7,900	5,826	8,501	4,101	6,501	108,498
Remove bills present after moveout date for each customer	7,900	5,826	8,501	4,101	6,501	108,498
Remove customers without at least 9 months pre or 9 months post	7,900	5,826	8,501	4,101	6,501	108,498
Remove observations with greater than 200 kWh/day (outlier)	7,900	5,826	8,501	4,101	6,501	108,498
Remove observations with negative consumption	7,900	5,826	8,501	4,101	6,501	108,498
Remove customers removed from evaluation due to optimization, reallocation, moveout	4,964	4,336	5,030	2,356	1,646	88,884

As displayed in the table above, the cleaning steps removed very few customers from the analysis. Although the cleaning steps displayed above had removed individual bills across a number of customers, each customer still displayed 9 valid billing months in each the pre-period and post-period, and therefore were retained in the analysis. However, the last step in the billing analysis removed 25% to 75% of customers within each treatment group due to changes in implementation eligibility.

After data preparation and cleaning, the Evaluators performed validity testing for all groups evaluated. The details of this step are provided in the next section.

4.2 Validity Testing Results

The remaining groups after usage data preparation and cleaning were tested for statistically significant differences in usage between the treatment and control groups for each of the 12 pre-period months in each group. The tables below detail differences and statistical significance between each group's treatment and control groups for each of the 12 months in the pre-period. The baseline months listed in each table differ between each group due to differing intervention dates.

Table 4-2 T1 Group T-Test Results

Pre-Period Month	Treatment Group Average Daily Usage (kWh/day)	Control Group Average Daily Usage (kWh/day)	Average Daily Usage Difference (kWh/day)	P-value	Statistically Significant Difference
Dec 2016	110.12	109.88	0.24	0.8110	-
Jan 2017	117.63	116.72	0.91	0.3684	-
Feb 2017	87.94	87.6	0.34	0.6937	-
Mar 2017	60.11	60.23	-0.12	0.8566	-
Apr 2017	52.06	52.28	-0.22	0.7169	-
May 2017	41.67	41.72	-0.05	0.9390	-
Jun 2017	42.55	42.26	0.29	0.6531	-
Jul 2017	55.49	55.59	-0.10	0.9049	-
Aug 2017	48.79	48.54	0.25	0.7394	-
Sep 2017	42.62	42.2	0.42	0.4695	-
Oct 2017	50.61	50.46	0.15	0.8170	-
Nov 2017	64.94	65.2	-0.26	0.7227	-

**Statistically significant if p<0.05*

Table 4-3 T2 Group T-Test Results

Pre-Period Month	Treatment Group Average Daily Usage (kWh/day)	Control Group Average Daily Usage (kWh/day)	Average Daily Usage Difference (kWh/day)	P-value	Statistically Significant Difference
Dec 2017	97.01	97.19	-0.18	0.8737	-
Jan 2018	83.29	83.69	-0.40	0.7070	-
Feb 2018	83.85	84.43	-0.58	0.5991	-
Mar 2018	68.06	68.29	-0.23	0.8182	-
Apr 2018	47.87	47.84	0.03	0.9661	-
May 2018	34.55	34.10	0.45	0.4750	-
Jun 2018	35.35	35.42	-0.07	0.9198	-
Jul 2018	45.21	44.84	0.37	0.6923	-
Aug 2018	40.09	39.92	0.17	0.8370	-
Sep 2018	33.51	33.46	0.05	0.9347	-
Oct 2018	44.14	44.19	-0.05	0.9433	-
Nov 2018	72.04	73.07	-1.03	0.3127	-

**Statistically significant if p<0.05*

Table 4-4 T3 Group T-Test Results

Pre-Period Month	Treatment Group Average Daily Usage (kWh/day)	Control Group Average Daily Usage (kWh/day)	Average Daily Usage Difference (kWh/day)	P-value	Statistically Significant Difference
Aug 2016	53.95	53.95	0.00	0.9933	-
Sep 2016	37.90	37.67	0.23	0.5414	-
Oct 2016	34.56	34.51	0.05	0.8915	-
Nov 2016	37.07	37.20	-0.13	0.6947	-
Dec 2016	48.86	49.16	-0.30	0.5072	-
Jan 2017	48.37	48.55	-0.18	0.7000	-
Feb 2017	40.70	40.78	-0.08	0.8278	-
Mar 2017	34.94	35.12	-0.18	0.5901	-
Apr 2017	33.64	33.64	0.00	0.9946	-
May 2017	37.12	37.05	0.07	0.8590	-
Jun 2017	46.26	46.31	-0.05	0.9107	-
Jul 2017	65.65	65.07	0.58	0.3212	-

**Statistically significant if $p<0.05$*

Table 4-5 T4 Group T-Test Results

Pre-Period Month	Treatment Group Average Daily Usage (kWh/day)	Control Group Average Daily Usage (kWh/day)	Average Daily Usage Difference (kWh/day)	P-value	Statistically Significant Difference
Aug 2016	36.99	37.43	-0.44	0.2336	-
Sep 2016	24.35	24.54	-0.19	0.3759	-
Oct 2016	22.82	22.89	-0.07	0.6889	-
Nov 2016	24.97	25.02	-0.05	0.8225	-
Dec 2016	33.35	33.01	0.34	0.3476	-
Jan 2017	33.45	32.80	0.65	0.1217	-
Feb 2017	27.78	27.18	0.60	0.0453	*
Mar 2017	23.83	23.48	0.35	0.1217	-
Apr 2017	22.73	22.42	0.31	0.1614	-
May 2017	24.52	24.44	0.08	0.7501	-
Jun 2017	31.43	31.67	-0.24	0.4316	-
Jul 2017	48.09	48.51	-0.42	0.4109	-

**Statistically significant if $p<0.05$*

Table 4-6 T5 Group T-Test Results

Pre-Period Month	Treatment Group Average Daily Usage (kWh/day)	Control Group Average Daily Usage (kWh/day)	Average Daily Usage Difference (kWh/day)	P-value	Statistically Significant Difference
Aug 2016	29.45	27.67	1.78	<0.0000	*
Sep 2016	19.03	17.79	1.24	<0.0000	*
Oct 2016	17.98	16.92	1.06	<0.0000	*
Nov 2016	19.70	18.72	0.98	<0.0000	*
Dec 2016	25.70	24.64	1.06	0.0001	*
Jan 2017	25.60	24.62	0.98	0.0010	*
Feb 2017	21.65	20.76	0.89	0.0001	*
Mar 2017	18.83	17.96	0.87	<0.0000	*
Apr 2017	18.24	17.15	1.09	<0.0000	*
May 2017	19.67	18.37	1.30	<0.0000	*
Jun 2017	25.84	24.09	1.75	<0.0000	*
Jul 2017	40.79	38.31	2.48	<0.0000	*

**Statistically significant if p<0.05*

Table 4-7 T6 Group T-Test Results

Pre-Period Month	Treatment Group Average Daily Usage (kWh/day)	Control Group Average Daily Usage (kWh/day)	Average Daily Usage Difference (kWh/day)	P-value	Statistically Significant Difference
Jun 2019	36.81	36.77	0.04	0.7989	-
Jul 2019	46.81	46.79	0.02	0.9479	-
Aug 2019	46.67	46.59	0.08	0.6814	-
Sep 2019	34.37	34.22	0.15	0.3093	-
Oct 2019	34.49	34.39	0.10	0.5898	-
Nov 2019	39.53	39.50	0.03	0.9085	-
Dec 2019	45.93	45.90	0.03	0.9029	-
Jan 2020	43.39	43.33	0.06	0.8145	-
Feb 2020	42.38	42.34	0.04	0.8819	-
Mar 2020	36.08	36.03	0.05	0.8004	-
Apr 2020	33.57	33.55	0.02	0.9181	-
May 2020	33.67	33.64	0.03	0.8235	-

**Statistically significant if p<0.05*

The RCT for the groups T1-T3 and T6 remained balanced at the 95% confidence level in the entire pre-period. The T4 group meanwhile had a statistically significant difference for one month (February 2017); however, the group as a whole was considered balanced. The Evaluators note that up to two months rejected of the 12 pre-period months is allowed for validity testing. In contrast, there was a significant difference between the treatment and controls groups for the T5 group for all pre-period months. Therefore, the Evaluators continued with the control group for the T1-T4 and T6 groups and employed propensity score matching in an attempt to create an ad-hoc control group for the T5 group. The result of the propensity score matching is displayed in the section below.

4.3 Propensity Score Matching Results

The Evaluators created a valid post-hoc control group for the T5 group via quasi-experimental methods. Quasi-experimental methods are required when the control group has not been randomly assigned as it would be in a RCT.

The Evaluators created a statistically similar control group using propensity score matching (PSM), a method that allows the Evaluators to find the most similar household based on the customers' consumption trends in the pre-period, specifically covariates for average summer, winter, fall, and spring pre-period usage were used and verified with statistical difference testing.

A propensity score is a metric that summarizes several dimensions of household characteristics into a single metric that can be used to group similar households. To create a post-hoc control group, the Evaluators compiled usage data of all control participants from all groups to compare against treatment households via quasi-experimental methods. This allowed the Evaluators to select from a large group of similar households that have not received home energy reports. With this information, the Evaluators matched the treatment group to a similar control group on the following variables:

- Pre-period spring usage
- Pre-period summer usage
- Pre-period fall usage
- Pre-period winter usage
- Customer zip code

After matching, a t-test was conducted for each month in the pre-period to help determine the success of PSM.

The Evaluators employed propensity score matching using the nearest match algorithm at a one-to-one matching ratio and had a considerable pool of control customers to draw upon, as shown in Table 4-8. The matching ratio defines the number of control customers to be matched to one treatment customer. In addition, the Evaluators allowed replacement of customers, essentially allowing the algorithm to select a control customer for more than one unique treatment customer. The following tables display the number of customers in the resulting matched dataset for the T5 group.

Table 4-8 PSM Customer Matches, T5 Group

Status	Control	Treated
All	36,726	1,646
Matched	1,589	1,646
Unmatched	34,911	0
Discarded	226	0

The following figures display the average customer usage between treatment group and control group before and after propensity score matching against the aggregate for all control customers.

Figure 4-1 T5 Average Daily Usage Before Matching

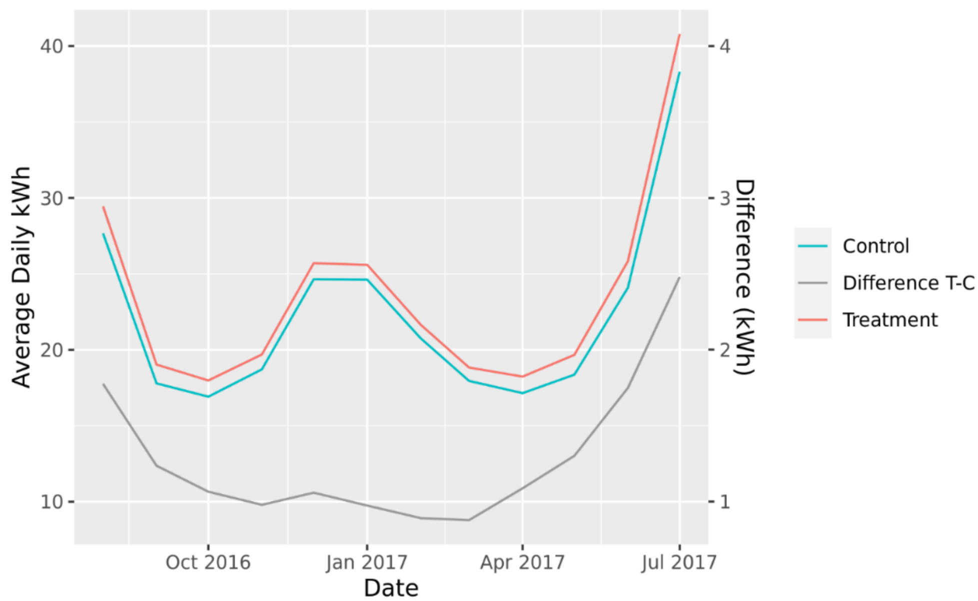
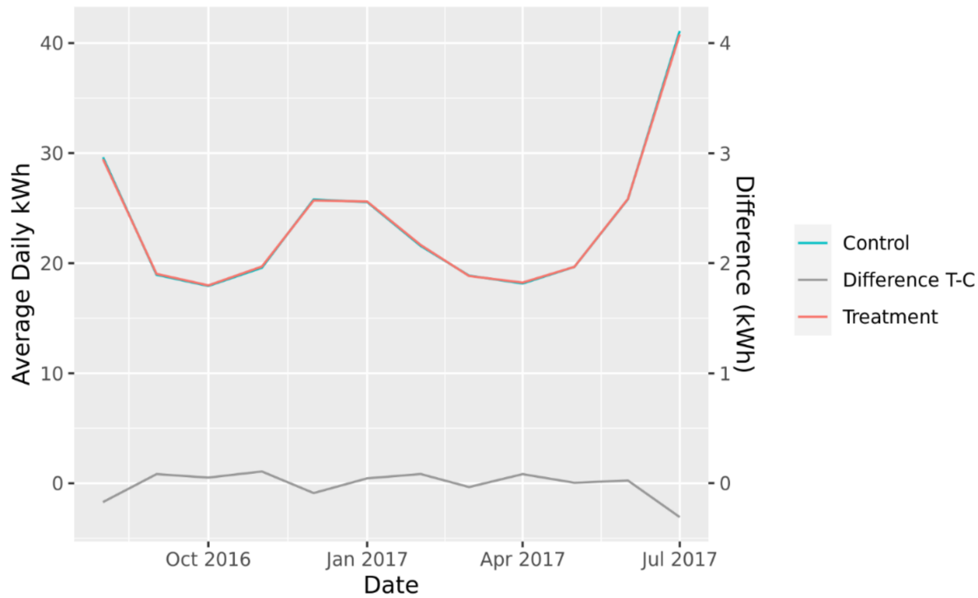


Figure 4-2 T5 Average Daily Usage After Matching



The difference between the groups for each month decreases after propensity score matching, and the difference between the groups nears 0 for all months for the T5 group, indicating the treatment and control groups are much more similar in terms of energy usage across the pre-period.

The tables below present the propensity score covariate summary of pre-period usage for treatment and control customers before and after matching for each of the groups in which propensity score matching was conducted. The standardized mean difference both prior to and after matching is around 1 kWh per day for all covariates.

Table 4-9 PSM Covariate Summary, T5

Variable	Before Matching			After Matching		
	Mean Treated	Mean Control	Standardized Mean Difference	Mean Treated	Mean Control	Standardized Mean Difference
Distance	0.047	0.043	0.215	0.047	0.047	0.001
Pre-period Winter Usage	24.317	23.341	0.099	24.317	24.303	0.001
Pre-period Spring Usage	18.915	17.824	0.188	18.915	18.897	0.003
Pre-period Summer Usage	32.026	30.023	0.179	32.026	32.177	-0.013
Pre-period Fall Usage	18.903	17.809	0.198	18.903	18.822	0.015

The tables below provide the results for a t-test which helps determine the success of matching for each group. The test measures whether there are statistically significant differences in average daily kWh usage between the treatment and control groups in the pre-period by month. Statistically significant differences occur when the P-Value is less than 0.05 at the 95% significance level. As displayed in the table below, the P-Value is much greater than 0.05 for all 12 pre-period months. This result further indicates propensity score matching performed satisfactorily, as there were no instances for a rejection of the null hypothesis for any of the pre-period months. Therefore, the Evaluators accept this group as a viable match for the T5 group.

Table 4-10 T5 Post Matching T-Test of Difference in Usage by Month

Pre-Period Month	Treatment Group Average Daily Usage (kWh/day)	Control Group Average Daily Usage (kWh/day)	Average Daily Usage Difference (kWh/day)	P-value	Statistically Significant Difference
Aug 2016	29.45	29.62	-0.17	0.6481	-
Sep 2016	19.03	18.95	0.08	0.7004	-
Oct 2016	17.98	17.93	0.05	0.7981	-
Nov 2016	19.7	19.59	0.11	0.6417	-
Dec 2016	25.7	25.79	-0.09	0.8124	-
Jan 2017	25.6	25.55	0.05	0.9118	-
Feb 2017	21.65	21.57	0.08	0.7819	-
Mar 2017	18.83	18.87	-0.04	0.8879	-
Apr 2017	18.24	18.16	0.08	0.7104	-
May 2017	19.67	19.67	0	0.9826	-
Jun 2017	25.84	25.81	0.03	0.9369	-
Jul 2017	40.79	41.1	-0.31	0.5819	-

After creating a PSM control group, the Evaluators fit a D-in-D and PPR model presented in Equation 3-1 to estimate daily consumption differences between homes that received home energy reports and home that did not receive home energy reports.

4.4 Double Counting Analysis Results

Participants in both the treatment and control groups participate in other Idaho Power Company energy efficiency programs. The double counted savings, defined in the methodology, whether positive or negative, are subtracted from the group's gross savings estimates from the regression analysis to get total verified savings. This section summarizes the results of the double counting analysis for downstream programs.

4.4.1 Downstream

IPC delivered tracking data for 10 different programs offered to residential customers. The Evaluators identified and summarized the average treatment customer, average control customer, and average incremental savings attributed to the residential programs for each group. Table 4-11 displays the verified double counting savings to be subtracted from each group's annual program savings for each program year.

Table 4-11 PY2021 Downstream Double Counting Results

Group	Average Treatment Household Daily Savings (kWh/day)	Average Control Household Daily Savings (kWh/day)	Average Incremental Household Daily Savings (kWh/day)	Average Annual Household Savings (kWh/year)	Weighted Treatment Customers	Downstream Program Double Count Savings	Contribution to Total Savings
T1	0.0337	0.0354	-0.0017	-0.6024	4,949	-2,990	-0.25%
T2	0.0230	0.0045	0.0186	6.7758	4,320	29,380	2.23%
T3	0.0067	0.0026	0.0041	1.5022	5,024	7,554	0.57%
T4	0.0033	0.0006	0.0027	0.9862	2,356	2,323	0.38%
T5	0.0018	0.0028	-0.0010	-0.3798	1,646	-625	-0.07%
T6	0.0083	0.0119	-0.0037	-1.3173	88,827	-117,087	-0.90%
Total	**0.0769**	**0.0578**	**0.0191**	**6.9646**	**107,122**	**-81,444**	**-0.44%**

PY2021 displays a total of -81,444 kWh in double counted savings, contributing a total of -0.44% towards program savings. Therefore, the total program savings declined by 0.44% due to removal of double counted savings. This estimate is in line with expectations that double counted savings contribute between -2% and 2% towards total program savings for a behavioral program. The downstream double counting values are estimated for 2021 other program participation and are subtracted from the regression model results to estimate energy savings as a result of the Home Energy Report Program offered by IPC.

4.5 Linear Regression Modeling Results

This section details the regression results of each of the evaluated groups. The T1, T2, T3, T4, and T6 groups were evaluated with the remaining RCT groups. The T5 group was evaluated with the matched control group created via propensity score matching.

As discussed in the evaluation approach section, savings are determined through parameters. The coefficients β_3 and β_4 which are defined again in Table 4-12, along with all the other model parameters.

Table 4-12 Regression Parameters

Variable	Parameter	Interpretation
Post	B1	Average daily usage in the post-period
Post*Month	B2	Average daily usage in month *i*
Treatment*Post	B3	Average daily usage for the treatment group in the post-period
Treatment*Post*Month	B4	Average daily usage in month *i* in the post-period

Per-home results and percent savings by month and by program year are presented for each of the analyzed groups. Joint savings attributable to IPC downstream programs were calculated and removed to avoid double counting.

The Evaluators found all groups to display positive savings that are statistically significant, and each model portrayed a sufficient fitness to the data.

4.5.1 T1 Group Results

This section summarizes the results of the persistence study evaluation for the T1 Group. In the table below, the coefficient estimates for Treatment*Post terms (B3) are negative, indicating lower usage per month in the post-period for treatment customers. In addition, these coefficients are statically significant at the 95% level in both program years. The estimates for Treatment*Post*Month (B4) are all positive. The Treatment*Post*Month coefficients are aggregated with the Treatment*Post coefficient, which results in a negative value. This indicates positive energy savings for all months in 2021. Each of the Treatment*Post*Monthly coefficients are statistically significant. This indicates a positive savings effect for home energy report treatment at the 95% confidence interval.

Table 4-13 T1 Group PY2021 Regression Results

Coefficient	Estimate	Std Error	P Value	5%	95%
Post	-6.44	0.2	<0.001	-6.76	-6.12
February	-26.53	0.28	<0.001	-26.99	-26.07
March	-53.2	0.28	<0.001	-53.66	-52.74
April	-62.33	0.28	<0.001	-62.79	-61.87
May	-72.55	0.28	<0.001	-73	-72.09
June	-70.29	0.28	<0.001	-70.74	-69.83
July	-58.01	0.28	<0.001	-58.47	-57.55
August	-65.7	0.28	<0.001	-66.15	-65.24
September	-72.26	0.28	<0.001	-72.71	-71.8
October	-64.44	0.28	<0.001	-64.9	-63.98
November	-49.29	0.28	<0.001	-49.75	-48.83
December	-6.82	0.28	<0.001	-7.29	-6.36
Treatment*Post	-24.7	0.37	<0.001	-25.31	-24.09
Treatment*Post*February	24.22	0.44	<0.001	23.5	24.94
Treatment*Post*March	32.11	0.44	<0.001	31.39	32.83
Treatment*Post*April	27.14	0.44	<0.001	26.43	27.86
Treatment*Post*May	28.24	0.44	<0.001	27.52	28.96
Treatment*Post*June	35.59	0.44	<0.001	34.87	36.31
Treatment*Post*July	30.54	0.44	<0.001	29.82	31.26
Treatment*Post*August	26.83	0.44	<0.001	26.11	27.55
Treatment*Post*September	25.83	0.44	<0.001	25.12	26.55
Treatment*Post*October	24.51	0.44	<0.001	23.79	25.23
Treatment*Post*November	27.1	0.44	<0.001	26.39	27.82
Treatment*Post*December	6.89	0.44	<0.001	6.16	7.61

*Per-household fixed-effects coefficients were omitted from this table for brevity

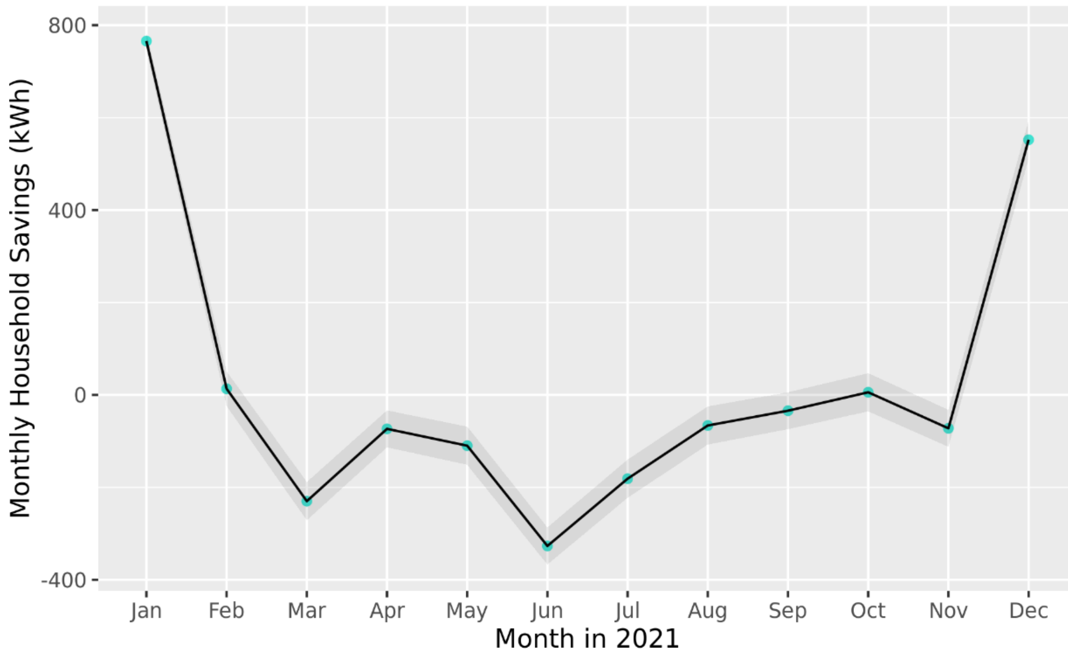
The PY2021 model of group T1 was a very good fit, per the Adjusted R-square in Table 4-14.

Table 4-14 T1 Group Model Fit

Adjusted R2	F Statistic	Number of Observations	Number of Weighted Treatment Customers
0.7343	66.66	147,564	4,949

Figure 4-3 displays the monthly household savings for PY2021 resulting from the linear regression, with associated confidence intervals.

Figure 4-3 T1 Group PY2021 Monthly Household Savings Before Adjustments



In the winter, the household savings for the T1 group are positive; however, in the summer these savings are near zero or negative. The following table presents the home energy report savings for the T1 group by month. This was calculated using the Post*Treatment*Month (B4) and Post*Treatment (B3) terms, multiplied by the number of days in the month, and the number of weighted customers present in that month. This table also presents the double counted savings for the group, as well as the final monthly savings after removing double counted savings for each month.

Table 4-15 T1 Group PY2021 Monthly Savings Summary

Month	Average Treatment Impact (kWh/month)	Average Incremental Double Counted Savings (kWh/month)	Average Treatment Impact per Customer After Double Count (kWh/month)	Control Group Usage (kWh/month)	Percent Savings
January	765.62	-0.05	765.67	2,633.59	29.07%
February	13.37	-0.05	13.42	2,297.97	0.58%
March	-229.84	-0.05	-229.79	1,962.26	-11.71%
April	-73.43	-0.05	-73.38	1,464.96	-5.01%
May	-109.86	-0.05	-109.81	1,231.54	-8.92%
June	-326.82	-0.05	-326.77	1,479.91	-22.08%
July	-181.24	-0.05	-181.19	1,769.72	-10.24%
August	-66.1	-0.05	-66.05	1,400.93	-04.72%
September	-34.11	-0.05	-34.06	1,115.54	-03.06%
October	5.73	-0.05	5.78	1,354.89	0.42%
November	-72.23	-0.05	-72.18	1,858.8	-3.89%
December	552.12	-0.05	552.17	2,614.11	21.12%

The ex-post gross kWh savings of Home Energy Report program for the T1 group is summarized below by program year. The number of customers used to calculate total ex-post kWh savings is the number of weighted treatment customers in the post-period.

Table 4-16 T1 Group Ex-Post Annual kWh Savings

Annual Unadjusted Savings Per Home (kWh/year)	5% CI Annual Unadjusted Savings Per Home (kWh/year)	95% CI Annual Unadjusted Savings Per Home (kWh/year)	Annual Double Counted Savings Per Home (kWh/year)	Annual Adjusted Savings Per Home (kWh/year)	Annual Control Group Usage Per Home (kWh/year)	Annual Percent Savings Per Home
243.31	399.73	86.9	-0.60	243.92	21,184.22	1.15%

Table 4-17 T1 Group Total Program Year Savings

Annual Adjusted Savings Per Home (kWh)	Weighted Treatment Customers	Program Year Savings (kWh)	Program Year Savings (kWh) 5% CI	Program Year Savings (kWh) 95% CI
243.92	4,949	1,207,146.24	1,981,248.71	433,043.78

The T1 group displayed 1.15% annual household savings for PY2021. Average annual household savings for treated customers in the T1 group was 243 kWh. Household savings estimates were extrapolated using the number of weighted treatment customers active in the post-period. The Evaluators found the T1 group to display 1,207,146 kWh in savings for the PY2021 evaluation. In addition, the 95% confidence intervals are summarized for each program year.

4.5.2 T2 Group Results

This section summarizes the results of the persistence study evaluation for the T2 Group. In the table below, the coefficient estimates for Treatment*Post terms (B3) are nearly all negative, indicating lower usage per month in the post-period for treatment customers. This coefficient is statistically significant for all PY2021 months except February. The estimate for Treatment*Post*Month (B4) is mostly negative with the exception being the early summer months of May, June, and July. The Treatment*Post*Month coefficients are aggregated with the Treatment*Post coefficient, which mostly results in a negative value. This indicates positive savings for the majority of the year. Apart from September, all the Treatment*Post*Monthly coefficients are statistically significant, and once aggregated the results remain statistically significant. This indicates a positive savings effect for home energy report treatment at the 95% confidence interval.

Table 4-18 T2 Group PY2021 Regression Results

Coefficient	Estimate	Std Error	P Value	5%	95%
Post	-1.19	0.23	<0.001	-1.57	-0.80
February	0.24	0.28	0.396	-0.22	0.70
March	-16.3	0.28	<0.001	-16.77	-15.84
April	-36.15	0.28	<0.001	-36.61	-35.69
May	-49.44	0.28	<0.001	-49.9	-48.97
June	-47.97	0.28	<0.001	-48.43	-47.51
July	-38.62	0.28	<0.001	-39.08	-38.16
August	-44.26	0.28	<0.001	-44.72	-43.8
September	-50.7	0.28	<0.001	-51.16	-50.23
October	-40.18	0.28	<0.001	-40.64	-39.72
November	-13.04	0.28	<0.001	-13.5	-12.58
December	12.21	0.28	<0.001	11.75	12.68
Treatment*Post	1.35	0.38	<0.001	0.72	1.98
Treatment*Post*February	-2.45	0.43	<0.001	-3.16	-1.74
Treatment*Post*March	-5.32	0.43	<0.001	-6.02	-4.61
Treatment*Post*April	-0.91	0.43	0.033	-1.62	-0.21
Treatment*Post*May	1.3	0.43	0.002	0.6	2.01
Treatment*Post*June	5.69	0.43	<0.001	4.98	6.39
Treatment*Post*July	2.41	0.43	<0.001	1.71	3.12
Treatment*Post*August	-1.62	0.43	<0.001	-2.32	-0.91
Treatment*Post*September	-0.29	0.43	0.496	-1	0.41
Treatment*Post*October	-1.53	0.43	<0.001	-2.23	-0.82
Treatment*Post*November	-10.31	0.43	<0.001	-11.01	-9.61
Treatment*Post*December	-13.14	0.43	<0.001	-13.84	-12.43

*Per-household fixed-effects coefficients were omitted from this table for brevity

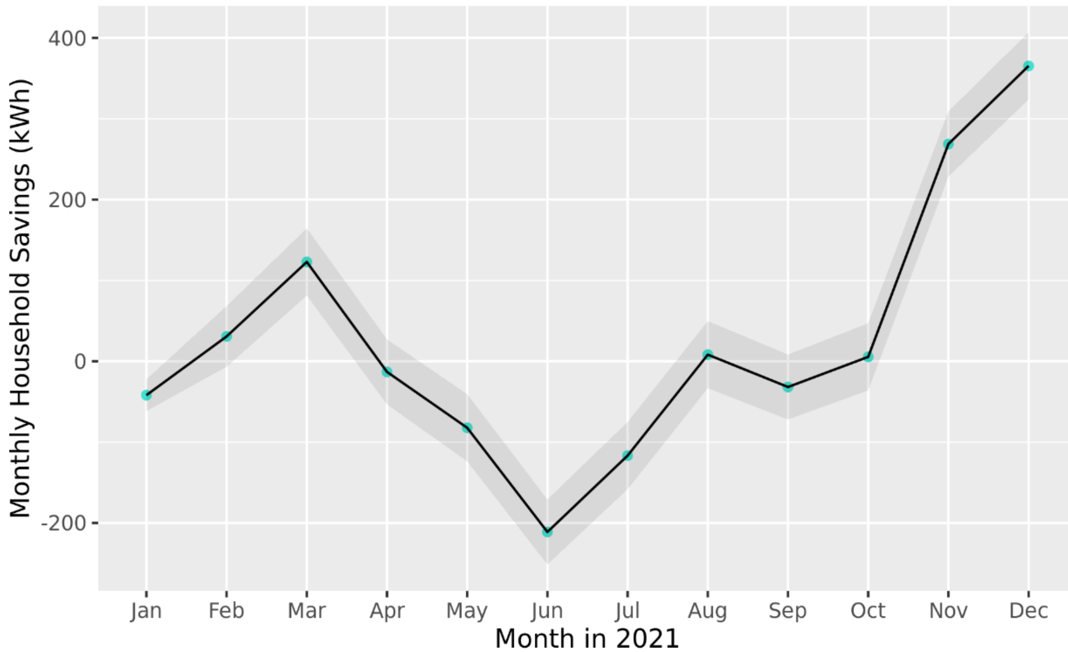
The PY2021 model of group T2 was a very good fit, per the Adjusted R-square in Table 4-19.

Table 4-19 T2 Group Model Fit

Adjusted R2	F Statistic	Number of Observations	Number of Weighted Treatment Customers
0.7605	76.58	120,324	4,320

Figure 4-4 displays the monthly household savings for PY2021 resulting from the linear regression, with associated confidence intervals.

Figure 4-4 T2 Group PY2021 Monthly Household Savings Before Adjustments



Although the summer months display negative savings, the annual household savings for the T2 group is positive. The following table presents the home energy report savings for the T2 group by month. This was calculated using the Post*Treatment*Month (B4) and Post*Treatment (B3) terms, multiplied by the number of days in the month, and the number of weighted customers present in that month. This table also presents the double counted savings for the group, as well as the final monthly savings after removing double counted savings for each month.

Table 4-20 T2 Group PY2021 Monthly Savings Summary

Month	Average Treatment Impact (kWh/month)	Average Incremental Double Counted Savings (kWh/month)	Average Treatment Impact per Customer After Double Count (kWh/month)	Control Group Usage (kWh/month)	Percent Savings
January	-41.92	0.58	-42.50	2,674.56	-1.57%
February	30.73	0.52	30.21	2,356.54	1.30%
March	122.88	0.58	122.30	1,997.87	6.15%
April	-13.17	0.56	-13.73	1,460.31	-0.90%
May	-82.29	0.58	-82.87	1,136.85	-7.24%
June	-211.16	0.56	-211.72	1,274.00	-16.57%
July	-116.72	0.58	-117.30	1,495.06	-7.81%
August	8.18	0.58	7.60	1,193.44	0.69%
September	-31.83	0.56	-32.39	1,002.91	-3.17%
October	5.45	0.58	4.87	1,326.82	0.41%
November	268.73	0.56	268.17	1,860.31	14.45%
December	365.35	0.58	364.78	2,624.05	13.92%

The ex-post gross kWh savings of Home Energy Report program for the T2 group is summarized below by program year. The number of customers used to calculate total ex-post kWh savings is the number of weighted treatment customers in the post-period.

Table 4-21 T2 Group Ex-Post Annual kWh Savings

Annual Unadjusted Savings Per Home (kWh/year)	5% CI Annual Unadjusted Savings Per Home (kWh/year)	95% CI Annual Unadjusted Savings Per Home (kWh/year)	Annual Double Counted Savings Per Home (kWh/year)	Annual Adjusted Savings Per Home (kWh/year)	Annual Control Group Usage Per Home (kWh/year)	Annual Percent Savings Per Home
304.49	483.89	125.09	6.78	297.71	20,402.72	1.46%

Table 4-22 T2 Group Total Program Year Savings

Annual Net Savings Per Home (kWh)	Weighted Treatment Customers	Program Year Savings (kWh)	Program Year Savings (kWh) 5% CI	Program Year Savings (kWh) 95% CI
297.71	4,320	1,286,193.89	2,061,254.98	511,132.80

The T2 group displayed 1.46% annual household savings for PY2021. Average annual household savings for treated customers in the T2 group was 298 kWh. Household savings estimates were extrapolated using the number of weighted treatment customers active in the post-period. The Evaluators found the

T2 group to display 1,286,194 kWh in savings for the PY2021 evaluation. In addition, the 95% confidence intervals are summarized for each program year.

4.5.3 T3 Group Results

This section summarizes the results of the persistence study evaluation for the T3 group. In the table below, the coefficient estimates for Treatment*Post terms (B3) are mostly negative, indicating lower usage per month in the post-period for treatment customers. In addition, these coefficients were statically significant at the 95% level. The estimate for Treatment*Post*Month (B4) was positive for all months. The Treatment*Post*Month coefficients are aggregated with the Treatment*Post coefficient, which results in a negative value. This indicates positive savings for the majority of the year. Each of the Treatment*Post*Monthly coefficients are statistically significant. This indicates a positive savings effect for home energy report treatment at the 95% confidence interval.

Table 4-23 T3 PY2021 Regression Results

Coefficient	Estimate	Std Error	P Value	5%	95%
Post	-1.05	0.09	<0.001	-1.19	-0.90
February	-6.05	0.16	<0.001	-6.31	-5.79
March	-11.56	0.16	<0.001	-11.83	-11.30
April	-13.11	0.16	<0.001	-13.37	-12.84
May	-10.12	0.16	<0.001	-10.39	-9.86
June	2.19	0.16	<0.001	1.93	2.45
July	18.93	0.16	<0.001	18.67	19.20
August	6.37	0.16	<0.001	6.11	6.64
September	-8.96	0.16	<0.001	-9.22	-8.70
October	-12.63	0.16	<0.001	-12.90	-12.37
November	-9.82	0.16	<0.001	-10.08	-9.55
December	0.88	0.16	<0.001	0.62	1.15
Treatment*Post	-5.26	0.22	<0.001	-5.63	-4.89
Treatment*Post*February	4.81	0.29	<0.001	4.33	5.28
Treatment*Post*March	5.72	0.29	<0.001	5.25	6.20
Treatment*Post*April	5.45	0.29	<0.001	4.98	5.92
Treatment*Post*May	4.03	0.29	<0.001	3.56	4.51
Treatment*Post*June	12.34	0.29	<0.001	11.87	12.81
Treatment*Post*July	5.18	0.29	<0.001	4.71	5.66
Treatment*Post*August	2.85	0.29	<0.001	2.38	3.33
Treatment*Post*September	5.19	0.29	<0.001	4.72	5.66
Treatment*Post*October	3.92	0.29	<0.001	3.44	4.39
Treatment*Post*November	4.41	0.29	<0.001	3.94	4.88
Treatment*Post*December	0.8	0.29	0.005	0.33	1.27

*Per-household fixed-effects coefficients were omitted from this table for brevity

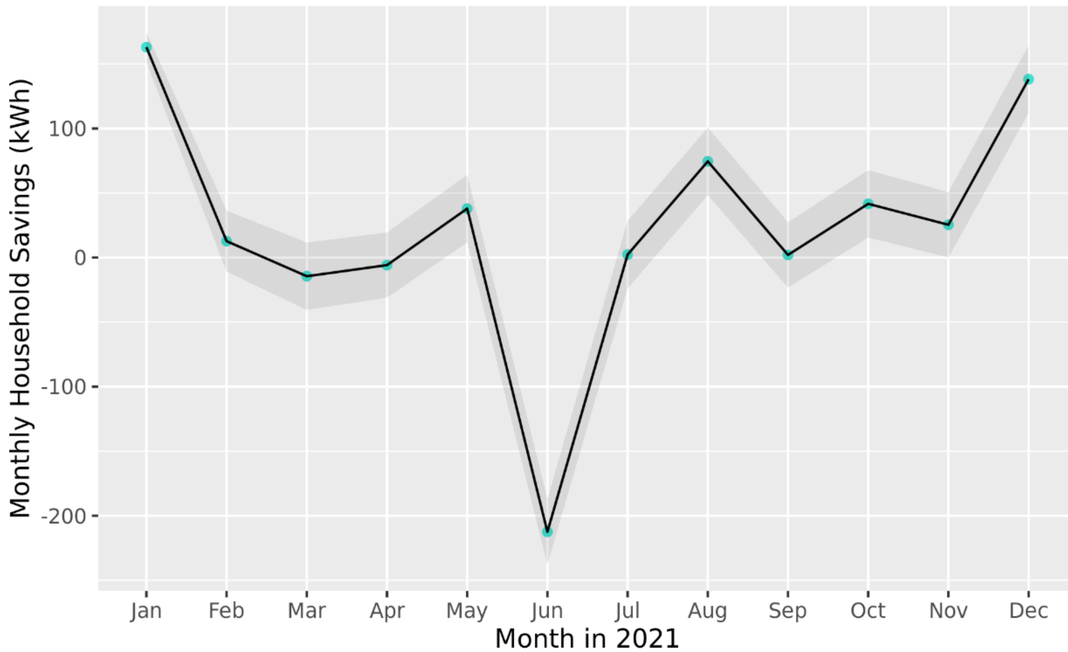
The PY2021 model of group T3 was a good fit, per the Adjusted R-square in Table 4-24.

Table 4-24 T3 Group Model Fit

Adjusted R2	F Statistic	Number of Observations	Number of Weighted Treatment Customers
0.6776	51.24	192,438	5,024

Figure 4-5 displays the monthly household savings for PY2021 resulting from the linear regression, with associated confidence intervals.

Figure 4-5 T3 Group PY2021 Monthly Household Savings Before Adjustments



Although there were substantially negative savings in June and slightly negative ones in March and April, the annual household savings for the T3 group is positive. The following table presents the home energy report savings for the T3 group by month. This was calculated using the Post*Treatment*Month (B4) and Post*Treatment (B3) terms, multiplied by the number of days in the month, and the number of weighted customers present in that month. This table also presents the double counted savings for the group, as well as the final monthly savings after removing double counted savings for each month.

Table 4-25 T3 Group PY2021 Monthly Savings Summary

Month	Average Treatment Impact (kWh/month)	Average Incremental Double Counted Savings (kWh/month)	Average Treatment Impact per Customer After Double Count (kWh/month)	Control Group Usage (kWh/month)	Percent Savings
January	163.02	0.13	162.89	1,286.79	12.67%
February	12.70	0.12	12.59	1,126.40	1.13%
March	-14.45	0.13	-14.58	1,098.81	-1.32%
April	-5.83	0.12	-5.95	1,003.13	-0.58%
May	37.97	0.13	37.84	1,085.42	3.50%
June	-212.46	0.12	-212.58	1,666.18	-12.75%
July	2.29	0.13	2.16	2,020.32	0.11%
August	74.53	0.13	74.41	1,555.50	4.79%
September	2.06	0.12	1.93	1,119.78	0.18%
October	41.64	0.13	41.51	1,013.25	4.11%
November	25.40	0.12	25.28	1,085.71	2.34%
December	138.21	0.13	138.08	1,347.97	10.25%

The ex-post gross kWh savings of Home Energy Report program for the T3 group is summarized below by program year. The number of customers used to calculate total ex-post kWh savings is the number of weighted treatment customers in the post-period.

Table 4-26 T3 Group Ex-Post Annual kWh Savings

Annual Unadjusted Savings Per Home (kWh/year)	5% CI Annual Unadjusted Savings Per Home (kWh/year)	95% CI Annual Unadjusted Savings Per Home (kWh/year)	Annual Double Counted Savings Per Home (kWh/year)	Annual Adjusted Savings Per Home (kWh/year)	Annual Control Group Usage Per Home (kWh/year)	Annual Percent Savings Per Home
265.19	345.62	184.76	1.50	263.69	15,409.27	1.71%

Table 4-27 T3 Group Total Program Year Savings

Annual Net Savings Per Home (kWh)	Weighted Treatment Customers	Program Year Savings (kWh)	Program Year Savings (kWh) 5% CI	Program Year Savings (kWh) 95% CI
263.69	5,024	1,324,881.76	1,728,990.32	920,773.21

The T3 group displayed 1.71% annual household savings for PY2021. Average annual household savings for treated customers in the T3 was 264 kWh. Household savings estimates were extrapolated using the number of weighted treatment customers active in the post-period. The Evaluators found the T3 group to display 1,324,882 kWh in savings for the PY2021 evaluation period. In addition, the 95% confidence intervals are summarized for each program year.

4.5.4 T4 Group Results

This section summarizes the results of the persistence study evaluation for the T4 Group. In the table below, the coefficient estimates for Treatment*Post terms (B3) are mostly negative, indicating lower usage per month in the post-period for treatment customers. In addition, these coefficients are statically significant at the 95% level. The estimate for Treatment*Post*Month (B4) is positive for all months in 2021. The Treatment*Post*Month coefficients are aggregated with the Treatment*Post coefficient, which results in a negative value and consequent positive savings. Each of the Treatment*Post*Monthly coefficients are statistically significant which indicates a statistically significant positive savings effect for home energy report treatment at the 95% confidence interval.

Table 4-28 T4 Group PY2021 Regression Results

Coefficient	Estimate	Std Error	P Value	5%	95%
Post	0.63	0.08	<0.001	0.50	0.76
February	-4.16	0.16	<0.001	-4.42	-3.9
March	-7.88	0.16	<0.001	-8.14	-7.63
April	-9.14	0.16	<0.001	-9.39	-8.88
May	-7.55	0.16	<0.001	-7.81	-7.29
June	2.81	0.16	<0.001	2.55	3.07
July	16.91	0.16	<0.001	16.65	17.17
August	5.19	0.16	<0.001	4.93	5.45
September	-6.88	0.16	<0.001	-7.14	-6.63
October	-9.01	0.16	<0.001	-9.27	-8.75
November	-6.67	0.16	<0.001	-6.93	-6.41
December	0.44	0.16	0.005	0.19	0.70
Treatment*Post	-3.54	0.24	<0.001	-3.93	-3.15
Treatment*Post*February	3.24	0.31	<0.001	2.73	3.75
Treatment*Post*March	3.51	0.31	<0.001	3.01	4.02
Treatment*Post*April	2.98	0.31	<0.001	2.47	3.49
Treatment*Post*May	2.05	0.31	<0.001	1.54	2.56
Treatment*Post*June	8.38	0.31	<0.001	7.87	8.89
Treatment*Post*July	2.65	0.31	<0.001	2.14	3.16
Treatment*Post*August	1.71	0.31	<0.001	1.20	2.22
Treatment*Post*September	3.3	0.31	<0.001	2.79	3.81
Treatment*Post*October	2.64	0.31	<0.001	2.13	3.15
Treatment*Post*November	2.85	0.31	<0.001	2.34	3.35
Treatment*Post*December	0.69	0.31	0.025	0.18	1.20

*Per-household fixed-effects coefficients were omitted from this table for brevity

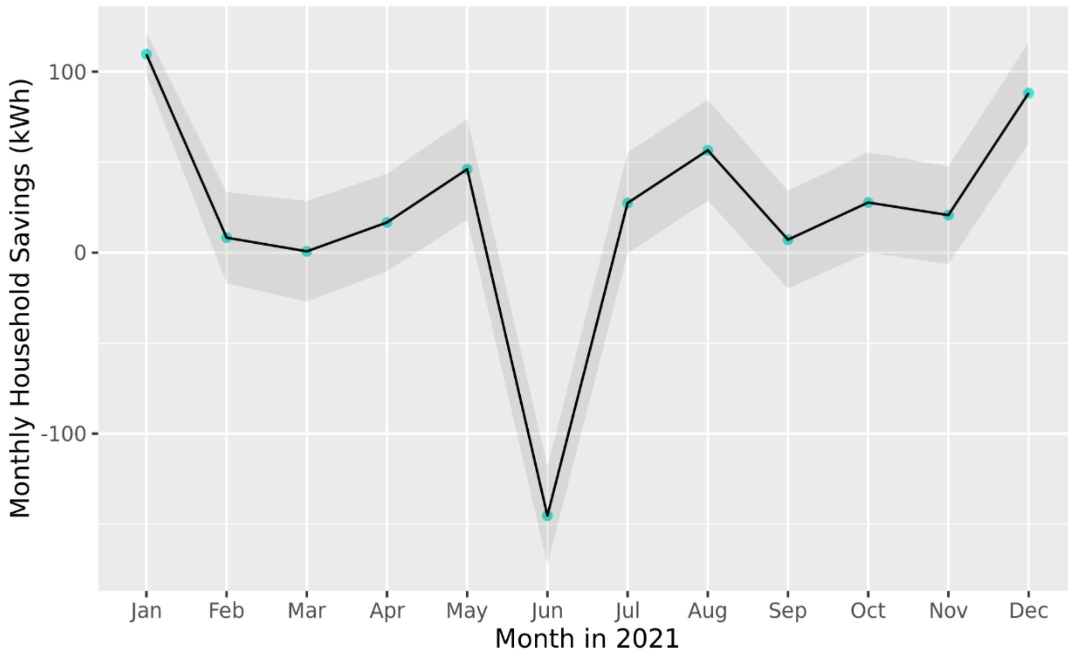
The PY2021 model of group T4 was a good fit, per the Adjusted R-square in Table 4-29.

Table 4-29 T4 Group Model Fit

Adjusted R2	F Statistic	Number of Observations	Number of Weighted Treatment Customers
0.5804	34.02	109,651	2,356

Figure 4-6 displays the monthly household savings for PY2021 resulting from the linear regression, with associated confidence intervals.

Figure 4-6 T4 Group PY2021 Monthly Household Savings Before Adjustments



Although June displays clear negative savings, the annual household savings for the T4 group is positive due to large savings in all other months. The following table presents the home energy report savings for the T4 group by month. This was calculated using the Post*Treatment*Month (B4) and Post*Treatment (B3) terms, multiplied by the number of days in the month, and the number of weighted customers present in that month. This table also presents the double counted savings for the group, as well as the final monthly savings after removing double counted savings for each month.

Table 4-30 T4 Group PY2021 Monthly Savings Summary

Month	Average Treatment Impact (kWh/day)	Average Incremental Double Counted Savings (kWh/month)	Average Treatment Impact per Customer After Double Count (kWh/month)	Control Group Usage (kWh/day)	Percent Savings
January	109.63	0.08	109.55	904.49	12.12%
February	8.28	0.08	8.20	785.78	1.05%
March	0.72	0.08	0.63	762.22	0.09%
April	16.70	0.08	16.62	689.04	2.42%
May	46.10	0.08	46.02	741.28	6.22%
June	-145.31	0.08	-145.40	1,231.8	-11.80%
July	27.43	0.08	27.35	1,539.91	1.78%
August	56.57	0.08	56.48	1,137.32	4.97%
September	7.18	0.08	7.09	780.98	0.92%
October	27.71	0.08	27.63	706.77	3.92%
November	20.73	0.08	20.65	766.39	2.70%
December	88.17	0.08	88.08	941.88	9.36%

The ex-post gross kWh savings of Home Energy Report program for the T4 group is summarized below by program year. The number of customers used to calculate total ex-post kWh savings is the number of weighted treatment customers in the post-period.

Table 4-31 T4 Group Ex-Post Annual kWh Savings by Program Year

Annual Unadjusted Savings Per Home (kWh/year)	5% CI Annual Unadjusted Savings Per Home (kWh/year)	95% CI Annual Unadjusted Savings Per Home (kWh/year)	Annual Double Counted Savings Per Home (kWh/year)	Annual Adjusted Savings Per Home (kWh/year)	Annual Control Group Usage Per Home (kWh/year)	Annual Percent Savings Per Home
263.98	342.98	184.97	0.99	262.99	10,987.86	2.39%

Table 4-32 T4 Group Total Program Year Savings by Evaluation Period

Annual Net Savings Per Home (kWh)	Weighted Treatment Customers	Program Year Savings (kWh)	Program Year Savings (kWh) 5% CI	Program Year Savings (kWh) 95% CI
262.99	2,356	619,578.90	805,709.18	433,448.62

The T4 group displayed 2.39% annual household savings for PY2021. Average annual household savings for treated customers in the T4 group was 263 kWh. Household savings estimates were extrapolated using the number of weighted treatment customers active in the post-period. The Evaluators found the

T4 group to display 619,579 kWh in savings for the PY2021 evaluation period. In addition, the 95% confidence intervals are summarized for each program year.

4.5.5 T5 Group Results

This section summarizes the results of the persistence study evaluation for the T5 Group. In the table below, the coefficient estimate for Treatment*Post terms (B3) is negative for most months, indicating lower usage per month in the post-period for treatment customers. The exceptions to this are the summer months June, July, and August, as well as December. The estimates for Treatment*Post*Month (B4) are all positive. The Treatment*Post*Month coefficients are aggregated with the Treatment*Post coefficient, which results in a negative value. Treatment*Post*Monthly coefficients were statistically significant for all months except December. However, the results remain statistically significant once aggregated. This indicates a statistically significant and positive savings effect for home energy report treatment at the 95% confidence interval.

Table 4-33 T5 Group PY2021 Regression Results

Coefficient	Estimate	Std Error	P Value	5%	95%
Post	3.3	0.09	<0.001	3.15	3.45
February	-2.94	0.18	<0.001	-3.24	-2.64
March	-5.9	0.18	<0.001	-6.2	-5.6
April	-6.84	0.18	<0.001	-7.14	-6.54
May	-5.57	0.18	<0.001	-5.87	-5.27
June	3.69	0.18	<0.001	3.39	3.99
July	16.47	0.18	<0.001	16.17	16.77
August	4.78	0.18	<0.001	4.48	5.07
September	-5.5	0.18	<0.001	-5.79	-5.2
October	-7.05	0.18	<0.001	-7.35	-6.75
November	-5.11	0.18	<0.001	-5.4	-4.81
December	0.52	0.18	0.004	0.22	0.81
Treatment*Post	-3.66	0.27	<0.001	-4.11	-3.21
Treatment*Post*February	2.1	0.36	<0.001	1.51	2.69
Treatment*Post*March	2.24	0.36	<0.001	1.65	2.83
Treatment*Post*April	2.05	0.36	<0.001	1.46	2.64
Treatment*Post*May	1.51	0.36	<0.001	0.92	2.1
Treatment*Post*June	7.23	0.36	<0.001	6.64	7.83
Treatment*Post*July	2.19	0.36	<0.001	1.6	2.78
Treatment*Post*August	2.04	0.36	<0.001	1.45	2.63
Treatment*Post*September	3.06	0.36	<0.001	2.47	3.65
Treatment*Post*October	2.15	0.36	<0.001	1.56	2.74
Treatment*Post*November	2.2	0.36	<0.001	1.61	2.79
Treatment*Post*December	0.53	0.36	0.14	-0.06	1.12

*Per-household fixed-effects coefficients were omitted from this table for brevity

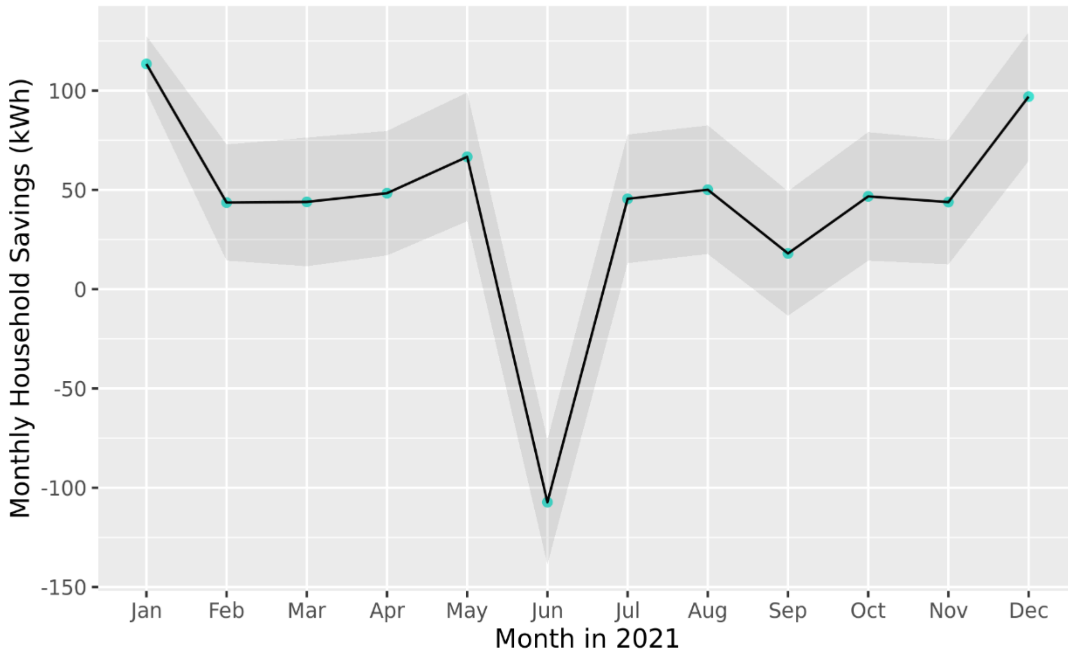
The PY2021 model of group T5 was a good fit, per the Adjusted R-square in Table 4-34.

Table 4-34 T5 Group Model Fit

Adjusted R2	F Statistic	Number of Observations	Number of Weighted Treatment Customers
0.5490	29.98	77,548	1,646

Figure 4-7 displays the monthly household savings for PY2021 resulting from the linear regression, with associated confidence intervals.

Figure 4-7 T5 Group PY2021 Monthly Household Savings Before Adjustments



All months except June display positive savings. Therefore, the annual household savings for the T5 group is positive. The following table presents the home energy report savings for the T5 group by month. This was calculated using the Post*Treatment*Month (B4) and Post*Treatment (B3) terms, multiplied by the number of days in the month, and the number of weighted customers present in that month. This table also presents the double counted savings for the group, as well as the final monthly savings after removing double counted savings for each month.

Table 4-35 T5 Group PY2021 Monthly Savings Summary

Month	Average Treatment Impact (kWh/day)	Average Incremental Double Counted Savings (kWh/month)	Average Treatment Impact per Customer After Double Count (kWh/month)	Control Group Usage (kWh/day)	Percent Savings
January	113.42	-0.03	113.45	807.45	14.05%
February	43.61	-0.03	43.64	706.77	6.17%
March	43.95	-0.03	43.98	680.50	6.46%
April	48.34	-0.03	48.37	613.34	7.88%
May	66.64	-0.03	66.67	659.47	10.10%
June	-107.27	-0.03	-107.24	1,104.30	-9.71%
July	45.50	-0.03	45.53	1,387.71	3.28%
August	50.08	-0.03	50.11	1,009.16	4.96%
September	18.00	-0.03	18.04	686.14	2.62%
October	46.72	-0.03	46.75	626.65	7.46%
November	43.86	-0.03	43.89	679.94	6.45%
December	96.95	-0.03	96.99	847.13	11.45%

The ex-post gross kWh savings of Home Energy Report program for the T5 group is summarized below by program year. The number of customers used to calculate total ex-post kWh savings is the number of weighted treatment customers in the post-period.

Table 4-36 T5 Group Ex-Post Annual kWh Savings

Annual Unadjusted Savings Per Home (kWh/year)	5% CI Annual Unadjusted Savings Per Home (kWh/year)	95% CI Annual Unadjusted Savings Per Home (kWh/year)	Annual Double Counted Savings Per Home (kWh/year)	Annual Adjusted Savings Per Home (kWh/year)	Annual Control Group Usage Per Home (kWh/year)	Annual Percent Savings Per Home
510.2	601.8	418.6	-0.38	510.58	9,808.57	5.21%

Table 4-37 T5 Group Total Program Year Savings

Annual Net Savings Per Home (kWh)	Weighted Treatment Customers	Program Year Savings (kWh)	Program Year Savings (kWh) 5% CI	Program Year Savings (kWh) 95% CI
510.58	1,646	840,396.58	991,167.48	689,625.69

The T5 group displayed 5.21% annual household savings for PY2021. Average annual household savings for treated customers in the T5 group was 511 kWh. Household savings estimates were extrapolated using the number of weighted treatment customers active in the post-period. The Evaluators found the

T5 group to display 840,397 kWh in savings for the PY2021 evaluation period. In addition, the 95% confidence intervals are summarized for each program year.

4.5.6 T6 Group Results

This section summarizes the results of the persistence study evaluation for the T6 Group. In the table below, the coefficient estimate for Treatment*Post terms (B3) is negative for all months except July, August, and December. All coefficients are statistically significant, indicating lower usage per month in the post-period for treatment customers. The estimate for Treatment*Post*Month (B4) is positive for all months except for June and July. The Treatment*Post*Month coefficients are aggregated with the Treatment*Post coefficient, which results in a negative value for nearly all months. This indicates positive savings for the majority of the year. Each of the Treatment*Post*Monthly coefficients are statistically significant. Overall, the results remain statistically significant once aggregated. This indicates a statistically significant and positive savings effect for home energy report treatment at the 95% confidence interval.

Table 4-38 T6 Group PY2021 Regression Results

Coefficient	Estimate	Std Error	P Value	5%	95%
Post	1.40	0.05	<0.001	1.32	1.48
February	-1.06	0.06	<0.001	-1.15	-0.96
March	-7.50	0.06	<0.001	-7.59	-7.40
April	-10.21	0.06	<0.001	-10.30	-10.11
May	-10.20	0.06	<0.001	-10.29	-10.10
June	-5.57	0.06	<0.001	-5.66	-5.47
July	4.32	0.06	<0.001	4.22	4.41
August	2.75	0.06	<0.001	2.66	2.85
September	-9.43	0.06	<0.001	-9.53	-9.34
October	-9.55	0.06	<0.001	-9.64	-9.45
November	-4.38	0.06	<0.001	-4.48	-4.29
December	2.41	0.06	<0.001	2.32	2.51
Treatment*Post	0.28	0.08	<0.001	0.15	0.42
Treatment*Post*February	-0.38	0.09	<0.001	-0.52	-0.24
Treatment*Post*March	-1.06	0.09	<0.001	-1.20	-0.91
Treatment*Post*April	-2.68	0.09	<0.001	-2.83	-2.54
Treatment*Post*May	-3.47	0.09	<0.001	-3.61	-3.33
Treatment*Post*June	8.86	0.09	<0.001	8.71	9.00
Treatment*Post*July	7.73	0.09	<0.001	7.58	7.87
Treatment*Post*August	-4.11	0.09	<0.001	-4.26	-3.97
Treatment*Post*September	-2.88	0.09	<0.001	-3.02	-2.73
Treatment*Post*October	-4.72	0.09	<0.001	-4.87	-4.58
Treatment*Post*November	-4.00	0.09	<0.001	-4.15	-3.86
Treatment*Post*December	-1.40	0.09	<0.001	-1.54	-1.26

*Per-household fixed-effects coefficients were omitted from this table for brevity

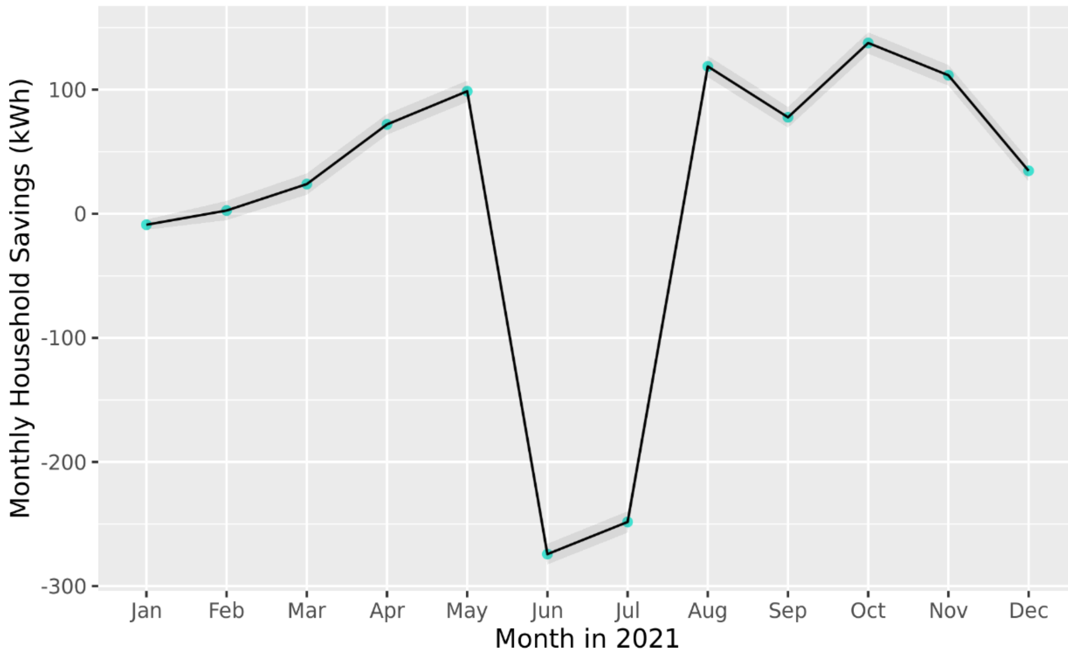
The PY2021 model of group T6 was a good fit, per the Adjusted R-square in Table 4-39.

Table 4-39 T6 Group Model Fit

Adjusted R2	F Statistic	Number of Observations	Number of Weighted Treatment Customers
0.6329	42.34	2,421,711	88,827

Figure 4-8 displays the monthly household savings for PY2021 resulting from the linear regression, with associated confidence intervals.

Figure 4-8 T6 PY2021 Monthly Household Savings Before Adjustments



Although January and early summer months display negative savings, the annual household savings for the T6 group is positive. The following table presents the home energy report savings for the T6 group by month. This was calculated using the Post*Treatment*Month (B4) and Post*Treatment (B3) terms, multiplied by the number of days in the month, and the number of weighted customers present in that month. This table also presents the double counted savings for the group, as well as the final monthly savings after removing double counted savings for each month.

Table 4-40 T6 Group PY2021 Monthly Savings Summary

Month	Average Treatment Impact (kWh/day)	Average Incremental Double Counted Savings (kWh/month)	Average Treatment Impact per Customer After Double Count (kWh/month)	Control Group Usage (kWh/day)	Percent Savings
January	-8.82	-0.11	-8.71	1,405.92	-0.63%
February	2.63	-0.10	2.73	1,231.36	0.21%
March	23.93	-0.11	24.04	1,144.14	2.09%
April	72.01	-0.11	72.11	979.31	7.35%
May	98.72	-0.11	98.84	986.24	10.01%
June	-274.21	-0.11	-274.11	1,466.97	-18.69%
July	-248.3	-0.11	-248.19	1,785.83	-13.90%
August	118.72	-0.11	118.83	1,370.14	8.66%
September	77.74	-0.11	77.85	998.25	7.79%
October	137.61	-0.11	137.73	967.14	14.23%
November	111.57	-0.11	111.68	1,116.75	9.99%
December	34.63	-0.11	34.74	1,441.99	2.40%

The ex-post gross kWh savings of Home Energy Report program for the T6 group is summarized below by program year. The number of customers used to calculate total ex-post kWh savings is the number of weighted treatment customers in the post-period.

Table 4-41 T6 Group Ex-Post Annual kWh Savings by Program Year

Annual Unadjusted Savings Per Home (kWh/year)	5% CI Annual Unadjusted Savings Per Home (kWh/year)	95% CI Annual Unadjusted Savings Per Home (kWh/year)	Annual Double Counted Savings Per Home (kWh/year)	Annual Adjusted Savings Per Home (kWh/year)	Annual Control Group Usage Per Home (kWh/year)	Annual Percent Savings Per Home
146.25	185.16	107.34	-1.32	147.57	14,894.04	0.99%

Table 4-42 T6 Group Total Program Year Savings by Evaluation Period

Annual Net Savings Per Home (kWh)	Weighted Treatment Customers	Program Year Savings (kWh)	Program Year Savings (kWh) 5% CI	Program Year Savings (kWh) 95% CI
147.57	88,827	13,108,083.44	16,564,309.12	9,651,857.76

The T6 group displayed 0.99% annual household savings for PY2021. Average annual household savings for treated customers in the T6 group was 148 kWh. Household savings estimates were extrapolated using the number of weighted treatment customers active in the post-period. The Evaluators found the

T6 group to display 13,108,083 kWh in savings for the PY2021 evaluation period. In addition, the 95% confidence intervals are summarized for each program year.

4.5.7 Aggregated Groups Results

The Evaluators present positive, statistically significant savings for all groups evaluated. The Evaluators adjusted regression results with double counted savings in downstream programs to arrive at the final program savings estimate. The following tables summarize each group's annual household energy savings impact with 95% confidence intervals.

Table 4-43 PY2021 Program Savings Summary

Group	Weighted Customers	Annual Household Savings (kWh)	Annual Household 5% CI (kWh)	Annual Household 95% CI (kWh)	Program Savings (kWh)	Program Savings 5% CI (kWh)	Program Savings 95% CI (kWh)
T1	4,949	243.92	400.33	87.50	1,207,146	1,981,249	433,044
T2	4,320	297.71	477.12	118.31	1,286,194	2,061,255	511,133
T3	5,024	263.69	344.12	183.26	1,324,882	1,728,990	920,773
T4	2,356	262.99	341.99	183.98	619,579	805,709	433,449
T5	1,646	510.58	602.18	418.98	840,397	991,167	689,626
T6	88,827	147.57	186.48	108.66	13,108,083	16,564,309	9,651,858
Total	**107,122**	**171.64**	**225.28**	**118.00**	**18,386,281**	**24,132,679**	**12,639,883**

4.6 Demand Reductions

The Evaluators estimated the demand reductions using the kWh savings estimated from the linear regression results after adjustments for double counted savings.

The Evaluators estimated demand reduction by dividing the annual energy savings by integrating hourly load factors with monthly estimated energy savings for each group for both the annual program year and the extended program year.

The following figures display average residential load by end use from the Energy Open Data Catalog database[4].

[4] Using TMY3 data from the Boise International Airport weather station

Figure 4-9 Typical Annual Load Profile

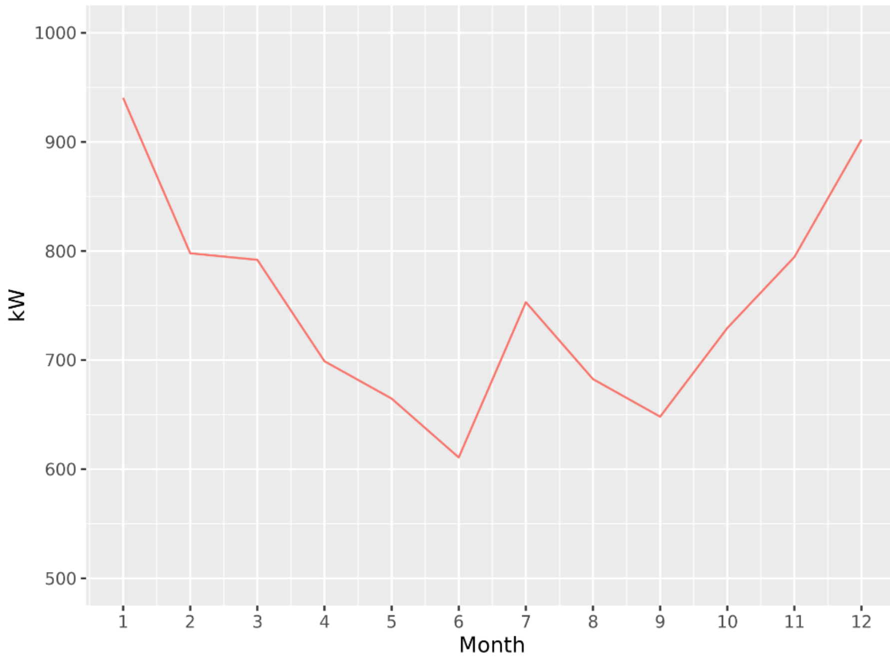
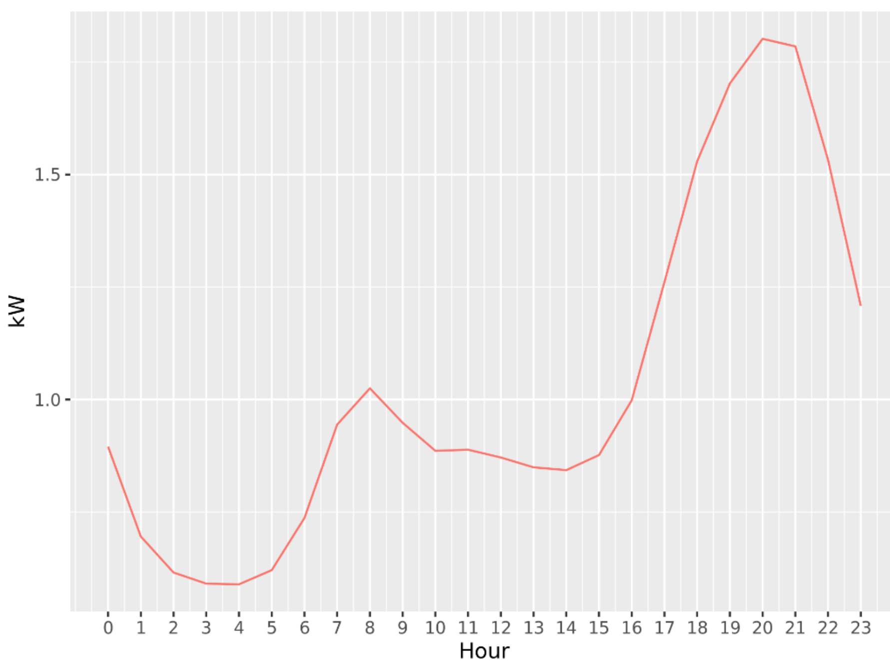


Figure 4-10 Typical Daily Load Profile



The Evaluators conducted the steps presented in the demand calculation methodology in Section 3.7. The following table displays the resulting demand reductions for each group and the total demand reductions for 2021 program year.

Table 4-44 Demand Reductions by Group

Group	Verified Demand Savings (kW)
T1	149.32
T2	159.09
T3	163.97
T4	76.68
T5	104.01
T6	1,622.13
Total	2,275.19

In summary, the 2021 program year for the Home Energy Report Program is estimated to save 2,275.19 kW.

4.7 Attrition Analysis Results

The Evaluators estimated the cumulative level of both treatment and control move outs over the program life by month, group, and treatment/control status for each program year. The following table displays the total reallocation (i.e., moveout and group re-assignment) rate aggregating all groups. Overall attrition in 2021 was approximately 7.5% and 0.9% for treatment and control customers, respectively.

Table 4-45 Program Reallocation Rates by Program Year

Period	Treatment Customers	Control Customers	Treatment Reallocation Percent	Control Reallocation Percent
2021	10,550	1,838	7.47%	0.88%

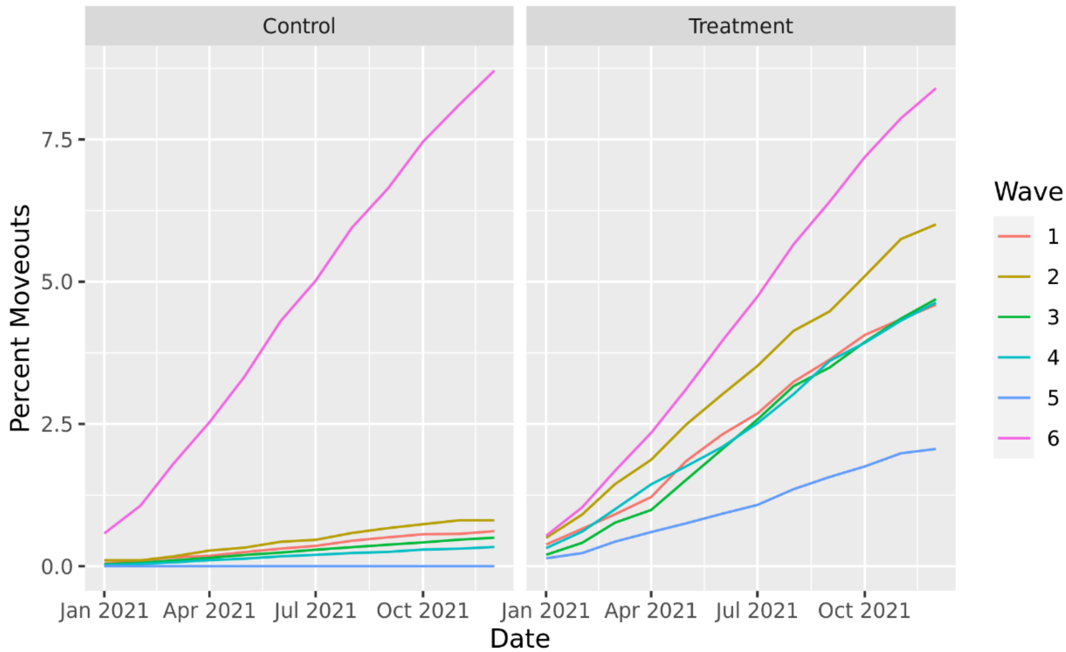
The moveout rates for each group and treatment group range between 0.0% and 8.7%. The low rates of attrition in T5 are likely due to the fact that despite earlier moveouts of nearly all control and treatment customers, the Evaluators still included this group in the analysis. Given that the T6 group was initiated in June 2020, it is possible that the high moveout rates can be explained by a combination of pandemic-related moves and group stabilization over the first full year of the program. That is, the T6 treatment and control groups consist of customers with household behaviors different than those of T1 through T5. The attrition rate indicates that the customers in T6 either have a naturally high attrition rate, or responded to the COVID-19 pandemic with a higher rate of moveouts than other groups.

