Western Treasure Valley Electrical Plan Update

Safety

Rebecca Irwin
Senior Planning Engineer
Electrical Plan Project Leader
Idaho Power

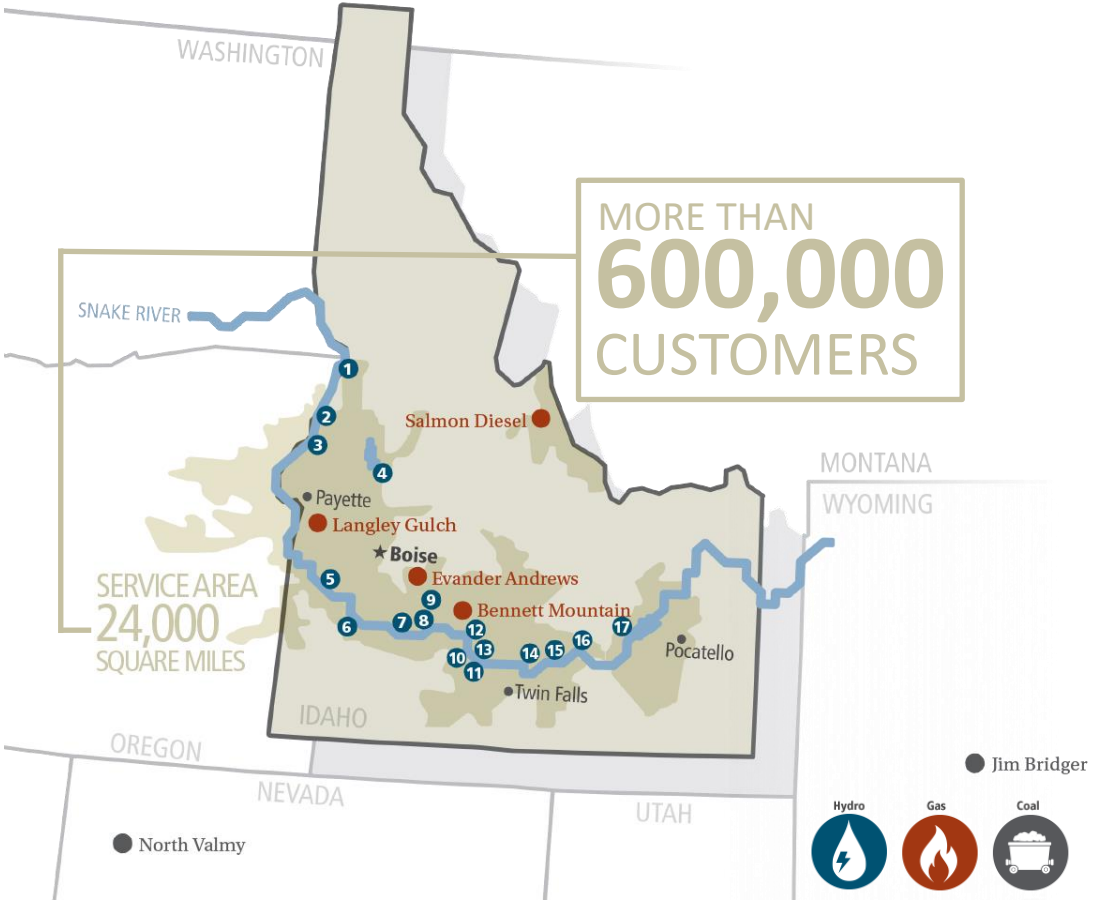
Western Treasure Valley Electrical Plan Update

Welcome

Mitch Colburn
Vice President of Customer Operations and Business Development Idaho Power

Powering Lives

Communities We Serve



1	Hells Canyon	391,500 kW
2	Oxbow	190,001 kW
3	Brownlee	675,000 kW
4	Cascade	12,420 kW
5	Swan Falls	27,170 kW
6	C.J. Strike	82,800 kW
7	Bliss	75,038 kW
8	Lower Malad	13,500 kW
9	Upper Malad	8,270 kW
10	Lower Salmon	60,000 kW
11	Upper Salmon	34,500 kW
12	Thousand Springs	6,800 kW
13	Clear Lake	2,500 kW
14	Shoshone Falls	14,729 kW
15	Twin Falls	52,898 kW
16	Milner	59,448 kW
17	American Falls	92,340 kW

Our Customer Focus

We Are Reliable

We Are Affordable

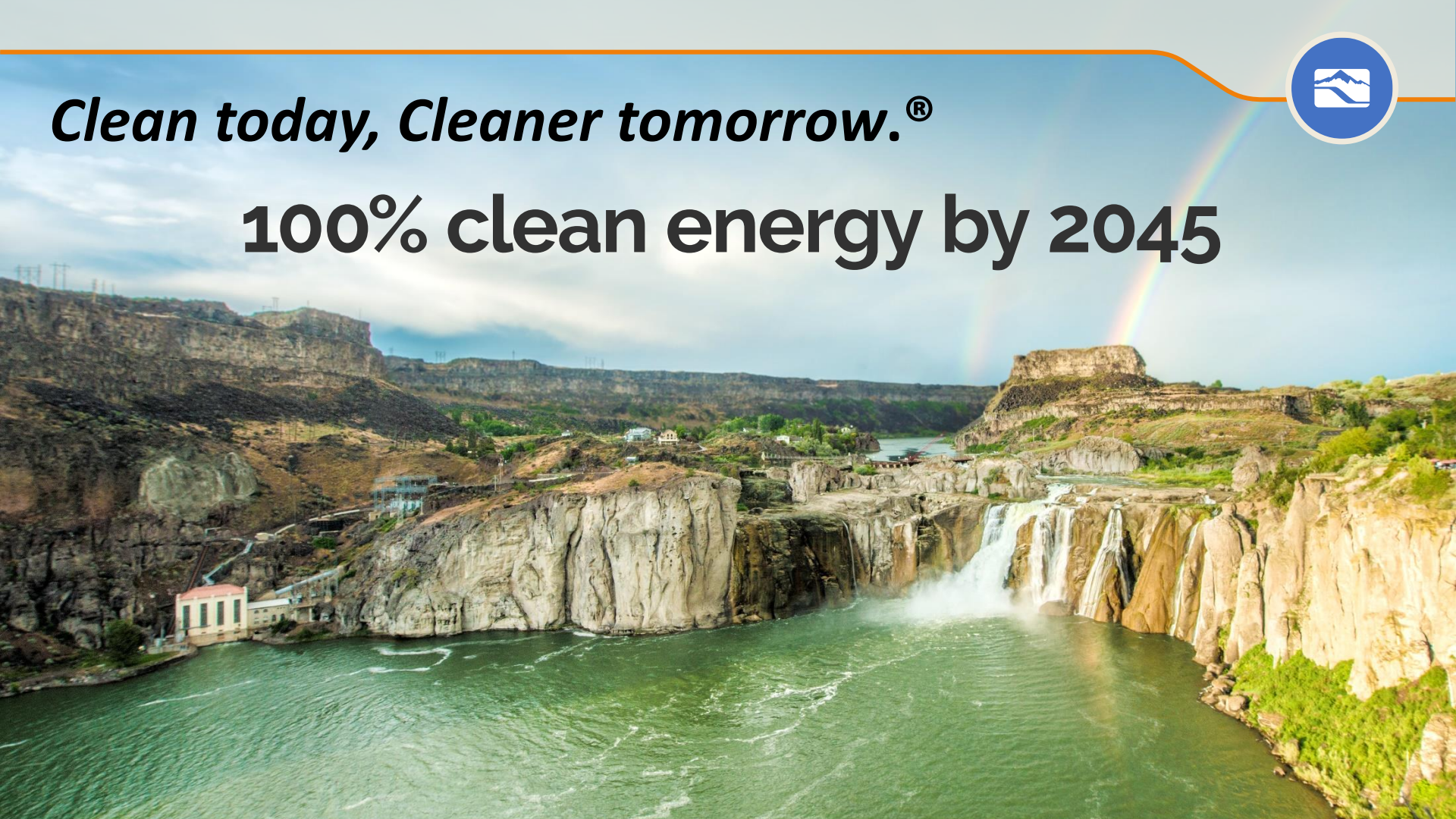
OUR PRICES ARE MORE THAN

20% BELOW

THE NATIONAL AVERAGE

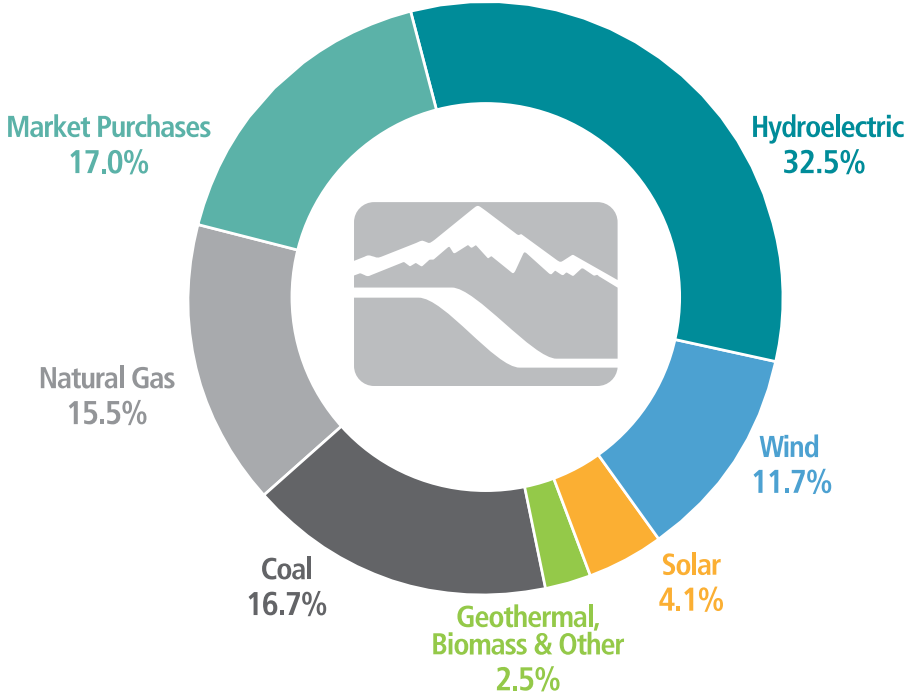
Clean today, Cleaner tomorrow.®

100% clean energy by 2045



Clean Energy

2021 Energy Mix



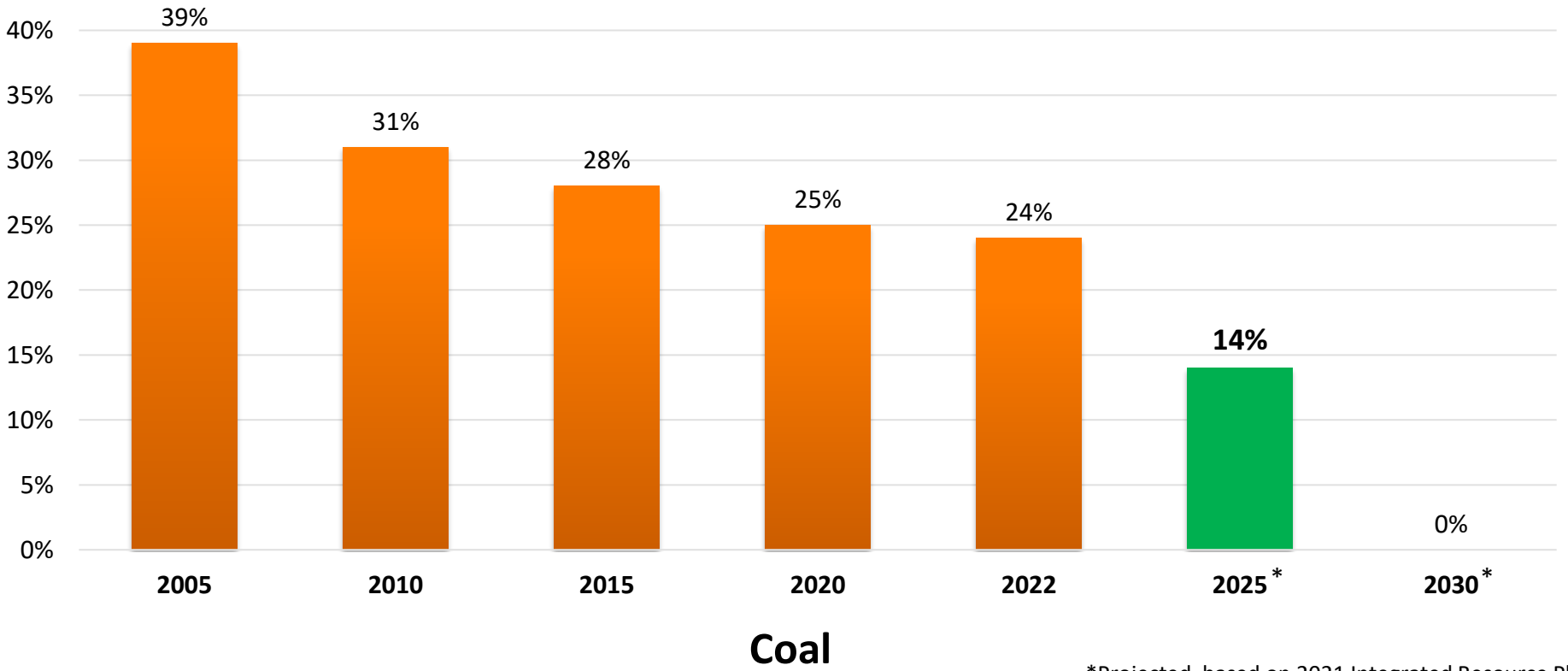
This shows the energy we generate from company-owned resources and energy we buy through long-term contracts with wind, solar, biomass, geothermal and small-scale hydro generators.

The mix does not represent the energy delivered to customers for two reasons.

- We participate in the wholesale energy market and sell energy both to other utilities and to retail customers.
- Some of our purchased power from renewable sources comes with a Renewable Energy Credit, or REC, which we sell to keep customer prices low.

Path Toward 100% Clean Energy

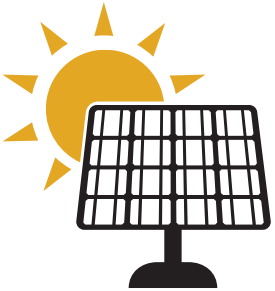
Coal's Share of Idaho Power's Generation Capacity



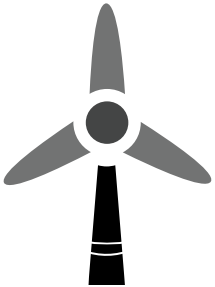
*Projected, based on 2021 Integrated Resource Plan

Costs

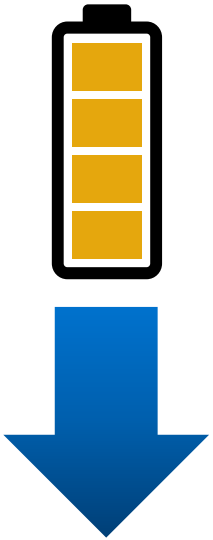
Technology Cost-Declines Since 2010



85%



49%

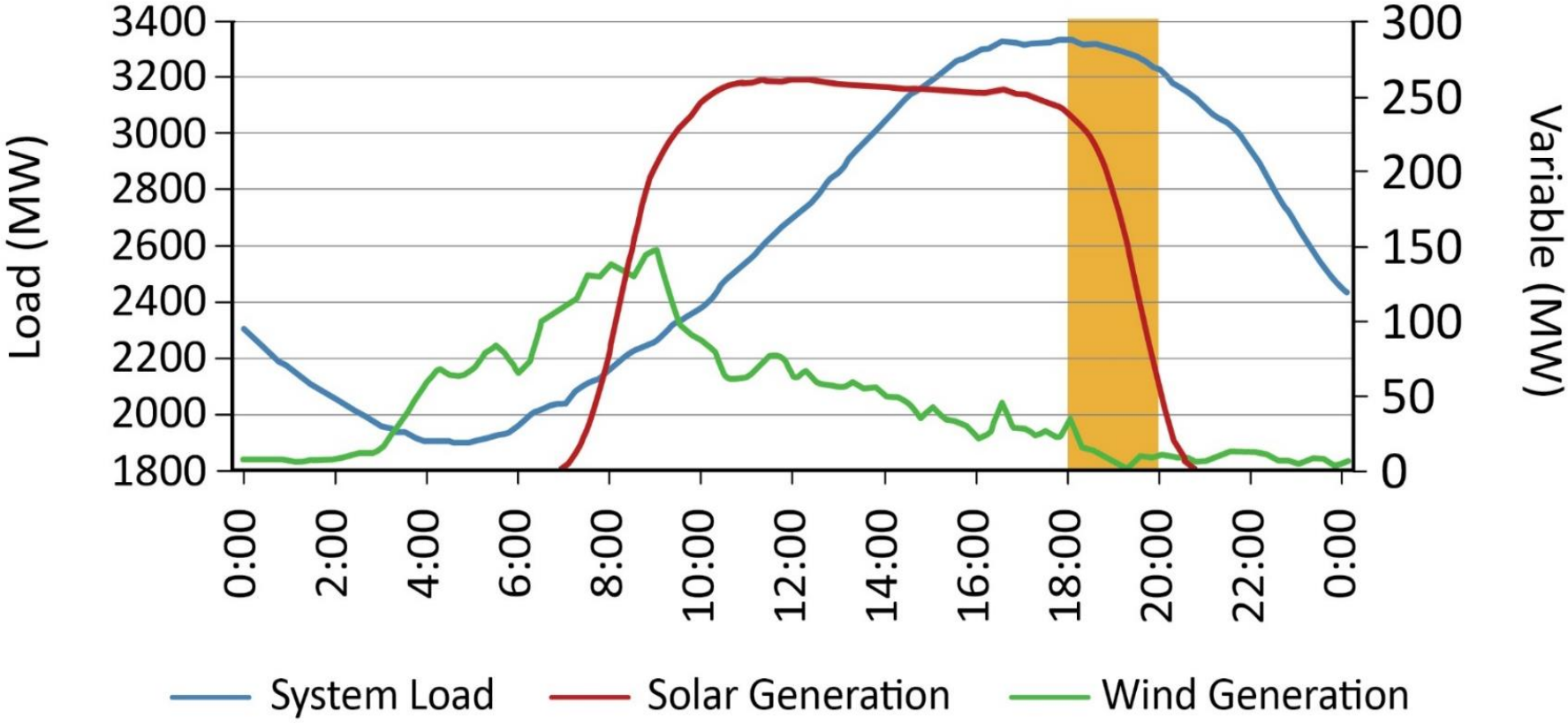


85%

(Source: Bloomberg NEF)

Why can’t you go 100% clean earlier?

