



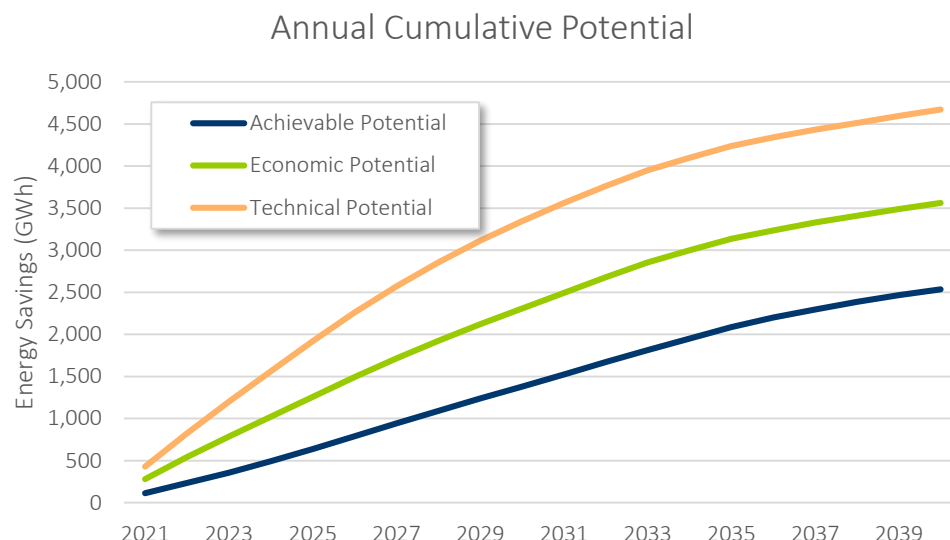
POTENTIAL STUDY OVERVIEW

Prepared for Idaho Power, January 8, 2021

POTENTIAL SUMMARY – ALL SECTORS

First-year achievable savings represent nearly 1% of the baseline projection

Achievable potential captures between 50-75% of the cumulative economic potential over horizon



Summary of Energy Savings (GWh)	2021	2025	2030	2035	2040
Baseline Projection (GWh)	14,677	15,189	16,045	16,977	17,961
Cumulative Savings (GWh)					
Achievable Potential	135	727	1,532	2,223	2,626
Economic Potential	291	1,374	2,488	3,275	3,669
Technical Potential	435	1,947	3,385	4,258	4,679
Energy Savings (% of Baseline)					
Achievable Potential	0.9%	4.8%	9.5%	13.1%	14.6%
Economic Potential	2.0%	9.0%	15.5%	19.3%	20.4%
Technical Potential	3.0%	12.8%	21.1%	25.1%	26.1%

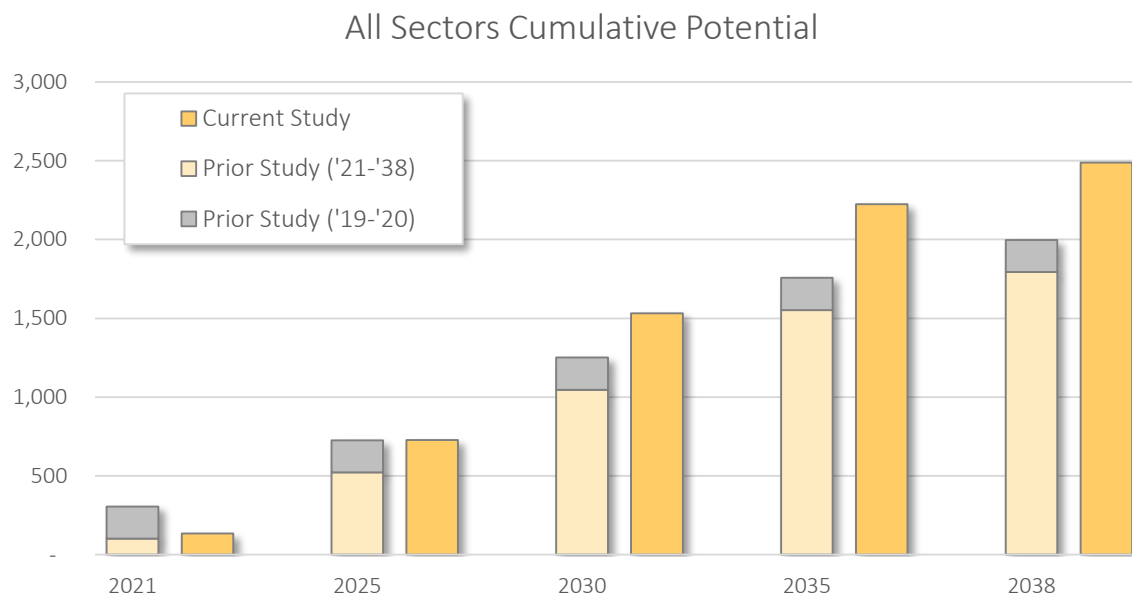
COMPARISON WITH PRIOR STUDY

Comparison must align calendar years, not study years

- Accounts for what transpired in last two years, (2019-2020)
- Also excludes last two years from current study (2039-2040)

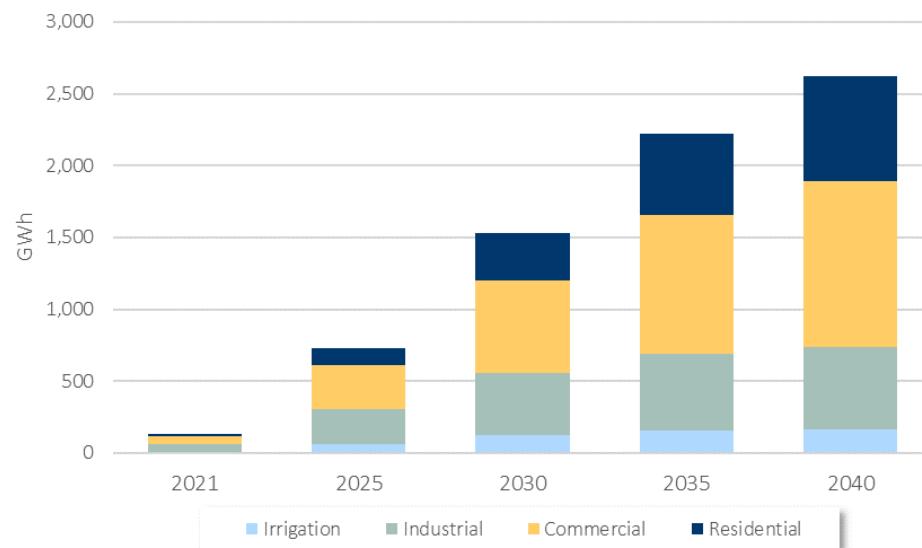
As a result, we can draw up to an 18-year comparison (2021-2038)

Note: previous study used TRC, current study uses UCT



POTENTIAL SUMMARY – ALL SECTORS

Commercial and Industrial sectors account for 77% of the Achievable Potential savings in the first year