Table 4-46 PY2021 Moveout Rates by Group

Group	Treatment Customers	Control Customers	Treatment Moveout Customers	Control Moveout Customers	Treatment Moveout Percent	Control Moveout Percent
T1	7,900	16,558	363	102	4.59%	0.62%
T2	5,826	5,826	350	47	6.01%	0.81%
T3	8,501	49,727	399	249	4.69%	0.50%
T4	4,101	46,191	190	156	4.63%	0.34%
T5	6,501	75,801	134	0	2.06%	0.00%
T6	108,498	14,744	9,114	1,284	8.40%	8.71%

The following figures summarize the cumulative moveout rates by month for each group and each treatment group in 2021.

Figure 4-11 PY2021 Monthly Moveout Rates by Group



4.8 Additional Research

The Evaluators conducted additional research for the following IPC objectives:

- T5 year-after-year savings
- Validation of rate schedule optimization
- Validation of benchmarking flags

The following sections detail the methodology and results of each of the research objectives listed above.

4.8.1 T5 Year-After-Year Savings

The T5 group was added to the Home Energy Report Pilot in year 1 and was designed to represent customers with low year-round energy use. As previously detailed, IPC stopped sending reports to the T5 group in April 2020 due to low propensity for savings. This decision was made in order to increase the cost-effectiveness of the program. IPC is interested to determine whether this group displays observable persistence savings (energy savings despite lack of treatment) and whether the decision to remove the T5 group was appropriate.

The T5 group started treatment in August 2017 and ended treatment in April 2020. The Evaluators estimated observed savings for this group using the same methodology presented for T1, T2, T3, T4, and T5, also presented in Section 3. The Evaluators estimated unadjusted kWh savings for each post-period year: 2018, 2019, 2020, and 2021. These estimates do not account for removal of double counted savings; however, these values provide context for incremental observed savings year-after-year for this group of customers. The results are as follows:

Table 4-47 T5 Year-After-Year Savings

Evaluated Year	Statistically Significant Savings	Annual kWh Savings per Household (Unadjusted)	Annual % Savings
2018	✓	208.77	2.13%
2019	✓	264.96	2.70%
2020	✓	408.81	4.17%
2021	✓	510.20	5.20%

As the table above illustrates, the T5 group indicated increasing savings over time, with Home Energy Report treatment contributing to 208.77 kWh or 2.13% annual household savings in the group's first post-period year in 2018 with a steady upward savings trend to 510.20 kWh or 5.20% annual household savings in 2021.

The T5 group continues to contribute statistically significant energy savings meeting or exceeding behavioral program expectations of 1-3% annual household savings. Although the T5 group contributes 1.5% towards participation in the Home Energy Report Program, the group continues to contribute disproportionately high energy savings towards the program at over 4.5% program savings contribution.

Table 4-48 T5 Contribution to 2021 Program Savings

Group	Weighted Customers	Contribution to Participation	Program Savings	Contribution to Program Savings
T1	4,949	4.62%	1,207,146	6.57%
T2	4,320	4.03%	1,286,194	7.00%
T3	5,024	4.69%	1,324,882	7.21%
T4	2,356	2.20%	619,579	3.37%
T5	1,646	1.54%	840,397	4.57%
T6	88,827	82.92%	13,108,083	71.29%

The results of this analysis indicate that the IPC customers with low year-round energy use may behave differently than the other groups in the program. Annual household energy savings for this group nearly doubled between 2019 and 2020. The COVID-19 pandemic shelter-in-place orders may have heavily impacted this group of customers' behaviors towards energy consumption. Customers with low year-round energy use may consist of a greater proportion of low-income customers. In the case that these customers prioritized keeping costs low during the shelter-in-place orders, these customers seem to have greatly benefitted from the energy saving tips communicated through the Home Energy Reports.

Based on these results, the Evaluators conducted additional efforts to explore year-after-year savings for the remaining groups as well. The T1, T2, T3, T4, and T5 groups have each responded differently to treatment over time, illustrated in the figures below.

Figure 4-12 T1 Year-After-Year Savings

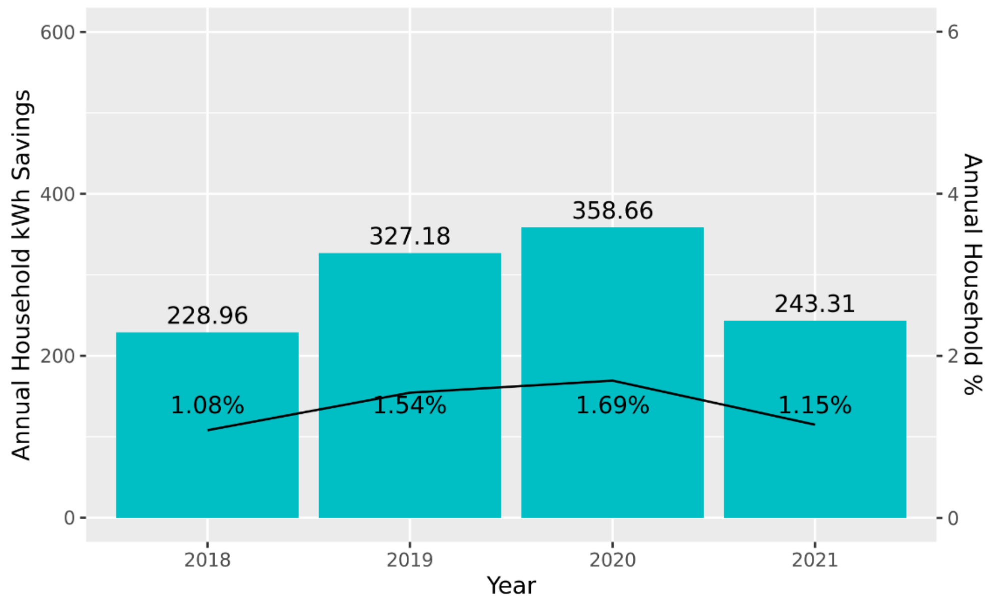


Figure 4-13 T2 Year-After-Year Savings

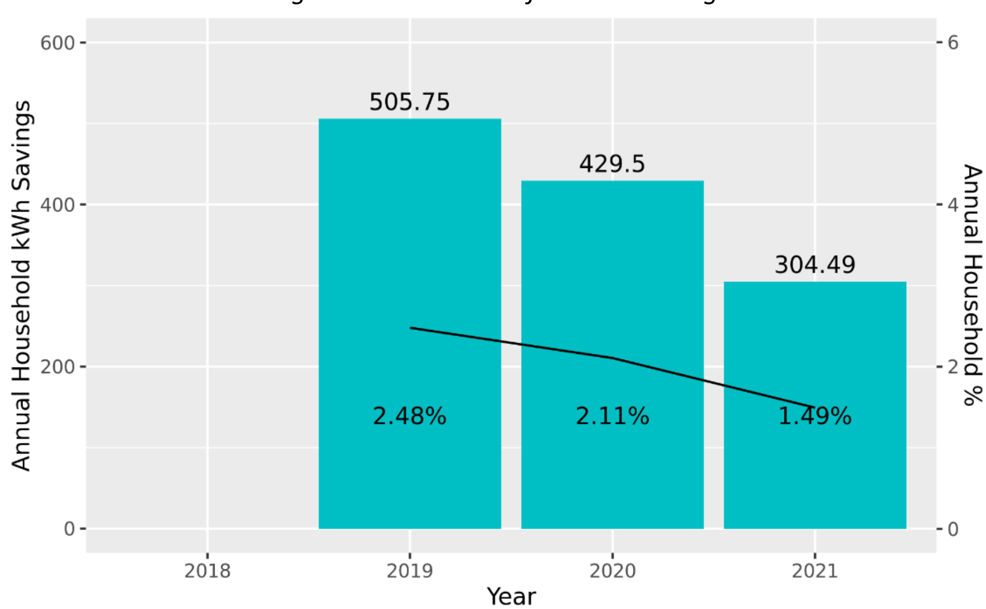


Figure 4-14 T3 Year-After-Year Savings

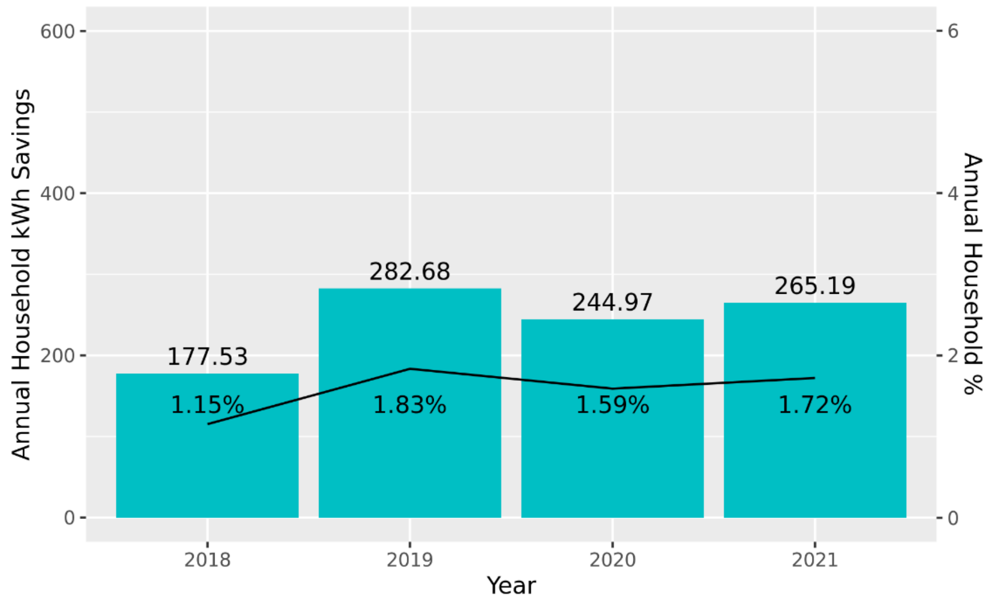


Figure 4-15 T4 Year-After-Year Savings

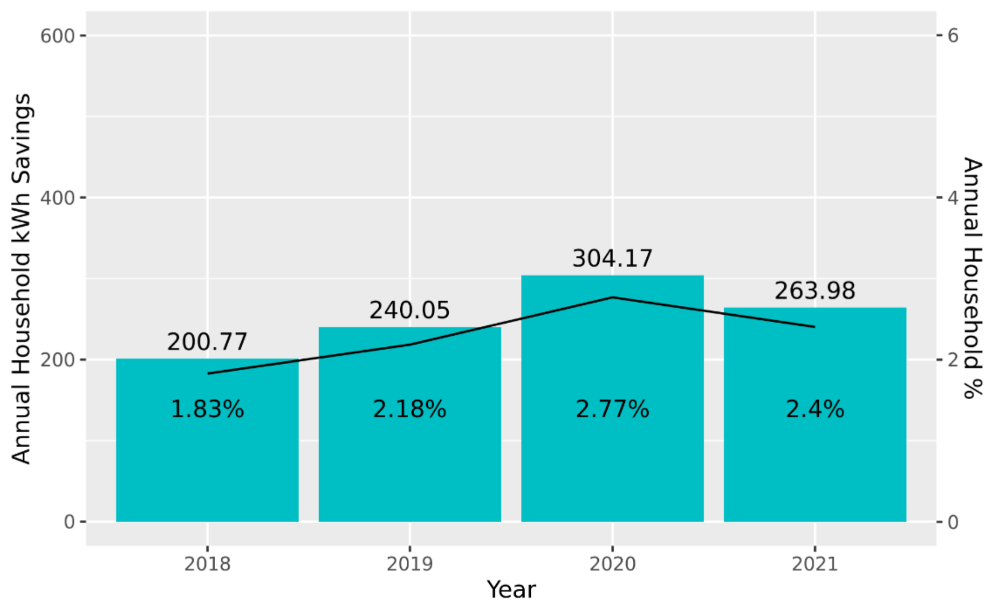


Figure 4-16 T5 Year-After-Year Savings

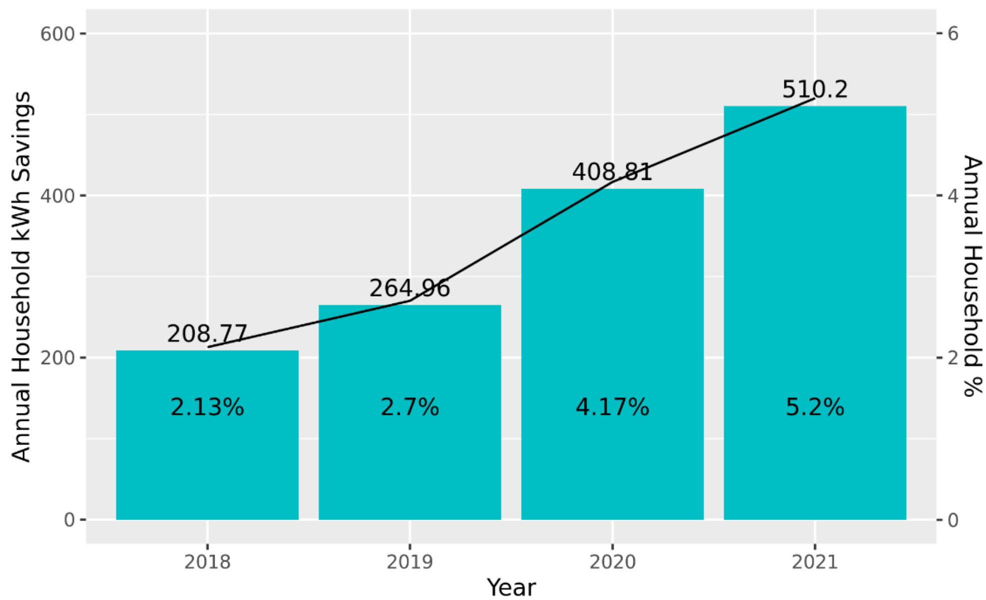
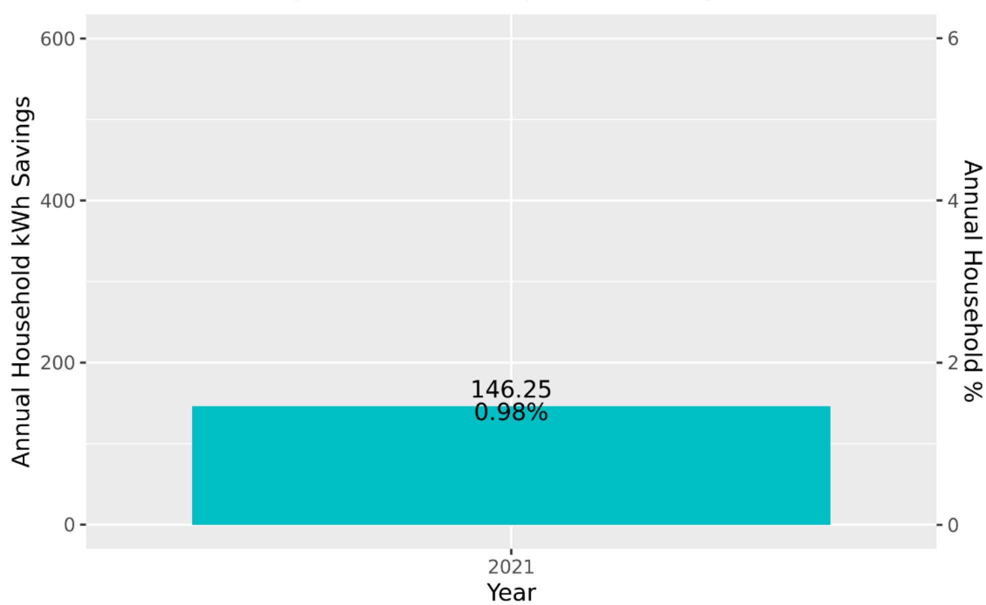


Figure 4-17 T6 Year-After-Year Savings



Each of the other groups seem to display a plateaued energy savings value, year-after-year, with the exception of T4 and T5. These two groups display an increasing trend towards increased energy savings, year-after-year. T4 consists of customers with medium year-round energy use, and T5 consists of customers with low year-round energy use. This research illustrates that, although there is reason to believe that low energy users have lower propensity to save energy through Home Energy Reports, these customers consistently display higher than expected savings during times when financial burden is high. The Evaluators therefore recommend that IPC continue treating customers with low to medium annual energy use.

4.8.2 Rate Schedule Optimization

In 2020, IPC made the decision to stop sending reports to customers who had transitioned from the residential rate schedule (I01) to the customer generation rate schedule (I06). These customers were retained in each group, but no longer receive Home Energy Reports. IPC is interested to know if there is a difference in savings magnitude between the groups when these customer generation rate schedule customers are included in the analysis, and when these customers are not included in the analysis.

The Evaluators found that when the customer generation customers were removed from each of the groups, the groups no longer remained statistically valid between treatment and control groups. This means that, although the IPC customers in each were randomly assigned to each the treatment and control group, the proportion of customers who had transitioned to the customer generation rate schedule between the treatment and control group is not equal. The table below illustrates the proportion of customers who had transitioned to customer generation rate schedules in each group and treatment group.

Table 4-49 Customer Generation Conversion by Group

Group	Treatment	Control
T1	0.75%	3.65%
T2	0.50%	2.58%
T3	0.98%	5.00%
T4	0.85%	4.12%
T5	1.15%	2.05%
T6	0.81%	1.47%

For groups T1 through T4, the control customers contributed to five times more customer generation rate schedule conversions than the treatment customers. For groups T5 and T6, the control customers contributed two times more customer generation rate schedule conversions than the treatment customers.

The treatment group may display less likelihood of converting to customer generation rate schedule due to the information provided on the neighbor comparison Home Energy Reports. The Home Energy Reports provide customer household information and compares the customers' energy usage to neighboring homes. If a customer is informed that their energy usage habits are relatively more efficient than their neighbors, these customers may be less inclined to take additional large financial home improvement projects, such as installing solar and switching to customer generation rate schedules.

Due to these findings, the Evaluators are unable to provide incremental household savings estimates with and without the customer generation rate schedule conversion customers. The Evaluators recommend that IPC continue to include these customers in the T1 through T6 groups and refrain from reallocating them to another treatment group. This will ensure that all legacy groups remain statistically valid and evaluable.

4.8.3 Benchmarking Flags

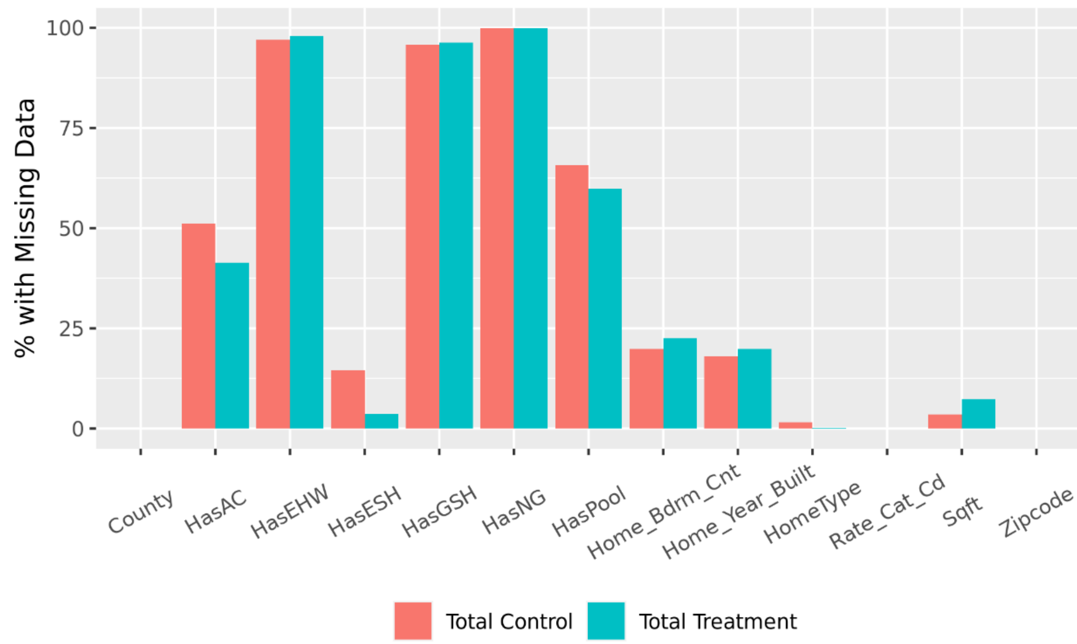
The Evaluators explored the benchmarking flags aggregated and used by the implementer for use in the Home Energy Report messaging. The benchmarking flags are currently required by the implementers to generate reports. Therefore, in the case that a home does not have valid benchmarking flags, the customer is ineligible for participation in the program in both the treatment and control group. The implementers document the following benchmarks for each household in the table below.

Table 4-50 Benchmarking Flags Summary

Item	Description
SDPID	Service Point Identifier (Device Location ID)
County	Physical address county location
HasAC	AC Flag (-1 = No data, 0 = No AC, 1 = Has AC)
HasEHW	Electrically heated water Flag (-1 = No data, 0 = No electric water heating, 1 = Has electric water heating)
HasESH	Electric space heating flag (-1 = No data, 0 = No electric space heating, 1 = Has electric space heating)
HasGSH	Gas space heating flag (-1 = No data, 0 = No gas space heating, 1 = Has gas space heating)
HasNG	Natural gas flag (-1 = No data, 0 = No natural gas service, 1 = Has natural gas service)
HasPool	Pool flag (-1 = No data, 0 = No pool, 1 = Has pool)
Rate_Cat_Cd	Rate Category (I01 = Residential Service, I06 = Residential on-site generation, I05 = Residential time of day)
PhyAddrZip	Zip code of physical home address
Home_Bdrm_Cnt	Bedroom Count
Home_Year_Built	Home year built
HomeType	Home type (-1 = No data, SFD = single family, Mobile = manufactured and mobile homes, Mplex = Multiplex, Condo = condo, MultiFamily Undifferentiated = multifamily, but less detail (for example, condo, multiplex, townhome, apartments)
Sqft	Home square footage

IPC provided the housing characteristics for all customers in the Home Energy Report Program. The Evaluators explored the number of households with missing benchmarking data. The results are provided in the figure below.

Figure 4-18 Proportion of Households with Missing Benchmarks



The Evaluators found that nearly 100% of the households had no data for HasEHW, HasGSH, and HasPool. However, the proportion of missing data within each the treatment and control groups were nearly equivalent in each category. Additionally, the proportion remains consistent when inspecting treatment and control groups within each group. Because nearly all of IPC's residential customer base is currently designated to either a treatment or control group, the lack of household characteristics in this benchmarking dataset provide no barriers for participation in the program.

The Evaluators understand that the addition of these benchmarking flags, especially the air conditioning and electric heating flags, have previously resulted in removal of a subset of customers in each treatment group group, until additional data was acquired (T2). The Evaluators have found that imperfect messaging to a larger population results in higher savings rather than what is achieved with more accurate messaging to the subset of the population which has better data available. Therefore, The Evaluators recommend that if a group is designed for the program in the future, that the lack of benchmarking characteristics is not used as a prerequisite for participation.

Impact & Process Evaluation of Idaho Power Company PY2021 Commercial Energy-Saving Kits Program

SUBMITTED TO: IDAHO POWER COMPANY

SUBMITTED ON: JANUARY 19, 2023

SUBMITTED BY: ADM ASSOCIATES, INC.

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1. Executive Summary

This report is a summary of the 2021 program year (PY2021) Commercial Energy-Saving Kits (CSK) Program Impact and Process Evaluation for Idaho Power Company (IPC) in the Idaho and Oregon service area. The evaluation was administered by ADM Associates, Inc. (herein referred to as the "Evaluators").

The Evaluators found the impact and process evaluation results for the Commercial Energy-Saving Kits Program to align with similar electric commercial kit programs offered. The impact evaluation resulted in 43% realization rate, which meets the typical realization for kit programs, between 30% and 50%. The Evaluators provide recommendations for adjusting measure-level savings assumptions and altering kit items to increase offerings of desired measures as well as satisfying facility- and customer-level needs.

In addition, the Evaluators found the vast majority of responding customers were satisfied or very satisfied with the program (88.4%) and about half of respondents were interested in learning more about other energy efficiency opportunities through Idaho Power (51.6%). The Evaluators conclude that the program is running smoothly and delivers sufficient energy efficiency options to Idaho Power customers. The Evaluators provide recommendations for improving opportunities to increase program satisfaction and provide additional information to program participants about other Idaho Power Company program offerings.

1.1 Savings Results

The Evaluators conducted an impact and process evaluation for IPC's Commercial Energy-Saving Kits Program during PY2021. The Commercial Energy-Saving Kits Program savings amounted to 130,037 kWh with a 43.82% realization rate for the kits overall. The Evaluators summarize the program verified savings in Table 1-1 and Table 1-2.

Table 1-1: Commercial Energy-Saving Kits Verified Impact Savings by Facility Type

Facility	Kits Delivered	Claimed Savings (kWh)	Verified Savings (kWh)	Realization Rate
Office	635	112,484	61,770	54.91%
Restaurant	218	172,898	57,220	33.09%
Retail	53	11,369	11,046	97.16%
Total	**906**	**296,751**	**130,037**	**43.82%**

Table 1-2: Commercial Energy-Saving Kits Verified Impact Savings by Measure and Facility Type

Facility	Measure	Claimed Savings (kWh)	Verified Savings (kWh)	Realization Rate
Office	9W A19	11,848	8,812	74.38%
	Exit Sign LED	27,111	6,113	22.55%
	Advanced Power Strip	38,473	26,100	67.84%
	Bathroom Faucet Aerator (1.0 GPM)	20,598	11,080	53.79%
	Kitchen Faucet Aerator (1.5 GPM)	14,456	9,665	66.85%

Restaurant	9W A19	11,796	897	7.61%
	Exit Sign LED	16,300	3,008	18.45%
	Faucet Aerator (1.0 GPM)	53,170	25,601	48.15%
	Kitchen Faucet Aerator (1.5 GPM)	63,753	12,281	19.26%
	Pre-Rinse Spray Valve	27,879	15,433	55.36%
Retail	9W A19	1,363	1,842	135.16%
	8W BR30	6,797	5,527	81.31%
	Exit Sign LED	1,715	989	57.67%
	Faucet Aerator (1.0 GPM)	1,494	2,689	180.00%

The Evaluators conducted the following evaluation tasks for the PY2021 Commercial Energy-Saving Kits Program impact and process evaluation:

- Impact Evaluation
    - Database review
    - Survey verification
    - Virtual verification
    - Deemed savings review and application
- Process Evaluation
    - Staff interviews
    - Participant surveys

In the following sections, the Evaluators summarize the findings and recommendations resulting from our evaluation activities.

1.2 Conclusions & Recommendations

The following section details the Evaluators' impact and process evaluation conclusions and recommendations for the Commercial Energy-Saving Kits Program.

1.2.1 Impact Evaluation

The Evaluators provide the following impact evaluation conclusions and recommendations regarding Idaho Power's Commercial Energy-Saving Kits Program:

First, the Evaluators present the conclusions and recommendations that affect all measures in the program:

- **Conclusion:** The Evaluators verified 130,037 kWh savings at 43.82% realization rate for the Commercial Saving Kits. The Evaluators verified savings and assumptions using the RTF-approved workbooks, the Idaho Power TRM v3.2, and Illinois TRM v9 for the measures included in the program. The discrepancy in realization rate is due to the large differences between assumed in-service rates (ISRs) based on the 2020 participant survey and the verified in-service rates calculated from participant responses to verification surveys as part of this evaluation. The Evaluators note that the difference in in-service rates between 2020 and 2021 is unusually large, given that each of the survey efforts achieved 90/10 precision and confidence. However, it may indicate that the provided measures are utilized less in current small business applications.

  - **Recommendation #1:** To more accurately estimate verified savings, the Evaluators recommend IPC continue to update their ISR assumptions when calculating claimed savings for future program years.

- **Conclusion:** The Evaluators found that office, restaurant, and retail participants displayed an electric water heat saturation rate of 56%, 40%, and 90%, respectively.
  - **Recommendation #2:** The Evaluators recommend IPC continue to update their electric water heat saturation assumptions when calculating claimed savings for future program years.
- **Conclusion:** The Evaluators found that the restaurant participants displayed significantly lower in-service rates for general service LEDs than expected due to lack of need for the item, the item did not fit, or management did not have time to install.
- **Conclusion:** The lighting measures displayed verified savings of 27,188 kWh with a realization rate of 35.34% compared to claimed IPC savings. The general lighting realization rate is being driven by the low verified in-service rates for restaurant LEDs (7% ISR) and Exit Sign LEDs across all facility types (6% ISR). In nearly all measures, the verified in-service rates resulting from participant surveys done as part of this evaluation are lower than the in-service rates Idaho Power had used to calculate claimed savings.
- **Conclusion:** The Evaluators reviewed measure-level engineering algorithms and savings sources to measure verified savings. For the lighting measures, the Evaluators found that differences in the expected savings and the adjusted savings for LED measures arise from lack of application of space heating and space cooling interactive effects. The verified adjusted savings the Evaluators calculated has used heating and cooling interactive effects sourced from the Idaho Power TRM v3.2 based on the facility type of the installed measure. The expected savings calculated by IPC did not integrate interactive effects, and therefore display lower expected savings than verified adjusted savings. This difference in methodology led to greater than 100% realization rates for verified adjusted savings.
  - **Recommendation #3:** The Evaluators recommend IPC include space heating and space cooling interactive effects when calculating claimed savings for lighting measures in the future.
- **Conclusion:** For the lighting measures, IPC had calculated claimed savings using "Other" facility type hours of use (3,800 annual hours) for retail applications whereas the Evaluators estimated verified savings using a blended value of retail facility types (4,533 annual hours) from the TRM. This difference in methodology led to greater than 100% realization rates for verified adjusted savings.
  - **Recommendation #4:** The Evaluators recommend IPC alter assumed hours of use for retail applications to 4,533 hours per year.
- **Conclusion:** The Evaluators note that the EISA backstop, which will be enforced July 1, 2023, requires that all general service lamps sold must display 45 lumens per watt. This code effectively changes the measure baseline to display efficiency values equivalent to LEDs. Therefore, any programs which incentivize the purchase of LED general service lamps no longer produce energy savings compared to the baseline.

- **Recommendation #5**: The Evaluators recommend that IPC plan to remove LED measures from the Commercial Energy-Saving Kits Program. The resulting verified savings for the measure will be claimable until July 1, 2023. After this date, third party evaluators must assume that all unqualified lighting measures have been replaced by LED measures due to burnout.

- **Conclusion:** The hot water measures displayed verified savings of 76,749 kWh with a realization rate of 42% compared to the claimed savings for these measures. The expected savings used to determine the realization rate were found by multiplying the savings per measure of the hot water measures included in kits by the total number of each measure sent out in kits during PY2021.
- **Conclusion:** The Evaluators found the expected savings assumptions for the bathroom and faucet aerators were appropriate and valid, and therefore did not apply adjustments to IPC expected savings for these measures. The Evaluators made no adjustments to the PRSV expected savings methods. This led to no savings adjustments for the faucet aerator measures and PRSV measures between expected and adjusted savings (assuming 100% ISR and 100% water heat saturation). Therefore, the discrepancy in the verified savings realization rates (43% realization rate) stem almost solely from the difference in assumed and verified ISRs and electric water heat saturation rates.
- **Conclusion:** The Evaluators found that participant survey responses observed in-service rates for faucet aerators between 24% and 31% across facility types, while the PRSV measure displayed in-service rates of 55%.
- **Conclusion:** The advanced power strip measure displayed verified savings of 26,100 kWh with a realization rate of 68% compared to the claimed savings for the measure. The restaurant and retail kits did not provide this measure. The Evaluators reviewed and applied the current RTF UES values for the advanced power strip measure and found a minor reference error resulting in 0.31% higher adjusted savings. The discrepancy in the verified savings realization rate (68% realization) stems almost solely from the difference in assumed and verified ISRs.
- **Conclusion:** The Evaluators found that participant survey responses observed in-service rates for advanced power strips in office businesses was 63% as opposed to the assumed ISR of 94%.
- **Conclusion:** As part of the evaluation, the Evaluators estimated non-energy benefits (NEBs) and non-energy impacts (NEIs) from the measures offered through the Commercial Energy-Saving Kits Program. The Evaluators verified the following NEBs and NEIs across all measures and facility types: $40.28 in verified Annual NEBs, 4.88 kW, and -406.28 Therms.

1.2.2 Process Evaluation

The Evaluators provide the following process evaluation conclusions and recommendations regarding Idaho Power's Commercial Savings Kit Program:

- **Conclusion:** The vast majority of responding customers were satisfied or very satisfied with the program (88.4%) and about half of respondents were interested in learning more about other energy efficiency opportunities through Idaho Power (51.6%). Many customers indicated interest in conducting additional upgrades and retrofits, such as installing occupancy sensors for lighting, and water heating and space heating upgrades.
  - **Recommendation # 6:** The Evaluators recommend that IPC provide more opportunities for participating customers to learn about other offerings IPC provides.

- **Conclusion:** The majority of respondents who remembered receiving a kit indicated they installed at least one measure from the kit (95.6%). LED retrofit kits for exits signs were the most common item not installed by respondents, followed by pre-rinse spray valve, low-flow kitchen faucet aerators, and low-flow bathroom faucet aerator. The most common reasons for respondents provided for not installing these items included not needing the item, the item did not fit, and not having time to install them. The Evaluators note that IPC has removed the pre-rinse spray valves from the new kit offering for future program years due to RTF deactivation of the measure. IPC has also reduced the number of exit sign kits and bathroom aerators due to low installation rates from the 2020 survey.
    - **Recommendation #7:** Evaluators recommend Idaho Power staff reconsider the inclusion of retrofit exit signs and low-flow aerators altogether for kits moving forward. Although these measures can garner energy savings, they are not popular among kit recipients and thus may not be cost-effective measures to provide consumers.
- **Conclusion**: In general, respondents noted they had not previously purchased the energy efficiency items included in the kit because they did not know enough about the item.
- **Conclusion:** Some participants were interested in receiving more LED lights, as well as occupancy sensors and timers in future kits.
    - **Recommendation #8:** Expanding upon Recommendation #7, rather than provide unwanted measures, such as retrofit exit signs, pre-rinse spray valves, and low-flow aerators, Idaho Power staff should consider providing other measures such as occupancy sensors, as customers indicate a desire for such applications.

2. General Methodology

The Evaluators completed an impact evaluation for each of the measures included in the Commercial Energy-Saving Kits Program. Our general approach for this evaluation considers the cyclical feedback loop among program design, implementation, impact evaluation, and process evaluation. Our activities estimate and verify annual energy savings and identify whether the program is meeting its goals. This is aimed to provide guidance for continuous program improvement. The Evaluators summarize the research objectives for the impact and process evaluation for this program here:

1. Determine and verify the energy impacts (kWh) as well as ex-post realization rates attributable to the Commercial Energy-Saving Kit Program for the 2021 program year;
2. Verify installation and operating conditions of equipment remotely via livestream/video call platform;
3. Develop estimates of program non-electric impacts (NEIs) and non-energy benefits (NEBs);
4. Evaluate program design[1], implementation[2], and administration[3];
5. Review customer surveys and offer guidance on program improvement; and
6. Report findings and observations from the evaluation and make recommendations to assist IPC in enhancing the effectiveness of programs and more accurately and transparently reporting program savings in future program cycles.

Furthermore, our team collected data on program performance, design, and administration. We synthesized these data to identify gaps in program design and barriers to program implementation. This synthesis allows development of recommendations for program improvement that are grounded in the existing design and based on real-world feedback.

The Evaluators used the following approaches to accomplish the impact-related research goals listed above and calculate energy impacts defined by the International Performance Measurement and Verification Protocols (IPMVP)[4] and the Uniform Methods Project (UMP)[5]:

- Simple verification (web-based surveys supplemented with phone surveys)
- Document verification (review project documentation)
- Deemed savings (RTF UES, Illinois Technical Reference Manual version 9.0)

The Evaluators used the following approaches to accomplish the process-related research goals and complete the research objectives identified by IPC for the program:

- Staff interviews
- Participant surveys

The M&V methodologies are determined by previous Idaho Power evaluation methodologies as well as the relative contribution of a given program to the overall energy efficiency impacts. The Evaluators

[1] Including program mission, logic, and use of industry best practices
[2] Including quality control, operational practice, and outreach
[3] Including program oversight, staffing, management, training, documentation, and reporting
[4] https://www.nrel.gov/docs/fy02osti/31505.pdf
[5] https://www.nrel.gov/docs/fy18osti/70472.pdf

reviewed relevant information on infrastructure, framework, and guidelines set out for EM&V work in several guidebook documents that have been published over the past several years. These include the following:

- Northwest Power & Conservation Council Regional Technical Forum (RTF)[6]
- Illinois Technical Reference Manual (TRM) version 9.0[7]
- National Renewable Energy Laboratory (NREL), United States Department of Energy (DOE) The Uniform Methods Project (UMP): Methods for Determining Energy Efficiency Savings for Specific Measures, April 2013[8]
- International Performance Measurement and Verification Protocol (IPMVP) maintained by the Efficiency Valuation Organization (EVO) with sponsorship by the U.S. Department of Energy (DOE)[9]

The Evaluators kept data collection instruments, calculation spreadsheets, programming code, and survey data available for Idaho Power records.

2.1 Glossary of Terminology

As a first step to detailing the evaluation methodologies, the Evaluators have provided a glossary of terms to follow:

- **Deemed Savings** – An estimate of an energy savings outcome for a single unit of an installed energy efficiency measure. This estimate (a) has been developed from data sources and analytical methods that are widely accepted for the measure and purpose and (b) are applicable to the situation being evaluated.
- **Expected Savings** – Calculated savings used for program and portfolio planning purposes.
- **Verified Savings** – Savings estimates after the unit-level savings values have been updated and energy impact evaluation has been completed, integrating results from appropriate RTF UES and Illinois TRM values.
- **Gross Savings** – The change in energy consumption directly resulting from program-related actions taken by participants in an efficiency program, regardless of why they participated.
- **Free Rider** – A program participant who would have implemented the program measure or practice in absence of the program.
- **Net-To-Gross** – A factor representing net program savings divided by gross program savings that is applied to gross program impacts to convert them into net program load impacts.
- **Net Savings** – The change in energy consumption directly resulting from program-related actions taken by participants in an efficiency program, with adjustments to remove savings due to free ridership.
- **Non-Energy Benefits** – Quantifiable impacts produced by program measures outside of energy savings (comfort, health and safety, reduced alternative fuel, etc.).

[6] https://rtf.nwcouncil.org/measures
[7] https://www.ilsag.info/technical-reference-manual/il-trm-version-9/
[8] Notably, The Uniform Methods Project (UMP) includes the following chapters authored by ADM. Chapter 9 (Metering Cross-Cutting Protocols) was authored by Dan Mort and Chapter 15 (Commercial New Construction Protocol) was Authored by Steven Keates.
[9] Core Concepts: International Measurement and Verification Protocol. EVO 100000 – 1:2016, October 2016.

- **Non-Energy Impacts** – Quantifiable impacts in energy efficiency beyond the energy savings gained from installing energy efficient measures (reduced cost for operation and maintenance of equipment, reduced environmental and safety costs, etc.).

2.2 Summary of Approach

This section presents our approach to accomplishing the impact and process evaluation of Idaho Power's Commercial Energy-Saving Kits Program. This chapter is organized by evaluation objective. Section 2.2.2.3 and Section 3 describe the Evaluators' measure-specific impact evaluation methods and results in further detail and Section 2.2.4 and Section 3.3.3.3 describe the Evaluator's process evaluation methods and results.

The Evaluators outline the approach for verifying, measuring, and reporting the program impacts as well as summarizing potential program improvements. The primary objective of the impact evaluation is to determine ex-post verified net energy savings. On-site verification and equipment monitoring was not conducted during this impact evaluation, however, the Evaluators completed virtual verification for a sample of projects.

Our general approach for this evaluation considers the cyclical feedback loop among program design, implementation, and impact evaluation. Our activities during the evaluation estimate and verify annual energy savings and identify whether the program is meeting its goals. These activities are aimed to provide guidance for continuous program improvement and increased cost effectiveness for future program years.

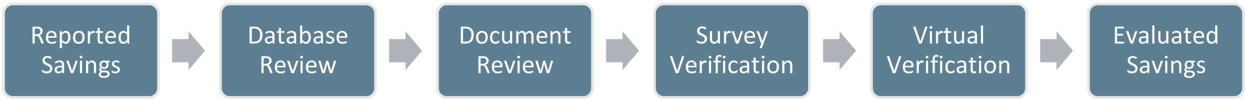
The Evaluators employed the following approach to complete impact evaluation activities for the program. The Evaluators define one major approach to determining net savings for Idaho Power's Commercial Energy-Saving Kits Program:

- A *Deemed Savings* approach involves using stipulated savings for energy conservation measures for which savings values are well-known and documented. These prescriptive savings may also include an adjustment for certain measures, such as baseline adjustments for hot water measures in which RTF annual water usage may differ from Illinois TRM values.

The Evaluators accomplished the following quantitative goals as part of the impact evaluation:

- Verify savings with 10% precision at the 90% confidence level;
- Cross-verify customer-reported survey values with virtual verification efforts; and,
- Where appropriate, apply the RTF or Illinois TRM to verify measure impacts.

The Evaluators calculated verified savings for each measure based on the RTF UES or Illinois TRM in combination with the results from document review. The Evaluators also applied in-service rates (ISRs) from verification surveys for measures which exceeded 90/10 precision requirements from survey responses.



2.2.1 Database Review

At the outset of the evaluation, the Evaluators reviewed the databases to ensure that the program tracking database conforms to industry standards and adequately tracks key data required for evaluation.

Measure-level net savings were evaluated primarily by reviewing measure algorithms and values in the tracking system to assure that they are appropriately applied using the Regional Technical Forum Unit Energy Savings (UES) or engineering equations and appropriate assumptions sourced from the Illinois TRM. The Evaluators then aggregated and cross-verify program and measure totals.

The Evaluators reviewed program documents including savings source workbooks, delivered technical reference manuals, and supplemental calculations to verify the tracking data accurately represents the program kit contents, total participants, and expected savings for each measure.

2.2.2 Verification Methodology

The Evaluators verified a sample of participating small businesses for verification of measure installation through web-based surveys. The Evaluators used the following equations to estimate survey completion requirements for the program in order to achieve 10% precision at the 90% confidence level. Required number of responses were estimated as follows:

Equation 2-1: Sample Size for Infinite Sample Size

$$n = \left(\frac{Z \times CV}{d}\right)^2$$

Equation 2-2: Sample Size for Finite Population Size

$$n_0 = \frac{n}{1 + \left(\frac{n}{N}\right)}$$

Where,

- n = Sample size
- Z = Z-value for a two-tailed distribution at the assigned confidence level.
- CV = Coefficient of variation
- d = Precision level
- N = Population

For a sample that provides 90/10 precision, *Z* = 1.645 (the critical value for 90% confidence) and *d* = 0.10 (or 10% precision). The remaining parameter is *CV*, or the expected coefficient of variation of measures for which the claimed savings may be accepted. A *CV* of .5 was assumed for the program due to the homogeneity of participation[10], which yields a sample size of 68 for an infinite population. Sample sizes were adjusted for smaller populations via the method detailed in Equation 2-2.

The following sections describe the Evaluator's methodology for conducting survey-based verification and virtual verification.

2.2.2.1 Response Goals

The Evaluators developed a sampling plan that achieves a sampling precision of ±10% at 90% statistical confidence – or "90/10 precision" – to estimate the percentage of projects for which the claimed savings are verified or require some adjustment.

The Evaluators developed the following samples for the program's verification survey efforts using Equation 2-1 and Equation 2-2. The Evaluators ensured representation for each measure.

Table 2-1: Survey-based Verification Completion and Precision by Facility Type

Facility Type	Kit Population	Completions (With Finite Population Adjustment) *	Precision at 90% CI
Office	635	60	90% Confidence ±8.67% Precision
Restaurant	218	20	
Retail	53	10	
Total	**906**	90	

*Assumes sample size of 68 for an infinite population, based on *CV* (coefficient of variation) = 0.5, *d* (precision) = 10%, *Z* (critical value for 90% confidence) = 1.645.

The Evaluators achieved 90 completed survey responses toward the impact and process evaluation activities for this program and surveyed a total of 600 participating customers to verify installation as well as gather customer satisfaction with the equipment, program, and utility in general. The table above represents the number of rebates sampled in the Idaho and Oregon territories combined.

2.2.2.2 Survey-Based Verification

The Evaluators conducted survey-based verification for the Commercial Energy-Saving Kits Program, described in the sections above. The primary purpose of conducting a verification survey is to confirm that the participant had indeed received the kit, that the measure was installed, and that the measure is still currently operational.

The Evaluators used the sample plan provided previously in Table 2-1 for the program simple verification task. The Evaluators developed a sampling plan that achieved a sampling precision of ±8.00% at 90% statistical confidence for ISRs estimates at the measure-level during web-based survey verification.

The Evaluators implemented a web-based survey to complete the verification surveys. The findings from these activities served to estimate ISRs for each measure surveyed, separated by facility type. These ISRs

[10] Assumption based off California Evaluation Framework: https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy/Energy_Programs/Demand_Side_Management/EE_and_Energy_Savings_Assist/CAEvaluationFramework.pdf

were applied to kit-level verified savings. ISRs were summarized and applied by measure and facility type. The measure-level ISRs resulting from the survey-based verification are summarized in Section 3.1.

2.2.2.3 Virtual Verification

In August and September 2022, the Evaluator completed 6 virtual verifications with Idaho Power Commercial Energy-Saving Kits Program participants. These virtual verification interviews informed the impact evaluation and addressed research questions on measures installed and not installed through the program.

Idaho Power provided a list of 600 unique participants for the 2021 program year. From that list, we recruited 31 potential respondents via email and phone form. We contacted all respondents and completed virtual verifications from 6 participants (Table 2-2).

Table 2-2: Virtual Verification Summary

Disposition	Count
Complete	6
Partial complete	0
Nonresponse	20
Refused	4
Bad number	1
Total	**31**

The Evaluators attempted to reach customers up to three times and offered a $50 gift card to all participants that completed the virtual verification. The virtual verification efforts, conducted by smartphone link, averaged about 30 minutes, and were recorded with permission of the respondent.

The Evaluators developed a sampling plan to achieve a sampling precision of ±20% at 90% statistical confidence – or “90/20 precision” – to estimate the percentage of projects for which the claimed savings are verified or require some adjustment. However, due to lack of responses through recruitment emails, nonresponse, and refusal, the Evaluators did not meet the 20% precision goal. The Evaluators achieved 6 total virtual verification completions at 31.88% precision at the 90% confidence interval.

The Evaluators completed the following samples for the program’s document review using Equation 2-1 and Equation 2-2.

Table 2-3: Virtual Verification Completions and Precision by Facility Type

Facility Type	Kit Population	Completions (With Finite Population Adjustment)*	Precision at 90% CI
Office	635	3	90% Confidence ±31.88% Precision
Restaurant	218	2	
Retail	53	1	
Total	**906**	**6**	

*Assumes sample size of 68 for an infinite population, based on *CV* (coefficient of variation) = 0.5, *d* (precision) = 10%, *Z* (critical value for 90% confidence) = 1.645.

Although web survey efforts did not meet precision requirements, the Evaluators found that the survey responses aligned with the information gathered through web surveys with these customers.

2.2.3 Impact Evaluation Methodology

The Evaluators employed a *deemed savings* approach to quantify program impacts for the Commercial Energy-Saving Kits Program. The Evaluators completed the steps outlined below to complete the impact evaluation for the program.

1. Deliver a detailed data request outlining the information we require for each kit type.
2. Complete a thorough and comprehensive summary of calculated savings.
3. Validate that appropriate inputs to deemed savings and engineering algorithms were used for each measure.
4. Apply observed in-service rates and observed electric water heater saturation rates acquired through web-based survey responses.
5. Verify the gross energy (kWh) savings that are a result of the program.
6. Summarize and integrate the impact evaluation findings into the final report.

The Evaluators completed the validation for specific measures across each program using the RTF unit energy savings (UES) values, where available. The Evaluators ensured the proper measure unit savings were recorded and used in the calculation of IPC's ex-ante measure savings. The Evaluators requested and used the RTF workbooks and Illinois TRM employed during calculation of ex-ante measure savings. The Evaluators documented any cases where recommended values differed from the specific unit energy savings workbooks used by IPC.

In cases where the RTF has existing unit energy savings (UES) applicable to IPC's measures, the Evaluators verified the quantity and quality of installations and apply the RTF's UES to determine verified savings. In cases where the RTF does not define UES for the measure, the Evaluators reviewed and applied savings values derived from the TRMs/workpapers presented in Table 2-4.

Table 2-4: Impact Analysis Methodology by Measure

End Use	Measure	Impact Analysis Methodology
Lighting	9W A19	IPC TRM v3.2 Section 1.7 & 2.1
	8W BR30	IPC TRM v3.2 Section 1.7 & 2.1
	Exit Sign LED	IPC TRM v3.2 Section 1.7 & 2.1
Hot Water	Faucet Aerator (1 GPM)	IL v9 TRM Section 4.3.2
	Faucet Aerator (1.5 GPM)	IL v9 TRM Section 4.3.2
	Pre-Rinse Spray Valve	RTF UES ComCookingPreRinseSprayValve_v2_5
Advanced Power Strip	Advanced Power Strip	RTF UES ComAdvancedPowerStrip_v4_1

The Evaluators detail measure-specific impact evaluation methodologies in Section 3.2.

2.2.4 Process Evaluation Methodology

The process evaluation of the Commercial Energy-Saving Kits Program was designed to accomplish the following research objectives:

- Evaluate program design including program mission, logic, and use of industry best practices;
- Evaluate program implementation including quality control, operational practice, outreach, and ease of customer participation;
- Evaluate program administration including program oversight, staffing, management, training, documentation, and reporting;
- Report findings, observations, and recommendations to enhance program effectiveness;
- Refine and refocus marketing strategies and increase program effectiveness;
- Provide recommendations for changing the program's structure, management, administration, design, delivery, operations, or target; and
- Help program designers and managers structure programs to achieve cost-effective savings.

The process evaluations will focus on documenting the effects that the program activity had on encouraging installations of the energy efficiency measure or influencing the customer to make an energy-efficiency decision.

The key research objectives in these process evaluations are the following:

- Evaluate program design including program mission, logic, and use of industry best practices;
- Evaluate program implementation including quality control, operational practice, and outreach;
- Review program forms, manuals, marketing and kit materials, and provide recommendations for improvement, as needed;
- Evaluate program administration including program oversight, staffing, management, training, documentation and reporting;
- Review customer surveys and offer guidance on program improvement; and
- Report findings and observations and recommendations to enhance program effectiveness.

The process evaluation was designed to ensure that best practices and lessons learned from individual programs are then shared and incorporated across the entire program portfolio. Customer participant surveys contain a standard set of questions to be addressed across all IPC programs to facilitate evaluation among and between programs. To achieve these objectives, the Evaluation team engaged in the research activities described in the sections below.

2.2.4.1 Documentation Review

The Evaluator reviewed materials on the program website including program marketing materials provided by program staff. This review provided a general understanding of the program design and implementation practices. The review also provided context for informing the interviews with program staff.

2.2.4.2 Program Staff Interviews

The Evaluators interviewed four IPC program staff. The interviews covered the following topics.

- Staff and partner roles in the program;
- The measures covered by the program and the decision processes used when considering measure offerings;
- Program marketing approaches;
- Past changes and future planned changes to the program;
- Clarification of the objectives for the process evaluation.

2.2.4.3 Participant Survey

The Evaluators administered a survey to customers who participated in the 2021 program. The objective of the survey was to collect data on the following components:

- Sources of program awareness and motivations for participating;
- Customer experiences with the program and overall satisfaction;
- Measure specific questions related to how the installed equipment was utilized; and
- Facility space and water heating characteristics.

The Evaluator developed the survey guide in conjunction with Idaho Power staff to address the above objectives through various questions to the participating customers. The survey questions are provided in Appendix A: Participant Survey.

2.2.5 Data Collection

The following primary data collection activities were completed to support the evaluation of the Commercial Energy-Saving Kits Program.

2.2.5.1 Program Staff Interviews

Evaluators interviewed four Idaho Power Staff to learn more about the history, purpose, and design of the Commercial Savings Kit program. Interviewees included two analysts and two program specialists, all of whom are involved in the Commercial Savings Kit program.

2.2.5.2 Participant Survey

The Evaluators administered a survey to customers who participated in the 2021 program. The participant survey responses were used to inform the process evaluation, verify the measure installations, and gather information of customer satisfaction with the kit contents and the program overall.

The survey was administered online, and customers were recruited by email in July 2022. Each customer received up to three emails asking them to complete the survey. Customers were offered a $25 electronic gift card for completing the survey. Customers with inactive IPC accounts were excluded from the survey sample.

Table 2-5 summarizes the survey data collection. The survey efforts received 98 program participants responses; however, 8 of those 98 did not remember receiving the kits, and therefore did not complete the survey. The survey effort received 90 total survey completions with an overall response rate of 15.0%.

Table 2-5: Summary of Survey Data Collection

Facility Type	Number of Kits	Number of Emailed Surveys	Number of Survey Completes	Response Rate
Office	635	432	60	13.89%
Restaurant	218	124	20	16.13%
Retail	53	44	10	22.73%
Total	**906**	**600**	**90**	**15.00%**

Table 2-6 compares the distributions of measures installed at participating sites to those who completed the survey. As shown, the survey sample was fairly representative of the participant population in terms of facility type and number of responses.

Table 2-6: Distribution of Measures Installed at Participating Sites and Installed by Survey Respondents

Facility Type	Number of Kits	Proportion of Kit Type	Number of Survey Responses	Proportion of Survey Responses
Office	635	70%	60	67%
Restaurant	218	24%	20	22%
Retail	53	6%	10	11%
Total	**906**	**-**	**90**	**-**

2.2.6 Net-To-Gross

The Northwest RTF UES measures do not require NTG adjustments as they are built into the deemed savings estimates. However, the Evaluators employed the Illinois TRM to calculate verified savings for the faucet aerator measures. For this measure, “NTG” is intertwined with baseline – savings from faucet aerators are based on their difference between the pre-condition gallons per minute (GPM) aerator and the new, efficient faucet aerator GPM. For this reason, the Evaluators used baseline estimates provided in deactivated RTF workbooks when appropriate in order to capture the current practice baseline. Further details are provided in the impact evaluation results section for the hot water measures in Section 3.3.1.3.

2.2.7 Non-Energy Impacts & Non-Energy Benefits

The Evaluators used the Regional Technical Forum (RTF) to quantify non-energy impacts (NEIs) and/or non-energy benefits (NEBs) for residential measures with established RTF values where available. Measures with quantified NEBs include lighting end-use measures. Measures with quantified NEIs include hot water end-use measures. Further details are provided in the measure-level impact evaluation result section in Section 3.3.

3. Impact Evaluation Results

The Evaluators completed an impact evaluation on Idaho Power's Commercial Energy-Saving Kit (CSK) Program to verify program-level and measure-level energy savings for PY2021. The following sections summarize findings for the electric impact evaluation in the program in the Idaho and Oregon service area. The Evaluators used data collected from participant surveys and applicable Regional Technical Forum (RTF) workbooks, technical reference manuals (TRMs), and workpapers to evaluate savings.

In PY2021, Idaho Power completed and provided incentives for commercial electric measures in Idaho and Oregon under the Commercial Energy-Saving Kits Program. Kits were sent to small businesses within the following categories: Office, Restaurant, and Retail. The contents of each kit provided are dependent on the facility type of each participant, however, the measures offered through the program include LEDs, bathroom faucet aerators, kitchen faucet aerators, pre-rinse spray valves, advanced power strips, and LED exit signs. The Evaluators summarize kit contents by facility type in the table below:

Table 3-1: Kit Contents Summary

Facility Type	Measure
Restaurant	(3) 9W A19 LED (2) Bathroom Faucet Aerator (1.0 GPM) (2) Kitchen Faucet Aerator (1.5 GPM) (2) Exit Sign LED (1) Pre-Rinse Spray Valve
Retail	(2) 9W A19 LED (2) 8W BR30 LED (1) Bathroom Faucet Aerator (1.0 GPM) (2) Exit Sign LED
Office	(2) 9W A19 LED (2) Bathroom Faucet Aerator (1.0 GPM) (1) Kitchen Faucet Aerator (1.5 GPM) (2) Exit Sign LED (1) Advanced Power Strip

Table 3-2 summarizes the CSK Program verified impact savings by measure. Claimed savings for this table represent the expected savings for each kit extrapolated to the population of surveyed kits and adjusted to reflect expected in-service rates (ISRs). The Evaluators determined verified savings by reviewing and adjusting expected deemed savings and by applying verified ISRs and electric water heating saturation rates resulting from program participant surveys. The Evaluators summarize the measure-level and total program verified savings in Table 3-2.

Table 3-2: Commercial Energy-Saving Kits Program Verified Impact Savings by Measure

Measure	Claimed Savings (kWh)	Verified Savings (kWh)	Realization Rate
9W A19 LED	25,007	11,552	46.19%
8W BR30 LED	6,797	5,527	81.31%
Exit Sign LED	45,126	10,109	22.40%
Bathroom Faucet Aerator (1.0 GPM)	75,261	39,370	52.31%

Measure	Claimed Savings (kWh)	Verified Savings (kWh)	Realization Rate
Kitchen Faucet Aerator (1.5 GPM)	78,209	21,946	28.06%
Pre-Rinse Spray Valve	27,879	15,433	55.36%
Advanced Power Strip	38,473	26,100	67.84%
Total	**296,751**	**130,037**	**43.82%**

*The total differs by 3 kWh due to small rounding differences between reported savings and workbook expected savings

The Evaluators found the Commercial Energy-Saving Kits Program resulted in 130,037 kWh of verified savings, displaying a 43.82% realization rate against the IPC-claimed savings of 296,751 kWh for the program. The Evaluators provide facility-type verified savings and realization rates by measure in Table 3-3.

Table 3-3: Commercial Energy-Saving Kits Program Verified Impact Savings by Measure and Facility Type

Measure	Facility	Claimed Savings (kWh)	Verified Savings (kWh)	Realization Rate
9W A19 LED	Office	11,848	8,812	74.38%
	Restaurant	11,796	897	7.61%
	Retail	1,363	1,842	135.16%
8W BR30 LED	Retail	6,797	5,527	81.31%
Exit Sign LED	Office	27,111	6,113	22.55%
	Restaurant	16,300	3,008	18.45%
	Retail	1,715	989	57.67%
Bathroom Faucet Aerator (1.0 GPM)	Office	20,598	11,080	53.79%
	Restaurant	53,170	25,601	48.15%
	Retail	1,494	2,689	180.00%
Kitchen Faucet Aerator (1.5 GPM)	Office	14,456	9,665	66.85%
	Restaurant	63,753	12,281	19.26%
Pre-Rinse Spray Valve	Restaurant	27,879	15,433	55.36%
Advanced Power Strip	Office	38,473	26,100	67.84%
Total		**296,751**	**130,037**	**43.82%**

*The total differs by 3 kWh due to small rounding differences between reported savings and workbook expected savings

Total realization rates for the program result in 43.82%. The primary factor in the low realization rates are the differences between assumed ISRs, based on the 2020 participant survey, and the verified ISRs and electric water heat saturation resulting from evaluation survey efforts. Verified ISRs were lower than IPC ISRs for nearly all measures and verified electric water heat saturation was lower than claimed saturation for all facility types. The ISRs and electric water heat saturation assumptions are crucial factors in determining verified savings, resulting in the lower realization rates across the board.

To determine ISR and electric water heat saturation rates, the Evaluators sent surveys to 600 unique contacts of program participants in PY2021. The following table provides the breakdown of participants, contacts, and responses by facility type.

Table 3-4: Commercial Energy-Saving Kits Delivered in PY2021

Facility	Participants	Customers Surveyed	Survey Respondents
Office	635	432	60
Restaurant	218	124	20
Retail	53	44	10
Total	**906**	**600**	**90**

Survey results were used to develop an in-service rate (ISR), which was applied to the program population and savings per kit to determine total verified program savings.

3.1 Simple Verification Results

The Evaluators surveyed participant customers between July and August of 2022 using a web approach (online survey). The Evaluators deployed 600 surveys and received responses from 98 unique customers that participated in Idaho Power's CSK Program. Customers with a valid email were sent the survey via an email invitation. The Evaluators summarize the aggregate results of the survey in Table 3-5.

Table 3-5: Simple Verification Survey Response Rate

Measurement	Number of Project Sites
Population	906
Customers Contacted by Email	600
Survey Responses	98
Response Rate	16.3%

3.1.1 In-Service Rates

The Evaluators calculated in-service rates of installed measures from the collection of 98 responses to the simple verification survey, detailed above. The Evaluators asked participants if they remembered receiving the kit and whether the equipment provided in the kit is currently installed and operational. The in-service rates of the measures by facility are presented in Table 3-6.

Table 3-6: Verified In-Service Rates by Measure and Facility Type

Measure	Office	Restaurant	Retail
9W A19	63%	7%	90%
8W BR30	-	-	40%
Faucet Aerator (1 GPM)	24%	45%	60%
Faucet Aerator (1.5 GPM)	29%	15%	-
Pre-Rinse Spray Valve	-	55%	-
Advanced Power Strip	63%	-	-
LED Exit Sign	5%	8%	10%

In contrast, the assumed in-service rates used by Idaho Power staff in the development of the claimed kWh savings for the program are as follows:

Table 3-7: Assumed In-Service Rates by Measure and Facility Type

Measure	Office	Restaurant	Retail
9W A19	90%	92%	85%
8W BR30	-	-	63%
Faucet Aerator (1 GPM)	41%	69%	50%
Faucet Aerator (1.5 GPM)	40%	58%	-
Pre-Rinse Spray Valve	-	74%	-
Advanced Power Strip	94%	-	-
LED Exit Sign	32%	56%	24%

The in-service rates used by Idaho Power were based on the survey results collected from respondents in 2020, which also met 90/10 confidence and precision. The differences between the in-service rates verified by the Evaluators and the in-service rates assumed led to the large discrepancies in realization rates across measures. In all cases except for retail 9W A19 LEDs and retail bathroom faucet aerators, the IPC-applied in-service rates are lower than the in-service rates resulting from the Evaluator's participant survey responses. Although the number of responses from the 2020 survey outnumbered the number of responses from the 2021 survey deployed during the evaluation, the responses in the 2021 survey indicated much lower in-service rates. The drastic change in in-service rates year-over-year is atypical. The Evaluators speculate that the in-service rates may have been impacted due to large changes in small business operations, productivity, and management since COVID-19 impacts. Therefore, the Evaluators expect that the in-service rates displayed in the 2021 survey will be more aligned with future in-service rates for the program moving forward.

3.2 Non-Energy Benefits and Non-Energy Impacts

As part of the evaluation, the Evaluators estimated non-energy benefits (NEBs) and non-energy impacts (NEIs) resulting from the Commercial Energy-Saving Kits Program. The table below summarizes the total NEBs and NEIs verified through the evaluation for this program.

Table 3-8: Total Verified NEBs and NEIs

End-Use	Verified Annual NEBs ($)	Verified kW Savings	Verified Therms Savings	Verified Water Savings (Gallons)
Lighting	$40.28	9.98	-820.25	N/A
Hot Water	-	4.46	3,987.89	1,547,524.73
Advanced Power Strips	-	-	-	-
Total	**$40.28**	**14.44**	**3,167.64**	**1,547,524.73**

The Evaluators estimated NEBs and NEIs using the savings sources defined for each measure in the measure-level sections below.

3.3 Measure-Level Impact Evaluation Results

The Evaluators summarize the program- and measure-specific impact analysis activities and results for the Commercial Energy-Saving Kits Program in the sections below.

3.3.1 Lighting

The Commercial Saving Kits Program includes various LED lighting equipment in each of the office, restaurant, and retail kits. Included in every kit is at least two general purpose 9W screw-in A19 LEDs and two exit sign LEDs. Two 8W BR30 LEDs are also included in the retail kits. Table 3-9 summarizes the lighting measures offered under this program.

Table 3-9: Lighting Measure Description

Measure	Description	Impact Analysis Methodology
9W A19	9W general purpose screw-in LED. Assumed to be replacing a 13W CFL Bulb	Idaho Power TRM v3.2 Section 1.7 & 2.1
8W BR30	8W BR30 bulb. Assumed to be replacing a 35W Halogen Bulb	Idaho Power TRM v3.2 Section 1.7 & 2.1
Exit Sign LED	4W dual-sided LED Exit Sign. Assumed to be replacing a 14W dual-sided CFL Exit Sign.	Idaho Power TRM v3.2 Section 1.7 & 2.1

Table 3-10 summarizes the verified electric energy savings resulting from the impact evaluation of the Commercial Energy-Saving Kits Program lighting measures.

Table 3-10: Lighting Measure Population Verified Savings

Measure	Facility	Claimed Savings (kWh)	Verified Savings (kWh)	Realization Rate
9W A19 LED	Office	11,848	8,812	74.38%
	Restaurant	11,796	897	7.60%
	Retail	1,363	1,842	135.14%
8W BR30 LED	Retail	6,797	5,527	81.32%
Exit Sign LED	Office	27,111	6,113	22.55%
	Restaurant	16,300	3,008	18.45%
	Retail	1,715	989	57.67%
Total		**76,930**	**27,188**	**35.34%**

The lighting measures displayed verified savings of 27,188 kWh with a realization rate of 35.34% compared to claimed IPC savings. The general lighting realization rate is being driven by the low verified in-service rates for restaurant LEDs (7% ISR) and Exit Sign LEDs across all facility types (6% ISR). The Evaluators summarize the measure-specific in-service rates and further details of verified savings for the lighting measures in the sections below.

3.3.1.1 In-Service Rates

The Evaluators randomly selected a subset of participant customers to survey for simple verification of installed measure. The Evaluators determined whether the provided measures were installed at the business or if there were any plans to install the provided equipment in the future. An ISR for each measure by facility type was developed using the number of each measure installed and the total number of measures. Table 3-11 displays the ISRs for each of the lighting measures offered in each of the kits.

Table 3-11: Lighting Measure Verification Survey ISR Results

Measure	Office	Restaurant	Retail	Total
9W A19	63%	7%	90%	50%
8W BR30	-	-	40%	40%
Exit Sign LED	5%	8%	10%	6%

3.3.1.2 Verified Savings

This section summarizes the verified impact results of the impact evaluation for the lighting measures. The Evaluators calculate adjusted savings as the difference in methodology application. This comparison verifies the difference in savings methodology alone, assuming 100% ISR and 100% electric water heat saturation. The Evaluators reviewed and applied the Idaho Power TRM v3.2 hours of use and heating and cooling interactive effect values for the lighting measures along with baseline assumptions agreed upon by Idaho Power to estimate savings per measure. Differences in the claimed savings and the adjusted savings arise from application of space heating and space cooling interactive effects. The verified savings the Evaluators calculated has used heating and cooling interactive effects sourced from the Idaho Power TRM v3.2 based on the facility type of the installed measure. The expected savings did not integrate interactive effects, and therefore display lower expected savings than verified adjusted savings.

Additionally, for the retail facility type, IPC had calculated claimed savings using "Other" facility type hours of use (3,800 annual hours) for retail applications whereas the Evaluators estimated verified savings using a blended value of retail facility types (4,533 annual hours) from the TRM, excluding "Retail Big Box" and "Retail - 3-story Large", as those facility types were unlikely to be included in the CSK program. These two differences in methodology led to greater than 100% realization rates for verified adjusted savings.

The expected savings values used to determine the program-level realization rate were found by multiplying the savings per measure of the lighting measures included in kits by the total number of each measure sent out in kits during PY2021. The verified savings were determined by applying the ISR from the survey responses.

Table 3-12 through Table 3-14 detail expected savings per lighting measure by facility type for both the ex-post and ex-ante. These tables detail savings with an assumed ISR of 100% to illustrate the difference in expected savings. The utilization of interactive effects in the verified savings calculations results in greater savings for all lighting measures. Therefore, the discrepancy resulting in low realization rates in verified savings (35%, as displayed in Table 3-10) stems solely from low ISRs.

Table 3-12: Office Kit Adjusted Lighting Savings

Facility	Measure	Expected Savings (100% ISR)	Adjusted kWh Savings (100% ISR)	Adjusted kWh Realization Rate (100% ISR)
Office	9W A19 LED (One)	10.40	11.10	106.75%
	9W A19 LED (Two)	10.40	11.10	106.75%
	Exit Sign LED (One)	66.58	93.51	140.46%

	Exit Sign LED (Two)	66.58	93.51	140.46%
	Total	**153.95**	**209.23**	**135.91%**

Table 3-13: Restaurant Kit Adjusted Lighting Savings

Facility	Measure	Expected Savings (100% ISR)	Adjusted kWh Savings (100% ISR)	Adjusted kWh Realization Rate (100% ISR)
Restaurant	9W A19 LED (One)	19.60	20.58	105.00%
	9W A19 LED (Two)	19.60	20.58	105.00%
	9W A19 LED (Three)	19.60	20.58	105.00%
	Exit Sign LED (One)	66.58	91.98	138.16%
	Exit Sign LED (Two)	66.58	91.98	138.16%
	Total	**191.95**	**245.70**	**128.00%**

Table 3-14: Retail Kit Adjusted Lighting Savings

Facility	Measure	Expected Savings (100% ISR)	Adjusted kWh Savings (100% ISR)	Adjusted kWh Realization Rate (100% ISR)
Retail	9W A19 LED (One)	15.20	19.31	127.04%
	9W A19 LED (Two)	15.20	19.31	127.04%
	8W BR30 LED (One)	102.60	130.35	127.04%
	8W BR30 LED (Two)	102.60	130.35	127.04%
	Exit Sign LED (One)	66.58	93.29	140.13%
	Exit Sign LED (Two)	66.58	93.29	140.13%
	Total	**368.75**	**485.90**	**131.77%**

3.3.1.3 Non-Energy Benefits and Non-Energy Impacts

As part of the evaluation, the Evaluators estimated NEBs and NEIs resulting from the lighting measures offered through the program. The Evaluators estimated NEBs using the Regional Technical Forum lighting workbook and the NEIs using the savings sources defined in Table 3-9.

For the lighting measures, the Evaluators estimated annual NEBs, kW savings, and Therms penalty as defined in the IL TRM. The following tables display the total program NEB and NEI savings from each facility type.

Table 3-15: Office Kit Lighting NEBs and NEIs

Facility	Measure	Verified Annual NEBs ($)	Verified kW Savings	Verified Therms Savings
Office	9W A19	$31.75	3.95	-264.16
	8W BR30	N/A	N/A	N/A
	Exit Sign LED	$0.00	1.56	-183.24
	Total	**$31.75**	**5.51**	**-447.40**

Table 3-16: Restaurant Kit Lighting NEBs and NEIs

Facility	Measure	Verified Annual NEBs ($)	Verified kW Savings	Verified Therms Savings
Restaurant	9W A19	$1.74	0.64	-23.07
	8W BR30	N/A	N/A	N/A
	Exit Sign LED	$0.00	0.79	-51.56
	Total	**$1.74**	**1.43**	**-74.63**

Table 3-17: Retail Kit Lighting NEBs and NEIs

Facility	Measure	Verified Annual NEBs ($)	Verified kW Savings	Verified Therms Savings
Retail	9W A19	$3.82	0.69	-65.73
	8W BR30	$2.97	2.08	-197.20
	Exit Sign LED	$0.00	0.27	-35.29
	Total	**$6.78**	**3.04**	**-298.21**

The Evaluators applied the ISRs for each of the estimates above. The kits offered through the program displayed a total of $40.28 in annual NEBs, 4.88 kW savings, and 406.28 Therms penalty for the program.

Table 3-18 Total Lighting Measure NEBs and NEIs Across Kits

Verified Annual NEBs	Verified kW Savings	Verified Therms Savings
$40.28	4.88	-406.28

3.3.2 Hot Water

The Commercial Energy-Saving Kits Program provides a form of hot water measure in each of the three facility type kits. A bathroom and/or kitchen faucet aerator is included in each kit (1.0 GPM and 1.5 GPM, respectively). One pre-rinse spray valve is also included in each restaurant kit. Table 3-19 further defines the hot water measures included in the kits and savings source methodology utilized to evaluate energy savings for each measure.

Table 3-19: Hot Water Measure Description

Measure	Description	Savings Source
Faucet Aerator (1 GPM)	A low flow faucet aerator with a GPM of 1. Intended to be installed in a restroom.	IL v9 TRM Section 4.3.2
Faucet Aerator (1.5 GPM)	A low flow faucet aerator with a GPM of 1.5. Intended for use in the kitchen.	IL v9 TRM Section 4.3.2
Pre-Rinse Spray Valve	A pre-rinse spray valve to be installed in a commercial kitchen.	RTF UES ComCookingPreRinseSprayValve_v2_5

Table 3-20 summarizes the verified electric energy savings for the hot water measures.

Table 3-20: Hot Water Measures Verified Electric Savings

Measure	Facility Type	Claimed Savings (kWh)	Verified Savings (kWh)	Realization Rate
Bathroom Faucet Aerator (1 GPM)	Office	20,598	11,080	53.79%
	Restaurant	53,170	25,601	48.15%
	Retail	1,494	2,689	180.00%
Kitchen Faucet Aerator (1.5 GPM)	Office	14,456	9,665	66.85%
	Restaurant	63,753	12,281	19.26%
Pre-Rinse Spray Valve	Restaurant	27,879	15,433	55.36%
Total		**181,350**	**76,749**	**42.32%**

The hot water measures displayed verified savings of 76,749 kWh with a realization rate of 42% compared to the claimed savings for these measures. The Evaluators summarize the measure-specific in-service rates and verified savings for the hot water measures in the sections below.

3.3.2.1 In-Service Rates

This section describes the results of the verification surveys completed for the hot water measures. The Evaluators randomly selected a subset of participant customers to survey for simple verification of installed measure. Table 3-21 displays the resulting verified ISRs for each of the hot water measures of the program.

Table 3-21: Hot Water Measures Verification Survey ISR Results

Measure	Office	Restaurant	Retail	In-Service Rate
Bathroom Faucet Aerator (1.0 GPM)	24%	45%	60%	31%
Kitchen Faucet Aerator (1.5 GPM)	29%	15%	-	24%
Pre-Rinse Spray Valve	-	55%	-	55%

3.3.2.2 Verified Savings

This section summarizes the verified impact results of the impact evaluation for the hot water measures. The Evaluators reviewed and applied the current RTF UES values for the pre-rinse spray valves and the IL v9 TRM for the faucet aerators along with surveyed ISRs to estimate program savings for these measures. The Evaluators employed the following sources to calculate verified savings for the measures:

- Bathroom faucet aerator: Illinois TRM Section 4.3.2

- Kitchen faucet aerator: Illinois TRM Section 4.3.2
- Pre-rinse spray valve: ComCookingPreRinseSprayValve_v2_5

The verified savings for the measure are 76,749 kWh with a realization rate of 42%, as displayed in Table 3-20. The expected savings used to determine the realization rate were found by multiplying the savings per measure of the hot water measures included in kits by the total number of each measure sent out in kits during PY2021. The verified savings were determined by applying the ISR from the survey responses. The following tables (Table 3-22 and Table 3-23 specify the expected and adjusted savings for each hot water measure per kit by facility type.