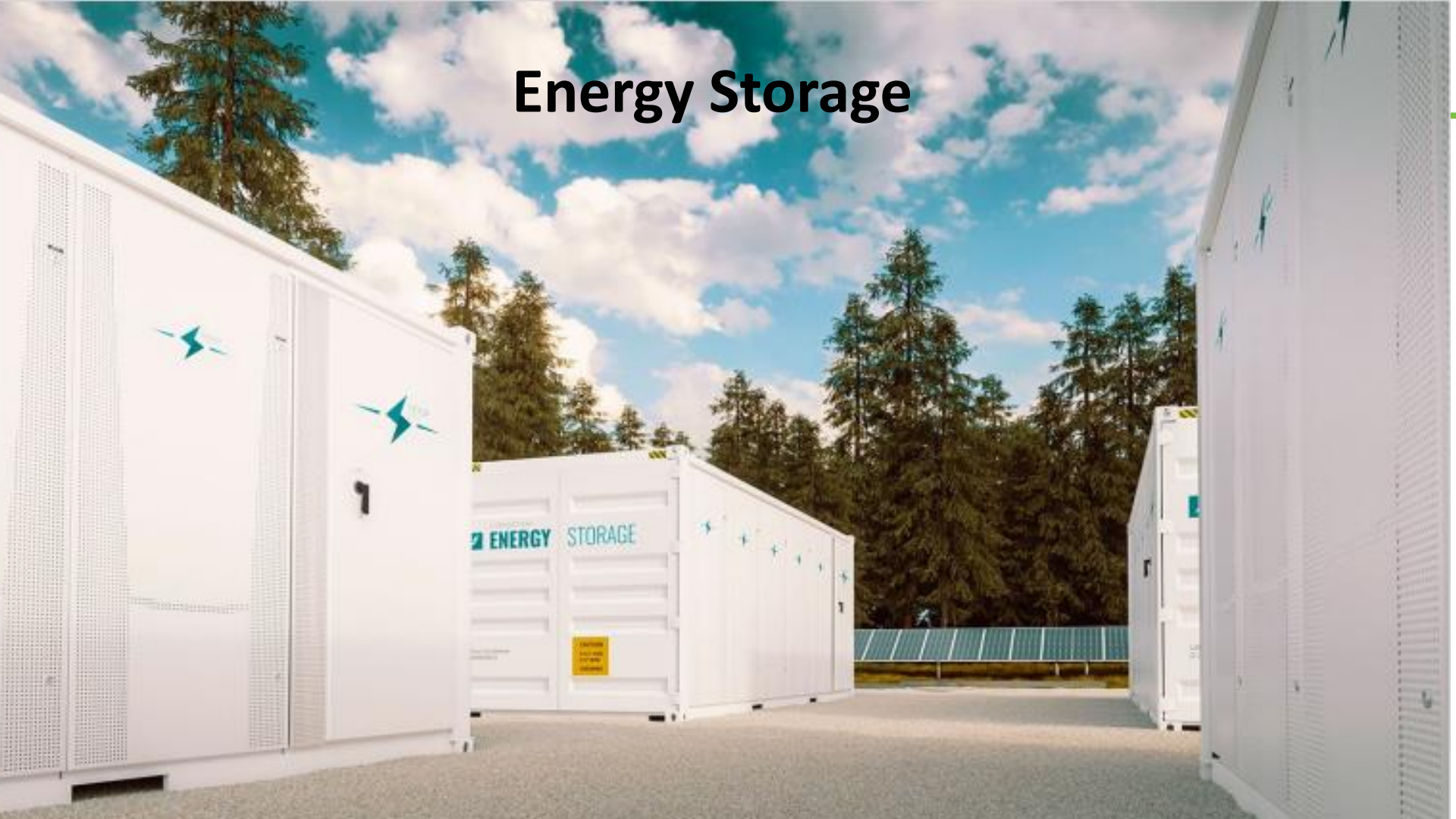

10:44:06


Load (MW)
3400
3200
3000
2800
2600
2400
2200
2000
1800
300
250
200
150
100
50
0
Variable (MW)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
System Load
Solar Generation
Wind Generation

How do we get there in the short-term?

Solar

Energy Storage



Transmission

Transmission

GRID EDGE

MIT Study: Transmission Is Key to a Low-Cost, Decarbonized US Grid

Modeling shows a nationwide transmission network could tap existing solar, wind and battery tech to reach zero-carbon power.

JEFF ST. JOHN | JANUARY 08, 2021

Diversity

Reliable & Non-Carbon

Other Long-Term Highlights:

Through 2040

- 700 MW of additional wind
- 1,405 MW of additional solar
- 1,685 MW of storage
- No more coal after 2028


Thank you

Western Treasure Valley Electrical Plan Update

Introductions

Mike Ybarguen
Economic & Community Development Advisor
Idaho Power

Committee Introductions

- Name
- Organization/community you are representing
- If you have participated in the Electrical Plan before
- Favorite Musical Artist

Western Treasure Valley Electrical Plan Update

Project Orientation

Jim Burdick
Engineering Leader
Idaho Power

2011 Western Treasure Valley Electrical Plan

Western Treasure Valley Electrical Plan

Previous Committee Members

- Jerry Hoagland – Owyhee County Commissioner
- Dave Dykstra – Windermere Real Estate
- Steve Fultz – City of Caldwell, Planning and Zoning Director
- Mary Huff – Owyhee County, Planning and Zoning Administrator
- Rodney Ashby – City of Nampa, Planning Director

Today's Agenda

10:00 a.m.	Welcome
10:25 a.m.	Introductions
10:40 a.m.	Project orientation and committee logistics
11:05 a.m.	General power concepts
12:00 p.m.	Lunch
12:30 a.m.	2011 WTVEP review
12:45 p.m.	Current conditions
1:15 p.m.	Community goals and siting criteria
1:45 p.m.	Next steps and wrap up
2:00 p.m.	Adjourn

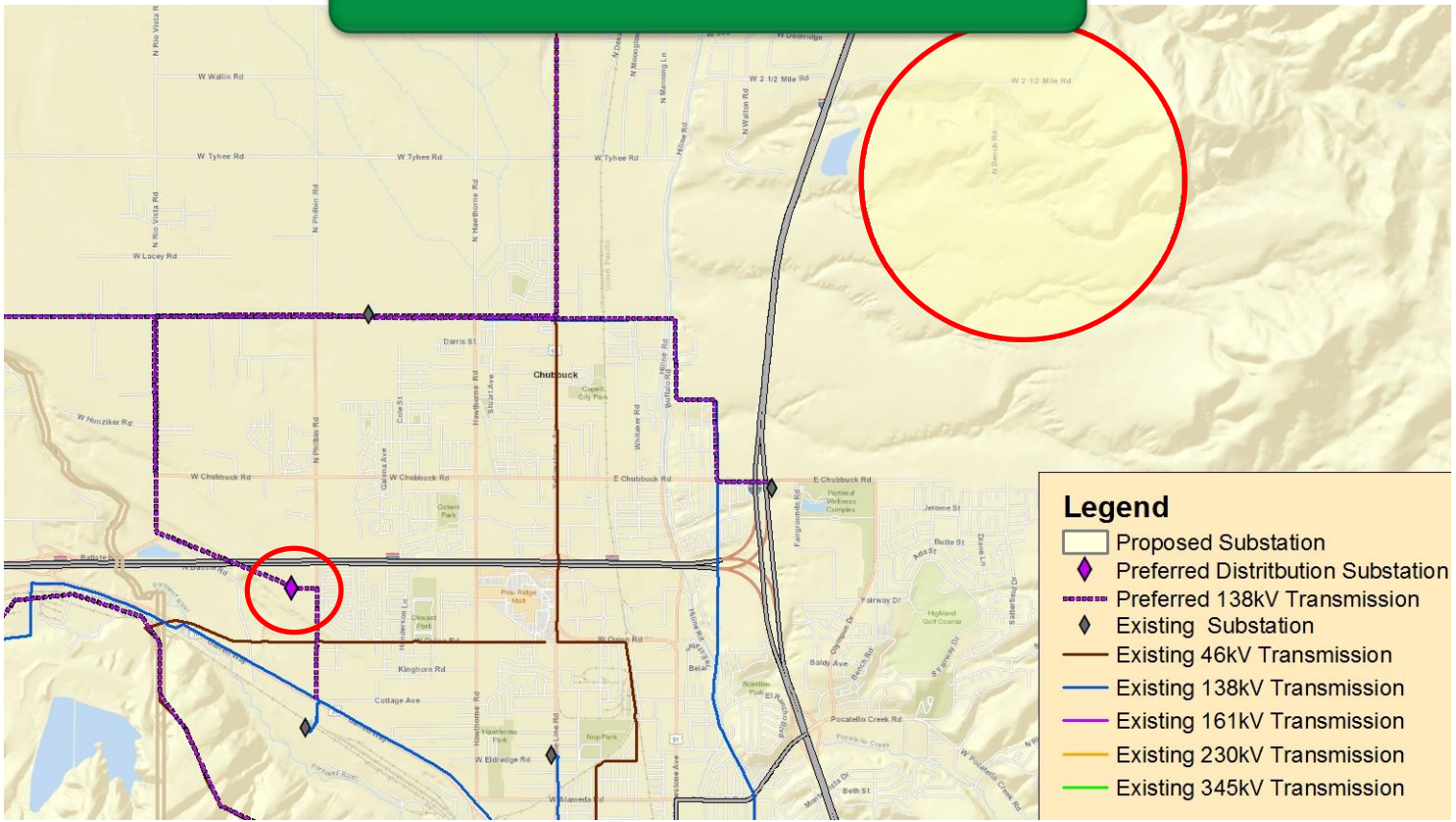
Purpose

Update Community Goals and Siting Criteria

- Siting and Design Goals
  - Cost
  - Economic Development
  - Energy Needs
  - Environment
  - Impacts
  - Planning
  - Reliability/Dependability
  - Siting
- Overarching Goals
  - Communication
  - Community/Political Support
  - Energy Efficiency/Conservation
  - Public Health
  - Environment
  - Marketing

Purpose

Update the Electrical Plan



Purpose

Comprehensive Plan Integration

Perspective

Meetings Outline

September:	Generation, substations, and transmission, WTVEP review, community goals and siting criteria
October:	Goals and siting criteria alignment, small-group mapping
November:	Small-group mapping
December:	Small-group mapping
January:	Finalize mapping
March:	Review draft update, discuss comprehensive plan integration

Adverse Weather

Western Treasure Valley Electrical Plan Update

General Power Concepts

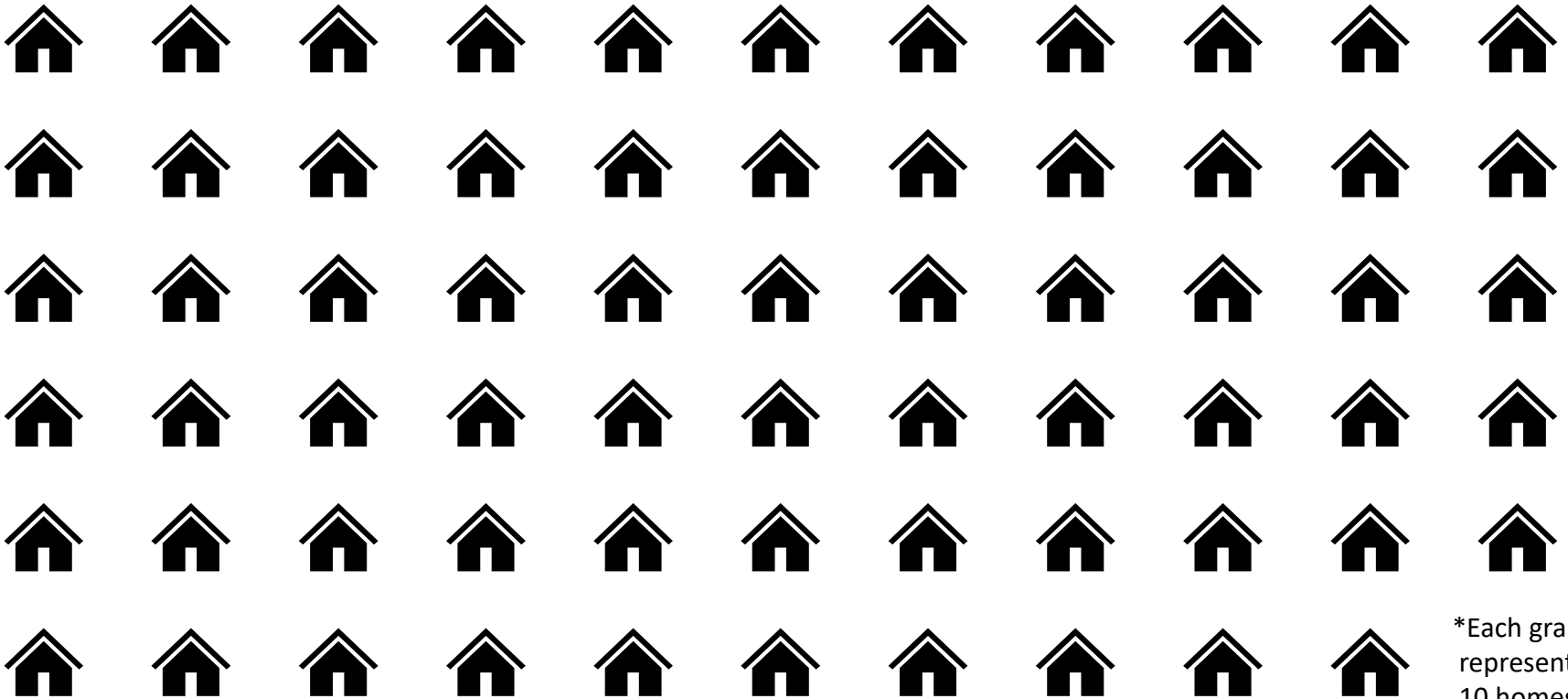
Dakota Pfaff
Technical Lead Engineer
Idaho Power

Power

The rate at which work is performed.