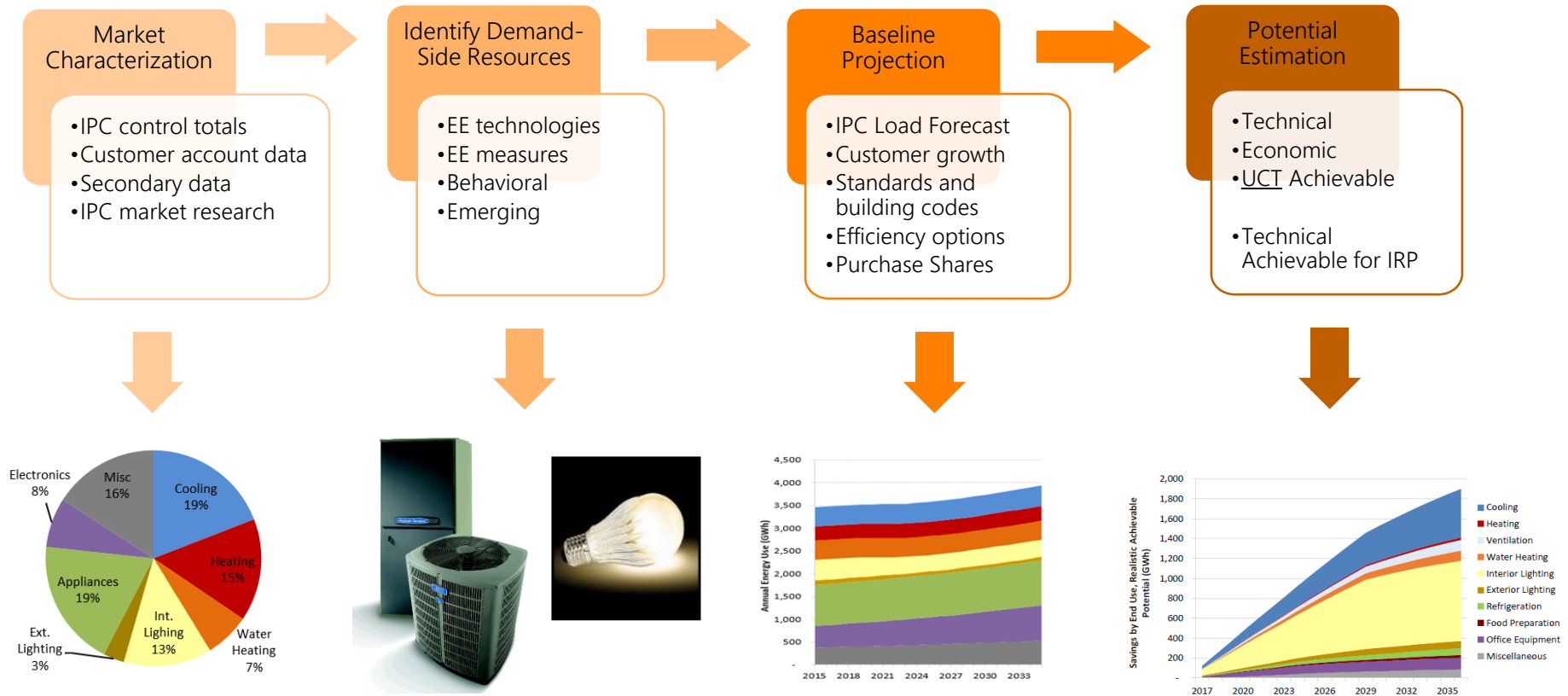
Summary of Energy Savings (GWh)	2021	2025	2030	2035	2040
Baseline Projection (GWh)	14,677	15,189	16,045	16,977	17,961
Achievable Potential Cumulative Savings (GWh)					
Residential	21	118	331	569	737
Commercial	53	306	647	968	1,153
Industrial	50	243	431	534	572
Irrigation	10	60	123	153	164
Total	135	727	1,532	2,223	2,626
Energy Savings (% of Baseline)					
Residential	0.1%	0.8%	2.1%	3.3%	4.1%
Commercial	0.4%	2.0%	4.0%	5.7%	6.4%
Industrial	0.3%	1.6%	2.7%	3.1%	3.2%
Irrigation	0.1%	0.4%	0.8%	0.9%	0.9%
Total	0.9%	4.8%	9.5%	13.1%	14.6%



Analysis Approach

OVERVIEW OF AEG'S APPROACH

Overview



KEY SOURCES OF DATA

Prioritization of Idaho Power Data

Data from Idaho Power was prioritized when available, followed by regional data, and finally well-vetted national data

Idaho Power sources:

- 2016 Residential End-Use study
- Customer Account Database
- Forecast data and load research
- Recent-year accomplishments
- DSM Avoided Costs, line losses, discount rate
- Assumptions for unique programs such as Behavioral and Low Income

Regional sources:

- NEEA studies (RBSA, CBSA, IFSA)
- RTF and Power Council methodologies, ramp rates, and measure assumptions

Additional sources:

- U.S. DOE's Annual Energy Outlook
- U.S. DOE's projections on solid state lighting technology improvements
- Technical Reference Manuals and California DEER
- AEG Research

MARKET SEGMENTATION

The first step in the potential study analysis is to characterize the market, answering the question *"How do Idaho Power's customers use energy today?"*

AEG begins by analyzing customer data to segment the market by:

Sector (Residential, Commercial, Industrial, Irrigation)

Segment (Many segments)

IPC Residential Segmentation

Segment	Households	Consumption (GWh)	Intensity (kWh/HH)
Single Family	363,973	4,175	11,471
Multifamily	55,996	428	7,636
Mobile Home	51,330	696	13,562
Total	471,298	5,299	11,243

Idaho Power Customers and Sales

Idaho Power Customer Account Data
Idaho Power Market Baseline Studies

- Dwelling and SIC codes
- kWh/customer

MARKET PROFILES

After segmenting the market, AEG allocates consumption and peak load to individual technologies present

UEC: Unit Energy Consumption

*Usage = (Saturation*UEC)*(# homes)*

Baseline Study Data

- Residential: Idaho Power Appliance Saturation Survey
- C&I: NEEA CBSA and IFSA, AEG Energy Market Profiles (Pacific Region)

Consumption Data

- HVAC: Calibrated energy simulations
- Non-HVAC: Engineering algorithms (TRMs and RTF workbooks) and the U.S. DOE's Annual Energy Outlook (AEO)

Single Family, 2019

End Use	Technology	Saturation	UEC (kWh)	Intensity (kWh/HH)	Usage (GWh)
Cooling	Central AC	81.9%	1,899	1,555	566
Cooling	Room AC	8.6%	408	35	13
Cooling	Air-Source Heat Pump	11.3%	1,988	225	82
Cooling	Geothermal Heat Pump	1.0%	1,751	17	6
Cooling	Evaporative AC	1.8%	647	11	4
Space Heating	Electric Room Heat	5.3%	9,047	483	176
Space Heating	Electric Furnace	8.7%	10,202	890	324
Space Heating	Air-Source Heat Pump	11.3%	6,647	753	274
Space Heating	Geothermal Heat Pump	1.0%	3,419	34	12
Space Heating	Secondary Heating	37.2%	392	146	53
Water Heating	Water Heater (<= 55 Gal)	36.7%	3,169	1,161	423
Water Heating	Water Heater (> 55 Gal)	4.9%	3,350	163	59
Interior Lighting	General Service Screw-in	100.0%	952	952	347
Interior Lighting	Linear Lighting	100.0%	254	254	92
Interior Lighting	Exempted Lighting	100.0%	72	72	26
Exterior Lighting	Screw-in	100.0%	216	216	79
Appliances	Clothes Washer	98.3%	74	72	26
Appliances	Clothes Dryer	91.2%	747	681	248
Appliances	Dishwasher	92.7%	377	349	127
Appliances	Refrigerator	100.0%	705	705	257
Appliances	Freezer	63.8%	498	318	116
Appliances	Second Refrigerator	38.2%	720	275	100
Appliances	Stove/Oven	81.1%	443	359	131
Appliances	Microwave	100.6%	116	116	42
Electronics	Personal Computers	79.7%	173	138	50
Electronics	Monitor	94.4%	67	64	23
Electronics	Laptops	130.3%	46	60	22
Electronics	TVs	278.0%	130	362	132
Electronics	Printer/Fax/Copier	79.7%	44	35	13
Electronics	Set-top Boxes/DVRs	295.7%	105	309	113
Electronics	Devices and Gadgets	100.0%	105	105	38
Miscellaneous	Electric Vehicles	0.2%	4,324	8	3
Miscellaneous	Pool Pump	2.6%	3,508	90	33
Miscellaneous	Pool Heater	0.6%	3,517	23	8
Miscellaneous	Furnace Fan	76.4%	205	157	57
Miscellaneous	Well pump	5.0%	561	28	10
Miscellaneous	Miscellaneous	100.0%	250	250	91
Total				11,471	4,175