These tables detail savings with an assumed ISR of 100% to illustrate the difference in expected and adjusted savings. The Evaluators found the expected savings assumptions for the bathroom, faucet aerators, and pre-rinse spray valves were appropriate and valid, and therefore did not apply adjustments to IPC expected savings for these measures. The Evaluators concluded that the adjusted RTF savings value of 321.78 kWh utilized by IPC to calculate pre-rinse spray valve savings was appropriate and therefore a 100% realization rate is also displayed for this measure.

Table 3-22: Office Kit Adjusted Hot Water Savings

Facility	Measure	Expected Savings (100% ISR, 100% Electric Water Heat Saturation)	Adjusted kWh Savings (100% ISR, 100% Electric Water Heat Saturation)	Adjusted kWh Realization Rate (100% ISR, 100% Electric Water Heat Saturation)
Office	Bathroom Faucet Aerator (1.0 GPM) (One)	64.34	64.34	100.00%
	Bathroom Faucet Aerator (1.0 GPM) (Two)	64.34	64.34	100.00%
	Kitchen Faucet Aerator (1.5 GPM) (One)	92.60	92.60	100.00%
	Total	**221.29**	**221.29**	**100.00%**

Table 3-23: Restaurant Kit Adjusted Hot Water Savings

Facility	Measure	Expected Savings (100% ISR, 100% Electric Water Heat Saturation)	Adjusted kWh Savings (100% ISR, 100% Electric Water Heat Saturation)	Adjusted kWh Realization Rate (100% ISR, 100% Electric Water Heat Saturation)
Restaurant	Bathroom Faucet Aerator (1.0 GPM) (One)	326.21	326.21	100.00%
	Bathroom Faucet Aerator (1.0 GPM) (Two)	326.21	326.21	100.00%
	Kitchen Faucet Aerator (1.5 GPM) (One)	469.47	469.47	100.00%
	Kitchen Faucet Aerator (1.5 GPM) (Two)	469.47	469.47	100.00%
	Pre-Rinse Spray Valve (One)	321.78	321.78	100.00%
	Total	**1,913.14**	**1,913.14**	**100.00%**

Table 3-24: Retail Kit Adjusted Hot Water Savings

Facility	Measure	Expected Savings (100% ISR, 100% Electric Water Heat Saturation)	Adjusted kWh Savings (100% ISR, 100% Electric Water Heat Saturation)	Adjusted kWh Realization Rate (100% ISR, 100% Electric Water Heat Saturation)
Retail	Bathroom Faucet Aerator (1.0 GPM) (One)	93.94	93.94	100.00%
	Total	**93.94**	**93.94**	**100.00%**

The tables above display 100% realization rates between expected and adjusted savings, for the hot water measures. Therefore, the discrepancy in the verified savings realization rates (42%, displayed in Table 3-20) stem almost solely from the difference in assumed and verified ISRs and electric water heat saturation rates.

3.3.2.3 Non-Energy Benefits and Non-Energy Impacts

As part of the evaluation, the Evaluators estimated NEIs resulting from the hot water measures offered through the program. There were no resulting NEBs for the hot water measures through the IL TRM. The Evaluators estimated the NEIs using the savings sources defined in Table 3-9.

For the hot water measures, the Evaluators estimated secondary kWh savings, kW savings, and Therms savings as defined in the IL TRM. The following tables display the total program NEI savings from each facility type.

Table 3-25: Office Kit Hot Water Measure NEIs

Facility	Measure	Verified kW Savings	Verified Therms Savings	Verified Water Savings (Gallons)
Office	Bathroom Faucet Aerator (1.0 GPM)	0.00	0.87	352.34
	Kitchen Faucet Aerator (1.5 GPM)	0.00	0.76	252.14
	Pre-Rinse Spray Valve	N/A	N/A	N/A
	Total	**0.01**	**1.63**	**604.48**

Table 3-26: Restaurant Kit Hot Water Measure NEIs

Facility	Measure	Verified kW Savings	Verified Therms Savings	Verified Water Savings (Gallons)
Restaurant	Bathroom Faucet Aerator (1.0 GPM)	2.79	1,917.65	805,058.71
	Kitchen Faucet Aerator (1.5 GPM)	1.34	920.15	316,856.95
	Pre-Rinse Spray Valve	0.00	1,014.19	387,427.98
	Total	**4.13**	**3,852.00**	**1,509,343.63**

Table 3-27: Retail Kit Hot Water Measure NEIs

Facility	Measure	Verified kW Savings	Verified Therms Savings	Verified Water Savings (Gallons)
Retail	Bathroom Faucet Aerator (1.0 GPM)	0.32	134.26	37,576.62
	Kitchen Faucet Aerator (1.5 GPM)	N/A	N/A	N/A
	Pre-Rinse Spray Valve	N/A	N/A	N/A
	Total	**0.32**	**134.26**	**37,576.62**

The Evaluators applied the ISRs for each of the estimates above. The kits offered through the program displayed a total of 4.46 kW savings and 3,987.89 Therms savings, and 1,547,524 gallons of water savings for the program.

Table 3-28: Total Hot Water Measure NEIs Across Kits

Verified kW Savings	Verified Therms Savings	Verified Water Savings (Gallons)
4.46	3,987.89	1,547,524.73

3.3.3 Advanced Power Strip

The Commercial Saving Kits Program includes (1) advanced power strip in each of the office kits sent to participants. Table 3-29 further summarizes the measure.

Table 3-29: Advanced Power Strip Measure Description

Measure	Description	Impact Analysis Methodology
Advanced Power Strip	Advanced Power Strip which turns off power to equipment when not in use.	RTF UES

Table 3-30 summarizes the verified electric energy savings the advance power strip measure.

Table 3-30: Advanced Power Strip Verified Electric Savings

Measure	Facility	Claimed Savings (kWh)	Verified Savings (kWh)	Realization Rate
Advanced Power Strip	Office	38,473	26,100	67.84%
Total		**38,473**	**26,100**	**67.84%**

The advanced power strip measure displayed verified savings of 26,100 kWh with a realization rate of 68% compared to the claimed savings for the measure. The Evaluators summarize the in-service rate and verified savings for the advanced power strip measure in the sections below.

3.3.3.1 In-Service Rates

This section describes the results of the verification surveys completed for this measure. Advanced power strips were provided in the office kits through the program. The restaurant and retail kits did not provide this measure. Participants who had received the advanced power strip in their kit were asked if the measure has been installed or if there were any plans to install the measure in the future. Table 3-21 displays the resulting ISRs for the advanced power strips.

Table 3-31: Advanced Power Strip Verification Survey ISR Results

Measure	Office	Restaurant	Retail	Total
Advanced Power Strip	63%	N/A	N/A	63%

3.3.3.2 Verified Savings

This section summarizes the verified impact results of the impact evaluation for the advanced power strip measure. The Evaluators reviewed and applied the current RTF UES values for the advanced power strip measure:

- ComAdvancedPowerStrips_v4-1

The verified savings for the measure is 26,100 kWh with a realization rate of 68%, as displayed in Table 3-30. The expected savings used to determine the realization rate were found by multiplying the savings per measure for advanced power strips included in kits by the total number of each measure sent out in kits during PY2021. The verified savings were determined by applying the ISR from the survey responses. The discrepancy between claimed and verified savings results from a difference in assumed and verified ISR.

The table below details savings with an assumed ISR of 100% to illustrate the difference in expected and adjusted savings for the advanced power strip measure. For this measure, the Evaluators updated the expected savings to reference the value present in the RTF workbook for advanced power strips.

Table 3-32: Office Kit Adjusted Savings

Facility	Measure	Expected Savings (100% ISR)	Adjusted kWh Savings (100% ISR)	Adjusted kWh Realization Rate (100% ISR)
Office	Advanced Power Strip	64.80	65.00	100.31%
	Total	**64.80**	**65.00**	**100.31%**

The table above display near-100% realization rate between expected and adjusted savings for the advanced power strip measure in the office kits. Therefore, the discrepancy in the verified savings realization rate stems almost solely from the difference in assumed and verified ISRs.

3.3.3.3 Non-Energy Benefits and Non-Energy Impacts

As part of the evaluation, the Evaluators aimed to estimate NEBs and NEIs resulting from the advanced power strip measure offered through the program. However, there were no resulting NEBs or NEIs for the advanced power strips through the RTF.

3.4 Potential Unified Kit Results

The Evaluators present the following findings to reflect how in-service rates and verified savings would be displayed if the measures provided in the facility-type kits were aggregated into one unified kit. The purpose of this review is to assist IPC with expected savings for the program going forward in which one unified kit will be delivered to participating small businesses, regardless of facility type. In this review, the Evaluators summarize findings for the following unified kit contents:

Table 3-33: Potential Unified Kit Contents

Measure	End Use	Units Included in Unified Kit
9W A19	Lighting	2
8W BR30		2
Exit Sign LED		1
Bathroom Faucet Aerator (1.0 GPM)	Hot Water	1
Kitchen Faucet Aerator (1.5 GPM)		1

Because verified savings requires facility-dependent inputs, the expected savings per kit is calculated using facility-level assumptions on participation, electric water heat saturation, and in-service rates. The Evaluators summarize the assumed inputs in Table 3-34 and Table 3-35, which summarize participant responses from the program year 2021 impact surveys conducted by the Evaluator.

Table 3-34: Assumed Facility-Level Participant Distribution

Facility Type	Weight of Participation

Office	70%
Restaurant	24%
Retail	6%

Table 3-35: Assumed Facility-Level Electric Water Heat Saturation

Facility Type	Electric Water Heat Saturation
Office	56%
Restaurant	40%
Retail	90%

Table: 3-36 summarizes the in-service rates displayed for the unified kit measure contents. The in-service rates are a blended rate summarizing the customer survey response installation rates for each business type and number of measures.

Table: 3-36 Adjusted Measure Level In-Service Rates Based on Number of Units

Measure	End Use	Units included in the kit	Office	Restaurant	Retail
9W A19	Lighting	2	63%	10%	90%
8W BR30		2	40%	40%	40%
Exit Sign LED		1	10%	15%	20%
Bathroom Faucet Aerator (1.0 GPM)	Hot Water	1	37%	70%	60%
Kitchen Faucet Aerator (1.5 GPM)		1	29%	30%	29%

Using the above assumptions on participation by facility type, ISR, and electric water heater saturation, the Evaluators estimate that a unified kit with the contents specified in Table 3-37 receive the following unadjusted and adjusted verified savings:

Table 3-37: Unified Kit Expected Savings by Measure

Measure	End Use	Units Included in Unified Kit	Expected Unadjusted Savings (Assumed 100% ISR, 100% Electric Water Heat Saturation)	Expected Adjusted Savings (Verified ISR and Electric Water Heat Saturation Applied)
9W A19	Lighting	2	27.73	12.75
8W BR30		2	187.86	75.14
Exit Sign LED		1	93.13	11.16
Bathroom Faucet Aerator (1.0 GPM)	Hot Water	1	129.08	34.21
Kitchen Faucet Aerator (1.5 GPM)		1	184.56	26.00
Total		-	**622.36**	**159.26**

The review of a unified kit resulted in 159 kWh verified savings per kit. This estimate assumes that facility-level participant distribution remains aligned with those displayed in program year 2021, and that in-service rates and electric water heat saturation rates are consistent with those displayed in program year 2021.

4. Process Evaluation Results

The Evaluators completed a process evaluation for Idaho Power's Commercial Energy-Saving Kits Program to gain a better understanding of customers' experiences with the program. The process evaluation included interviews with the CSK program staff as well as customer surveys.

The findings of the following sections summarize the results of those interviews and surveys. Interview results are included in Section 4.1 while survey results are included in Section 4.2.

4.1 Program Design and Operations

Evaluators interviewed four Idaho Power Staff to learn more about the history, purpose, and design of the Commercial Energy-Saving Kits program. Interviewees included two analysts and two program specialists, all of whom are involved in the Commercial Energy-Saving Kits program.

Idaho Power first launched the Commercial Savings Kit program in 2018 as a means of providing additional services to small businesses. The program was meant for smaller, mom-and-pop type businesses.

During the initial roll out year, customers learned about and received the commercial savings kits in one of two ways: 1) as a leave behind item following a visit from Idaho Power field staff person, or 2) a call campaign marketing effort. Initially program staff had wanted to use the kits as a means of improving engagement with small businesses, offering them a chance to start a conversation with customers and tell them about the utility's other offerings. Thus, the "leave behind" model had initially been the preferred distribution model. However, as the program progressed, staff found that "leave behind" model proved difficult from a tracking standpoint. Field staff were provided boxes of kits to distribute to customers and instructed on how to track which customers received kits; however, the tracking system was not streamlined and not all kits were properly accounted for. As the program entered its third year and COVID-19 emerged, much of the distribution moved to call center campaign. Although this method of distribution removed the personal touch and conversation starter of the field person visits, this model enabled Idaho Power staff to better track kit recipients.

The Commercial Energy-Saving Kits program offered three different types of kits based on business type. Table 4-1 demonstrates the types of measures included in each kit. Staff determined which measures were included in the kits based on vendor recommendations and cost effectiveness of each measure. In addition to the energy efficiency measures, kits also included an educational component that provided customers with various tips and suggestions on how to save energy.

Table 4-1: Kit Measures and quantities

Measure	Office	Restaurant	Retail
9W A19 LED	2	2	3
8W BR30 LED	0	2	0
LED Exit Sign	2	2	2
Bathroom Faucet Aerator (1.0 GPM)	2	1	2
Kitchen Faucet Aerator (1.5 GPM)	1	1	2
Pre-Rinse Spray Valve	0	0	1
Advanced Power Strip	1	0	0

Moving forward, Idaho Power plans to send one universal kit to all small business types.

4.2 Commercial Savings Kit Customer Survey Results

Program participants were contacted via email to complete the survey. Idaho Power provided evaluators a list of 905 customers. Of those 905 customers, evaluators sent the survey to 600 unique participants. The remaining 305 customers did not receive a survey either because they did not have an email address on file, or they were a non-unique contact. Participants were contacted up to three times via email: one initial invitation and two follow-up reminders.

4.2.1 Survey Respondents

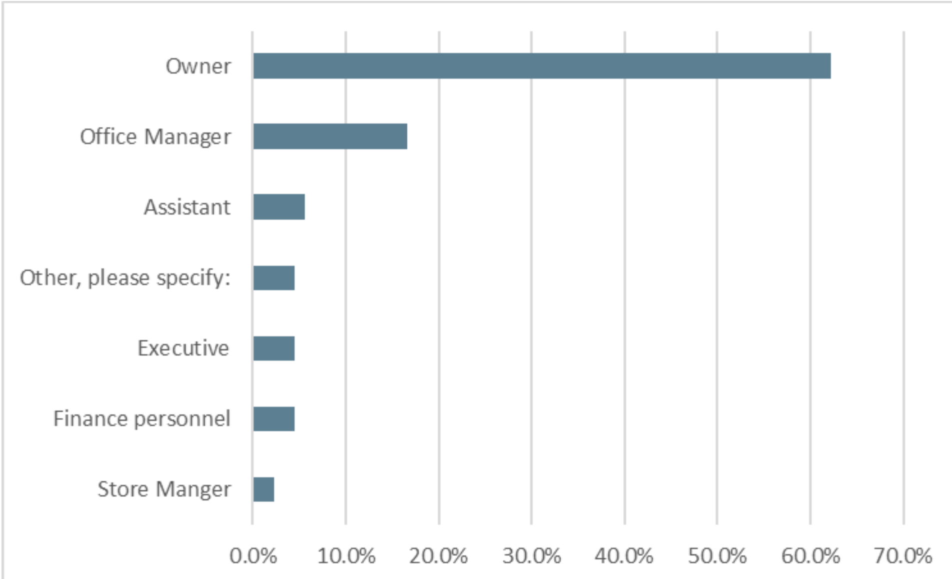
In total, 98 recipients responded to the survey for a 16.3% response rate. The majority of respondents were offices, followed by restaurants, and retail stores (*Table* 4-2). Of those 98 respondents, 90 remembered receiving a kit and completed the survey. The eight respondents who did not remember receiving a kit were participants within the office facility type.

Table 4-2: Respondent Type

Facility Type	Total Possible (n)	Proportion of Total	Respondents (n)	Proportion of Respondents
Office	432	72%	68	67%
Restaurant	124	21%	20	22%
Retail	44	7%	10	11%
Total	**600**	**100%**	**98**	**16.3%**

Less than two-thirds of respondents were the owner of the business (*Figure*).

Figure 4-1: Respondents' Role (n=90)



The Evaluators found that 60% of responding businesses have gas heating (60.2%) (*Figure* 4-2) and more than half of responding business have electric water heating (56.1%) (*Figure* 4-3).

Figure 4-2: Heating Fuel Type (n=90)

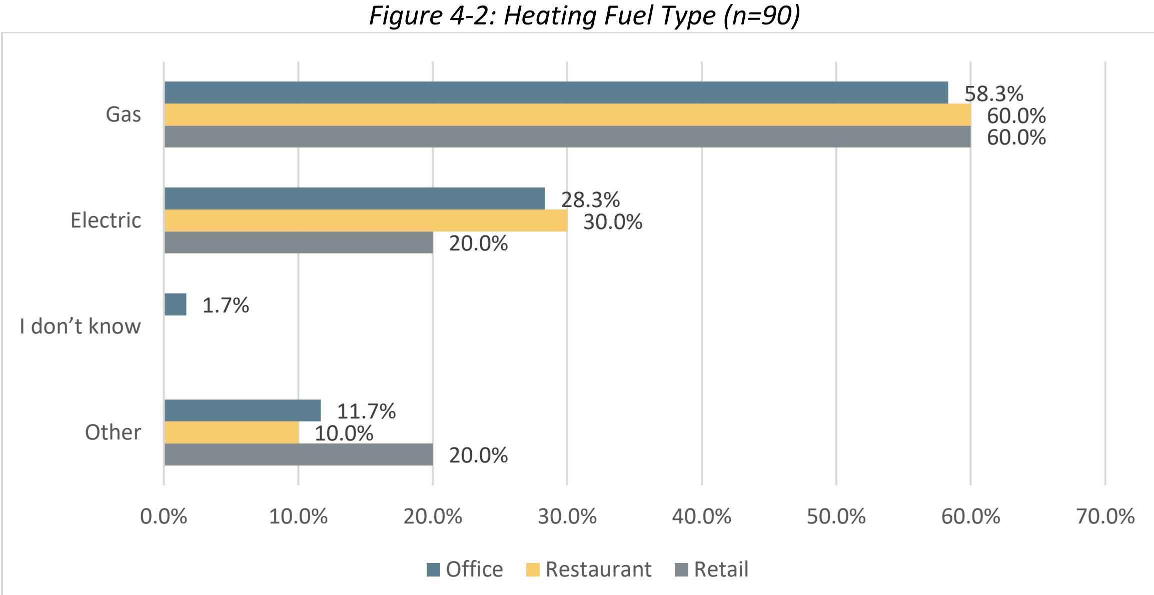
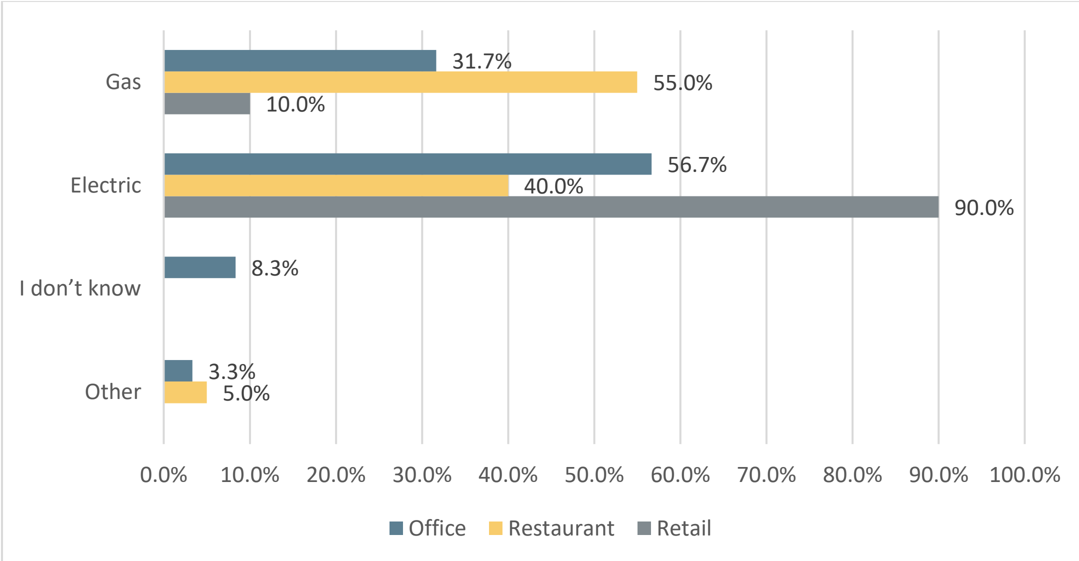


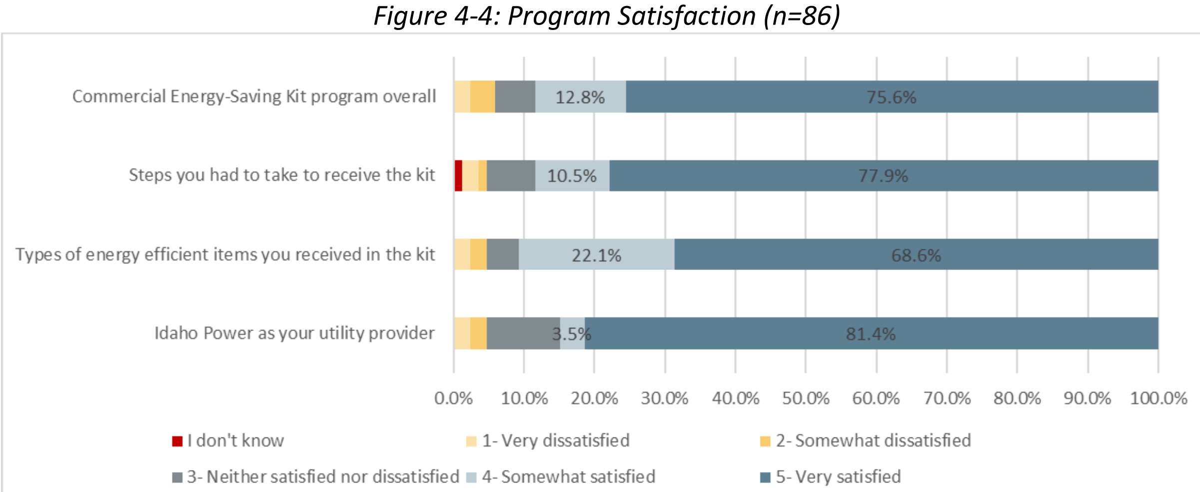
Figure 4-3: Water Heater Fuel Type (n=90)



4.2.1.1 Program Satisfaction

The vast majority of respondents were either satisfied or very satisfied with the Commercial Energy Saving Kits program (88.4%, n=76). Additionally, respondents were generally satisfied with the steps they had to take to receive the kit, as well as the items included in the kit (*Figure* 4-4). Among those respondents who expressed dissatisfaction with the kit, the primary complaint was that the measures were not useful to them and thus the kits felt wasteful.

Figure 4-4: Program Satisfaction (n=86)



Almost 80% of respondents found the installation guide helpful (78.9%, n=71). Remaining respondents noted that they did not need the guide because installation was easy or self-explanatory. Under two-thirds of respondents indicated that participation through the Commercial Energy-Saving Kits Program increased their satisfaction with Idaho Power as their utility provider (61.6%, n=53), and about half of respondents were interested in learning more about other energy efficiency opportunities through Idaho Power (51.6%, n=44).

4.2.1.2 Program Awareness

Most respondents learned about the kits program through Idaho Power either via a mailing or bill insert (30%, n=27), email (24.4%, n=22), the Idaho Power website (21.1%, n=19), or a customer service representative (16.6%, n=14) (*Figure*). Respondents indicated that email and mail/bill inserts are their preferred method of communication (*Figure 4-6*).

Figure 4-5: Program Awareness (n=90)

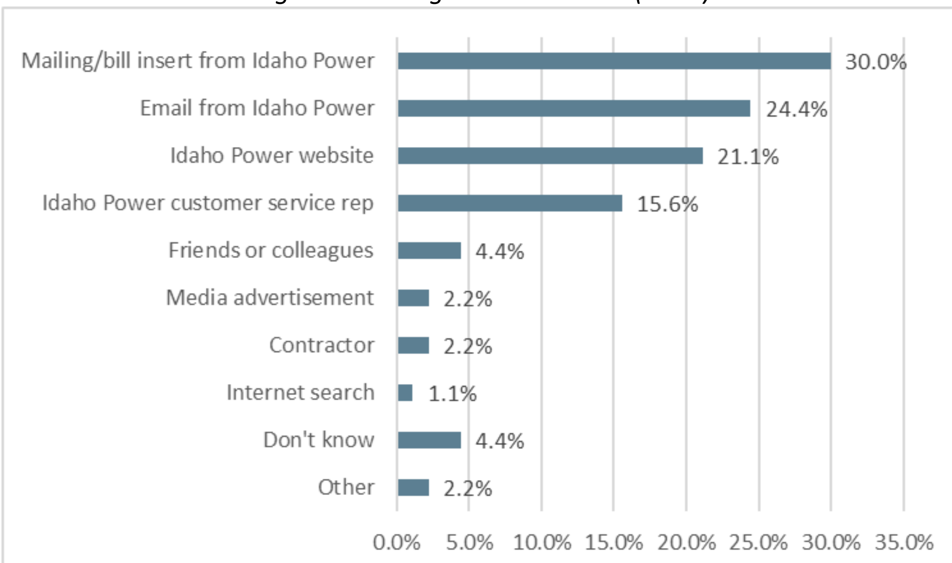
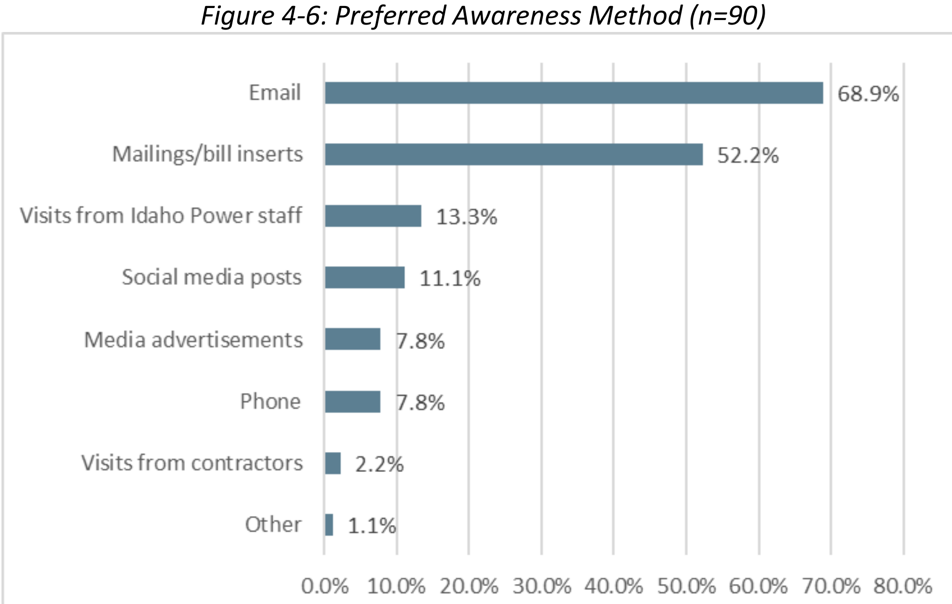


Figure 4-6: Preferred Awareness Method (n=90)



4.2.1.3 Program Participation

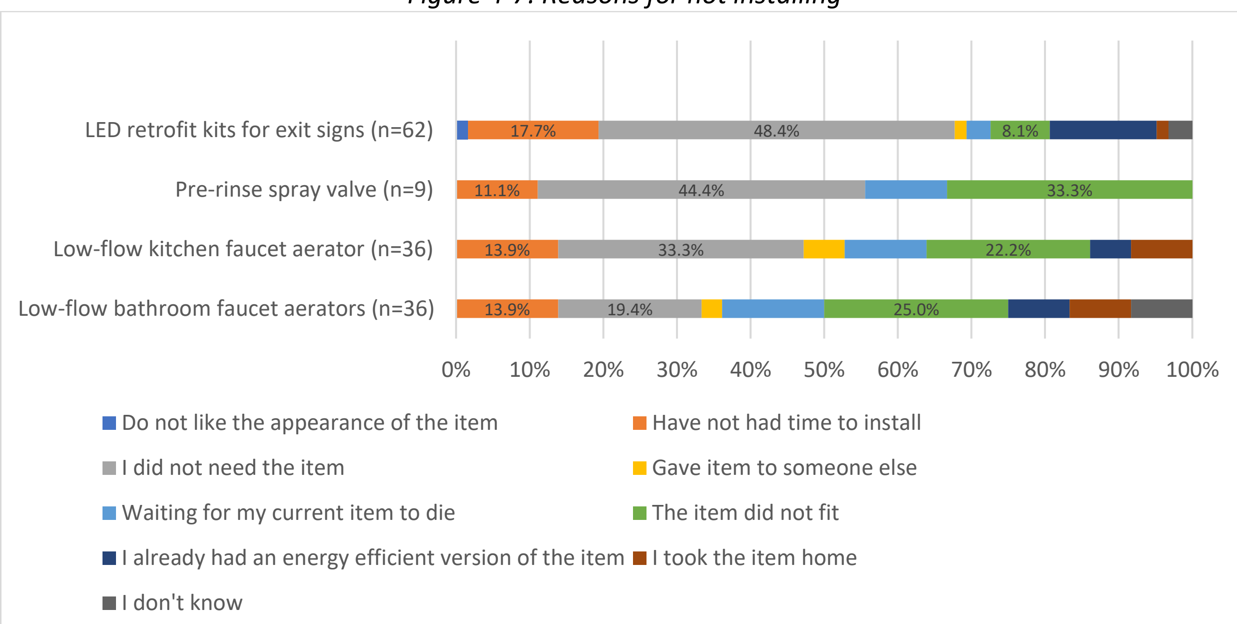
The majority of respondents who remembered receiving a kit (n=90), indicated they installed some of the measures from the kit (95.6%, n=86). LED retrofit kits for exits signs were the most common item not installed by respondents, followed by pre-rinse spray valve, low-flow kitchen faucet aerators, and low-flow bathroom faucet aerators.

Table 4-3: Number of respondents who did not install some/all of a measure

Measure	Possible respondents (n)	Respondents who did not install (n)	Respondents who did not install (%)
LED general screw in bulbs	90	3	3.3%
LED BR30 bulbs	10	3	30.0%
Advanced power strip	60	5	8.3%
Pre-rinse spray valve	20	9	45.0%
Low-flow bathroom faucet aerators	90	36	40.0%
Low-flow kitchen faucet aerator	90	36	40.0%
LED retrofit kits for exit signs	90	62	68.9%

Respondents were asked why they chose not to install all or some of each of the measures provided in the kit. In general, "I did not need the item", "the item did not fit", and "I have not had time to install the item" were the most popular reasons for not installing the exit signs, pre-rinse spray valve, and aerators (Figure). LED general screw in bulbs and advanced power strips were not included in Figure 4-7 due to low number of no installs.

Figure 4-7: Reasons for not installing



Prior to receiving the kit, many respondents had purchased or planned to purchase a variety of energy efficient items (Figure 4-8). Table 4-4 demonstrates that the most popular reason respondents listed for not buying each of the measures prior to receiving the kit was because they did not know enough about the item.

Figure 4-8: Energy efficient items purchasing habits

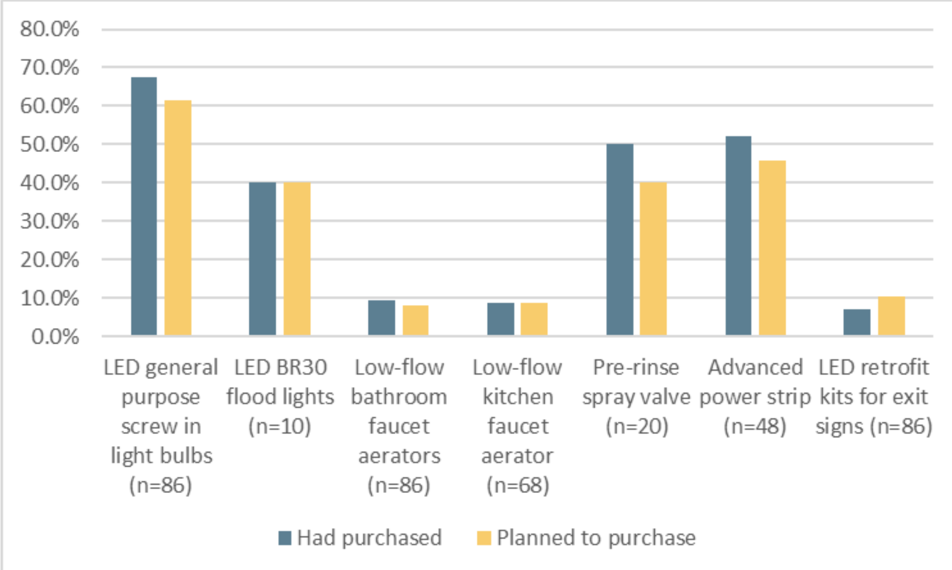


Table 4-4: Reasons why respondents did not previously purchase energy efficient items

Measure	Reason	Proportion
LED general screw in bulbs (n=27)	Didn't know enough about it	51.9%
LED BR30 bulbs (n=5)	Didn't know enough about it/ Didn't like the appearance	40.0% 40.0%
Bathroom faucet aerator (n=78)	Didn't know enough about it	69.2%
Kitchen faucet aerator (n=65)	Didn't know enough about it	67.7%
Pre-rinse spray valve (n=10)	Didn't know enough about it	60.0%
Advanced Power Strip (n=22)	Didn't know enough about it	59.1%
LED exit signs (n=78)	Didn't know enough about it	76.9%

When asked what additional items they would like to have received, respondents listed of variety of energy efficient items (Table 4-5). Among the items mentioned, occupancy sensors and timers for lights, air filters, smart thermostats, and weatherization measures were the only items listed that were not included in any of the kits. The Evaluators summarize the responses in the table below.

Table 4-5: Requested Measures

Measure	n
LED lights	17
Occupancy sensors/timers	9
Outdoor lighting	5
Advanced power strips	5
Weatherization	3
Solar measures	3
Air filters	1
Exit signs	1
Smart thermostat	1
Faucet aerator	1

5. Appendix A: Participant Survey

This section provides a copy of the survey sent to participants of the Commercial Energy Saving Kits Program.

5.1 Pre-Defined Variables

Prepopulated variables are shown in all caps enclosed in brackets, e.g., [PREDEFINED VARIABLE]

Variable	Definition
CONTACT_NAME	Premise Customer Name
BUSINESS_TYPE	Office=1; Restaurant=2; Retail=3
LOCATION	Business Location

5.2 Email Survey Message

Subject: Invitation to Help Improve Idaho Power's Commercial Energy-Saving Kit Program

Hello ${e://Field/CONTACT_NAME},

Thank you for participating in Idaho Power's Commercial Energy-Saving Kit Program. Idaho Power is interested in your feedback about the program and invites you to take an online survey to let us know how we can improve it!

The survey should take no more than **10 minutes** of your time, and as a thank you we are providing a **$25 gift card** to the **first 75 respondents** who complete the survey.

Follow this link to the Survey:
${l://SurveyLink?d=Take the Survey}

Or copy and paste the URL below into your internet browser:
${l://SurveyURL}

If you require technical assistance, please contact Tiffani Tonso at tiffani.tonso@admenergy.com. In addition, if you have any question regarding this survey request, please contact Idaho Power customer service at 208-388-2323 or 1-800-488-6151. You may also contact Chad Severson at Idaho Power at 208-388-2398 or by email at cseverson@idahopower.com.

Thank you so much for your time.

Sincerely,
Tiffani Tonso

5.3 Survey

Start of Block: Qualification Questions

Q1 Our records indicate that your business located at **${e://Field/LOCATION}** received a free energy saving kit from Idaho Power. This kit included measures like LED lighting, faucet aerators, and LED 'Exit' sign retrofit kit.

Do you recall receiving this kit?

- ◯ Yes (1)
- ◯ No (2)

Page Break

Display This Question:

If Our records indicate that your business located at ${e://Field/LOCATION} received a free energy s... = No

Q2 Is there someone else in your business who may be able to answer questions about the kit?

- ◯ Yes (1)
- ◯ No (2)

Page Break

Display This Question:

If Is there someone else in your business who may be able to answer questions about the kit? = No

X→

Q3 What is the main fuel type used for **heating** the building/facility?

- ◯ Electric (1)
- ◯ Gas (2)
- ◯ Other, please specify: (3) ____
- ◯ I don't know (98)

Display This Question:

If Is there someone else in your business who may be able to answer questions about the kit? = No

Q4 What is the main fuel type used for heating the building/facility's **water**?

- Electric (1)
- Gas (2)
- Other, please specify: (3) ____
- I don't know (98)

Display This Question:

If Is there someone else in your business who may be able to answer questions about the kit? = Yes

Q5 Can you provide me with their contact information?

- Name (1) ____
- Email (2) ____
- Phone Number (3) ____

End of Block: Qualification Questions

Start of Block: Commercial Kit Program Awareness

Q6 This first set of questions are about how you became aware of the Commercial Energy-Saving Kit Program.

What is your job title or role?

- Office Manager (1)
- Store Manger (2)
- Executive (3)
- Assistant (4)
- Food Service Staff (5)
- Owner (6)
- Other, please specify: (7) ____

Page Break

Q7 How did you learn about Commercial Energy-Saving Kit Program?
(Please select all that apply.)

- ☐ Idaho Power customer service representative or energy advisor (1)
- ☐ Idaho Power website (2)
- ☐ Email from Idaho Power (3)
- ☐ Mailing/bill insert from Idaho Power (4)
- ☐ Contractor (5)
- ☐ Friends or colleagues (6)
- ☐ Internet search (e.g., Google) (7)
- ☐ Media advertisement (internet, radio, television) (8)
- ☐ Other, please specify: (9) ____
- ☐ ⊗I don't know (98)

Page Break

Q8 What are the best ways to reach companies like yours with information about incentives for energy savings opportunities, like the ones offered through the Commercial Energy-Saving Kit Program?
(Please select all that apply.)

- ☐ Visits from Idaho Power staff (1)
- ☐ Email (2)
- ☐ Mailings/bill inserts (3)
- ☐ Phone (4)
- ☐ Social media posts (5)
- ☐ Media advertisements (internet, radio, television) (6)
- ☐ Visits from contractors (7)
- ☐ Other, please specify: (8) ____

Page Break

X→

Q9 The kit you received included an installation guide. Did you find the installation guide helpful?

- Yes (1)
- No (2)
- Did not receive an installation guide (3)
- I don't know (98)

Page Break

Display This Question:

If The kit you received included an installation guide. Did you find the installation guide helpful? = No

Q10 What can Idaho Power do to improve the installation guide?

____

End of Block: Commercial Kit Program Awareness

Start of Block: Small Business Energy Kit Installation

Q11 This set of questions asks you about the energy saving kit you received through Idaho Power's Commercial Energy-Saving Kit Program.

Were you able to install **any** of the items in the kit at your business located at **${e://Field/LOCATION}**?

- Yes (1)
- No (2)

Display This Question:

If This set of questions asks you about the energy saving kit you received through Idaho Power's Com... = No

Q12 What were the reasons or circumstances that prevented you from installing the items in the kit at your business?

____

End of Block: Small Business Energy Kit Installation

Start of Block: Kit Install

Q13 Below is a list of items that were included in your kit. Of these items how many did you **install** in your business?

Display This Question:

If BUSINESS_TYP = 1

Or BUSINESS_TYP = 3

Q14 How many of the **(2) LED general purpose screw light bulbs** did you install in your business?
▼ None (0) ... I don't know (98)

Display This Question:

If BUSINESS_TYP = 2

Q15 How many of the **(3) LED general purpose screw light bulbs** did you install in your business?
▼ None (0) ... I don't know (98)

Display This Question:

If BUSINESS_TYP = 3

16 How many of the **(2) LED BR30 (flood lights)** did you install in your business?
▼ None (0) ... I don't know (98)

Display This Question:

If BUSINESS_TYP = 1

Or BUSINESS_TYP = 2

Q17 How many of the **(2) low flow bathroom faucet aerators** did you install in your business?
▼ None (0) ... I don't know (98)

Display This Question:

If BUSINESS_TYP = 3

Q18 Did you install the **(1) low flow bathroom faucet aerator** in your business?
▼ Yes (1) ... I don't know (98)

Display This Question:

If BUSINESS_TYP = 1

Q19 Did you install the **(1) low flow kitchen faucet aerator** in your business?

▼ Yes (1) ... I don't know (98)

Display This Question:

If BUSINESS_TYP = 2

Q20 How many of the **(2) low flow kitchen faucet aerator** did you install in your business?

▼ None (0) ... I don't know (98)

Display This Question:

If BUSINESS_TYP = 2

Q21 Did you install the **(1) pre-rinse spray valve** in your business?

▼ Yes (1) ... I don't know (3)

Display This Question:

If BUSINESS_TYP = 1

Q22 Did you install the **(1) advanced power strip** in your business?

▼ Yes (1) ... I don't know (3)

Q23 How many of the **(2) LED retrofit kits for exit signs** did you install in your business?

▼ None (0) ... I don't know (98)

Display This Question:

If How many of the (2) LED general purpose screw light bulbs did you install in your business? = None

Or How many of the (3) LED general purpose screw light bulbs did you install in your business? = None

Or How many of the (2) LED BR30 (flood lights) did you install in your business? = None

Or How many of the (2) low flow bathroom faucet aerators did you install in your business? = None

Or Did you install the (1) low flow bathroom faucet aerator in your business? = No

Or Did you install the (1) low flow kitchen faucet aerator in your business? = No

Or How many of the (2) low flow kitchen faucet aerator did you install in your business? = None

Or Did you install the (1) pre-rinse spray valve in your business? = No

Or Did you install the (1) advanced power strip in your business? = No

Or How many of the (2) LED retrofit kits for exit signs did you install in your business? = None

Q24 Why didn't you install the following energy saving items at your business?
(Please select all that apply for each item. Use the right arrow next to the statement box to view

additional items. Once all items have been answered, please click the right arrow at the bottom of the page to continue with the survey.)

Display This Choice:

If How many of the (2) LED general purpose screw light bulbs did you install in your business? = None

Or How many of the (3) LED general purpose screw light bulbs did you install in your business? = None

Display This Choice:

If How many of the (2) LED BR30 (flood lights) did you install in your business? = None

Display This Choice:

If How many of the (2) low flow bathroom faucet aerators did you install in your business? = None

Or Did you install the (1) low flow bathroom faucet aerator in your business? = No

Display This Choice:

If Did you install the (1) low flow kitchen faucet aerator in your business? = No

Or How many of the (2) low flow kitchen faucet aerator did you install in your business? = None

Display This Choice:

If Did you install the (1) pre-rinse spray valve in your business? = No

Display This Choice:

If Did you install the (1) advanced power strip in your business? = No

Display This Choice:

If How many of the (2) LED retrofit kits for exit signs did you install in your business? = None

	Do not like the appearance of the item (1)	Have not had time to install (2)	Item was broken (3)	I did not need the item (4)	Gave item to someone else (5)	Waiting for my current item to die (6)	The item did not fit (7)	I already had an energy efficient version of the item (8)	I took the item home (9)	I don't know (10)
Display This Choice: *If How many of the (2) LED general purpose screw light bulbs did you install in your business? = None* *Or How many of the (3) LED general purpose screw light bulbs did you install in your business? = None* LED general screw in bulbs (1)	○	○	○	○	○	○	○	○	○	○

Display This Choice: *If How many of the (2) LED BR30 (flood lights) did you install in your business? = None* LED BR30 bulbs (2)	
Display This Choice: *If How many of the (2) low flow bathroom faucet aerators did you install in your business? = None* *Or Did you install the (1) low flow bathroom faucet aerator in your business? = No* Low-flow bathroom faucet aerators (3)	

Display This Choice: *If Did you install the (1) low flow kitchen faucet aerator in your business? = No* *Or How many of the (2) low flow kitchen faucet aerator did you install in your business? = None* Low-flow kitchen faucet aerator (4)	○	○	○	○	○	○	○	○	○	○
Display This Choice: *If Did you install the (1) pre-rinse spray valve in your business? = No* Pre-rinse spray valve (5)	○	○	○	○	○	○	○	○	○	○

Display This Choice: If Did you install the (1) advanced power strip in your business? = No Advanced power strip (6)	○	○	○	○	○	○	○	○	○	○
Display This Choice: If How many of the (2) LED retrofit kits for exit signs did you install in your business? = None LED retrofit kits for exit signs (7)	○	○	○	○	○	○	○	○	○	○

End of Block: Kit Install

Start of Block: Free Ridership

Q25 The next set of questions asks you to think back to before you received the energy efficient items in your kit.

Before you received your energy savings kit, had your organization purchased any of the following in the past...

Display This Choice:

If BUSINESS_TYP = 3

Display This Choice:

If BUSINESS_TYP = 1

Or BUSINESS_TYP = 2

Display This Choice:

If BUSINESS_TYP = 2

Display This Choice:

If BUSINESS_TYP = 1

	Yes (1)	No (2)	I don't know (98)
LED general purpose screw in light bulbs (1)	○	○	○
Display This Choice: If BUSINESS_TYP = 3 LED BR30 flood lights (2)	○	○	○
Low-flow bathroom faucet aerators (3)	○	○	○
Display This Choice: If BUSINESS_TYP = 1 Or BUSINESS_TYP = 2 Low-flow kitchen faucet aerator (4)	○	○	○
Display This Choice: If BUSINESS_TYP = 2 Pre-rinse spray valve (5)	○	○	○
Display This Choice: If BUSINESS_TYP = 1 Advanced power strip (6)	○	○	○
LED retrofit kits for exit signs (7)	○	○	○

Q26 Before receiving your energy savings kit, **did you have plans** to purchase any...

Display This Choice:

If BUSINESS_TYP = 3

Display This Choice:

If BUSINESS_TYP = 1

Or BUSINESS_TYP = 2

Display This Choice:

If BUSINESS_TYP = 2

Display This Choice:

If BUSINESS_TYP = 1

	Yes (1)	No (2)	I don't know (98)
LED general purpose screw in light bulbs (1)	o	o	o
Display This Choice: If BUSINESS_TYP = 3 LED BR30 flood lights (2)	o	o	o
Low-flow bathroom faucet aerators (3)	o	o	o
Display This Choice: If BUSINESS_TYP = 1 Or BUSINESS_TYP = 2 Low-flow kitchen faucet aerator (4)	o	o	o
Display This Choice: If BUSINESS_TYP = 2 Pre-rinse spray valve (5)	o	o	o
Display This Choice: If BUSINESS_TYP = 1 Advanced power strip (6)	o	o	o
LED retrofit kits for exit signs (7)	o	o	o

Page Break

Display This Question:

If The next set of questions asks you to think back to before you received the energy efficient item... = LED general purpose screw in light bulbs [No]

Q27 Why have you not purchased **${Q25/ChoiceDescription/1}** before?
(Please select all that apply.)

- ▢ They cost too much (1)
- ▢ Didn’t know where to purchase ${Q25/ChoiceDescription/1} (2)
- ▢ Didn’t know enough about ${Q25/ChoiceDescription/1} (3)
- ▢ Don’t like their appearance or the quality of the ${Q25/ChoiceDescription/1} (4)

Page Break

Display This Question:

If The next set of questions asks you to think back to before you received the energy efficient item... = LED BR30 flood lights [No]

Q28 Why have you not purchased **${Q25/ChoiceDescription/2}** before?
(Please select all that apply.)

- ▢ They cost too much (1)
- ▢ Didn’t know where to purchase ${Q25/ChoiceDescription/2} (2)
- ▢ Didn’t know enough about ${Q25/ChoiceDescription/2} (3)
- ▢ Don’t like their appearance or the quality of the ${Q25/ChoiceDescription/2} (4)

Page Break

Display This Question:

If The next set of questions asks you to think back to before you received the energy efficient item... = Low-flow bathroom faucet aerators [No]

Q29 Why have you not purchased **${Q25/ChoiceDescription/3}** before?
(Please select all that apply.)

- They cost too much (1)
- Didn't know where to purchase ${Q25/ChoiceDescription/3} (2)
- Didn't know enough about ${Q25/ChoiceDescription/3} (3)
- Don't like their appearance or the quality of the ${Q25/ChoiceDescription/3} (4)

Display This Question:

If The next set of questions asks you to think back to before you received the energy efficient item... = Low-flow kitchen faucet aerator [No]

Q30 Why have you not purchased **${Q25/ChoiceDescription/4}** before?
(Please select all that apply.)

- They cost too much (1)
- Didn't know where to purchase ${Q25/ChoiceDescription/4} (2)
- Didn't know enough about ${Q25/ChoiceDescription/4} (3)
- Don't like their appearance or the quality of the ${Q25/ChoiceDescription/4} (4)

Page Break

Display This Question:

If The next set of questions asks you to think back to before you received the energy efficient item... = Pre-rinse spray valve [No]

Q31 Why have you not purchased **${Q25/ChoiceDescription/5}** before?
(Please select all that apply.)

- They cost too much (1)
- Didn't know where to purchase ${Q25/ChoiceDescription/5} (2)
- Didn't know enough about ${Q25/ChoiceDescription/5} (3)
- Don't like their appearance or the quality of the ${Q25/ChoiceDescription/5} (4)

Page Break

Display This Question:

If The next set of questions asks you to think back to before you received the energy efficient item... = Advanced power strip [No]

Q32 Why have you not purchased **${Q25/ChoiceDescription/6}** before?
(Please select all that apply.)

- ▢ They cost too much (1)
- ▢ Didn't know where to purchase ${Q25/ChoiceDescription/6} (2)
- ▢ Didn't know enough about ${Q25/ChoiceDescription/6} (3)
- ▢ Don't like their appearance or the quality of the ${Q25/ChoiceDescription/6} (4)

Page Break

Display This Question:

If The next set of questions asks you to think back to before you received the energy efficient item... = LED retrofit kits for exit signs [No]

Q33 Why have you not purchased **${Q25/ChoiceDescription/7}** before?
(Please select all that apply.)

- ▢ They cost too much (1)
- ▢ Didn't know where to purchase ${Q25/ChoiceDescription/7} (2)
- ▢ Didn't know enough about ${Q25/ChoiceDescription/7} (3)
- ▢ Don't like their appearance or the quality of the ${Q25/ChoiceDescription/7} (4)

End of Block: Free Ridership

Start of Block: Lost Opportunity Analysis

Display This Question:

If How many of the (2) LED general purpose screw light bulbs did you install in your business? = 2

Or How many of the (3) LED general purpose screw light bulbs did you install in your business? = 3

Or How many of the (2) LED BR30 (flood lights) did you install in your business? = 2

Or How many of the (2) low flow bathroom faucet aerators did you install in your business? = 2

Or Did you install the (1) low flow bathroom faucet aerator in your business? = Yes

Or Did you install the (1) low flow kitchen faucet aerator in your business? = Yes

Or How many of the (2) low flow kitchen faucet aerator did you install in your business? = 2

Or Did you install the (1) pre-rinse spray valve in your business? = Yes

Or Did you install the (1) advanced power strip in your business? = Yes

Or How many of the (2) LED retrofit kits for exit signs did you install in your business? = 2

*

Q34 The next set of questions asks you about additional measures you may have installed if more measures were provided.

How many more of each would you have installed at **${e://Field/LOCATION}**, if you were able to request more?
(Please provide a numeric value.)

Display This Choice:

If How many of the (2) LED general purpose screw light bulbs did you install in your business? = 2

Or How many of the (3) LED general purpose screw light bulbs did you install in your business? = 3

Display This Choice:

If How many of the (2) LED BR30 (flood lights) did you install in your business? = 2

Display This Choice:

If How many of the (2) low flow bathroom faucet aerators did you install in your business? = 2

Or Did you install the (1) low flow bathroom faucet aerator in your business? = Yes

Display This Choice:

If Did you install the (1) low flow kitchen faucet aerator in your business? = Yes

Or How many of the (2) low flow kitchen faucet aerator did you install in your business? = 2

Display This Choice:

If Did you install the (1) pre-rinse spray valve in your business? = Yes

Display This Choice:

If Did you install the (1) advanced power strip in your business? = Yes

Display This Choice:

If How many of the (2) LED retrofit kits for exit signs did you install in your business? = 2

	Additional Quantity (1)
Display This Choice: *If How many of the (2) LED general purpose screw light bulbs did you install in your business? = 2* *Or How many of the (3) LED general purpose screw light bulbs did you install in your business? = 3* LED general purpose screw bulbs (1)	
Display This Choice: *If How many of the (2) LED BR30 (flood lights) did you install in your business? = 2* LED BR30 flood lights (2)	
Display This Choice: *If How many of the (2) low flow bathroom faucet aerators did you install in your business? = 2* *Or Did you install the (1) low flow bathroom faucet aerator in your business? = Yes* Low-flow bathroom faucet aerators (3)	
Display This Choice: *If Did you install the (1) low flow kitchen faucet aerator in your business? = Yes* *Or How many of the (2) low flow kitchen faucet aerator did you install in your business? = 2* Low-flow kitchen faucet aerator (4)	

Display This Choice: *If Did you install the (1) pre-rinse spray valve in your business? = Yes* Pre-rinse spray valve (5)	
Display This Choice: *If Did you install the (1) advanced power strip in your business? = Yes* Advanced power strip (6)	
Display This Choice: *If How many of the (2) LED retrofit kits for exit signs did you install in your business? = 2* LED retrofit kits for exit signs (7)	

Page Break

Q35 Idaho Power is considering adding additional items to the kit and would like your opinion of useful items.

Please list any energy efficient items that you would install at your business if they were included in an energy saving kit.

____

End of Block: Lost Opportunity Analysis

Start of Block: Kit Satisfaction

Q36 The next set of questions asks you about your satisfaction with the Commercial Energy-Saving Kit Program and Idaho Power more generally.

Please provide your satisfaction with each of the following:

	1- Very dissatisfied (1)	2- Somewhat dissatisfied (2)	3- Neither satisfied nor dissatisfied (3)	4- Somewhat satisfied (4)	5- Very satisfied (5)	I don't know (98)
The types of energy efficient items you received in the kit (1)	o	o	o	o	o	o
The steps you had to take to receive the kit (2)	o	o	o	o	o	o
The Commercial Energy-Saving Kit program overall (3)	o	o	o	o	o	o
Idaho Power as your utility provider (4)	o	o	o	o	o	o

Page Break

Display This Question:

If The next set of questions asks you about your satisfaction with the Commercial Energy-Saving Kit... = The steps you had to take to receive the kit [1- Very dissatisfied]

Or The next set of questions asks you about your satisfaction with the Commercial Energy-Saving Kit... = The steps you had to take to receive the kit [2- Somewhat dissatisfied]

Or The next set of questions asks you about your satisfaction with the Commercial Energy-Saving Kit... = The Commercial Energy-Saving Kit program overall [1- Very dissatisfied]

Or The next set of questions asks you about your satisfaction with the Commercial Energy-Saving Kit... = The Commercial Energy-Saving Kit program overall [2- Somewhat dissatisfied]

Or The next set of questions asks you about your satisfaction with the Commercial Energy-Saving Kit... = Idaho Power as your utility provider [1- Very dissatisfied]

Or The next set of questions asks you about your satisfaction with the Commercial Energy-Saving Kit... = Idaho Power as your utility provider [2- Somewhat dissatisfied]

Q37 You indicated some dissatisfaction. Why were you dissatisfied?

____

Page Break

Display This Question:

If The next set of questions asks you about your satisfaction with the Commercial Energy-Saving Kit... = The types of energy efficient items you received in the kit [1- Very dissatisfied]

Or The next set of questions asks you about your satisfaction with the Commercial Energy-Saving Kit... = The types of energy efficient items you received in the kit [2- Somewhat dissatisfied]

Q38 You indicated dissatisfaction with the energy efficient items included in your kit. What measures or changes to the measures would you like to see included?

____

Page Break

Q39 How has the receipt of your energy-saving kit affected your satisfaction with Idaho Power as your electrical provider?

- ◯ Greatly increased your satisfaction (1)
- ◯ Somewhat increased your satisfaction (2)
- ◯ Did not affect your satisfaction (3)
- ◯ Somewhat decreased your satisfaction (4)
- ◯ Greatly decreased your satisfaction (5)
- ◯ I don't know (98)

Q40 Would you like the Idaho Power team to contact you about other energy efficiency opportunities available for you and your business?

- ◯ Yes (1)
- ◯ No (2)

Display This Question:

If Would you like the Idaho Power team to contact you about other energy efficiency opportunities av... = Yes

Q41 Please provide the name and contact information of the best person to contact about additional energy efficiency opportunities.

- ◯ Name (1) ____
- ◯ Title (2) ____
- ◯ Phone Number (3) ____
- ◯ Email (4) ____

End of Block: Kit Satisfaction

Start of Block: Fuel Type

Q42 This final set of questions ask you about your business.

What is the main fuel type used for **heating** the building/facility?

- Electric (1)
- Gas (2)
- Other, please specify: (3) ____
- I don't know (98)

Q43 What is the main fuel type used for heating the building/facility's **water**?

- Electric (1)
- Gas (2)
- Other, please specify: (3) ____
- I don't know (98)

End of Block: Fuel Type

Start of Block: About Your Organization

Q44 How would you describe your company's facility located at **${e://Field/LOCATION}**?

- Your company's only location (1)
- One of several locations owned by your company (2)
- The headquarter location of a company with several locations (3)
- I don't know (98)

Page Break

Display This Question:

If How would you describe your company's facility located at ${e://Field/LOCATION}? = One of several locations owned by your company

Or How would you describe your company's facility located at ${e://Field/LOCATION}? = The headquarter location of a company with several locations

Q45 Did the company's other locations also receive a Commercial Energy-Saving Kit from Idaho Power?

- Yes (1)
- No (2)
- I don't know (98)

Page Break

Q46 Does your company pay the electric bill for this location?

- Yes (1)
- No (2)
- I don't know (98)

Page Break

Q47 Do you have any other comments that you would like to relay to Idaho Power about energy efficiency in the commercial and industrial sector or about their programs?

____

____

____

____

____

Page Break

Q48 We are interested in speaking with customers who installed measures from the kit using a video conference. To participate, you need to have a smart phone with access to the internet. In exchange, we are providing a **$50 gift card** for customers selected to participate in this additional research. This is in addition to the $25 gift card you will receive for completing this survey.

Are you interested in participating in this research?

◯ Yes (1)

◯ No (2)

Page Break

Display This Question:

If We are interested in speaking with customers who installed measures from the kit using a video co... = Yes

Q49 Please provide the following information. If selected, we will contact you to arrange an appointment time.

◯ Name (1) ____

◯ Email (2) ____

◯ Phone Number (3) ____

◯ Best day(s) and time(s) to contact (4)

____

End of Block: About Your Organization

Start of Block: Gift Card Confirmation

Q50 Thank you for taking the time today to complete this survey. As stated in the email, we are providing a $25 electronic gift card to the first 75 people who complete the survey as a thank you for a timely response. The email address we have on file for you is **${e://Field/EMAIL}**. Please confirm this information:

◯ Yes, please send my electronic gift card to the **above** email (1)

◯ No, please send my electronic gift card to the **following** email (2)

____

End of Block: Gift Card Confirmation

Idaho Power Company

Idaho Power Company Commercial and Industrial Energy Efficiency Program – New Construction

2021 Program Year Impact and Process Evaluation Results

TETRA TECH

November 8, 2022

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ACKNOWLEDGEMENTS

We would like to acknowledge the many individuals who contributed to the 2021 impact and process evaluation of the New Construction offering of the Idaho Power Commercial and Industrial Efficiency program. This evaluation effort would not have been possible without their help and support.

We would like to specifically thank Sheree Willhite, Chad Severson, and Kathy Yi of Idaho Power, who provided invaluable insight into the Program and operations. These individuals participated in ongoing evaluation deliverable reviews and discussions and graciously responded to follow-up questions and data and documentation requests. Tetra Tech received valuable assistance from Idaho Power Energy Advisors with scheduling verification visits.

The Tetra Tech Evaluation Team was made up of the following individuals: Kimberly Bakalars, Mark Bergum, Graham Thorbrogger, Nathan Kwan, Andrew Spista, and Laura Meyer.

1.0 EXECUTIVE SUMMARY

Tetra Tech is pleased to provide Idaho Power Company (Idaho Power) with a report for the 2022 impact and process evaluation of the 2021 New Construction and Major Renovations (New Construction) offering of the Idaho Power Commercial and Industrial Energy Efficiency (CIEE) program. The Idaho Power CIEE program provides a comprehensive menu of incentives and services to facilitate the implementation of cost-effective energy-efficiency improvements for commercial and industrial (C&I) customers. Incentives cover retrofits, new construction and major renovation projects, and custom incentives for cost-effective projects not covered on the menu of incentives.

This report section consists of (1) an introduction describing the program, (2) methodology, and (3) key findings and recommendations. The detailed impact results can be found in Section 3.0, with process results detailed in Section 4.0.

1.1 PROGRAM DESCRIPTION

The New Construction offering provides incentives for designing and building better-than-code energy-efficient features into new construction, major renovation, addition, expansion, or change-of-space projects. The New Construction offering, which originated in 2004, currently offers a menu of 33 measures in Idaho and 25 measures in Oregon, including efficient lighting and lighting controls, cooling, ventilation, building shell, controls, appliances, refrigeration, office equipment, and compressed air projects.

The program offers both customer and professional assistance incentives (PAI). Customer incentives are calculated based on eligibility criteria and applicable units for each specific measure; PAIs are available to architects and engineers for up to 20 percent of the participants' total incentive, with a maximum of $5,000 per application.

Customers complete the *Preliminary Application* tab of the New Construction application if they are interested in receiving New Construction incentives. Idaho Power reviews each application and works with the customer and vendors to gather sufficient information. Qualification specifications are shared with the design team, and projects are completed. Then customers finish the New Construction application process by submitting all required documentation and emailing it to Idaho Power. Post-project verifications are conducted on ten percent of completed projects.

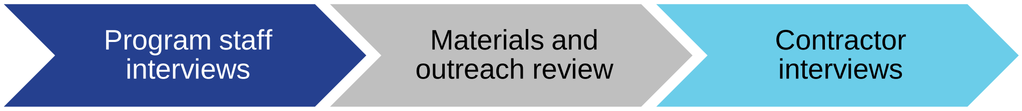
1.2 METHODOLOGY

To address the evaluation objectives, which included verifying energy impacts attributable to the 2021 program, providing estimates of realization rates, and suggesting enhancements to the savings analysis and reporting, the evaluation team conducted the impact evaluation activities shown in Figure 1.

Figure 1. Impact Evaluation Activities

Tetra Tech also conducted a process evaluation for the New Construction offering; Figure 2 highlights the activities undertaken to address the process research objectives.

Figure 2. Process Evaluation Activities



1.3 FINDINGS AND RECOMMENDATIONS

The process and impact evaluation for the New Construction offering of the CIEE program found a successfully run program that actively engages with the marketplace on new construction projects to impact the design and construction of new C&I facilities. The program stays current with code requirements and works with individual buildings to ensure they exceed code for the appropriate design and construction period. The program is historically heavily dependent on lighting, which will decrease as more projects in the pipeline update to IECC 2018 code.

The evaluation team found that recommendations from the previous evaluation have been sufficiently addressed. We also found slight adjustments to ex-ante savings claimed in the PY2021 program and limited opportunities for process improvements. Because the Idaho Power staff delivering this program have developed good documentation and are continually pursuing improvements, we found the Program Engineer had identified and addressed many of the findings from this evaluation before the evaluation team presented them. In addition, Idaho Power is proactively making some of the adjustment options for PY2022 program implementation that were identified through the PY2021 evaluation.

Overall, the impact evaluation found the program measures and savings are well supported and documented. The evaluation team determined that the realization rate is 102.5 percent for the PY2021 New Construction program.

Table 1. PY2021 New Construction Offering Realization Rate

Program year	Number of projects	MWh claimed	MWh evaluated	Program realization rate
2021	95	17,536	17,971	102.5%

1.3.1 Impact Recommendations

The following impact recommendations are provided for Idaho Power's consideration:

Document project worksheets at stages throughout the process. Documenting the project calculations and worksheets at three consistent stages will support project understanding. The evaluation team recommends that documentation is filed at three primary stages of the program process: (1) at preliminary application, (2) at final application, and (3) at final claimed savings.

Documenting at these stages will make information available to understand project adjustment timing, purpose, and scale throughout the new construction process.

Increase program review and feedback of the submitted code-checking software, COMcheck. The COMcheck submittal, provided by the contractor, architect, or engineer, contains details about the claimed components of the design and determines if they meet or exceed the code. It is most commonly used for lighting calculations. The program staff currently completes a review of the proposed lighting equipment; still, an additional review of minimum code selections used to determine the calculation baseline will provide information to determine the consistency of applications to the program. The evaluation team recommends the information collected from the COMcheck review be used to engage with the contractors, architects, and engineers about preferred approaches for the program.

Document the HVAC control systems that meet code and exceed code. Commercial HVAC systems are all designed based on the space requirements and can have systems that fit into one or more exemptions within the baseline code system. Understanding the baseline code and the exemptions in the context of determining what exceeds code can be complicated because some exemptions create a situation where a partial percentage of the installation total is required by code. Documenting the HVAC controls installed to meet code and those installed to exceed code will ensure the whole control system is documented and understood by all parties. Redesigning the HVAC controls and HVAC worksheets to document these values will support the program's quality assurance reviews.

1.3.2 Process Recommendations

The New Construction offering of the CIEE program is operating well. Idaho Power staff have acted on previous recommendations to consolidate CIEE program information, and a couple of the current recommendations are an extension of that strategy. The following process recommendations are provided for Idaho Power's consideration:

Continue to expand in-person outreach and program overview training where possible. Idaho Power has recently begun scheduling face-to-face meetings with architects and engineers after suspending them during the pandemic; our conversations with these firms confirm a real appetite for resuming those meetings. Although they understand why meetings were suspended, several respondents mentioned interest in getting back to the face-to-face meetings for the interaction they provide with Idaho Power staff and other firms. Small architect firms are particularly interested in training on program requirements and application processes that will make them more efficient.

Consider developing a consolidated contractor list across CIEE programs with substantial overlap. The New Construction Program Engineer conducts numerous outreach activities with architects and engineers. However, firms we spoke with were often unclear on which CIEE program offering they were utilizing (New Construction, Retrofits, Custom) because it was usually more than one. A consolidated list of active contractors, architects, and engineering firms may help coordinate messaging to market actors, giving them more clarity as they work with customers.

Maintaining a combined outreach list will also provide documentation in the event of staff changes and can assist with further managing outreach and engagement. Tracking could include flags for the type of market actor and latest event-date attendance and record notes on known relationships such as architect and engineer, engineer and subcontractor, etc.

Consider a leave-behind brochure for contractors with all CIEE program offerings. There is substantial overlap in experience across programs among firms we interviewed. Idaho Power already enters contractor and design firm conversations with a CIEE overview and leaves appropriate program-specific information for them, depending on the firm's specialty. However, some of the firms we interviewed were concerned that there were customers they could not help with incentives. An overview document may assist design firms with a way to explain program offerings and route customers to one that can benefit them the most.

2.0 INTRODUCTION

2.1 PROGRAM OVERVIEW

The New Construction offering of the CIEE program provides incentives for designing and building better-than-code energy-efficient features into new construction, major renovation, addition, expansion, or change-of-space projects. The offering originated in 2004 and currently provides a menu of 33 measures in Idaho and 25 measures in Oregon, including efficient lighting and controls, cooling, ventilation, building shell, controls, appliances, refrigeration, office equipment, and compressed air projects.

The program offers both customer and Professional Assistance incentives. Customer incentives are calculated based on eligibility criteria and applicable units for each specific measure; Professional Assistance incentives are available to architects and engineers for up to 20 percent of the participants' total incentive, with a maximum of $5,000 per application.

Customer incentives

- Specific to measure type and calculated by square foot, kilowatt-hour saved, cooling capacity, hp, unit, etc.
- Eligibility requirements outlined in New Construction brochure

Professional assistance incentives

- 20 percent of total participant incentive
- Maximum of $5,000 per applicant
- Increased from 10 percent and $2,500 max in September 2020

Idaho Power's New Construction offering manual outlines all the incentives available and the steps to participate in the program. The Professional Assistance incentive increases the engagement with architects and engineers and is most beneficial to small- and medium-sized businesses that typically do not have staff with a technical background in construction, making it challenging to complete applications and submit documentation.

Customers complete the *Preliminary Application* tab of the New Construction application if they are interested in receiving New Construction incentives. Idaho Power reviews each application and works with the customer and vendors to gather sufficient information. Qualification specifications are shared with the design team, and projects are completed. Then customers finish the New Construction application process by submitting all required documentation and emailing it to Idaho Power.

Assess design for energy efficient opportunities

- Discuss energy efficiency options with design team
- Research requirements for incentive qualification

Begin New Construction application

- Download and complete *preliminary* tab
- Email for Idaho Power review
- Share qualification specifications with design team for the Professional Assistance incentive

Complete project

- Collect specification sheets
- Collect proof-of-performance documentation

Complete New Construction application

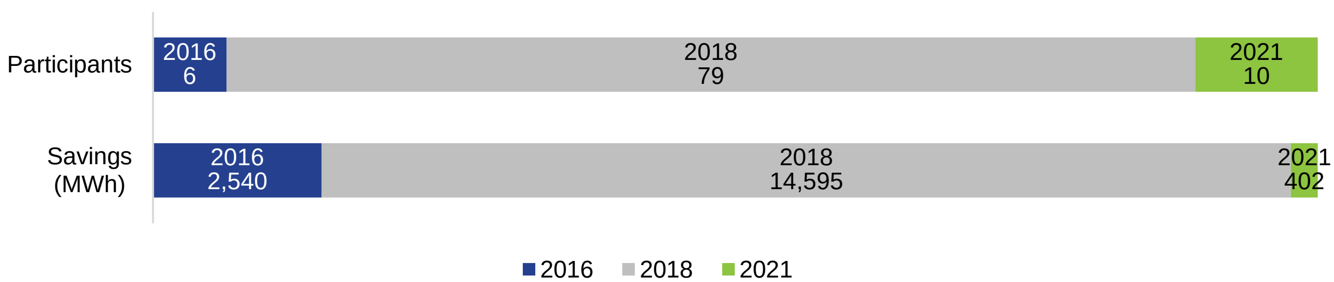
- Attach documentation including invoices and proof of payment
- Attach COMcheck if needed
- Attach control strategy summary if needed
- Email for Idaho Power review

Post-project verifications are conducted on 10 percent of completed projects. With COVID-19 restrictions in 2020, no on-site post-project verifications occurred. Instead, all documentation went through desk reviews. In 2021, on-site verification was completed on 13 percent of projects but found more discrepancies than in previous years.

New Construction offering rolls out a new program format approximately every other year. Each format updates savings based on current code, conditions, and information captured in the Technical Reference Manual (TRM) at that time. When customers turn in a preliminary application, they are assigned the savings and incentives available under that program format for the project duration. Often new construction projects have long construction periods and require consistent and dependable incentives. Due to this, savings and incentives may be booked years later. The most recent 2021 format was rolled out on June 15, 2021, and captures the current code, costs, and savings in TRM Version 3. The 2021 format expanded the program offerings with ten new measures or additional offerings and adjusted existing measures to match the new code baseline.

In 2021, the program completed 95 projects with total savings of 17,536 MWh. Most of the savings were generated using the 2018 version program rules, and only three percent of the savings used the 2021 version program rules. About 15 percent of the savings were attributed to projects using the 2016 program rules version.

Figure 3. C&I New Construction Participants and Savings by Program Year Rules



The program savings in PY2021 was over 90 percent lighting and controls. The categories of HVAC, building controls, and compressed air are the majority of the remaining savings with a limited number of measures installed in refrigeration, building shell, and appliances with hot water heating. This breakdown of savings is typical for a C&I New Construction program and identifies the risk to program savings as lighting code baselines increase efficiency, reducing lighting savings.

2.2 EVALUATION ACTIVITIES

The evaluation activities conducted for New Construction offering projects are summarized in Table 2. Researchable issues are also discussed in this section.

Table 2. PY2021 New Construction Offering Evaluation Activities

Activity	Sample size	Outcome
Program delivery staff interview	1	Understood the program design and delivery and obtained program staff perspectives on program successes and challenges. Confirmed the researchable issues.
Program delivery and marketing material review	N/A	Reviewed the marketing brochures, program manuals, outreach plans, and the program website for messaging and communication benefits.
Tracking system review	N/A	Reviewed the tracking system to determine if all necessary inputs are tracked and if reporting tools contain sufficient information for program review.
Desk reviews	17	Reviewed project documentation and calculations to assess the accuracy of savings claimed for each project. This included review of the energy savings calculations for conformance to the TRM for the version year identified.
Verification on-site visits	7	Completed site visits to verify the installation of measures and assumptions in savings calculations. Verified that the locations matched projects that had a completed desk review.
Architect and engineer interviews	9	Collected feedback from builders and design engineers working with the program, which included satisfaction and suggested improvements.

2.2.1 Evaluation Goals

The impact and process evaluation goals below were outlined in the RFP; objectives were addressed through the evaluation activities listed above.

Impact Evaluation

- Review the tracking database to determine and verify the energy (kilowatt-hour) impacts attributable to the 2021 program.
- Complete file reviews and verify engineering calculations with 90/10 (relative error of no more than 10 percent with 90 percent confidence) confidence and precision.
- Provide credible and reliable program energy and non-energy impact estimates and ex-post realization rates for projects finalized in 2021.
- Report findings and observations and provide recommendations that enhance the effectiveness of future ex-ante savings analyses and the accurate and transparent reporting of program savings.
- Review the implemented changes in the 2021 version year.
- Verify installation and operating conditions of equipment.
- Review updated project verification standards developed by Idaho Power and the Integrated Design Lab (IDL) in 2022.

Process Evaluation

- Evaluate program design to ensure the use of industry best practices.

- Evaluate program implementation, including quality control, operational practice, and outreach.
- Review program forms, manuals, and marketing materials, and provide recommendations for improvements as needed.
- Evaluate program administration, including program oversight, staffing, management, training, documentation, and reporting.
- Understand customer and contractor barriers to participation in the program and provide recommendations to increase participation.
- Investigate how to best integrate the Custom Projects, New Construction, and Retrofits offerings.

3.0 IMPACT EVALUATION

The following sections provide a detailed review of the impact evaluation methodology, evaluation results, and recommendations from the evaluation activities.

3.1 METHODOLOGY

The impact methodology consisted of the four primary evaluation activities shown in Figure 4. Each activity is explained in more detail below.

Figure 4. Process for Verifying Program Savings

Review Data and Conduct Sampling

The tracking system and documentation were provided to the evaluation team for review; the tracking data included information from Idaho Power and participants. The participants provided information through the Project Pre-Approval and Payment Applications for the New Construction offering. It included the following:

- account information, including business name and account number, installation address, and contact information;
- a project description;
- estimated project costs and savings;
- project timeline information (dates); and
- payee information, if different from the account holder.