Unit: Megawatt (MW)

1MW Visualized – Average day

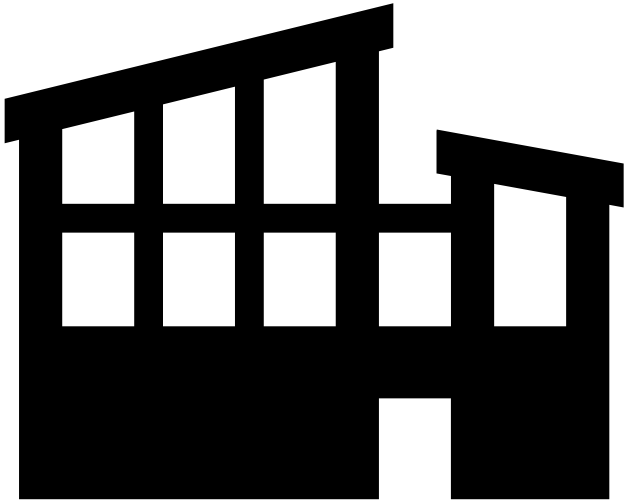


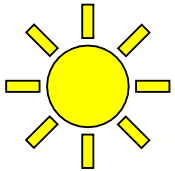
*Each graphic represents 10 homes

1MW Visualized – Peak summer day

*Each graphic represents 10 homes

1 MW Visualized – Large box store



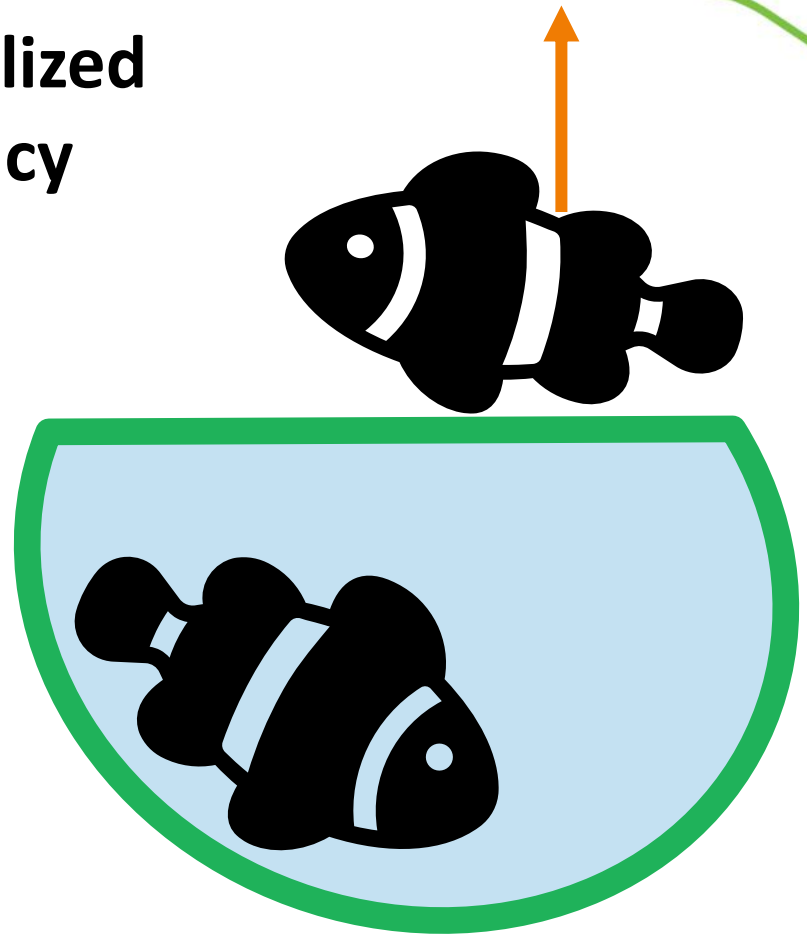


Capacity

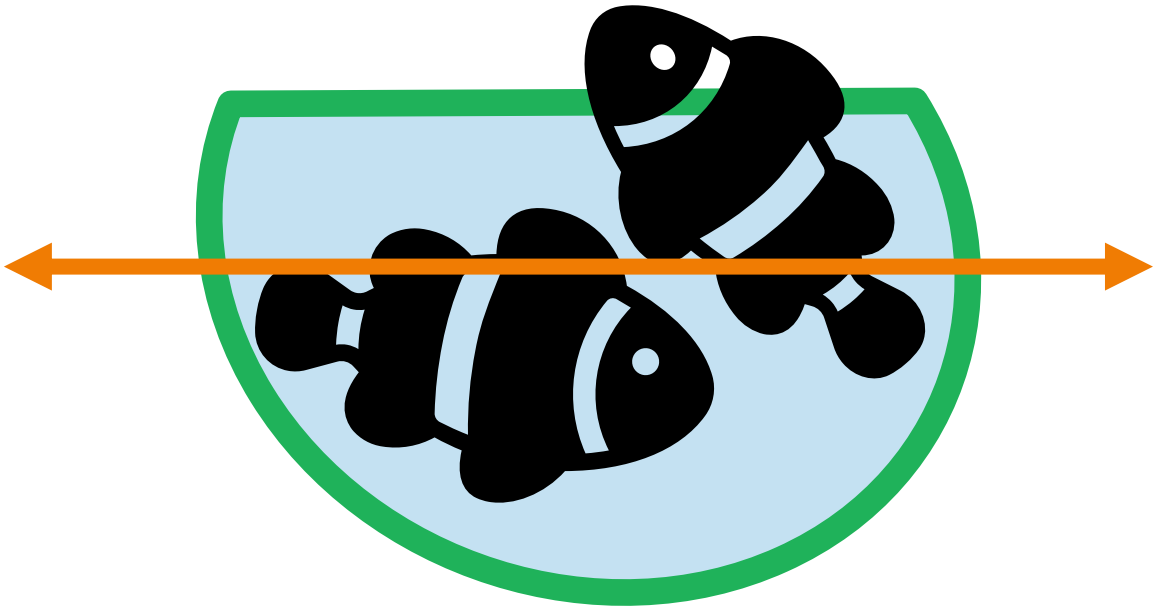
The amount of power an element can handle

- The unit is the same as it is for power (MW)

Capacity Visualized
Energy Efficiency

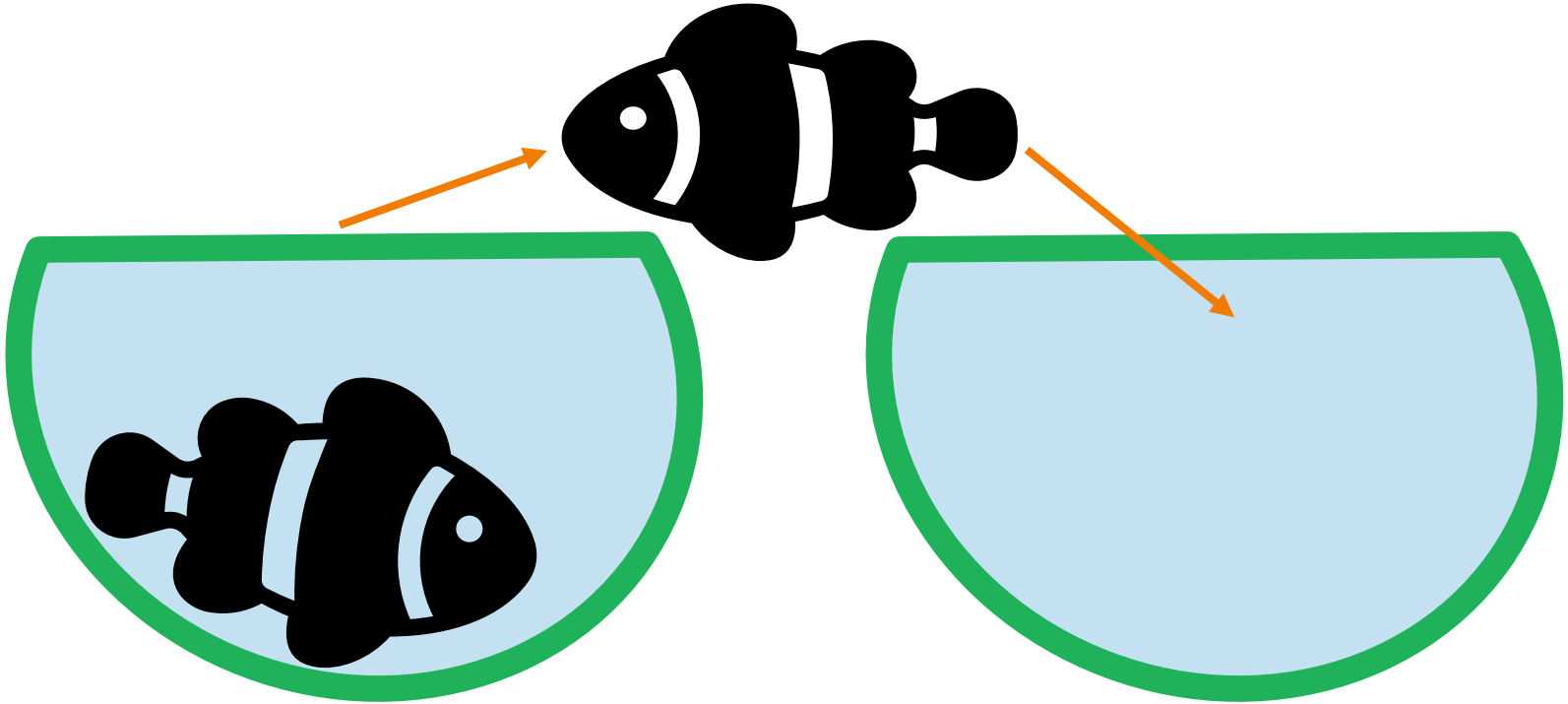


Capacity Visualized
Upgrade Existing Infrastructure



Capacity Visualized

Construct New Infrastructure



Capacity

Energy

The amount of power used in a given period:

- kilowatt-hour (kWh) = unit of measure for electrical energy

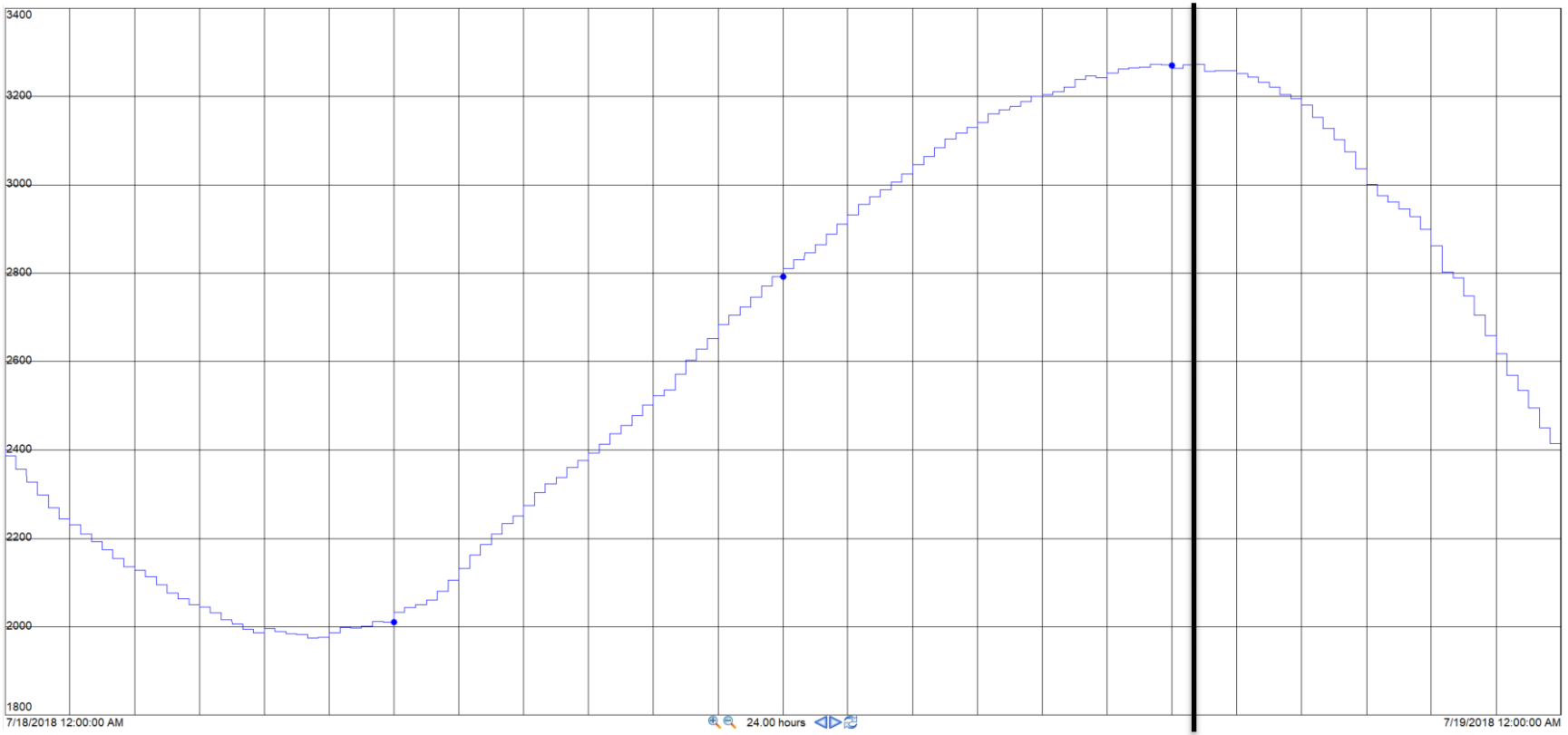
Energy vs Capacity Analogy

- Capacity: 2 vehicles at a time

- Energy: 1,000 vehicles pass the line in an hour

Demand (Load)