BASELINE PROJECTION

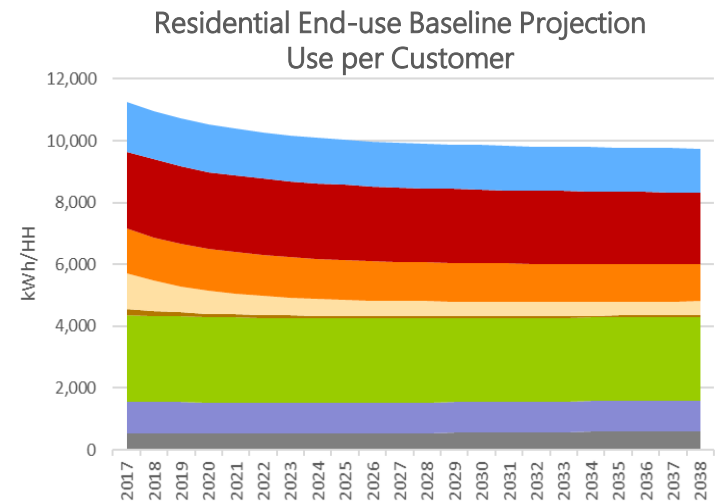
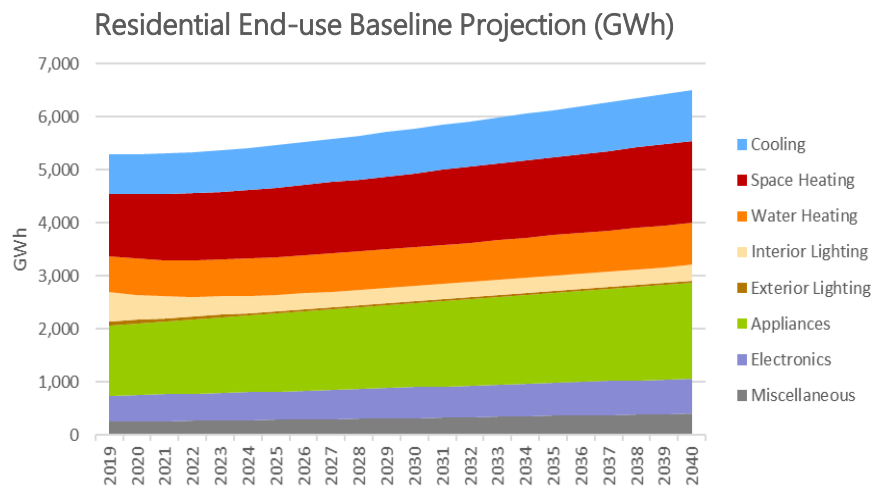
End-use projection of energy and demand, aligned as appropriate with Idaho Power's approved Load Forecast

Frozen efficiency for most measures (technology is fixed at present-day levels throughout forecast)

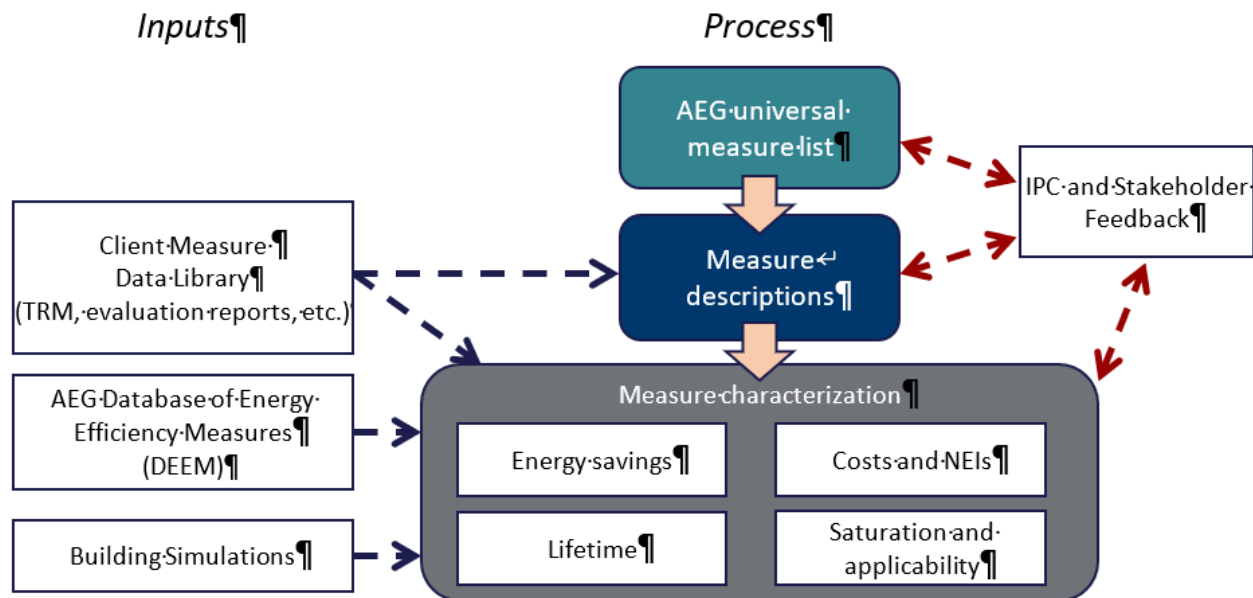
Codes and standards applied when "on the books" at the federal and state levels

- The EISA 2020 backstop is no longer on the books

Market baseline for some measures in relevant jurisdictions when naturally-occurring efficiency and market transformation are present (e.g., LED lighting)



MEASURE CHARACTERIZATION



Measures are applied to the Baseline Projection, yielding energy and peak savings.

AEG identifies the most relevant source for each measure, prioritizing territory-specific data and regional analyses wherever feasible

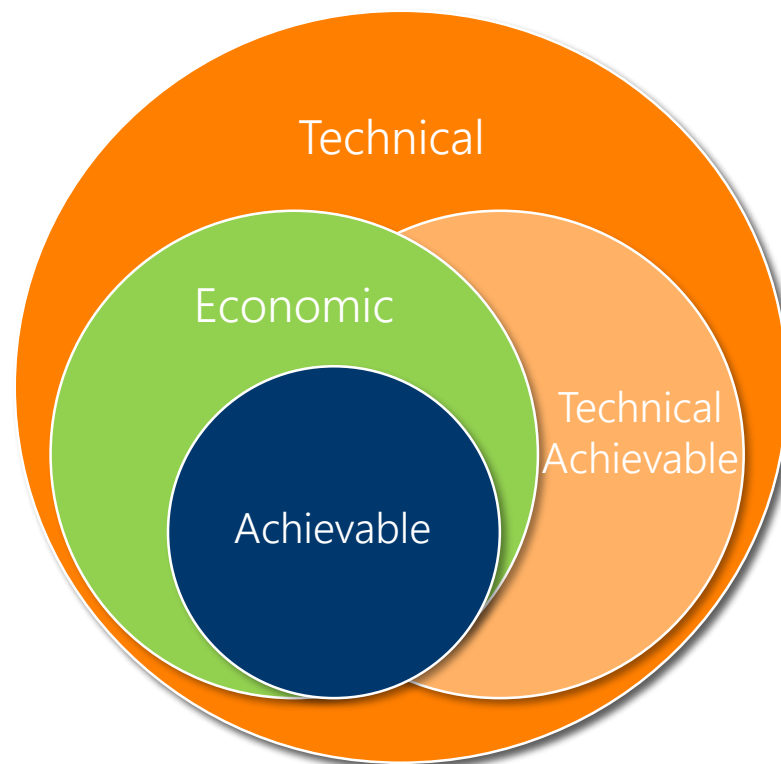
- IPC programs & evaluations
- RTF, Power Council, and other regional sources
- Other sources as necessary (e.g., AEO, CA DEER)

LEVELS OF POTENTIAL

We estimate three levels of potential:

- **Technical:** theoretical maximum where everyone chooses the efficient option when equipment fails regardless of cost
 - **Technical Achievable** provides an additional perspective into the EE potential landscape and is calculated by applying customer adoption curves directly to technical potential, rather than to the economic potential.
- **Economic** is a subset of technical potential that includes only cost-effective measures. Cost-effectiveness screening is performed under the UCT test.
- **Achievable** is a subset of economic potential that accounts for achievable participation within utility programs as well as non-utility mechanisms, such as regional initiatives and market transformation.