Idaho Power logged this information and stored it in the program tracking database, CLRIS. In addition to the information above, the CLRIS database includes:

- a customer ID;
- the Idaho Power project representative and region;
- customer rate class, building type, and owner occupant status;
- version year and report year;
- pre-application, final application, and inspected dates;
- project type and area;
- participant, architect, and applicable engineer contact information;
- measure description and category type; and
- gross kilowatt and kilowatt-hour savings and incentives per measure.

The documentation files provided for the New Construction offering showed both application submittal and the verification analysis with a post-installation final project review document. The files Idaho Power provided included:

- the application,
- engineering analysis and calculations,
- verification report,
- tracking system screenshot of project closeout, and
- a post-installation project description.

In addition to output from CLRIS and documentation files, Idaho Power program staff made the following supporting manuals available to the Tetra Tech team for review:

- New Construction offering tracking database download for program year (PY) 2021;
- Technical Reference Manuals (TRM) Versions 2.2, 3.0, 3.1, and 3.2;
- Non-standard Lighting template;
- New Construction marketing list from 2021;
- C&I EE Programs Policy and Procedures Manual 2021 and 2022; and
- New Construction Handbook 2022.

Sampling was conducted at the project level with the stratum completed based on the program version year tracked on the project. The stratum was selected to ensure current implementation rules were evaluated as best as possible. The sampling is summarized in Table 3.

Table 3. PY2021 New Construction Offering Sampling Summary

Sampling stratum	Total projects (total quantity)	Program kWh savings percentage	Sample projects (total quantity)	Sample kWh savings percentage
Version year 2021	10	2.29%	6	1.85%
Version years 2018 and 2016	85	97.71%	11	40.39%
Total	**95**	**100.00%**	**17**	**42.24%**

The objective of the impact evaluation was to meet the precision requirement of 90/10 (relative error of no more than 10 percent with 90 percent confidence). The sample required one project to accomplish this, as the individual project savings was 30 percent of the total program savings. The remainder of the projects were randomly selected within the sampling stratum.

The list of sampled projects was delivered to Idaho Power; individual project files were securely delivered to the evaluation team by an internet-based file-sharing site that required log-in access. The files delivered included:

- applications and worksheets (administrative copies),
- submitted project documents and emails,
- equipment specifications,
- post-install verification reports, and
- incentive payment verification.

Complete Desk Reviews and Site Verifications

Tetra Tech staff conducted desk reviews of the sampled project files. This engineering documentation review was conducted to describe the project, confirm tracking data, identify key assumptions, and determine critical questions before the site verification phase.

The evaluation team reached out to the participants in the sample to schedule site visits in the first half of August 2022. Staff completed site visits by interviewing participants and verifying quantities, equipment specifications, and operating parameters.

Verify Kilowatt-Hour Savings

The final step of the impact evaluation combined information from desk reviews and site verifications to provide quality assurance for each reviewed project, describe any revisions to project assumptions and actual conditions, and update calculations to finalize evaluated savings.

The data gathered from the site verifications was reconciled with the information from the initial desk reviews. Desk reviews and site verifications were completed for seven participants, and the remaining ten had only a desk review completed.

3.2 IMPACT REVIEW RESULTS

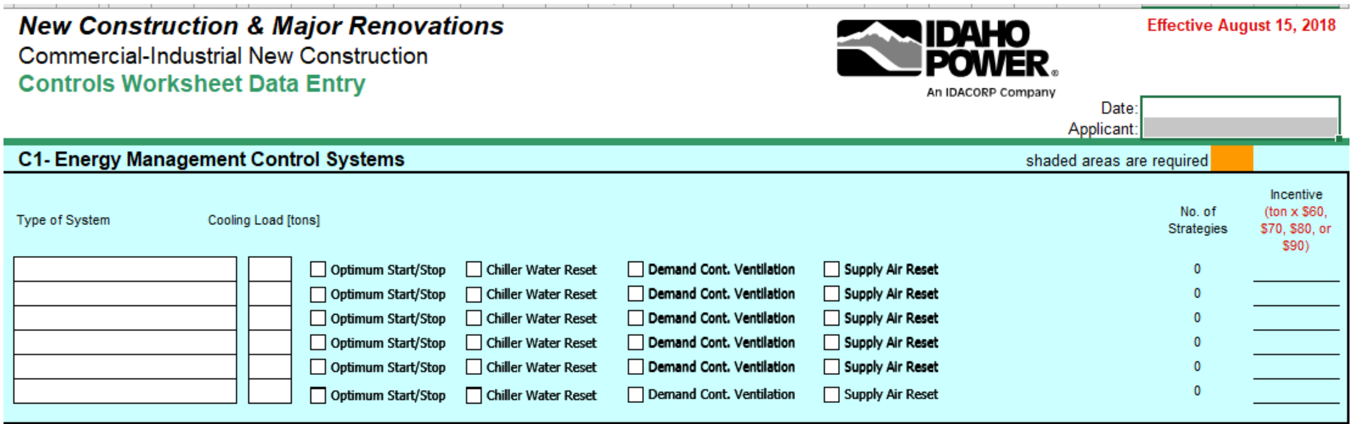
Overall, the evaluation found that the New Construction offering had a realization rate of 102.5 percent with a relative precision of 2.20 percent at the 90 percent confidence interval. The overall and measure-category realization rates of the sample are shown in Table 4.

Table 4. PY2021 Realization Rates for Measure Categories

Measure category	Ex-ante kWh	Ex-post kWh	Realization rate
Lighting	6,692,449	6,882,603	102.8%
HVAC	33,962	25,461	75.0%
Controls	506,110	507,303	100.2%
Compressed air	118,547	118,547	100.0%
Building shell	28,002	28,002	100.0%
Refrigeration	3,024	3,024	100.0%
Appliances	5,561	5,561	100.0%
Total	**7,387,655**	**7,570,501**	**102.5%**

In addition to evaluating the savings claimed, available information, calculation protocols, and the program's quality assurance were reviewed. The Idaho Power New Construction & Major Renovations documentation is clear, and the application workbook is generally sufficient in providing clear direction and communication of project parameters from contractors to Idaho Power. However, on the HVAC Controls Worksheet, the worksheet has check boxes for different HVAC controls under the *Energy Management Control Systems* section for each type of HVAC system (see Figure 5 below).

Figure 5: Application Workbook—Controls Worksheet



New Construction & Major Renovations
Commercial-Industrial New Construction
Controls Worksheet Data Entry

IDAHO POWER
An IDACORP Company

Effective August 15, 2018

Date:
Applicant:

C1- Energy Management Control Systems shaded areas are required

Type of System	Cooling Load [tons]					No. of Strategies	Incentive (ton x $60, $70, $80, or $90)
		☐ Optimum Start/Stop	☐ Chiller Water Reset	☐ Demand Cont. Ventilation	☐ Supply Air Reset	0	
		☐ Optimum Start/Stop	☐ Chiller Water Reset	☐ Demand Cont. Ventilation	☐ Supply Air Reset	0	
		☐ Optimum Start/Stop	☐ Chiller Water Reset	☐ Demand Cont. Ventilation	☐ Supply Air Reset	0	
		☐ Optimum Start/Stop	☐ Chiller Water Reset	☐ Demand Cont. Ventilation	☐ Supply Air Reset	0	
		☐ Optimum Start/Stop	☐ Chiller Water Reset	☐ Demand Cont. Ventilation	☐ Supply Air Reset	0	
		☐ Optimum Start/Stop	☐ Chiller Water Reset	☐ Demand Cont. Ventilation	☐ Supply Air Reset	0	

For a contractor or engineer opening this document at the end of the design, the workbook does not indicate the control system should be above the current code to be selected on the worksheet. Not including this language could result in the selection of all HVAC controls present in the system. Incentives and energy savings for HVAC controls are only eligible when controls are installed on equipment when Idaho's commercial energy code does not require it. Full and partial systems listed can be required by code in various situations. Documenting the installed system and capacity and the code-required systems and capacities in the application would provide transparency and consistency. However, the current practice of ensuring the supporting documentation includes the information meets the basic requirements to ensure program requirements are met.

Following the application, the Idaho Power team reviews the package, opens a dialog with the applicant team to understand the details of the projects, and coordinates potential incentives. Some adjustments happen to the project applications and calculations throughout the project. The Idaho Power implementation team updated the calculations to ensure accurate energy savings; however, the evaluation team found that the adjustments were not logged or identified in the documentation. The Program Engineer noted that her email contains the justification and decision on adjustments after the initial application and that information is unavailable in the accessible documentation file. Projects may have long development periods between the initial application and completion; including this documentation in project files could support the staff's ability to recall past decisions on the project.

The post-install verification report contained limited information about the critical items for energy efficiency but focused on the incentive. A post-install verification focusing on the details of the improvement and equipment installed would better support the program implementation. The primary reason for the realization rate exceeding 100 percent was that the old post-install verification report did not provide enough detail to identify an installation quantity deviation from the proposed plan. The program used a new verification report template in PY2022, which met the potential evaluation recommendation.

The savings calculations were consistent and followed the TRM. Identifying the proper TRM and building code baseline did not always follow the tracking system information but was identified in the submitted documentation. The evaluation team agreed with the process for selecting the proper baseline code and TRM version, but consistent documentation would support clear tracking and calculation review. The baseline code and TRM version adjust for projects based on multiple conditions, so the program reporting year includes many variations of past TRMs and baseline codes. In particular, the previous versions of the TRM were unclear on the expected hours of use for lighting and HVAC components. However, edits to the PY2021 TRM already coordinated and simplified the values to address this finding.

The submitted code requirements require careful consideration by the program implementation staff. The components with the most variation are the lighting area determination, space type selection, and the HVAC controls required by the code. These determinations require judgment, and the applicant team may have a different level of judgment than the program implementation team. Tracking current assumptions in the COMcheck submittals will help the Program Engineer understand variations between submittals and support communication with contractors, architects, and engineers about current assumption selections.

The evaluation team found that the confirmation of proposed or installed equipment was consistent. Although DLC is not required for some lighting measures if an engineer or architect specified and completed COMcheck, the evaluation team uses third-party verification of lighting fixture wattages such as Design Lights Consortium (DLC) resulting in several adjustments to project energy savings. In addition, the evaluation used the Air Conditioning, Heating, and Refrigeration Institute (AHRI) efficiency for HVAC units which also led to small adjustments in energy savings for projects. On one project, the evaluation found that the AHRI-rated efficiency disqualified the unit, significantly impacting the HVAC energy savings.

3.2.1 Lighting

Lighting projects account for approximately 84 percent of the 2021 New Construction offering savings. The sample included 13 projects with lighting components, accounting for about 91 percent of the sampled kilowatt-hours. Five of the sampled projects included at least one other non-lighting project. Table 5 shows realization rates for each project, with the total realization rate for lighting savings claimed at 102.8 percent.

Table 5. PY2021 New Construction Lighting Impact Results Summary

Project ID	Claimed kWh	Evaluated kWh	Realization rate
16166	1,114,881	1,227,151	110.1%
18238	3,499	4,734	135.3%
18289	40,016	41,231	103.0%
18311	82,546	84,563	102.4%
18315	16,604	15,136	91.2%
18365	74,313	76,029	102.3%
18458	5,324,012	5,400,102	101.4%
18541	1,391	1,391	100.0%
21006	10,974	5,048	44.5%
21014	3,423	3,593	105.0%
21050	5,197	6,081	117.0%
21051	5,197	5,381	103.5%
21078	10,396	12,163	117.0%
Overall	**6,692,449**	**6,882,603**	**102.8%**

The lighting energy efficiency calculations were determined by identifying the code allowable lighting power density (LPD) and subtracting the installed lighting wattage. Evaluation adjustments from savings occurred for three primary reasons:

1. adjustment to the lighting area or space type in the LPD determination,
2. adjustment of the lighting quantity based on the evaluation site visits, and
3. adjustment of lighting fixture wattage based on third-party certification used by the evaluation team.

The most significant risk to future program energy savings accuracy is the adjustments based on lighting area and space type for the LPD determination. However, the most significant adjustment to the impact evaluation results was the adjustment of the lighting quantity in a large agricultural facility. The Program Engineer has already implemented adjustments to the post-install inspection report template and training for site verifiers to address the evaluation findings in this area.

Adjusting lighting fixtures to match third-party certifications ensures that the energy consumption is tested and verified for the lighting fixtures. In general, most lighting specification sheets are near the certified wattages, and savings adjustments are minor. However, there are cases where the adjustment can reach ten percent of the lighting savings on individual projects, such as Project ID 18315. The program should balance the implementation workload to determine certified wattages with the potential evaluation risk of not confirming the lighting wattage from the certification source. The evaluation did not recommend utilizing third-party certification for lighting because the conversation is ongoing across several programs implemented by Idaho Power.

The descriptions below detail the evaluation findings for each lighting savings adjustment.

Project ID 16166: The project involved installing DLC- and non-DLC-qualified fixtures for a new cold storage facility. An on-site visit was conducted for this location. We found that the number of fixtures within the office area was slightly lower than the quantity claimed. We also noted wattage adjustments for seven interior and four exterior fixtures. As a result, the energy savings slightly increased with a realization rate for lighting savings of 110 percent.

Project ID 18238: A customer installed new DLC-qualified LED lighting troffers for a remodel. We found that the *space-by-space* method LPD baseline values were used rather than the *building area* method LPD baseline values which matched the area measured. We adjusted the baseline lighting power density (LPD) to match the 2015 International Energy Conservation Code (IECC) value for retail using the *building area* method, resulting in a significant energy savings increase. The realization rate is 135 percent.

Project ID 18289: A customer building was built with DLC and ENERGY STAR-qualified fixtures. An on-site visit was conducted for this location. We found a slight increase in fixture quantity in the data room. We also noted a wattage adjustment for nine different interior fixtures. These changes led to a slight increase in energy savings. The resulting realization rate for lighting savings is 103 percent.

Project ID 18311: A school was built with interior and exterior LED fixtures. Some of these fixtures were both non-DLC and non-ENERGY STAR-qualified. The interior lighting LPD was adjusted from 0.78 to 0.87 to match the value in IECC 2015 for a school/university. An on-site visit was conducted for this location. Fixture quantities were slightly increased based on the site visit. We also noted wattage adjustments for 19 fixtures, added a 1,100-foot exterior walkway to the calculation, and decreased the parking area. The resulting realization rate for lighting savings is 102 percent.

Project ID 18315: The project involved installing DLC-qualified interior LED fixtures in a significant renovation of a manufacturing facility. We made a significant wattage adjustment for the primary high bay fixtures, adjusting the fixture wattage from 128 W to 137 W based on the DLC-qualified listing for the product. Adjustments were also made for the smaller fixtures, changing one from 104 W to 107 W and the second from 26 W to 39 W. Overall, this increased the installed LPD and reduced energy savings. In addition, the hallway LPD was adjusted to match the IECC 2015 LPD for the *space-by-space* method. The resulting realization rate for lighting is 91 percent.

Project ID 18365: This new project included LED fixtures. Some of the fixtures were not DLC- or ENERGY STAR-qualified. Three of the exterior fixtures had their wattages adjusted based on specification sheets. Sensors were found to be eligible based on IECC 2015 code. The resulting realization rate for interior and exterior lighting is 102 percent.

Project ID 18458: This project involved installing DLC-qualified fixtures in a large unconditioned agricultural facility. The evaluation site visit identified 932 fixtures, reduced from 980 in the documentation. We also verified that the lighting was on at all hours and the building was exposed to exterior conditions; therefore, the interactive effects and coincidence factors were applied correctly. The resulting realization rate for lighting is 101 percent.

Project ID 18541: The project included the installation of DLC-qualified fixtures for a new manufacturing facility. We found no discrepancies between the tracking system data and documentation. The realization rate is 100 percent.

Project ID 21006: A new building was built with interior and exterior LED lighting. During the desk review and on-site verification visit, we subtracted approximately 500 linear feet of sidewalk in the public right-of-way and incorporated the lengths of the on-site walkways. The adjusted walkway area reduced the baseline LPD allowances, which reduced the exterior lighting savings to zero. Overall, the resulting realization rate is 44 percent.

Project ID 21014: A major renovation to an office included new LED fixtures. During the evaluation, one LPD value for storage was adjusted based on the IECC 2015 (*space-by-space* method) value. The installed lighting wattage was also lowered based on a review of the installed fixtures. The combination of adjustments lowered the savings below the HVAC component of the project; therefore, the stacking effect further lowered the lighting savings. The coordinating HVAC impact increased energy savings. The resulting lighting realization rate is 105 percent.

Project ID 21050: The project consisted of the installation of DLC- and non-DLC-qualified interior fixtures for an agricultural building. The evaluation identified that the baseline lighting code selected in COMcheck was incorrect; therefore, the LPDs were adjusted to match the IECC 2015 code. A slight wattage adjustment for two fixtures was also identified. The resulting realization rate for this project is 117 percent.

Project ID 21051: The project consisted of DLC- and non-DLC-qualified interior and exterior fixtures for an agricultural building. The evaluation identified that the baseline lighting code selected in COMcheck was incorrect; therefore, the LPDs were adjusted to match the IECC 2015 code. Our verification site visit found that one of the high bay fixtures was missing and identified a slight wattage adjustment for two fixtures. The combination of the adjustments resulted in a 104 percent realization rate for lighting.

Project ID 21078: The project consisted of installing DLC- and non-DLC-qualified interior fixtures for an agricultural building. We identified that the baseline lighting code selected in COMcheck was incorrect; therefore, the LPDs were adjusted to match the IECC 2015 code. The resulting realization rate is 117 percent.

3.2.1.1 Looking Forward—Lighting

The evaluation tested the 2021 version year lighting projects to determine the impact of updating these projects immediately to IECC 2018 from IECC 2015. The IECC 2018 increases the baseline lighting efficiency, which reduces the allowable lighting wattage in the New Construction offering lighting calculations. The test found that the lighting savings decreased by approximately 20 percent.

As projects are designed to IECC 2018 code, the program can expect a reduction in lighting savings claimed per project. Since the claimed projects will continue to have a mixture of baseline code in the designs and calculations, this reduction will not immediately be apparent in the program savings but will be noticeable at the project level, depending on the baseline code.

3.2.2 HVAC

HVAC projects account for about five percent of the 2021 New Construction offering savings. The sample included five projects, which accounted for less than one percent of the total sampled energy savings. Table 6 shows the realization rate for the savings claimed is 43.3 percent.

Table 6. PY2021 New Construction Air-Conditioning Impact Results Summary

Project ID	Claimed kWh	Evaluated kWh	Realization rate
16166	4,062	4,062	100.0%
18311	25,872	18,060	69.8%
18315	650	0	0.0%
18365	774	773	100.0%
21014	2,604	2,566	101.5%
Overall	**33,962**	**25,461**	**75.0%**

The HVAC category has two major adjustments, although because of the relative size of the savings to the whole program, the impact on the program was not as high. Each adjustment occurred for unique reasons; for one project, the HVAC units in the program's post-install verification could not be verified, and the evaluation removed the saving from the two small units from the project. The second project had an adjustment to the efficiency rating (SEER) of the installed units, adjustment of hours of use.

The descriptions below detail the evaluation findings for each HVAC project savings adjustment.

Project ID 16166: The project consisted of installing nine heat pumps at 5 tons or less and five split systems at 3 tons or less at a new cold storage facility. A site visit was completed for this project, and no discrepancies were found between the tracking system data, documentation, and site visit results. The realization rate for HVAC is 100 percent.

Project ID 18311: The project included the installation of 38 packaged systems at 5 tons or less, two packaged systems over 5 tons, four split systems below 5 tons, and economizers controlling over 190 cooling tons for an education facility. The SEER value for the 4YCZ6036 (3-ton) units was adjusted from 16.0 to 16.6; the SEER value for 4YCZ6060 (5-ton) units was adjusted from 16.0 to 15.1. The SEER of 15.1 does not qualify for incentives, and the 5-ton unit savings were reduced. The primary adjustment to energy savings was the reduction in cooling hours for the HVAC units for an education-primary school facility. The hours were adjusted from 700 to 203 based on Table 2-104 in TRM Volume 2.2. The savings calculation was adjusted to match the TRM by the evaluation team, although the Program Specialist acknowledged that alternate hours were used for this TRM version. In addition, the evaluation team removed an undocumented scaling factor included in the calculation spreadsheet.

A second component of the savings was the airside economizer measure. The evaluation found the energy savings is acceptable, although several questions about the applicability of the code to the situation required conversations to determine. The combined adjustments resulted in a 75.0 percent realization rate for the HVAC.

Project ID 18315: The HVAC portion of this project consisted of two split-system units at a remodeled manufacturing facility. The post-install verification report noted that the split systems were not located during the site visit. Our evaluation site visit could not be scheduled; the units were not verified as installed, and therefore, the evaluation removed their savings from the project. The HVAC savings were less than five percent of the total New Construction project claimed savings. The realization rate for the HVAC component measures is zero percent.

Project ID 18365: The project consisted of a two-ton split system for a new hospital. We found no discrepancies between the tracking system data and documentation, but we were unable to confirm the model through the invoice. The resulting realization rate for this measure is 100 percent.

Project ID 21014: The project consisted of a one-ton air-cooled heat pump and six water-cooled heat pumps for a remodeled office building. We found a slight cooling capacity adjustment for one water-cooled heat pump. The resulting realization rate is 101.5 percent for the HVAC component.

3.2.3 Controls

Controls projects account for eight percent of the 2021 New Construction offering savings. The sample included six projects which accounted for seven percent of the sampled kilowatt-hours. Table 7 shows the realization rate for the savings claimed is slightly over 100 percent.

Table 7. PY2021 New Construction Controls Impact Results Summary

Project ID	Claimed kWh	Evaluated kWh	Realization rate
18311	102,494	103,687	101.2%
18365	45,716	45,716	100.0%
18477	71,580	71,580	100.0%
21003	143,160	143,160	100.0%
21050	71,580	71,580	100.0%
21051	71,580	71,580	100.0%
Overall	**506,110**	**507,303**	**100.2%**

The controls project in the sample were primarily variable frequency drives (VFD) installed on fans. We found no adjustments for these projects. However, the remaining project used multiple control strategies for an HVAC system coupled with a kitchen demand-controlled ventilation system. There were minimal adjustments to the project controls.

The descriptions below detail the evaluation findings for each Controls savings adjustment.

Project ID 18311: The project included installing an energy management system with three control strategies, a kitchen hood exhaust, and a VFD fan for a new school. An on-site visit was conducted for this location, although the strategies could not be verified by the site contact, and a reach-out to the remote-controls contact was not answered. The evaluation team found that the installed control system creates efficiencies above the code-required control system.

The supply air temperature reset received an exemption because of the HVAC design and therefore was not required by code and remained a control strategy. The supply air temperature reset strategy was confirmed eligible based on the IECC 2015 exemption that did not require installation because of the limited mixing of HVAC air in the design. The demand control ventilation (DCV) strategy was confirmed eligible based on the IECC 2015 exemption that allows for facilities with 25 or fewer people per 1,000 square feet of space to operate without the controls required by code. For the kitchen hood VFD exhaust, it was found to have no discrepancies between the tracking system data and documentation. The resulting realization rate from removing one control strategy is 101 percent.

Project ID 18365: This project consisted of nine 6 hp supply air fans installed with VFDs for a new hospital. There were no discrepancies between the tracking system data and documentation. The realization rate is 100 percent.

Project ID 18477: This project included the installation of 60 hp of VFD fans for a new agricultural facility. There were no discrepancies between the tracking system data and documentation. The realization rate is 100 percent.

Project ID 21003: This project included the installation of 120 hp of VFD fans for a new agricultural facility. There were no discrepancies between the tracking system data and documentation. The realization rate is 100 percent.

Project ID 21050: This project included the installation of 60 hp of VFD fans for a new agricultural facility. There were no discrepancies between the tracking system data and documentation. The realization rate is 100 percent.

Project ID 21051: This project included the installation of 60 hp of VFD fans for a new agricultural facility. There were no discrepancies between the tracking system data and documentation. The realization rate is 100 percent.

3.2.4 Compressed Air

Compressed air projects account for about two percent of the total 2021 New Construction offering savings. The sample included two projects which accounted for less than one percent of the sampled kilowatt-hours. Table 8 shows the realization rate for each project.

Table 8. PY2021 New Construction Compressed Air Impact Results Summary

Project ID	Claimed kWh	Evaluated kWh	Realization rate
18390	20,536	20,535.5	100.0%
18411	98,011	98,011	100.0%
Overall	**118,547**	**118,546.5**	**100.0%**

The descriptions below detail the evaluation findings; no adjustments were made for the compressed air measures.

Project ID 18390: A manufacturing plant expanded operations with a new 20 hp air compressor with a VFD, and zero-loss condensate drains. No discrepancies were found between the tracking system data and documentation. The realization rate is 100 percent.

Project ID 18411: A new manufacturing plant was built with a 100 hp air compressor with a VFD, and zero-loss condensate drains. No discrepancies were found between the tracking system data and documentation. The realization rate is 100 percent.

3.2.5 Building Shell

Building shell projects account for less than one percent of total 2021 New Construction offering savings. The sample included two projects which accounted for less than one percent of the sampled kilowatt-hours. Table 9 shows the realization rate for each project.

Table 9. PY2021 New Construction Building Shell Impact Results Summary

Project ID	Claimed kWh	Evaluated kWh	Realization rate
16166	26,648	26,648.45	100.0%
18365	1,354	1,353.882	100.0%
Overall	**28,002**	**28,002.33**	**100.0%**

The descriptions below detail the evaluation findings; no adjustments were made for the building shell measures.

Project ID 16166: This project consists of the installation of a reflective roof for a new cold storage facility. No discrepancies were found between the tracking system data and documentation. The realization rate for this measure is 100 percent.

Project ID 18365: This project consists of the installation of a reflective roof for a new hospital. No discrepancies were found between the tracking system data and documentation. The realization rate for this measure is 100 percent.

3.2.6 Refrigeration

Refrigeration projects account for less than one percent of total 2021 New Construction offering savings. The sample included one project, accounting for less than one percent of the sampled kilowatt-hours. Table 10 shows the realization rate for the project.

Table 10. PY2021 New Construction Refrigeration Impact Results Summary

Project ID	Claimed kWh	Evaluated kWh	Realization rate
18365	3,024	3,024	100.0%

The description below details the evaluation findings. We made no adjustments to the Refrigeration measures.

Project ID 18365: This project includes the installation of strip curtains for a walk-in cooler in a new hospital. We found no discrepancies between the tracking system data and documentation. The realization rate is 100 percent.

3.2.7 Appliances with Electric Water Heating

Appliances projects for less than one percent of total 2021 New Construction offering savings. The sample included one project, accounting for less than one percent of the sampled kilowatt-hours. Table 11 shows the realization rate for the project.

Table 11. PY2021 New Construction Appliances Impact Results Summary

Project ID	Claimed kWh	Evaluated kWh	Realization rate
18365	5,561	5,561	100.0%

The description below details the evaluation findings. No adjustments were made to the appliance measures.

Project ID 18365: This project includes the installation of an ENERGY STAR commercial dishwasher in a new hospital. No discrepancies were found between the tracking system data and documentation. The realization rate is 100 percent.

3.3 REVIEW OF PY2018 IMPACT RECOMMENDATIONS

As part of the impact evaluation, Tetra Tech reviewed Idaho Power's progress against the recommendations made during the last impact evaluation of the 2018 program. The table below highlights Idaho Power's actions to address the previous impact recommendations.

Table 12. PY2018 CIEE New Construction Program Recommendations Review

Category	Key finding and recommendation	PY2021 implementation	Status
Calculations	Utilize *hours of use* from the TRM for lighting and HVAC projects that started after the TRM was implemented.	Idaho Power updated TRM 3.0 to simplify and coordinate HVAC hours of use. However, the projects claimed in PY2021 are generally using previous versions and therefore are not using the updated hours of use. The lighting hours of use are custom-entered for interior lighting and TRM-based for exterior lighting.	In progress
Tracking system	Tracking data should include the version of the TRM utilized for each project.	The tracking data includes an identification of the TRM version in use for calculating the claimed savings.	Complete

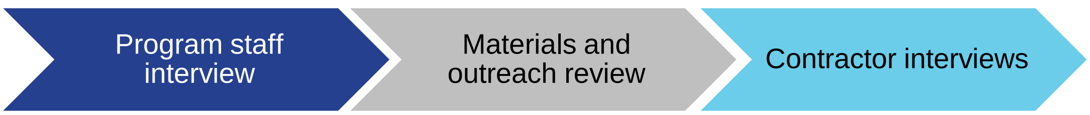
4.0 PROCESS EVALUATION

The following sections provide a detailed review of the process evaluation methodology, evaluation results, and recommendations from the evaluation activities.

4.1 METHODOLOGY

The process methodology consisted of three primary evaluation activities shown in Figure 6. Each activity is explained below.

Figure 6. Process Evaluation Activities



Program Staff Interviews

Idaho Power staff responsible for the program delivery provided Tetra Tech staff with an overview of the program design, objectives, staffing, outreach, procedures, tracking, and achievements. Idaho Power program staff also responded to evaluation questions and provided requested materials.

Materials and Outreach Review

Tetra Tech read the *Idaho Power Commercial and Industrial Energy Efficiency Policies and Procedures Manual* dated January 2021. The program logic model developed in 2018 was also reviewed for the entire Commercial and Industrial Energy Efficiency (CIEE) program at the time, including Retrofits, New Construction, and Custom Projects offerings.

Tetra Tech explored the Idaho Power website for energy efficiency information for businesses and any linked documentation, including applications and instructions. Idaho Power staff also provided an overarching CIEE slide deck and general CIEE brochure to facilitate discussions with customers and contractors regarding all of the CIEE offerings from Idaho Power. A program-specific New Construction brochure was also reviewed, which details the incentives and requirements for the New Construction program.

Contractor Interviews

C&I customers work with architects and engineers to design energy-efficient buildings that qualify for Idaho Power New Construction offering incentives. The Program Engineer provided a list of firms and contacts associated with projects in 2021. Tetra Tech sampled 30 companies; all architects and engineers with email addresses were emailed and followed up with via telephone to complete interviews with nine firms that could provide feedback on the New Construction offering incentives.

4.2 PROCESS REVIEW RESULTS

Idaho Power follows program management best practices with a program manual and logic model developed for the CIEE suite of programs. Communication between Idaho Power, architects, and engineers is working well, and engineers find the application process straightforward and easy to complete for their customers.

4.2.1 Materials and Outreach Review

Policies and Procedures Manual

Tetra Tech reviewed the 2020 and 2021 versions of the *Idaho Power Commercial and Industrial Energy Efficiency Policies and Procedures Manual*. The 2020 version was updated through November 2019, and the 2021 version was updated in January 2021. Edits to the manual included slight customer eligibility changes and equipment adjustments.

The program manual includes a good overview of all CIEE offerings from Idaho Power. In addition, it offers sufficient detail for each major offering (Custom Projects, Retrofits, and New Construction), such as pre-approval and payment application processes and inspection requirements. Other commercial offerings, including Energy Assessments, Energy-Saving Kits, Flex Peak, Green Rewind, and Technical Training, are briefly described for the reader.

The Idaho Power contact information and revision history sections are also beneficial to both internal utility and external partner and customer users. Other resources listed include approximately 25 organizations like ASHRAE, ENERGY STAR®, and Integrated Design Labs.

The primary program manual sections include the following:

1. Program Overview - including eligibility requirements
2. Program Offerings - Retrofits, New Construction, Custom Projects, Additional Offerings
3. Steps to Participate - Lighting retrofits, Non-lighting retrofits, New Construction
4. Custom Projects - steps to participate
5. Energy Efficient Assessments
6. Inspections, Measurement and Verification
7. False Information
8. Pre-Approval
9. Satisfaction of Customers
10. Program Staff Contact Information
11. Commercial & Industrial Energy Efficiency Program Terms and Conditions
12. Other Resources
13. Review and Revision History

Logic Model

Our review of the CIEE logic model, developed in 2018 in response to a previous evaluation recommendation, shows that the New Construction offering closely follows the program design and delivery steps laid out in the logic model. The major steps—(1) Idaho Power outreach, (2) customer submission of preliminary application, (3) customer implementation, and (4) customer submission of final application—are all in line with the current program delivery as outlined in the program policies and procedures manual. In addition, the short- and long-term outcomes of the New Construction offering are being realized.

Outreach

Idaho Power continues to market the New Construction offering in conjunction with all CIEE offerings. Methods such as bill inserts, newsletters, airport advertising, radio, and social media messages communicate the benefits businesses can realize through Idaho Power's energy efficiency programs.

In addition, there were a few outreach options specific to New Construction:

- The summer newsletter issue, sent to 13,971 customers in June 2021, focused on incentive changes for Retrofit and New Construction offerings. It also included a Simplot success story and promotion of the GMI.
- Idaho Power sponsored the virtual BOMA Commercial Real Estate Symposium on February 18, 2021. During the event, Idaho Power shared a video from the New Construction Senior Engineer that included the Idaho Humane Society success-story video. The company also developed slides with key company facts that rotated on the screen before the event, placed LEDs and a brochure in the event giveaway box that was available for pickup, and placed an ad and article in the event program. In March, the company also participated in BOMA's virtual Thursday Conversations video blog.
- Idaho Power representatives conducted conversations via telephone and email with architectural and engineering firms in Boise; in-person visits were not allowed in 2021 due to COVID-19 restrictions. The conversations helped build relationships with the local design community.

The Idaho Power website was explored for energy efficiency information for businesses and any linked documentation, including applications and instructions. The selection of state and then New Construction information was easy to follow.

Since most of the initial marketing and outreach are done as an overarching CIEE program, Idaho Power staff provided the overarching CIEE slide deck and general CIEE brochure that staff use to facilitate discussions with customers and contractors regarding all the CIEE offerings from Idaho Power. A program-specific New Construction offering brochure was also reviewed, which details the incentives and requirements for the New Construction offering of the CIEE program.

All slides and brochures are visually appealing and provide good information on what is offered through the CIEE program. The New Construction offering brochure provides the specific information needed for customers or design firms interested in applying for New Construction offering incentives.

4.2.2 Contractor Interviews

A mix of thirty architecture and engineering firms were contacted from a list provided by Idaho Power; interviews were completed with nine firms in August 2022. Five of our discussions were with architects, and four were with engineering firms; all provide design services for C&I customers with little residential work.

The firms we spoke with have all been working with Idaho Power programs for several years. At least five of the firms also completed projects that qualified for another Idaho Power CIEE program, such as Retrofit or Custom Projects.

Communication

Both architects and engineers reported having a good relationship or support from Idaho Power staff. Emailed information has been sufficient for most firms to remain updated on program requirements. Two of the firms mentioned direct contact with the Program Engineer if they have questions, and one thought the presentation they attended was helpful. Two of the smaller architecture firms would like more in-person contact with Idaho Power staff to better understand the New Construction offering.

How firms handle discussions with customers about energy-efficient projects varies by firm. Two of the architecture firms leave the responsibility for the discussion to the engineers; one of the architects talks to their customers early in the design about energy efficiency; one large firm is working to increase awareness among their internal staff of Idaho Power offerings to better serve their customers. However, as Idaho Power is aware, a common barrier to many discussions is customer preference for aesthetics over mechanical efficiency.

Architecture and design firms that help customers meet the New Construction offering incentive requirements are eligible for a Professional Assistance incentive. Two of the firms we spoke with were not aware of the incentive; four firms were aware of the incentive, with two using it heavily and two others that were happy with it but did not find it critical to encouraging customers to build above code. One respondent mentioned the recent increase in the incentive and said that it was providing additional motivation for their internal staff to work with customers on eligible designs.

Applications

Projects incentivized through the New Construction offering are required to fill out a preliminary application that is reviewed by Idaho Power or IDL. At that point, the customer is assisted with any preliminary calculations and is assigned a project number. Opportunities that qualify for Custom Projects are identified for the customer. Once a project is completed, a final application is submitted.

At least seven of the firms we spoke with complete applications for customers, although two of the architects do so through the engineers working with them. Six of the respondents volunteered how easy the process is to complete applications for Idaho Power. Although the process is easy, it does take a certain amount of time. A couple of the firms are grateful for the Professional Assistance incentive for that reason.

> ***"It is easy, we plug in the information. It is nice and straightforward."***

In most cases, the program incentive is paid to the customer. Only in a few instances will the customer request the incentive be paid to the architect or engineer.

Satisfaction

Overall, architecture and engineering firms are satisfied with the New Construction offering; they feel it provides good service and support, benefitting the C&I customers they serve. Just one respondent provided a neutral response, mostly due to a lack of interaction with the program.

Four of the respondents we spoke with were familiar with the meetings and training provided by Idaho Power and IDL; they found those meetings to be useful and a good source of information and interaction. Three firms were not aware of meetings or training. All the firms felt it would be good to continue meetings to discuss program requirements and get new, small firms up to speed.

The firms we spoke with had few suggestions for improving the New Construction offering. One mentioned improving options for enrolling in major rehabilitation projects and opportunities for office buildings. Another suggested an easy-to-read guide for the customer that the architects or engineers could present early in their customer discussions.

COVID-19

At least three of the firms we spoke with thought they were busier during COVID-19 than before the pandemic; however, at least six firms mentioned supply chain delays and complications with project scheduling. One said the pandemic created more flexibility in how they do business. Interestingly, two firms have noticed changes in customer requests, including better filtration and airflow and more touchless technology and sensors.

OTHER REPORTS

Report Title	Sector	Analysis Performed By	Study Manager	Study/Evaluation Type
2022 A/C Cool Credit Program End-of-Season Report	Residential	Idaho Power	Idaho Power	Other
2022 Flex Peak Program End-of-Season Annual Report	Commercial/Industrial	Idaho Power	Idaho Power	Other
2022 Irrigation Peak Rewards Program Report	Irrigation	Idaho Power	Idaho Power	Other
Historical DSM Expense and Performance, 2002–2022	Residential, Commercial/Industrial, Irrigation	Idaho Power	Idaho Power	Other
Student Energy Efficiency Kit Program—School Year 2021–2022 Annual Report	Residential	Tinker LLC	Tinker LLC	Other
Home Energy Reports Summary	Residential	Harris Utility Consumer Analytics	Harris Utility Consumer Analytics	Other
Idaho Power Company Demand Response Potential Assessment Report *(online)*	Residential, Commercial/Industrial, Irrigation	AEG	AEG	Other
Idaho Power Company Energy Efficiency Potential Study *(online)**	Residential, Commercial/Industrial, Irrigation	AEG	AEG	Other

* Titles appearing in blue are links to the online versions of the reports.

A/C Cool Credit - 2022 Results

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Summary

This report presents an analysis of the demand response events called by Idaho Power's A/C Cool Credit program during the summer of 2022. The program called a total of 13 demand response events that included 19,127 households. The peak realized reduction at the generator level during this period occurred on July 29th, with a reduction of 1.05 kW per participant and a total system curtailment of 20.1 MW. In comparison, the maximum potential reduction for the season is estimated to be 26.8 MW, based on a generator level reduction of 1.4 kW per participant at a cycling rate of 65%.

Table 1. Season Summary Results

Region	Participant Count	Peak Realized Curtailment	Peak Potential Curtailment
Idaho	18,910	19.9 MW	26.5 MW
Oregon	217	0.2 MW	0.3 MW
Total	19,127	20.1 MW	26.8 MW

Program Overview

The A/C Cool Credit program underwent several operational changes in 2022. Most notably, the end of the cycling season was extended by one month, from August 15th to September 15th. This program change allowed the program to operate on multiple high-temperature days in early September that previously would have been ineligible for demand response. Figure 1 provides an overview of important dates in the 2022 cycling season.

Program event guidelines allow for event duration of up to four hours. However, events in the last several years of the program have generally lasted only three hours. In 2022, the program began incorporating longer event spans: eight out of the 13 events called this season spanned four hours.

Additionally, Idaho Power enacted a more flexible approach to event cycling rates. In 2020, all events were cycled at 50%, meaning participating A/C units were switched off for approximately 30 minutes out of an hour. In 2021, the cycling rate was set at 55%. This season, the cycling rate was dynamically selected based on the circumstances of each demand response event. Five of the events in 2022 were cycled at 55%, with the other eight cycled at 50%.

Overall, the changes made to the program in 2022 have significantly improved its potential effectiveness for Idaho Power. The extension of the cycling season and incorporation of longer event spans have allowed the program to respond to a wider range of high-temperature days and better meet system needs. The more flexible approach to cycling rates has also given the program greater control over the size and timing of demand reductions, ensuring that it can effectively reduce energy demand while still maintaining participant comfort. These operational changes make the program a more reliable and effective tool for managing energy demand and helping to reduce strain on the power grid.

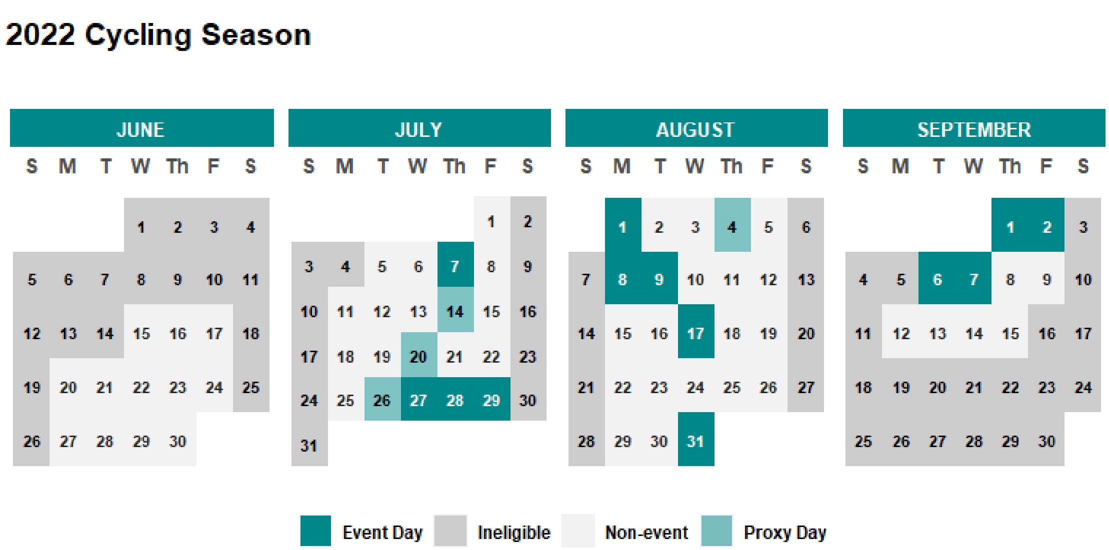

Figure 1. 2022 Season Dates

Methodology

Idaho Power continues to calculate A/C Cool Credit program savings using the evaluation methodology created by ADM Associates as part of the 2021 impact evaluation. This methodology models demand reductions by using a variety of statistical methods to determine each participant's hypothetical usage as if there had not been a demand response event that day. Additionally, the methodology evaluates the number of households who did not contribute a statistically significant demand reduction to each event. This section provides an overview of the model steps; a more detailed discussion can be found in ADM's 2021 program impact evaluation in Supplement 2 of Idaho Power's *2021 Demand-Side Management Annual Report*.

Baseline Usage Calculation

To model participant energy usage at the household level, the evaluation methodology requires four primary data inputs: a list of participating demand response switches, hourly meter reads for all participants for the cycling season, hourly weather reads for the service territory, and the date and time of all demand response events. By integrating these inputs, the methodology takes into account the unique energy usage patterns of each household.

Since each household is unique and may exhibit vastly different energy usage patterns, there is no single statistical model that will perfectly fit every participant. Instead, the methodology tests five possible models to find the best fit for each household. These models fall into two categories:

1. A weather-adjusted Linear Fixed Effect Regression (LFER) model. This is a regression model that controls for variables including Cooling Degree Days, Heating Degree Days, and hour of the day, and treats each household as an individual fixed effect.

2. A Customer Baseline (CBL) model tuned with various eligibility periods and offset methods. The possible eligibility periods are 3-of-5 and 3-of-10, the latter of which would mean that the model looks at the three highest usage days of the last 10 eligible days. The offset factor determines how the model scales usage based on usage prior to the event start. The possible methods are additive and multiplicative.

Model performance was assessed based on how well the model predicted the household's energy consumption across four proxy days. These days were chosen because they were the hottest days of the season that were not affected by any events. The data used to train the household models did not include energy usage during these proxy days or event days.

In both 2021 and 2022, the LFER model was the best fit for the largest number of participants. The final reported savings are derived from a mixed model, which incorporates household level results based on the best fit of the five models for each participant. This approach ensures that baseline estimates are robust to variance in household behavior.

Non-Contributing Households

A separate calculation within the model provides an estimate of Non-Contributing Households (NCH), or the number of households during each event that did not produce a statistically noticeable demand reduction. This is an important metric for understanding overall impacts of demand response efforts and for identifying characteristics of event days and households that may prompt non-responsiveness. Importantly, NCH is calculated for informational purposes and is ultimately independent of overall savings results, which include all program participants whether responsive or not.

In some cases, a statistically non-responsive household may indicate a communication, switch, or A/C unit failure, however there are a number of other likely factors to consider. For example, occupants may be away during an event or have temporarily changed the household's temperature set point. On event days with cooler weather or lower cycling rates it is harder for the model to confidently identify a demand reduction, as a result the NCH rate tends to be higher.

The model utilizes a three step calculation process to identify NCHs:

1. The first calculation is a Cumulative Sum (CSUM) analysis, which is a technique that evaluates the slope of a smoothed curve of energy usage data for the hours before and during the event, and comparing the ratios of these slopes to determine if there is a significant change in demand due to the event. Devices with a slope ratio less than one are considered contributing devices.

2. The second calculation is the linear decrease analysis, which involves comparing the consumption for the hour prior to the event to the consumption during the first hour of the event. Devices that do not see a 10% reduction in this step are considered non-contributing devices.

3. Finally, the model performs a check for signs of a snapback effect, which is the increase above baseline usage that frequently occurs at the conclusion of a demand response event as an A/C unit works to return to the household to normal set temperature. Households that were labeled as non-contributing by the first two tests but show signs of a snapback effect are reclassified as contributing households.

Results

The following tables and charts display the outputs of the evaluation models. All demand reduction numbers presented in the text and figures of this report are calculated at the generator level which includes an overall system loss number of 9.7%.

For simplicity, only Treasure Valley temperature data is shown in the charts below. However, the underlying baseline evaluation model utilizes weather reads from both the Treasure Valley region and the Twin Falls/Pocatello region.

Tables

Table 2. 2022 Event Details

Event Date	Event Time	Peak Temperature	Cycle Rate	Average Reduction	Total Reduction
Jul 7	6-9 p.m.	94°F	55%	0.6 kW	11.4 MW
Jul 27	4-8 p.m.	101°F	50%	0.87 kW	16.7 MW
Jul 28	4-8 p.m.	103°F	50%	0.94 kW	18.1 MW
Jul 29	4-8 p.m.	104°F	50%	1.05 kW	20.1 MW
Aug 1	6-9 p.m.	102°F	55%	0.98 kW	18.7 MW
Aug 8	5-8 p.m.	102°F	55%	0.86 kW	16.4 MW
Aug 9	5-8 p.m.	98°F	55%	0.88 kW	16.8 MW
Aug 17	6-10 p.m.	102°F	50%	0.76 kW	14.5 MW
Aug 31	6-10 p.m.	105°F	50%	0.78 kW	14.9 MW
Sep 1	5-8 p.m.	97°F	55%	0.82 kW	15.7 MW
Sep 2	5-9 p.m.	100°F	50%	0.81 kW	15.5 MW
Sep 6	5-9 p.m.	100°F	50%	0.68 kW	12.9 MW
Sep 7	5-9 p.m.	104°F	50%	0.9 kW	17.1 MW

Table 3. 2022 Household Non-Contribution Results

Event Date	Non-Contribution Ratio
Jul 7	20.5%
Jul 27	18.4%
Jul 28	16.3%
Jul 29	16.2%
Aug 1	8.7%
Aug 8	17%
Aug 9	15.5%
Aug 17	15.9%
Aug 31	15.2%
Sep 1	20.6%
Sep 2	31.4%
Sep 6	29.8%
Sep 7	20.6%

Charts

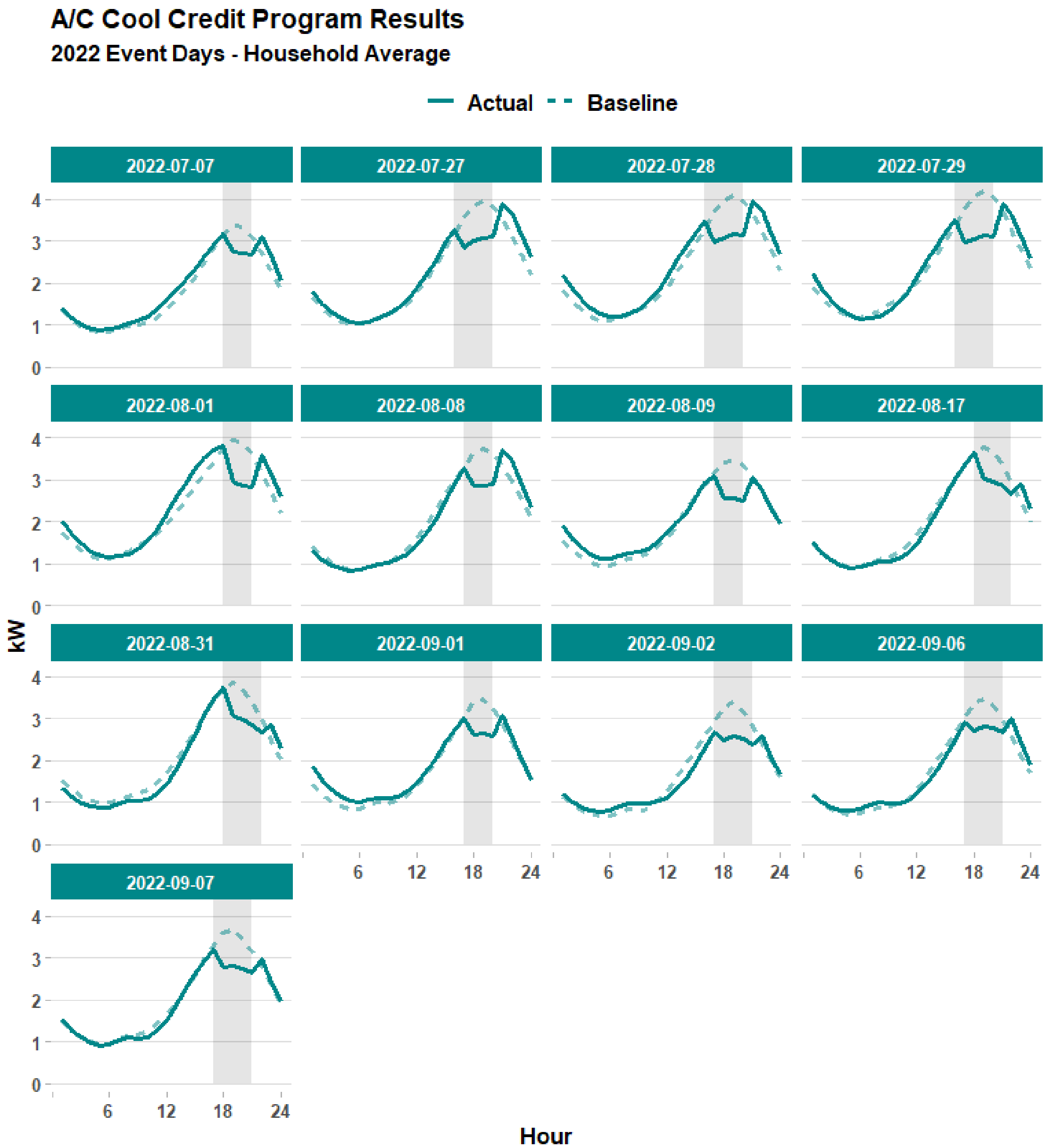

Figure 2. Household Results by Event

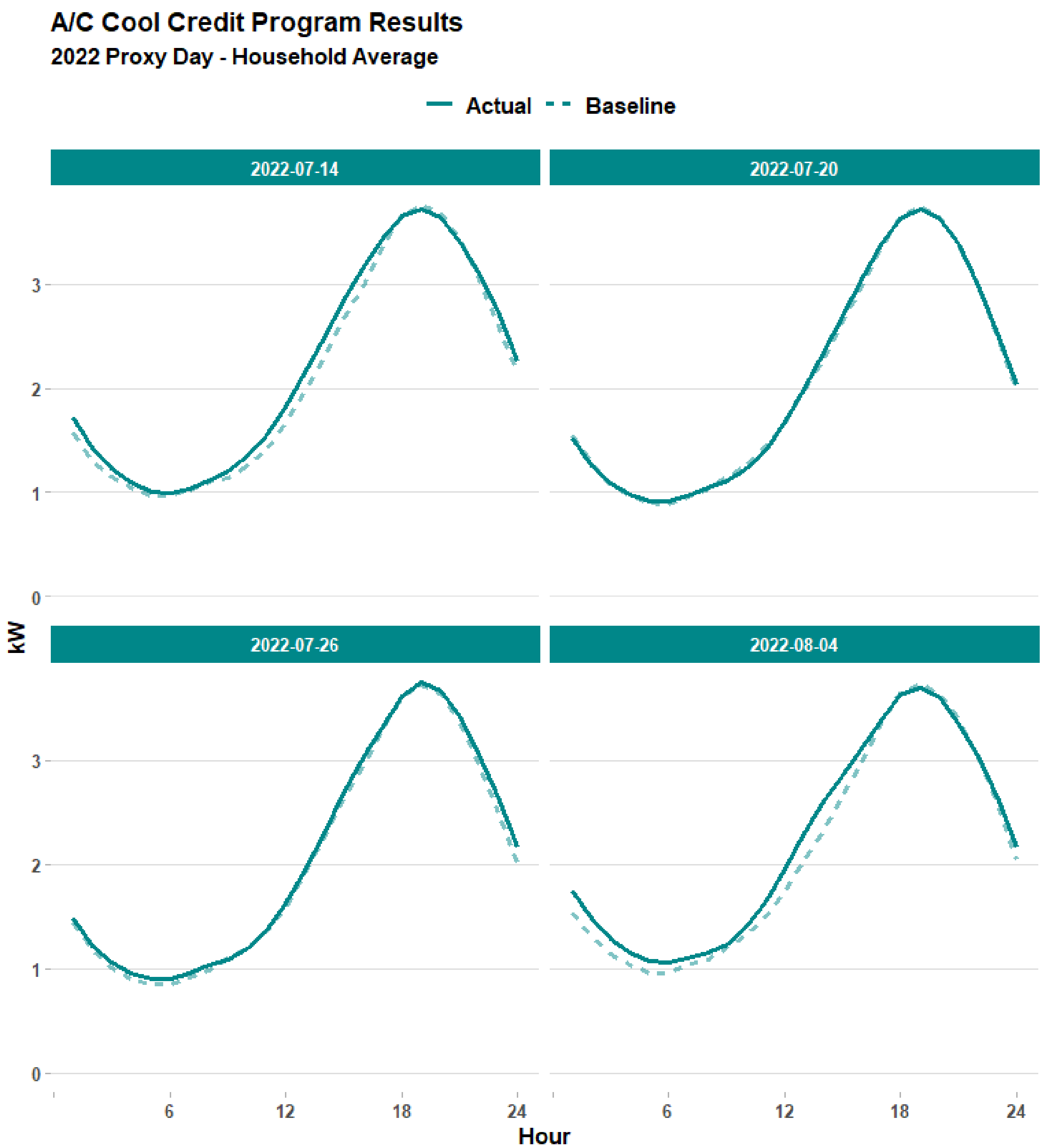

Figure 3. Household Proxy Day Performance

2022 Flex Peak Program
End-of-Season Annual Report

March 8, 2023

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INTRODUCTION

The Flex Peak Program (program) has been operated by Idaho Power Company (Idaho Power or company) since 2015. The program is a voluntary demand response (DR) program available to large commercial and industrial customers that can reduce their electrical energy loads for short periods during summer peak days. This program, along with Idaho Power's other DR programs—Irrigation Peak Rewards and the residential A/C Cool Credit program—have helped delay the need for new supply-side resources.

The results presented in this report are from the 2022 program season, the company's eighth year of operating the program internally. The 2022 program season had a decrease in load reduction and realization rates from the prior year (2021). There were 25 new sites added, and overall participation resulted in the highest hourly load reduction for the season of 24.5 megawatts (MW). The average realization rate for the seven load reduction events that occurred in the 2022 program season was 63%. Enrollment increased slightly in 2022, and 96% of previously participating sites re-enrolled in the program. The maximum available capacity of the program came from the nominated amount in week three of 30 MW. The total program costs through December 31, 2022, were $519,618.

BACKGROUND

In 2015, the company requested approval to implement the Flex Peak Program as an Idaho Power operated program. The Idaho Public Utilities Commission (IPUC) approved the company's request in Order No. 33292,[1] and the Public Utility Commission of Oregon (OPUC) accepted the proposal from Advice No. 15-03.[2] Prior to 2015, a similar DR program for commercial and industrial customers was operated by a third-party vendor.

As part of Advice No. 15-03, the OPUC adopted Staff's recommendation that the company file an annual end-of-season report with information regarding the program. The company was also directed by the IPUC in Order No. 33292 to file an annual end-of-season report detailing the results of the program. In compliance with the reporting requirements, the annual end-of-season report includes the following:

- Number of participating customers
- Number of participating sites
- MW of demand response under contract

[1] *In the Matter of Idaho Power's Company's Application for Approval of New Tariff Schedule 82, A Commercial and Industrial Demand-Response Program (Flex Peak Program),* Case No. IPC-E-15-03, Order No. 33292 (May 7, 2015).

[2] Schedule 76, Flex Peak Program, Docket No. ADV 7/Advice No. 15-03 (approved April 28, 2015).

- MW of demand response realized and incented per dispatch
- Percent of nominated MW achieved in each dispatch event by participant
- Cost analysis of the program
- Number of events called
- Total load dropped for each event
- Event duration
- Total capacity payments made
- Total energy payments made
- Number of customers who failed to meet their load
- Number of program applications denied due to program subscription limit
- Participant attrition
- Issues the utility has identified meeting requests to participate in the program
- Changes in baseline methodology taken or anticipated
- Improvements Idaho Power and the program might benefit from

Program Details

The program pays participants a financial incentive for reducing load within their facility and is active June 15 to September 15, between the hours of 3 p.m. and 10 p.m. on non-holiday weekdays.

Customers with the ability to nominate or provide load reduction of at least 20 kW are eligible to enroll in the program. The 20 kW threshold allows a broad range of customers to participate.

The parameters of the program are in Schedule 763 in Oregon and Schedule 824 in Idaho, and include the following:

- A minimum of three load reduction events will occur each program season.
- Events can occur any weekday (excluding July 4 and Labor Day) between the hours of 3 p.m. and 10 p.m. and last between two to four hours
- Events can occur up to four hours per day and up to 16 hours per week, but no more than 60 hours per program season
- Idaho Power will provide notification to participants four hours prior to the initiation of an event
- If prior notice of a load reduction event has been sent, Idaho Power can choose to cancel the event and notify participants of cancellation 30 minutes prior to the start of the event

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[3] Idaho Power Company, P.U.C. ORE. No. E-27, Schedule 76.

[4] Idaho Power Company, I.P.U.C. No. 29, Tariff No. 101, Schedule 82.

Program Incentives

The program includes both a fixed and variable incentive payment. The fixed incentive is calculated by multiplying the actual kW reduction by $3.25 for weeks when an event is called or the weekly nominated kW amount by $3.25 for weeks when an event is not called. The variable energy incentive is calculated by multiplying the kW reduction by the event duration hours to achieve the total kilowatt-hour (kWh) reduction during an event. The variable incentive payment is $0.20 per kWh and is implemented for events that occur after the first four events.

The program also includes an incentive adjustment of $2.00 per kW not achieved for each event hour when participants do not achieve their nominated amount during load reduction events, which is subtracted from their credit or payment. Incentives are calculated using Idaho Power's interval metering billing data; participants were issued the incentives within 30 days of the end of the program season. Participants can elect to have their incentive checks mailed or their Idaho Power account credited within the 30 days. The incentive structure offered for the 2022 season is listed in Table 1.

Table 1. 2022 Incentive Structure

Fixed-Capacity Payment Rate*	Variable Energy Payment Rate**
$3.25 per Weekly Effective kW Reduction	$0.20 per kWh (Actual kW reduction x Hours of Event)
Adjustment (subtracted from payment) $2.00 per kW of nomination not achieved for each hour of the event	

*To be prorated for partial weeks

**Does not apply to first four program events

PROGRAM RESULTS

The results presented throughout this report are at the generation level and system losses have been considered. Idaho Power called seven load reduction events in 2022: two events in July, three events in August, and two events in September. The maximum realization rate achieved during the season was 86% during the event on July 28 and the average for all seven events combined was 63%. The realization rate is the percentage of load reduction achieved versus the amount of load reduction committed for an event. The highest hourly load reduction achieved was during the July 28th event at 24.5 MW.

Participants had a committed load reduction of 29.5 MW in the first week of the program season and ended with 27.2 MW at the end of the season. This was a decrease from the 2021 season as participants had a committed load reduction of 36 MW in the first week of the 2021 season and ended with 29.7 MW. This weekly commitment, or "nomination," was comprised of customers participating in the program totaling 159 sites as compared to 139 sites in 2021. The maximum available capacity of the program came from a nominated amount in week three at 30 MW. In past years, certain events have achieved higher than a 100% realization rate which would make this the maximum potential available capacity for the program.

Enrollment specific to the Oregon service area included 6 participants totaling 9 sites enrolled. These 9 sites had an average nominated capacity for the season of 4.8 MW and achieved a maximum reduction during the season of 5.6 MW during hour four on the August 8 event.

Participation

The number of sites enrolled in the program for 2022 was 159 from 69 participants. The average number of sites enrolled per participating customer was 2.3. A total of 134 of the 139 sites that participated in 2021 re-enrolled in the program in 2022. The four customers (five sites) that did not re-enroll made the decision that demand reduction was not in line with their facilities' needs for 2022. There was one customer that terminated their participation early in the 2022 season due to extensive electrical upgrades which kept them from curtailing usage when events were called.

This past season Idaho Power continued the auto-enrollment option where existing participants were re-enrolled in the program automatically: a confirmation packet was mailed early in April based on the prior year's enrollment information. Participants notified the company in writing to disenroll, to change their nomination amount, or to update/change contact information regarding personnel for event notification. The auto-enrollment process has proven to be successful, and the company anticipates utilizing this process in the future.

The 2022 season was the first year with the new program parameters per Idaho Case IPC-E-21-32 and Oregon Docket No. ADV 1355/Advice No. 21-12, which replaced the 13-14 Settlement agreement.

The company did deny one program application in 2022, as the applicant was not able to meet the 20 kW minimum load reduction.

Figure 1 represents Idaho Power's service area divided into three regional areas: Canyon-West (Canyon and Western), Capital, and South-East (Southern and Eastern). Figure 2 represents the enrolled capacity (total nominations) that were enrolled in 2022 and the distribution by Idaho Power's regional service areas. Figure 3 represents the enrolled capacity in 2022 and the diversity based on business type.

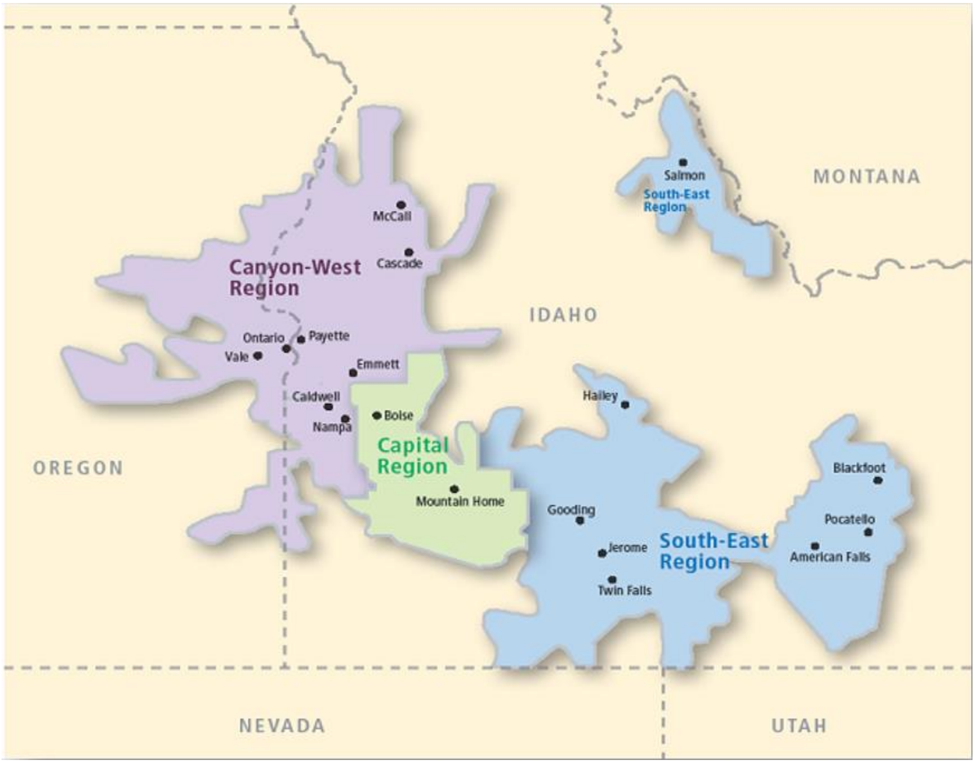

Figure 1. Idaho Power's Service Area

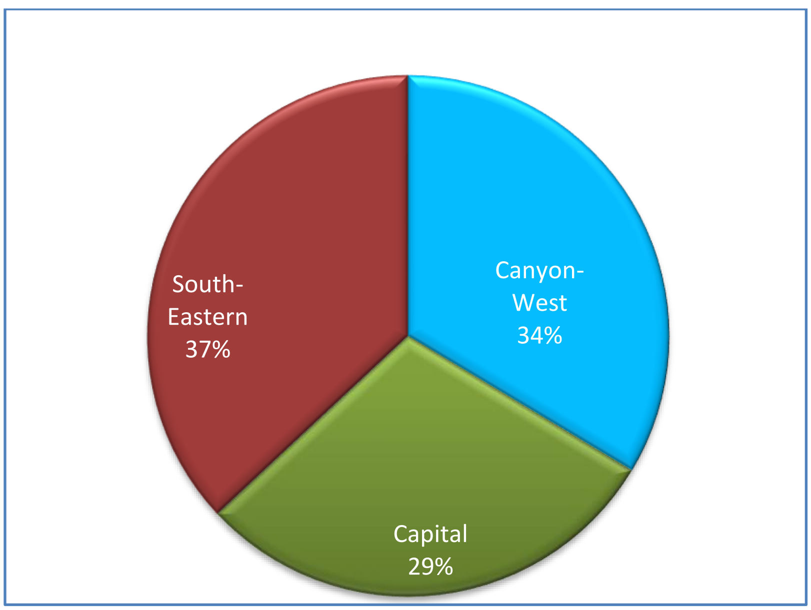

Figure 2. 2022 Enrolled Capacity (% of Total Nomination) by Region

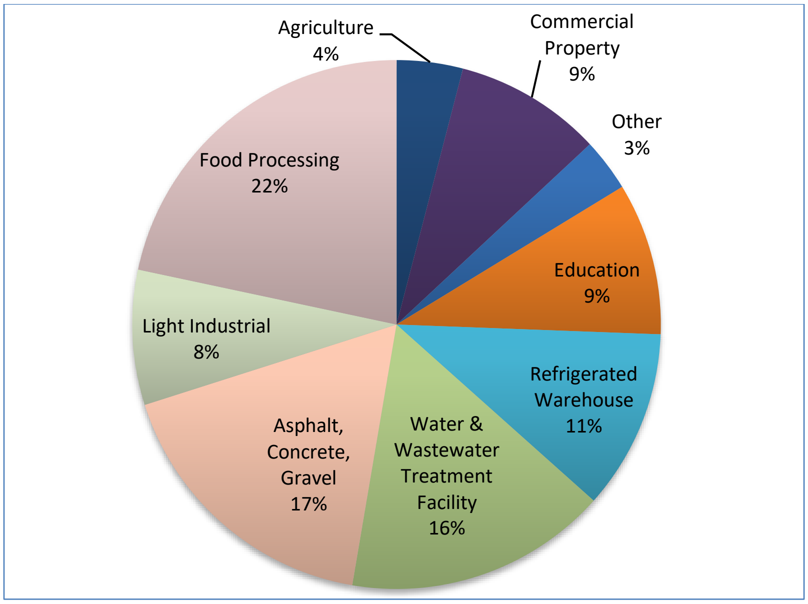

Figure 3. 2022 Enrolled Capacity (Total Nomination) by Business Type

Operations

After an event, interval metering data provides Idaho Power the ability to view a history of each participant's load before, during, and after events. The metering data was used to calculate the reduction achieved per site for each event, allowing Idaho Power to provide participants with a report that showed their hourly baseline, actual usage, and reduction for each event. This data can assist participants in refining their nomination for future events and aids Idaho Power in determining which sites may have an opportunity to provide more reduction or change their reduction strategy if nomination amounts were not achieved.

The company believes by calling at least three events per season the program will be more effective in providing consistent and reliable reduction. A minimum of three events allows the company to test processes and software and helps customers fine tune their curtailment plan. The company called seven load reduction events during the 2022 program season which is the first time this has occurred since 2012. This past season was extremely hot and dry across the west with constraints across the Pacific Northwest that impacted energy availability; as a result, the program was utilized more often. In all seven events the program provided a resource to assist Load Serving Operators with balancing load and resources, as well as potentially avoiding additional market purchases.

The variable energy price for utilizing the program after the fourth event was $0.20/kWh and could be considered the dispatch price for calling load reduction events beginning with the fifth event. The price of $0.20/kWh is typically higher than the energy market price. The company believes the variable energy price is appropriate because having a dispatch price below

$0.20/kWh could cause the company to call events more frequently resulting in reduced participant performance and event fatigue.

Load Reduction Analysis

The baseline that reductions are measured against during load reduction events is the average kW of the highest energy usage days during the event availability time (3-10 p.m.) from the highest three days out of the last 10 non-event weekdays. The baseline with a Day-of-Adjustment (DOA) methodology used in 2022 was changed slightly to be consistent with the updated event availability time (3-10 p.m.) and to reflect more accurate load reductions. Individual baselines are calculated for each facility site. Once the original baseline is calculated, a DOA adjustment is used to more accurately reflect the load behavior of the participant on event day. The DOA is the difference between the average baseline kW and the average curtailment day kW during the hour prior to the participant receiving notification of an event, and can be an upward or downward adjustment. Scaling factors are calculated by dividing the original baseline kW for each program event hour by the baseline kW of the hour preceding the event notification time. The actual event day kW for the hour preceding the event notification time is then multiplied by the scaling factor to calculate the adjusted baseline kW from which load reduction is measured. The adjusted baseline kW for each hour cannot exceed the maximum kW amount for any hour from the highest energy use days or the hours during the event day prior to event notification.

Sites are classified into four size segments based on nomination: 0-50 kW, 51-200 kW, 201-500 kW, and 500+ kW. As Figure 4 depicts, the nomination group with the most sites was in the 0-200 kW range, accounting for approximately 79% of the sites. Figure 5 shows both the average and maximum demand reduction achieved during each of the seven curtailment events.

Figure 6 represents the realization rate achieved by each nomination group, averaged across all seven events. To calculate the results, each site's average load reduction (across seven events) was divided by its average nomination across the seven events and then grouped by size. Idaho Power will continue to work with all customer segments to help refine nominations to align closer with realistic reduction opportunities, which will increase the overall program realization rate.

Based on Figure 5 and Figure 6, the segment with the smallest nominated load reduction, 0–50 kW, had the highest number of sites enrolled (66 sites) with an achieved realization rate across the seven events at 62%. The 51–200 kW segment had the second highest number of sites enrolled (60 sites) and achieved the highest average realization rate of all groups at 80%. The 201-500 kW group had 25 sites enrolled and achieved a realization rate of 58%. The largest size class, 501+ kW, had 8 sites enrolled and achieved an average realization rate across the seven events at 52%.