Peak Demand



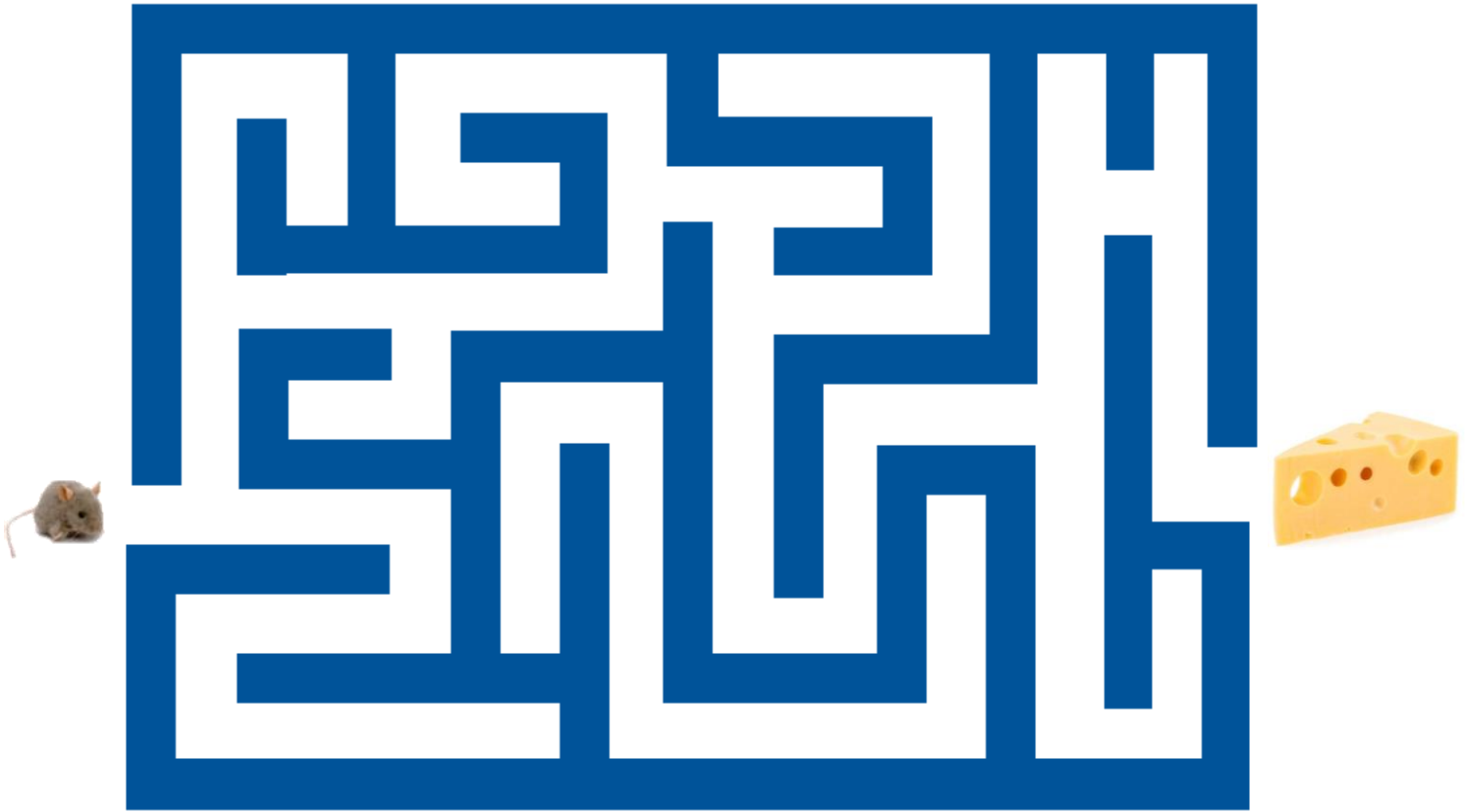
Typical Units for Power Delivery

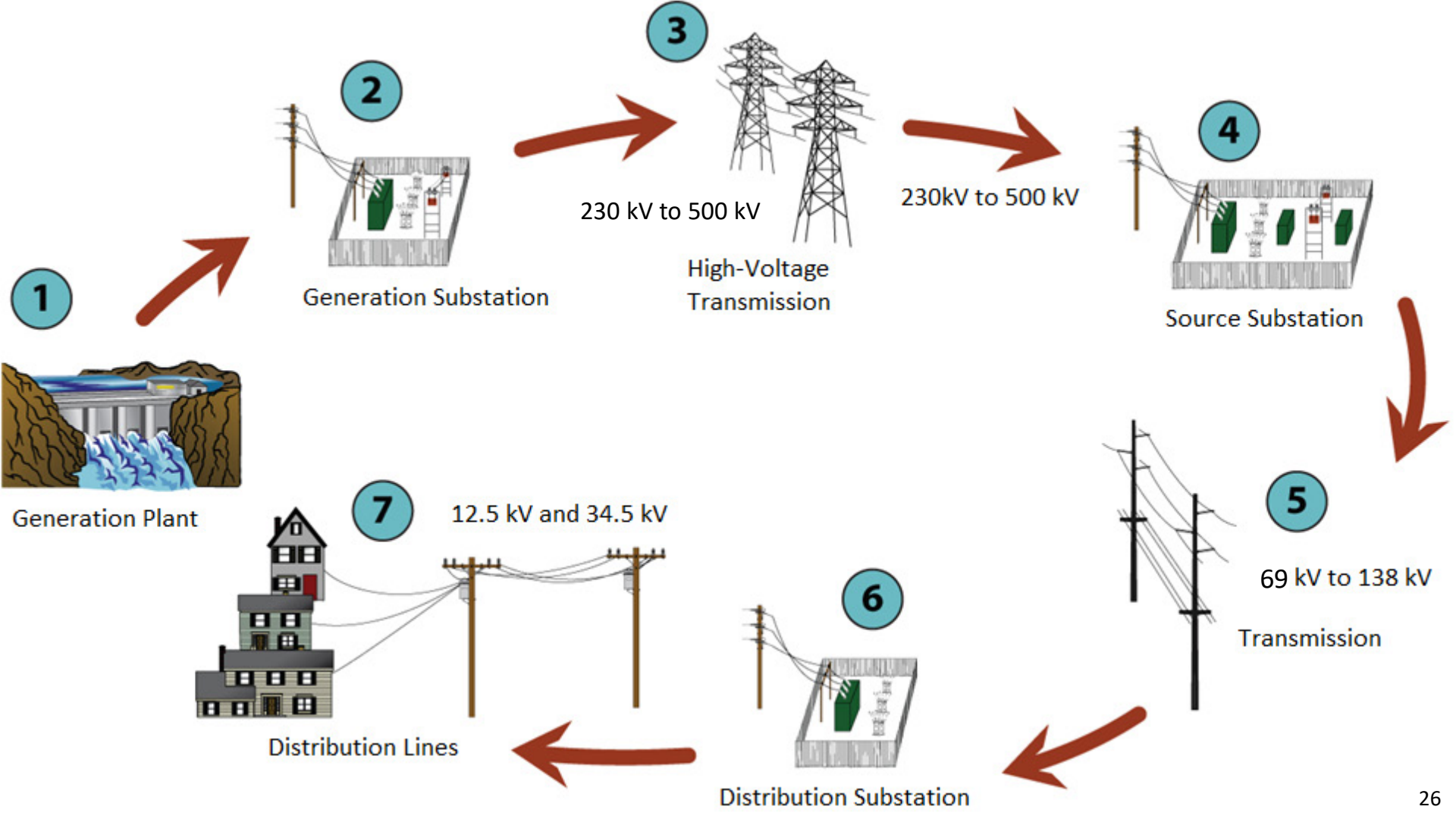
	Base Unit	Typical Unit
Voltage	Volt (V)	kilovolt (kV)*
Power	Watt (W)	megawatt (MW)**
Capacity	Watt (W)	megawatt (MW)**
Energy	Watt-hours (Wh)	kilowatt-hours (kWh)

kilo = 1,000

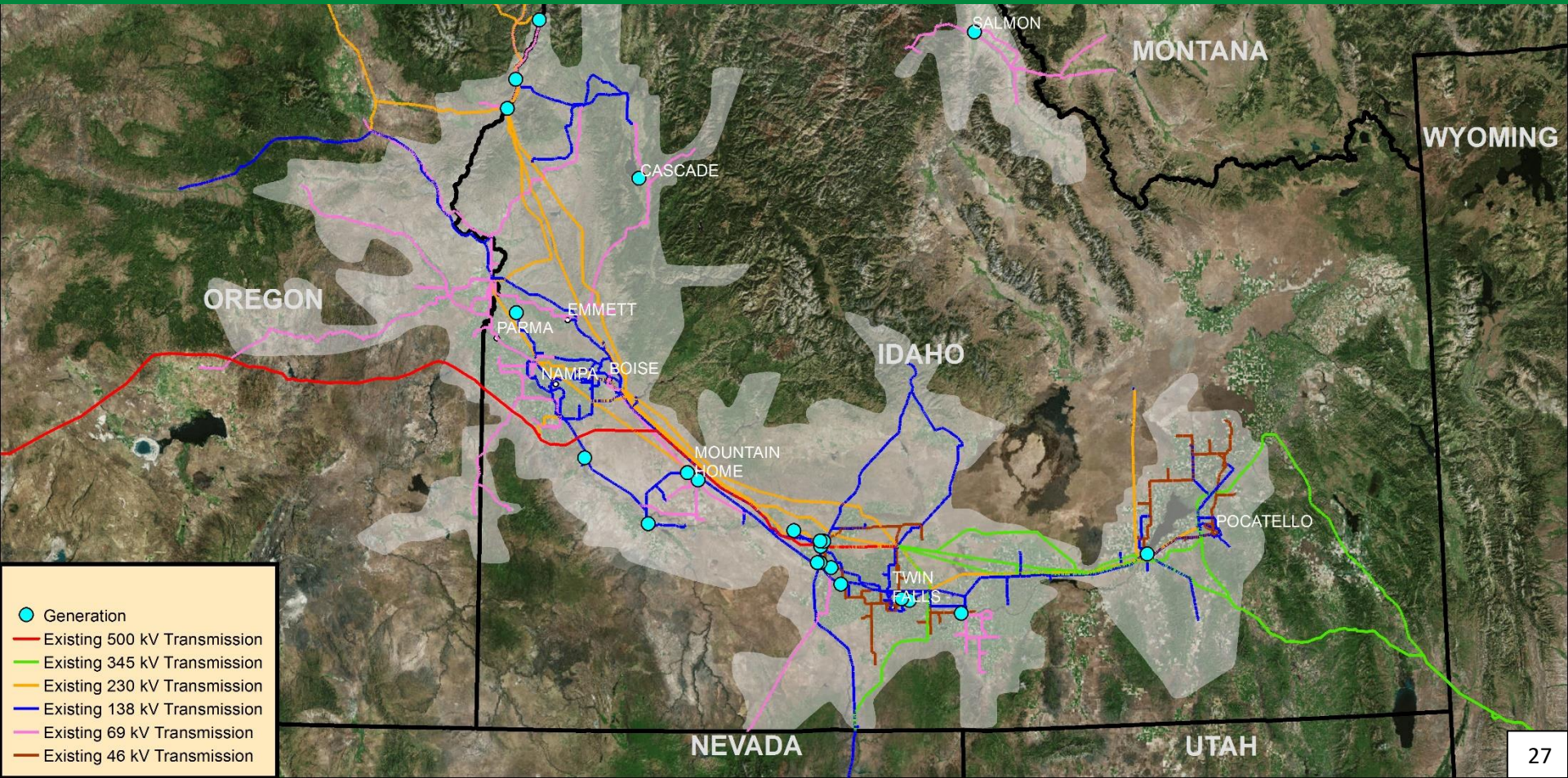
mega = 1,000,000

Power Flow

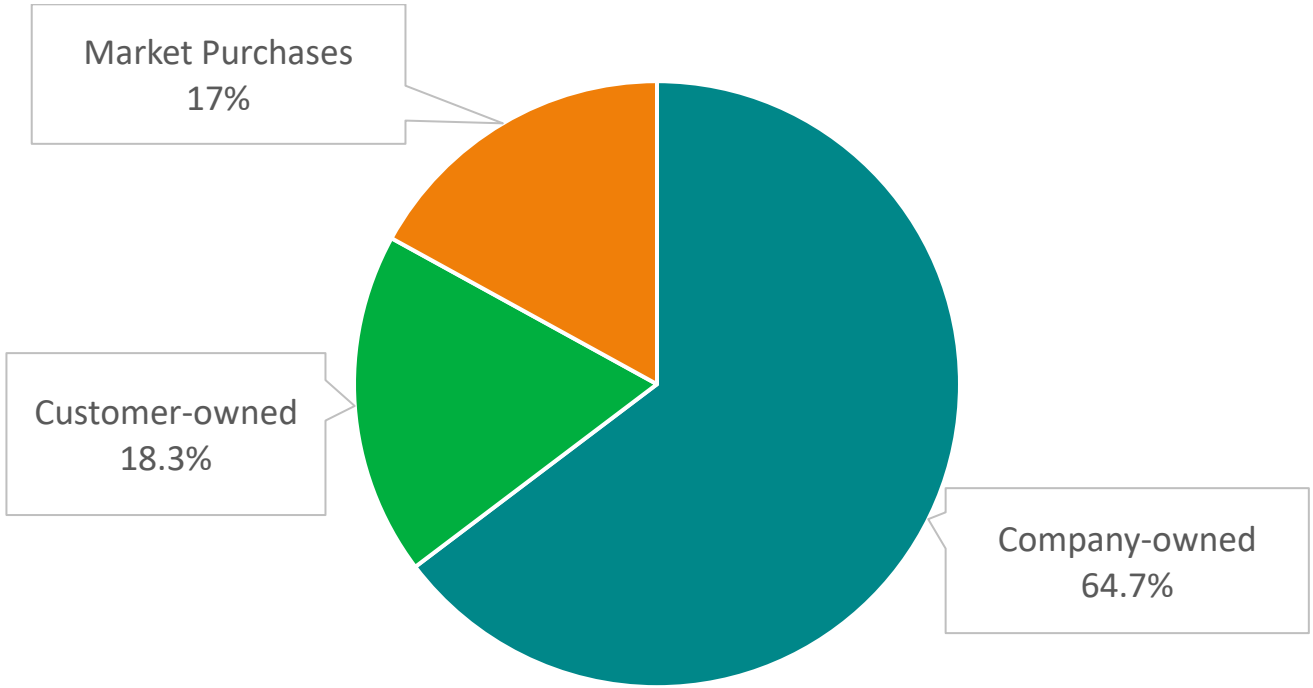



1
Generation Plant
2
Generation Substation
3
230 kV to 500 kV
High-Voltage
Transmission
230kV to 500 kV
4
Source Substation
5
69 kV to 138 kV
Transmission
6
Distribution Substation
7
12.5 kV and 34.5 kV
Distribution Lines