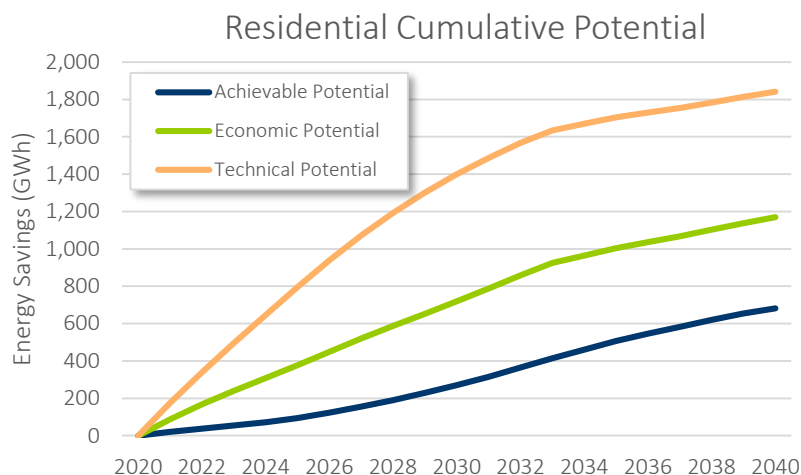
Levels of Potential





Sector-level Potential

POTENTIAL SUMMARY – RESIDENTIAL

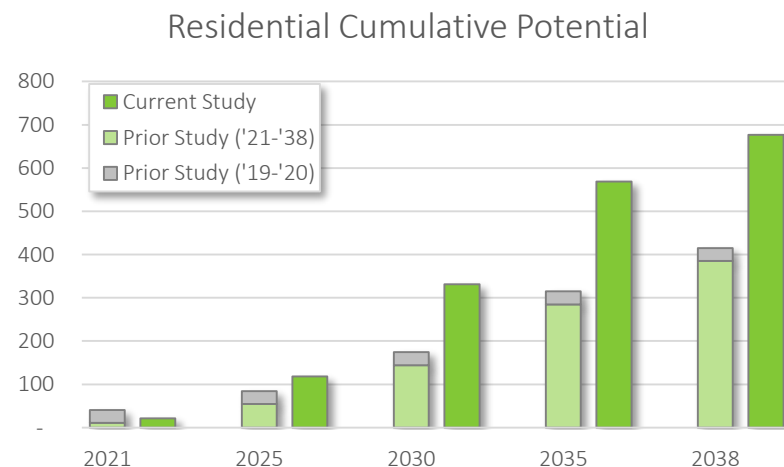


Summary of Energy Savings (GWh)	2021	2025	2030	2035	2040
Baseline Projection (GWh)	5,304	5,466	5,779	6,130	6,507
Cumulative Savings (GWh)					
Achievable Potential	21	118	331	569	737
Economic Potential	90	454	849	1,120	1,271
Technical Potential	176	799	1,403	1,704	1,840
Energy Savings (% of Baseline)					
Achievable Potential	0.4%	2.2%	5.7%	9.3%	11.3%
Economic Potential	1.7%	8.3%	14.7%	18.3%	19.5%
Technical Potential	3.3%	14.6%	24.3%	27.8%	28.3%

Achievable Potential is

- 21 GWh (0.4%) in the first year
- 737 GWh (11.3%) by the end of the forecast period

By 2040, cumulative achievable potential is two-thirds of economic potential



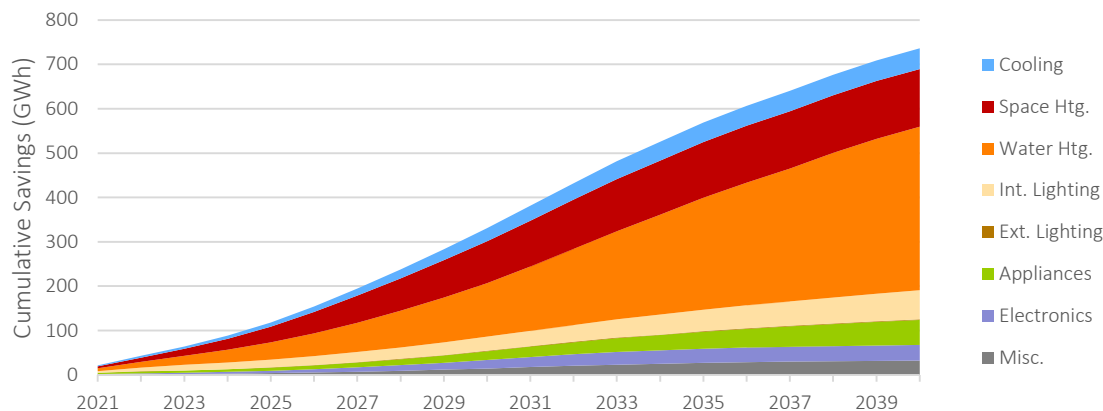
POTENTIAL SUMMARY – RESIDENTIAL

Substantial water heating savings in the later years is driven by installation of heat pump water heaters in the Residential sector

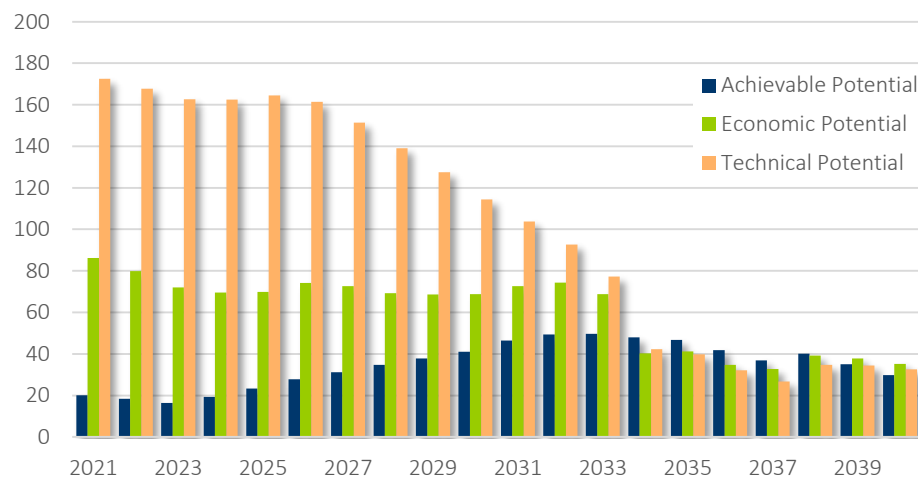
- As well as other water heating non-equipment measures such as faucet aerators and showerheads

Lighting savings are low due to based on the RTF's market baseline, which forecasts substantial market transformation over the next 5-10 years, even in the absence of a federal standard.