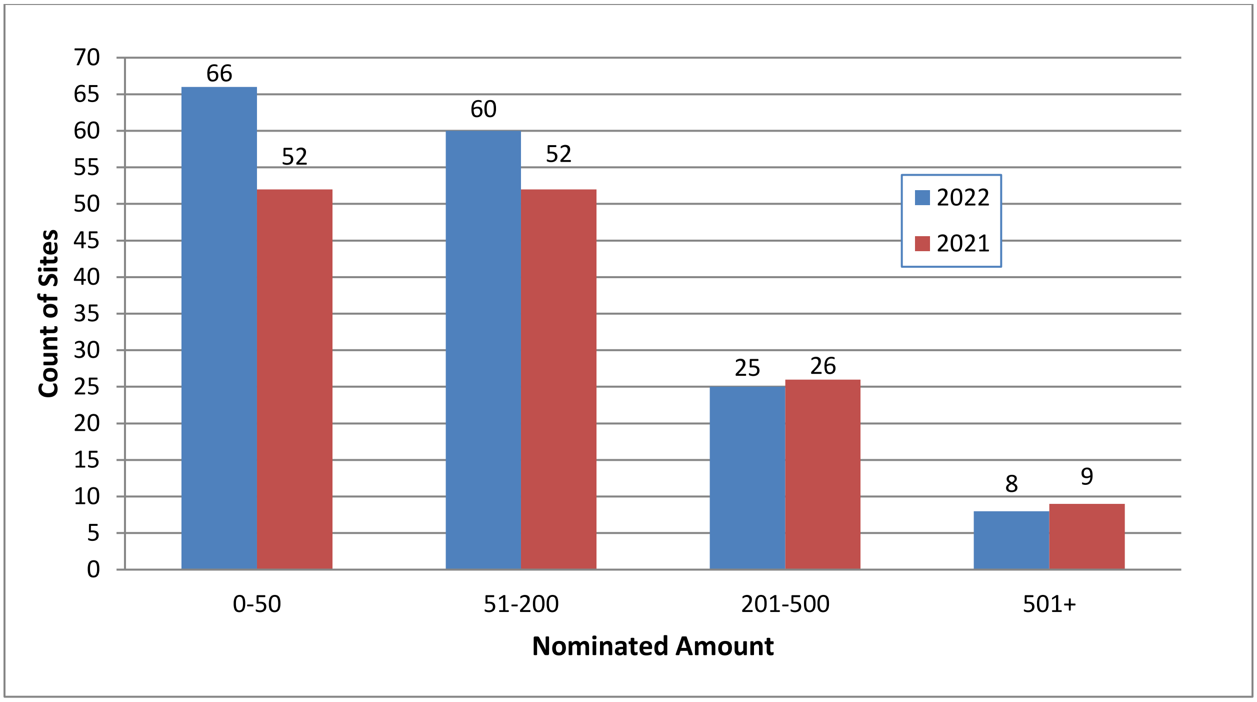

Figure 4. Range of Nominated Load Reduction (kW)

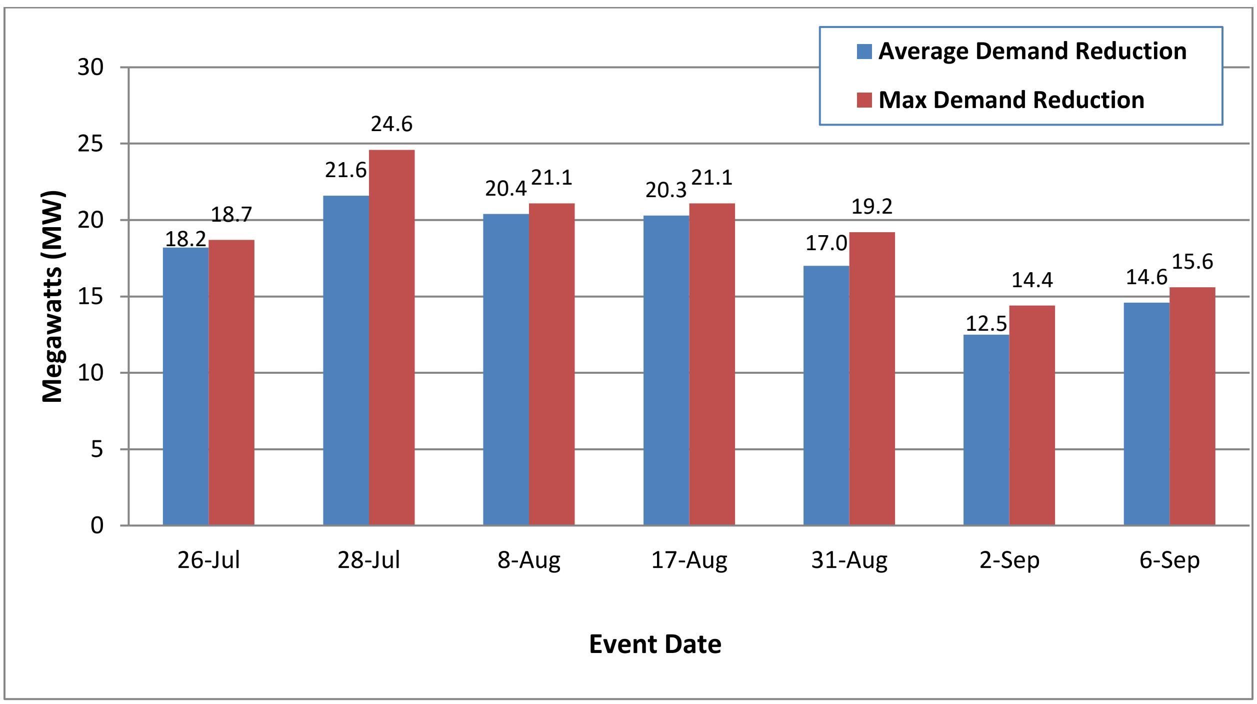

Figure 5. Average and Maximum Reduction Achieved per Event

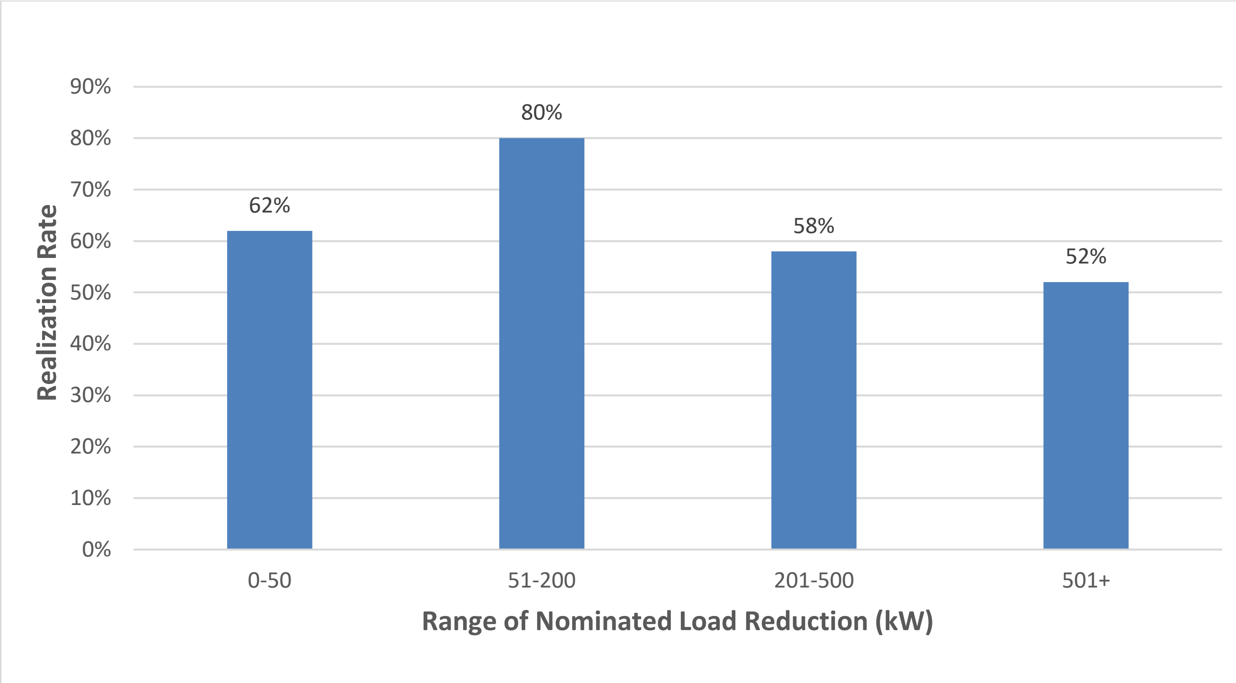

Figure 6. Average Realization Rate by Each Nomination Size Class

Table 2 shows the program realization rates for 2022 based on average demand reduction per event. The maximum demand reduction achieved ranged from a low of 14 MW with a maximum demand reduction realization rate of 53% to a high of 24.5 MW with a maximum demand reduction realization rate of 86%. The average demand reduction realization rate for the 2022 season was 63%.

Table 2. Realization rate per event - 2022

Curtailment Event	Event Timeframe	Nominated Demand Reduction	Average Demand Reduction (MW)	Max Demand Reduction (MW)	Realization Rate*
July 26	5-9 pm	28.6	18.2	18.7	64%
July 28	5-9 pm	28.6	21.6	24.5	76%
August 8	5-9 pm	28.7	20.4	21.1	71%
August 17	5-9 pm	28.6	20.3	21.1	71%
August 31	6-10 pm	28.2	17	19.2	60%
September 2	5-9 pm	27.3	12.5	14.4	45%
September 6	5-9 pm	27.3	14.6	15.6	53%
Average		28.2	17.8	19.2	63%

* Based on average reduction

Event performance and realization rates for the 2022 season were reduced due to the impact of COVID-19 such as supply chain and production issues. Typically, the program achieves a realization rate of 85%. The baseline and DOA methodology changed this year as well as the program parameters. COVID-19 has changed business operations, which will have an ongoing effect on how businesses can curtail load. Also, the later event times have impacted many customers' ability to get the load reductions that were more attainable with earlier event hours. Additionally, this was the first season in eight years that had more than five events called which could have also had an impact on customers' operations. More events may have resulted in some participants being less able to participate in all events as the season progressed. Table 3 shows the realization rate for each participant in the program for 2022.

Table 3. Realization Rate Per Participant for Each Event - 2022

Participant Number	July 26 Event Realization	July 28 Event Realization	August 8 Event Realization	August 17 Event Realization	August 31 Event Realization	September 2 Event Realization	September 6 Event Realization
1	0%	239%	214%	93%	118%	136%	0%
2	24%	6%	4%	14%	0%	5%	5%
3	33%	48%	22%	28%	7%	3%	24%
4	34%	19%	164%	73%	148%	69%	0%
5	96%	97%	133%	125%	78%	61%	97%
6	76%	32%	0%	0%	28%	5%	0%
7	76%	13%	97%	87%	42%	9%	7%
8	87%	74%	73%	87%	53%	Opt out	Opt out
9	207%	291%	104%	253%	260%	262%	47%
10	13%	0%	187%	130%	60%	0%	100%
11	136%	155%	90%	10%	8%	81%	55%
12	18%	33%	75%	3%	126%	16%	11%
13	7%	8%	35%	23%	98%	111%	16%
14	4%	4%	42%	12%	7%	124%	2%
15	28%	32%	101%	0%	191%	126%	115%
16	99%	243%	130%	346%	138%	147%	16%
17	3%	98%	1%	20%	132%	9%	122%
18	3%	3%	0%	0%	2%	4%	2%
19	9%	10%	20%	23%	4%	0%	0%
20	108%	187%	90%	131%	91%	58%	97%
21	116%	113%	155%	77%	36%	212%	0%
22	229%	253%	178%	199%	70%	76%	26%
23	18%	66%	74%	44%	51%	61%	38%
24	152%	132%	16%	101%	0%	66%	87%
25	155%	156%	142%	113%	4%	0%	124%
26	0%	3%	1%	0%	1%	11%	8%

27	639%	96%	145%	448%	75%	179%	70%
28	193%	146%	161%	183%	107%	0%	186%
29	0%	3%	39%	115%	95%	0%	0%
30	2%	0%	21%	46%	9%	2%	1%
31	109%	131%	70%	122%	10%	2%	5%
32	1%	4%	9%	13%	46%	6%	8%
33	11%	10%	2%	9%	38%	5%	19%
34	100%	15%	46%	0%	40%	12%	158%
35	45%	205%	208%	0%	130%	0%	217%
36	0%	59%	165%	71%	134%	182%	363%
37	91%	59%	12%	6%	0%	5%	13%
38	32%	120%	31%	60%	151%	28%	117%
39	0%	0%	0%	0%	0%	0%	0%
40	35%	82%	13%	25%	8%	0%	0%
41	76%	9%	1%	16%	23%	2%	4%
42	114%	138%	180%	208%	247%	26%	189%
43	28%	180%	152%	73%	0%	88%	3%
44	74%	51%	0%	0%	0%	5%	0%
45	2%	0%	73%	21%	18%	17%	17%
46	91%	48%	73%	205%	45%	37%	38%
47	0%	42%	5%	49%	0%	3%	0%
48	25%	13%	4%	20%	13%	19%	9%
49	0%	0%	1%	3%	3%	4%	11%
50	0%	51%	42%	55%	58%	59%	56%
51	0%	0%	0%	0%	0%	0%	0%
52	0%	71%	8%	10%	18%	44%	55%
53	1%	18%	0%	2%	63%	3%	41%
54	0%	7%	0%	6%	27%	46%	1%
55	98%	2%	96%	89%	92%	98%	88%
56	64%	0%	85%	18%	39%	33%	88%
57	51%	45%	31%	24%	59%	68%	61%
58	77%	40%	80%	87%	82%	87%	75%
59	6%	2%	126%	3%	2%	3%	2%
60	39%	72%	50%	100%	102%	74%	80%
61	54%	64%	95%	93%	97%	96%	93%
62	112%	126%	45%	101%	96%	26%	99%
63	21%	21%	0%	88%	15%	0%	1%
64	640%	757%	370%	500%	584%	21%	262%

65	67%	48%	5%	20%	19%	14%	24%
66	115%	80%	94%	92%	70%	95%	131%
67	116%	139%	110%	69%	57%	17%	82%
68	5%	7%	7%	0%	1%	1%	2%
69	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*

*Participant #69 terminated their participation in the program on July 8th.

Program Costs

Program costs for 2022 totaled $519,618. Incentive payments were the largest expenditure, comprising approximately 83% of total costs.

The incentive payments from the seven events called during the 2022 program season were broken down as follows: the fixed capacity payments total was $430,322 and the variable energy payment total was $28,890. Variable energy payments were made during the season based on kilowatt-hour reductions for the fifth, sixth, and seventh events.

Table 4. Annual Program Costs – 2022

Expense Category	2022 Program Costs
Materials & Equipment	$ 8,446
Marketing & Administration	$ 80,851
Incentive payments	$430,322
Total	**$519,618**

CONCLUSION

The program currently contributes approximately 9% of the company's overall DR portfolio and can be relied on to provide dispatchable load reduction to the electrical grid. When analyzing the program at the generation level, industrial and commercial customers have made noteworthy contributions to Idaho Power's DR programs.

2022 Irrigation Peak Rewards Program Report

January 2023

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INTRODUCTION

The Irrigation Peak Rewards Program (IPR) is a voluntary demand response program available to Idaho Power's agricultural irrigation customers since 2004. IPR pays irrigation customers a financial incentive for the ability to turn off participating irrigation pumps on high energy use days. Idaho Power estimates future capacity needs through the Integrated Resource Plan and then plans resources to mitigate shortfalls. IPR is a result of this planning process and the success of the program is measured by the amount of demand reduction available to Idaho Power during during periods of high energy demand or for other system needs.

Program Description

Interruption Options

IPR is available to Idaho Power irrigation customers receiving service under schedules 24 and 84 in Idaho and Oregon. All Irrigation customers are eligible to participate. There are two options for shut off: an automatic dispatch option and a manual dispatch option. The program is limited to 4 hours per service location from 3-10 p.m. (standard option) or for 4 hours during the period from 3-11 p.m. (extended option). The program is limited to 16 hours per week and 60 hours per season. However, due the size of the program, the participants have been split into four groups which can be used independently on different days or used all together at the same time or staggered out at different times on an event day. If five or more events are dispatched for a group, the participants enrolled in the standard option will receive an additional variable payment of $0.18 per kilowatt (kW) billed x 4 hours. Participants enrolled in the extended option (3-11 p.m.) are eligible for an extended variable payment of $0.25 per kW billed x 4 hours. In 2022, participants were organized into four categories and labeled groups A, B, C, and D.

Automatic Dispatch Option

Pumps enrolled in the automatic dispatch option have one of two devices installed that control the irrigation pump(s) via signal from Idaho Power. This option requires that all pumps shut off at a site for the demand-response event. Approximately 99% of the devices are demand response units (DRU) and use Idaho Power's Automated Metering Infrastructure (AMI) to send a signal that opens the contactor and shuts off the pump. The other 1% of automatic dispatch participants have a cellular device (cell device) installed. The cell device has the same load control feature as the AMI DRU, except a cellular network signal is used to send the command for shut off during the event.

Manual Dispatch Option

Pumps with at least 1,000 cumulative horse power (hp) or that Idaho Power has determined to have limited communication availability are eligible for the manual dispatch option, where participants manually control which pumps are turned off during a load control event. Manual participants are required to select a nominated load reduction of kW available and anticipated for shut off during the season. They may choose to shut down all or partial load at the site.

Parameters

- Season dates June 15 to September 15
- Minimum of three load control events
- Load control events may occur any weekday or Saturday, excluding July 4 and September 5, between the hours of 3-10 p.m. (standard option), or between the hours of 3-11 p.m. (extended option)
- Load control events may occur up to four hours per day and up to 16 hours per week, but no more than 60 hours per program season—applies to both standard option and extended option
- Idaho Power notifies automatic participants by phone, email, and/or text messaging four hours before the start of the event whenever possible
- Idaho Power notifies manual participants by phone, email, and/or text four hours before the start of the event
- Idaho Power may cancel the load control event and notify participants of the cancellation up to 30 minutes before the event start time
- Parameters for IPR do not apply to system emergencies

Fixed and Variable Incentives

The IPR incentive structure includes fixed incentives (billing credits) and variable event-related incentives. Participants receive fixed incentives in the form of monthly billing credits that are not tied to events: a demand credit and an energy credit. The fixed demand and fixed energy credits for the automatic dispatch participants were applied to the monthly bill for billing dates June 15 through September 15. The fixed demand and fixed energy credits for the manual dispatch participants were paid with a check.

- Fixed demand credits are calculated by multiplying the monthly billing kW by the demand-related incentive amount
- Fixed energy credits are calculated by multiplying the monthly billing kilowatt-hour (kWh) usage by the energy-related incentive amount

Credits are prorated for periods when meter reading/billing cycles do not align with the IPR season dates. Monthly billing credits for 2022 are summarized in Table 1.

Table 1. Monthly fixed billing credits for manual and automatic options

Fixed Demand Credit ($/billing kW)	Fixed Energy Credit ($/billing kWh)
$5.25	$0.008

Variable incentives apply if more than four events occur in the season. Participants who choose the extended option (3–11 p.m.) are paid a higher variable credit. In 2022 group A and D experienced a total of six events and groups B and C experienced seven events which caused the variable payments to be initiated. The variable incentive rates for 2022 are listed in Table 2.

Table 2. Variable incentive after the fourth event

Standard Option 3–10 p.m. Variable Energy Credit per hour ($/billing kW)	Extended Option 3–11 p.m. Variable Energy Credit per hour ($/billing kW)
$0.18	$0.25

Opt-Outs

Under the rules of the automatic dispatch option, participants have the option to opt out of any load control event. Opt-out fees are equal to $6.25 multiplied by the billed kW for that billing cycle. An explicit opt-out occurs when the participant asks Idaho Power to remove the pump for that specific load control event.

PARTICIPATION

In March 2022, Idaho Power mailed IPR enrollment packets to all customers. The packets included an enrollment worksheet with estimated credits for participation, contact worksheets, and an IPR brochure.

Nominated billing demand was 346,333 kilowatts (kW) with 2,142 pumps enrolled for the 2022 season.

Figure 1 shows Idaho Power's service area divided into three regional areas: Canyon–West, Capital, and South–East. Also referenced within this report are sub-areas within the Canyon-West region (Western, Canyon, and Oregon) and sub-areas within the South-East region (Southern and Eastern).

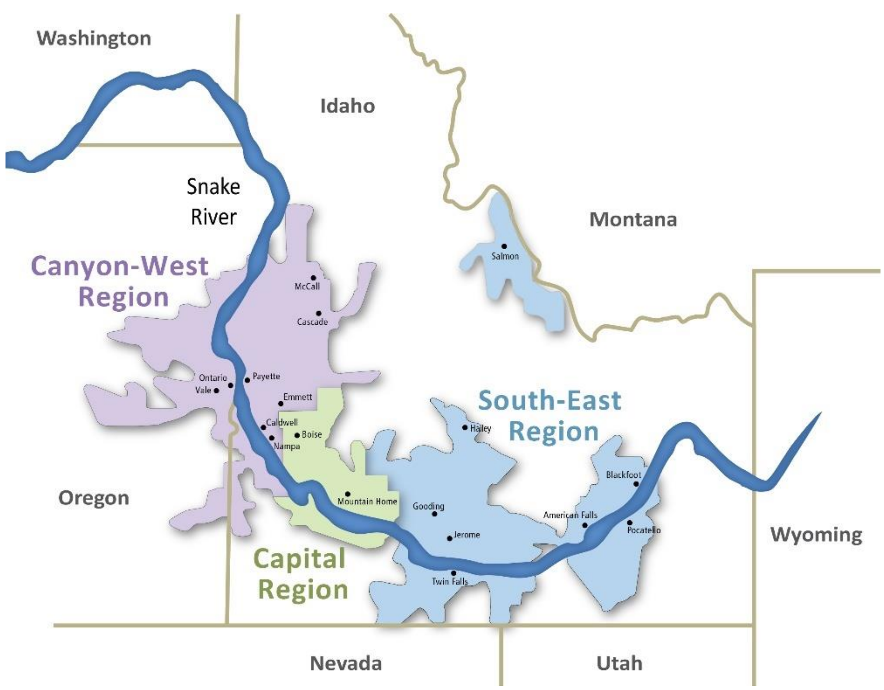


Figure 1. Idaho Power service area

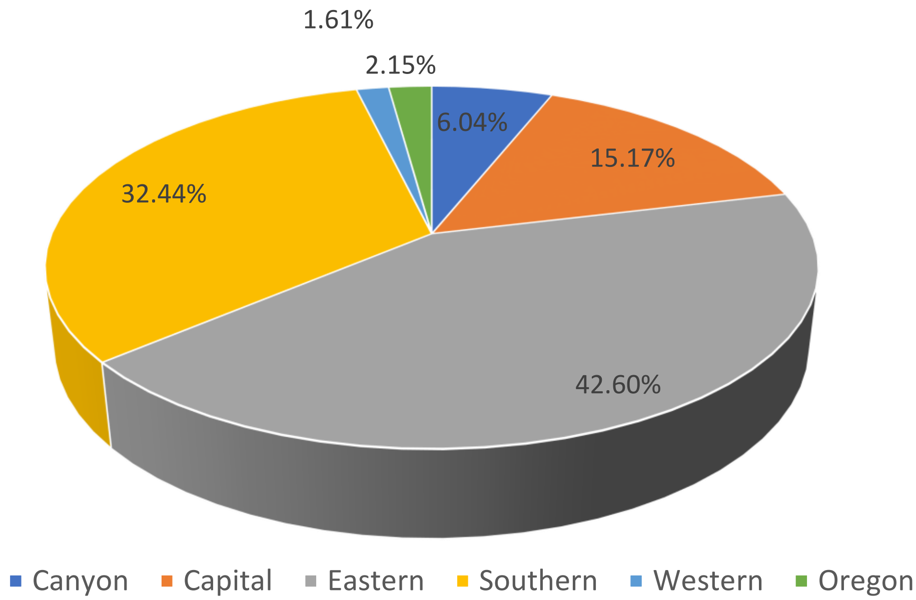


Figure 2. 2022 percentage of participants by service area

Table 3. Eligible pump locations and participation levels by area

Idaho Power Regional Area	Eligible Service Locations	Manual Dispatch Option	Automatic Dispatch Option	Total Enrolled by Area	Eligible Enrolled
Canyon	2,888		39	39	1.4%
Western	4,497		52	52	1.2%
Oregon	104	3	61	64	61.5%
Capital	1,879	23	246	269	14.3%
Eastern	3,549		977	977	27.5%
Southern	8,693	4	737	741	8.5%
Totals	**21,610**	**30**	**2,112**	**2,142**	**9.9%**

OPERATIONS

Equipment

Idaho Power has expanded the use of AMI technology with the use of DRUs installed at pump locations. AMI technology provides the ability to turn off pumps during an IPR event by sending a command through the power line, and allows Idaho Power to analyze the interval metering data of participating pumps during load control events. Interval metering reports provide data to help determine which DRUs functioned properly and which pumps were turned off and stayed off during the event. During the 2022 season 2,376 DRUs were active and installed at 2,078 pump locations.

In addition to using AMI technology, Idaho Power developed its own load control device. This device utilizes a cellular network signal to communicate with and shut off the pump during a load control event. The data available from the cellular device systems allows Idaho Power to view status information for each location. Hourly usage data is not available for these sites. During the end of 2020 and the spring of 2021 many of the cellular devices were exchanged for the DRU due to an AMI substation expansion project. Only 33 pump locations remain with 39 cellular devices.

Monitoring

Identification and correction of device failure is an ongoing effort before the season begins and throughout the season. Proper identification of malfunctioning devices helps to accurately predict the load reduction. Based on information and assumptions made using the interval metering data and the communication reports provided weekly, a work order may be created and sent to the electrician to troubleshoot the device. Often it is found the device is not working or damaged and exchanged for a new device.

Several issues with DRUs and cell devices were identified in 2022, including:

- Inoperable
- Damaged
- Device missing a fuse
- DRU serial number or cell device IP address and/or SG number had been recorded inaccurately and the system could not find the correct communication path
- New panel install at the pump site requiring a new device install on the new panel
- Water damage to the device
- Device—no longer at the pump location

Data Gathering and Processing

Troubleshooting, electrician work orders, and load reduction calculations are informed by the interval metering data analysis. Data gathering includes AMI data, cellular device data, MV-90 hourly data, and logged data from manually read meters. The data is then separated into three data sets:

1. Pumps with AMI technology and interval metering data
2. Pumps with cellular device data
3. Pumps running on the manual dispatch option with interval data

The AMI data, Cellular data, MV-90 data and logged data from manually read meters record the hourly reads. The data is useful for troubleshooting of devices and to calculate load reduction for the program.

LOAD REDUCTION ANALYSIS

The load reduction analysis or program performance for the season is calculated using four primary sources:

1. Participating service location list
2. Interval metering data
3. Cellular device communication data from event days
4. Total system load data for event days and surrogate days

The IPR participant data for each event day includes the following:

- Pump number
- Device Location
- 2022 dispatch option
- 2022 dispatch group
- Nominated kW
- Cellular device or DRU serial number or identified as a manual site

Idaho Power system load monitoring was used as a comparison for impact of the load reduction during the event. The total system load monitoring provides MW readings in 5-minute increments.

Baseline Calculations and Event Reduction Calculations

Calculating the performance of the program requires a comparison between usage before the event (baseline usage) and usage during the event. See Appendix 1 for the definition of terms and the demand reduction calculation method. The descriptions below outline the process. Table 4 displays the load reduction results for each event day. The load reduction at generation level includes a 9.7 percent line loss.

- Baseline usage is calculated using the average of the first four hours of the five hours before the dispatch group start time.
- The event hour reduction is calculated using the average of the event timeframe for each dispatch group.
- Data with errors are removed from the data set and the group average is extrapolated and used in place of the error set.
- Load reduction for service locations with interval metering data (AMI, MV-90, and manual data loggers) is calculated and then extrapolated to represent all load including those with errors and without interval metering data.

- 2112 pump locations had interval data in 2022, representing 98.6% of the total enrolled pump locations.

Table 4. Hourly demand reduction results (MW) for each event and groups called, including line losses

		Hourly Load Reduction (MW)						
Event Date	Groups*	3–4 p.m.	4–5 p.m.	5–6 p.m.	6–7 p.m.	7–8 p.m.	8–9 p.m.	9–10 p.m.
7/7/2022	A, B				115.3	121.2	119.5	119.1
7/12/2022	C, D	5.5	67.1	109.1	108.9	101.1	40.5	
7/26/2022	A, C	3.1	68.5	113.5	113.5	108.7	43.0	
7/27/2022	B, D			42.2	75.8	76.2	75.8	32.5
7/28/2022	A, C	5.1	59.7	102.6	102.1	96.1	40.6	
7/29/2022	B, D		40.4	40.5	76.2	76.8	35.5	35.0
8/8/2022	C, D	16.3	54.4	83.9	80.6	67.8	30.2	
8/9/2022	A, B		40.1	74.0	75.1	74.6	33.7	
8/17/2022	B, C		4.1	55.8	86.7	86.8	81.4	29.5
9/2/2022	A, B, C, D	4.5	43.7	117.7	155.1	147.3	110.2	37.5
9/6/2022	A, B,C, D				102.8	122.7	151.0	152.1

*Group C had some customers on an early off time.

Event Day Highlights

July 7

The first event, a Thursday, was sixteen days into the program season and the temperature was 95° F in Boise. Groups A and B were dispatched for shut off. Idaho Power received 80 opt-outs. The opt-out reasons noted were “must have the water,” “too dry, can’t catch up,” “water just came back on and I cannot have it go off again now.” Due to several devices being set up in an incorrect cycle group, some service locations were dispatched differently than customer expectations. This caused customer confusion because some customers were notified but not cycled, and some customers were cycled but not notified. This issue also caused higher opt-outs and resetting of pump panels which caused device failure numbers to look higher. The issue was addressed when it was realized after the July 12 event.

July 12

The second event occurred on a Tuesday following a record high heat wave in the northwest including heat cones over Seattle and Portland. The temperature was 100° F in Boise. Groups C and D were dispatched for shut off. The event started at 4:00 p.m. and experienced 18 opt-outs. The issue that the program experienced in the July 7 event was not discovered and therefore customers experienced similar dispatch issues. After this event the issue was identified and corrected.

July 26

The third event occurred on a Tuesday. Groups A and C were dispatched for shut off. The event started at 4:00 p.m. and the temperature was 100° F in Boise. For this event, there were five opt-outs and many of them were the same as the previous event. It seemed that the stress for irrigators had lessened this late in the season as some crops were harvested entirely and others had a mature canopy, thus four hours of no water was less of an issue. The notifications to participants went out as designed and the communication to the DRUs and cell devices occurred without delays.

July 27

The fourth event occurred on a Wednesday. Idaho Power had called the program on Tuesday of this same week, so on Wednesday different groups were called. The temperature was 100° F in Boise. Groups B and D were dispatched for shut off. The event started at 5:00 p.m. with 16 opt-outs. The notifications to participants went out as designed and the communication to the DRUs and cell devices occurred without delays. Overall the event went smoothly with only a little feedback from the participants.

July 28

The fifth event occurred on a Thursday. Groups A and C were dispatched for shut off. The event started at 4:00 p.m. and 35 pumps opted out; a few of the opt-out calls indicated the pump/water had been off in the past week and they were unable to participate due to just getting the water back up.

July 29

The sixth event occurred on a Friday and was the third event for groups B and D. The event started at 4:00 p.m. and the temperature was 104° F in Boise. Ten pumps opted out. The notification system and communication to the cell devices and DRUs worked as designed.

August 8

The seventh event occurred on a Monday and was the fourth event for groups C and D. The event started at 4:00 p.m. and the temperature was 104° F in Boise. Eleven pumps opted out. The notifications to participants went out as designed and the communication to the DRUs and Cell devices occurred without delays.

August 9

The eighth event occurred on a Tuesday and was the fourth event for groups A and B. The event started at 4:00 p.m. Temperature was 99° F in Boise. Twenty pumps opted out. The notifications to participants went out as designed and the communication to the DRUs and cell devices occurred without delays.

August 17

The ninth event occurred on a Wednesday and was the fifth event for groups B and D. Participating pump locations were eligible for a variable credit payment based on billed kW. The event started at 5:00 p.m. and the temperature in Boise was 103° F. A total of 59 pumps opted out. The notifications to the participants went out as designed and the communication to the DRUs and cell devices occurred without delay.

September 2

The tenth event occurred on a Friday and was the fifth event for groups A and D, and the sixth event for groups B and C. The event started at 4:00 p.m. and the temperature in Boise was 101° F. A total of 35 pumps opted out. The notifications to the participants went out as planned and the communication to the DRUs and cell devices occurred on time.

September 6

The eleventh event occurred on a Tuesday and the event was planned for groups A, B and D. However, an emergency event was called due to issues with fires in the vicinity of transmission lines and a problem with one of the generating plants, so group C was also called. This was the sixth event for groups A and D, and the seventh event for groups B and C. Participating pump locations were eligible for a variable credit payment based on billed kW. The event started at 6:00 p.m. for groups A, B, and D and 7:17 p.m. for group C. The temperature in Boise was 101° F. A total of 35 pumps explicitly opted out. The notifications to the participants went out as planned and the communication to the DRUs and cell devices occurred on time.

Table 5 shows the percentage of device failures, opt-outs, small load left on, and average MW on during each event.

Table 5. Total left on and average MW on during each event

Event Date	Device Failure	Opt Out	Small Load Left On	Total Left On	Average MW On During the Event
7/7/2022	14.3%	3.8%	1.4%	19.5%	36.0
7/12/2022	16.9%	1.5%	0.7%	19.0%	27.1
7/26/2022	4.8%	0.9%	0.4%	6.1%	7.4
7/27/2022	7.5%	0.6%	0.7%	8.8%	14.5
7/28/2022	4.1%	2.3%	0.3%	6.7%	6.7
7/29/2022	7.4%	0.9%	0.8%	9.0%	12.0
8/8/2022	4.8%	0.6%	0.7%	6.1%	6.5
8/9/2022	3.5%	0.9%	0.3%	4.6%	7.2
8/17/2022	2.9%	4.4%	0.4%	7.7%	6.9
9/2/2022	9.2%	1.3%	0.7%	11.2%	32.9
9/6/2022	5.9%	2.1%	0.8%	8.8%	28.2

Percentages are based on load left on during event compared to total nominated MW.
Data for participants with meter data errors are interpolated.

Potential Realization Rate Analysis

The realization rate is used to determine the IPR potential performance for any day during the season. It shows what is on and available for shutoff during a demand response event. For the analysis, the realization rate percentage is reduced by the average of device failures, opt-outs, and small loads left on during an event. These reductions averaged 8.2% for the 2022 season, excluding the first two events where devices were incorrectly categorized. The average of 8.2% was applied to each day throughout the irrigation season. By removing the average left on, Idaho Power more accurately calculates the potential load reduction for any day during the season. Figure 3 shows the 2022 season participant demand potential realization rate by day (all days except for event days, Sundays, July 4, and Labor Day).

The 2022 maximum potential realization rate of 67.3% on July 1st results in a maximum potential load reduction for IPR of 255.6 MW for the 2022 season. The realization rate is typically the highest at the end of June and the beginning of July when a larger percentage of irrigation pumps are operating nearly 24 hours per day, seven days per week. Later in the season, when many pumps are not operating due to crop maturity and reduced watering demands, the potential realization rate is lower.

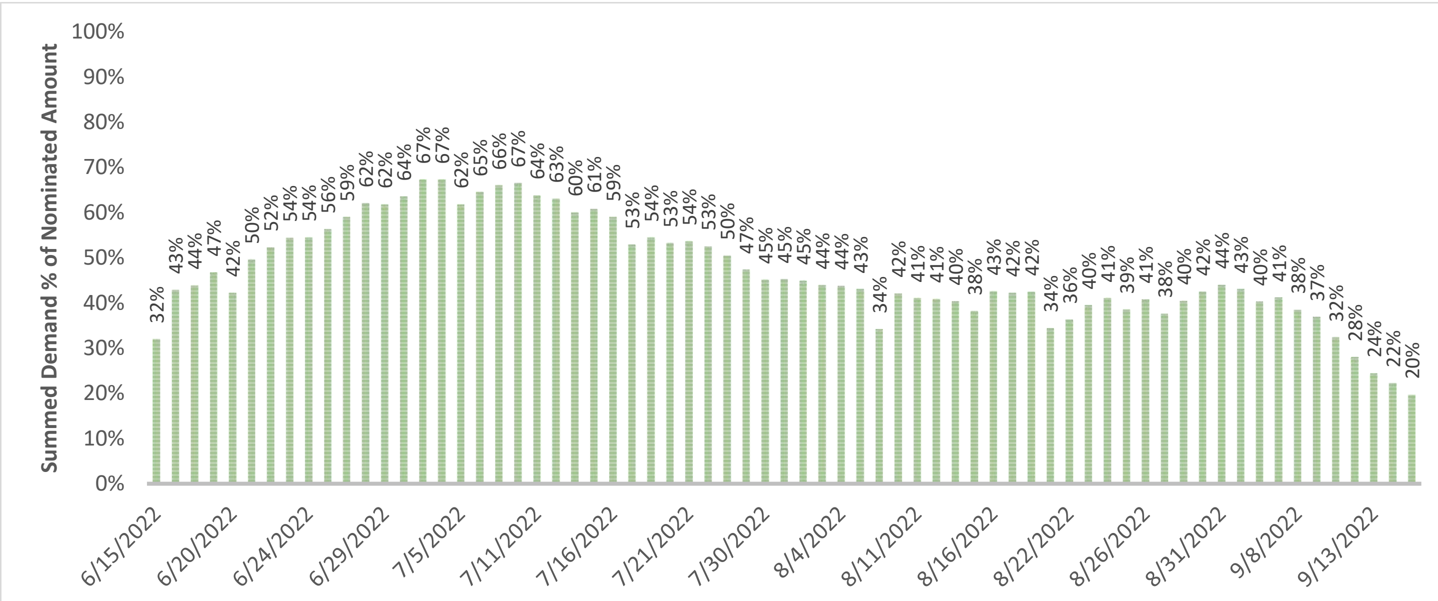
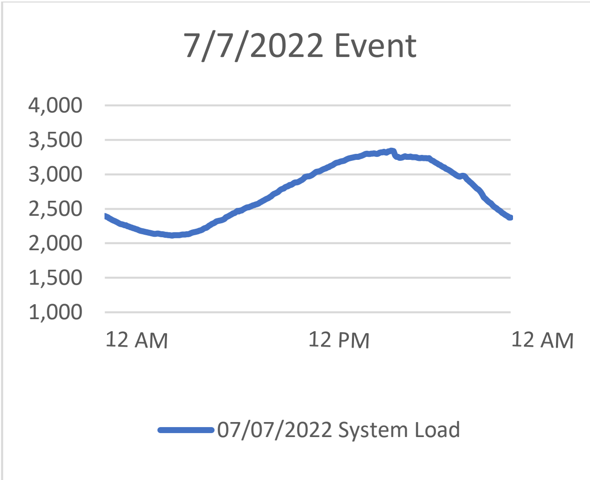
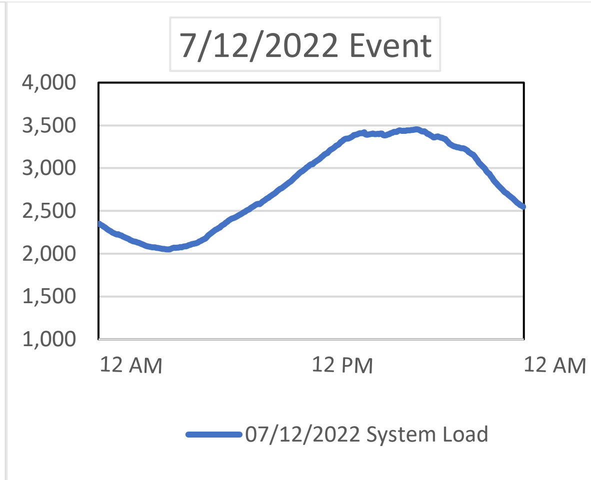


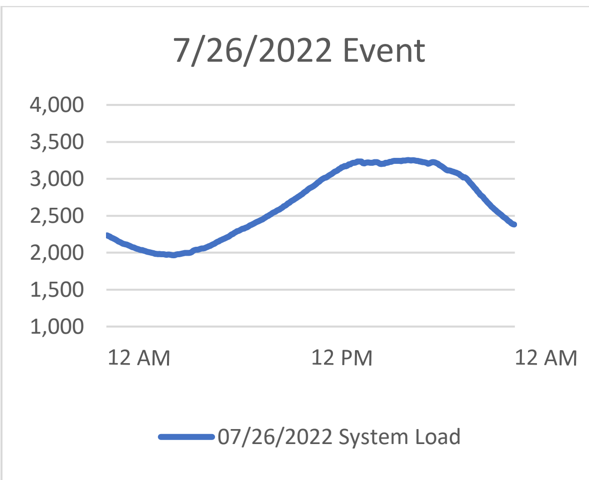
Figure 3. 2022 Participant Demand and Realization Rate (%)

Load Reduction Results—Total System Load Data

The line graphs presented below show the actual Idaho Power system load in 5-minute intervals for each event day. Due to the size of the program and the groups that were called, it is readily apparent in each graph how the program is impacting overall system load.


7/7/2022 Event
4,000
3,500
3,000
2,500
2,000
1,500
1,000
12 AM
12 PM
12 AM
07/07/2022 System Load


7/12/2022 Event
4,000
3,500
3,000
2,500
2,000
1,500
1,000
12 AM
12 PM
12 AM
07/12/2022 System Load


7/26/2022 Event
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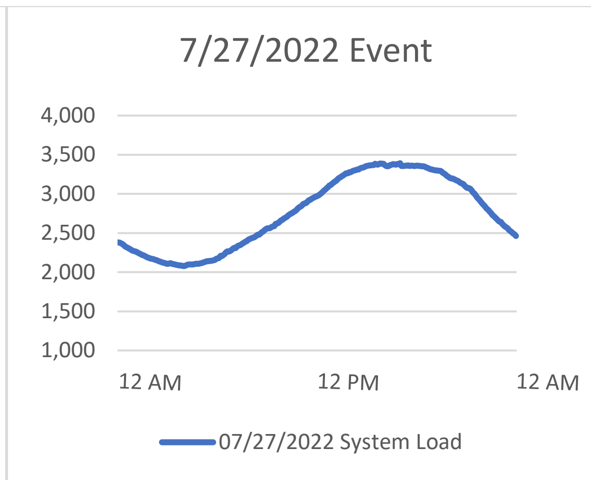
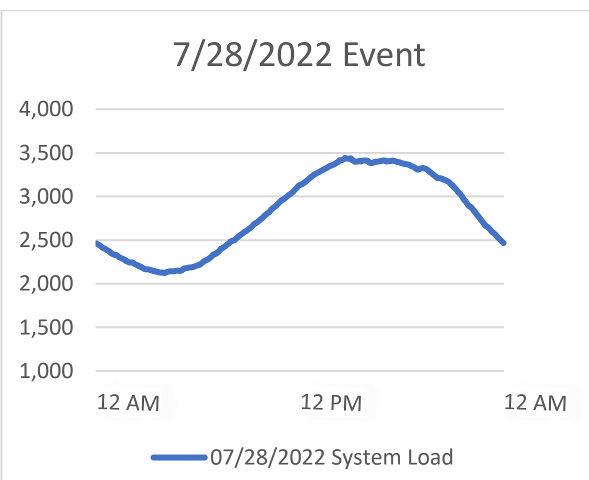
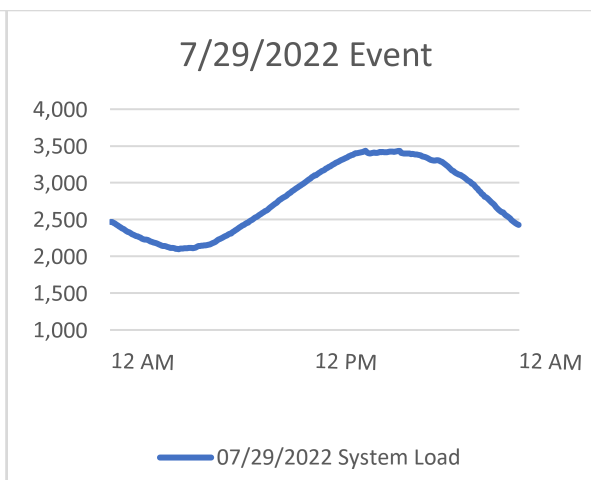
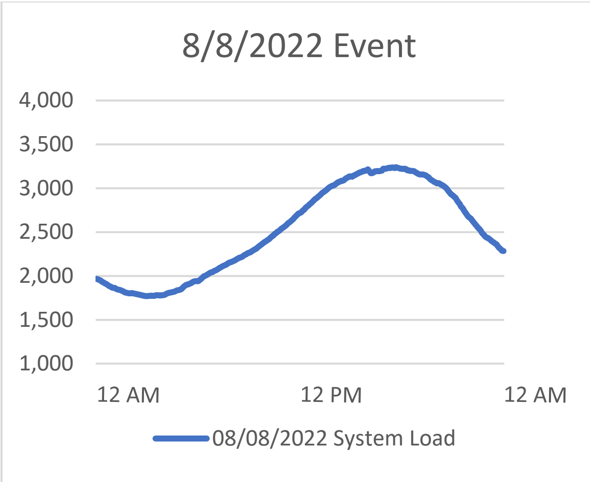
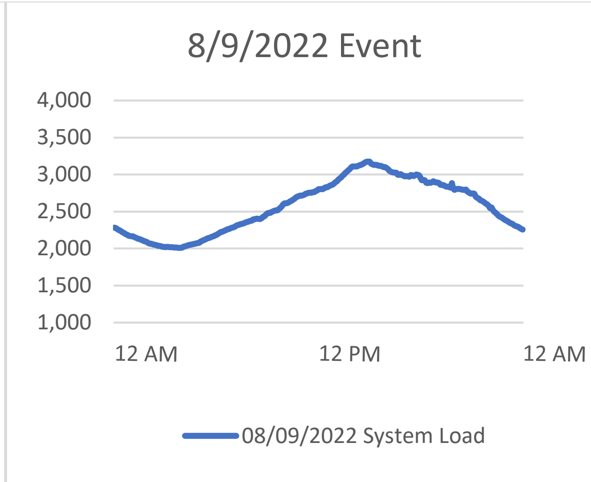
3,000
2,500
2,000
1,500
1,000
12 AM
12 PM
12 AM
07/26/2022 System Load

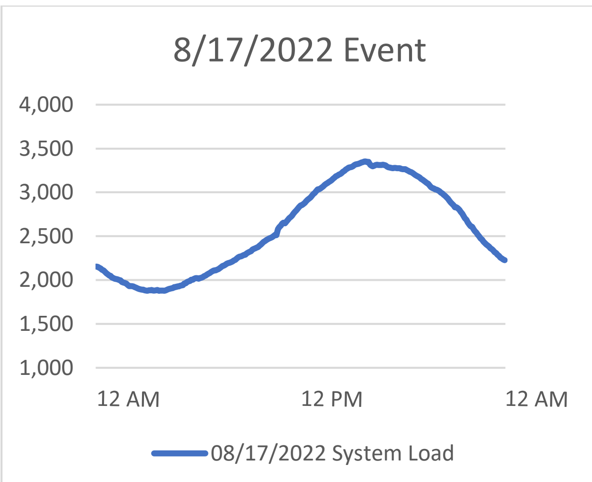

7/27/2022 Event
4,000
3,500
3,000
2,500
2,000
1,500
1,000
12 AM
12 PM
12 AM
07/27/2022 System Load

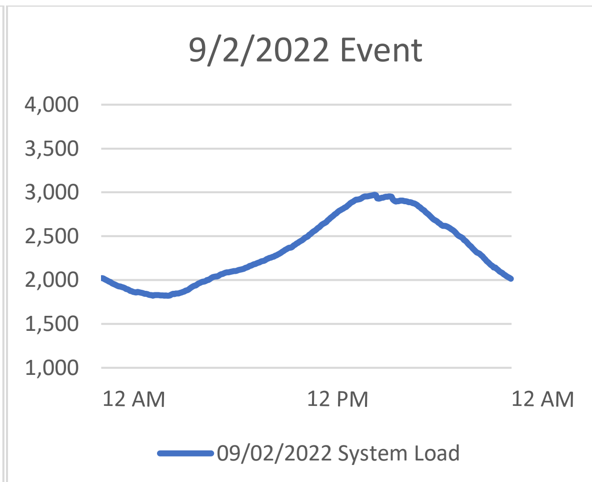

7/28/2022 Event
4,000
3,500
3,000
2,500
2,000
1,500
1,000
12 AM
12 PM
12 AM
07/28/2022 System Load

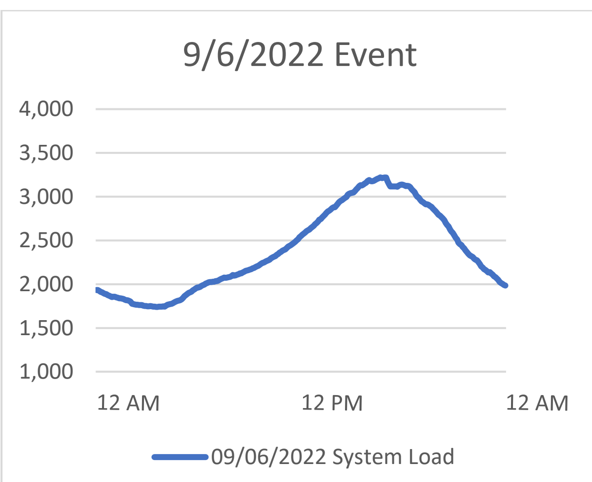

7/29/2022 Event
4,000
3,500
3,000
2,500
2,000
1,500
1,000
12 AM
12 PM
12 AM
07/29/2022 System Load











COSTS

Program costs totalled $8,503,140 in 2022 with incentives being the largest portion at 92.8%. Incentives paid for the 2022 season totalled $7,895,970, including variable incentives. The participants had six or seven events each and were paid $503,547.59 in variable payments. The estimated maximum cost of variable incentives had the program run for the full 60 hours totalled an additional $1.97 million.

Table 6. Annual program costs by category

Expense Item	2022 Total Cost
Administration	$ 129,992.54
Marketing	21,601.31
Materials	117,356.40
Services	334,041.83
Evaluation	26,677.50
Other Expenses	(22,500.00)
Incentives	7,895,970.71
Total (Actuals)	**$ 8,503,140.29**

CONCLUSIONS

Highlights from the 2022 season included:

- 2,142 service points enrolled
- 346,333 kW of enrolled billing demand
- Maximum program potential of 255.6 MW including line losses
- Event 1: July 7 – actual reduction 121.2 MW including line losses
- Event 2: July 12 – actual reduction 109.1 MW including line losses
- Event 3: July 26 – actual reduction 113.5 MW including line losses
- Event 4: July 27 – actual reduction 76.2 MW including line losses
- Event 5: July 28 – actual reduction 102.6 MW including line losses
- Event 6: July 29 – actual reduction 76.8 MW including line losses
- Event 7: August 8 – actual reduction 83.9 MW including line losses
- Event 8: August 9 – actual load reduction 75.1 MW including line losses
- Event 9: August 17 – actual load reduction 86.8 MW including line losses
- Event 10: September 2 – actual load reduction 155.1 MW including line losses
- Event 11: September 6 -- actual load reduction 152.1 MW including line losses
- 2,376 active AMI DRUs
- 46 active Idaho Power cellular devices

- 9.9% of irrigation service locations were signed up to participate in 2022
- Variable credits for the fifth, sixth, and seventh events totalled $503,547.59
- The actual total cost of having the program this season was $8,503,140
- The estimated cost of running the program for the maximum of 60 hours in 2022 is an additional $1.96 million

Appendix 1. The Demand Reduction Calculation Method

Abbreviations

ADO—Automatic Dispatch Option

AEL—Average Event Load

AMI—Automated Metering Infrastructure

BL—Baseline Load (Baseline Usage)

DR—Demand Reduction

MDO—Manual Dispatch Option

MV-90—Specific Meter Package with Interval Data

Σ—Sum

Automatic Dispatch Option

Load reduction for each event was calculated using hourly data for each pump using the four hours of each curtailment event was calculated as follows:

$$DR_{pump} = BL_{pump} - AEL_{pump}$$

The load reduction for all pumps within a dispatch group is the total hourly reduction for each group as calculated below:

$$DR_{group} = \Sigma\, DR_{pump\ (groups\ 1\text{-}4)} + \frac{DR_{(groups)}}{DR_{nominated\ (groups)}} * \text{Nominated } DR_{pumps\ with\ errors}$$

Load reduction for the automatic dispatch option was calculated as follows:

$$DR_{ADO} = \Sigma\, DR_{group}$$

Manual Dispatch Option

Data utilized for manual dispatch option participants is AMI hourly usage, MV-90 interval data or data logger interval metering data.

Load reduction for manual dispatch option was calculated as follows:

$$DR_{group} = \Sigma\, DR_{pump\ AMI} + \Sigma\, DR_{pump\ MV\text{-}90} + \frac{DR_{(groups)}}{DR_{nominated\ (groups)}} * \text{Nominated } DR_{pumps\ with\ errors}$$

The total demand reduction for the Manual Dispatch Option was calculated as follows:

$$DR_{MDO} = \Sigma\, DR_{group}$$

The total IPR load reduction was calculated by summing the calculated reduction for the Automatic Dispatch Option sites and the Manual Dispatch Option sites:

$$\text{Total Program DR} = DR_{MDO} + DR_{Group}$$

IDAHO POWER®
An IDACORP Company

Historical DSM Expense and Performance

2002–2022

		Total Costs		Savings and Demand Reductions			Levelized Costs [a]	
Program/Year	Participants	Utility Cost [b]	Resource Cost [c]	Annual Energy (kWh)	Peak Demand [d] (MW)	Measure Life (Years)	Total Utility ($/kWh)	Total Resource ($/kWh)
Demand Response								
A/C Cool Credit								
2003	204	$ 275,645	$ 275,645		0.0			
2004	420	287,253	287,253		0.5			
2005	2,369	754,062	754,062		3			
2006	5,369	1,235,476	1,235,476		6			
2007	13,692	2,426,154	2,426,154		12			
2008	20,195	2,969,377	2,969,377		26			
2009	30,391	3,451,988	3,451,988		39			
2010	30,803	2,002,546	2,002,546		39			
2011	37,728	2,896,542	2,896,542		24			
2012	36,454	5,727,994	5,727,994		45			
2013	n/a	663,858	663,858		n/a			
2014	29,642	1,465,646	1,465,646		44			
2015	29,000	1,148,935	1,148,935		36			
2016	28,315	1,103,295	1,103,295		34			
2017	28,214	936,272	936,272		29			
2018	26,182	844,369	844,369		29			
2019	23,802	877,665	877,665		24			
2020	22,536	765,020	765,020		19			
2021	20,846	751,989	751,989		27			
2022	19,127	829,771	829,771		20			
Total		**$ 31,413,857**	**$ 31,413,857**					
Flex Peak Program								
2009	33	528,681	528,681		19			
2010	60	1,902,680	1,902,680		48			
2011	111	2,057,730	2,057,730		59			
2012	102	3,009,822	3,009,822		53			
2013	100	2,743,615	2,743,615		48			
2014	93	1,563,211	1,563,211		40			
2015	72	592,872	592,872		26			
2016	137	767,997	767,997		42			
2017	141	658,156	658,156		36			

		Total Costs		Savings and Demand Reductions			Levelized Costs [a]	
Program/Year	Participants	Utility Cost [b]	Resource Cost [c]	Annual Energy (kWh)	Peak Demand [d] (MW)	Measure Life (Years)	Total Utility ($/kWh)	Total Resource ($/kWh)
2018	140	433,313	433,313		33			
2019	145	626,823	626,823		31			
2020	141	542,480	542,480		24			
2021	139	501,973	501,973		31			
2022	159	519,618	519,618		25			
Total..........................		**$ 16,448,969**	**$ 16,448,969**					
Irrigation Peak Rewards								
2004	58	344,714	344,714		6			
2005	894	1,468,282	1,468,282		40			
2006	906	1,324,418	1,324,418		32			
2007	947	1,615,881	1,615,881		37			
2008	897	1,431,840	1,431,840		35			
2009	1,512	9,655,283	9,655,283		160			
2010	2,038	13,330,826	13,330,826		250			
2011	2,342	12,086,222	12,086,222		320			
2012	2,433	12,423,364	12,423,364		340			
2013	n/a	2,072,107	2,072,107		n/a			
2014	2,225	7,597,213	7,597,213		295			
2015	2,259	7,258,831	7,258,831		305			
2016	2,286	7,600,076	7,600,076		303			
2017	2,307	7,223,101	7,223,101		318			
2018	2,335	6,891,737	6,891,737		297			
2019	2,332	6,771,708	6,771,708		278			
2020	2,292	6,407,412	6,407,412		292			
2021	2,235	7,013,315	7,013,315		255			
2022	2,142	8,503,140	8,503,140		155			
Total..........................		**$ 121,019,471**	**$ 121,019,471**					
Residential Efficiency								
Ductless Heat Pump Pilot								
2009	96	202,005	451,605	409,180		18	0.031	0.086
2010	104	189,231	439,559	364,000		20	0.044	0.103
2011	131	191,183	550,033	458,500		20	0.028	0.081
2012	127	159,867	617,833	444,500		20	0.024	0.094

Program/Year	Participants	Total Costs: Utility Cost[b]	Total Costs: Resource Cost[c]	Savings and Demand Reductions: Annual Energy (kWh)	Savings and Demand Reductions: Peak Demand[d] (MW)	Measure Life (Years)	Levelized Costs[a]: Total Utility ($/kWh)	Levelized Costs[a]: Total Resource ($/kWh)
2013	215	237,575	992,440	589,142		15	0.032	0.132
2014	179	251,446	884,211	462,747		15	0.042	0.148
Total	**852**	**$ 1,231,307**	**$ 3,935,681**	**2,728,069**		15	**$ 0.044**	**$ 0.138**
Easy Savings : Low-Income Energy Efficiency Education								
2015	2,068	127,477	127,477	624,536		10	0.021	0.021
2016	2,001	127,587	127,587	402,961		9	0.035	0.035
2017	2,470	149,813	149,813	280,049		8	0.064	0.064
2018	282	147,936	147,936	29,610		3	1.370	1.370
2019	430	145,494	145,494	45,150		3	0.885	0.885
2020	155	9,503	9,503	10,628		3	0.299	0.299
2021	0	145,827	145,827	0		3	n/a	n/a
2022	267	152,718	152,718	22,755		5	1	1
Total	**7,673**	**$ 1,006,354**	**$ 1,006,354**	**1,415,690**		**9**	**$ 0.097**	**$ 0.097**
Educational Distributions								
2015	28,197	432,185	432,185	1,669,495		10	0.026	0.026
2016	67,065	2,392,884	2,392,884	15,149,605		10	0.016	0.016
2017	84,399	3,466,027	3,466,027	21,187,261		11	0.016	0.016
2018	94,717	3,180,380	3,180,380	16,051,888		11	0.019	0.019
2019	95,528	2,880,467	2,880,467	10,805,474		11	0.025	0.025
2020	97,228	3,106,820	3,106,820	9,481,801		11	0.038	0.038
2021	47,027	449,790	449,790	2,931,280		10	0.019	0.019
2022	49,136	1,086,813	1,086,813	3,741,954		10	0.037	0.037
Total	**563,297**	**$ 16,995,365**	**$ 16,995,365**	**81,018,758**		**11**	**$ 0.025**	**$ 0.025**
Energy Efficiency Packets								
2002	2,925	755	755	155,757		7	0.001	0.001
Total	**2,925**	**$ 755**	**$ 755**	**155,757**		**7**	**$ 0.001**	**$ 0.001**
Energy Efficient Lighting								
2002	11,618	243,033	310,643	3,299,654		7	0.012	0.015
2003	12,662	314,641	464,059	3,596,150		7	0.014	0.021
2004	n/a	n/a	n/a	n/a			n/a	n/a
2005	43,760	73,152	107,810	1,734,646		7	0.007	0.010
2006	178,514	298,754	539,877	6,302,794		7	0.008	0.014
2007	219,739	557,646	433,626	7,207,439		7	0.012	0.017

Program/Year	Participants	Total Costs: Utility Cost [b]	Total Costs: Resource Cost [c]	Savings and Demand Reductions: Annual Energy (kWh)	Savings and Demand Reductions: Peak Demand [d] (MW)	Measure Life (Years)	Levelized Costs [a]: Total Utility ($/kWh)	Levelized Costs [a]: Total Resource ($/kWh)
2008	436,234	1,018,292	793,265	14,309,444		7	0.011	0.013
2009	549,846	1,207,366	1,456,796	13,410,748		5	0.020	0.024
2010	1,190,139	2,501,278	3,976,476	28,082,738		5	0.020	0.031
2011	1,039,755	1,719,133	2,764,623	19,694,381		5	0.015	0.024
2012	925,460	1,126,836	2,407,355	16,708,659		5	0.012	0.025
2013	1,085,225	1,356,926	4,889,501	9,995,753		8	0.016	0.058
2014	1,161,553	1,909,823	7,148,427	12,882,151		8	0.018	0.066
2015	1,343,255	2,063,383	4,428,676	15,876,117		10	0.013	0.028
2016	1,442,561	3,080,708	10,770,703	21,093,813		11	0.014	0.049
2017	1,766,758	4,872,888	11,078,990	37,765,190		12	0.012	0.026
2018	1,340,842	2,435,130	3,277,039	18,856,933		14	0.011	0.014
2019	1,336,440	2,126,262	2,782,039	16,245,551		14	0.011	0.014
2020	1,148,061	1,667,159	3,065,781	13,942,202		14	0.012	0.022
2021	0	43,631	43,631	0		14	n/a	n/a
2022	370,739	534,982	714,445	1,728,352		15	0.030	0.040
Total	**15,603,161**	**$ 29,151,022**	**$ 61,453,762**	**262,732,714**		**9**	**$ 0.015**	**$ 0.032**
Energy House Calls								
2002	17	26,053	26,053	25,989		20	0.082	0.082
2003	420	167,076	167,076	602,723		20	0.023	0.023
2004	1,708	725,981	725,981	2,349,783		20	0.025	0.025
2005	891	375,610	375,610	1,775,770		20	0.017	0.017
2006	819	336,701	336,701	777,244		20	0.035	0.035
2007	700	336,372	336,372	699,899		20	0.039	0.039
2008	1,099	484,379	484,379	883,038		20	0.045	0.045
2009	1,266	569,594	569,594	928,875		20	0.052	0.052
2010	1,602	762,330	762,330	1,198,655		20	0.054	0.054
2011	881	483,375	483,375	1,214,004		20	0.027	0.027
2012	668	275,884	275,884	1,192,039		18	0.016	0.016
2013	411	199,995	199,995	837,261		18	0.016	0.016
2014	297	197,987	197,987	579,126		18	0.029	0.029
2015	362	214,103	214,103	754,646		18	0.020	0.020
2016	375	206,437	206,437	509,859		18	0.029	0.029
2017	335	183,035	183,035	428,819		16	0.032	0.032

		Total Costs		Savings and Demand Reductions			Levelized Costs [a]	
Program/Year	**Participants**	**Utility Cost [b]**	**Resource Cost [c]**	**Annual Energy (kWh)**	**Peak Demand [d] (MW)**	**Measure Life (Years)**	**Total Utility ($/kWh)**	**Total Resource ($/kWh)**
2018	280	160,777	160,777	374,484		16	0.032	0.032
2019	248	161,894	161,894	309,154		16	0.039	0.039
2020	51	46,352	46,352	56,944		16	0.075	0.075
2021	11	18,257	18,257	14,985		18	0.105	0.105
2022	52	38,163	38,163	54,516		19	0.062	0.062
Total	**12,493**	**$ 5,970,354**	**$ 5,970,354**	**15,567,813**		**22**	**$ 0.033**	**$ 0.033**
ENERGY STAR® Homes Northwest (gas heated)								
2014	282			195,372		22		
2015	69			46,872		22		
Total	**351**	**$ 0**	**$ 0**	**242,244**		**22**		
Fridge and Freezer Recycling Program								
2009	1,661	305,401	305,401	1,132,802		8	0.041	0.041
2010	3,152	565,079	565,079	1,567,736		8	0.054	0.054
2011	3,449	654,393	654,393	1,712,423		8	0.046	0.046
2012	3,176	613,146	613,146	1,576,426		8	0.046	0.046
2013	3,307	589,054	589,054	1,442,344		8	0.061	0.061
2014	3,194	576,051	576,051	1,390,760		6	0.062	0.062
2015	1,630	227,179	227,179	720,208		6	0.048	0.048
2016	1,539	257,916	257,916	632,186		6	0.062	0.062
2017	2,031	265,942	265,942	498,513		6	0.080	0.080
2018	304	33,907	33,907	73,602		7	0.061	0.061
Total	**23,443**	**$ 4,088,069**	**$ 4,088,069**	**10,747,000**		**7**	**$ 0.062**	**$ 0.062**
Heating & Cooling Efficiency Program								
2006		17,444	17,444					
2007	4	488,211	494,989	1,595		18	27.344	27.710
2008	359	473,551	599,771	561,440		18	0.073	0.092
2009	349	478,373	764,671	1,274,829		18	0.034	0.054
2010	217	327,669	1,073,604	1,104,497		20	0.025	0.083
2011	130	195,770	614,523	733,405		20	0.018	0.056
2012	141	182,281	676,530	688,855		20	0.018	0.066
2013	210	329,674	741,586	1,003,730		20	0.022	0.050
2014	230	362,014	1,247,560	1,099,464		20	0.022	0.075
2015	427	626,369	2,064,055	1,502,172		20	0.028	0.092

		Total Costs		Savings and Demand Reductions			Levelized Costs [a]	
Program/Year	Participants	Utility Cost [b]	Resource Cost [c]	Annual Energy (kWh)	Peak Demand [d] (MW)	Measure Life (Years)	Total Utility ($/kWh)	Total Resource ($/kWh)
2016	483	594,913	1,404,625	1,113,574		20	0.040	0.040
2017	654	597,198	1,433,357	1,138,744		15	0.041	0.099
2018	712	585,211	1,686,618	1,556,065		15	0.029	0.085
2019	681	499,179	1,512,183	1,412,183		15	0.028	0.084
2020	1,019	606,559	1,911,792	1,839,068		14	0.033	0.103
2021	1,048	635,182	2,223,826	1,365,825		15	0.044	0.157
2022	1,080	666,016	2,414,026	1,310,260		15	0.050	0.180
Total..........................	**7,744**	**$ 7,665,614**	**$ 20,881,159**	**17,705,867**		**17**	**$ 0.039**	**$ 0.107**
Home Energy Audits								
2013		88,740	88,740					
2014	354	170,648	170,648	141,077		10	0.150	0.150
2015	251	201,957	226,806	136,002		10	0.184	0.184
2016	539	289,812	289,812	207,249		11	0.163	0.163
2017	524	282,809	353,385	175,010		12	0.146	0.182
2018	466	264,394	321,978	211,003		12	0.113	0.137
2019	421	230,786	282,215	179,754		11	0.122	0.150
2020	97	130,546	142,649	31,938		12	0.448	0.490
2021	37	70,448	75,461	3,768		11	2.173	2.328
2022	425	184,858	239,783	28,350		11	0.771	1.000
Total..........................	**3,114**	**$ 1,914,998**	**$ 2,191,478**	**1,114,151**		**11**	**$ 0.203**	**$ 0.233**
Home Energy Reports Program								
2018	23,914	194,812	194,812	3,281,780		1	0.046	0.046
2019	24,976	200,406	200,406	8,444,746		1	0.018	0.018
2020	127,138	899,203	899,203	10,427,940		1	0.081	0.081
2021	115,153	970,197	970,197	15,929,074		1	0.057	0.057
2022	104,826	964,791	964,791	20,643,379		1	0.044	0.044
Total..........................	**396,007**	**$ 3,229,408**	**$ 3,229,408**	**58,726,919**		**1**	**$ 0.052**	**$ 0.052**
Home Improvement Program								
2008	282	123,454	157,866	317,814		25	0.029	0.037
2009	1,188	321,140	550,148	1,338,876		25	0.019	0.032
2010	3,537	944,716	2,112,737	3,986,199		45	0.016	0.035
2011	2,275	666,041	2,704,816	917,519		45	0.038	0.155
2012	840	385,091	812,827	457,353		45	0.044	0.093

Program/Year	Participants	Total Costs: Utility Cost [b]	Total Costs: Resource Cost [c]	Savings and Demand Reductions: Annual Energy (kWh)	Savings and Demand Reductions: Peak Demand [d] (MW)	Measure Life (Years)	Levelized Costs [a]: Total Utility ($/kWh)	Levelized Costs [a]: Total Resource ($/kWh)
2013	365	299,497	1,061,314	616,044		45	0.025	0.090
2014	555	324,717	896,246	838,929		45	0.020	0.055
2015	408	272,509	893,731	303,580		45	0.046	0.152
2016	482	324,024	1,685,301	500,280		45	0.034	0.177
2017	355	166,830	1,345,002	415,824		45	0.021	0.167
2018		2,926	2,926					
Total	**10,287**	**$ 3,830,946**	**$ 12,222,915**	**9,692,418**		**42**	**$ 0.026**	**$ 0.084**
Multifamily Energy Savings Program								
2016	196	59,046	59,046	149,760		10	0.040	0.040
2017	683	168,216	168,216	617,542		11	0.026	0.026
2018	764	205,131	205,131	655,953		11	0.030	0.030
2019	457	131,306	131,306	346,107		11	0.036	0.036
2020	33	89,829	89,829	28,041		11	0.372	0.372
2021	0	68,973	68,973	0		11	n/a	n/a
2022	97	34,181	34,181	41,959		11	0.096	0.096
Total	**2,230**	**$ 756,682**	**$ 756,682**	**1,839,363**		**11**	**$ 0.049**	**$ 0.049**
Oregon Residential Weatherization								
2002	24	-662	23,971	4,580		25	0.010	0.389
2003		-943						
2004	4	1,057	1,057					
2005	4	612	3,608	7,927		25	0.006	0.034
2006		4,126	4,126					
2007	1	3,781	5,589	9,971		25	0.028	0.042
2008	3	7,417	28,752	22,196		25	0.025	0.096
2009	1	7,645	8,410	2,907		25	0.203	0.223
2010	1	6,050	6,275	320		30	0.011	0.062
2011	8	7,926	10,208	21,908		30	0.021	0.027
2012	5	4,516	11,657	11,985		30	0.022	0.056
2013	14	9,017	14,369	14,907		30	0.035	0.055
2014	13	5,462	9,723	11,032		30	0.028	0.050
2015	4	5,808	10,388	11,910		30	0.028	0.050
2016	7	3,930	5,900	2,847		30	0.079	0.118
2017	7	2,384	3,755	2,154		30	0.063	0.099

		Total Costs		Savings and Demand Reductions			Levelized Costs [a]	
Program/Year	Participants	Utility Cost [b]	Resource Cost [c]	Annual Energy (kWh)	Peak Demand [d] (MW)	Measure Life (Years)	Total Utility ($/kWh)	Total Resource ($/kWh)
2018	5	5,507	5,507					
2019	8	5,982	14,432	2,069		45	0.149	0.360
2020	0	5,313	5,313	0		45	n/a	n/a
2021	0	4,595	4,595	0		45	n/a	n/a
2022	7	8,825	8,825	0		45	n/a	n/a
Total	**116**	**$ 98,348**	**$ 186,460**	**126,713**		**28**	**$ 0.057**	**$ 0.108**
Rebate Advantage								
2003	73	27,372	79,399	227,434		45	0.008	0.022
2004	105	52,187	178,712	332,587		45	0.010	0.034
2005	98	46,173	158,462	312,311		45	0.009	0.032
2006	102	52,673	140,289	333,494		45	0.010	0.027
2007	123	89,269	182,152	554,018		45	0.010	0.021
2008	107	90,888	179,868	463,401		45	0.012	0.025
2009	57	49,525	93,073	247,348		25	0.015	0.029
2010	35	39,402	66,142	164,894		25	0.018	0.031
2011	25	63,469	85,044	159,325		25	0.024	0.033
2012	35	37,241	71,911	187,108		25	0.012	0.024
2013	42	60,770	92,690	269,891		25	0.014	0.021
2014	44	63,231	89,699	269,643		25	0.014	0.020
2015	58	85,438	117,322	358,683		25	0.014	0.020
2016	66	111,050	148,142	411,272		25	0.016	0.022
2017	66	104,996	229,104	214,479		45	0.025	0.055
2018	107	147,483	355,115	284,559		45	0.027	0.064
2019	109	156,748	355,897	353,615		44	0.023	0.052
2020	116	180,422	437,263	366,678		44	0.031	0.075
2021	88	173,193	309,790	235,004		45	0.046	0.083
2022	97	167,622	402,649	255,541		44	0.043	0.104
Total	**1,553**	**$ 1,799,154**	**$ 3,790,123**	**6,001,284**		**39**	**$ 0.020**	**$ 0.043**
Residential New Construction Program (ENERGY STAR® Homes Northwest)								
2003		13,597	13,597	0				
2004	44	140,165	335,437	101,200		25	0.103	0.246
2005	200	253,105	315,311	415,600		25	0.045	0.056
2006	439	469,609	602,651	912,242		25	0.038	0.049

		Total Costs		Savings and Demand Reductions			Levelized Costs[a]	
Program/Year	Participants	Utility Cost[b]	Resource Cost[c]	Annual Energy (kWh)	Peak Demand[d] (MW)	Measure Life (Years)	Total Utility ($/kWh)	Total Resource ($/kWh)
2007	303	475,044	400,637	629,634		25	0.056	0.047
2008	254	302,061	375,007	468,958		25	0.048	0.059
2009	474	355,623	498,622	705,784		25	0.039	0.055
2010	630	375,605	579,495	883,260		25	0.033	0.051
2011	308	259,762	651,249	728,030		32	0.020	0.051
2012	410	453,186	871,310	537,447		35	0.046	0.089
2013	267	352,882	697,682	365,370		36	0.053	0.104
2014	243	343,277	689,021	332,682		36	0.057	0.114
2015	598	653,674	1,412,126	773,812		36	0.046	0.099
2016	110	142,158	297,518	150,282		36	0.051	0.107
2017	277	323,520	603,420	608,292		45	0.029	0.054
2018	307	400,912	926,958	777,369		36	0.028	0.064
2019	322	534,118	1,411,391	774,597		54	0.035	0.092
2020	248	473,504	865,989	649,522		58	0.044	0.081
2021	90	247,600	524,876	389,748		61	0.039	0.082
2022	109	235,732	578,922	337,562		58	0.045	0.110
Total	**5,633**	**$ 6,805,133**	**$ 12,651,220**	**10,541,390**		**36**	**$ 0.044**	**$ 0.082**
Shade Tree Project								
2014	2,041	147,290	147,290					
2015	1,925	105,392	105,392					
2016	2,070	76,642	76,642					
2017	2,711	195,817	195,817					
2018	2,093	162,995	162,995	35,571		20	0.307	0.307
2019	2,063	147,750	147,750	35,727		30	0.235	0.235
2020	0	28,490	28,490	52,662		30	0.038	0.038
2021	2,970	184,680	184,680	44,173		40	0.269	0.269
2022	1,874	128,856	128,856	39,595		40	0.218	0.218
Total	**17,747**	**$ 1,177,912**	**$ 1,177,912**	**207,728**		32	**$ 0.400**	**$ 0.400**
Simple Steps, Smart Savings								
2007		9,275	9,275	0				
2008	3,034	250,860	468,056	541,615		15	0.044	0.082
2009	9,499	511,313	844,811	1,638,038		15	0.031	0.051
2010	16,322	832,161	1,025,151	1,443,580		15	0.057	0.070

		Total Costs		Savings and Demand Reductions			Levelized Costs [a]	
Program/Year	Participants	Utility Cost [b]	Resource Cost [c]	Annual Energy (kWh)	Peak Demand [d] (MW)	Measure Life (Years)	Total Utility ($/kWh)	Total Resource ($/kWh)
2011	15,896	638,323	1,520,977	1,485,326		15	0.034	0.080
2012	16,675	659,032	817,924	887,222		14	0.061	0.075
2013	13,792	405,515	702,536	885,980		12	0.041	0.071
2014	10,061	227,176	302,289	652,129		12	0.031	0.041
2015	9,343	139,096	397,898	770,822		10	0.018	0.053
2016	7,880	153,784	379,752	577,320		11	0.025	0.063
2017	12,556	191,621	484,380	900,171		11	0.020	0.051
2018	7,377	90,484	133,101	241,215		12	0.034	0.050
2019	5,729	90,499	123,541	271,452		11	0.032	0.043
2020	6,894	99,141	98,629	148,404		12	0.073	0.073
Total	**135,058**	**$ 4,298,280**	**$ 7,308,320**	**10,443,274**		**13**	**$ 0.043**	**$ 0.073**
Weatherization Solutions for Eligible Customers								
2008	16	52,807	52,807	71,680		25	0.057	0.057
2009	41	162,995	162,995	211,719		25	0.059	0.059
2010	47	228,425	228,425	313,309		25	0.056	0.056
2011	117	788,148	788,148	1,141,194		25	0.042	0.042
2012	141	1,070,556	1,070,556	257,466		25	0.254	0.254
2013	166	1,267,791	1,267,791	303,116		25	0.240	0.240
2014	118	791,344	791,344	290,926		25	0.163	0.163
2015	171	1,243,269	1,243,269	432,958		25	0.175	0.175
2016	147	1,323,793	1,323,793	621,653		25	0.130	0.130
2017	164	1,108,862	1,121,071	604,733		23	0.115	0.117
2018	141	1,022,471	1,022,471	571,741		23	0.112	0.112
2019	129	957,626	957,626	504,988		23	0.119	0.119
2020	27	208,715	208,715	47,360		23	0.338	0.338
2021	7	57,656	57,656	12,591		30	0.317	0.317
2022	27	205,788	205,788	48,233		30	0.307	0.307
Total	**1,459**	**$ 10,490,245**	**$ 10,502,454**	**5,433,667**		**24**	**$ 0.150**	**$ 0.150**
Window AC Trade Up Pilot								
2003	99	6,687	10,492	14,454		12	0.051	0.079
Total	**99**	**$ 6,687**	**$ 10,492**	**14,454**		**12**	**$ 0.052**	**$ 0.081**