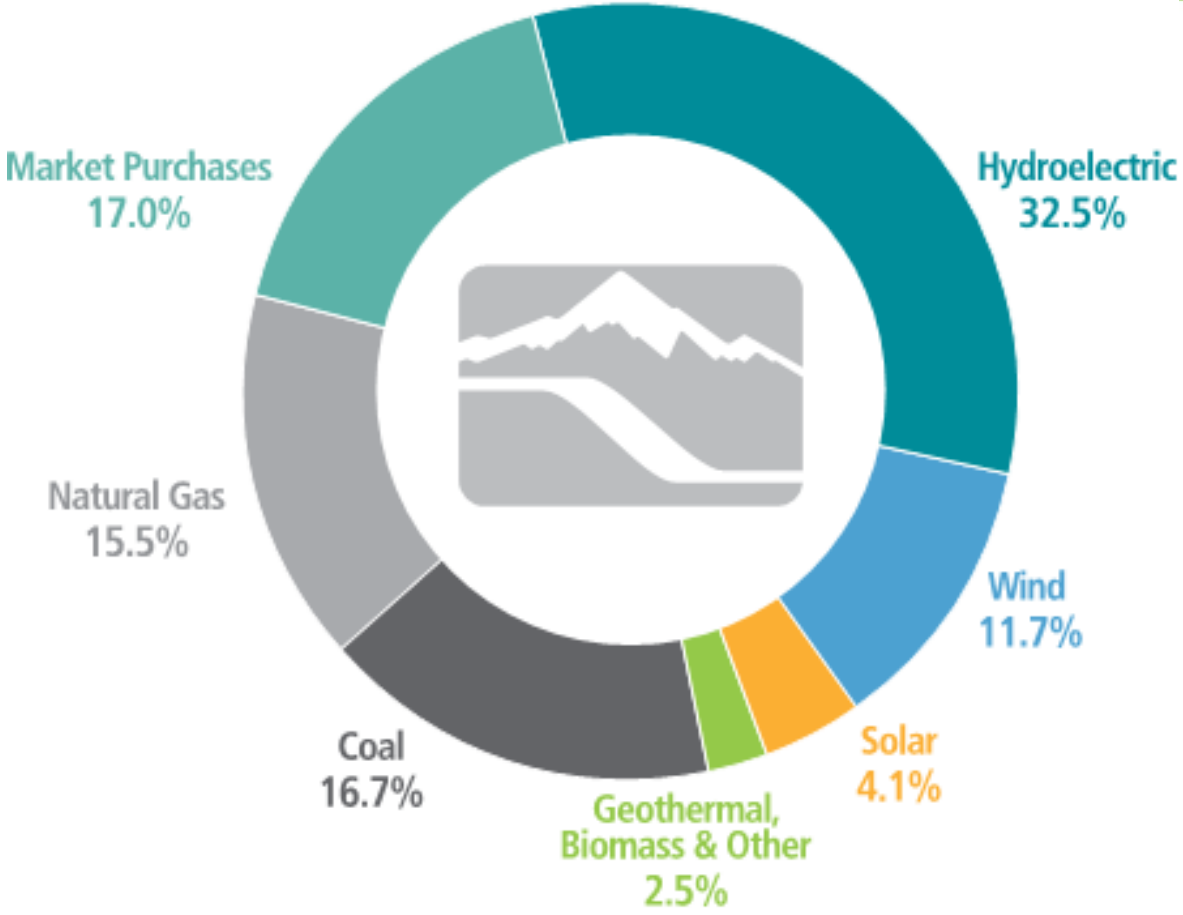
Idaho Power System Overview



2021 Generation Profile



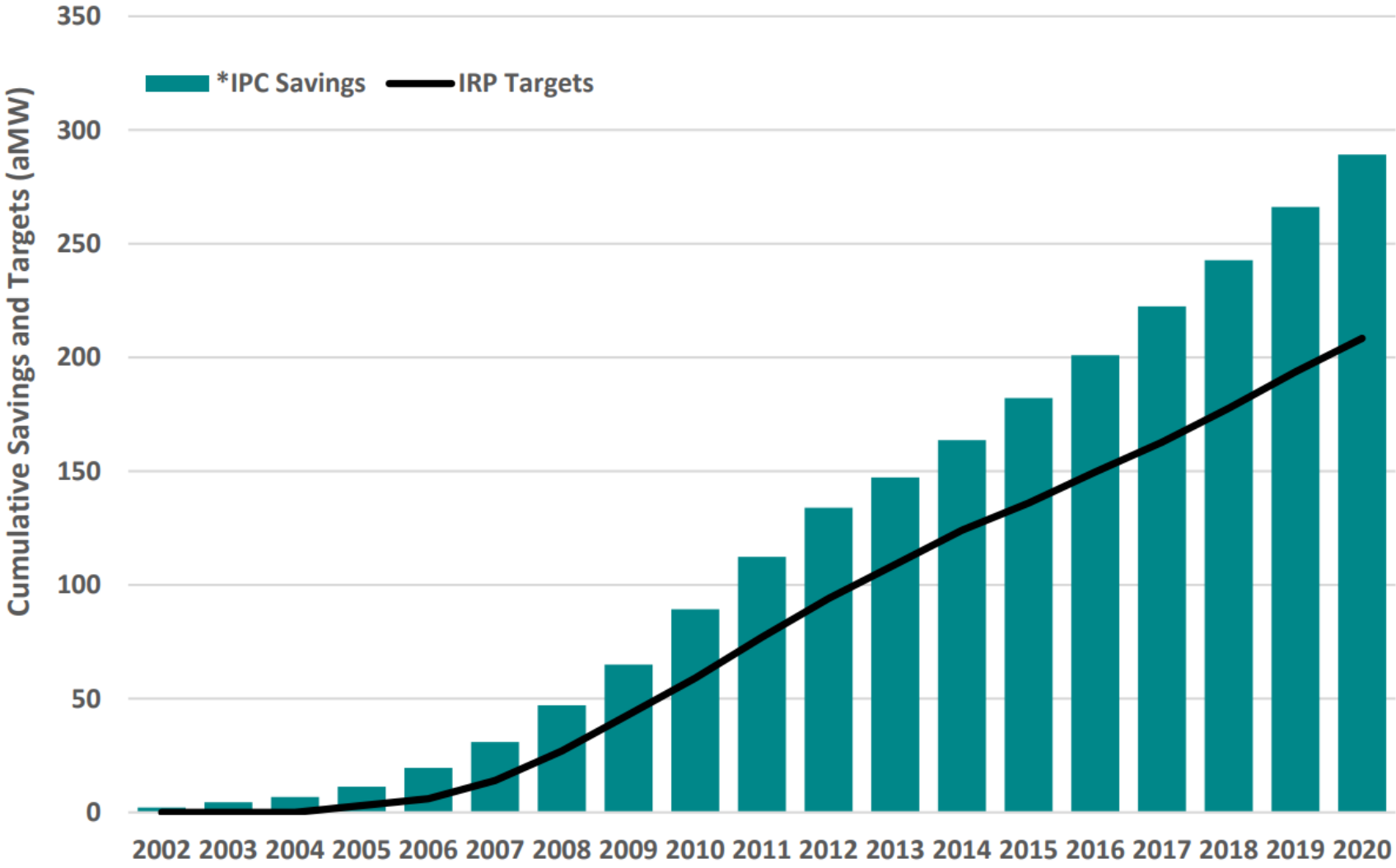
2021 Generation Profile



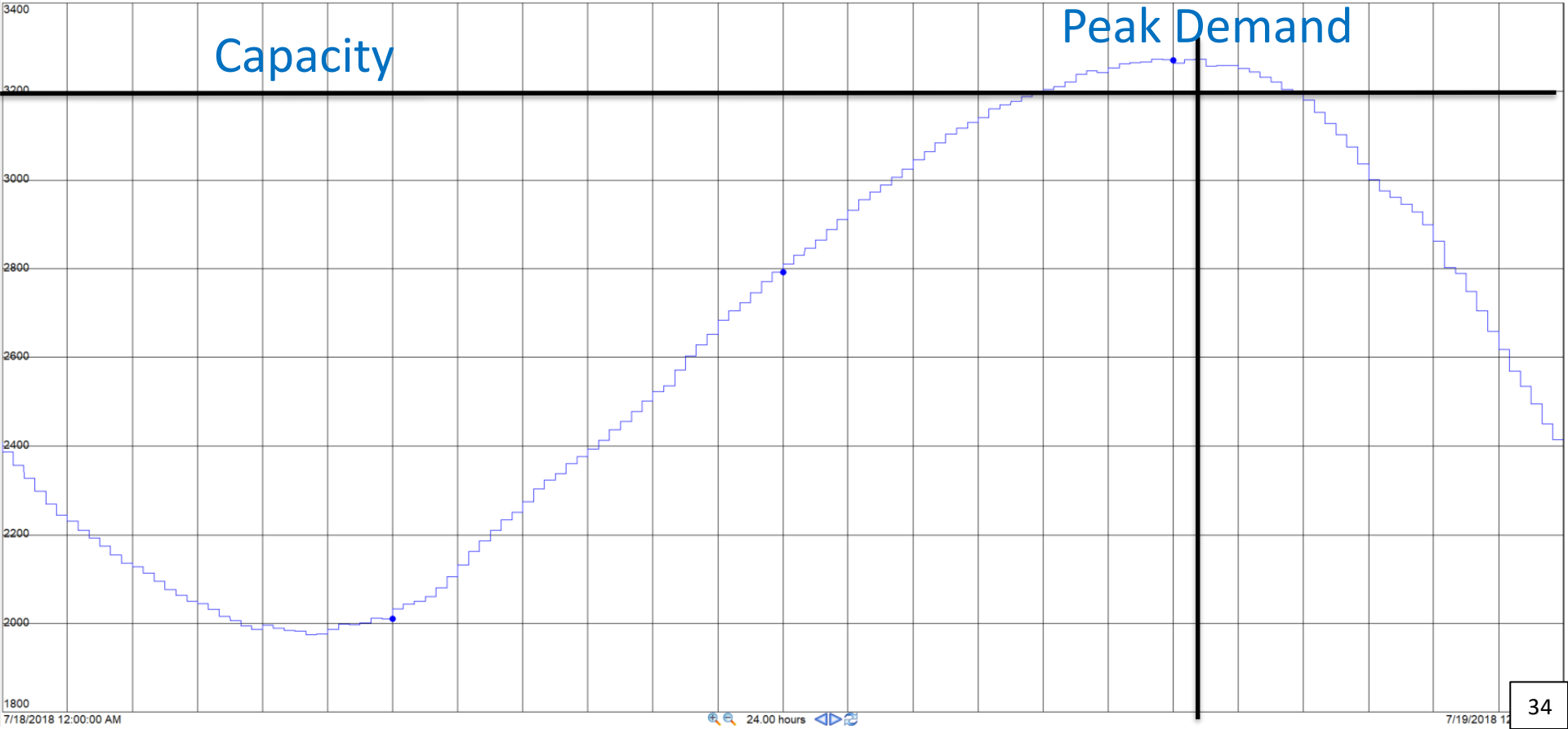
Energy Efficiency

Energy Efficiency

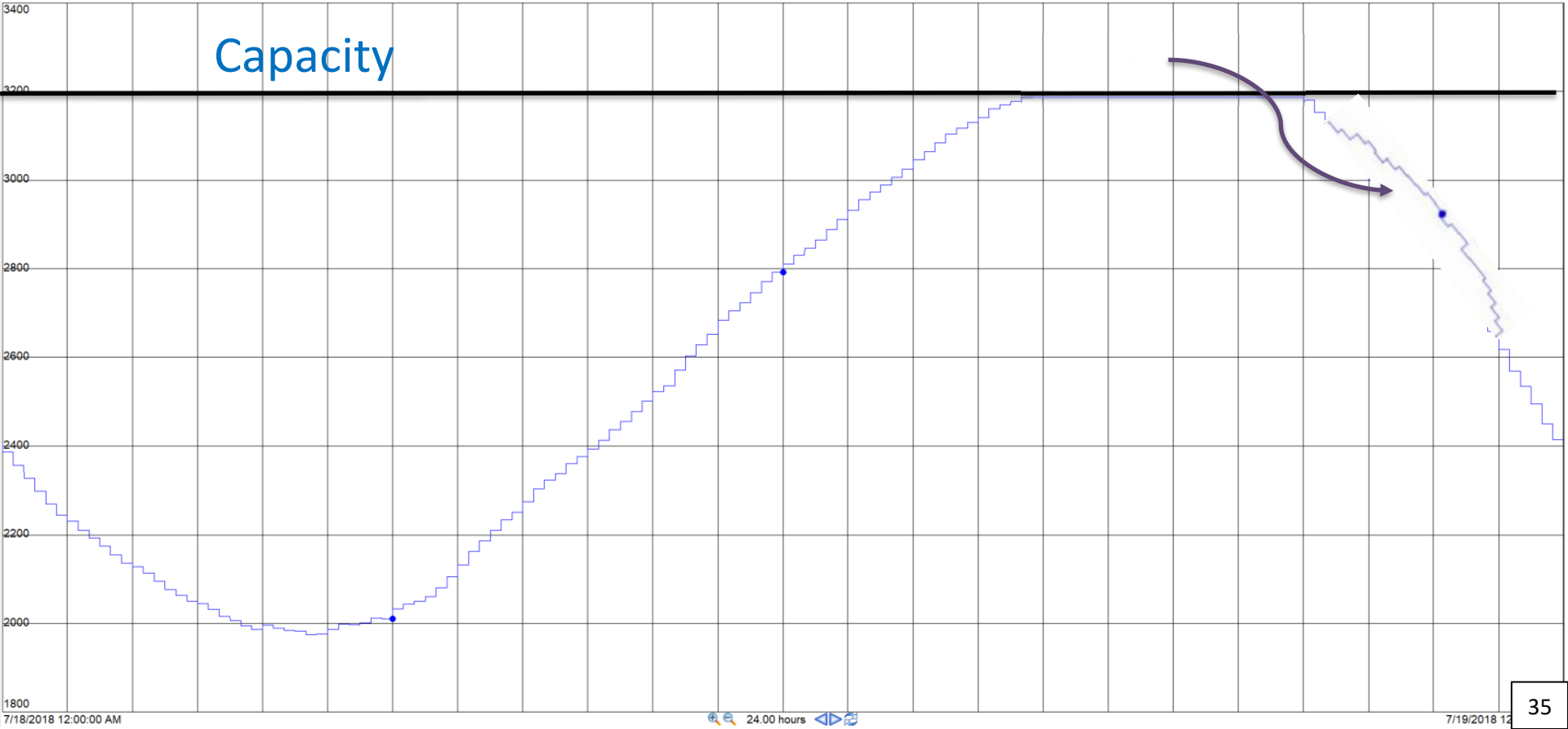
Energy Efficiency


Cumulative Savings and Targets (aMW)
350
300
250
200
150
100
50
0
*IPC Savings
IRP Targets
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020

Demand Response (DR)



Demand Response (DR)



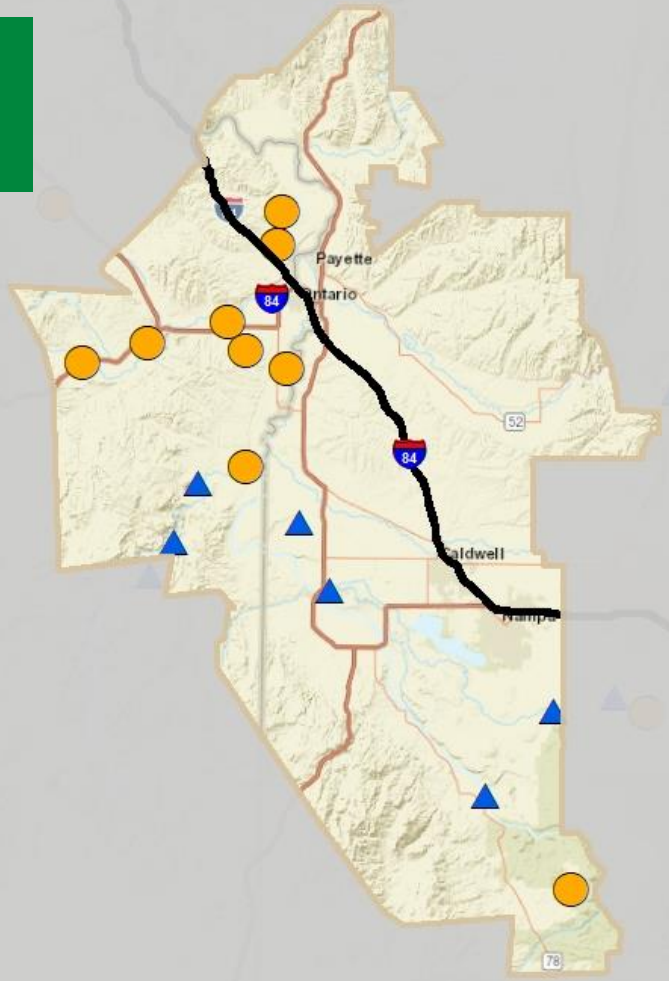
Demand Response

Demand Response

Demand Response

Distributed Energy Resources

WTVEP Distributed Energy Resource Map



Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Kor
(Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

PV Solar Generation

Market Purchases

High demand, high cost

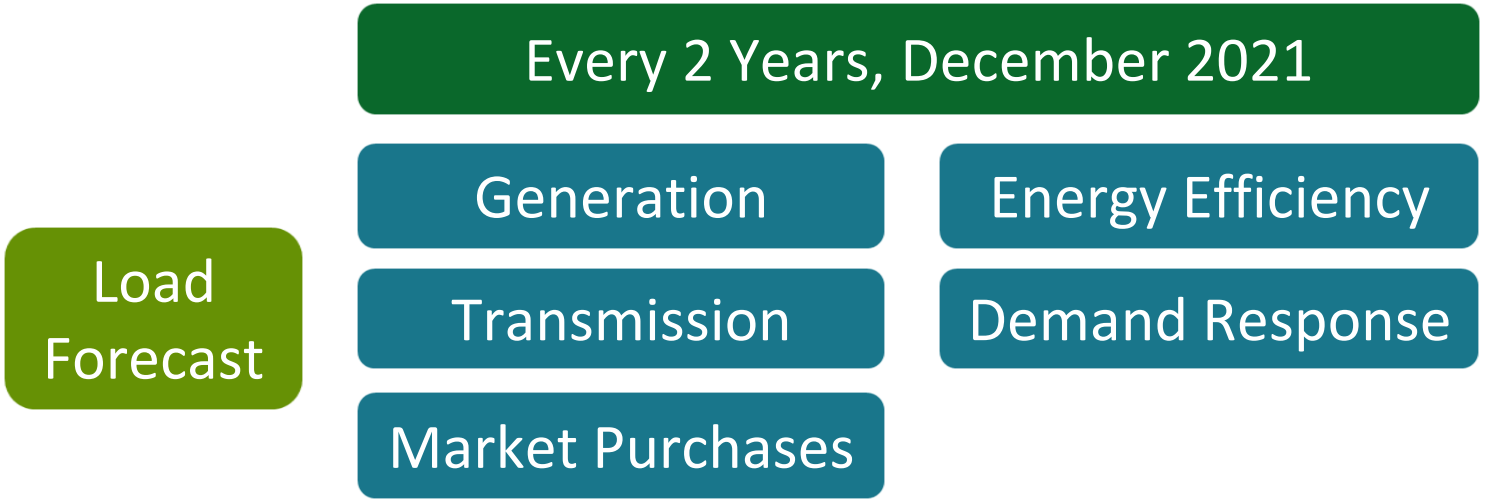
25% in 2021

Low demand, low cost

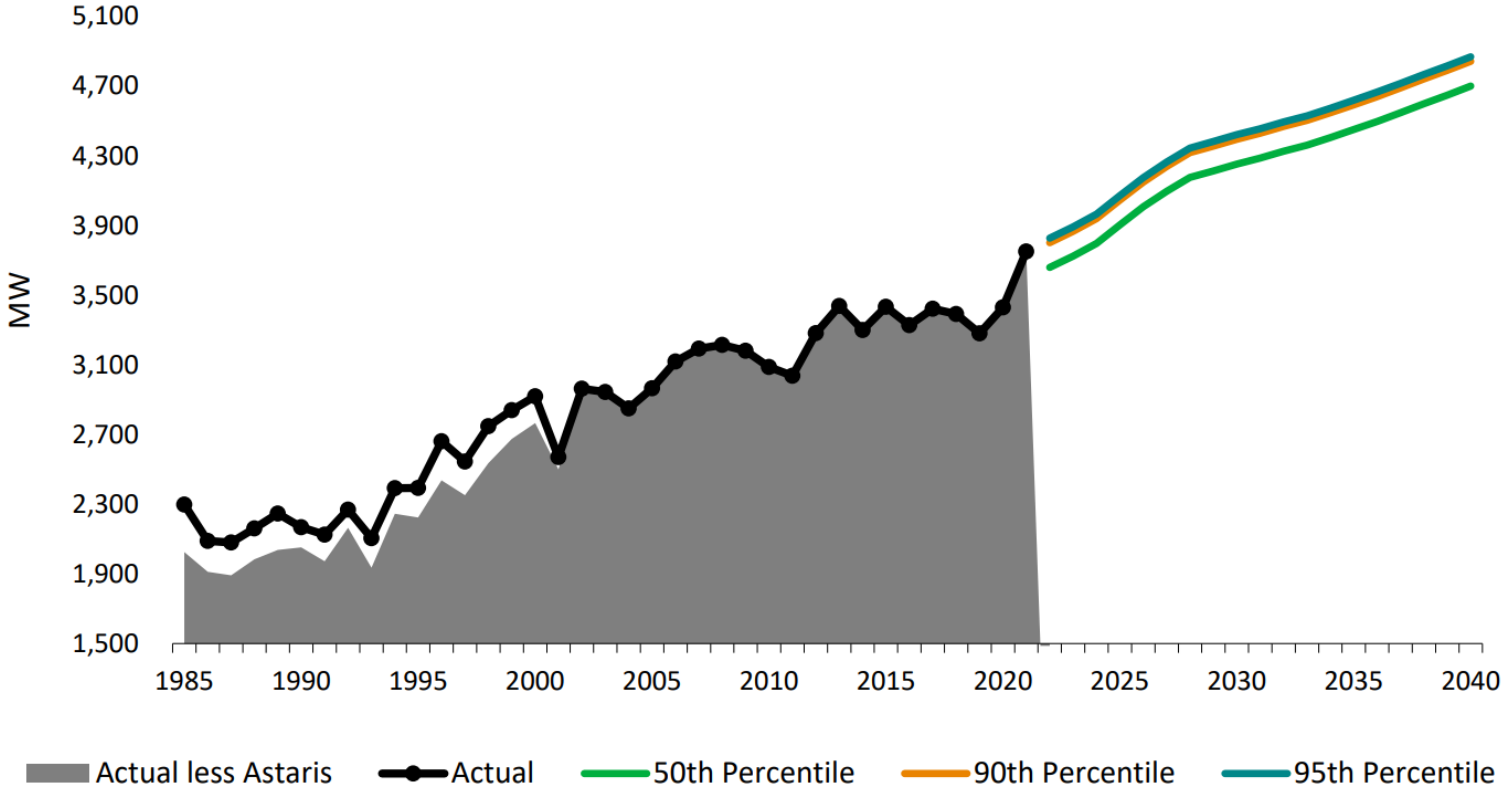
Long-Term Plans

www.idahopower.com

Integrated Resource Plan (IRP)