Cumulative Savings by End Use



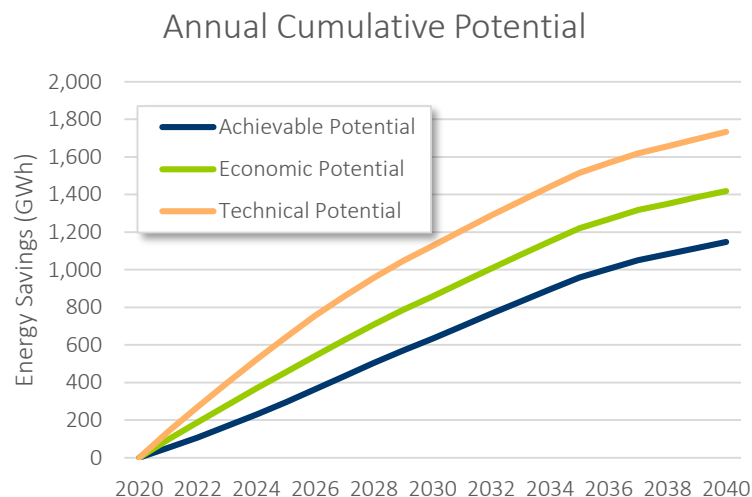
Annual Incremental Potential



RESIDENTIAL TOP MEASURES

Rank	Measure / Technology	2021 Achievable Potential Savings (MWh)	2021 % of Total
1	Behavioral Programs (Home Energy Report)	9,344	44.2%
2	Water Heater - Thermostatic Shower Restriction Valve	2,050	9.7%
3	General Service Screw-in LED Lamps	1,849	8.7%
4	Water Heater (<= 55 Gal) - HPWH	1,642	7.8%
5	Water Heater - Faucet Aerators	1,289	6.1%
6	Insulation - Wall Cavity Installation	1,119	5.3%
7	Linear LED Lighting	939	4.4%
8	Mobile Home Low Income - HVAC and Weatherization	546	2.6%
9	Single Family Low Income - HVAC and Weatherization	353	1.7%
10	Water Heater (> 55 Gal) - HPWH	318	1.5%
11	Insulation - Ceiling Installation	239	1.1%
12	Exempted LED Lighting	209	1.0%
13	High-efficiency Dishwasher	207	1.0%
14	Exterior Screw-in LED Lamps	183	0.9%
15	High-efficiency Pool Pumps	168	0.8%
16	High-efficiency TVs	140	0.7%
17	High-efficiency Monitor	137	0.6%
18	Single Family Low Income - Weatherization Only	85	0.4%
19	High-efficiency Room AC	81	0.4%
20	Mobile Home Low Income - Weatherization Only	58	0.3%
	Subtotal	20,956	99.1%
	Total Savings	21,141	100.0%

POTENTIAL SUMMARY – COMMERCIAL

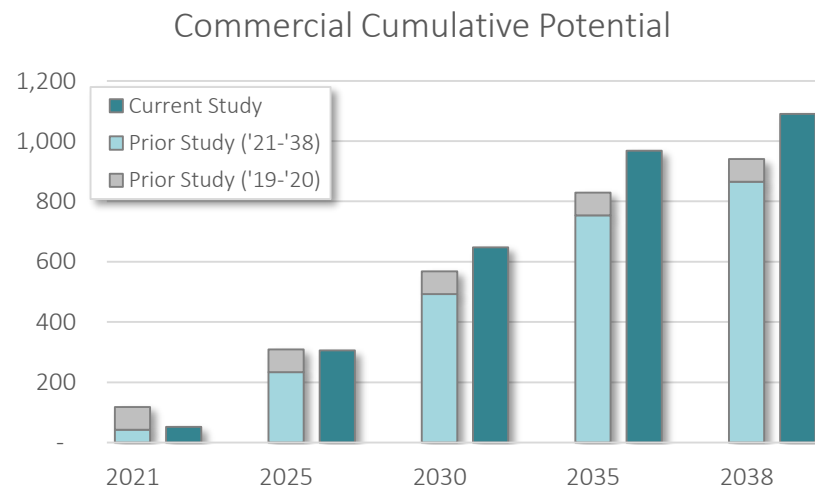


Summary of Energy Savings (GWh)	2021	2025	2030	2035	2040
Baseline Projection (GWh)	3,720	3,885	4,183	4,528	4,911
Cumulative Savings (GWh)					
Achievable Potential	53	306	647	968	1,153
Economic Potential	100	473	878	1,235	1,429
Technical Potential	140	641	1,128	1,517	1,734
Energy Savings (% of Baseline)					
Achievable Potential	1.4%	7.9%	15.5%	21.4%	23.5%
Economic Potential	2.7%	12.2%	21.0%	27.3%	29.1%
Technical Potential	3.8%	16.5%	27.0%	33.5%	35.3%

Achievable Potential is

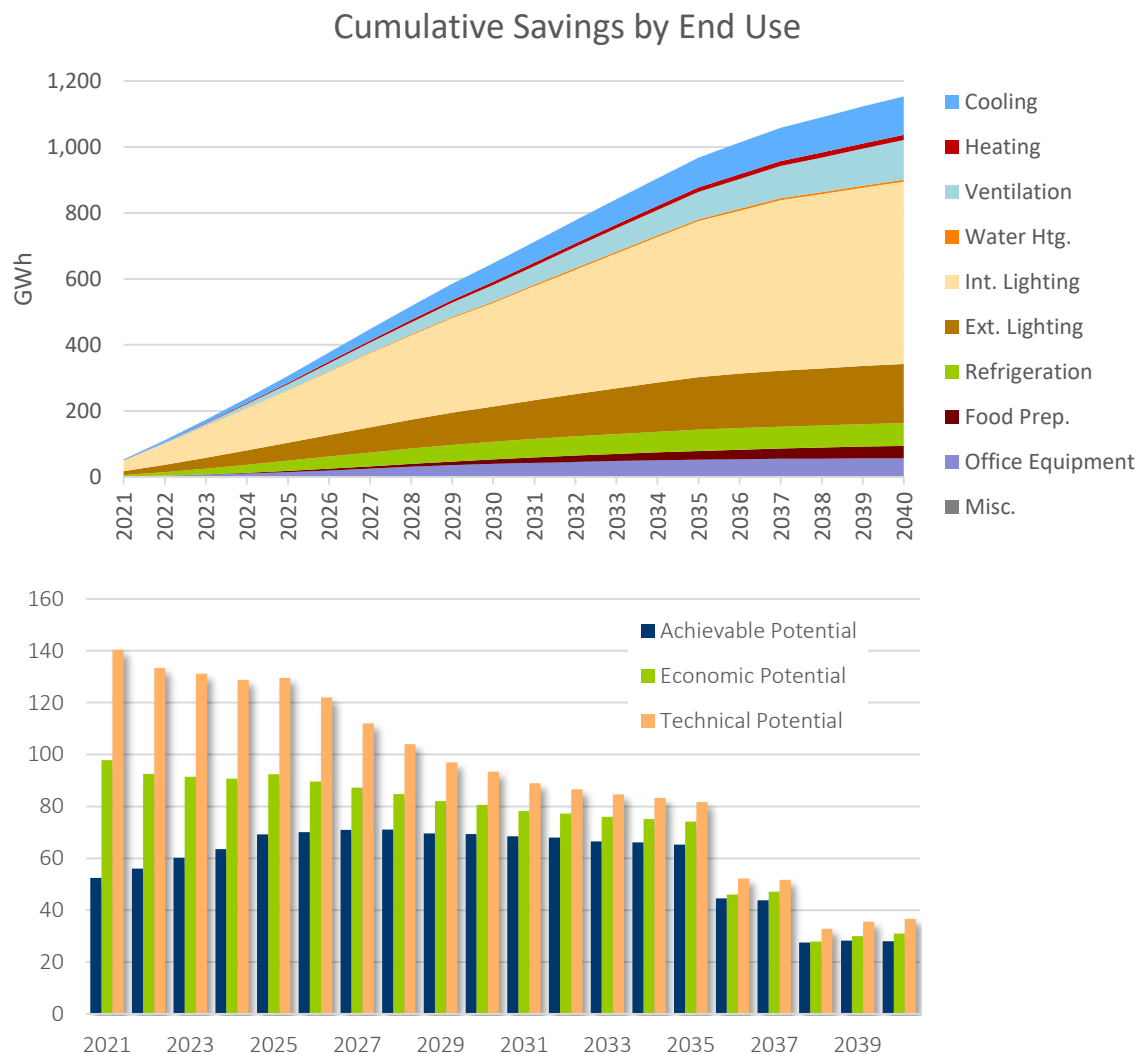
- 53 GWh (1.4%) in the first year
- 1,153 GWh (23.5%) by 2040