		Total Costs		Savings and Demand Reductions			Levelized Costs [a]	
Program/Year	Participants	Utility Cost [b]	Resource Cost [c]	Annual Energy (kWh)	Peak Demand [d] (MW)	Measure Life (Years)	Total Utility ($/kWh)	Total Resource ($/kWh)
Residential—Weatherization Assistance for Qualified Customers (WAQC)								
WAQC—Idaho								
2002	197	235,048	492,139					
2003	208	228,134	483,369					
2004	269	498,474	859,482	1,271,677		25	0.029	0.050
2005	570	1,402,487	1,927,424	3,179,311		25	0.033	0.045
2006	540	1,455,373	2,231,086	2,958,024		25	0.037	0.056
2007	397	1,292,930	1,757,105	3,296,019		25	0.029	0.040
2008	439	1,375,632	1,755,749	4,064,301		25	0.025	0.032
2009	427	1,260,922	1,937,578	4,563,832		25	0.021	0.033
2010	373	1,205,446	2,782,597	3,452,025		25	0.026	0.060
2011	273	1,278,112	1,861,836	2,648,676		25	0.036	0.052
2012	228	1,321,927	1,743,863	621,464		25	0.157	0.208
2013	245	1,336,742	1,984,173	657,580		25	0.150	0.223
2014	244	1,267,212	1,902,615	509,620		25	0.184	0.276
2015	233	1,278,159	2,072,901	529,426		25	0.179	0.290
2016	234	1,254,338	1,870,481	722,430		25	0.129	0.192
2017	196	1,269,507	1,721,632	654,464		30	0.134	0.182
2018	190	1,254,630	1,795,301	641,619		30	0.136	0.194
2019	193	1,264,767	1,890,584	639,880		30	0.137	0.205
2020	115	1,361,163	1,703,879	218,611		30	0.432	0.540
2021	161	1,177,366	1,668,566	289,353		30	0.253	0.371
2022	147	1,277,717	2,024,735	272,647		30	0.338	0.535
Total	**5,879**	**$ 24,296,086**	**$ 36,467,095**	**31,190,960**		**25**	**$ 0.060**	**$ 0.089**
WAQC—Oregon								
2002	31	24,773	47,221	68,323		25	0.027	0.051
2003	29	22,255	42,335	102,643		25	0.016	0.031
2004	17	13,469	25,452	28,436		25	0.035	0.067
2005	28	44,348	59,443	94,279		25	0.035	0.047
2006						25		
2007	11	30,694	41,700	42,108		25	0.054	0.074
2008	14	43,843	74,048	73,841		25	0.040	0.068
2009	10	33,940	46,513	114,982		25	0.023	0.031

		Total Costs		Savings and Demand Reductions			Levelized Costs [a]	
Program/Year	Participants	Utility Cost [b]	Resource Cost [c]	Annual Energy (kWh)	Peak Demand [d] (MW)	Measure Life (Years)	Total Utility ($/kWh)	Total Resource ($/kWh)
2010	27	115,686	147,712	289,627		25	0.030	0.038
2011	14	46,303	63,981	134,972		25	0.025	0.035
2012	10	48,214	76,083	26,840		25	0.133	0.210
2013	9	54,935	67,847	24,156		25	0.168	0.208
2014	11	52,900	94,493	24,180		25	0.162	0.289
2015	10	36,873	46,900	20,595		25	0.133	0.169
2016	12	35,471	63,934	23,732		25	0.111	0.199
2017	7	37,978	61,052	15,074		30	0.175	0.281
2018	3	18,344	24,191	7,886		30	0.161	0.213
2019	4	38,960	62,905	9,419		30	0.287	0.463
2020	0	24,414	24,414	0		30		
2021	1	9,473	21,586	1,752		30	0.375	0.854
2022	0	3,778	3,778	0				
Total	**248**	**$ 736,649**	**$ 1,095,587**	**1,102,845**		**25**	**$ 0.051**	**$ 0.076**
WAQC—BPA Supplemental								
2002	75	55,966	118,255	311,347		25	0.013	0.028
2003	57	49,895	106,915	223,591		25	0.017	0.036
2004	40	69,409	105,021	125,919		25	0.041	0.062
Total	**172**	**$ 175,270**	**$ 330,191**	**660,857**		**25**	**$ 0.020**	**$ 0.037**
WAQC Total	**6,152**	**$ 23,926,511**	**$ 35,864,361**	**32,682,015**		**25**	**$ 0.058**	**$ 0.088**
Commercial								
Air Care Plus Pilot								
2003	4	5,764	9,061	33,976		10	0.021	0.033
2004		344	344					
Total	**4**	**$ 6,108**	**$ 9,405**	**33,976**		**10**	**$ 0.023**	**$ 0.035**
Commercial Energy-Saving Kits (Commercial Education Initiative)								
2005		3,497	3,497					
2006		4,663	4,663					
2007		26,823	26,823					
2008		72,738	72,738					
2009		120,584	120,584					
2010		68,765	68,765					
2011		89,856	89,856					

Program/Year	Participants	Total Costs: Utility Cost [b]	Total Costs: Resource Cost [c]	Savings and Demand Reductions: Annual Energy (kWh)	Savings and Demand Reductions: Peak Demand [d] (MW)	Measure Life (Years)	Levelized Costs [a]: Total Utility ($/kWh)	Levelized Costs [a]: Total Resource ($/kWh)
2012		73,788	73,788					
2013		66,790	66,790					
2014		76,606	76,606					
2015		65,250	65,250					
2016								
2017								
2018	1,652	146,174	146,174	442,170		10	0.034	0.034
2019	2,629	161,945	161,945	569,594		10	0.029	0.029
2020	1,379	103,678	103,678	258,368		11	0.047	0.047
2021	906	74,617	74,617	296,751		11	0.029	0.029
2022	334	22,770	22,770	48,758		10	0.059	0.059
Total	**6,900**	**$ 1,178,544**	**$ 1,178,544**	**1,615,641**		**10**	**$ 0.092**	**$ 0.092**
New Construction								
2004		28,821	28,821					
2005	12	194,066	233,149	494,239		12	0.043	0.052
2006	40	374,008	463,770	704,541		12	0.058	0.072
2007	22	669,032	802,839	2,817,248		12	0.015	0.040
2008	60	1,055,009	1,671,375	6,598,123		12	0.017	0.028
2009	72	1,327,127	2,356,434	6,146,139		12	0.024	0.043
2010	70	1,509,682	3,312,963	10,819,598		12	0.016	0.035
2011	63	1,291,425	3,320,015	11,514,641		12	0.010	0.026
2012	84	1,592,572	8,204,883	20,450,037		12	0.007	0.036
2013	59	1,507,035	3,942,880	10,988,934		12	0.012	0.032
2014	69	1,258,273	3,972,822	9,458,059		12	0.012	0.037
2015	81	2,162,001	6,293,071	23,232,017		12	0.008	0.024
2016	116	1,931,222	4,560,826	12,393,249		12	0.014	0.033
2017	121	2,433,596	4,265,056	17,353,820		12	0.013	0.022
2018	104	2,069,645	5,054,215	13,378,315		12	0.014	0.034
2019	168	3,548,476	5,292,835	20,640,334		12	0.015	0.023
2020	119	2,383,983	4,175,611	14,565,936		12	0.018	0.031
2021	95	2,691,171	4,160,999	17,536,004		12	0.017	0.026
2022	88	2,780,507	3,641,930	27,615,777		12	0.011	0.015
Total	**1,443**	**$ 30,807,651**	**$ 65,754,495**	**226,707,011**		**12**	**$ 0.015**	**$ 0.032**

Program/Year	Participants	Total Costs: Utility Cost [b]	Total Costs: Resource Cost [c]	Savings and Demand Reductions: Annual Energy (kWh)	Savings and Demand Reductions: Peak Demand [d] (MW)	Measure Life (Years)	Levelized Costs [a]: Total Utility ($/kWh)	Levelized Costs [a]: Total Resource ($/kWh)
Retrofits								
2006		31,819	31,819					
2007	104	711,494	1,882,035	5,183,640	0.8	12	0.015	0.040
2008	666	2,992,261	10,096,627	25,928,391	4.5	12	0.013	0.043
2009	1,224	3,325,505	10,076,237	35,171,627	6.1	12	0.011	0.032
2010	1,535	3,974,410	7,655,397	35,824,463	7.8	12	0.013	0.024
2011	1,732	4,719,466	9,519,364	38,723,073		12	0.011	0.022
2012	1,838	5,349,753	9,245,297	41,568,672		12	0.012	0.020
2013	1,392	3,359,790	6,738,645	21,061,946		12	0.014	0.029
2014	1,095	3,150,942	5,453,380	19,118,494		12	0.015	0.025
2015	1,222	4,350,865	7,604,200	23,594,701		12	0.017	0.029
2016	1,577	5,040,190	8,038,791	28,124,779		12	0.016	0.026
2017	1,137	4,343,835	12,500,303	23,161,877		12	0.017	0.049
2018	1,358	5,990,179	16,253,716	34,910,707		12	0.015	0.042
2019	1,033	6,281,056	17,700,769	42,674,418		12	0.013	0.037
2020	630	3,587,277	11,964,431	20,965,215		12	0.019	0.063
2021	787	3,826,750	11,486,766	21,181,022		12	0.020	0.059
2022	525	4,870,916	13,402,016	22,890,679		12	0.024	0.065
Total	**17,855**	**$ 65,906,507**	**$ 159,697,439**	**440,083,703**		**12**	**$ 0.017**	**$ 0.041**
Holiday Lighting								
2008	14	28,782	73,108	259,092		10	0.014	0.035
2009	32	33,930	72,874	142,109		10	0.031	0.066
2010	25	46,132	65,308	248,865		10	0.024	0.034
2011	6	2,568	2,990	66,189		10	0.004	0.005
Total	**77**	**$ 111,412**	**$ 214,280**	**716,255**		**10**	**$ 0.020**	**$ 0.038**
Oregon Commercial Audit								
2002	24	5,200	5,200					
2003	21	4,000	4,000					
2004	7	0	0					
2005	7	5,450	5,450					
2006	6							
2007		1,981	1,981					
2008		58	58					

		Total Costs		Savings and Demand Reductions			Levelized Costs [a]	
Program/Year	Participants	Utility Cost [b]	Resource Cost [c]	Annual Energy (kWh)	Peak Demand [d] (MW)	Measure Life (Years)	Total Utility ($/kWh)	Total Resource ($/kWh)
2009	41	20,732	20,732					
2010	22	5,049	5,049					
2011	12	13,597	13,597					
2012	14	12,470	12,470					
2013	18	5,090	5,090					
2014	16	9,464	9,464					
2015	17	4,251	4,251					
2016	7	7,717	7,717					
2017	13	8,102	8,102					
2018	0	1,473	1,473					
2019	11	7,262	7,262					
2020	2	1,374	1,374					
2021	3	4,401	4,401					
2022	12	7,493	7,493					
Total	**253**	**$ 125,164**	**$ 125,164**					
Oregon School Efficiency								
2005		86	86					
2006	6	24,379	89,771	223,368		12	0.012	0.044
Total	**6**	**$ 24,465**	**$ 89,857**	**223,368**		**12**	**$ 0.012**	**$ 0.044**
Small Business Direct Install								
2020	139	339,830	339,830	780,260		9	0.058	0.058
2021	452	1,032,056	1,032,056	2,421,842		11	0.062	0.062
2022	680	1,345,429	1,345,429	3,228,366		11	0.049	0.049
Total	**1,271**	**$ 2,717,315**	**$ 2,717,315**	**6,430,468**		**5**	**$ 0.091**	**$ 0.091**
Industrial								
Custom Projects								
2003		1,303	1,303					
2004	1	112,311	133,441	211,295		12	0.058	0.069
2005	24	1,128,076	3,653,152	12,016,678		12	0.010	0.033
2006	40	1,625,216	4,273,885	19,211,605		12	0.009	0.024
2007	49	3,161,866	7,012,686	29,789,304	3.6	12	0.012	0.026
2008	101	4,045,671	16,312,379	41,058,639	4.8	12	0.011	0.044
2009	132	6,061,467	10,848,123	51,835,612	6.7	12	0.013	0.024

		Total Costs		Savings and Demand Reductions			Levelized Costs[a]	
Program/Year	Participants	Utility Cost[b]	Resource Cost[c]	Annual Energy (kWh)	Peak Demand[d] (MW)	Measure Life (Years)	Total Utility ($/kWh)	Total Resource ($/kWh)
2010	223	8,778,125	17,172,176	71,580,075	9.5	12	0.014	0.027
2011	166	8,783,811	19,830,834	67,979,157	7.8	12	0.012	0.026
2012	126	7,092,581	12,975,629	54,253,106	7.6	12	0.012	0.021
2013	73	2,466,225	5,771,640	21,370,350	2.4	12	0.010	0.024
2014	131	7,173,054	13,409,922	50,363,052	5.6	12	0.013	0.024
2015	160	9,012,628	20,533,742	55,247,192	6.3	11	0.016	0.035
2016	196	7,982,624	16,123,619	47,518,871		16	0.013	0.026
2017	170	8,679,919	17,279,117	44,765,354		16	0.015	0.029
2018	248	8,808,512	16,112,540	46,963,690		16	0.014	0.026
2019	257	11,879,873	24,590,176	70,433,920		15	0.013	0.027
2020	169	18,059,396	41,604,451	94,006,717		15	0.018	0.042
2021	135	8,608,903	22,552,383	53,728,267		13	0.017	0.044
2022	106	8,919,927	25,715,468	56,157,060		13	0.017	0.049
Total.........................	**2,507**	**$ 132,381,486**	**$ 295,904,345**	**888,489,944**		**13**	**$ 0.016**	**$ 0.035**
Green Motors Rewind—Industrial								
2016	14			123,700		7		
2017	13			143,976		7		
2018	25			64,167		7		
2019	12			117,223		8		
2020	10			56,012		8		
2021	4		12,172	20,430		8		
2022	9		3,424	19,851		8		
Total.........................	**87**	**$ 0**	**$ 15,596**	**545,358**		**7**		
Irrigation								
Irrigation Efficiency Rewards								
2003	2	41,089	54,609	36,792	0.0	15	0.106	0.141
2004	33	120,808	402,978	802,812	0.4	15	0.014	0.048
2005	38	150,577	657,460	1,012,883	0.4	15	0.014	0.062
2006	559	2,779,620	8,514,231	16,986,008	5.1	8	0.024	0.073
2007	816	2,001,961	8,694,772	12,304,073	3.4	8	0.024	0.103
2008	961	2,103,702	5,850,778	11,746,395	3.5	8	0.026	0.073
2009	887	2,293,896	6,732,268	13,157,619	3.4	8	0.026	0.077
2010	753	2,200,814	6,968,598	10,968,430	3.3	8	0.030	0.096

		Total Costs		Savings and Demand Reductions			Levelized Costs [a]	
Program/Year	Participants	Utility Cost [b]	Resource Cost [c]	Annual Energy (kWh)	Peak Demand [d] (MW)	Measure Life (Years)	Total Utility ($/kWh)	Total Resource ($/kWh)
2011	880	2,360,304	13,281,492	13,979,833	3.8	8	0.020	0.113
2012	908	2,373,201	11,598,185	12,617,164	3.1	8	0.022	0.110
2013	995	2,441,386	15,223,928	18,511,221	3.0	8	0.016	0.098
2014	1,128	2,446,507	18,459,781	18,463,611	4.6	8	0.016	0.119
2015	902	1,835,711	9,939,842	14,027,411	1.6	8	0.016	0.085
2016	851	2,372,352	8,162,206	15,673,513		8	0.018	0.063
2017	801	2,475,677	8,382,962	16,824,266		8	0.018	0.060
2018	1,022	2,953,706	11,948,469	18,933,831		8	0.019	0.076
2019	1,080	2,661,263	10,042,514	10,073,455		8	0.032	0.120
2020	1,018	3,401,673	16,857,055	12,847,823		15	0.025	0.125
2021	1,019	2,607,200	19,138,043	9,680,497		19	0.023	0.166
2022	519	2,080,027	14,083,686	6,937,855		18	0.027	0.179
Total	**15,172**	**$ 41,701,474**	**$ 194,989,441**	**235,585,492**		**9**	**$ 0.024**	**$ 0.113**
Green Motors Rewind—Irrigation								
2016	23			73,617		19		
2017	27			63,783		19		
2018	26			67,676		19		
2019	34			44,705		20		
2020	23			36,147		20		
2021	12		87,254	19,352		21		
2022	6		5,634	16,951		23		
Total	**151**	**$ 0**	**$ 92,888**	**322,230**		**20**		
Other Programs								
Building Operator Training								
2003	71	48,853	48,853	1,825,000		5	0.006	0.006
2004	26	43,969	43,969	650,000		5	0.014	0.014
2005	7	1,750	4,480	434,167		5	0.001	0.002
Total	**104**	**94,572**	**97,302**	**2,909,167**		**5**	**0.007**	**0.007**
Comprehensive Lighting								
2011		2,404	2,404					
2012		64,094	64,094					
Total		**$ 66,498**	**$ 66,498**					

Program/Year	Participants	Total Costs: Utility Cost [b]	Total Costs: Resource Cost [c]	Savings and Demand Reductions: Annual Energy (kWh)	Savings and Demand Reductions: Peak Demand [d] (MW)	Measure Life (Years)	Levelized Costs [a]: Total Utility ($/kWh)	Levelized Costs [a]: Total Resource ($/kWh)
Distribution Efficiency Initiative								
2005		21,552	43,969					
2006		24,306	24,306					
2007		8,987	8,987					
2008		-1,913	-1,913					
Total		**$ 52,932**	**$ 75,349**					
DSM Direct Program Overhead								
2007		56,909	56,909					
2008		169,911	169,911					
2009		164,957	164,957					
2010		117,874	117,874					
2011		210,477	210,477					
2012		285,951	285,951					
2013		380,957	380,957					
2014		478,658	478,658					
2015		272,858	272,858					
2016		293,039	293,039					
2017		1,759,352	1,759,352					
2018		1,801,955	1,801,955					
2019		2,119,820	2,119,820					
2020		1,811,869	1,811,869					
2021		2,226,910	2,226,910					
2022		2,795,885	2,795,885					
Total		**$ 14,947,383**	**$ 14,947,383**					
Local Energy Efficiency Fund								
2003	56	5,100	5,100					
2004		23,449	23,449					
2005	2	14,896	26,756	78,000		10	0.024	0.042
2006	480	3,459	3,459	19,027		7	0.009	0.009
2007	1	7,520	7,520	9,000		7	0.135	0.135
2008	2	22,714	60,100	115,931	0.0	15	0.019	0.049
2009	1	5,870	4,274	10,340	0.0	12	0.064	0.047
2010	1	251	251		0.0			

Program/Year	Participants	Total Costs: Utility Cost[b]	Total Costs: Resource Cost[c]	Savings and Demand Reductions: Annual Energy (kWh)	Savings and Demand Reductions: Peak Demand[d] (MW)	Measure Life (Years)	Levelized Costs[a]: Total Utility ($/kWh)	Levelized Costs[a]: Total Resource ($/kWh)
2011	1	1,026	2,052	2,028		30	0.035	0.070
2012								
2013								
2014	1	9,100	9,100	95,834		18		
Total	**545**	**$ 93,385**	**$ 142,061**	**330,160**		**14**	**$ 0.029**	**$ 0.044**
Other C&RD and CRC BPA								
2002		55,722	55,722					
2003		67,012	67,012					
2004		108,191	108,191					
2005		101,177	101,177					
2006		124,956	124,956					
2007		31,645	31,645					
2008		6,950	6,950					
Total		**$ 495,654**	**$ 495,654**					
Residential Economizer Pilot								
2011		101,713	101,713					
2012		93,491	93,491					
2013		74,901	74,901					
Total		**$ 270,105**	**$ 270,105**					
Residential Education Initiative								
2005		7,498	7,498					
2006		56,727	56,727					
2007								
2008		150,917	150,917					
2009		193,653	193,653					
2010		222,092	222,092					
2011		159,645	159,645					
2012		174,738	174,738					
2013		416,166	416,166					
2014	6,312	423,091	423,091	1,491,225		11		
2015		149,903	149,903					
2016		290,179	290,179					
2017		223,880	223,880					

Program/Year	Participants	Total Costs		Savings and Demand Reductions		Measure Life (Years)	Levelized Costs[a]	
		Utility Cost[b]	Resource Cost[c]	Annual Energy (kWh)	Peak Demand[d] (MW)		Total Utility ($/kWh)	Total Resource ($/kWh)
2018		172,215	172,215					
2019		160,851	160,851					
2020		223,731	223,731					
2021		483,067	483,067					
2022		300,175	300,175					
Total		**$ 3,808,528**	**$ 3,808,528**	**1,491,225**				
Solar 4R Schools								
2009		45,522	45,522					
Total		**$ 45,522**	**$ 45,522**					
Market Transformation								
Consumer Electronic Initiative								
2009		160,762	160,762					
Total		**$ 160,762**	**$ 160,762**					
NEEA								
2002		1,286,632	1,286,632	12,925,450				
2003		1,292,748	1,292,748	11,991,580				
2004		1,256,611	1,256,611	13,329,071				
2005		476,891	476,891	16,422,224				
2006		930,455	930,455	18,597,955				
2007		893,340	893,340	28,601,410				
2008		942,014	942,014	21,024,279				
2009		968,263	968,263	10,702,998				
2010		2,391,217	2,391,217	21,300,366				
2011		3,108,393	3,108,393	20,161,728				
2012		3,379,756	3,379,756	19,567,984				
2013		3,313,058	3,313,058	20,567,965				
2014		3,305,917	3,305,917	26,805,600				
2015		2,582,919	2,582,919	23,038,800				
2016		2,676,387	2,676,387	24,352,800				
2017		2,698,756	2,698,756	24,440,400				
2018		2,500,165	2,500,165	25,666,800				
2019		2,721,070	2,721,070	18,368,135				
2020		2,789,210	2,789,210	17,614,323				

		Total Costs		Savings and Demand Reductions			Levelized Costs [a]	
Program/Year	Participants	Utility Cost [b]	Resource Cost [c]	Annual Energy (kWh)	Peak Demand [d] (MW)	Measure Life (Years)	Total Utility ($/kWh)	Total Resource ($/kWh)
2021		2,977,678	2,977,678	16,818,788				
2022 [1]		2,789,937	2,789,937	24,448,132				
Total..........................	**$**	**45,281,416**	**$ 45,281,416**	**416,746,789**				
Annual Totals								
2002		1,932,520	2,366,591	16,791,100	0.0			
2003		2,566,228	3,125,572	18,654,343	0.0			
2004		3,827,213	4,860,912	19,202,780	6.5			
2005		6,523,348	10,383,577	37,978,035	43.9			
2006		11,174,181	20,950,110	67,026,303	43.6			
2007		14,896,816	27,123,018	91,145,357	57.9			
2008		20,213,216	44,775,829	128,508,579	74.3			
2009		33,821,062	53,090,852	143,146,365	235.5			
2010		44,643,541	68,981,324	193,592,637	357.7			
2011		44,877,117	79,436,532	183,476,312	415.2			
2012		47,991,350	77,336,341	172,054,327	448.8			
2013		26,100,091	54,803,353	109,505,690	54.5			
2014		35,648,260	71,372,414	145,475,713	389.7			
2015		37,149,893	70,467,082	162,533,155	374.5			
2016		40,499,570	70,984,604	170,792,152	379.0			
2017		44,828,089	78,799,054	191,471,395	383.0			
2018		42,926,872	75,797,483	184,078,634	358.7			
2019		47,390,056	83,661,890	203,301,810	332.5			
2020		49,354,064	100,230,772	198,432,599	336.0			
2021		37,056,897	79,194,093	142,920,507	312.8			
2022		41,456,433	82,964,848	169,888,530	199.7			
Total Direct Program.............................	**$**	**634,880,818**	**$ 1,161,313,482**	**2,751,640,723**				
Indirect Program Expenses								
DSM Overhead and Other Indirect								
2002		128,855						
2003		-41,543						
2004		142,337						
2005		177,624						
2006		309,832						

Program/Year	Participants	Total Costs: Utility Cost [b]	Total Costs: Resource Cost [c]	Savings and Demand Reductions: Annual Energy (kWh)	Savings and Demand Reductions: Peak Demand [d] (MW)	Measure Life (Years)	Levelized Costs [a]: Total Utility ($/kWh)	Levelized Costs [a]: Total Resource ($/kWh)
2007		765,561						
2008		980,305						
2009		1,025,704						
2010		1,189,310						
2011		1,389,135						
2012		1,335,509						
2013		$741,287						
2014		1,065,072						
2015		1,891,042						
2016		2,263,893						
2017		2,929,407						
2018		1,335,208						
2019		1,194,640						
2020		1,202,238						
2021		1,296,605						
2022		1,507,146						
Total	**$**	**$22,829,168**						
Total Expenses								
2002		2,061,375						
2003		2,528,685						
2004		3,969,550						
2005		6,700,972						
2006		11,484,013						
2007		15,662,377						
2008		21,193,521						
2009		34,846,766						
2010		45,832,851						
2011		46,266,252						
2012		49,326,859						
2013		26,841,378						
2014		36,713,333						
2015		39,040,935						
2016		42,763,463						

		Total Costs		Savings and Demand Reductions			Levelized Costs [a]	
Program/Year	Participants	Utility Cost [b]	Resource Cost [c]	Annual Energy (kWh)	Peak Demand [d] (MW)	Measure Life (Years)	Total Utility ($/kWh)	Total Resource ($/kWh)
2017		47,757,496						
2018		44,262,080						
2019		48,584,696						
2020		50,556,303						
2021		38,353,503						
2022		42,963,579						
Total 2002–2022........		**$ 657,709,986**						

[a] Levelized Costs are based on financial inputs from Idaho Power's *2019 Second Amended Integrated Resource Plan* and calculations include line loss adjusted energy savings.
[b] The Total Utility Cost is all cost incurred by Idaho Power to implement and manage a DSM program.
[c] The Total Resource Cost is the total expenditures for a DSM program from the point of view of Idaho Power and its customers as a whole.
[d] Peak Demand is reported for programs that directly reduce load or measure demand reductions during summer peak season. Peak demand reduction for demand response programs is reported at the generation level assuming 9.7% peak line losses.
[1] Savings are preliminary estimates provided by NEEA. Final savings for 2022 will be provided by NEEA April 2023.

22

SCHOOL YEAR 2021-2022

ANNUAL REPORT

Student Energy Efficiency Kit Program
Designed and implemented by Tinker LLC

IDAHO POWER®

STUDENT ENERGY EFFICIENCY KIT PROGRAM

MESSAGE FROM **TINKER LLC**

Joseph Thrasher

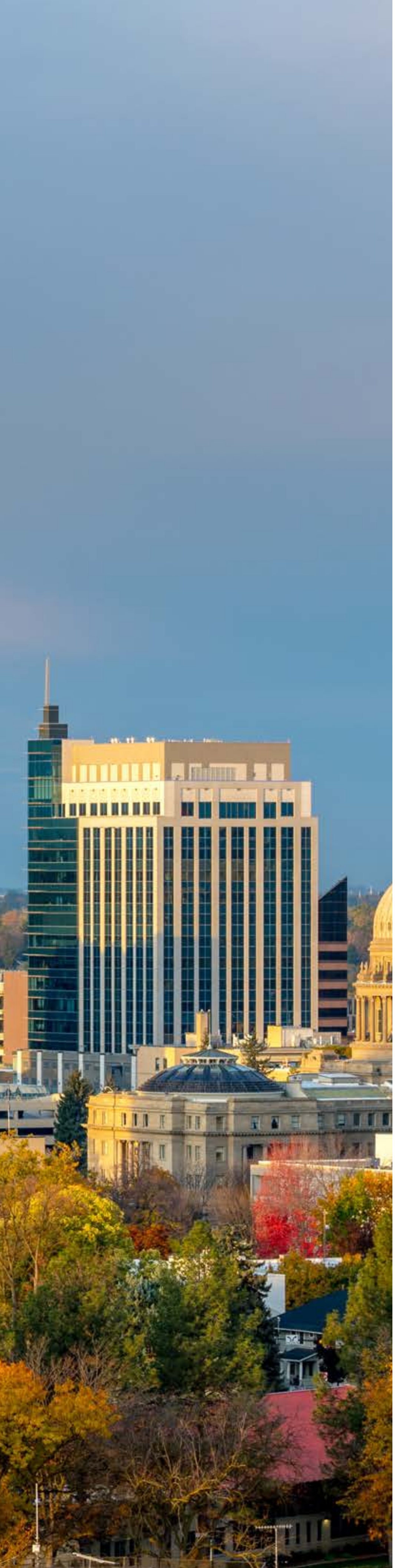
Dear Denise,

We wanted to take a moment to express our appreciation and gratitude for selecting Tinker to deliver IPC's Student Energy Efficiency Kit Program. We thoroughly enjoyed working with the teachers, students, and parents within your service area. This was such a great group of people to work with!

We truly appreciate your support and are excited to continue as your preferred vendor for years to come. Thanks again!

Cheerfully,

Joseph Thrasher



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STUDENT ENERGY EFFICIENCY KIT PROGRAM
EXECUTIVE SUMMARY

School Year 2021-2022

Tinker LLC is pleased to submit this annual report describing the implementation and outcomes of the Student Energy Efficiency Kit Program ("SEEK"). From August 2021 through June 2022, Tinker LLC supported the energy efficiency education efforts in Idaho and Oregon through a partnership with Idaho Power Company ("IPC").

The program was developed to educate students in IPC's service area about energy efficiency through the implementation of a locally-based education program within schools. Tinker LLC and IPC staff developed curriculum that included lessons, STEM activities, digital program resources, student contests, teacher grants, and an Energy Efficiency Kit containing energy-saving devices for each student. The Student Energy Efficiency Kit Program is known and marketed to the schools as the EnergyWise Program. Program objectives included the following:

- Leverage classroom teachers from schools within IPC's service area to provide their 4th – 6th grade students with quality, age-appropriate instruction regarding the wise use of electricity.
- Encourage the wise use of electricity at home by engaging students and their families in activities that support and reinforce energy efficiency and conservation concepts.
- Provide age-appropriate tools to facilitate student participation and incentives to encourage follow through for all Program participants, i.e., teachers, students, and parents.
- Cross-market IPC's other residential energy efficiency programs as directed by IPC.
- Provide IPC with annual energy savings information in the form of an annual program summary report based on student responses.
- Enhance IPC's brand as a trusted energy advisor.
- Maintain or enhance IPC's customer satisfaction.

By the Numbers

174
schools participated

338
teachers participated

12,257
students enrolled

2,349,367
kWh saved annually

188.02
kWh per student kit distributed

132.40
kWh per teacher kit distributed

Tinker LLC managed all aspects of the program design and implementation, including school recruitment, lesson development, day-to-day program management, and reporting.
Below are the program outcomes:

1. **Curriculum.** To support educational goals, Tinker worked with IPC staff to develop six lessons specifically for Idaho Power students. Each lesson included locally-based information, teacher resources, hands-on activities, and supported Idaho state education standards. Below is the list of lessons developed:

    - Natural Resources
    - Electric Energy
    - Energy-Water Nexus
    - Peak and Off-Peak Time
    - Electric Bill
    - Efficiency and Conservation

2. **School Participation.** During the school year 2021-2022, 174 schools, representing 338 teachers and 12,257 students participated in the program. Each of these students received an Energy Efficiency Kit and access to digital learning resources.

3. **Knowledge Retention.** To determine the baseline knowledge, students were asked to complete a 10-question assessment before the program was introduced. After completing the lessons, they completed a post-program assessment to determine the knowledge gained through the program. The average pre-assessment test score was 66%. After completing the lessons, the average test score was 87%--an increase of 21%.

4. **Energy Efficiency Kits.** A take-home Energy Efficiency Kit was provided to 12,257 students and 338 teachers. Each contained products that can be used at home to conserve water and energy. Students work with their parents to use the products and report on their actions.

5. **Student Survey.** At the close of the program, students are asked to complete a survey detailing the actions they took and which products from the Energy Efficiency Kit they installed. Surveys were received from 7,720 students. Based on the reported data, projected savings from kits can be found below.

	Electricity	Natural Gas	Water	Green House Gas Reduction
Annual savings per student kit:	188.02 kWh	3.44 Therms	1,408.11 Gals	0.15 Metric Tons
Annual savings per teacher kit:	132.40 kWh	2.42 Therms	991.51 Gals	0.11 Metric Tons
Annual program savings:	2,349,367 kWh	42,995 Therms	17,594,315 Gals	1,893.45 Metric Tons
Lifetime program savings:	18,405,454 kWh	429,947 Therms	175,943,147 Gals	15,318.73 Metric Tons

*The algorithms and data used for these calculations can be found in Appendix A & B

STUDENT ENERGY EFFICIENCY KIT PROGRAM
DESCRIPTION

School Year 2021-2022

The Student Energy Efficiency Kit Program is a locally-based curriculum designed to teach fourth-, fifth-, and sixth-grade school students about energy and how to use it wisely. Offered as a completely turnkey program, Tinker managed all aspects of the program implementation.

Tinker designed and customized three lessons appropriate for fourth-, fifth-, and sixth-grade students attending schools in IPC's service territory. Next, Tinker contacted fourth-, fifth-, and sixth-grade teachers using a variety of communication tools to introduce the program and collect enrollment commitments. Participating teachers, students, and parents were then provided access to Tinker's online platform or web application.

Program Delivery
Delivered by classroom teachers, the curriculum fit seamlessly within the current classroom setting. The curriculum included lessons that were designed to support Idaho and Oregon state education standards, featured engaging digital content, and included hands-on activities. Moreover, each lesson included resources such as video streaming content, online assessments, and more.

Using resources from our web application, teachers delivered the curriculum to their students. Students and parents were also provided access to the web application, which included portals designed specifically for each participating segment.

IPC was provided with its own customized version of the web application that displayed its logo at the top of each page and referenced it throughout the pages.

> "I love the online portion compared to the workbook in previous years."
>
> V. Medda, Teacher
> Summit Elementary School

The digital delivery of the program through the web application allowed for:

- **Program Tracking.** All program actions were tracked and recorded in real-time. The data was analyzed and used to inform unique actions by program staff and published within an on-line dashboard. IPC staff was supplied credentials to access the dashboard and encouraged to follow program progress.
- **Additional Engagement Opportunities.** Other IPC related programs were promoted within each relevant portal.

Upon completion of the lessons, students acquired new knowledge of energy efficiency, and each student was provided an Energy Efficiency Kit containing energy-saving devices. During the final lesson, students completed exercises using the devices included in the kit, giving their families an opportunity to immediately and consistently conserve water and energy.

Throughout the program, students completed simple surveys and assessments. This data was collected, analyzed, and summarized to gauge the curriculum's impact on students. At the close of the unit, students and parents completed a pledge to continue to conserve energy and water.

> "I loved that the program provided education on energy usage and awareness for the students and made it applicable for them to participate in conserving and efficiency."
>
> K. Platt, Teacher
> Heights Elementary School

At the end of the school year, all data generated from the lessons and any predefined success metrics were collected to present in this Final Report.

STUDENT ENERGY EFFICIENCY KIT PROGRAM
PROGRAM TIMELINE

School Year 2021-2022

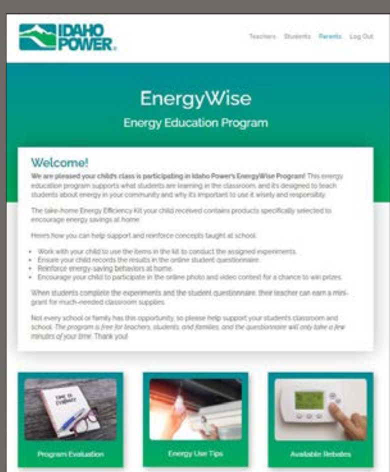
Phase	Activity	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Phase 1: Launch	Branding information provided	■										
Phase 1: Launch	Incentive programs developed	■										
Phase 1: Launch	Print & digital materials published		■									
Phase 1: Launch	Quality control checks performed		■	■								
Phase 1: Launch	Eligible school information identified	■										
Phase 2: Implementation	Teachers introduced to the program		■	■								
Phase 2: Implementation	Participation commitments collected		■	■	■	■	■	■	■			
Phase 2: Implementation	Access to digital materials granted		■	■	■	■	■	■	■	■		
Phase 2: Implementation	Materials and Kits shipped			■	■	■	■	■	■	■		
Phase 2: Implementation	Communication with teachers		■	■	■	■	■	■	■	■	■	
Phase 2: Implementation	Collection & evaluation of program data				■	■	■	■	■	■	■	
Phase 3: Reporting	Program closed to participation										■	■
Phase 3: Reporting	Program data compiled and analyzed										■	■
Phase 3: Reporting	Final report developed and delivered											■

STUDENT ENERGY EFFICIENCY KIT PROGRAM
PROGRAM MATERIALS

Phase 1: Launch

During the program, teachers, students, and parents were provided with a variety of resources expertly designed to educate about energy efficiency and encourage energy efficient behaviors. These resources, including the web application, a printed teacher guide, parent letter, and online lesson materials, were customized to feature the IPC logo and brand. Each are described on the following pages and below.

PARENT PROGRAM RESOURCES



DIGITAL MATERIALS

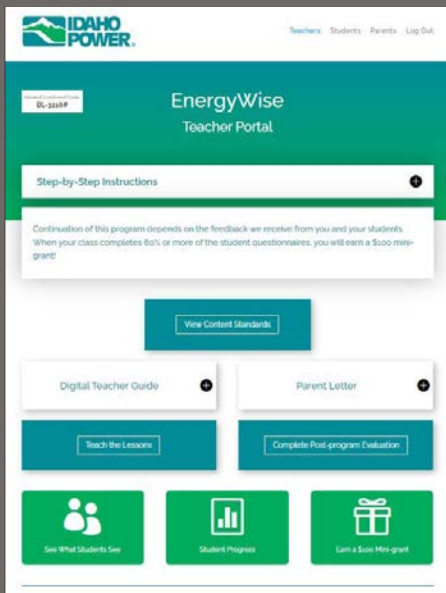
Parents of participating students were provided access to the parent portal through the web application. The available resources included the following.

- A parent letter describing the program, its goals, and the energy efficiency opportunities available
- Additional energy efficiency resources offered by IPC
- Program evaluation

"I loved that my students were able to take this activity home with the student kits. It helped with engagement and parent involvement."

A. Crisp, Teacher
Central Elementary School

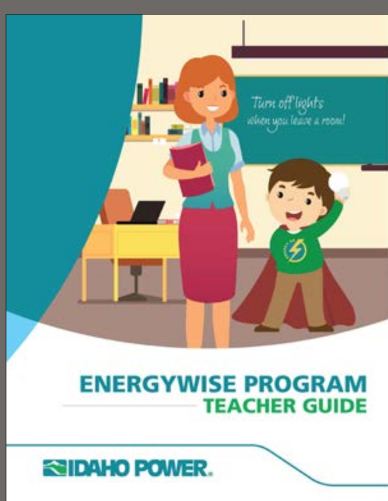
TEACHER PROGRAM RESOURCES



DIGITAL MATERIALS

Teachers were provided access to the teacher portal through the web application. The available resources included the following.

- Instructions to guide teachers through the administration of the program
- Supported Idaho state education standards
- Letter to parents in English and Spanish
- Lesson materials including:
    - Lesson plans
    - Digital slides for classroom presentations
    - Online resources
    - Video content
    - Online homework exercises
    - Assessments
- Post-program Evaluation
- Student progress reporting

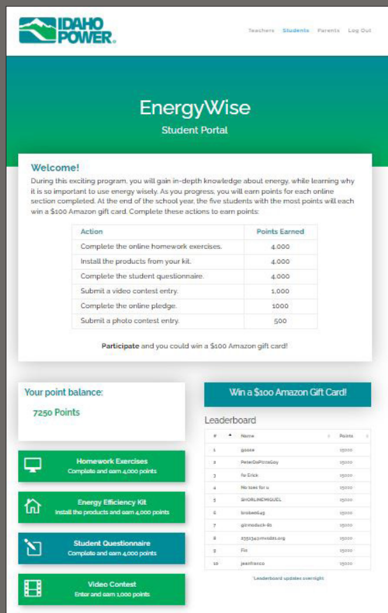


SUPPORTING PHYSICAL MATERIALS

Participating teachers were provided a printed Teacher Guide to support the digital resources. The Teacher Guide included the following:

- Program goals
- Instructions to administer the program
- Unit plan
- Lesson plans
- Contest and mini-grant information
- Answer keys

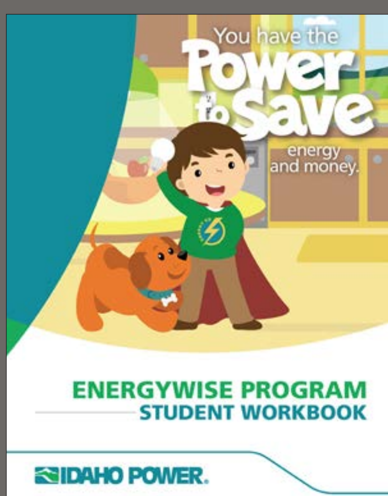
STUDENT PROGRAM RESOURCES



DIGITAL MATERIALS

Students were provided access to the student portal within the web application. Resources available included the following:

- Instructions for installing the products inside the kits
- Access to digital lessons and assessments
- Video contest information
- The student leader board
- Additional energy efficiency information



SUPPORTING PHYSICAL MATERIALS

Participating students were provided a student workbook to support the digital resources. The student workbook included the following:

- Classroom activity worksheets
- Classroom assessments
- The Energy Efficiency Kit product installation guide and data collection forms

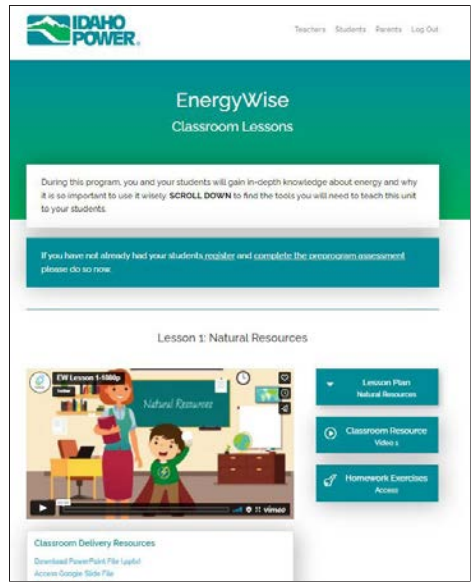
STUDENT ENERGY EFFICIENCY KIT PROGRAM
PROGRAM CONTENT

Phase 2: Implementation

The Student Energy Efficiency Kit Program curriculum was designed to build upon and supplement fourth-, fifth-, and sixth-grade science, math, and language arts curriculum. The curriculum included the following:

Locally-Based Content: To support educational goals, Tinker worked with IPC staff to develop six lessons specifically for students. Each lesson included locally-based information and supported Idaho state education standards. Below is the list of lessons we developed:

- Natural Resources
- Electric Energy
- Energy-Water Nexus
- Peak and Off-Peak Time
- Electric Bill
- Efficiency and Conservation



Web Application

To support each lesson, Tinker worked with IPC staff to include teaching resources, video resources, hans-on activities, and homework exercises in the lessons.

At the conclusion of each classroom lesson, teachers had the option of assigning online homework exercises that reviewed the content taught in the classroom. Tinker worked with IPC staff to develop each homework exercise. These exercises included locally-based video content, interactive activities, labeled graphics, flash card grids, and more.
The extensive information in each exercise was designed to be engaging and to maximize the knowledge retention of the student.

> "The program activities were great. I would love to have more, easy to use stem activities tosupport the information."
>
> K. Strawser, Teacher
> Melba Elementary School

STUDENT ENERGY EFFICIENCY KIT PROGRAM
ENERGY EFFICIENCY KIT

Phase 2: Implementation

A take-home Energy Efficiency Kit was provided to 338 teachers and 12,257 students. Each contained products that can be used at home to conserve water and energy. Students work with their parents to use the products and report on their actions.

Each kit contained the following items:

- Showerhead
- Three LED Lightbulbs
- LED Night Light
- Shower Timer
- Digital Thermometer
- Filter Whistle
- Water Flow Rate Bag
- Quick Start Guide
- Water Bottle Decals

Energy Efficiency Kit

STUDENT ENERGY EFFICIENCY KIT PROGRAM
STUDENT COMPETITIONS

Phase 2: Implementation

A fun component of the Student Energy Efficiency Kit Program was the student competitions: the Student Challenge, Video Contest, and Photo Contest.

Student Challenge
Each student that registered for the online activities were automatically entered into the Student Challenge. As students progressed through the online portion of the program, they earned points for each activity completed. In the web application, students followed their point progress and competed with classmates. Below is a sample of these activities:

Action	Points Earned
Complete the online homework exercises	4,000
Install the products from the Energy Efficiency Kit	4,000
Complete the student survey	4,000
Submit a video contest entry	1,000
Complete the online pledge	500

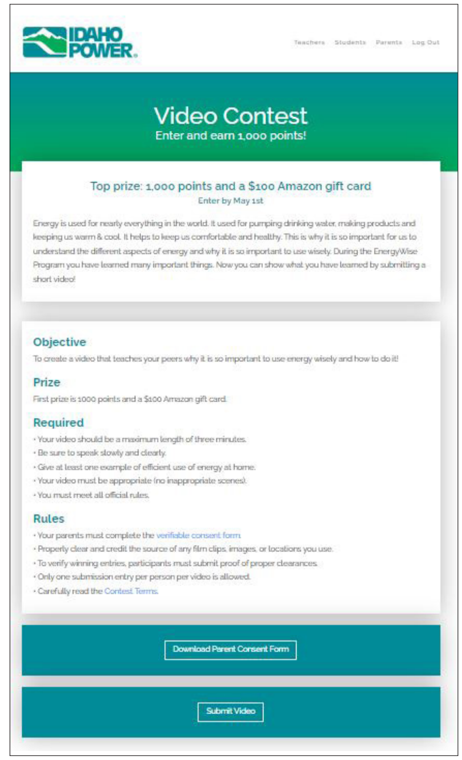
The five students that accumlated the most points were awarded prizes.

Photo Contest
Students were given the opportunity to participate in a product photo contest. Students snapped a photo of a product installed from their kit for a chance to earn points and win prizes. Photos were uploaded through the Tinker web application. Thirteen entries were selected as winners and received prizes.

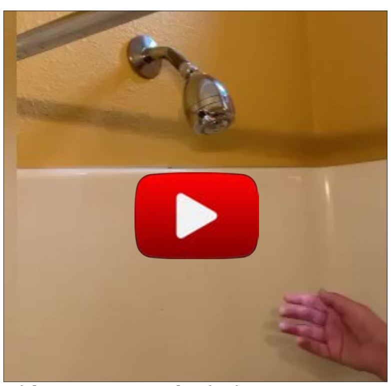
Photo Contest Submission

Video Contest

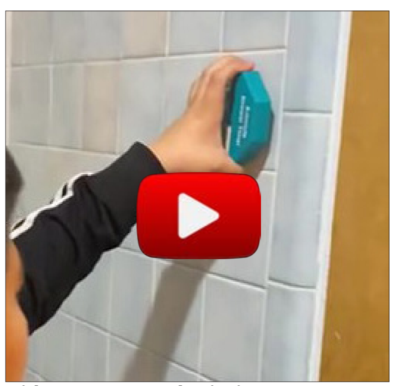
As part of the program, students were given the opportunity to participate in a video contest. Students could create a short two- to three-minute video about energy efficiency for a chance to win. Videos could be uploaded through the Tinker web application. Five entries were selected as winners and received prizes.



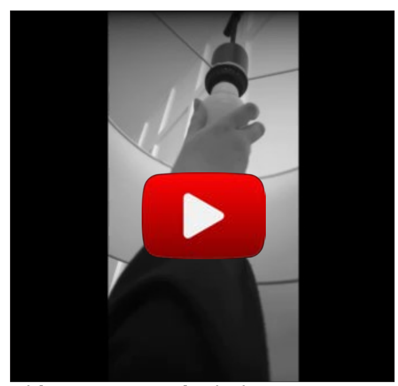
> "My favorite thing about the program was the kit boxes, the online homework quizzes for the students, and points awarded."
>
> C. Royse, Teacher
> Silver Trail Elementary School



Video Contest Submission



Video Contest Submission



Video Contest Submission

STUDENT ENERGY EFFICIENCY KIT PROGRAM
RECRUITMENT

Phase 2: Implementation

Beginning in August 2021, Tinker began the planning and recruitment of eligible teachers. Eligible teachers were from elementary schools in IPC's service area based on a list of zip codes and communities served as provided by IPC. Tinker staff researched school and teacher information as well as determined eligibility in such a way that students who received a kit at that school in a prior grade did not have a second opportunity to receive a kit at the same school in a subsequent grade. As needed, IPC provided written clarification and verification of school and regional assignments.

In September 2021, Tinker commenced active recruitment of eligible teachers. The program was offered to fourth-, fifth-, and sixth-grade teachers using a variety of communication tools to introduce the program and collect enrollment commitments. This included email templates, phone scripts, a promotional flyer, and video content. Tinker received commitments from 338 teachers. In April 2022, Tinker ceased active recruitment activities.

Teacher Recruitment Video

During the 2021–2022 school year, fourth-, fifth, and sixth-grade teachers were introduced to the program and asked to participate. Commitments were received from 174 schools, representing 338 teachers and 12,257 students. The table represents participation in each region of IPC's service territory.

Region	State	Teachers	Students	Total Kits
Canyon	ID	65	2797	2862
Capital	ID	129	3922	4051
Eastern	ID	44	1,542	1,586
Southern	ID	54	2620	2674
Western	ID	29	1,019	1,048
	Total Idaho:	321	11,900	12,221
Western	OR	17	357	374
	Total Oregon:	17	357	374

*Detailed participation data can be found in Appendix C

STUDENT ENERGY EFFICIENCY KIT PROGRAM
PROJECTED SAVINGS

Phase 3: Reporting

Through the program, 12,257 Energy Efficiency Kits were distributed to students. The kits were packed with high efficiency products that when installed help to curb household water and energy usage while reducing green house gas emissions. Students work with their parents to install the products and report their actions. Using the data collected, we calculated the projected resource savings. Projections are found below:

	Electricity	Natural Gas	Water	Green House Gas Reduction
Annual savings per student kit	188.02 kWh	3.44 Therms	1,408 Gals	0.15 Metric Tons
Annual program savings student kits	2,304,617.38 kWh	42,176 Therms	17,259,185 Gals	1,857.40 Metric Tons
Lifetime program savings student kits	18,054,873.77 kWh	421,757 Therms	172,591,850 Gals	15,027 Metric Tons

*The algorithms and data used for these calculations can be found in Appendix A

Through the program, 338 Energy Efficiency Kits were distributed to teachers. Like students, teachers are asked to install the products. However, unlike students, some teachers received a kit in a prior school year or prior school years. To best estimate the projected savings from the teacher kits, Tinker has applied a 25% discount to the kit savings for each year a teacher previously received a kit. The table below depicts the percentage of savings applied to teacher kits based on previous program participation.

Participating Years	Number of Teachers	Savings Percentage Applied
1	136	100%
2	75	75%
3	56	50%
4	71	25%

The factors that Tinker considered to determine the discount percentage were:

1. Energy efficiency products within the kits have changed occasionally year-over-year. Thus the entirety of the product savings for those products in which teachers have never received can be counted.
2. Products such as the LED lightbulbs and showerhead can be used in others areas of the home. Thus savings can be counted for those products.
3. In future program years, we intend to ask the teachers to report specific installation data. In the absence of data for this year a reasonable discount percentage was applied.

Savings projections for the Teacher Kits are found below:

	Electricity	Natural Gas	Water	Green House Gas Reduction
Average annual savings per teacher kit	132.40 kWh	2.42 Therms	991.51 Gals	0.11 Metric Tons
Average annual program savings teacher kits	44,749.85 kWh	818.95 Therms	335,129.8 Gals	36.05 Metric Tons
Average lifetime program savings teacher kits	350,580.07 kWh	8,189.46 Therms	3,351,298.05 Gals	291.73 Metric Tons

*The algorithms and data used for these calculations can be found in Appendix B

Total projected program savings was derived by adding the projected savings from students and teachers. The total projected savings is found below:

	Electricity	Natural Gas	Water	Green House Gas Reduction
Annual program savings:	2,349,367 kWh	42,995 Therms	17,594,315 Gals	1,893.45 Metric Tons
Lifetime program savings:	18,405,454 kWh	429,947 Therms	175,943,147 Gals	15,318.73 Metric Tons

PROGRAM ASSESSMENTS

Phase 3: Reporting

To determine the effectiveness of the program, we collected pre- and post-program data to assess changes in students' knowledge, attitude, and behavior with respect to energy efficiency. The outcome is provided below.

PRE-ASSESSMENT

ON THE AVERAGE STUDENTS SCORED 66% ON THE PRE-PROGRAM ASSESSMENT.

National Average: 68%

POST-ASSESSMENT

ON THE AVERAGE STUDENTS SCORED 87% ON THE POST-PROGRAM ASSESSMENT.

National Average: 85%

21%

AFTER PARTICIPATING IN THE PROGRAM, STUDENTS INCREASED THEIR TEST SCORES BY 21%

National Average: 17%

LESSON ASSESSMENTS

At the conclusion of each lesson, students were ask to complete a lesson assessment. The assessment was designed to measure knowledge growth within the topic as well as the re-enforce the education. The results are used to determine the effectiveness of each lesson. The table below contains the average student score within each lesson assessment.

Lesson	Assessment
Natural Resources	93%
Electric Energy	91%
Energy-Water Nexus	84%
Peak and Off-peak Time	83%
Electric Bill	89%
Efficiency and Conservation	91%

STUDENT ENERGY EFFICIENCY KIT PROGRAM

STUDENT PLEDGES

Phase 3: Reporting

As part of the program students are asked to pledge four different ways they will save energy at home. Below is a sampling of the pledges collected:

"I pledge to turn of all the lights when I don't need to use them anymore."

Ashley V, Student

"I pledge that i will turn off the TV when not watching it."

Isaiah C, Student

"I pledge to save energy by not leaving the refrigerator open for long."

Kristen B, Student

"I pledge to save energy by turn off computers, monitors and games when not in use."

Aaron A, Student

"I pledge to save energy by using the LED lightbulbs from my energy efficiency kit."

Jaden D, Student

"Telling those around me how they can use energy more efficiently and conservatively."

Camila F, Student

"I pledge to close my blinds during the summer, and keep them open during the winter."

Emily U, Student

"I pledge to ask my mom to make sure to clean my clothes with cold water instead of hot water."

Aryan H, Student

"I pledge to save energy by teaching other people to save water and use less energy."

Samuel O, Student

"I pledge to turn off lights when they are not needed."

Katie T, Student

"I pledge to tell my family to save electricity."

Fernando M, Student

"I pledge to save energy and water by taking in shorter showers."

Fatima M, Student

STUDENT SURVEY

Phase 3: Reporting

At the conclusion of the program, students are asked to complete a survey detailing the actions they took and which products from the Energy Efficiency Kit they install. Surveys were received from 7,720 students. The reported data can be found below.

1 Did you enjoy the program?

It was excellent	34.09%
Pretty good	45.46%
Neutral	13.38%
Not so great	4.35%
It was terrible	2.73%

2 Was the online content easy to use?

Yes	70.58%
No	29.42%

3 How many people (adults and children) live in your home?

5.02 People

4 Which type of fuel (energy) is used to heat water in your home?

Electricity	60.27%
Natural gas	29.13%
Propane	10.60%

5 How many showers are in your home?

2.19 Showers

6 Did you install the high efficiency showerhead from your kit?

Yes	41.13%
No, but I will install	29.54%
No	29.32%

7 What was the water flow rate from your previous showerhead?

2.15 G.P.M.

8 What was the water flow rate when you installed the new showerhead from the kit?

1.41 G.P.M.

9 Did you use the shower timer from your kit?

Yes	64.07%
No, but I will	19.86%
No	16.07%

10 Did you install the LED night light?

Yes	78.13%
No, but I will	20.68%
No	1.19%

11 When installing the night light did you replace an existing night light?

Yes	54.57%
No	45.43%

13 How many LED lightbulbs did you install?

3	31.15%
2	65.60%
1	83.82%
0	16.17%

14 What was the wattage of the first lightbulb you replaced with the LED lightbulb?

39.1 Watts

15 What was the wattage of the second lightbulb you replaced with the LED lightbulb?

40.1 Watts

16 What was the wattage of the third lightbulb you replaced with the LED lightbulb?

41.3 Watts

17 Did you use the digital thermometer?

Yes	49.50%
No, but I will	24.84%
No	25.66%

18 Did you raise or lower your water temperature?

Our water was the perfect temperature. We did not adjust the water heater temperature

79.05%

Our water was too hot! We lowered the water heater temperature

13.54%

Our water was not hot enough. We raised our water heater temperature.

7.41%

19 Did you install the furnace filter whistle?

Yes	33.21%
No, but I will	26.63%
No	40.16%

20 Did you use the sticker and magnet pack from your kit?

Yes	63.20%
No, but I will	18.28%
No	18.53%

STUDENT ENERGY EFFICIENCY KIT PROGRAM
TEACHER EVALUATION

Phase 3: Reporting

At the conclusion of the unit teachers were asked to complete a post-program evaluation. Outcomes are below:

1. Did you enjoy the program?

It was excellent	43.59%
It was pretty good	38.46%
Neutral	10.26%
Not so great	7.69%
It was terrible	0.00%

2. How satisfied were your students with this program?

They thought it was AWESOME!	25.64%
They liked it	53.85%
It was ok	16.67%
They really didn't like it	3.85%

3. Did this program support the education standards in your grade level?

Yes	96.15%
No	0.00%
Unsure	3.85%

4. Was the online content easy to use?

Yes	60.26%
No	39.74%

5. Was the program staff courteous?

Yes	80.77%
No	1.28%
Did not interact with program staff	17.95%

5a. Did the program staff effectively answer all of your questions?

Yes	98.41%
No	1.59%

6. In your opinion, were parents effectively engaged?

Yes	58.97%
No	41.03%

7. Would you like to see this program continue?

Yes	98.72%
No	1.28%

8. If offered, would you participate again next school year?

Yes	96.15%
No	3.85%

9. To aid in continuous improvement of the program, select teachers serve in an advisory capacity. Advising teachers are provided a stipend and meet twice per year. If asked, would you be willing to participate as an advisor?

Yes	24.36%
No	35.90%
Maybe	39.74%

STUDENT ENERGY EFFICIENCY KIT PROGRAM
TEACHER MINI-GRANTS

Phase 3: Reporting

As part of the program, teachers had the opportunity to a mini-grant for classroom supplies. Teachers that earned the mini-grant completed the following activities:

1. Completed the classroom portion of the lessons.
2. Assigned the online homework exercises.
3. Distributed the Energy Efficiency Kits to students.
4. Completed the post-program evaluation in the online teacher portal.
5. Returned the postage-paid return envelope with the following:
    - Student thank-you letters
    - Teacher thank-you letter on school letterhead

The mini-grant award was based on verified completion of each task above, as well as how many students completed the student survey. The amount of the mini-grant varied depending on the number of student surveys submitted. The awards are listed in the table below:

Student Survey Return Rate	Award Amount	Number Awarded
25 to 49%	$25.00	32
50 to 64%	$50.00	25
65 to 79%	$75.00	51
80 to 100%	$100.00	103

*Detailed award information can be found in the Student Energy Efficiency Kit Program dashboard.

CONTINUOUS IMPROVEMENT

Phase 3: Reporting

In addition to successful implementation of the Student Energy Efficiency Kit Program, Tinker LLC evaluates program outcomes in an effort to continually improve the program. Areas to be enhanced are identified below:

Content. As identified in this report, students successfully completed the lessons which resulted in a net knowledge gain. During school year 2022-2023, Tinker LLC plans to enhance the content through:

1. The redesign of some lessons and minor updates to others. This includes designing unique Electric Bill lessons for fourth-, fifth-, and sixth-grade students.
2. Offer teachers the option to receive paper copies of the Student Survey during the enrollment process.
3. Review lesson length for lower grade levels.

Teacher Program Administration. Based on feedback from particiating teachers, Tinker LLC plans to enhance the following teacher administration tools:

1. Integrate the seemless google login feature for teachers and students. This will allow teachers and students to use a single school login to access the google suite of digital tools and the Web App.
2. For teachers without google classroom, Tinker will normalize the student username across all classes.
3. Upgrade the student tracking and reporting module in the teacher portal.

These enhancements will improve the program while continuing to meet the changing needs of educators and students. Ultimately these will result in increased knowledge leading to the adoption of sustainable habits as well as responsible energy use amongst program participants.

SHOWERHEAD RETROFIT

Student Energy Efficiency Kit Projected Savings

Reported Inputs (Exact Numbers Reported)

Average household size:	5.02	people
Showers per home:	2.19	showers
Previous showerhead flow rate:	2.15	gallons
Retrofit showerhead flow rate:	1.41	gallons
Percent of homes with electric water heat:	60.27%	
Percent of homes with natural gas water heat:	29.13%	
Retrofit showerhead installation rate:	41.13%	
Participants using kits:	12,257	Kits

Assumed Inputs

Showers per day per person:	0.67	showers[1]
Average length of use:	8.2	minutes[1]
Percent of showerhead water that is heated:	73%	hot water[1]
Temperature of incoming cold water:	55°	[1]
Temperature of outgoing hot water:	120°	[1]
Product life:	10	years[2]

Outcomes

Projected annual water savings for all households:	17,259,184.93	Gallons[1]
Projected annual electric savings for all households:	1,366,788.76	kWh[4]
Projected annual natural gas savings for all households:	33,030.73	Therms[5]
Projected annual GHG reduction for all households:	1,144.00	Metric Tons[3]
Projected lifetime water savings for all households:	172,591,849.33	Gallons[1]
Projected lifetime electric savings for all households:	13,667,887.57	kWh[1]
Projected lifetime natural gas savings for all households:	330,307.28	Therms[1]
Projected lifetime GHG reduction for all households:	11,434.00	Metric Tons[3]

SHOWERHEAD RETROFIT

Student Energy Efficiency Kit Projected Savings

[1] *WaterSense® Specification for Showerheads Supporting Statement. EPA, 2010, Appendix A: Calculations and Key Assumptions. Note:*

Step 1 [(Previous showerhead flow rate - Retrofit showerhead flow rate) x Average length of use: 8.2min x Showers per day per person: 0.67 x Average household size] ÷ Full bathrooms per home = gallons saved per day

**Equation is divided by full bathrooms per home because we only provide one showerhead*

Step 2 gallons saved per day x 365 days = gallons saved per year

Step 3 gallons saved per year x retrofit showerhead installation rate x participants = gallons saved per year program-wide

[2] *Manufacturer*

[3] *"Greenhouse Gas Equivalencies Calculator." EPA, Environmental Protection Agency, June. 2022, https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.*

[4] *WaterSense® Specification for Showerheads Supporting Statement. EPA, 2010, Appendix A: Calculations and Key Assumptions. Note:*

o KWh Required to Raise 1 Gallon of Water 65º F
[(1.0 Btu/lbs x º F) (1kWh/3,412 Btus) / (1 gal/8.34 lbs) x 65º F] / 0.90 = 0.18 kWh/gal

[5] *WaterSense® Specification for Showerheads Supporting Statement. EPA, 2010, Appendix A: Calculations and Key Assumptions. Note:*

o Therms Required to Raise 1 Gallon of Water 65º F
[(1.0 Btu/lbs x º F) (1 Therm/99,976 Btus) / (1 gal/8.34 lbs) x 65º F] / 0.60 = 0.009 Therms/gal

LED LIGHTBULB #1 RETROFIT

Student Energy Efficiency Kit Projected Savings

Retrofit LED light bulb installation rate:	83.82%	
Participants using kits:	12,257	Kits
Average watts used by the replaced bulb:	39.13	watts

Assumed Inputs

Remaining useful life of replaced bulb:	1,000	hours[1]
Watts used by the LED light bulb:	8	watts[2]
Hours of operation per day:	2.1	hours per day[3]

Outcomes

Projected annual electric savings for all households:	245,155.71	kWh[4]
Projected annual GHG reduction for all households:	174	Metric Tons[5]
Projected lifetime electric savings for all households:	319,837.84	kWh[6]
Projected lifetime GHG reduction for all households:	227	Metric Tons[5]

[1] Remaining Useful Life (RUL) is 1/3 of useful life. Average Halogen useful life is 3,000 hours. Thus RUL is 1000 hours. (https://www.bulbs.com/learning/arl.aspx)

[2] Manufacturer

[3] "Regional Technical Forum." ResidentialLighting-v10-0. Lamps_StorageRemoval. General Purpose and Three Way. 250 to 1049 lumens. Any - Res. Only

[4] {[(Average wattage of light bulb replaced - Wattage of LED light bulb) x Hours of operation per day x 365 Days] ÷ 1,000} x Participants using kits x Retrofit LED light bulb installation rate

[5] "Greenhouse Gas Equivalencies Calculator." EPA, Environmental Protection Agency, June. 2022, https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.

[6] {[(Average wattage of light bulb replaced - Wattage of LED light bulb) x Remaining useful life of replaced bulb]

LED LIGHTBULB #2 RETROFIT

Student Energy Efficiency Kit Projected Savings

Retrofit LED light bulb installation rate:	65.60%	
Participants using kits:	12,257	Kits
Average watts used by the replaced bulb:	40.09	watts

Assumed Inputs

Remaining useful life of replaced bulb:	1,000	hours[1]
Watts used by the LED light bulb:	8	watts[2]
Hours of operation per day:	2.1	hours per day[3]

Outcomes

Projected annual electric savings for all households:	197,770.63	kWh[4]
Projected annual GHG reduction for all households:	140	Metric Tons[5]
Projected lifetime electric savings for all households:	258,017.79	kWh[6]
Projected lifetime GHG reduction for all households:	183	Metric Tons[5]

[1] *Remaining Useful Life (RUL) is 1/3 of useful life. Average Halogen useful life is 3,000 hours. Thus RUL is 1000 hours. (https://www.bulbs.com/learning/arl.aspx)*

[2] *Manufacturer*

[3] *"Regional Technical Forum." ResidentialLighting-v10-0. Lamps_StorageRemoval. General Purpose and Three Way. 250 to 1049 lumens. Any - Res. Only*

[4] *{[(Average wattage of light bulb replaced - Wattage of LED light bulb) x Hours of operation per day x 365 Days] ÷ 1,000} x Participants using kits x Retrofit LED light bulb installation rate*

[5] *"Greenhouse Gas Equivalencies Calculator." EPA, Environmental Protection Agency, June. 2022, https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.*

[6] *{[(Average wattage of light bulb replaced - Wattage of LED light bulb) x Remaining useful life of replaced bulb]*

LED LIGHTBULB #3 RETROFIT

Student Energy Efficiency Kit Projected Savings

Retrofit LED light bulb installation rate:	31.15%	
Participants using kits:	12,257	Kits
Average watts used by the replaced bulb:	41.25	watts

Assumed Inputs

Remaining useful life of replaced bulb:	1,000	hours[1]
Watts used by the LED light bulb:	8	watts[2]
Hours of operation per day:	2.1	hours per day[3]

Outcomes

Projected annual electric savings for all households:	97,323.34	kWh[4]
Projected annual GHG reduction for all households:	69	Metric Tons[5]
Projected lifetime electric savings for all households:	126,971.09	kWh[6]
Projected lifetime GHG reduction for all households:	90	Metric Tons[5]

[1] *Remaining Useful Life (RUL) is 1/3 of useful life. Average Halogen useful life is 3,000 hours. Thus RUL is 1000 hours. (https://www.bulbs.com/learning/arl.aspx)*

[2] *Manufacturer*

[3] *"Regional Technical Forum." ResidentialLighting-v10-0. Lamps_StorageRemoval. General Purpose and Three Way. 250 to 1049 lumens. Any - Res. Only*

[4] *{[(Average wattage of light bulb replaced - Wattage of LED light bulb) x Hours of operation per day x 365 Days] ÷ 1,000} x Participants using kits x Retrofit LED light bulb installation rate*

[5] *"Greenhouse Gas Equivalencies Calculator." EPA, Environmental Protection Agency, June. 2022, https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.*

[6] *{[(Average wattage of light bulb replaced - Wattage of LED light bulb) x Remaining useful life of replaced bulb]*

LED NIGHT LIGHT RETROFIT

Student Energy Efficiency Kit Projected Savings

Reported Inputs

Retrofit LED night light installation rate:	78.13%	
Participants using kits:	12,257	Kits

Assumed Inputs

Product life:	8	years[1]
Watts used by the LED night light:	0.5	watts[1]
Average length of use:	4380	hours per year
Average watts used by the replaced bulb:	4	watts[1]

Outcomes

Projected annual electric savings for all households:	146,814.98	kWh[3]
Projected annual GHG reduction for all households:	104	Metric Tons[4]
Projected lifetime electric savings for all households:	1,174,519.85	kWh[3]
Projected lifetime GHG reduction for all households:	832	Metric Tons[4]

[1] *Manufacturer*

[3] *{[(Average wattage of light bulb replaced - Wattage of LED night light) x Hours of operation per day x 365 Days] ÷ 1,000} x Participants using kits x Retrofit LED night light installation rate*

[4] *"Greenhouse Gas Equivalencies Calculator." EPA, Environmental Protection Agency, June. 2022, https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.*

FILTER WHISTLE RETROFIT

Student Energy Efficiency Kit Projected Savings

Reported Inputs		
Filter Whistle installation rate:	33.21%	
Participants using kits:	12,257	Kits
Assumed Inputs		
Annual energy (electricity) use by a central air conditioner:	4467	kWh[1]
Percent of customers with central air conditioning or heat pump:	78.8%	[2]
Annual energy (natural gas) use by a central space heating or furnace	421	therms[1]
Percent of customers using gas heat:	58.0%	[2]
Projected increase in efficiency (electricity):	1.75%	[3]
Projected increase in efficiency (natural gas):	0.92%	[3]
Product life:	10	years[4]
Outcomes		
Projected annual electric savings for all households:	250,763.96	kWh
Projected annual natural gas savings for all households:	9,144.98	Therms
Projected annual GHG reduction for all households:	226.4	Metric Tons[5]
Projected lifetime electric savings for all households:	2,507,639.63	kWh
Projected lifetime natural gas savings for all households:	91,449.81	Therms
Projected lifetime GHG reduction for all households:	2,261	Metric Tons[5]

[1] U.S. Department of Energy, Energy Information Administration 2005 Residential Energy Consumption Web site: http://www.eia.gov/

[2] Idaho Power's 2022 Residential End-Use Study

[3] Reichmuth P.E., Howard. (1999). Engineering Review and Savings Estimates for the Filter Restriction Alarm.

[4] Provided by manufacturer.

[5] "Greenhouse Gas Equivalencies Calculator." EPA, Environmental Protection Agency, June. 2022, https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.