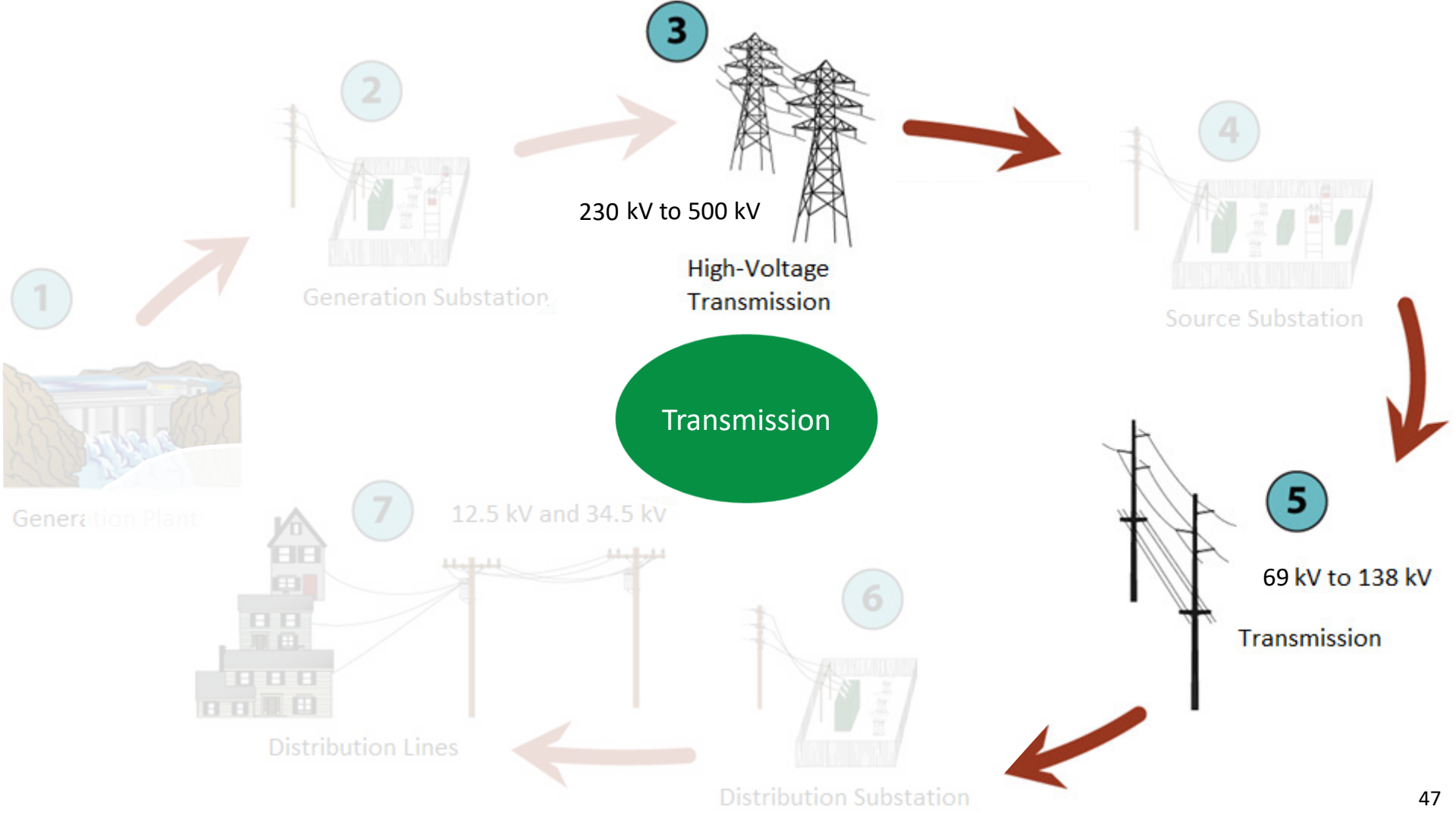


Forecasted Demand

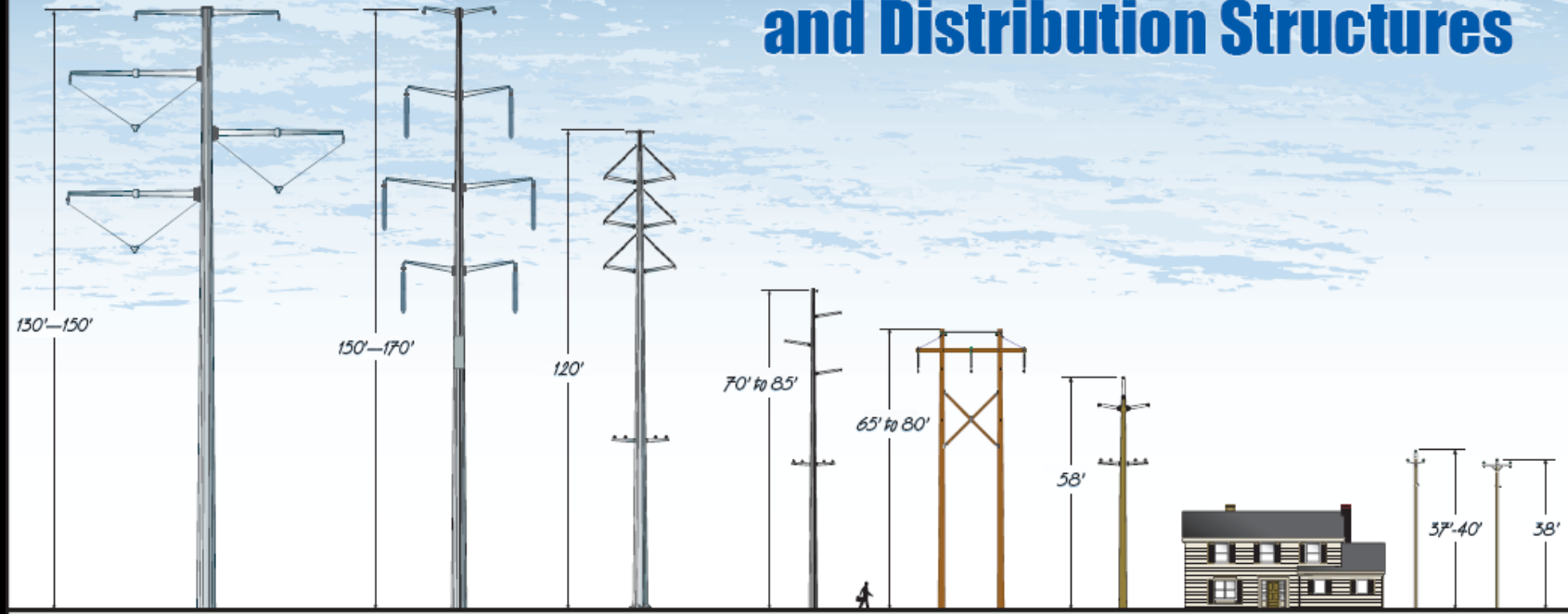


Integrated Resource Plan (IRP)

Year	Gas	Wind	Solar	Storage	Trans.	DR	Coal Exits	EE Forecast	EE Bundles
2021	0	0	0	0	0	0	0	23	0
2022	0	0	0	0	0	300	0	24	0
2023	0	0	120	115	0	20	-357	24	0
2024	357	700	0	5	0	0	0	25	0
2025	0	0	300	105	0	20	-308	27	0
2026	0	0	215	0	500	0	0	28	0
2027	0	0	250	5	0	0	0	27	0
2028	0	0	120	55	0	0	-175	27	0
2029	0	0	100	255	0	0	0	26	0


3
230 kV to 500 kV
High-Voltage
Transmission
Transmission
5
69 kV to 138 kV
Transmission

Typical Transmission and Distribution Structures



SINGLE-CIRCUIT 500 kV STEEL POLE STRUCTURE

DOUBLE-CIRCUIT 345 kV STEEL POLE STRUCTURE

DOUBLE-CIRCUIT 230 kV STEEL POLE STRUCTURE

SINGLE-CIRCUIT 138 kV WOOD or STEEL POLE STRUCTURE AT 300' SPACING

SINGLE-CIRCUIT 138 kV H-FRAME STRUCTURE AT 600' SPACING

SINGLE-CIRCUIT 69 kV WOOD POLE STRUCTURE

TWO-STORY HOUSE

SINGLE-CIRCUIT 12 kV or 34.5 kV WOOD POLE STRUCTURES

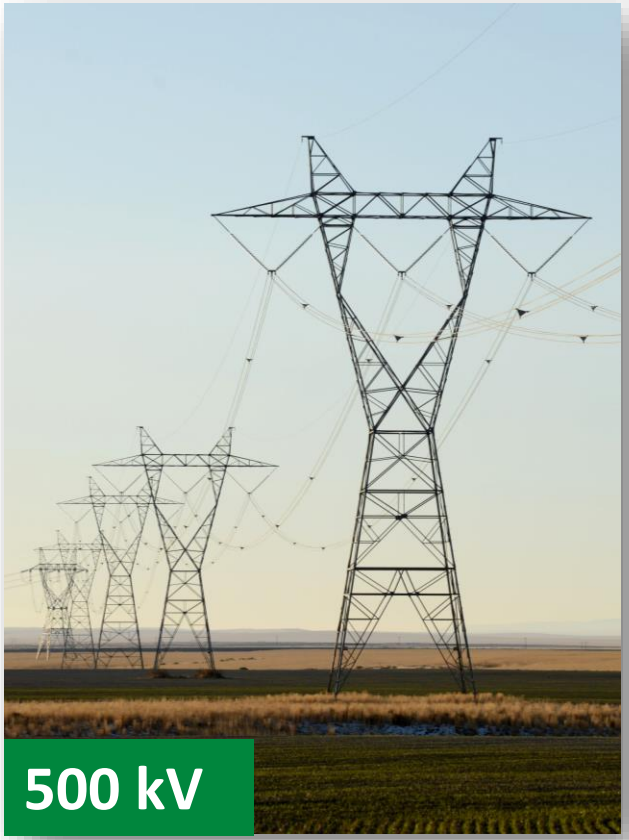
IDAHO POWER An IDACORP Company

Transmission and Sub-Transmission Lines

Distribution Lines

REVISED (6/2004 JPC/jhb)