Achievable potential captures between 50% and 80% of economic potential



POTENTIAL SUMMARY – COMMERCIAL

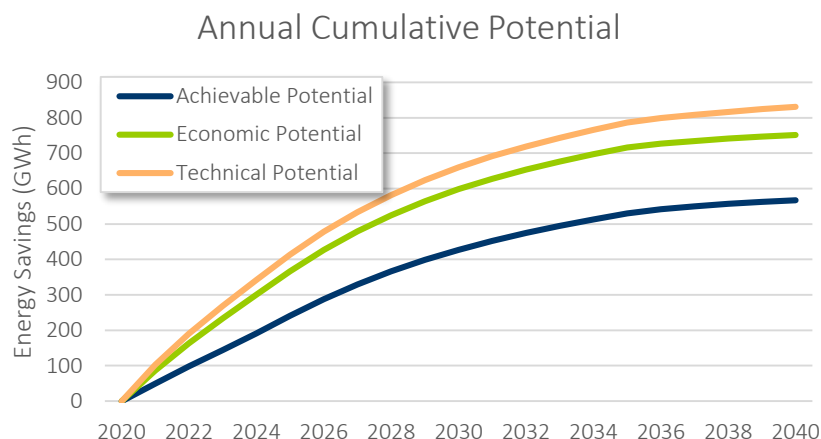
Linear and High-Bay lighting are the largest portion of the savings in the Commercial sector, as it was in the previous study, and as we typically see in other studies.



COMMERCIAL TOP MEASURES

Rank	Measure / Technology	2021 Achievable Potential Savings (MWh)	2021 % of Total
1	Linear LED Lighting	16,491	31.2%
2	High-Bay LED Lighting	13,611	25.7%
3	Area LED Lighting	7,602	14.4%
4	Strategic Energy Management	2,190	4.1%
5	Retrocommissioning	2,130	4.0%
6	General Service LED Lighting	1,700	3.2%
7	Refrig. - Evaporative Condenser	1,033	2.0%
8	Refrig. - Replace Single-Compressor w/ Subcooled Multiplex	946	1.8%
9	Ventilation	857	1.6%
10	Int. Fluorescent - Delamp and Install Reflectors	839	1.6%
11	Ext. Lighting - Bi-Level Parking Garage Fixture	631	1.2%
12	Desktop Computer	513	1.0%
13	Refrig. - Evaporator Fan Controls	432	0.8%
14	Refrig. - ECM Compressor Head Fan Motor	425	0.8%
15	Roof Top Unit	315	0.6%
16	Vending Machine - Occupancy Sensor	308	0.6%
17	Refrigeration - Demand Defrost	281	0.5%
18	Grocery - Display Case - LED Lighting	223	0.4%
19	Server	206	0.4%
20	Interior Fluorescent - Bi-Level Stairwell Fixture	190	0.4%
	Subtotal	50,923	96.3%
	Total Savings	52,901	100.0%

POTENTIAL SUMMARY – INDUSTRIAL



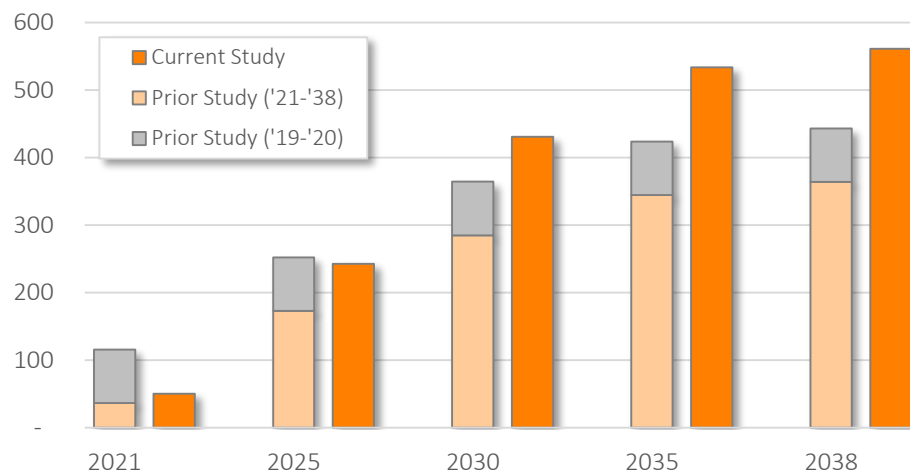
Achievable Potential is

- 50 GWh (1.3%) in the first year
- 572 GWh (13%) by 2040

Achievable potential captures between 55% and 75% of economic potential

Summary of Energy Savings (GWh)	2021	2025	2030	2035	2040
Baseline Projection (GWh)	3,863	3,980	4,133	4,270	4,390
Cumulative Savings (GWh)					
Achievable Potential	50	243	431	534	572
Economic Potential	88	371	605	724	760
Technical Potential	103	415	662	789	833
Energy Savings (% of Baseline)					
Achievable Potential	1.3%	6.1%	10.4%	12.5%	13.0%
Economic Potential	2.3%	9.3%	14.6%	17.0%	17.3%
Technical Potential	2.7%	10.4%	16.0%	18.5%	19.0%

Industrial Cumulative Potential



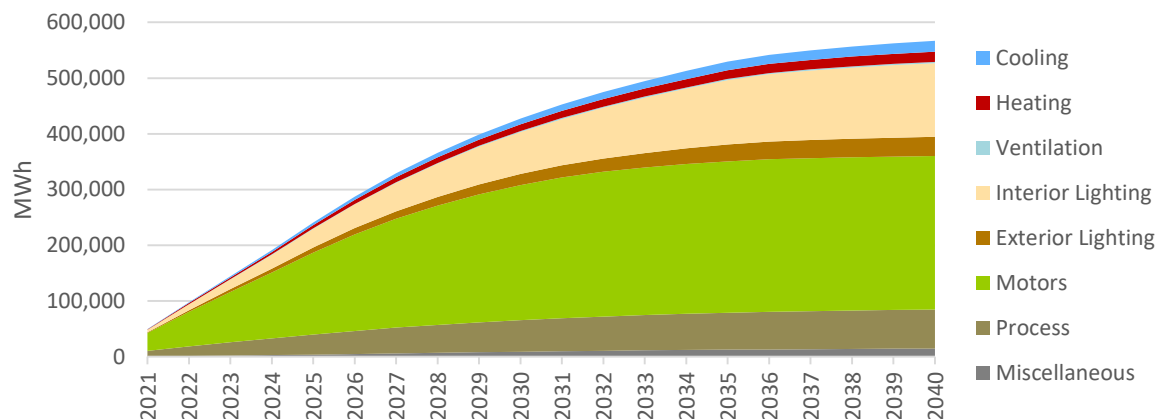
POTENTIAL SUMMARY – INDUSTRIAL

Ramp rates for this sector reflect the maturity of IPC's industrial programs

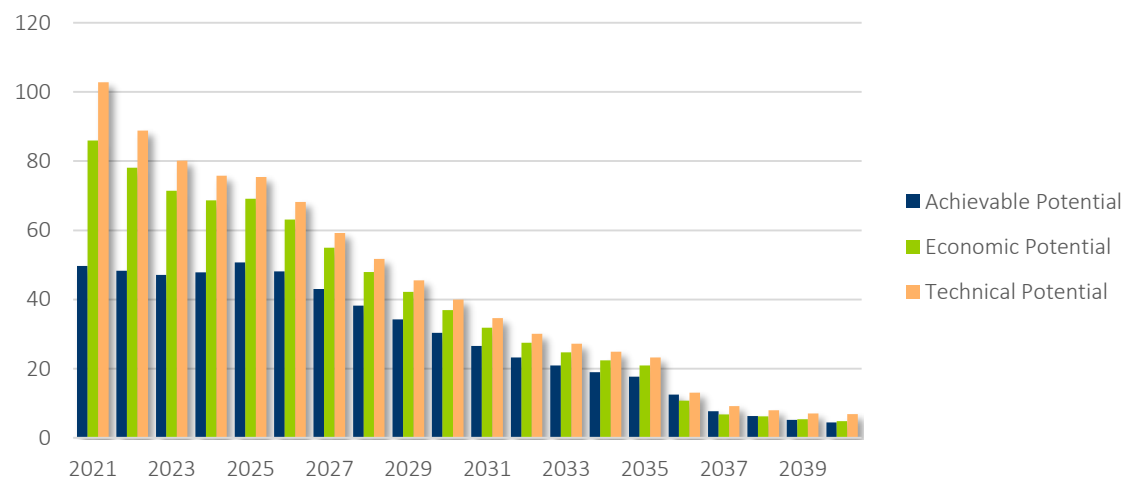
- Savings in the Motors end use are made up of VFD measures, as well as compressed air and pumping equipment upgrades

Lighting savings come from replacement of High-Bay lighting to LEDs.