TEACHER KIT SAVINGS

Teacher Energy Efficiency Kit Projected Savings

No. of Years Participating	Student Kit Savings	Savings Percentage Applied	Number of Teachers	Total Annual Savings
1	188.02 kWh	100%	136	25,571.34 kWh
2	188.02 kWh	75%	75	10,576.38 kWh
3	188.02 kWh	50%	56	5,264.69 kWh
4	188.02 kWh	25%	71	3,337.44 kWh

Student Kit Savings x Savings Percentage Applied x Number of Teachers = Total Annual Savings

Total: 44,749.85 kWh

No. of Years Participating	Student Kit Savings	Savings Percentage Applied	Number of Teachers	Total Annual Savings
1	3.44 Therms	100%	136	467.97 Therms
2	3.44 Therms	75%	75	193.55 Therms
3	3.44 Therms	50%	56	96.35 Therms
4	3.44 Therms	25%	71	61.08 Therms

Student Kit Savings x Savings Percentage Applied x Number of Teachers = Total Annual Savings

Total: 818.95 Therms

No. of Years Participating	Student Kit Savings	Savings Percentage Applied	Number of Teachers	Total Annual Savings
1	1,408.11 Gals	100%	136	191,502.75 Gals
2	1,408.11 Gals	75%	75	79,206.10 Gals
3	1,408.11 Gals	50%	56	39,427.04 Gals
4	1,408.11 Gals	25%	71	24,993.92 Gals

Student Kit Savings x Savings Percentage Applied x Number of Teachers = Total Annual Savings

Total: 335,129.80 Gals

Total Annual Savings	No. of Teacher Kits Distributed	Average Annual Savings per Kit
44,749.85 kWh	338 kits	132.40 kWh
818.95 Therms	338 kits	2.42 therms
335,129.80 Gals	338 kits	991.51 Gals

Total Annual Savings ÷ No. of Teacher Kits Distributed = Average Annual Savings per Kit

PARTICIPATION TABLE

Capital Region

Region	State	School	Teachers	Students	Total
Capital	ID	Adams Elementary	1	50	51
Capital	ID	Amity Elementary School	3	74	77
Capital	ID	Andrus Elementary	1	27	28
Capital	ID	Basin Elementary School	1	30	31
Capital	ID	Chaparral Elementary	1	27	28
Capital	ID	Christine Donnell School of the Arts	1	76	77
Capital	ID	Desert Sage Elementary	1	31	32
Capital	ID	Discovery Elementary	3	70	73
Capital	ID	Eagle Hills Elementary	1	25	26
Capital	ID	Falcon Ridge Charter	1	34	35
Capital	ID	Future Public School	2	105	107
Capital	ID	Galileo STEM Academy	3	93	96
Capital	ID	Garfield Elementary	1	26	27
Capital	ID	Glenns Ferry Elementary School	2	37	39
Capital	ID	Grace Jordan Elementary School	3	68	71
Capital	ID	Hacker Middle School	10	266	276
Capital	ID	Heritage Middle School	1	180	181
Capital	ID	Hidden Springs Elementary	2	47	49
Capital	ID	Highlands Elementary School	2	46	48
Capital	ID	Hillcrest Elementary School	1	19	20
Capital	ID	Hillsdale Elementary School	4	108	112
Capital	ID	Home School	1	2	3
Capital	ID	Horizon Elementary	1	30	31

PARTICIPATION TABLE

Capital Region

Region	State	School	Teachers	Students	Total
Capital	ID	Hunter Elementary	4	100	104
Capital	ID	Joplin Elementary	2	56	58
Capital	ID	Koelsch Elementary	1	25	26
Capital	ID	Lake Hazel Elementary	3	77	80
Capital	ID	Liberty Elementary	2	55	57
Capital	ID	Longfellow Elementary School	1	28	29
Capital	ID	Mary McPherson Elementary	1	26	27
Capital	ID	Meridian Middle School	1	155	156
Capital	ID	Monroe Elementary	1	21	22
Capital	ID	Morley Nelson Elementary School	2	62	64
Capital	ID	North Elementary School	3	79	82
Capital	ID	Owyhee Elementary	1	18	19
Capital	ID	Peregrine Elementary	2	101	103
Capital	ID	Ponderosa Elementary	3	93	96
Capital	ID	Raising Arrows Academy	1	4	5
Capital	ID	Reed Elementary School	7	159	166
Capital	ID	Rimrock Jr./Sr. High	1	20	21
Capital	ID	Riverside Elementary School	1	26	27
Capital	ID	Riverstone International School	1	33	34
Capital	ID	Roosevelt Elementary	1	50	51
Capital	ID	Rose Hill Montessori	1	11	12
Capital	ID	Ross Elementary	2	59	61
Capital	ID	Sacred Heart Catholic School	1	17	18

PARTICIPATION TABLE

Capital Region

Region	State	School	Teachers	Students	Total
Capital	ID	Sawtooth Elementary School	1	145	146
Capital	ID	Sawtooth Middle School	1	115	116
Capital	ID	Seven Oaks Elementary	3	105	108
Capital	ID	Shadow Hills Elementary School	3	78	81
Capital	ID	Silver Sage Elementary School	1	50	51
Capital	ID	Silver Trail Elementary	4	86	90
Capital	ID	Spalding Elementary	1	30	31
Capital	ID	Spalding STEM Academy	2	59	61
Capital	ID	Star Elementary	4	117	121
Capital	ID	Summerwind STEM Academy	3	69	72
Capital	ID	Valley View Elementary School	4	45	49
Capital	ID	Washington Elementary School	2	21	23
Capital	ID	West Elementary School	3	79	82
Capital	ID	White Pine Elementary School	3	72	75
Capital	ID	Whitney Elementary School	3	75	78
Capital	ID	Whittier Elementary School	1	30	31
		Total:	129	3922	4051

PARTICIPATION TABLE

Canyon Region

Region	State	School	Teachers	Students	Total
Canyon	ID	Birch Elementary	5	116	121
Canyon	ID	Centennial Elementary	3	79	82
Canyon	ID	Central Canyon Elementary School	3	83	86
Canyon	ID	Central Elementary	2	45	47
Canyon	ID	Desert Springs Elementary	4	106	110
Canyon	ID	East Canyon Elementary School	1	112	113
Canyon	ID	Fremont Middle School	1	120	121
Canyon	ID	Gem Prep Nampa	2	72	74
Canyon	ID	Heights Elementary	1	105	106
Canyon	ID	Heritage Community Charter	1	65	66
Canyon	ID	Kuna Middle School	1	152	153
Canyon	ID	Lewis and Clark Elementary School	3	70	73
Canyon	ID	Melba Elementary	3	75	78
Canyon	ID	Middleton Middle School	2	290	292
Canyon	ID	Mill Creek Elementary	5	135	140
Canyon	ID	Mosaics Public School	1	47	48
Canyon	ID	Owyhee Elementary	2	55	57
Canyon	ID	Park Ridge Elementary	2	50	52
Canyon	ID	Purple Sage Elementary	3	71	74
Canyon	ID	Ronald Reagan Elementary	3	82	85
Canyon	ID	Sacajawea Elementary School	3	84	87
Canyon	ID	South Middle School	2	375	377
Canyon	ID	St Pauls Catholic School	1	17	18

PARTICIPATION TABLE

Canyon Region

Region	State	School	Teachers	Students	Total
Canyon	ID	Thomas Jefferson Charter School	1	33	34
Canyon	ID	Vallivue Middle School	1	145	146
Canyon	ID	Van Buren Elementary	1	24	25
Canyon	ID	Washington Elementary School	1	30	31
Canyon	ID	West Canyon Elementary School	3	74	77
Canyon	ID	Wilder Elementary	1	21	22
Canyon	ID	Wilson Elementary School	3	64	67
		Total:	65	2797	2862

PARTICIPATION TABLE

Eastern Region

Region	State	School	Teachers	Students	Total
Eastern	ID	Aberdeen Middle School	1	55	56
Eastern	ID	Alameda Middle School	1	91	92
Eastern	ID	American Falls Academy	1	12	13
Eastern	ID	Chief Tahgee Elementary Academy	1	15	16
Eastern	ID	Chubbuck Elementary School	1	82	83
Eastern	ID	CONNOR ACADEMY	2	64	66
Eastern	ID	Donald D. Stalker Elementary	2	36	38
Eastern	ID	Fort Hall Elementary	1	24	25
Eastern	ID	Franklin Middle School	2	174	176
Eastern	ID	Gem Prep Pocatello	1	50	51
Eastern	ID	Greenacres Elementary School	2	65	67
Eastern	ID	Groveland Elementary	2	43	45
Eastern	ID	Hawthorne Middle School	1	44	45
Eastern	ID	Holy Spirit Catholic School	1	15	16
Eastern	ID	I.T Stoddard	1	30	31
Eastern	ID	Idaho Science and Technology	1	22	23
Eastern	ID	Inkom Elementary School	2	27	29
Eastern	ID	Leadore School	1	20	21
Eastern	ID	Lewis and Clark Elementary	3	80	83
Eastern	ID	Pocatello Community Charter	1	74	75
Eastern	ID	Ridge Crest Elementary	2	46	48
Eastern	ID	Rockland School	1	20	21
Eastern	ID	Rulon M Ellis Elementary School	3	72	75

PARTICIPATION TABLE

Eastern Region

Region	State	School	Teachers	Students	Total
Eastern	ID	Salmon Pioneer Elementary School	1	42	43
Eastern	ID	Syringa Elementary School	3	83	86
Eastern	ID	Tendoy Elementary School	1	30	31
Eastern	ID	Tyhee Elementary School	4	111	115
Eastern	ID	William Thomas Middle School	1	115	116
		Total:	44	1,542	1,586

PARTICIPATION TABLE

Southern Region

Region	State	School	Teachers	Students	Total
Southern	ID	Acorn Learning Center	1	9	10
Southern	ID	BUHL MIDDLE SCHOOL	1	100	101
Southern	ID	Camas County Schools	1	25	26
Southern	ID	Carey School	1	19	20
Southern	ID	Dietrich Schools	1	13	14
Southern	ID	Downey Elementary	1	13	14
Southern	ID	Ernest Hemingway Steam School	1	25	26
Southern	ID	Filer Intermediate School	3	70	73
Southern	ID	Hagerman Elementary School	1	31	32
Southern	ID	Hailey Elementary School	3	58	61
Southern	ID	Harrison Elementary School	2	52	54
Southern	ID	Hollister Elementary School	2	20	22
Southern	ID	I.B. Perrine Elementary	3	71	74
Southern	ID	Immanuel Lutheran School	1	16	17
Southern	ID	Jerome Middle School	2	330	332
Southern	ID	Oakley Elementary	1	34	35
Southern	ID	Popplewell Elementary School	2	145	147
Southern	ID	Robert Stuart Middle School	3	359	362
Southern	ID	Rock Creek Elementary School	2	139	141
Southern	ID	Sawtooth Elementary School	1	29	30
Southern	ID	Shoshone Elementary	2	40	42
Southern	ID	South Hills Middle School	1	240	241
Southern	ID	St Edwards Catholic School	1	13	14

PARTICIPATION TABLE

Southern Region

Region	State	School	Teachers	Students	Total
Southern	ID	Stricker Elementary	1	21	22
Southern	ID	Summit Elementary	11	266	277
Southern	ID	Vera C. O'Leary Middle School	1	105	106
Southern	ID	West Minico Middle School	2	202	204
Southern	ID	Wood River Middle School	2	175	177
		Total:	54	2620	2674

PARTICIPATION TABLE

Western Region

Region	State	School	Teachers	Students	Total
Western	ID	Cambridge Elementary	1	12	13
Western	ID	Cascade Elementary School	1	18	19
Western	ID	Fruitland Elementary School	5	138	143
Western	ID	Fruitland Middle School	1	20	21
Western	ID	Horseshoe Bend Elementary School	1	11	12
Western	ID	Kenneth J. Carberry Elementary	4	117	121
Western	ID	McCain Middle School	1	125	126
Western	ID	New Plymouth Elementary	3	74	77
Western	ID	Ola Elementary School	1	10	11
Western	ID	Park School	4	105	109
Western	ID	Parma Middle School	1	80	81
Western	ID	Payette Lakes Middle School	1	105	106
Western	ID	Weiser Middle School	1	101	102
Western	ID	Westside Elementary School	4	103	107
		Total:	29	1,019	1,048

PARTICIPATION TABLE

Western Region

Region	State	School	Teachers	Students	Total
Western	OR	Adrian Elementary	1	24	25
Western	OR	Annex Charter School	1	16	17
Western	OR	Harper Charter School	1	19	20
Western	OR	Henry L. Slater Elementary School	3	62	65
Western	OR	Huntington School	1	11	12
Western	OR	May Roberts Elementary School	2	49	51
Western	OR	Nyssa Elementary School	2	43	45
Western	OR	Pioneer Elementary School	1	17	18
Western	OR	St Peter Catholic School	1	40	41
Western	OR	Vale Elementary	3	55	58
Western	OR	Willowcreek Elementary School	1	21	22
		Total:	17	357	374

PARTICIPANT LETTERS

Teacher Letters

WEST MINICO MIDDLE SCHOOL

155 S. 600 W.
PAUL, ID 83347

PH: 208.438.5018
FAX: 208.438.8513

March 4, 2022

Dear Idaho Power:

Thank you for asking me to present the Energy Wise program to my 6th grade students. My students did enjoy this project and have learned many things about using electricity in their homes.

At first, my students complained about the project. They are 11 and 12 years old! After we got started, they enjoyed the lessons and did their homework. We did have technical problems, but Tinker was great to work with. Many students were not able to submit the work they completed. Tinker helped work through the issues and finally most students could turn in their work.

When we finished the workbook, my students wanted to do more. I had each student make a poster with an energy saving tip. We displayed the posters around our school for all the student body to see.

I did have several students ask questions that we researched. With many wind turbines in this area, students were very interested in how they worked. We also discussed hydropower because we live so close to the Snake River with the many hydroelectric plants in our area. Even the topic of fish ladders came up. Many students were surprised that their parents paid a power bill.

The Energy Wise program opened the eyes of many students and created a pathway for discussion on many subjects. I know that my students learned many real world facts that a textbook does not supply.

Thank you for your sponsorship of the Energy Wise program.

Karla Tarbet
6th grade science teacher
West Minico Middle School
Paul, ID 83347

HOME OF THE WARRIORS

PARTICIPANT LETTERS

Teacher Letters

Melba Elementary School

Learners Today, Leaders Tomorrow
PO Box 185 ~ 521 Carrie Rex Avenue
Melba, Idaho 83641
phone 208-495-2508 ~ fax 208-495-1142
www.melbaschools.org
Ashli Nelson, Principal

December 14, 2021

Idaho Power
An IDACORP Company
750 4th Street
Sparks, NV 89431-9998

Dear Idaho Power Energy Wise Program:

The new digital platform for the Energy Wise Program was amazing. Thank you for the hard work creating a digital platform for our classroom.

There were many new items in the Energy Wise Program. For example, I learned more about conservation and efficiency. The concept of the nexus was also very interesting. I know these were discussed in the previous versions of the program, but these two important topics were explained in a way the students understood exactly what was expected to learn.

Thank you again for your efforts on teaching students about conserving energy in an unbiased and beneficial way. The 6th graders enjoyed learning about how to save energy.

Sincerely,
Stephanie Gunstream
Stephanie Gunstream
Melba Elementary
Melba Idaho

PARTICIPANT LETTERS

Teacher Letters

Ellis Elementary School
5500 Whitaker Road
Chubbuck, Idaho 83202
Phone: 237-4742
Denise Lane, Principal

March 16, 2022

Dear Idaho Power,

I wanted to take the time and say thank you for the energy wise program and kits. I feel that my students are able to understand what it means to conserve energy and protect our resources. The information that was contained in the workbooks fit well with what they are learning in science and allowed for nice tie-ins. I loved the online component of the program. It allowed my students the opportunity to build upon their learning in the classroom. The new lesson designs were so engaging and made the lessons flow smoothly. Also, my students found the hands-on activities to be exciting. I know that my students have seen the value in conserving energy and will be using the kits to save energy at home. Thank you again for the time and energy that went into these kits and the program. I look forward to doing this program again next year.

Sincerely,
Mr. Perry

Ellis School Mission Statement: "I am responsible and always learning."

PARTICIPANT LETTERS

Teacher Letters

December 20, 2021

Dear Idaho Power,

Thank you again for the opportunity for Desert Springs 4th graders to be a part of your energy saving program again. My students always love the kits and love doing the activities and projects at home! The new activities and the online, interactive videos and lessons were so engaging for the kiddos. Every year I do this unit, my students seem much more aware about the energy and power they use every day, and they are eager to make new, healthier habits to conserve energy at home, as well as at school.

As always, I would love to participate in this program again with my 4th grade students next year. It will give me some time to navigate the website and better understand the new, online platform. The activities and projects are fun, engaging, and help my students better understand how the science standards we learn in 4th grade relate to their community.

Thank you again.

Have a wonderful holiday season and happy new year!

Sincerely,

Mrs. Matteson

Janelle Matteson
4th Grade Teacher – Desert Springs Elementary
Nampa, Idaho

Utility Consumer Analytics, Inc

Adaptive Consumer Engagement

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Idaho Power Corporation
Home Energy Report 2022
Final Program Summary

Version 1.3

Updated: 3/9/2023

HARRIS UCA UTILITY CONSUMER ANALYTICS

www.adaptiveconsumerengagement.com

Table of Contents

Revision History

Date	Version	Description	Author/Editor
2-27-2023	1.0	Initial Draft	Thea Winch
3-3-2023	1.1	Additional edits/comments	Thea Winch
3-9-2023	1.2	Final Version	Thea Winch
	1.3	Additional edits/comments	

Document Approval

The purpose of this section is to acknowledge approval of the information presented within. Please use the track-changes features to indicate any changes necessary before approval of the plan can be made. When ready to approve, please indicate the version number being approved, and complete the fields below.

This Idaho Power Company Home Energy Report 2022 Final Program Summary, version 1.3 approved by:

Client Name:	
Name, Title:	
Signature	
Date:	
Client Name:	
Name, Title:	
Signature:	
Date:	
Utility Consumer Analytics, Inc.	
Name, Title	
Signature:	
Date:	

1. Executive Summary

1. Project Overview

Energy savings due to behavioral changes in the home have traditionally been difficult to measure. Home Energy Report (HER) programs rely on a randomized controlled trial (RCT) structure to calculate energy savings and ensure program results are both unbiased and precise. The RCT approach is the most commonly used approach for implementing HER programs in North America.

With this approach, we identify an eligible pool of customers based on the desired program outcome, and then randomly allocate a subset of customers into the treatment group who will receive the behavioral intervention (Home Energy Reports), and the remainder into the control group who will not receive the intervention.

We estimate average customer-level savings from the behavioral program by measuring the difference in the average energy usage among the treatment group relative to the control group. Program energy savings are the average customer-level savings multiplied by the number of active treatment group participants.

Filters applied to identify customers who may participate in the program are based on recommendations from the vendor, as well as Idaho Power's experience and pilot learnings. Due to Oregon's small customer base, Idaho Power's (IPC) HER program is currently available only in Idaho.

Program Group refers to customers that are in the treatment group and are actively being treated with reports. These customers by default are also part of the evaluation group.

Evaluation Group refers to customers that are in the treatment or control group and are factored into the savings evaluations. Treatment customers in this group may or may not be actively receiving reports. Customers in the treatment group but not in program group remain in the treatment group to maintain the RCT but are not actively treated for a variety of reasons discussed later in the report.

Customers in the evaluation group are broken into treatment and corresponding control groups. T1 through T5 were onboarded in 2017 and 2018 as part of the pilot. T6 became active in 2020.

- **T1:** customers with high winter use (electric heating) added in Year One
- **T2:** customers with high winter use (electric heating) added in Year Two
- **T3:** customers with high year-round energy use added in Year One
- **T4:** customers with medium year-round energy use added in Year One
- **T5:** customers with low year-round energy use added in Year One.
    - o *Note: these customers were removed from the program in 2020 and received their last report in February of 2020*
- **T6:** expansion customers based on eligibility criteria determined after the pilot

The table below shows the number of customers in the treatment, control, and program groups at the beginning and end of 2022. Customers are removed from both groups when they **move out**.

Table 1: 2022 RCT and Program Group Participant Counts

	Program			Control			Treatment		
	Jan 1	Dec 31	Net Diff	Jan 1	Dec 31	Net Diff	Jan 1	Dec 31	Net Diff
T1	4,664	4,398	266	1,257	1,186	71	5,094	4,730	364
T2	3,865	3,670	195	710	664	46	4,429	4,154	275
T3	4,861	4,610	251	3,073	2,881	192	5,174	4,837	337
T4	2,274	2,164	110	2,277	2,135	142	2,426	2,272	154
T5*				48,081	45,295	2,786	4,149	3,915	234
T6	89,162	83,674	5,488	12,493	11,477	1,016	91,817	84,772	7,045
Combined Total	104,826	98,516	6,310	67,891	63,638	4,253	113,089	104,680	8,409

**T5 stopped receiving reports in 2020 so they are no longer in the Program Group. Residual savings from T5 are still calculated for the PSR, so Treatment and Control counts are still tracked.*

The Home Energy Reports included the following elements:

- **Customer information:** customer name, address, and account number
- **Household energy-usage disaggregation:** home usage separated into four loads (heating, air conditioning, lights & appliances, and always-on)
- **Targeted message(s)**: customized messaging to drive customers to relevant programs and the *My Account* portal
- **Social benchmarks**: customer's home energy use compared to similar homes and efficient homes, designed to motivate savings
- **Personalized savings recommendations:** Tips for saving energy based on home profile attributes, customer segmentation, and season

Table 2 – 2022 Report Delivery Schedule by Cohort

	2022											
Cohort	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
T1, T2, T3, T4, T6		✓			✓			✓			✓	

2. 2022: Summary of Results and Findings

Main takeaways from 2022 are as follows.

Savings

In 2022, total savings calculated are 20,474,995 kWh. Collectively, the savings for all waves combined are statistically significant. Although T-5 did not receive reports after February of 2020, when compared with their control group, they showed persistent savings. Including the savings from T5, the overall annual 2022 savings from this program are 20,734,611 kWh.

Using a weighted average calculation without T5 residual savings factored in, the treatment groups saved 1.31% or 200.74 kWh per customer. With residual savings from T5 included, the weighted average savings for all treatment groups was 195.77 per customer or 1.30%.***Table 3: 2022 Program Savings by T-Groups***

Cohort	Average Energy Savings in kWh per Customer	Cumulative Savings (all months, all households, kWh)	Percent Savings	Statistical Significance
T1	162.77	781,761	0.71%	N
T2	56.71	238,339	0.26%	N
T3	227.70	1,113,894	1.49%	Y
T4	267.44	612,969	2.47%	Y
T5	66.31	259,616	0.89%	N
T6	206.61	17,728,033	1.35%	Y
Combined Groups	**195.77**	**20,734,611**	**1.3%**	**Y**

Table 4: 2022 Home Energy Reports Delivered in 2022

Report Cycle	Recipients	# of Email only Recipients	# of Paper Only Recipients	# of Both Email & Paper Recipients	# of Unique Customers Receiving HERs	Total Reports Delivered
February	T1, T2, T3, T4, T6	150	104,676	N/A	104,826	104,826
May	T1, T2, T3, T4, T6	150	102,828	N/A	102,978	102,978
August	T1, T2, T3, T4, T6	153	47,766	52,801	100,720	153,521
November	T1, T2, T3, T4, T6	125	52,747	45,769	98,641	144,410
2022 Report Totals		**578**	**308,017**	**98,570**	**N/A**	**505,735**
2022 Participants					**104,826**	

Notes on Table 4:

- *In August of 2022 we expanded email HERs (eHERs) to all customers with an email address.*
- *Prior to the eHER expansion, only customers that opted into email and out of paper were eligible to receive email reports. This is why there were no customers receiving email and paper reports prior to August 2021.*
- *For the purposes of calculating cost effectiveness, the participant count will include customers who receive at least one report during the calendar year. This is typically based on the number of reports sent in the first report cycle of the year. For 2022, the participant count will be 104,826.*

Table 5: Year-Over-Year Home Energy Reports Delivered

Program Year	Recipients	Email Only Reports Sent	Paper Only Reports Sent	Both Paper and Email Reports Sent	# of Program Participants
Year 1 of Pilot (2017-2018)	T1, T3, T4, T5	N/A	149,546	N/A	23,914
Year 2 of Pilot (2018-2019)	T1, T2, T3, T4, T5	N/A	116,087	N/A	24,976
2020	T1, T2, T3, T4, T5, T6	257	488,545	N/A	127,313
2021	T1, T2, T3, T4, T6	507	445,334	N/A	115,153
2022	T1, T2, T3, T4, T6	578	406,587	98,570	104,826
Total Reports Delivered	**N/A**	**1,342**	**1,718,002**	**98,570**	**N/A**

Notes on Table 5:

- *T2 was launched in 2018*
- *Email reports launched at the beginning of 2019*
- *T5 was discontinued in 2020. The last report they received was in February 2020*
- *T6 launched in May of 2020 and customers received first report in June of 2020*
- *IPC pulled Total Reports Delivered data for Year 1 of Pilot (2017-2018) and Year 2 (2018-2019)*
- *Uplight pulled Total Reports Delivered Data for 2020, 2021, and 2022*

Email HER-Specific Statistics

In 2022, 99,148 total emails were sent. Of those, 97,971 emails were successfully delivered, and a total of 49,617 were opened. This is a 51% open rate which is stronger than average. The total clickthrough rate (that is, the rate of clicks on links contained within the emails) was 2.47%.

Customer Calls fielded by IPC's Customer Solutions Advisors

The total number of customer calls has steadily decreased from the peak in 2020 when T6 was launched. In 2022 there was a 38% decrease in the total number of calls compared to 2021. The reduction in 2022 is especially notable since the number of eHERs being sent increased significantly when eHERs were expanded to all eligible customers in the Program Group. The expansion increased the number of eHERs sent from 507 in 2021 to 99,148 in 2022.

Table 6: Year-Over-Year Customer Calls

	Year 1 of Pilot (2017-2018)	Year 2 of Pilot (2018-2019)	2020	2021	2022
Total Calls*	411	246	1,087	660	409
Total Reports Delivered	149,546	116,087	448,802	445,841	505,735
% to # of reports delivered	0.27%	0.21%	0.24%	0.15%	0.08%

Notes on Table 6:

- *IPC pulled Total Reports Delivered data for Year 1 of Pilot (2017-2018) and Year 2 (2018-2019)*
- *Uplight pulled Total Reports Delivered Data for 2020, 2021, and 2022*

3. 3. PROGRAM ATTRITION

Attrition Rates

Attrition rate measures the number of people removed from the HER program, either due to not meeting program requirements (as specified below), or because participants chose to opt out. The permanent attrition rate in 2022 was 6.92% with 9,334 customers either opting out or being permanently removed for one of the following reasons: move-outs, incompatible location type*, or incompatible property type**. This is down from 2021 when permanent attrition rate was 7.82% with 10,546 customers either opting out or being permanently removed, and from 2020 when permanent attrition rate was 9.4% with 11,850 customers either opting out or being permanently removed.

Permanent removals affect the Evaluation Group (both treatment and control). Customers who opt-out of the program no longer receive reports (no longer part of the program group), but their data remain as part of the evaluation group to maintain the balance of the RCT.

**Customers with zip codes outside of the geographic parameters for similar home comparrisons, or those catgorized as insufficient location benchmarking, are verified as incompatible location.*

***Pilot customers whose home types are single family home or manufactured home are eligible to receive reports. For T6, only customers whose home type is single family home are eligible to receive reports. All other home types are considered incompatible property type.*

Table 7: 2022 Attrition Summary

	Permanent Removals		Opt-Outs	
	Count	%	Count	%
T1234	1,170	4.44%	17	0.07%
T6	8,058	7.42%	89	0.08%
Combined	9,228	6.84%	106	0.08%
Overall Attrition Rate	**6.92%**			

Table 8: Year Over Year Attrition

	Opt Out Count	Opt Out %	Overall Attrition %
2018	172	0.64%	12%
2019	66	0.22%	15.15%
2020	154	0.1%	9.4%
2021	138	0.12%	7.8%
2022	106	.08%	6.92%

Year Over Year Savings Comparisons

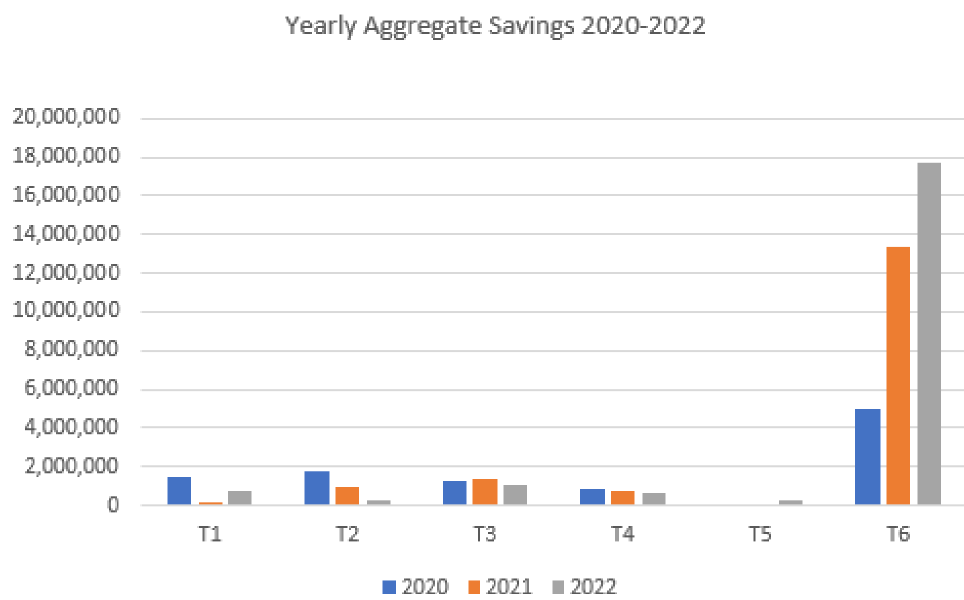
Table 9: Year Over Year Savings Comparisons

	T1	T2	T3	T4	T5	T6	Aggregate Savings in kWh	Participant Count
2018	___	___	___	___	___	N/A	3,281,780	23,914
2019	___	___	___	___	___	N/A	8,444,746	24,976
2020	1,445,666	1,734,800	1,237,313	881,080	67,831	5,017,703	10,427,940	127,138
2021	183,325	981,868	1,378,427	740,448	100,575	13,382,802	16,767,446	115,153
2022	781,761	238,339	1,113,894	612,969	259,616	17,728,033	20,734,611	104,826
Aggregate Savings in MWh	___	___	___	___	___	___	59,656	N/A

Notes on Table 9:

- *2018-2019 savings and participant counts were sourced from IPC's DSM Reports and/or Pilot Program Summary Reports (PSR). Only the aggregate savings for T1 - T5 were pulled.*
- *T5 transitioned to residual savings starting from March 2020.*
- *T6 launched in 2020.*

Figure 1: Yearly Aggregate Savings 2020-2022



Note on Figure 1: T5 savings are present in the chart. The savings are so small in comparison to T6 that they aren't visible.

1. Program Overview

1.1 Team Structure

The IPC Home Energy Report program has been a joint effort between Idaho Power Company, Utility Consumer Analytics | N. Harris Computer Corporation (formerly Aclara), and Uplight (formerly Ecotagious) since 2017. Uplight acquired Ecotagious in July of 2019. In June 2021, N. Harris Computer Corporation acquired Adaptive Consumer Engagement (ACE) from Aclara Technologies.

1.2 Objectives

1.2.1 2022 Objectives

The following business requirements were captured during an onsite meeting on August 22, 2019 and documented in the contract as part of the design of this expansion from the pilot project:

- Maximize the total kWh saved, ensuring a UCT of >1 (with a buffer), and maintain high customer satisfaction levels.
- Meet cost-effectiveness guidelines from a Total Resource Cost (TRC) and UCT perspective.
  - >1 UCT + buffer
- Maintain or enhance the current customer satisfaction levels.
  - Maintain low opt-out rate
  - Drive positive customer interactions
  - Maintain low volume of program-related calls to the Customer Interaction Center
- Average annual savings of 1-3%
  - So long as savings are detectable and statistically significant
- Encourage customer engagement with energy usage, including utilization of online tools and lift for other EE programs.

1.2.2 Additional Objectives

Monitor persistent savings of T5 group

In the expansion program, T5 customers were removed from treatment because their overall usage was low, and they had not achieved statistically significant savings in the pilot program. IPC would like to continue to monitor their persistent savings going forward to determine if combining them with the rest of the treatment population could yield additional combined savings. Because the T5 customers received reports through February of 2020, the savings calculated using a difference-in-difference methodology can be attributed to treatment in previous years.

IPC is working with their third party consultant to identify an appropriate trigger to stop including T5 savings in the aggregate yearly savings estimate.

1.3 Eligibility Screening

1.3.1 Eligibility Screening

Eligibility screening for T1, T3, T4, and T5 was initially conducted in year one, and these groups persisted into year two.

Eligibility screening for T2 was conducted in year one with the T1 group; however, heating source data for these customers was unavailable until year two, at which time they were re-evaluated for eligibility.

The eligibility criteria applied in years one and two were also applied in year three to determine the eligible participants in the T6 group, with new criteria added based on learnings from the pilot.

Table 10: 2020 Expansion

Idaho only	Required Idaho service addresses
AMI Data	Required AMI data
Active only	Removed all accounts without >12 months active history
Individual only	Filtered out all non-individual accounts
Exclude Do Not Contact	Filtered out do not contact list
Net Metering and Master metered accounts (I03)	Removed all Net Metering and Master metered accounts (I03)
Exclude non-English	Removed all known language types other than English
Comparable homes only	Removed homes built prior to 1860, or more than 6 bathrooms, or more than 8 bedrooms, and homes with <350 ft^2 or >7000 ft^2
Homes only	Effectively excludes junk accounts (barn, shop, garage, well, pump, etc., etc.)
Exclude manufactured homes	Excluded all manufactured homes
Exclude multi-family	Exclude Multi-family
Remove duplicates	Remove duplicates

For the expansion in 2020, all T5 and C5 customers were removed from both participation and eligibility based on savings results from the two-year pilot. Additionally, a third party (DNV) randomly removed 29,369 customers from the control groups for Pilot waves 1, 2, 3, and 4 to free them up for possible treatment in the expansion. The analysis by DNV-GL determined how many customers could be removed from these control groups while still allowing for statistical significance in calculating savings cumulatively across all treatment groups.

In April 2020, eligibility screening was conducted to establish a new T6 group from the remaining Idaho Power customers and those freed up from C1, C2, C3, and C4.

Idaho Power scrubbed the initial count of customers and applied the following filters:

IPC Applied Filters are Shown in Table 9

The criteria for culling customers during eligibility screening is shown in Table 9.

In late 2020, an issue arose where the benchmarking group for a number of treatment customers fell below the required threshold of 100 homes. Although adequate benchmarking was part of the initial criteria, the size for the benchmarking group during eligibility screening had been set too low. This issue created a situation where customers remaining in the program could potentially receive sporadic reports and have a negative customer experience. As a result, the vendor and IPC made a joint decision to remove participants with inadequate benchmarks from active treatment. At this time, the vendor also confirmed those customers remaining in treatment had enough homes in their respective benchmarking groups to provide quality data for subsequent reporting periods.

Table 11: Criteria and Rationale for Culling Customers During Eligibility Screening

[removed table for public version]

Figure 2: Eligibility Funnel for 2020 Expansion

[removed table for public version]

1.4 Evaluation, Measurement & Verification Process

The treatment groups' energy savings were evaluated following standard industry-accepted evaluation practices. The program was set up as a Randomized Control Trial (RCT), with a third party (DNV-GL) randomly assigning the treatment and control groups. The evaluation employed a difference-in-differences method, which allows for accurate evaluation of program-driven energy savings.

Pilot Year One

In year one, appropriately sized treatment and control groups were created for each cohort, assuming an attrition rate of 10 percent and allowing for statistically significant detection of energy savings in excess of 1.2 percent in the treatment groups. To achieve this objective, all eligible customers were placed in either the treatment or control group.

In year one, 27,000 customers were identified as initial program participants. After taking into consideration exclusionary factors such as move-ins/move-outs, as well as removing some potential T1 participants due to a lack of adequate county benchmarks, the sample size at the time of the first report was 25,677.

Pilot Year Two

In year two, at the time the bimonthly and monthly groups were created, the total number of customers in treatment groups was down to around 23,000, a net decrease from the previous year. The changes made to the treatment groups were as follows:

1. The T2 group was added to the study.
2. Move-outs were removed from all EMV treatment groups, the rI'm esult of on-going attrition due to customers moving out over the course of year 1.
3. All groups were optimized to remove households with low savings potential.

The total number of customers in control groups in year two was 110,969 (down from 166,840 in year one). The same changes made to the treatment groups were applied to the control groups:

1. A new control group was created to accompany the new T2 group.
2. Move-outs were removed from all control groups, the result of on-going attrition due to customers moving out over the course of year 1.
3. The control groups were similarly optimized to remove households with low savings potential.

Households where residents moved out during the evaluation period were taken out of both the treatment and control groups for the purpose of measuring energy savings. Customers who opted out or did not receive reports due to being marked non-deliverable by the National Change of Address database were left in both the treatment and control groups for the purpose of measuring energy savings.

2020 Expansion

The treatment customers from the pilot continued treatment (except T5) and a new treatment group and new control group were created to expand the number of customers in treatment. After optimization of the existing treatment groups was complete, a total of 18,492 customers were identified as pilot participants eligible for treatment in year three. The following changes were made to the pilot treatment customers:

1. The T5 treatment group was removed from participation because this group showed the lowest propensity to save energy during the pilot.
2. All remaining treatment customers from the pilot (years one and two) were moved to a consolidated quarterly treatment schedule.
3. The C5 control group was removed from eligibility for treatment.

The following changes were made to the pilot control groups:

The C1, C2, C3, and C4 control groups were reduced in size significantly. 75,973 customers were randomly removed from these four control groups to free them up for inclusion in the T6 experimental design—that is freed up to be randomly allocated to T6 and C6 during the 2020 expansion. The number of customers removed from each control group was determined by DNV-GL with consideration given to the impact their removal would have on the statistical significance of calculated savings across all treatment groups. See table 9 for a record of the changes made to the C1, C2, C3, and C4 control groups.

Table 12: Reduction in Pilot Control Groups

Group	Original Control Group Size	Reduced New Control Group Size
C1	12,090	1,450
C2	5,024	800
C3	35,194	3,520
C4	31,995	2,560

In the spring of 2020, a new wave was created with 108,498 in the treatment group (T6) and 14,744 in the control group (C6) based on eligibility criteria applied to the remaining population.

1.5 Customer Data Acquisition/Integration

In the 2022 Program year, there were two improvements made to the program's data acquisition/integration. The first is the quarterly incorporation of updated Do Not Contact (DNC) lists. This was done as part of the eHER expansion effort in August of 2022. IPC provides an updated DNC list once a quarter before eHERs go out. Uplight then cross-references the DNC list with the eHER mailing list and removes any customers that appear on both lists. This ensures that Program

Group customers who ask to be added to Idaho Power's DNC list are not receiving emails they do not want.

The second improvement is the addition of a "hot water heater likely" flag. IPC had collected data on customers likely to have electric hot water heaters. IPC sent the data they collected to Uplight, who then used it to supplement My Account's electric water heater data. Below is the method Uplight used for prioritizing the hot water heater data.

1. If there is no water heater data from My Account for a customer, and there is no data in the "hot water heater likely" file from Idaho Power, leave it blank.
2. If there is no data from My Account for a customer, but there is data in the "hot water heater likely" file from Idaho Power, use the hot water heater data from Idaho Power.
3. If there is water heater data from My Account but no data in the "hot water heater likely" file from Idaho Power, use the hot water heater data from My Account.
4. If there is water heater data from My Account and data in the "hot water heater likely" file from Idaho Power, prioritize the hot water heater data from My Account.

With the hot water heater flag incorporated, enhanced segmentation for customers with and without electric water heaters became possible. In November 2022, we used the new flag to provide money and electricity-saving water tips to customers likely to have electric hot water heaters.

To further improve the data and process for future segmentation, Uplight plans to upload the "hot water heater likely" flag directly to My Account using the above-mentioned prioritization. This will not only improve customers' Profiles in My Account, but will allow Uplight to use the existing My Account data export, rather than an ad-hoc process.

Table 13: Data Requirements

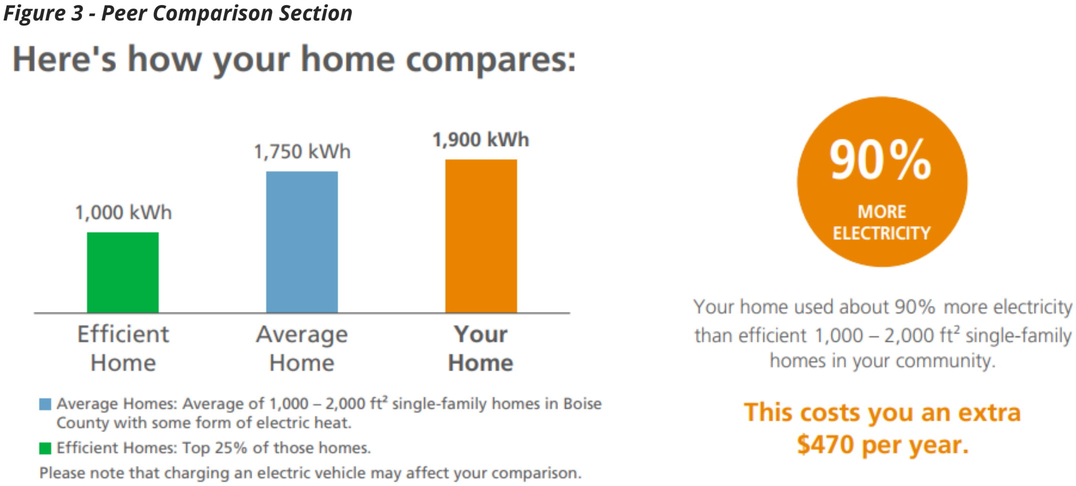
Integration Point	Description	Format	Frequency	Initiator	Recipient
Public Record Data	Aclara calls Melissa Data for latest property records for treatment group customers, selected control customers, and random samples for benchmarking.	CSV	batch: one-time historical (performed year one)	Aclara	Aclara
Electric Customer-Billing Data	Idaho Power provides electric customer-billing data for treatment-group customers, selected control customers, and all eligible customers incrementally each week.	CSV	recurring weekly	IPC	Aclara
Electric Customer-AMI Data	Idaho Power provides recurring daily AMI updates of electric AMI data for treatment group customers, selected control customers, and all eligible customers for benchmarking.	CSV	recurring daily	Idaho Power	Aclara
Action and Profile Data	Aclara extracts customer action and profile data from *My Account* tools (EnergyPrism) for treatment and control group customers.	CSV	recurring weekly	Aclara	Aclara
Opt-Outs	Aclara provides a weekly report on all customer calls and opt-outs to Idaho Power.	CSV	recurring weekly	Idaho Power	Aclara

[NEW] Do Not Contact (DNC) List	Starting with the August 2022 cycle, Idaho Power provides an updated DNC list once a quarter - prior to reports being sent. Uplight removes customers on the DNC list from the eHER mailing list.	CSV	recurring quarterly	Idaho Power	Uplight
[NEW] Hot Water "likely list"	Idaho Power provided account numbers for customers that are likely to have electric hot water heaters. This data was then used to provide targeted water usage tips for customers that are likely to have hot water heaters.	CSV	one-time (performed in November 2022 as part of the eHER expansion)	Idaho Power	Uplight

1.6 Benchmarking Flags

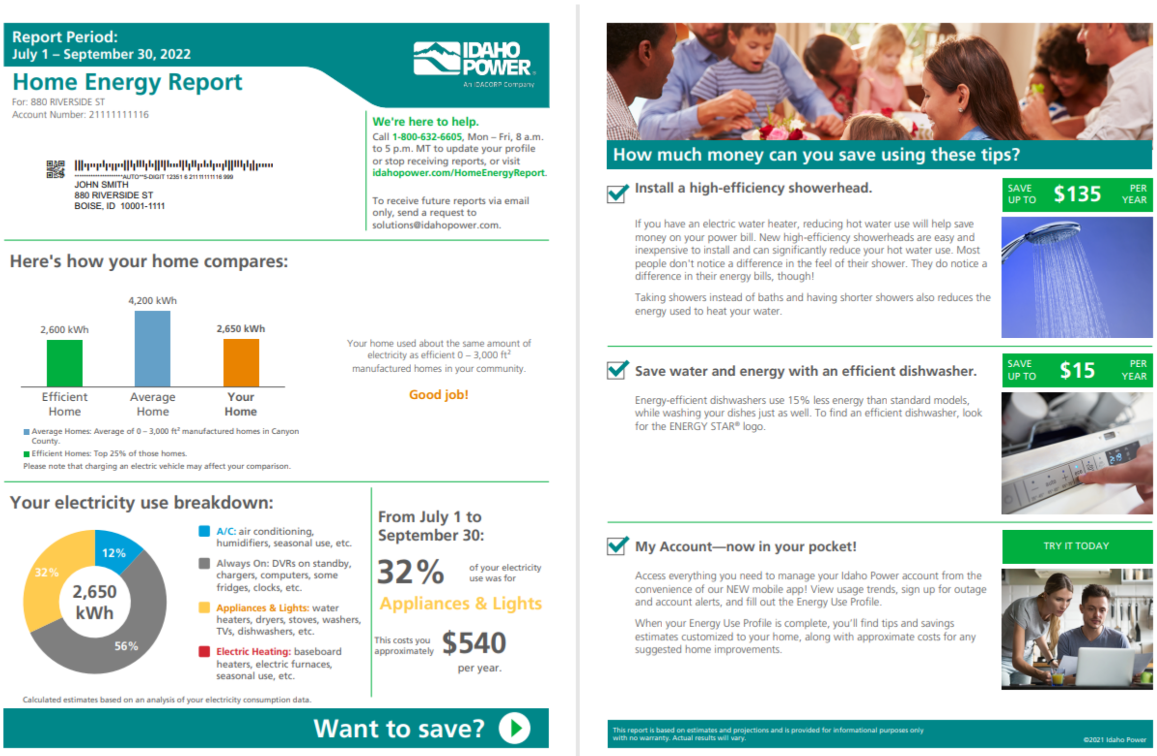
Benchmarking flags are used to cluster customers based on similar home properties for the purpose of calculating peer comparisons and identifying how each treatment customer's usage compares to the average and efficient homes of similar properties. In the pilot program, the flags used to identify benchmarking clusters were 1) Home Size (square feet), 2) Home Type, and 3) County. In the 2020 expansion, two additional flags were added, one for ESH and one for AC.

Figure 3 - Peer Comparison Section



1.7 Improving Tip Selection

4. 1.6.1 Enhanced Water Heater Tips



5. 1.6.2 Overview of Segmentation Used for 2022

Idaho Power and Uplight are always on the lookout for new ways to keep report messaging personalized and fresh. This is good way to drive additional customer engagement with intent of increasing program savings and participation. In 2022 the segmentation in Table 14 was used.

Table 14: Segmentation Used for 2022 Quarterly Home Energy Reports

Report Cycle	Segmentation
February	Electrical Space Heating/Appliances and lights
May	Air conditioning/Appliances and lights
August	Air conditioning/Always on
November	Electrical Space Heating/Appliances and lights/Hot water

2. 2022 Program Results Detail

2.1 Objectives: Findings

2.1.1 Energy Savings

Cumulative Savings During Treatment Period

In total, we saw an average of 200.74 kWh savings per treatment customer. This added up to a total combined savings of 20,474,995 kWh across all treatment groups as of December 31, 2022. Savings calculations from T3, T4 and T6 were statistically significant. See table 5 for savings per cohort. The aggregate savings with all groups combined were statistically significant.

Additionally, the T5 treatment group was treated with home energy reports through February 2020 and did continue to show persistent savings post-treatment. All treatment customers in 2022, including the T5 post-treatment period, showed a total combined savings of 20,734,611 kWh and an average savings of 195.77 kWh per customer . See table 6 for the treatment and persistence savings for the T5 group; and table 7 for combined savings including T5.

In tables 5, 6, and 7 we included the Avg kWh Savings per Customer, Average savings percent, and the Cumulative Aggregate Savings (kWh), with IO6 customers included in the Evaluation Group. In 2021, the decision was made to continue including IO6 customers in our Evaluation Group for yearly reporting.

Table 15: 2022 Cumulative Savings Active by Cohort
T12346 Treatment Period: Jan 1, 2022 - Dec 31, 2022

Cohort	Avg kWh Savings per Customer w/ IO6	Average Savings Percent w/ IO6	95% Confidence Margin of Error w/ IO6	One-Sided Null Hypothesis P-Value w/IO6	Cumulative Aggregate Savings (kWh) w/ IO6
Winter Heating – T1	162.77	0.71%	375.569	0.197821	781,761
Winter Heating – T2	56.71	0.26%	429.37	0.397873	238,339
Year-Round - T3	227.70	1.49%	209.78	0.00166919	1,113,894
Year-Round - T4	267.44	2.47%	188.10	0.002662	612,969
Expansion - T6	206.61	1.35%	71.38	7.00829E-09	17,728,033
Combined	200.74	1.31%	27.28	1.81872E-47	**20,474,995**

Table 16: 2022 Cumulative Savings by T5 (inactive Cohort)
T5 Persistent Period: Jan 1, 2022 - Dec 31, 2022

Cohort	Avg kWh Savings per Customer w/ IO6	Average Savings Percent w/ IO6	Cumulative Aggregate Savings (kWh) w/ IO6
Year-Round - T5	66.31	0.89%	259,616

Table 17: 2022 Combined cumulative Savings for all Treatment Groups including T5

Cohort	Avg kWh Savings per Customer w/ IO6	Average Savings Percent w/ IO6	Cumulative Aggregate Savings (kWh) w/ IO6
T123456	195.77	1.30%	20,734,611

2.1.2 Monthly Savings by Treatment Group

Table 18: Average kWh Savings per Cohort

	T1	T2	T3	T4	T6
Jan 2022	-11.37	-8.79	-19.17	-33.16	-16.78
Feb 2022	-26.13	-8.86	-16.42	-31.66	-18.64
Mar 2022	13.19	-23.22	-19.02	-30.32	-13.30
Apr 2022	44.06	-15.70	-12.51	-27.24	-10.15
May 2022	-4.36	-22.75	-16.99	-20.70	-9.78
Jun 2022	-13.22	1.46	-19.79	-16.07	-13.29
Jul 2022	-6.20	-18.41	-29.04	-22.82	-15.15
Aug 2022	-10.39	-5.11	-21.58	-25.87	-14.40
Sep 2022	-7.79	4.77	-16.59	-15.47	-16.06
Oct 2022	-6.69	8.63	-13.68	-11.01	-11.37
Nov 2022	11.68	19.46	-23.58	-21.77	-17.83
Dec 2022	-3.35	-4.07	-29.28	-38.09	-18.44

2.1.3 2022 Combined Savings for Expansion participants (T6) Vs. Pilot Participants (T1234)

The T6 group is much larger than other treatment groups and more closely represents the entire Idaho Power customer base than any other group. T6 alone accounts for over 80% of the total treatment group. Savings for T6 have ramped up and are performing well.

An analysis of savings within the expansion participant group (T6), compared to the pilot customer group, found that in 2022, T6 saved an average of 206.61 kWh per customer. T3 and T4 continue to outperform T6, while T1 and T2 have underperformed. In aggregate, the active pilot cohorts saved an average of 169.67 kWh per customer and T5 had a residual average savings of 66.31 kWh per customer. The combined average savings for T1, T2, T3, T4, T5, and T6 was 195.77 kWh per customer.

2022 was the second full year where all waves were on the same report schedule, and thus, we are beginning to look at the program group more holistically.

2.2 Email Reports

2.2.1 Delivery, Open, and Bounce Rates

In 2022, a total of 99,148 email reports had been sent to Idaho customers and seeds (i.e., IPC employees receiving an eHER to evaluate it). Of these, 97,971 emails were successfully delivered, and a total of 49,617 were opened. This is a 51% open rate which is stronger than average. The total clickthrough rate (that is, the rate of clicks on links contained within the emails) was 2.47%.

2.3 Customer Feedback

2.3.1 Customer Service Line Calls and Opt-Out Rates

Table 19: CSA Calls and Opt-Out Call Rates

	2018	2019	2020	2021	2022
Total Calls	411	246	1,087	660	409
Opt-Out Calls	172	66	211	115	93
% of Opt-Out Calls to Total Calls	42%	27%	19%	17%	23%

In 2022, IPC customer solutions advisors (CSAs) received 409 calls related to the HER program. Customers must call in to opt out of paper reports, so it makes sense that opt-outs are a notable percentage of total calls.

From January to December 2022, CSAs classified each call they received into one of eight categories as specified in the table below:

- General
- Profile Update
- Opt-Out
- Escalation
- Non-Program-Related
- Switching to Email
- Switch to Paper
- Other

Figure 4: 2022 Calls by Type

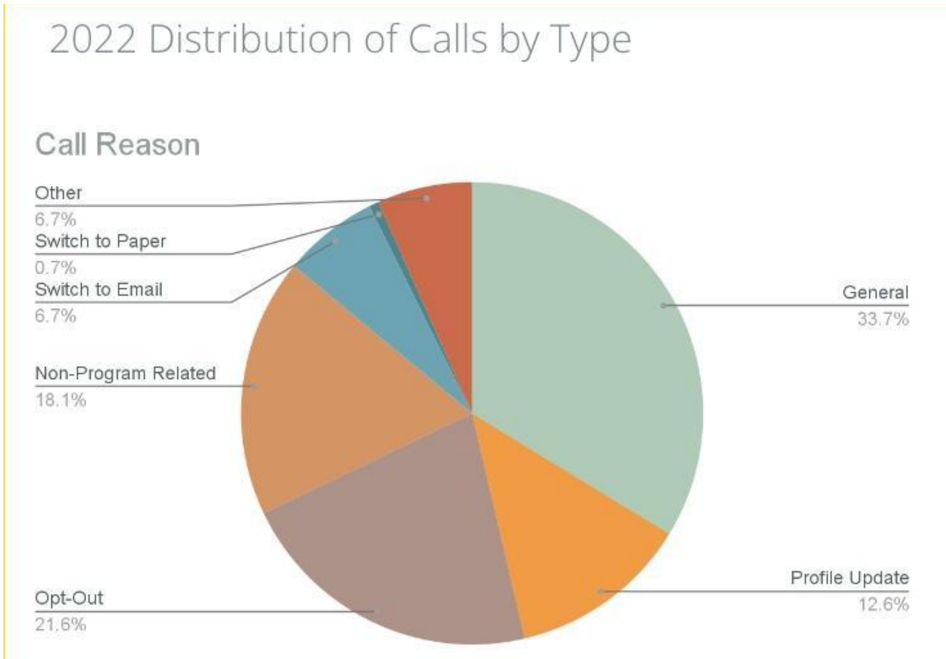


Table 20: – Reasons for Calls to CSAs in 2022 by Category

Call Reason	2022												Total
	Jan	Feb 🗎	Mar	Apr	May 🗎	Jun	Jul	Aug 🗎	Sep	Oct	Nov 🗎	Dec	
General	3	20	5	3	53	2	3	31	3	7	15	1	146
Profile Update	—	14	1	—	13	1	—	11	—	5	10	—	55
Opt-Out	—	20	2	—	25	1	3	17	2	4	16	3	93
Escalation	—	—	—	—	—	—	—	—	—	—	—	—	0
Non-Program-Related	1	14	8	1	17	5	1	19	1	3	7	2	79
Switch to Email	—	6	2	—	5	—	—	8	—	3	4	1	29
Switch to Paper	—	—	1	—	1	—	—	1	—	—	—	—	3
Other	—	5	1	1	5	—	1	7	—	4	4	1	29
Total Reasons*	**4**	**79**	**20**	**5**	**119**	**9**	**8**	**94**	**6**	**26**	**56**	**8**	**434**
Total Calls*	**4**	**77**	**20**	**4**	**108**	**9**	**7**	**92**	**6**	**23**	**51**	**8**	**409**

🗎 ***indicates report month***

Some customers call in for more than one reason which is why there is a variance in Total Reasons and Total Calls.

Following are some sample notes from CSAs regarding phone calls from customers about the HER program:

- *"[Customer] called advised of needs for more power than others due to caring for her husband in the home..says she will look at the tips and her usage breakdown to see if they can be any more judicious with their usage"*
- *"[Customer] called we discussed his report..all electric but was not in that category so updated profile to electric heat pump for heating..discussed hot tub added that to profile to..advised how we are determining the usage breakdown"*
- *"Questions about the accuracy of the report. hasn't filled out a home profile yet. helped fill it out the generic info"*
- *"Customer stated he knows he uses a lot of energy, he is an all electric house and has 2 water heaters."*
- *"[Customer] called and was added..discussed always on looks like for that time frame a lot of that extra was for xmas lights so would be good to go LED with those and then highest usage Christmas week..advised otherwise looks very good"*
- *"[Customer] called says got new hvac from El Ada after he called us due to a high HER report last fall..verified it looks like last couple months have much lower comparative usage than before his new system"*
- *"Asked about the HER report and went over usage comparison."*
- *"Usage history, helped customer set up MyAccount to fill out the Energy Profile online."*
- *"Customer wanted to go over some of the energy efficiency options"*
- *"Appreciates the information!"*
- *"Inquired about hour Home Energy Audit, also suggested to log into the Home Profile. sent email with some helpful energy-savings tips and Energy Efficiency Programs."*

2.4 Additional Metrics

2.4.1 Microsite Engagement

Table 21: Microsite Activity by Month

	Jan	Feb 🗎	Mar	Apr	May 🗎	Jun	Jul	Aug 🗎	Sep	Oct	Nov 🗎	Dec	Total
Unique Clicks	96	58	43	18	23	17	18	14	11	22	29	74	423
Total Clicks	96	58	43	18	23	17	18	14	11	30	29	74	431
Unique Page Views	19	45	21	26	43	12	22	66	18	116	41	14	443
Total Page Views	19	44	21	28	44	12	28	70	20	141	43	18	488

🗎 ***indicates report month***

From January 1, 2022 to December 31, 2022, there were a total of 443 unique page views (that is, people who navigated to the site) and 423 unique clicks within the site.

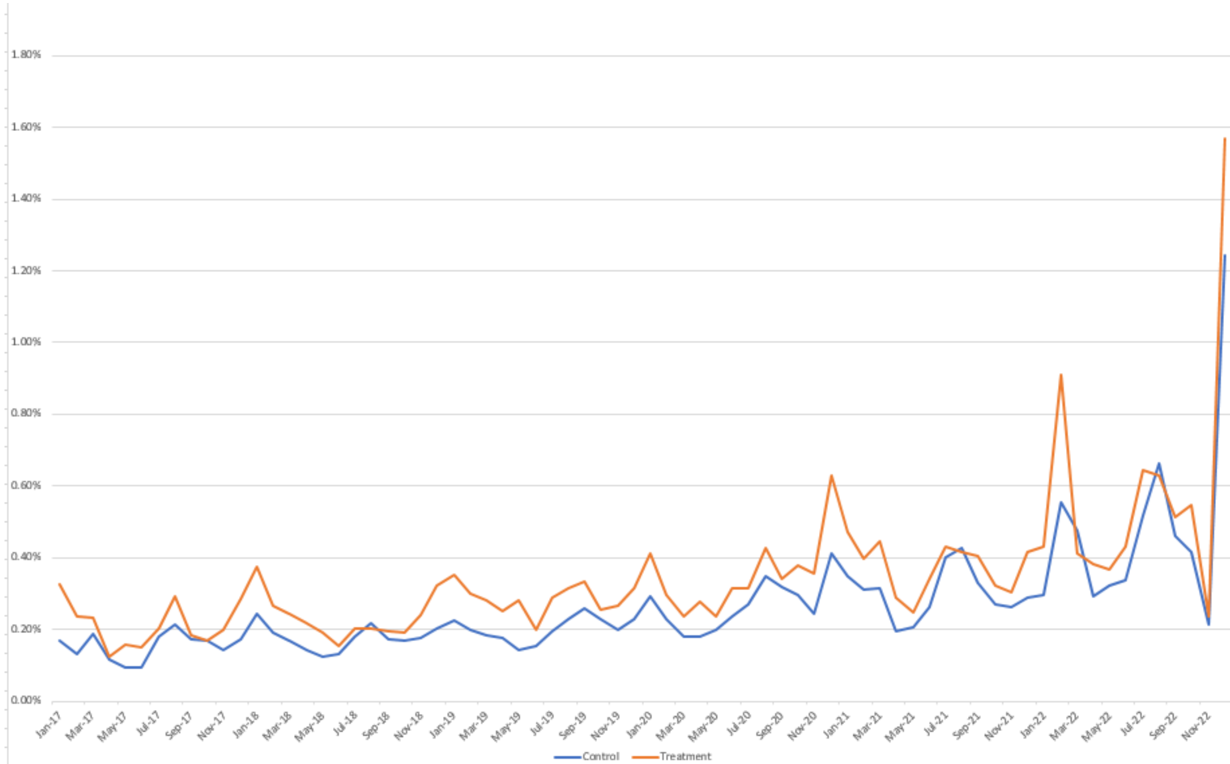
Low microsite usage is to be expected, as the site serves only to supplement the HER program and does not offer extra value to customers beyond answering basic FAQs. It is not a venue for customers to update their home profiles or opt out of the program; it functions primarily to help reduce call volumes.

The microsite link — idahopower.com/HomeEnergyReport — is available from HER reports.

2.4.2 My Account Web Activity

Since the beginning of the program, the treatment groups have consistently used IPC's *My Account* slightly more than the controls. The treatment group has been an average of 0.07 percent more active on My Account than the controls since January 2017.

Figure 5 - My Account Activity Treatment vs Control Program to Date



2.4.3 Attrition Rate Detail

HER Expansion (T6) Attrition Rates

Table 22: T6 Attrition Rates in 2022

T6	Feb	May	Aug	Nov	Total
Total Reports Delivered	89,025	87,418	85,462	83,674	345,579
Move Outs	385	2,970	1,663	2,187	7,205
Unsupported Rate Code (I06)	192	167	197	194	750
Location	—	—	—	—	—
Property	9	2	—	3	14
Opt Outs	17	23	20	17	77
USPS - Non Deliverables[1]	—	—	—	—	—
Total Permanent Removals	**603**	**3,162**	**1,880**	**2,401**	**8,046**
AMI Insufficient/Negative Usage	779	579	653	198	2,209
Insufficient Benchmarking	20	26	28	44	118
Total Temporary Removals	**799**	**605**	**681**	**242**	**2,327**
Total Removals	**1,402**	**3,767**	**2,561**	**2,643**	**10,373**

[1] USPS – Non Deliverables were temporarily removed from eligibility each month; then those customers regained eligibility for treatment the following month until after October of 2020. Starting with the November reports, any customer listed as non-deliverable was permanently removed from the program. In May of 2021 we started treating the undeliverable customers again which is why you see the USPS-Non Deliverables count drop to 0 starting in May.

HER Pilot (T12345) Attrition Rates

Table 23: T12345 Attrition Rates in 2022

T12345	Feb	May	Aug	Nov	Total
Total Reports Delivered	15,651	15,410	15,105	14,839	61,005
Move Outs	50	435	250	307	1,042
Unsupported Rate Code (I06)	22	25	31	33	111
Location	—	—	—	—	—
Property	—	—	—	—	—
Opt Outs	2	1	6	5	14
USPS - Non Deliverables[2]	—	—	—	—	—
Total Permanent Removals	**74**	**461**	**287**	**345**	**1,167**
AMI Insufficient/Negative Usage	92	70	88	31	281
Insufficient Benchmarking	5	7	8	11	31
Total Temporary Removals	**97**	**77**	**96**	**42**	**312**
Total Removals	**171**	**538**	**383**	**387**	**1,479**

[2] USPS – Non Deliverables were temporarily removed from eligibility each month; then those customers regained eligibility for treatment the following month until after October of 2020. Starting with the November reports, any customer listed as non-deliverable was permanently removed from the program. In May of 2021 we started treating the undeliverable customers again which is why you see the USPS-Non Deliverables count drop to 0 starting in May.

3. Process Improvements, Lessons Learned, and Future Considerations

3.1 Process Improvements

Midway through the year, it became apparent that the Program was not meeting the previously forecasted savings targets. IPC worked with SilverBlaze/Uplight to explore options for boosting savings while maintaining costs. Two ideas were introduced: 1) Increase HER participant engagement by sending email reports (in addition to paper reports) to all HER participants for which Idaho Power has an email on file, and 2) Find a way to deliver higher-savings hot water heater tips to participants with electric water heaters.

Both ideas had some technical and business challenges that required process tweaks and improvements.

Incorporating the Do Not Contact List Quarterly

As part of the eHER expansion in August 2022, we updated our cadence to incorporate new Do Not Contact (DNC) lists. Idaho Power provides an updated DNC list once a quarter before eHERs go out. Uplight then cross-references the DNC list with the eHER mailing list and removes any customers that appear on both lists. This ensures that Program Group customers who ask to be added to Idaho Power's DNC list are not receiving emails they do not want.

Improved Electric Water Heater Data

Idaho Power and Uplight are always on the lookout for new ways to keep report messaging personalized and fresh. This is good way to drive additional customer engagement with intent of increasing program savings.

November 2022, a new flag was implemented to provide money and electricity-saving water tips to customers likely to have electric hot water heaters. Previously, IPC had been concerned about sending these tips because customers expect their HERs to be personalized. In addition to creating customer concern about the quality of data driving the reports, sending water-heater related tips to customers without electric water heaters would not have resulted in additional program savings. Incorporating the new data flag allowed us to better target the higher-savings tips while maintaining customers' trust in the integrity of the data.

Idaho Power had collected data on customers likely to have electric hot water heaters. Idaho Power sent the data they collected to Uplight, who then used it to supplement My Account's electric water heater data. Below is the method Uplight used for prioritizing the water heater data.

1. If there is no water heater data from My Account for a customer, and there is no data in the "electric hot water heater likely" file from Idaho Power, leave it blank.
2. If there is no data from My Account for a customer, but there is data in the "hot water heater likely" file from Idaho Power, use the hot water heater data from Idaho Power.
3. If there is water heater data from My Account but no data in the "hot water heater likely" file from Idaho Power, use the hot water heater data from My Account.
4. If there is water heater data from My Account and data in the "hot water heater likely" file from Idaho Power, prioritize the hot water heater data from My Account.

Included NCOA group (USPS undeliverables) in Program Group

The inclusion of USPS undeliverables in our Program Group went well in 2022 and is now part of our permanent process.

Before May 2021, customers flagged as NCOA/USPS undeliverable were moved out of the Program Group. Since they were retained in the Evaluation Group but no longer received reports, this created the potential for diluting savings. In April, IPC compared the NCOA list with the mailing addresses in IPC's system and found no explicable reason they should have been removed. At IPC's request, Uplight developed a solution that allowed us to deliver reports to these participants and keep them in the Program Group.

From the May report throughout 2021, Uplight paid first-class postage and worked with IPC and the printer to break these customers into their own send list so they could continue receiving reports. Immediately after implementing this process, improvement allowed us to treat an additional 128 customers in May 2021. IPC has not received HERs marked "return to sender" in any notable quantity to date.

3.2 Lessons Learned

In 2022 there were several lessons learned. These learnings serve as a way to identify future program improvement opportunities.

Bill Ingestor for Program Wasn't Erasing Email Addresses

When eHERs were initially launched, they were only sent to customers who opted into email-only reports. The customer's email address was requested as part of the opt-in process. This ensured that we had the current customer's latest email address.

In August of 2022, we expanded eHERs to all customers in the Program Group with valid email addresses. After the first cycle of eHERs was sent, we realized that the bill ingestor used for the program was not erasing email addresses from the database when they moved out of a location and became inactive. The ingestor will overwrite the old inactive customer's email address with the new active customers, but only if that email address is not blank.

This became a problem since Service Point ID (SDPID) is the unique primary identifier for a location (e.g., a house). If multiple customers live in a given location over time, one after the other, they will share the SDPID for that location in their billing records. This means that if a customer with an email address moved out of a location and a new one moved in and did not have an email address, the database would store the original customer's email address. As a result, the original customer's email address would receive the eHERs intended for the new, active customer.

To resolve this issue, we now only send eHERs to customers we could verify had email addresses belonging to their SDPID in the most recent six weeks of billing data. As part of our standard process, we now validate that we've received billing data for, without an inactive date and with a valid email, since the end of the report window, for all customers receiving eHERs.

3.3 Future Considerations

Based on the findings from 2022, Utility Consumer Analytics/Uplight has the following recommendations for enhancing the program in 2022 and beyond:

Silver Blaze/Uplight to Implement Smart Notifications for CSA Escalations

We considered this change in 2022, but decided the cost-benefit was minimal at this time. Overall, the number of HER escalations are low - we've seen 23 escalations since 2017. None of those escalations were in 2022, and only 3 of the 23 were in 2021. However, one escalation call received in 2021 brought an opportunity to light. When customers call in with a HER-related escalation, the CSA inputs notes on the call into a CSA survey. From there, the IPC Program Specialist only knows about the escalation through the weekly CSA Report that captures all CSA surveys. Escalations should be responded to quickly. Since the current process relies on a CSA Report, which is pulled once a week, there may be a delay between when the escalation call occurs and when the IPC Program Specialist can act on the escalation.

The team concurs it's in IPC's best interest to reconfigure the CSA survey with "smart notification" so that an email is immediately sent to the IPC Program Specialist when an escalation is submitted to Silver Blaze/Uplight through a CSA survey. This will allow the Program Specialist to quickly respond within one business day to any calls marked as an escalation. Uplight is currently investigating the practicality of implementing this change. We are currently manually tracking escalations on a frequent cadence.

Add "electric hot water heater likely" data to My Account

Now that the electric hot water heater flag is incorporated, enhanced segmentation for customers with and without electric water heaters is possible. In November 2022, we used the new flag to provide money and electricity-saving water tips to customers likely to have electric hot water heaters.

The next step is to upload the “electric hot water heater likely” directly to My Account with the abovementioned prioritization. This will improve customers’ Profiles in My Account and allow us to use the My Account data export as the source of truth for the water heater type.

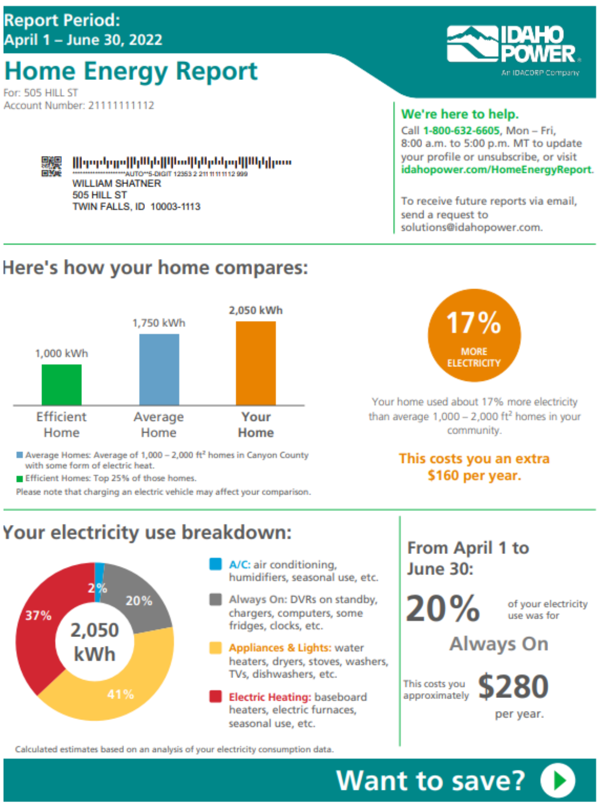
Revise How Quarterly Progress to Forecast is Tracked

IPC noted that forecast numbers didn't always align with the quarter's savings recorded in the QMR. Uplight explained that there was a method difference in how the two numbers were pulled and is currently looking into aligning those methods to remove some of the confusion.

4. Appendices

4.1 Appendix A: Sample Home Energy Reports

A-1. Sample Print HER — Always-On Tips


Report Period:
April 1 – June 30, 2022

IDAHO POWER
An IDACORP Company

Home Energy Report
For: 505 HILL ST
Account Number: 21111111112

*********************AUTO**5-DIGIT 12353 2 211 11111112 999
WILLIAM SHATNER
505 HILL ST
TWIN FALLS, ID 10003-1113

We're here to help.
Call 1-800-632-6605, Mon – Fri, 8:00 a.m. to 5:00 p.m. MT to update your profile or unsubscribe, or visit idahopower.com/HomeEnergyReport.

To receive future reports via email, send a request to solutions@idahopower.com.

Here's how your home compares:

1,000 kWh
Efficient Home
1,750 kWh
Average Home
2,050 kWh
Your Home

■ Average Homes: Average of 1,000 – 2,000 ft² homes in Canyon County with some form of electric heat.
■ Efficient Homes: Top 25% of those homes.
Please note that charging an electric vehicle may affect your comparison.

17% MORE ELECTRICITY

Your home used about 17% more electricity than average 1,000 – 2,000 ft² homes in your community.

This costs you an extra $160 per year.

Your electricity use breakdown:

2,050 kWh
2%
20%
41%
37%

A/C: air conditioning, humidifiers, seasonal use, etc.
Always On: DVRs on standby, chargers, computers, some fridges, clocks, etc.
Appliances & Lights: water heaters, dryers, stoves, washers, TVs, dishwashers, etc.
Electric Heating: baseboard heaters, electric furnaces, seasonal use, etc.

Calculated estimates based on an analysis of your electricity consumption data.

From April 1 to June 30:
20% of your electricity use was for Always On
This costs you approximately $280 per year.

Want to save?


Summer is here. Here are some tips to help lower your costs.

Tame living room electronics.
SAVE UP TO $50 PE YEA

Most TVs, DVRs and game consoles continue to use electricity even when in standby mode. Prevent this by plugging your TV and other electronics into a smart power strip. Smart power strips automatically reduce standby power use by turning off electronics. Based on your needs, choose from several types including activity monitors, timers, remotes and motion sensors.

In addition to saving energy, smart strips can help tame unruly entertainment system cords by allowing many items to be plugged safely into one strip.

Get rid of the screensaver.
SAVE UP TO $30 PE YEA

Using a screensaver is the same as leaving your computer on at full power.

Most computers have a power management feature that automatically puts the computer in sleep mode after a certain period of inactivity. Disable the screensaver and enable these power-management features on your computer so you won't need to remember to put it in sleep mode when you step away.

Upgrade to LEDs for long-lasting savings!
USE AT LEAST 70% LES ENERG

ENERGY STAR® certified LEDs use 70 to 90% less energy and last at least 15 times longer than incandescent bulbs. Idaho Power offers instant discounts on select ENERGY STAR certified bulbs and fixtures at select retailers.

Visit idahopower.com/lighting to learn more.

This report is based on estimates and projections and is provided for informational purposes only with no warranty. Actual results will vary.
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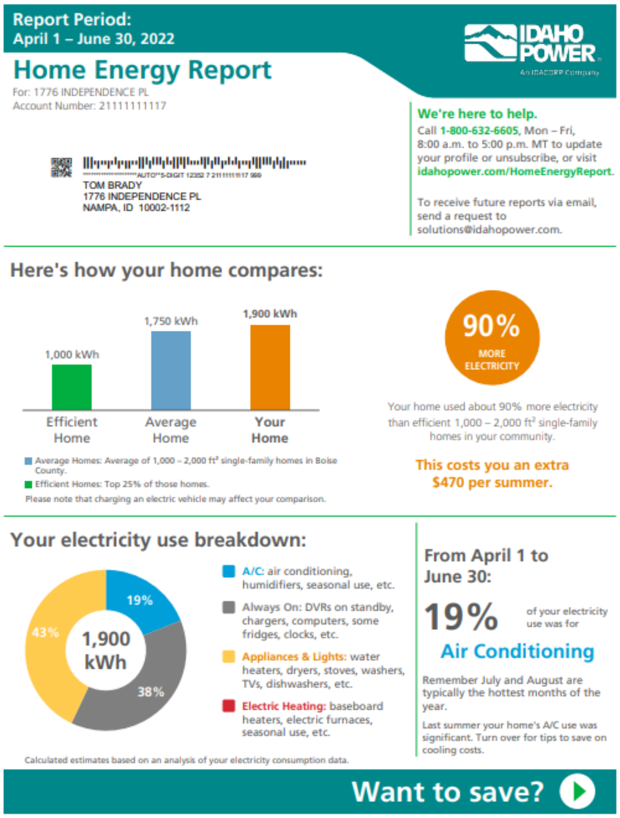
A-2. Sample Print HER — A/C Tips



Report Period:
April 1 – June 30, 2022

IDAHO POWER
An IDACORP Company

Home Energy Report

For: 1776 INDEPENDENCE PL
Account Number: 21111111117

TOM BRADY
1776 INDEPENDENCE PL
NAMPA, ID 10002-1112

We're here to help.
Call 1-800-632-6605, Mon – Fri, 8:00 a.m. to 5:00 p.m. MT to update your profile or unsubscribe, or visit idahopower.com/HomeEnergyReport.

To receive future reports via email, send a request to solutions@idahopower.com.

Here's how your home compares:

1,000 kWh Efficient Home
1,750 kWh Average Home
1,900 kWh Your Home

Average Homes: Average of 1,000 – 2,000 ft² single-family homes in Boise County.
Efficient Homes: Top 25% of those homes.
Please note that charging an electric vehicle may affect your comparison.

90% MORE ELECTRICITY

Your home used about 90% more electricity than efficient 1,000 – 2,000 ft² single-family homes in your community.

This costs you an extra $470 per summer.

Your electricity use breakdown:

19%
43%
38%
1,900 kWh

A/C: air conditioning, humidifiers, seasonal use, etc.
Always On: DVRs on standby, chargers, computers, some fridges, clocks, etc.
Appliances & Lights: water heaters, dryers, stoves, washers, TVs, dishwashers, etc.
Electric Heating: baseboard heaters, electric furnaces, seasonal use, etc.

Calculated estimates based on an analysis of your electricity consumption data.

From April 1 to June 30:

19% of your electricity use was for

Air Conditioning

Remember July and August are typically the hottest months of the year.

Last summer your home's A/C use was significant. Turn over for tips to save on cooling costs.

Want to save?

Take action to save energy this summer.

Clean or replace your A/C filter at least twice each year.

SAVE UP TO $45 PER YEAR

Save on cooling costs! Replace the dirty filter in your air handler with a clean one to improve your air conditioner's energy efficiency by 5 to 15%. If your filter is the reusable kind, clean it to improve efficiency.

You will get more efficient cooling in the summer and ensure a longer life for your air system.

Install an energy-efficient ceiling fan.

SAVE UP TO $20 PER YEAR

Energy Star® rated ceiling fans use 20% less energy than regular models, which means even more savings when you leave your A/C off and use a fan instead. If you don't have a ceiling fan, consider installing one as an efficient alternative to A/C.

Discover Idaho Power's heating and cooling cash incentives!

INCENTIVES UP TO $1,000

Reduce your heating and cooling expenses now!

Idaho Power offers cash incentives on new energy-saving equipment and services for qualifying homes. Incentives range from $75 to $1,000 and include smart thermostats, heat pumps, water heaters and more.

Increasing your home's efficiency reduces energy use and helps you feel comfortable year-round. Visit www.idahopower.com/heatingcooling for eligibility and program information.

This report is based on estimates and projections and is provided for informational purposes only with no warranty. Actual results will vary.

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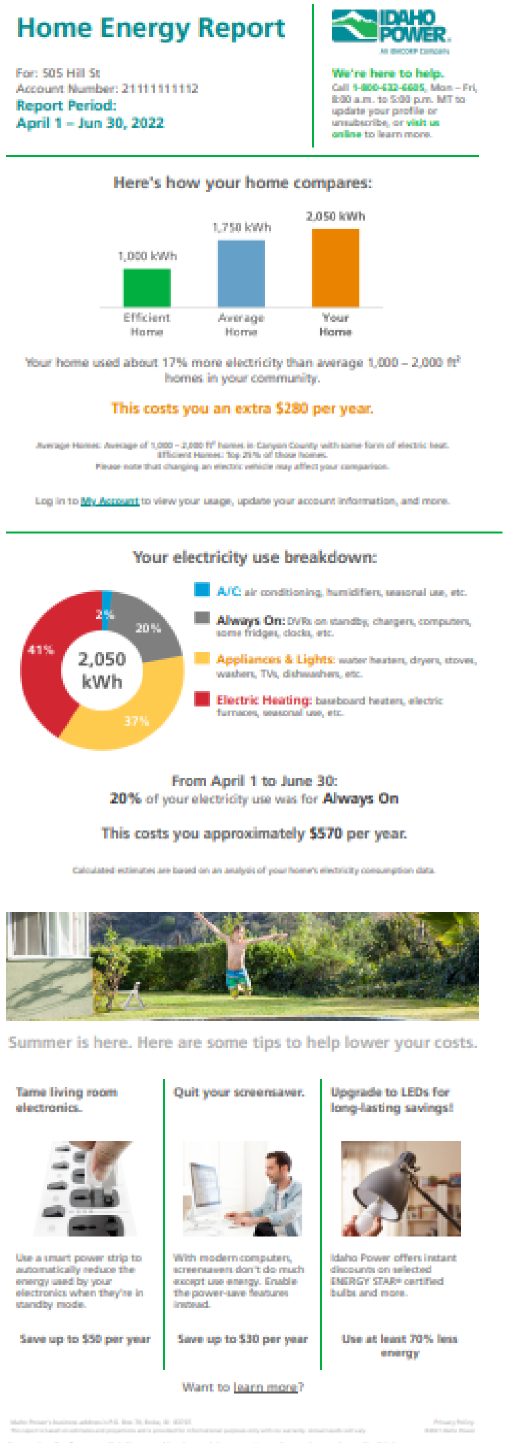
A-3. Sample Email Report — Always-On Tips



Home Energy Report

For: 505 Hill St
Account Number: 21111111112
Report Period:
April 1 – Jun 30, 2022

IDAHO POWER.