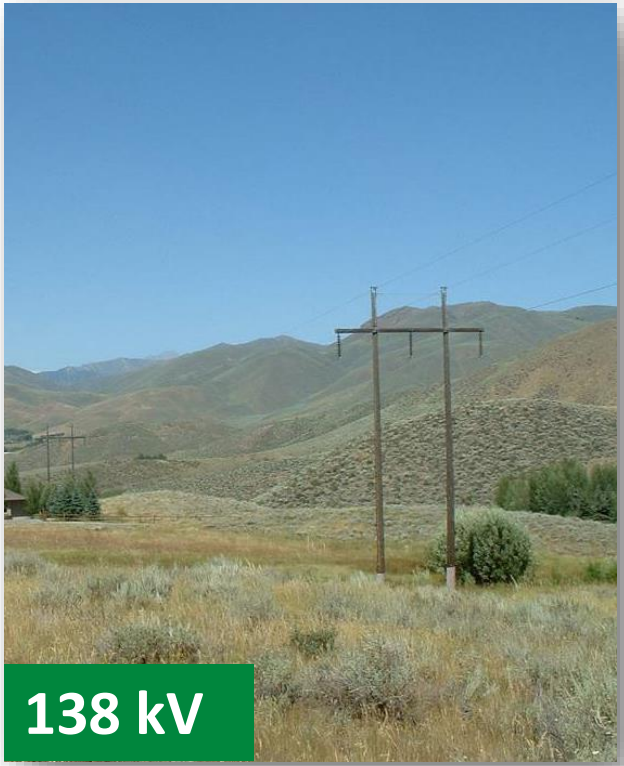
High-Voltage Transmission



230 kV - 500 kV

- Large amounts
- Long distances
- In scope

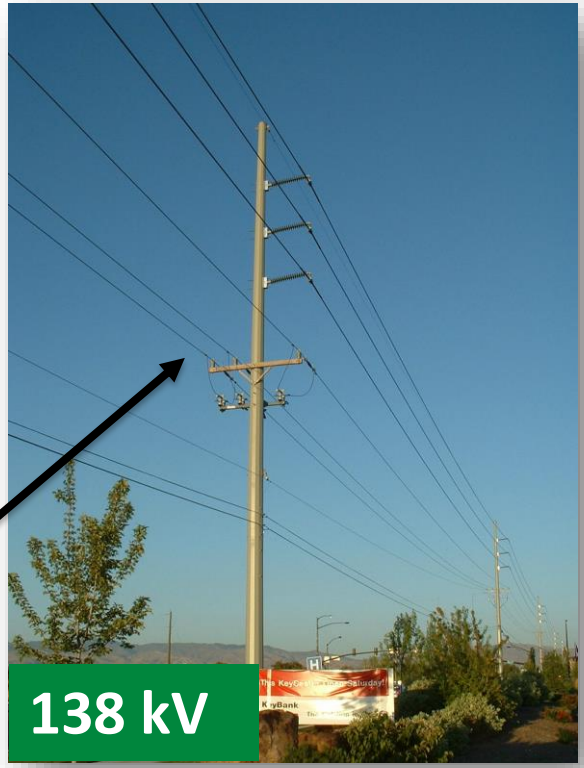
Transmission



138 kV

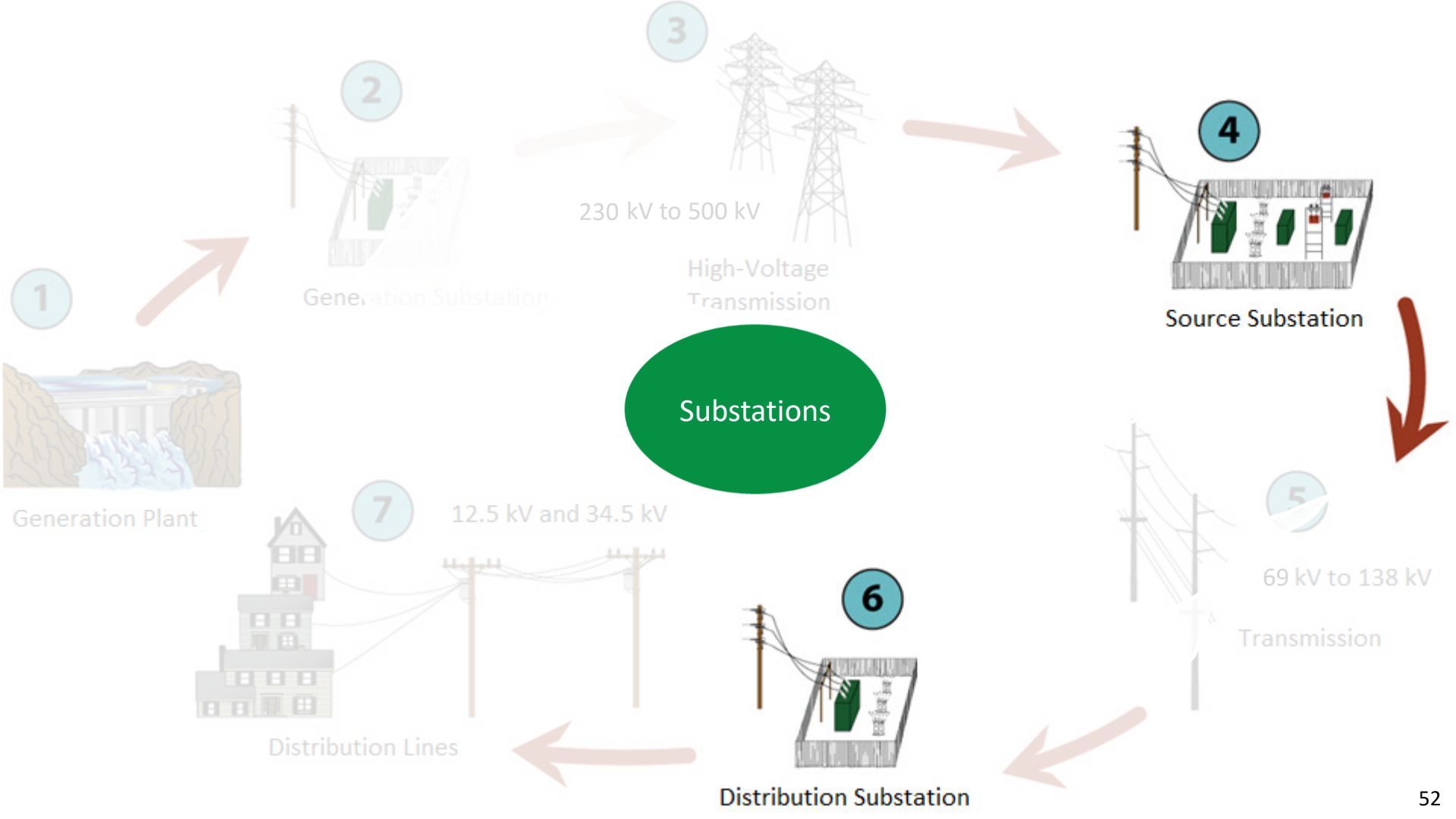
- Connects Distribution Substations
- In scope

Distribution line



Transmission Line Information

Voltage (kV)	Capacity (MW)	Typical Height (feet)	Cost (per mile)
500 kV	1,500	150	$ Millions
230 kV	500	100–120	$1 Million – $1.2 Million
138 kV	200	65–85	$450k - $500k
69 kV	70	58	$250k - $300k


Substations
Generation Plant
Source Substation
230 kV to 500 kV
High-Voltage Transmission
69 kV to 138 kV
Transmission
12.5 kV and 34.5 kV
Distribution Lines
Distribution Substation

Substation

Transformer

Circuit Breaker

Source Substation

- Converts high-voltage to lower voltage transmission
- 5–10 acres

Distribution Substation

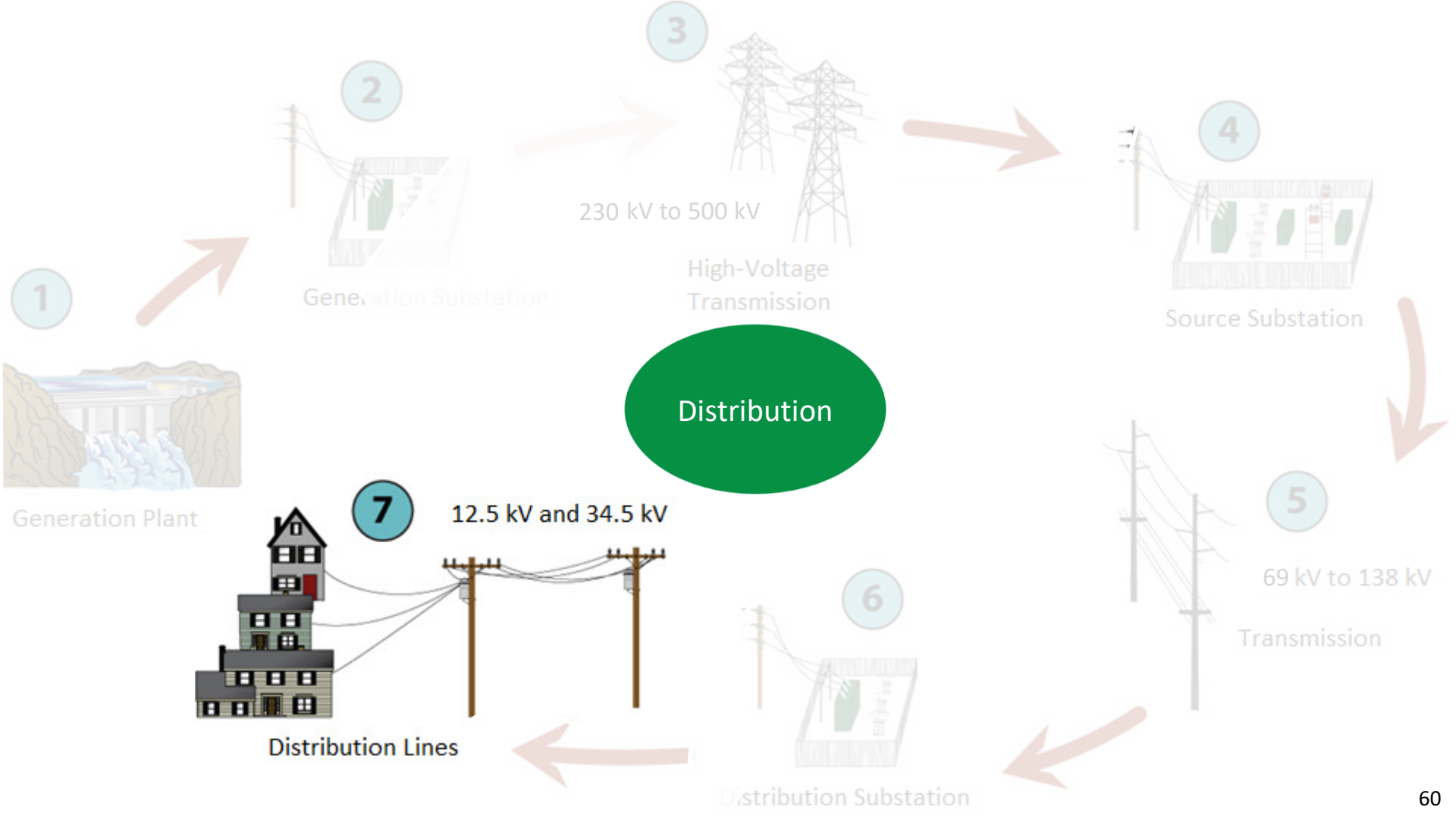
- These are the substations in your neighborhood

Distribution Substation

- Convert low voltage transmission to distribution
- Source power to homes and businesses
- 2-3 Acres

Substation Information

Substation Type	Capacity (MW)	Area (acres)	Cost
Source	200 - 600	5 - 10	$12M - $18M
Distribution	5 - 88	2 - 3	$6M - $8M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12.5 kV and 34.5 kV
Distribution Lines

Distribution Lines

- 12.5 kV and 34.5 kV
- Overhead or Underground
- From Substation to Home
- Out of Scope

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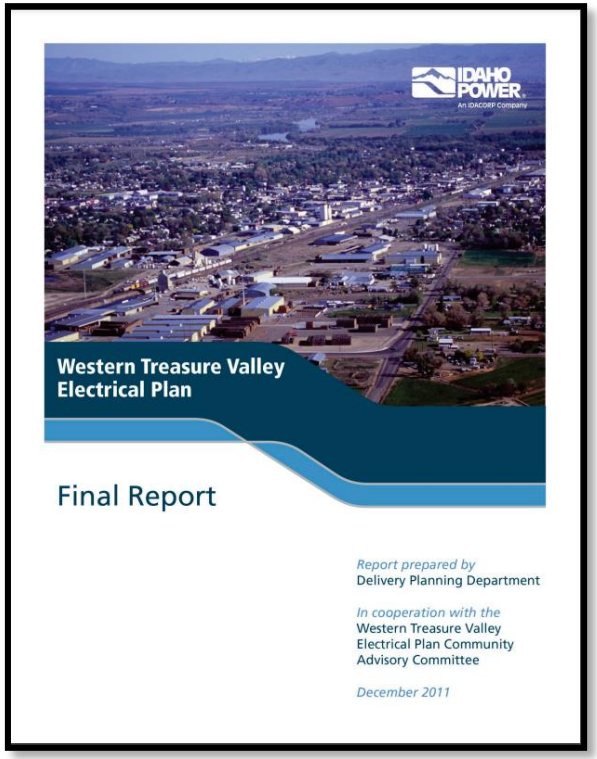
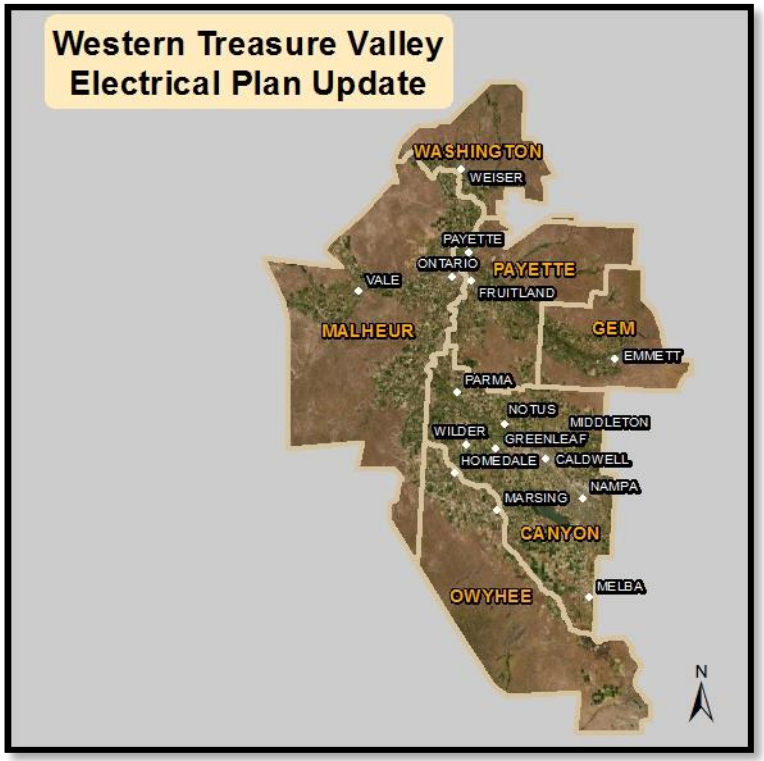
2011 WTVEP Review

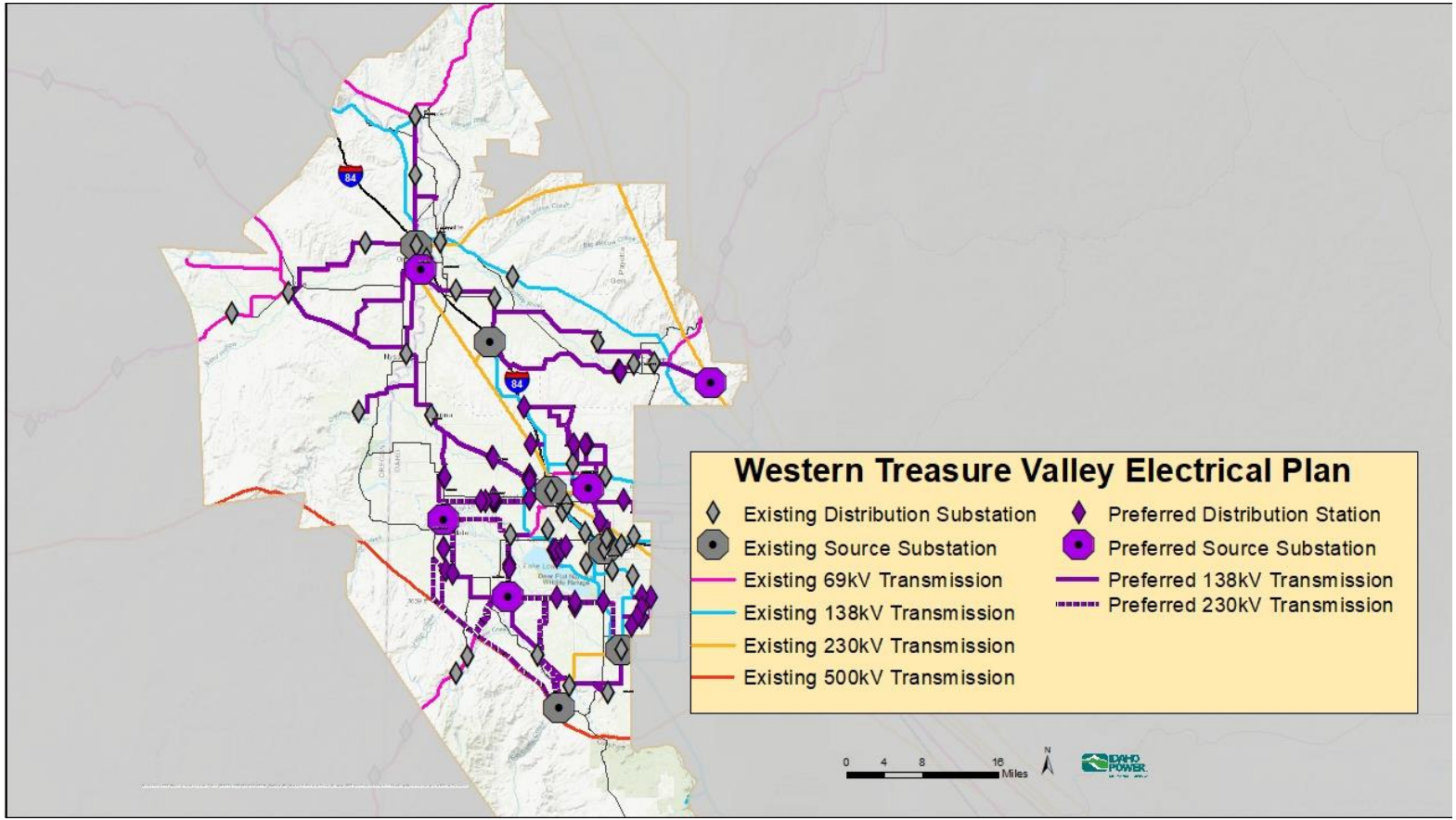
Rebecca Irwin
Senior Planning Engineer
Electrical Plan Project Leader
Idaho Power

Western Treasure Valley Electrical Plan (WTVEP)