Cumulative Savings by End Use



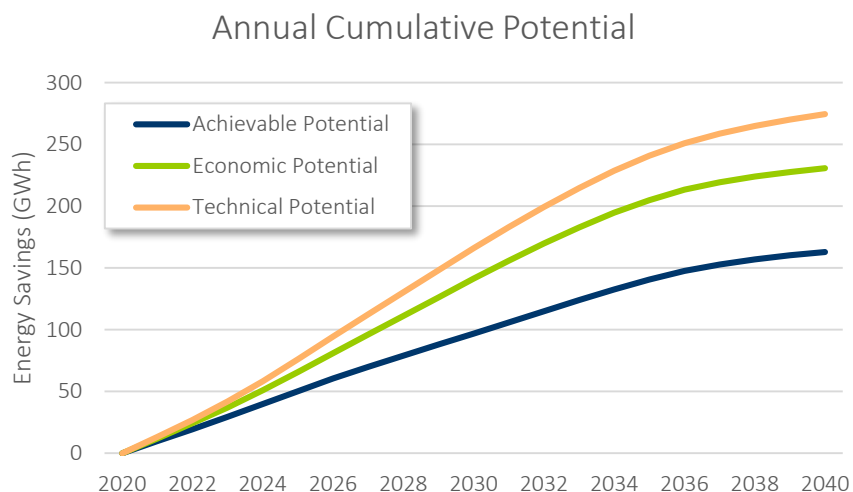
Annual Incremental Potential



INDUSTRIAL TOP MEASURES

Rank	Measure / Technology	2021 Achievable Potential Savings (MWh)	2021 % of Total
1	Strategic Energy Management	7,357	14.6%
2	Refrigeration - System Optimization	4,423	8.8%
3	Material Handling - Variable Speed Drive	3,305	6.5%
4	High-Bay Lighting	2,778	5.5%
5	Refrigeration - Floating Head Pressure	2,751	5.4%
6	Fan System - Variable Speed Drive	2,580	5.1%
7	Compressed Air - Raise Compressed Air Dryer Dewpoint	2,421	4.8%
8	Pumping System - System Optimization	2,120	4.2%
9	Switch from Belt Drive to Direct Drive	2,052	4.1%
10	Pumping System - Variable Speed Drive	2,030	4.0%
11	Fan System - Flow Optimization	1,898	3.8%
12	Retrocommissioning	1,873	3.7%
13	Compressed Air - End Use Optimization	1,689	3.3%
14	Compressed Air - Equipment Upgrade	1,674	3.3%
15	Compressed Air - Leak Management Program	1,652	3.3%
16	Fan System - Equipment Upgrade	1,610	3.2%
17	Municipal Water Supply Treatment - Optimization	1,414	2.8%
18	Motors - Synchronous Belts	843	1.7%
19	Pumping System - Equipment Upgrade	815	1.6%
20	Area Lighting	741	1.5%
	Subtotal	46,026	91.1%
	Total Savings	50,497	100.0%

POTENTIAL SUMMARY – IRRIGATION

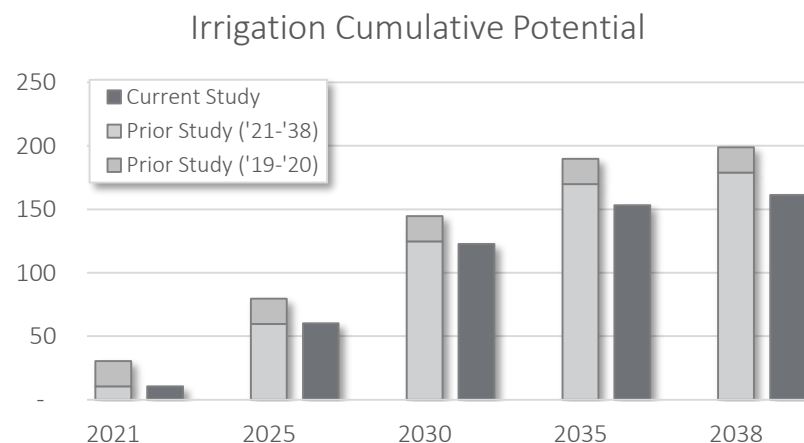


Summary of Energy Savings (GWh)	2021	2025	2030	2035	2040
Baseline Projection (GWh)	1,790	1,858	1,950	2,048	2,152
Cumulative Savings (GWh)					
Achievable Potential	10	60	123	153	164
Economic Potential	13	75	156	196	209
Technical Potential	15	92	192	247	273
Energy Savings (% of Baseline)					
Achievable Potential	0.6%	3.2%	6.3%	7.5%	7.6%
Economic Potential	0.7%	4.1%	8.0%	9.6%	9.7%
Technical Potential	0.9%	4.9%	9.8%	12.1%	12.7%

Achievable Potential is

- 10 GWh (0.5%) in the first year
- 163 GWh (7.6%) by 2040

Achievable potential captures most of economic potential through the forecast period



IRRIGATION TOP MEASURES

Rank	Measure / Technology	2021 Achievable Potential Savings (MWh)	2021 % of Total
1	Motors - Variable Frequency Drive	3,682	35.1%
2	CS to CS Pump Replacement	2,766	26.4%
3	Center Pivot/Linear - Medium P to Low P	1,172	11.2%
4	Center Pivot/Linear - High P to Medium P	780	7.4%
5	Wheel/Hand - Pipe Maintenance	412	3.9%
6	Center Pivot/Linear - Boot Gasket Replacement	355	3.4%
7	VS to VS Pump Replacement	269	2.6%
8	Wheel/Hand - Nozzle Replacement	229	2.2%
9	Center Pivot/Linear - Upgrade High P to MESA	211	2.0%
10	Green Motor Rewind - Surface and Tailwater Pump	155	1.5%
11	Wheel/Hand - Gasket Replacement	143	1.4%
12	Green Motor Rewind - Well Pump	128	1.2%
13	Thunderbird - Hub Replacement	118	1.1%
14	Green Motor Rewind - Booster Pump	55	0.5%
15	Center Pivot/Linear - Upgrade MESA to LESA	3	0.0%
	Subtotal	10,479	100.0%
	Total Savings	10,479	100.0%