We're here to help.
Call 1-800-632-6605, Mon – Fri, 8:00 a.m. to 5:00 p.m. MT to update your profile or unsubscribe, or visit us online to learn more.

Here's how your home compares:

Your home used about 17% more electricity than average 1,000 – 2,000 ft² homes in your community.

This costs you an extra $280 per year.

Average Homes: Average of 1,000 – 2,000 ft² homes in Canyon County with some form of electric heat.
Efficient Homes: Top 25% of those homes.
Please note that charging an electric vehicle may affect your comparison.

Log in to My Account to view your usage, update your account information, and more.

Your electricity use breakdown:

From April 1 to June 30:
20% of your electricity use was for Always On

This costs you approximately $570 per year.

Calculated estimates are based on an analysis of your home's electricity consumption data.

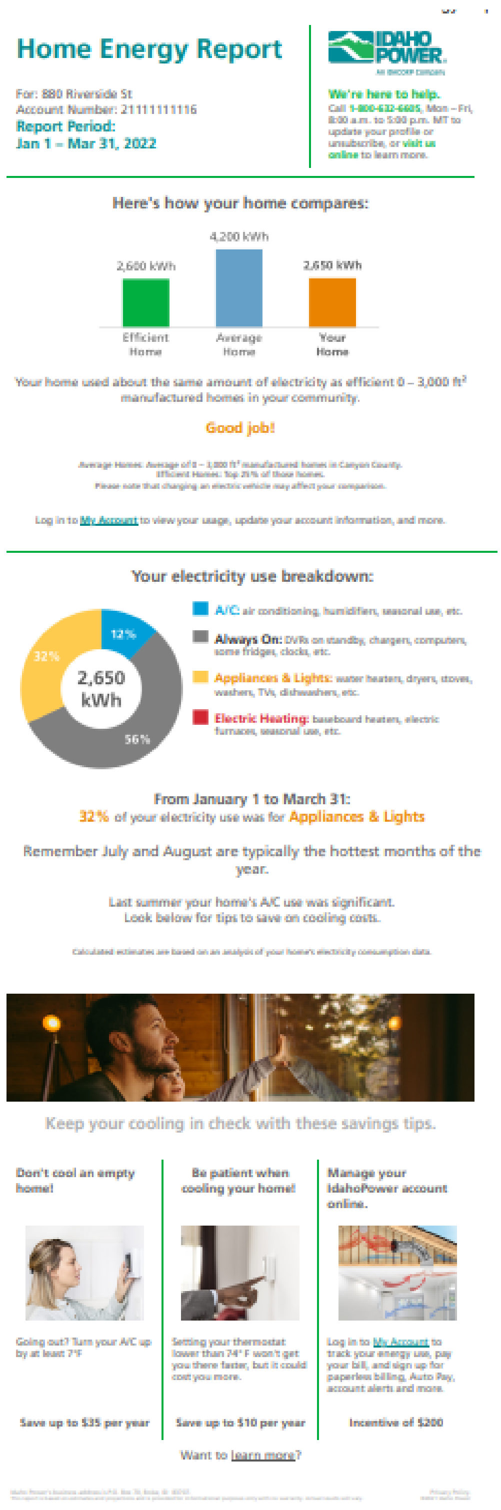
Summer is here. Here are some tips to help lower your costs.

Tame living room electronics.	Quit your screensaver.	Upgrade to LEDs for long-lasting savings!
Use a smart power strip to automatically reduce the energy used by your electronics when they're in standby mode.	With modern computers, screensavers don't do much except use energy. Enable the power-save features instead.	Idaho Power offers instant discounts on selected ENERGY STAR® certified bulbs and more.
Save up to $50 per year	Save up to $30 per year	Use at least 70% less energy

Want to learn more?

To unsubscribe from email delivery and begin receiving your Home Energy Report by mail, click here.

A-4. Sample Email Report — A/C Tips



Home Energy Report

For: 880 Riverside St
Account Number: 21111111116
Report Period:
Jan 1 – Mar 31, 2022

IDAHO POWER.
An IDACORP Company

We're here to help.
Call **1-800-632-6605**, Mon – Fri, 8:00 a.m. to 5:00 p.m. MT to update your profile or unsubscribe, or **visit us online** to learn more.

Here's how your home compares:

Efficient Home	Average Home	Your Home
2,600 kWh	4,200 kWh	2,650 kWh

Your home used about the same amount of electricity as efficient 0 – 3,000 ft² manufactured homes in your community.

Good job!

Average Homes: Average of 0 – 3,000 ft² manufactured homes in Canyon County.
Efficient Homes: Top 25% of those homes.
Please note that charging an electric vehicle may affect your comparison.

Log in to My Account to view your usage, update your account information, and more.

Your electricity use breakdown:

2,650 kWh
12%
32%
56%

- **A/C:** air conditioning, humidifiers, seasonal use, etc.
- **Always On:** DVRs on standby, chargers, computers, some fridges, clocks, etc.
- **Appliances & Lights:** water heaters, dryers, stoves, washers, TVs, dishwashers, etc.
- **Electric Heating:** baseboard heaters, electric furnaces, seasonal use, etc.

From January 1 to March 31:
32% of your electricity use was for **Appliances & Lights**

Remember July and August are typically the hottest months of the year.

Last summer your home's A/C use was significant.
Look below for tips to save on cooling costs.

Calculated estimates are based on an analysis of your home's electricity consumption data.

Keep your cooling in check with these savings tips.

Don't cool an empty home!	**Be patient when cooling your home!**	**Manage your IdahoPower account online.**
Going out? Turn your A/C up by at least 7°F	Setting your thermostat lower than 74° F won't get you there faster, but it could cost you more.	Log in to My Account to track your energy use, pay your bill, and sign up for paperless billing, Auto Pay, account alerts and more.
Save up to $35 per year	**Save up to $10 per year**	**Incentive of $200**

Want to learn more?

To unsubscribe from email delivery and begin receiving your Home Energy Report by mail, click here.

A-5. Sample Print Report — Appliances & Lights Tips

Report Period:
October 1 – December 31, 2021

Home Energy Report

For: 505 HILL ST
Account Number: 21111111112

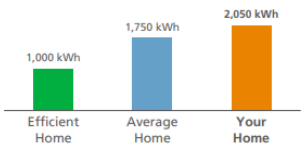
IDAHO POWER
An IDACORP Company

WILLIAM SHATNER
505 HILL ST
TWIN FALLS, ID 10003-1113

We're here to help.
Call **1-800-632-6605**, Mon – Fri, 8:00 a.m. to 5:00 p.m. MT to update your profile or unsubscribe, or visit **idahopower.com/HomeEnergyReport**.

To receive future reports via email, send a request to solutions@idahopower.com.

Here's how your home compares:



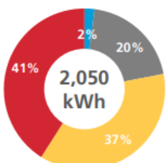
Average Homes: Average of 1,000 – 2,000 ft² homes in Canyon County with some form of electric heat.
Efficient Homes: Top 25% of those homes.
Please note that charging an electric vehicle may affect your comparison.

17% MORE ELECTRICITY

Your home used about 17% more electricity than average 1,000 – 2,000 ft² homes in your community.

This costs you an extra $160 per year.

Your electricity use breakdown:



- **A/C:** air conditioning, humidifiers, seasonal use, etc.
- Always On: DVRs on standby, chargers, computers, some fridges, clocks, etc.
- **Appliances & Lights:** water heaters, dryers, stoves, washers, TVs, dishwashers, etc.
- **Electric Heating:** baseboard heaters, electric furnaces, seasonal use, etc.

From October 1 to December 31:

41% of your electricity use was for **Appliances & Lights**

This costs you approximately **$570** per year.

Calculated estimates based on an analysis of your electricity consumption data.

Want to save?

Here's how you can save on your next bill.

Throw a dry towel in with your load. SAVE UP TO **$15** PER YEAR

Drying times can be quite long for large laundry loads. Reduce the time by adding a dry towel for the first 15 minutes of the drying cycle. It will absorb water and shorten the overall drying time to save you energy and money.

Store hot coffee in a thermos or coffee carafe. SAVE UP TO **$15** PER YEAR

Coffee — it's not just for the morning anymore! Have a hot cup of your favorite brew available anytime you need it by turning off your coffee maker's hot plate and transferring your coffee to a thermos or insulated carafe.

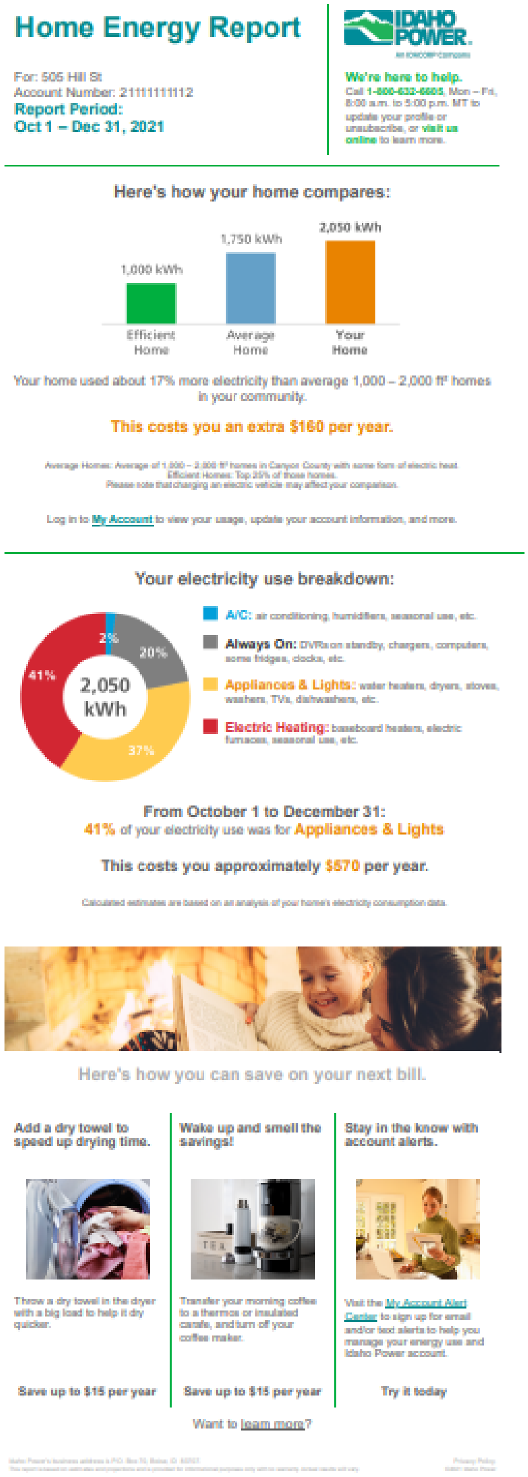
You'll save money and energy, and your coffee will stay fresh longer.

Stay in the know with account alerts. TRY IT TODAY

Visit the My Account Alert Center at idahopower.com/myaccount to sign up to receive email and/or text alerts to help you manage your energy use and Idaho Power account. We'll notify you when you reach a set billing amount, miss a payment or when an outage impacts your home.

This report is based on estimates and projections and is provided for informational purposes only with no warranty. Actual results will vary.

A-6. Sample Email Report — Appliances & Lights Tips



Home Energy Report

For: 505 Hill St
Account Number: 21111111112
Report Period:
Oct 1 – Dec 31, 2021

IDAHO POWER.

We're here to help.
Call 1-800-632-6605, Mon – Fri, 8:00 a.m. to 5:00 p.m. MT to update your profile or unsubscribe, or visit us online to learn more.

Here's how your home compares:

1,000 kWh — Efficient Home
1,750 kWh — Average Home
2,050 kWh — Your Home

Your home used about 17% more electricity than average 1,000 – 2,000 ft² homes in your community.

This costs you an extra $160 per year.

Average Homes: Average of 1,000 – 2,000 ft² homes in Canyon County with some form of electric heat.
Efficient Homes: Top 25% of those homes.
Please note that charging an electric vehicle may affect your comparison.

Log in to My Account to view your usage, update your account information, and more.

Your electricity use breakdown:

2,050 kWh
2%
20%
37%
41%

A/C: air conditioning, humidifiers, seasonal use, etc.
Always On: DVRs on standby, chargers, computers, some fridges, clocks, etc.
Appliances & Lights: water heaters, dryers, stoves, washers, TVs, dishwashers, etc.
Electric Heating: baseboard heaters, electric furnaces, seasonal use, etc.

From October 1 to December 31:
41% of your electricity use was for Appliances & Lights

This costs you approximately $570 per year.

Calculated estimates are based on an analysis of your home's electricity consumption data.

Here's how you can save on your next bill.

Add a dry towel to speed up drying time.
Throw a dry towel in the dryer with a big load to help it dry quicker.
Save up to $15 per year

Wake up and smell the savings!
Transfer your morning coffee to a thermos or insulated carafe, and turn off your coffee maker.
Save up to $15 per year

Stay in the know with account alerts.
Visit the My Account Alert Center to sign up for email and/or text alerts to help you manage your energy use and Idaho Power account.
Try it today

Want to learn more?

To unsubscribe from email delivery and begin receiving your Home Energy Report by mail, click here.

A-7. Sample Print Report — Heating Tips

Report Period:
October 1 – December 31, 2021

Home Energy Report

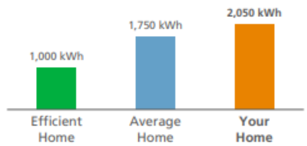
For: 505 HILL ST
Account Number: 21111111112

******************AUTO**5-DIGIT 12353 2 21111111112 999
WILLIAM SHATNER
505 HILL ST
TWIN FALLS, ID 10003-1113

We're here to help.
Call **1-800-632-6605**, Mon – Fri, 8:00 a.m. to 5:00 p.m. MT to update your profile or unsubscribe, or visit **idahopower.com/HomeEnergyReport**.

To receive future reports via email, send a request to solutions@idahopower.com.

Here's how your home compares:



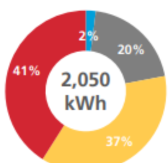
■ Average Homes: Average of 1,000 – 2,000 ft² homes in Canyon County with some form of electric heat.
■ Efficient Homes: Top 25% of those homes.
Please note that charging an electric vehicle may affect your comparison.

17% MORE ELECTRICITY

Your home used about 17% more electricity than average 1,000 – 2,000 ft² homes in your community.

This costs you an extra $160 per year.

Your electricity use breakdown:



- **A/C:** air conditioning, humidifiers, seasonal use, etc.
- Always On: DVRs on standby, chargers, computers, some fridges, clocks, etc.
- **Appliances & Lights:** water heaters, dryers, stoves, washers, TVs, dishwashers, etc.
- **Electric Heating:** baseboard heaters, electric furnaces, seasonal use, etc.

From October 1 to December 31:

41% of your electricity use was for

Electric Heating

This costs you approximately **$570** per year.

Calculated estimates based on an analysis of your electricity consumption data.

Want to save?

Kick off the New Year with these energy-saving tips.

Lower your thermostat and use your ceiling fan to stay comfortable. SAVE UP TO **$55** PER YEAR

Your ceiling fan can help keep you warm in the winter as well as cool in the summer. During cold weather, set your ceiling fan to a low setting and run it clockwise (when looking up) to move warm air near the ceiling back down into the living area. Since you'll feel warmer, you can turn the thermostat down a degree or two.

To change the direction of your fan, use the reverse switch on the body of your fan, or select the reverse setting on your fan's remote.

Insulate your outlets and switches to save energy. SAVE UP TO **$30** PER YEAR

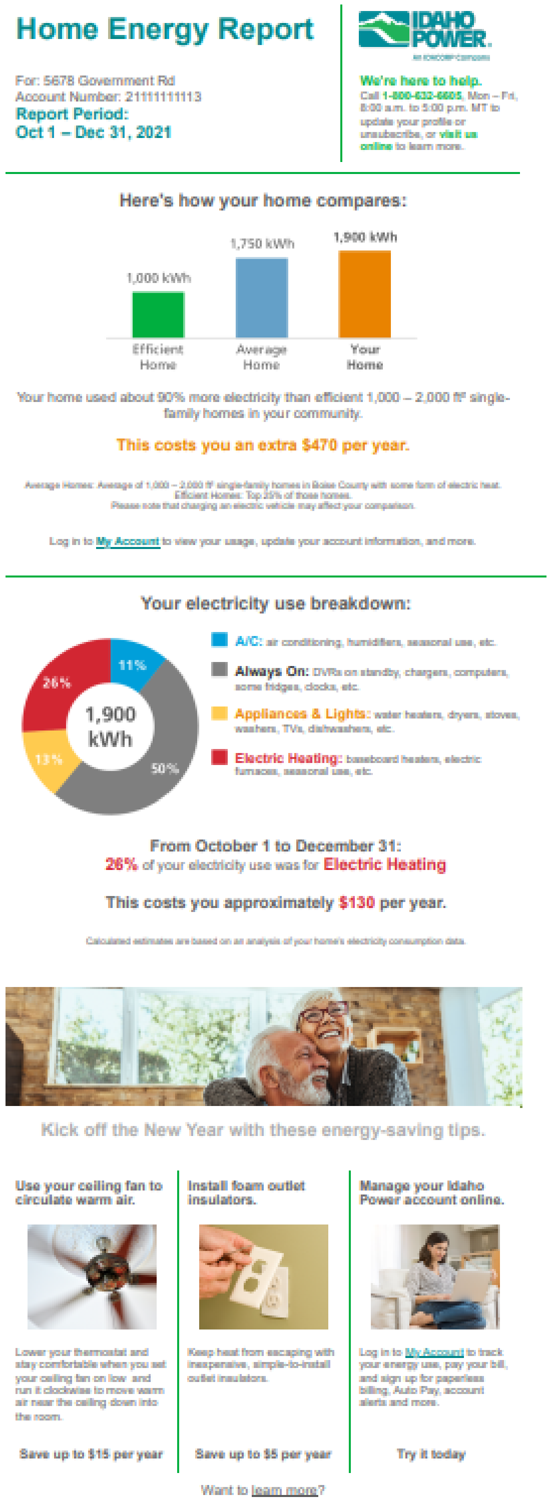
Did you know warm air can escape through your outlets? Keep heat in and drafts out with this easy and inexpensive DIY improvement. Install foam outlet insulators or gasket covers behind your switch plates and outlets on exterior walls to prevent cold air from coming into your home.

Manage your Idaho Power account online. TRY IT TODAY

Log in to My Account at idahopower.com/myaccount to track your energy use, pay your bill, and sign up for paperless billing, Auto Pay, account alerts and more.

This report is based on estimates and projections and is provided for informational purposes only with no warranty. Actual results will vary.

A-8. Sample Email Report — Heating Tips



Home Energy Report

For: 5678 Government Rd
Account Number: 21111111113
Report Period:
Oct 1 – Dec 31, 2021

IDAHO POWER.

We're here to help.
Call 1-800-632-6605, Mon – Fri, 8:00 a.m. to 5:00 p.m. MT to update your profile or unsubscribe, or visit us online to learn more.

Here's how your home compares:

Your home used about 90% more electricity than efficient 1,000 – 2,000 ft² single-family homes in your community.

This costs you an extra $470 per year.

Average Homes: Average of 1,000 – 2,000 ft² single-family homes in Boise County with some form of electric heat.
Efficient Homes: Top 25% of those homes.
Please note that charging an electric vehicle may affect your comparison.

Log in to My Account to view your usage, update your account information, and more.

Your electricity use breakdown:

A/C: air conditioning, humidifiers, seasonal use, etc.
Always On: DVRs on standby, chargers, computers, some fridges, clocks, etc.
Appliances & Lights: water heaters, dryers, stoves, washers, TVs, dishwashers, etc.
Electric Heating: baseboard heaters, electric furnaces, seasonal use, etc.

From October 1 to December 31:
26% of your electricity use was for Electric Heating

This costs you approximately $130 per year.

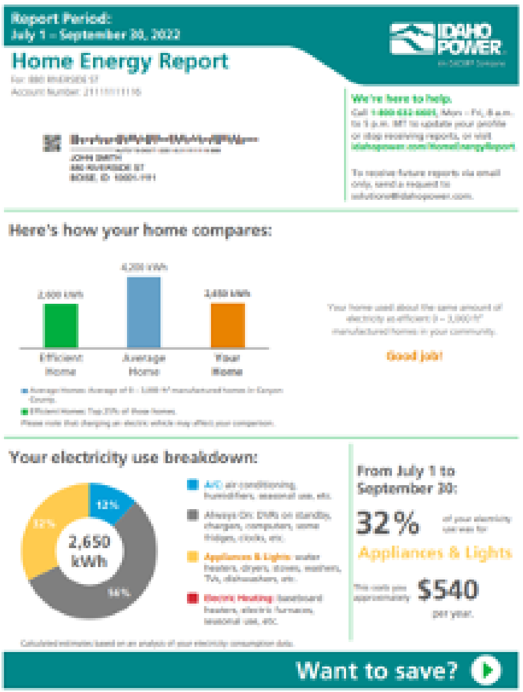
Calculated estimates are based on an analysis of your home's electricity consumption data.

Kick off the New Year with these energy-saving tips.

Use your ceiling fan to circulate warm air.	Install foam outlet insulators.	Manage your Idaho Power account online.
Lower your thermostat and stay comfortable when you set your ceiling fan on low and run it clockwise to move warm air near the ceiling down into the room.	Keep heat from escaping with inexpensive, simple-to-install outlet insulators.	Log in to My Account to track your energy use, pay your bill, and sign up for paperless billing, Auto Pay, account alerts and more.
Save up to $15 per year	Save up to $5 per year	Try it today

Want to learn more?

A-9 Samples print report - hot water tips



4.2 Appendix B: Quarterly Program Monitoring Reports

Reports on program metrics were reported on a quarterly basis, according to the schedule below.

Report #	Date Presented	Report Period
Q1	May 16, 2022	January 1, 2022 – March 31, 2022
Q2	August 16, 2022	April 1, 2022 - June 30, 2022
Q3	November 15, 2022	July 1, 2022 - September 30, 2022
Q4	February 21, 2023	October 1, 2022 - December 31, 2022

Idaho Power Company Home Energy Report Program Year 2022

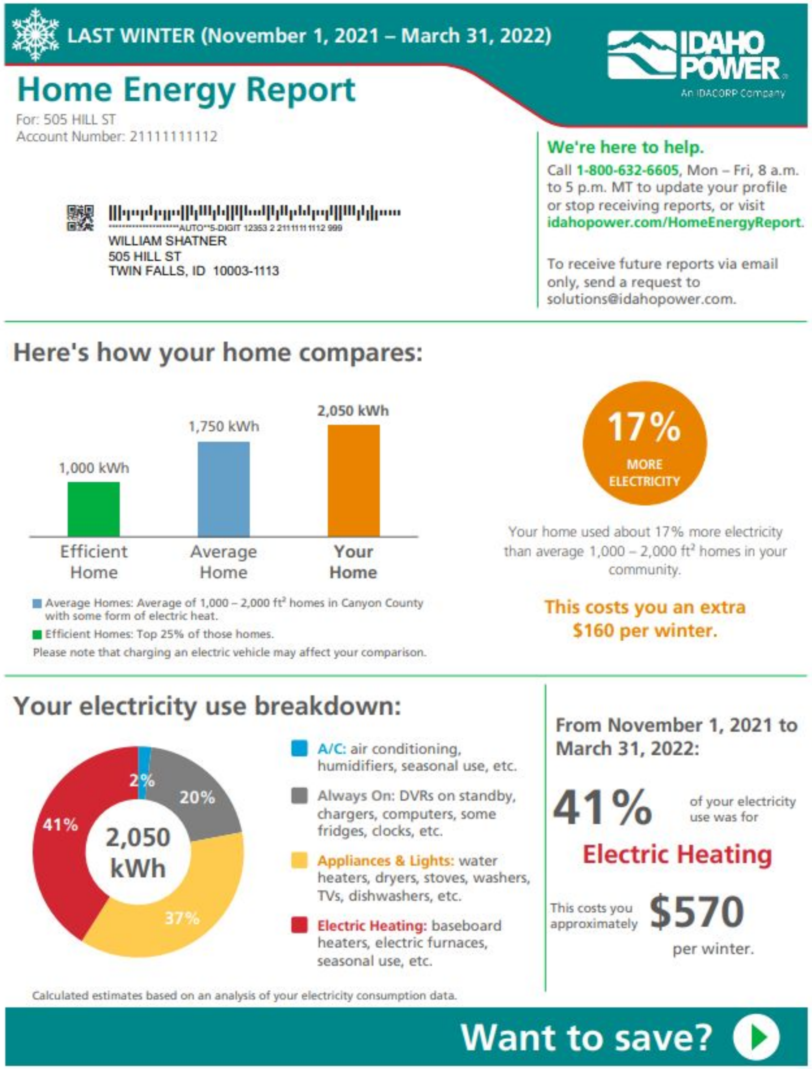
Quarterly Monitoring Report is for Report Period October 1, 2022 – December 31, 2022

Presented on February 21, 2023

HARRIS
UTILITIES

Agenda

- Program Overview
- Savings Estimates
- Program Results
- Microsite and CSA Results
- Attrition and Opt-outs
- Questions



Home Energy Report Program Overview

2022 Program Design

Pilot Customers Treated: **14,867**

Total # of Customers in Quarter		
Group	**Customers Eligible to Receive Reports**	**Customers that Received Reports**
T1 (electric heating)	4,400	4,398
T2 (electric heating)	3,680	3,670
T3	4,616	4,610
T4	2,171	2,164
T6	84,210	83,674
Total	**99,077**	**98,516**

Pulled quarterly after reports are sent.

Customers Eligible to Receive Reports is a subset of the Evaluation Group. Some of the eligible customers did not receive reports.

HARRIS UTILITIES

Report Schedule

	2022											
Cohort	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
T1, T2, T3, T4, T6												

	2023											
Cohort	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
T1, T2, T3, T4, T6												

T5 customers were removed from treatment in May 2020

HARRIS UTILITIES

Terminology

Program Group

The program group is the term we use to refer to customers that are in the treatment group and are actively being treated with reports. These customers by default are also part of the evaluation group.

Evaluation Group

The evaluation group is the term we use to refer to customers that are in the treatment or control group and are factored into the savings evaluations. These customers may or may not be actively receiving reports.

Overview of Waves

Wave 1

- Group 1 = high heating group
- Group 3 = high overall usage group
- Group 4 = medium overall usage group
- Group 5 = low overall usage group (removed)

Wave 2

- Group 2 = high heating group

Wave 3

- Group 6 = all remaining eligible customers (added June 2020)

Program Savings Summary

Q4 Quarterly Savings Summary

Cohort	Treatment Period	Average Energy Savings in kWh per Customer	Cumulative Savings (all months, all households, kWh)	Percent Savings
T1234	October 1, 2022 – December 31, 2022	21.56	344,854	0.83%
T6	October 1, 2022 – December 31, 2022	47.60	4,034,857	1.25%
T12346	October 1, 2022 – December 31, 2022	43.46	4,379,711	1.18%

	T1	T2	T3	T4	T6
Treatment	4,730	4,154	4,837	2,272	84,772
Control	1,186	664	2,881	2,135	11,477

T&C counts are for the current quarter only and are captured at end of quarter.

This is what we refer to as the Evaluation Group. Customers that moved out before the beginning of the quarter are not included in savings and T&C counts.

2022 Savings Summary

Cohort	Treatment Period	Average Energy Savings in kWh per Customer	Cumulative Savings (all months, all households, kWh)	Percent Savings
T1234	January 1, 2022 – December 31, 2022	169.67	2,746,962	1.08%
T6	January 1, 2022 – December 31, 2022	206.61	17,728,033	1.35%
T12346	January 1, 2022 – December 31, 2022	200.74	20,474,995	1.31%

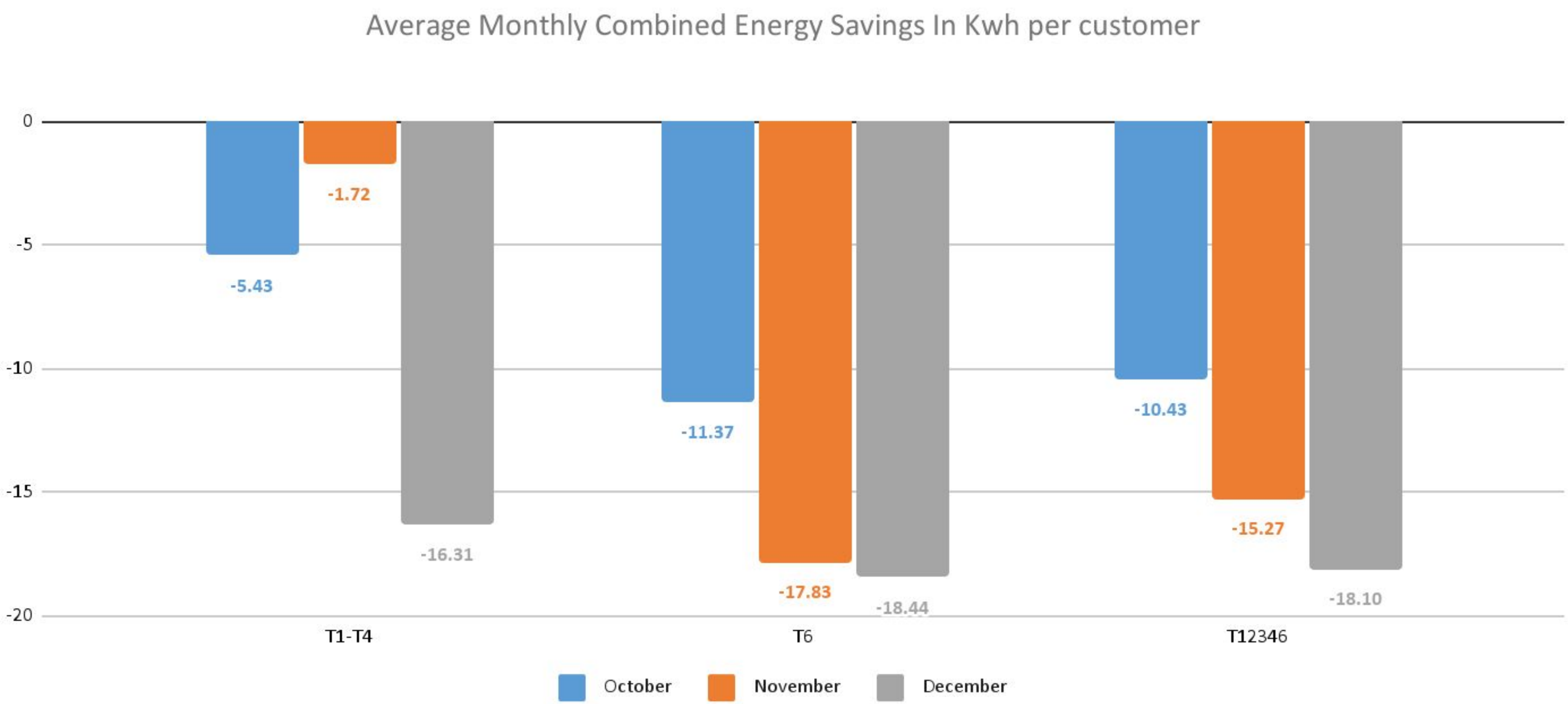
	T1	T2	T3	T4	T6
Treatment	4,803	4,203	4,892	2,292	85,806
Control	1,196	674	2,916	2,158	11,604

T&C counts are for Jan 1st - Treatment Period end date and are captured at end of the treatment quarter. This is what we refer to as the Evaluation Group. Customers that moved out during the Treatment Period <u>are</u> included in savings and T&C counts.

HARRIS UTILITIES

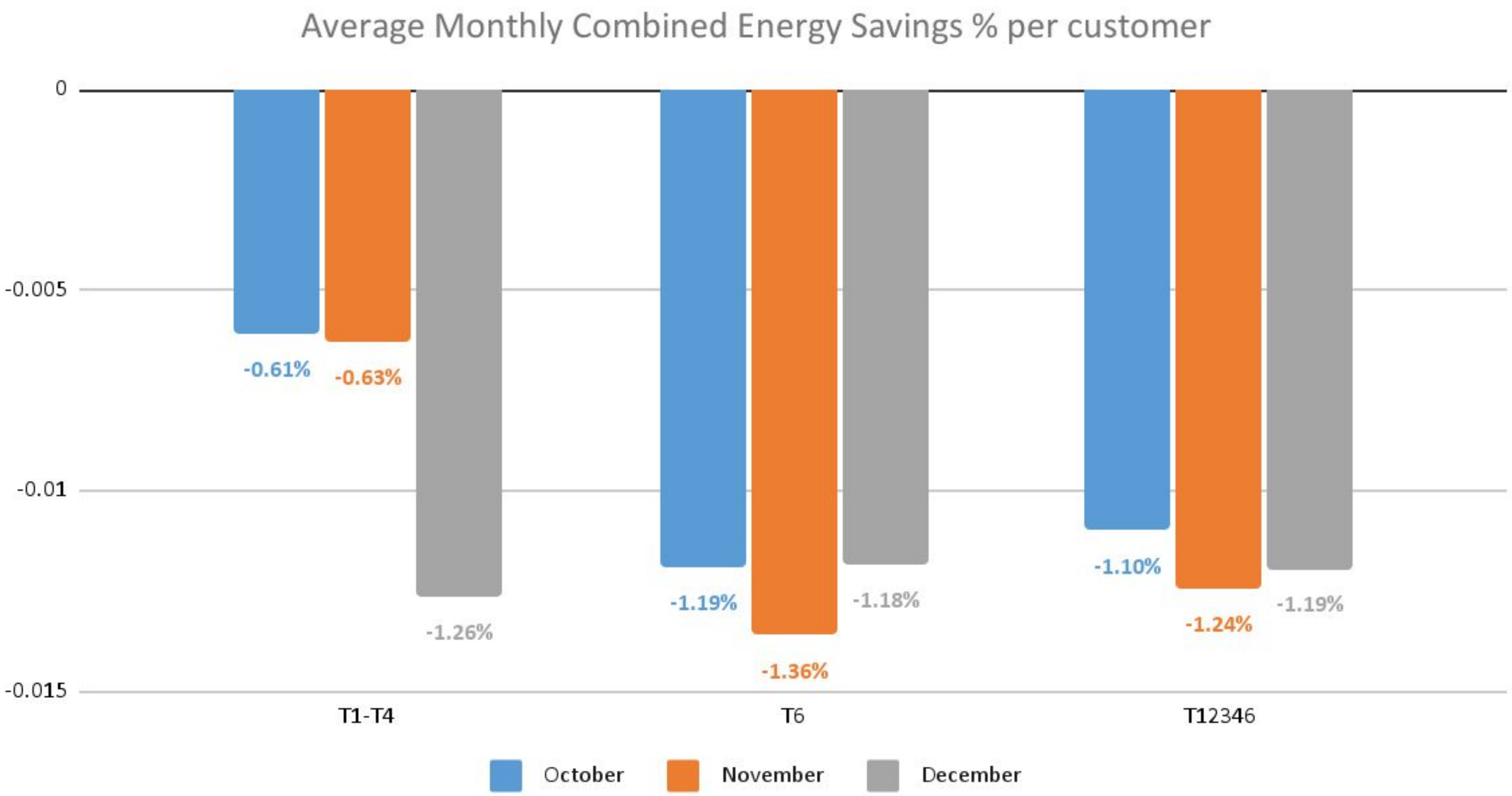
HER Program Results

Average Energy Savings in kWh per Customer

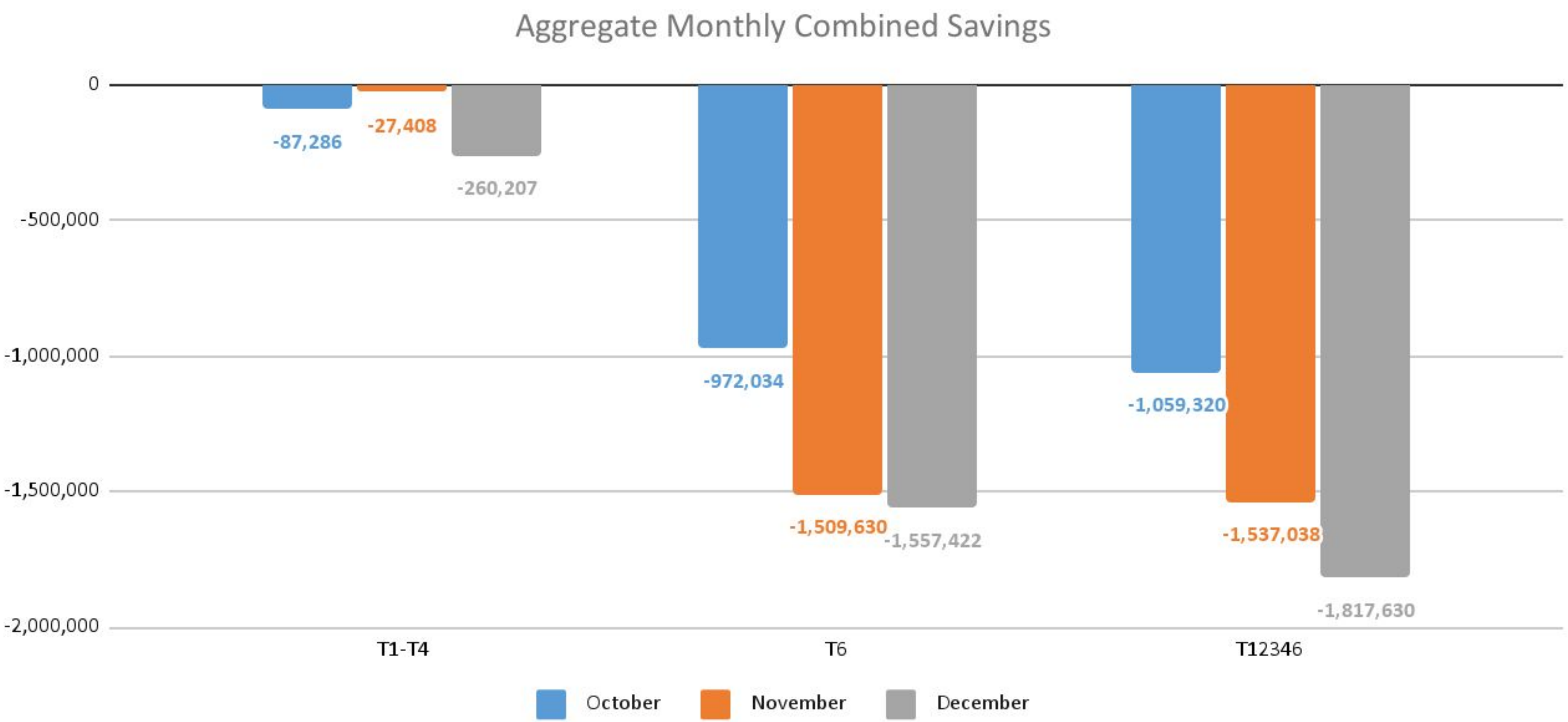


HARRIS UTILITIES

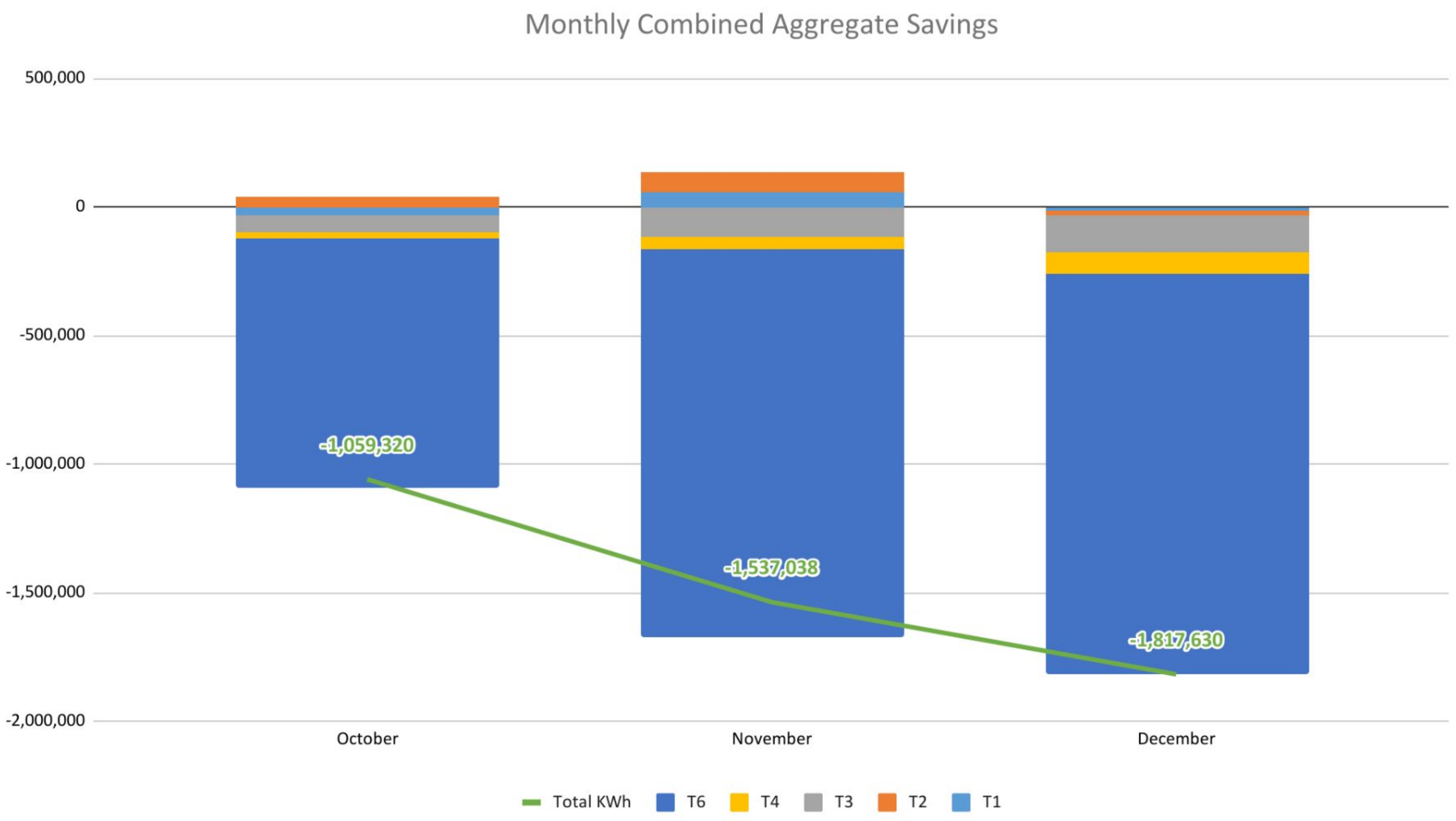
Average Monthly Energy Savings in %



Aggregate Monthly Savings

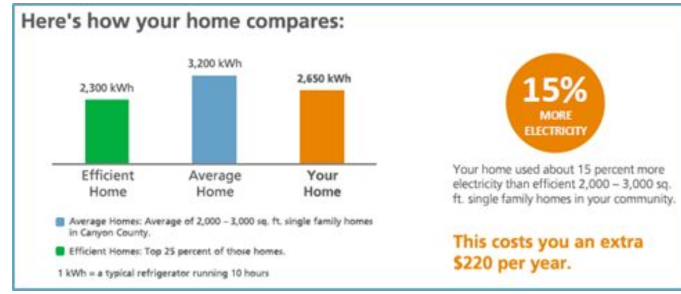


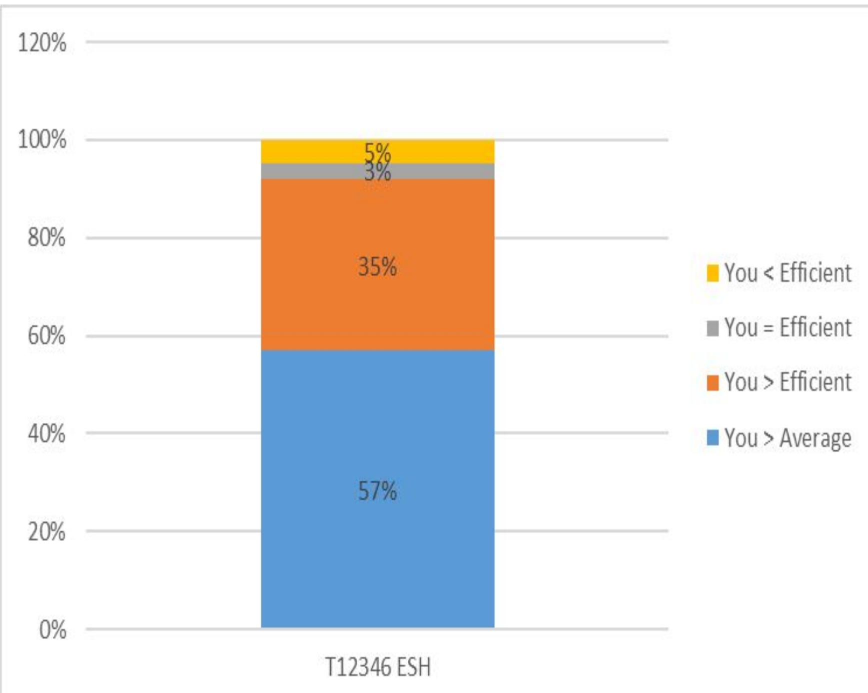
Combined Aggregate Savings by Month (kWh)

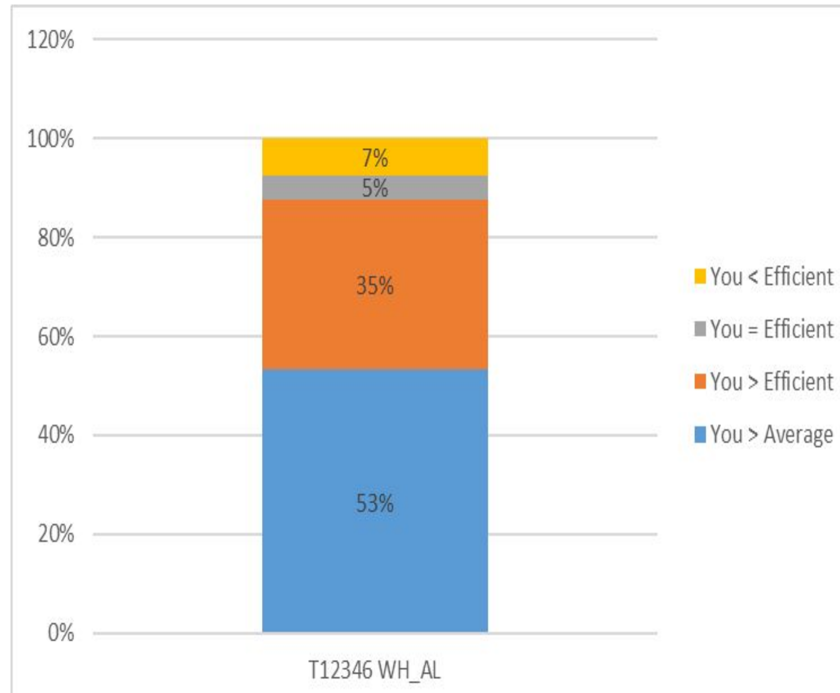


HARRIS UTILITIES

T12346 Peer Comparison Distribution for the November Report







Attrition Overview – T1234

T12345	Feb 2021	May 2021	Aug 2021	Nov 2021	Feb 2022	May 2022	Aug 2022	Nov 2022	2022 Total
Total Reports Delivered	**16,915**	**16,652**	**16,263**	**15,965**	**15,651**	**15,410**	**15,105**	**14,839**	**61,005**
Move Outs	269	214	298	271	50	435	250	307	1,042
Unsupported Rate Code (IO6)	—	—	—	103	22	25	31	33	111
Location	100	—	—	—	—	—	—	—	—
Property	—	—	57	—	—	—	—	—	—
Opt-Outs	4	7	1	1	2	1	6	5	14
USPS - Non Deliverables	47	—	—	—	—	—	—	—	—
Total Permanent Removals	**420**	**221**	**356**	**375**	**74**	**461**	**287**	**345**	**1,167**
AMI Insufficient/Negative Usage	65	48	132	105	92	70	88	31	281
Insufficient Benchmarking	—	4	2	4	5	7	8	11	31
Total Temporary Removals	**65**	**52**	**134**	**109**	**97**	**77**	**96**	**42**	**312**
Total Removals	**485**	**273**	**490**	**484**	**171**	**538**	**383**	**387**	**1,479**

Numbers for current quarter are pulled right before quarterly report generation

Attrition Overview – T6

T6	Feb 2021	May 2021	Aug 2021	Nov 2021	Feb 2022	May 2022	Aug 2022	Nov 2022	2022 Total
Total Reports Delivered	**98,238**	**96,277**	**93791**	**91,233**	**89,025**	**87,418**	**85,462**	**83,674**	**345,579**
Move Outs	1,501	1,702	2,199	2,265	385	2,970	1,663	2,187	7,205
Unsupported Rate Code (IO6)	—	—	—	599	192	167	197	194	750
Location	377	—	—	—	—	—	—	—	—
Property	5	14	24	8	9	2	—	3	14
Opt-Outs	38	38	21	28	17	23	20	17	77
USPS - Non Deliverables	314	—	—	—	—	—	—	—	—
Total Permanent Removals	**2,235**	**1,754**	**2,244**	**2,900**	**603**	**3,162**	**1,880**	**2,401**	**8,046**
AMI Insufficient/Negative Usage	513	374	901	996	779	579	653	198	2,209
Insufficient Benchmarking	—	18	5	19	20	26	28	44	118
Total Temporary Removals	**513**	**392**	**906**	**1,105**	**799**	**605**	**681**	**242**	**2,327**
Total Removals	**2,748**	**2,146**	**3,105**	**3,915**	**1,402**	**3,767**	**2,561**	**2,643**	**10,373**

Numbers for current quarter are pulled right before quarterly report generation

Attrition and Opt Out Rates

All Treatment Customers (January 1, 2022 – December 31, 2022)		
Permanent Removals	9,228	6.84%
Opt Outs	106	0.079%

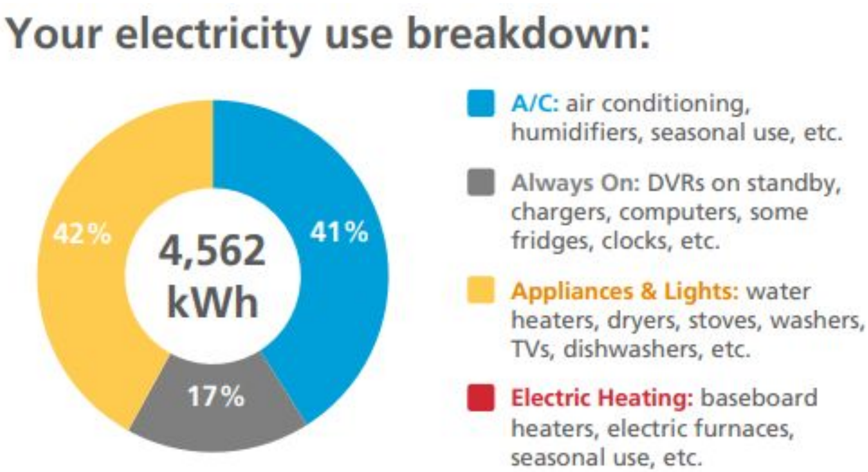
T1234 Customers (January 1, 2022 – December 31, 2022)		
Permanent Removals	1,170	4.44%
Opt Outs	17	0.065%

T6 Customers (January 1, 2022 – December 31, 2022)		
Permanent Removals	8,058	7.42%
Opt Outs	89	0.082%

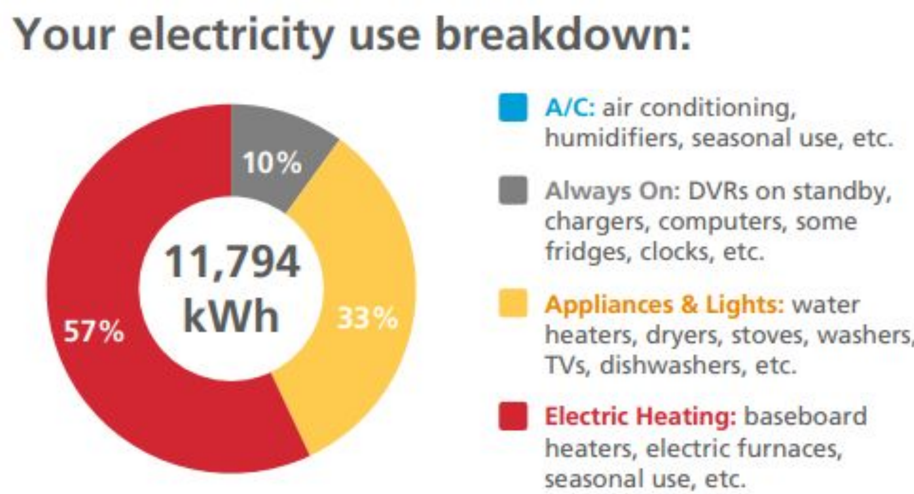
HARRIS UTILITIES

Average Electricity Use Breakdown

T12346 July - Sept AL_WH



T12346 Nov - March (Previous Winter) ESH

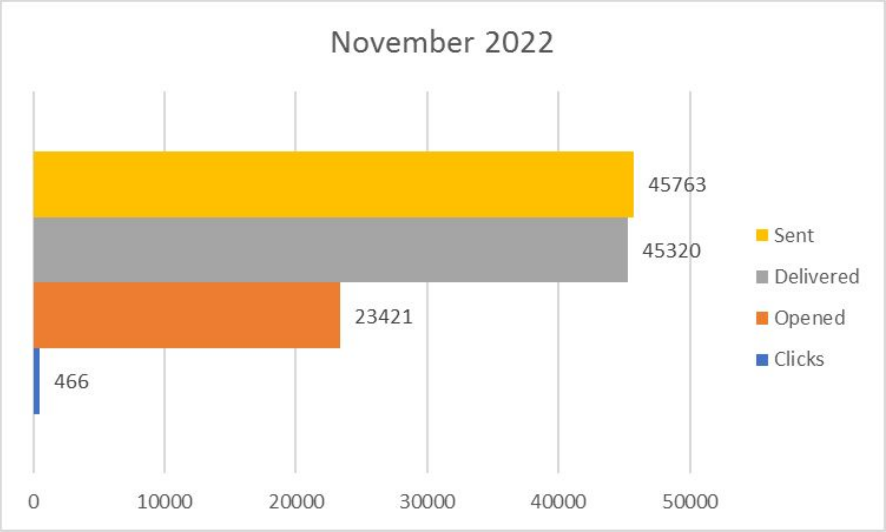


HARRIS UTILITIES

Email Open Rates Remain High

	May 2020	Aug 2020	Oct 2020	Nov 2020	Dec 2020	Feb 2021	May 2021	Aug 2021	Nov 2021	Feb 2022	May 2022	Aug 2022	Nov 2022
Total # of Emails	12	55	75	16	89	106	122	126	153	151	152	52,348	45,320
Click-Through Rate	25%	7.5%	7.7%	8.3%	22.6%	16.5%	4.8%	6.4%	10.4%	22%	9.9%	2.8%	2.0%
Open Rate	73%	73%	69%	75%	70%	75%	68%	75%	75%	81%	73%	49%	52%
Unsubscribe Clicks	0	0	0	0	0	0	3	0	3	5	0	58	42
Unsubscribe Rate	0%	0%	0%	0%	0%	0%	0.8%	0%	0%	1.2%	0%	0.05%	0.02%
Click Rate on Rebate Link	0%	0%	0%	0%	0%	4%	0%	1.1%	0%	1.6%	1.8%	0.72%	6.2%

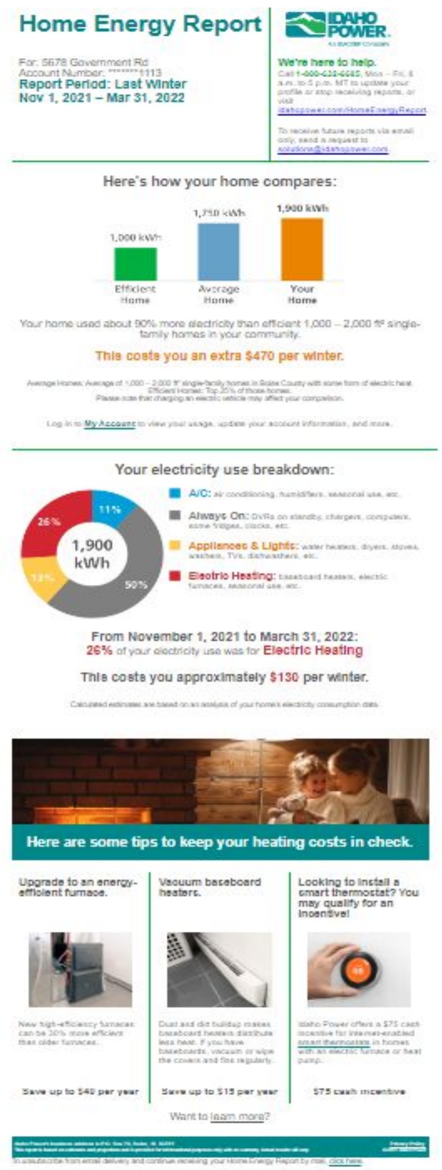
- 15 total pilot customers switched to email (0.1%)
- 176 total new customers switched to email (0.16%)
- 45,320 total emails were delivered in November 2022

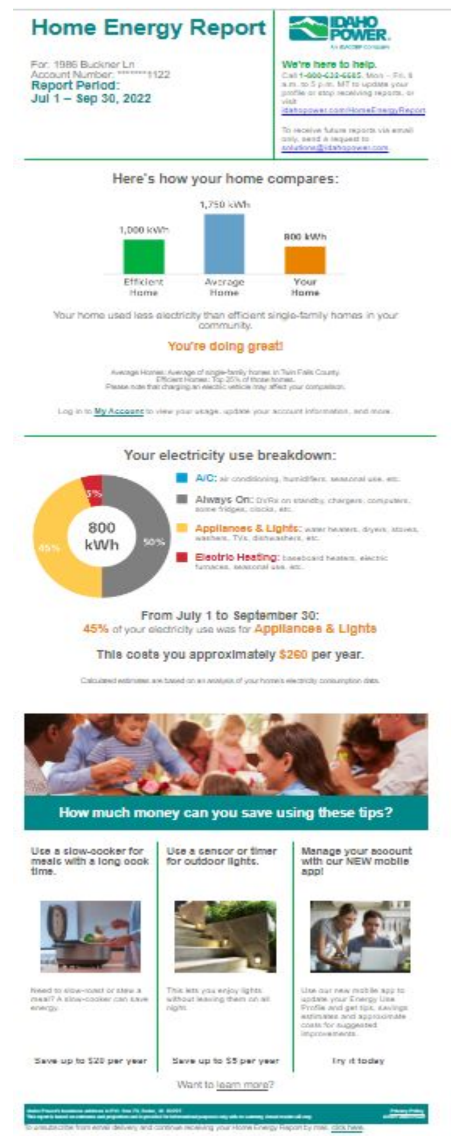


HARRIS UTILITIES

2022 Email Click-Throughs

	Feb	May	Aug	Nov
View HTML	9	4	270	169
Rebates	2	2	187	29
MyAccount	3	3	122	123
FAQ	0	0	0	0
Privacy	2	0	7	2
Learn More	3	1	30	16
Unsubscribe	5	0	58	42





CSA & Microsite Analysis

Call Center Volume Reflects Quarterly Schedule

Call Reason	2022												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
General	3	20	5	3	53	2	3	31	3	7	15	1	146
Profile Update	—	14	1	—	13	1	—	11	—	5	10	—	55
Opt-Out	—	20	2	—	25	1	3	17	2	4	16	3	93
Escalation	—	—	—	—	—	—	—	—	—	—	—	—	0
Non-Program Related	1	14	8	1	17	5	1	19	1	3	7	2	79
Switch to Email	—	6	2	—	5	—	—	8	—	3	4	1	29
Switch to Paper	—	—	1	—	1	—	—	1	—	—	—	—	3
Other	—	5	1	1	5	—	1	7	—	4	4	1	29
Total Reasons*	**4**	**79**	**20**	**5**	**119**	**9**	**8**	**94**	**6**	**26**	**56**	**8**	**434**

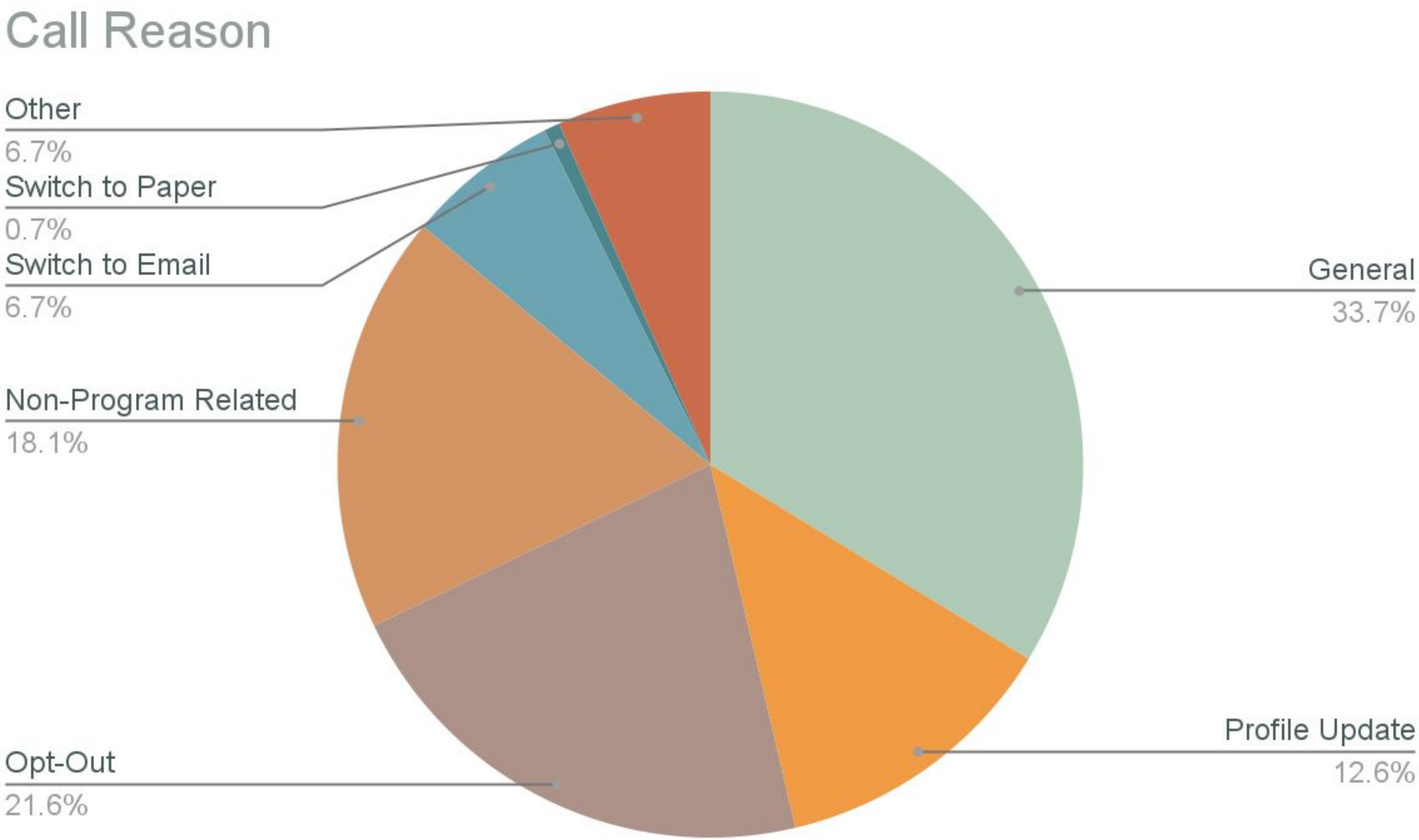
Treatment Month

* Some customers call in for more than one reason which is why there is a variance in Total Reasons and Total Calls.

	2018	2019	2020	2021	2022
Total Calls*	411	246	1,087	660	409

Total Call Center Volume down 38% compared to 2021 and 62% from 2020!

2022 Distribution of Calls by Type



HARRIS UTILITIES

Customer Insights and Comments

General Questions

- "Requested info on energy-savings programs for our residential customers. "
- "[Customer] was concerned that uses 70 percent more over summer AC time. We talked about historical heat wave and isn't directly related to homes in his sub it is the county. We talked about smart thermostat, energy audit and EE tips. They are on well water and retired so home all the time. Didn't want to fill out home profile. Would like to know on report how many homes were in this higher threshold."
- "Wanted to know if any programs available to upgrade home."
- "Gary called showing above average even with new AC and furnace..advised he does pretty good just at the high range of 1k-2k comparison with 1980 sq ft"

Opt-outs

- "Customer feels the information is inaccurate"
- "Customer is planning to move out"

Other

- "she feels like she is being judged for using too much electricity."
- "[Customer] high efficiency showerhead from past kit needs another one. Advised we no longer offer the kits. Recommended researching the brand online or at local hardware store for replacement. It was a High efficiency Evolve showerhead with thermostatic shower valve (TSV)"

HARRIS UTILITIES

Appendix

HARRIS UTILITIES

Attrition Overview Definitions

Unsupported Rate Code: Customers whose rate code is I06.

Location: People who don't have assigned benchmark location due to insufficient benchmarks. In February 2021, customers under this category were permanently removed. Location removals afterwards are temporary and can be tracked under Insufficient Benchmarking.*

Property: Customers with unsupported hometype. For T12345, it is home type other than single family home and manufactured home. For T6, it is home type other than single family home.

Opt-Out: Customers who opted out. This number is pulled directly from our backend system.

USPS - Non deliverables: Customers verified as undeliverable by USPS. They were not removed from program anymore after 2021 February.

AMI Insufficient/ Negative Usage: Customers whose total hourly AMI count is below 90% within report window period or below 97.5% within HoD period (one year); customers whose total usage within window period is negative. Before 2020 June, this category is permanent removals. Afterwards it changed into temporary removals.*

Insufficient benchmark: Customers whose benchmark home count is below threshold. These customers are temporarily removed as they could lead to the missing of assigned benchmark location. Benchmarking is related to the home profile information.

The HPU is updated every month. If customers or the benchmark homes' HPU got updated, the benchmarking may become insufficient. For example, if the threshold of benchmark count is 100 homes and one customer has exactly 100 benchmark homes. Once one of the benchmark home's HPU doesn't match with the customer home after we update HPU, the customers would be labelled as insufficient benchmark.

*IPC raised concerns over the usage of permanent vs temporary removals. Work is needed for these definitions. We will be working together to improve definitions.

Savings Method Change

Old Method

Prior to Q3 2021, only customers that were active through the end of the analysis period were included in the evaluation group. This means that if a customer moved out in the third month of the quarter, their savings for the first two months of the quarter were not measured.

New Method

Per Craig Williamson's suggestion, starting in Q3 2021, data for customers who moved out during the analysis period are included *up until the date they moved out*. This is done consistently for both treatment and control groups.

Impact

Customers with less than three months will have lower consumption. This (appropriately) leads to a slightly lower average savings per customer, but it increases the total savings, since we are multiplying that average by the total count of customers who were active for any part of the quarter.

Statistical Significance of Savings Calculated

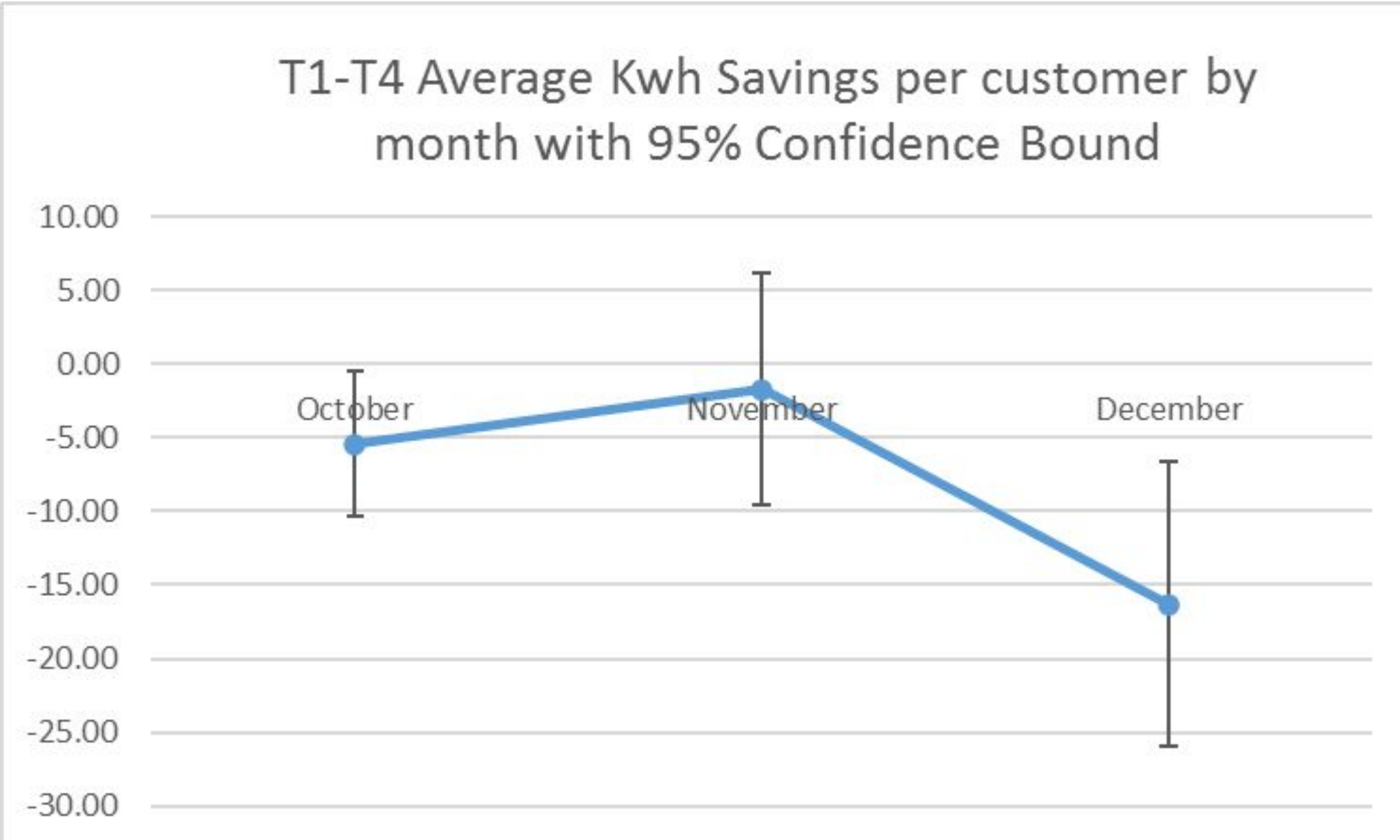
Null hypothesis = no energy savings; Alternative hypothesis = treatment is using less energy than control. Corresponds to a one-tailed test

Cohort	Average Savings (kWh) per Customer	95% Confidence Margin of Error	P-Value of Null Hypothesis being true	Statistically Significant?	Treatment Period
T1234	21.56	14.46	0.00173	YES	October 1, 2022 – December 31, 2022
T6	47.60	24.91	9.005E-05	YES	October 1, 2022 – December 31, 2022
T12346 Combined	43.46	9.49	1.42419E-19	YES	October 1, 2022 – December 31, 2022

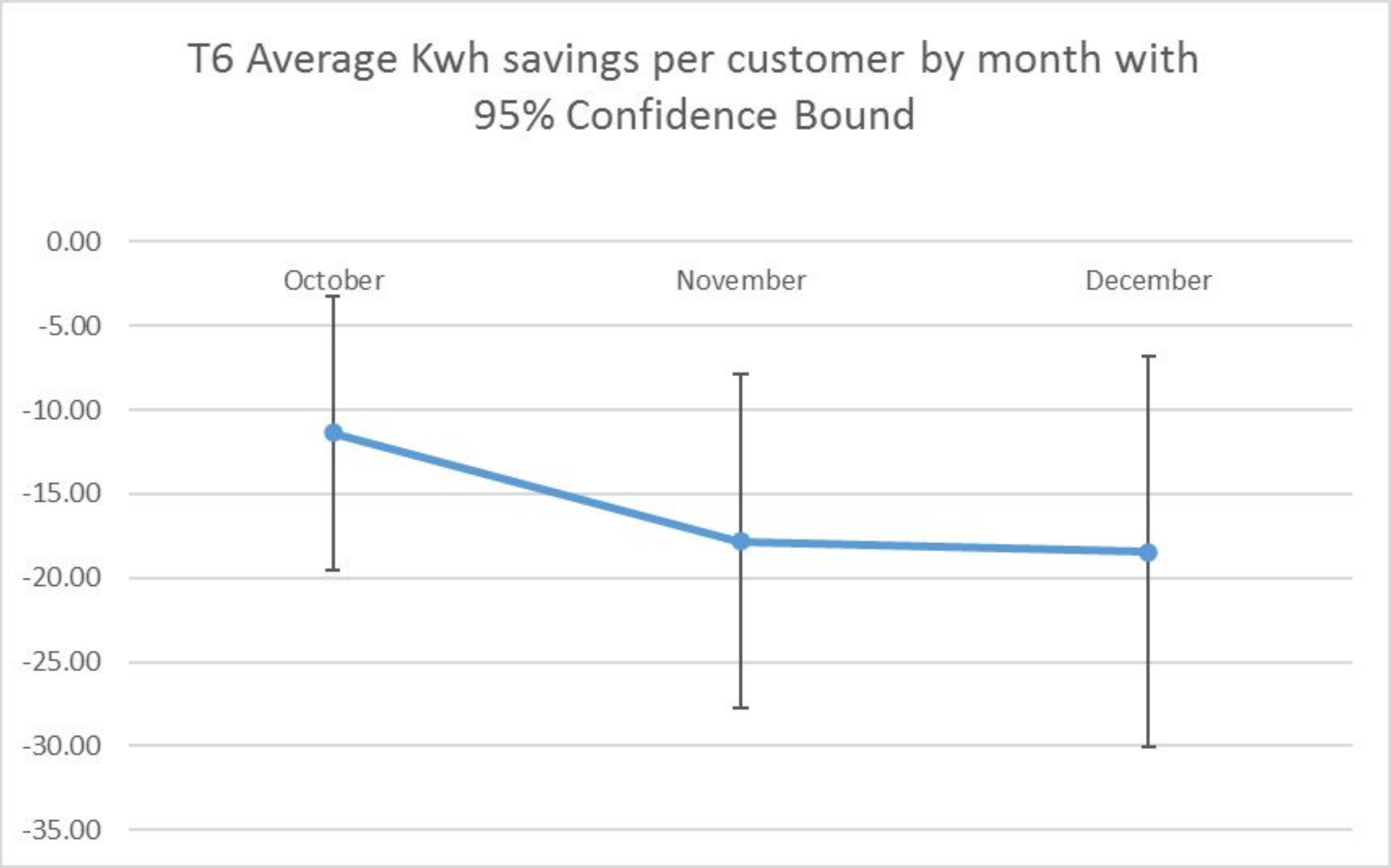
	T1	T2	T3	T4	T6
Treatment	4,730	4,154	4,837	2,272	84,772
Control	1,186	664	2,881	2,135	11,477

HARRIS UTILITIES

T1234 Savings Confidence Intervals



T6 Savings Confidence Intervals



T12346 Savings Confidence Intervals