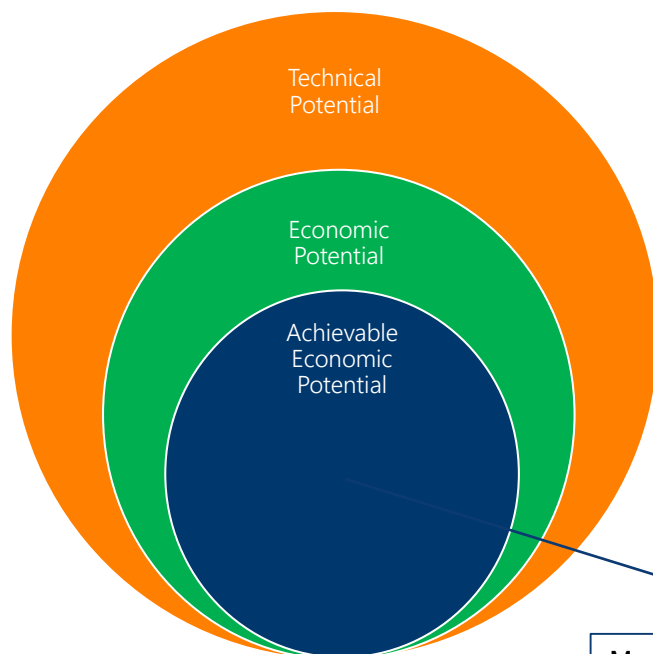


IRP Integration

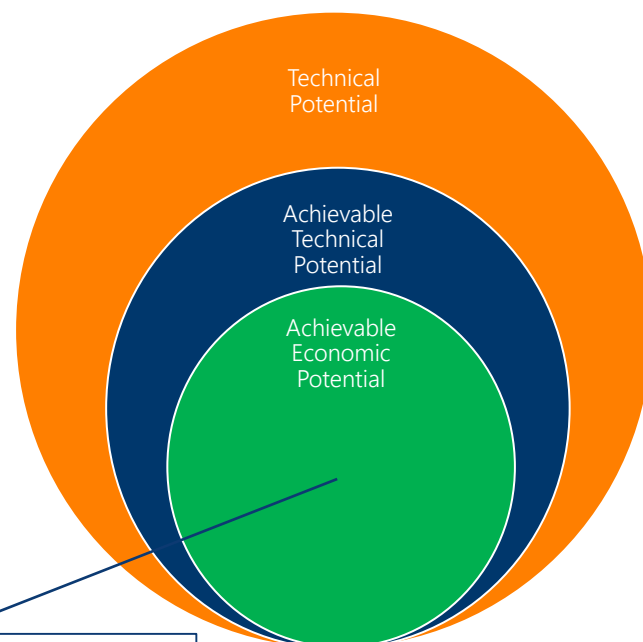
ENERGY EFFICIENCY AS AN IRP RESOURCE

Two general options for incorporating energy efficiency resources into Integrated Resource Planning:

1. Economic Screening in CPA
(current Idaho Power method)



2. Economic Screening in IRP
(Northwest Power and Conservation Council method)



May not produce the same results for
Achievable Economic Potential

PROS AND CONS OF EACH OPTION

	Option 1	Option 2
Pros	<ul style="list-style-type: none"> Based on industry standard practice: <ul style="list-style-type: none"> Technical -> Economic -> Achievable Potential Allows all types of potential to be calculated within the CPA Simple to implement in IRP as decrement to load forecast 	<ul style="list-style-type: none"> Consistent with regional methodology Allows IRP to dynamically determine avoided cost based on cost and availability of competing resources
Cons	<ul style="list-style-type: none"> Inconsistent with regional methodology Requires pre-determination of avoided costs 	<ul style="list-style-type: none"> Achievable economic potential not available in CPA May require bundling of energy efficiency resources Some benefits may need to be accounted for outside IRP

OPTION 2 EXAMPLE: AVISTA DRAFT 2021 ELECTRIC IRP

- Avista includes each CPA measure (~7,000) as a separate resource in the IRP
- Resources are characterized by annual energy savings, winter peak impacts, summer peak impacts, and levelized cost
- Measures compete directly against demand- and supply-side alternatives. Hourly shapes are used to calculate energy efficiency measure benefits
- Levelized cost for each state calculated based on primary cost-effectiveness criterion used (i.e, UCT in Idaho, TRC in Washington)

Figure 5.7: Washington Energy Efficiency Avoided Cost

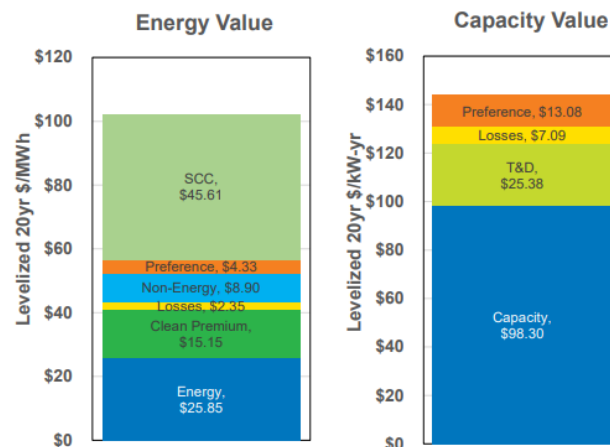
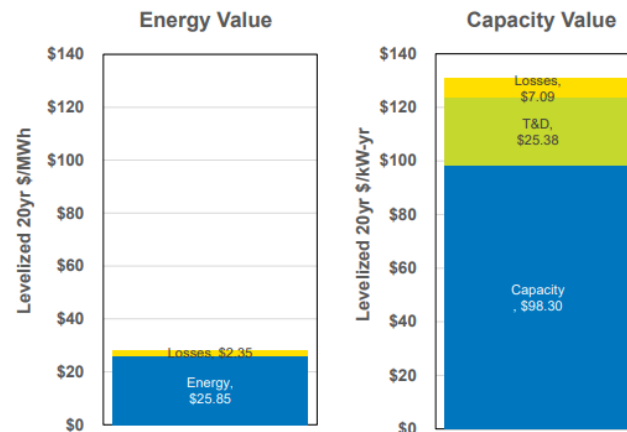


Figure 5.8: Idaho Energy Efficiency Avoided Cost



Source: Avista Draft 2021 Electric IRP, page 5-14

OPTION 2 EXAMPLE: PACIFICORP 2019 IRP

- AEG's CPA included over 30,000 energy efficiency measure permutations, so measures were bundled by state and levelized cost of conserved energy for the IRP
- Levelized cost for each state calculated based on primary cost-effectiveness criterion used
- PacifiCorp applied cost credits before loading bundles into IRP:
 - T&D deferral
 - Risk reduction
 - 10% regional conservation credit
- PacifiCorp is currently considering alternate bundling methods for its 2021 IRP

Table 6.9 – 20-Year Cumulative Energy Efficiency Potential by Cost Bundle (MWh)

Bundle	California	Idaho	Oregon	Utah	Washington	Wyoming
<= 10	38,912	98,747	549,917	1,418,505	210,292	394,131
10 - 20	5,902	35,788	109,045	566,451	76,449	111,399
20 - 30	4,600	67,228	344,713	693,917	69,502	68,278
30 - 40	33,081	47,387	611,481	583,173	166,070	251,490
40 - 50	13,351	24,007	527,253	347,710	52,089	233,920
50 - 60	6,383	38,617	260,480	243,779	46,787	167,890
60 - 70	3,769	18,357	200,163	126,915	47,964	74,670
70 - 80	7,788	8,773	168,229	187,482	29,400	30,877
80 - 90	2,953	12,369	70,325	137,044	24,985	14,797
90 - 100	4,346	14,246	11,637	143,151	23,308	41,359
100 - 110	4,338	7,669	56,015	183,773	18,899	85,951
110 - 120	2,303	15,195	39,623	136,567	14,302	20,700
120 - 130	2,189	13,926	15,688	86,346	25,419	13,837
130 - 140	10,391	7,160	115,146	93,739	35,915	6,266
140 - 150	7,600	4,996	62,573	174,762	18,017	19,605
150 - 160	1,930	5,055	137,281	43,708	13,759	9,608
160 - 170	1,947	9,360	33,284	46,478	10,014	6,732
170 - 180	2,458	2,396	72,957	44,581	7,050	17,150
180 - 190	1,723	1,843	15,798	37,927	11,791	10,135
190 - 200	795	1,362	2,294	34,678	20,928	4,693
200 - 250	14,147	32,139	2,924	115,841	56,428	44,598
250 - 300	10,007	8,305	4,795	100,695	17,555	19,324
300 - 400	11,658	13,731	4,220	170,174	31,286	23,599
400 - 500	1,848	4,078	17,134	55,579	11,608	9,894
500 - 750	6,087	10,509	46,965	131,028	24,455	12,672
750 - 1,000	5,567	4,268	42,758	26,471	22,776	16,008
> 1,000	5,423	9,639	21,631	110,459	23,582	29,420

Source: PacifiCorp 2019 Integrated Resource Plan, Volume 1, page 166



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