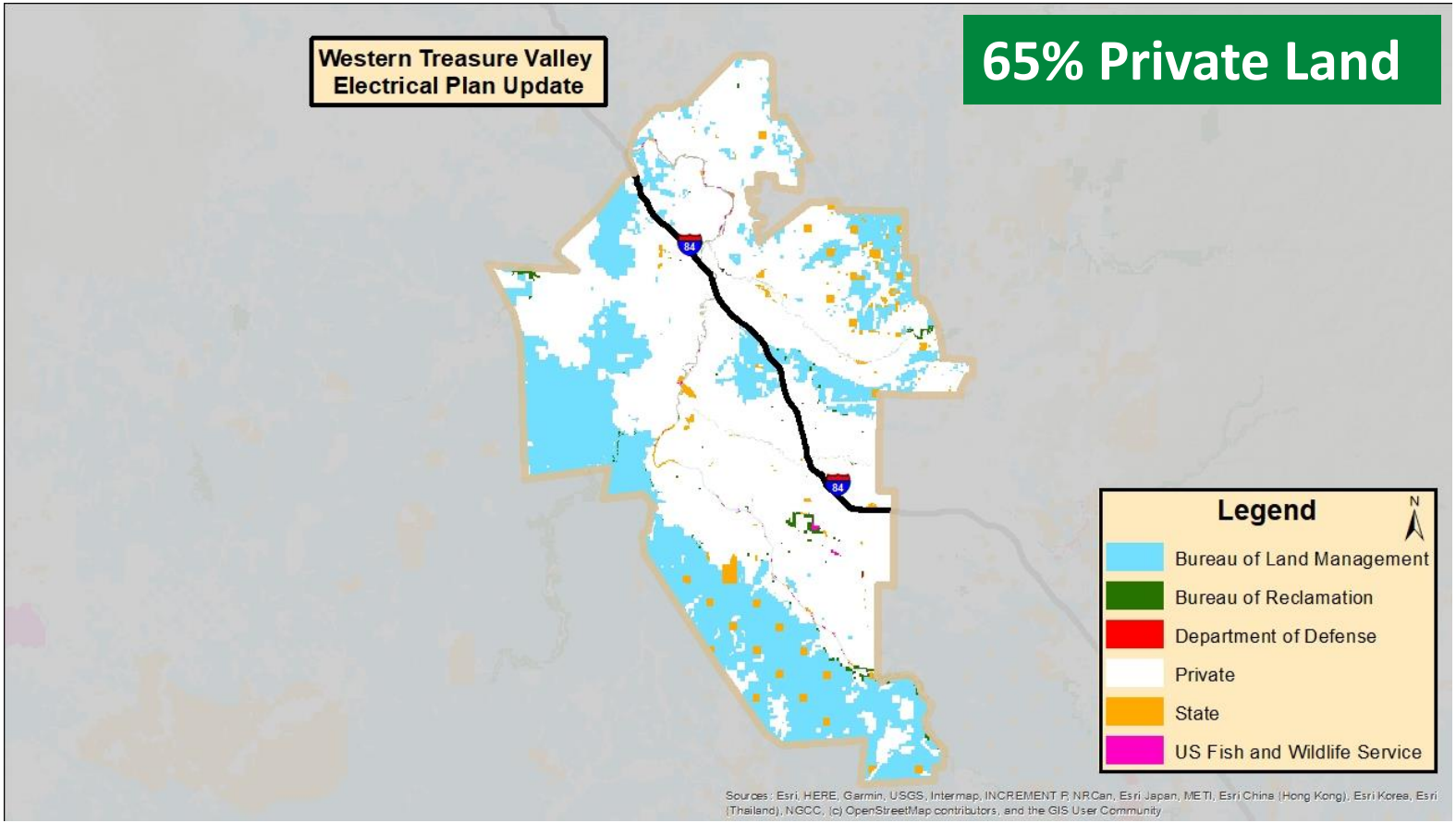




2011 WTVEP Result

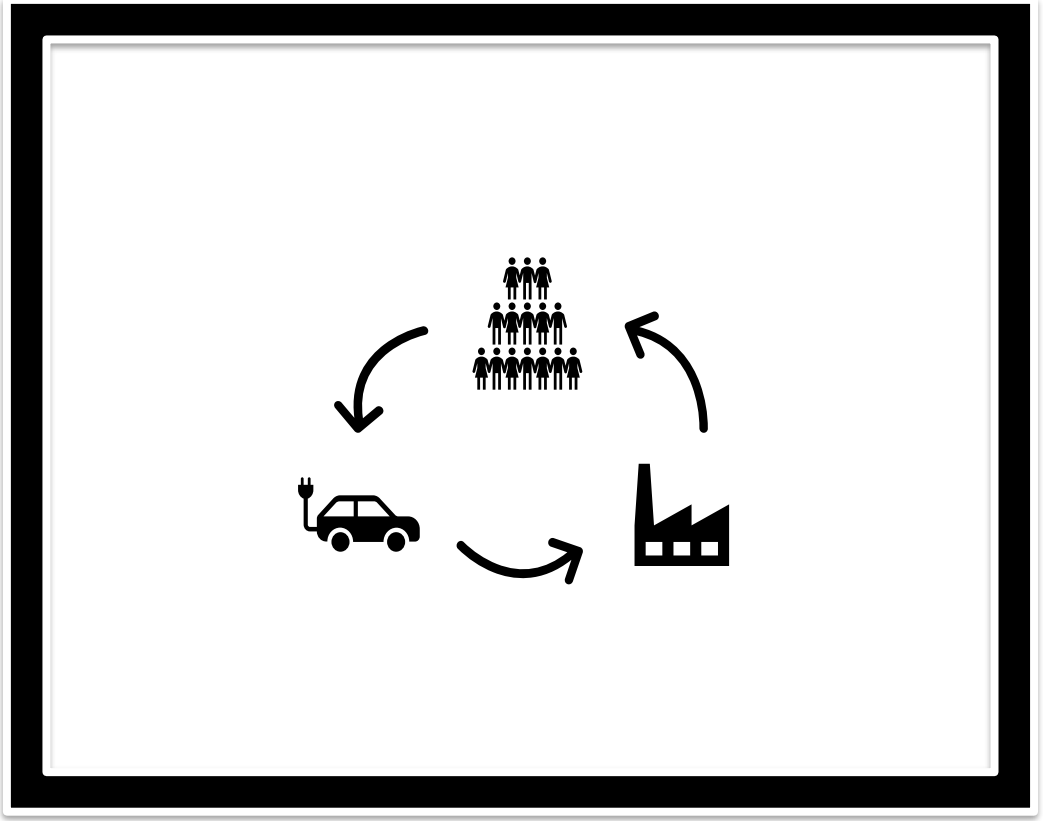


Spatial Load Forecast



Growth

Land



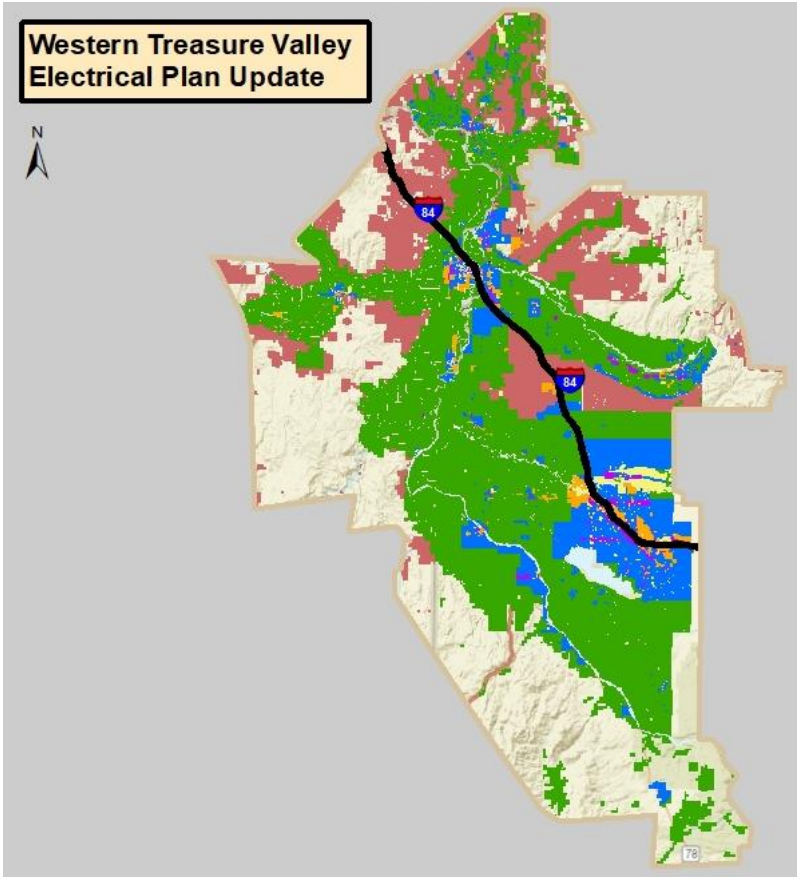
Water

Buildout

- The point in time when all available land is developed according to the land-use designations

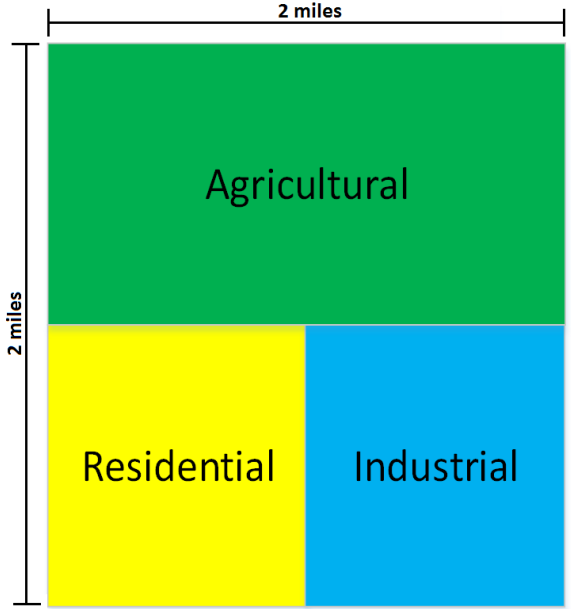
Land Use/Zoning

- Maps obtained from county and city jurisdictions
- Assigned zoning designations to all private land



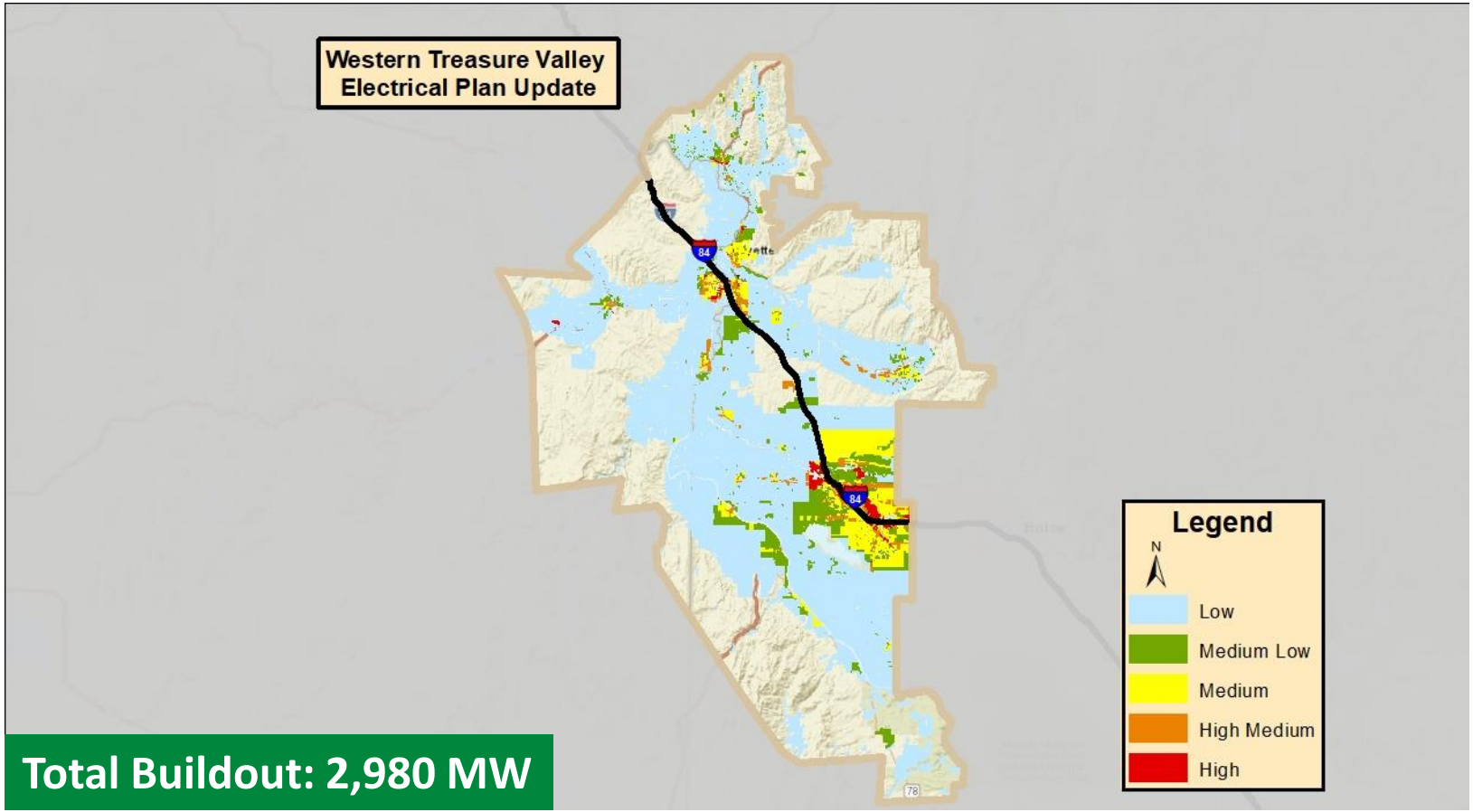
Load Density

- Assigned a load density to land use/zoning designations for all private land
- = MW/mi^2



Zoning Description	Load Density (MW/mi^2)	Zone Area (mi^2)	Load (MW)
Agricultural	0.4	2	0.8
Residential	6	1	6
Industrial	40	1	40
Total		4	46.8

Buildout Load Density

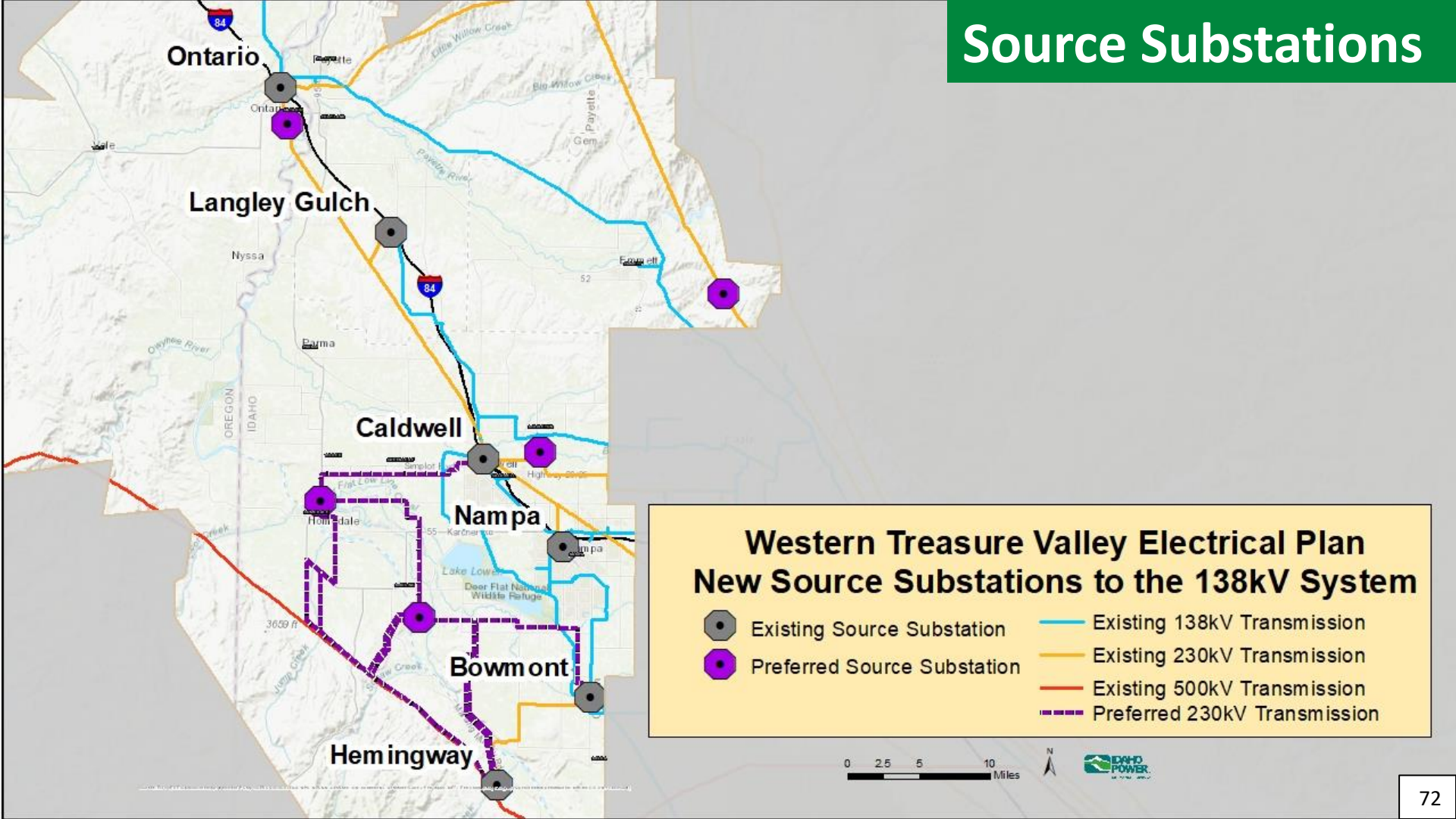


Total Buildout: 2,980 MW

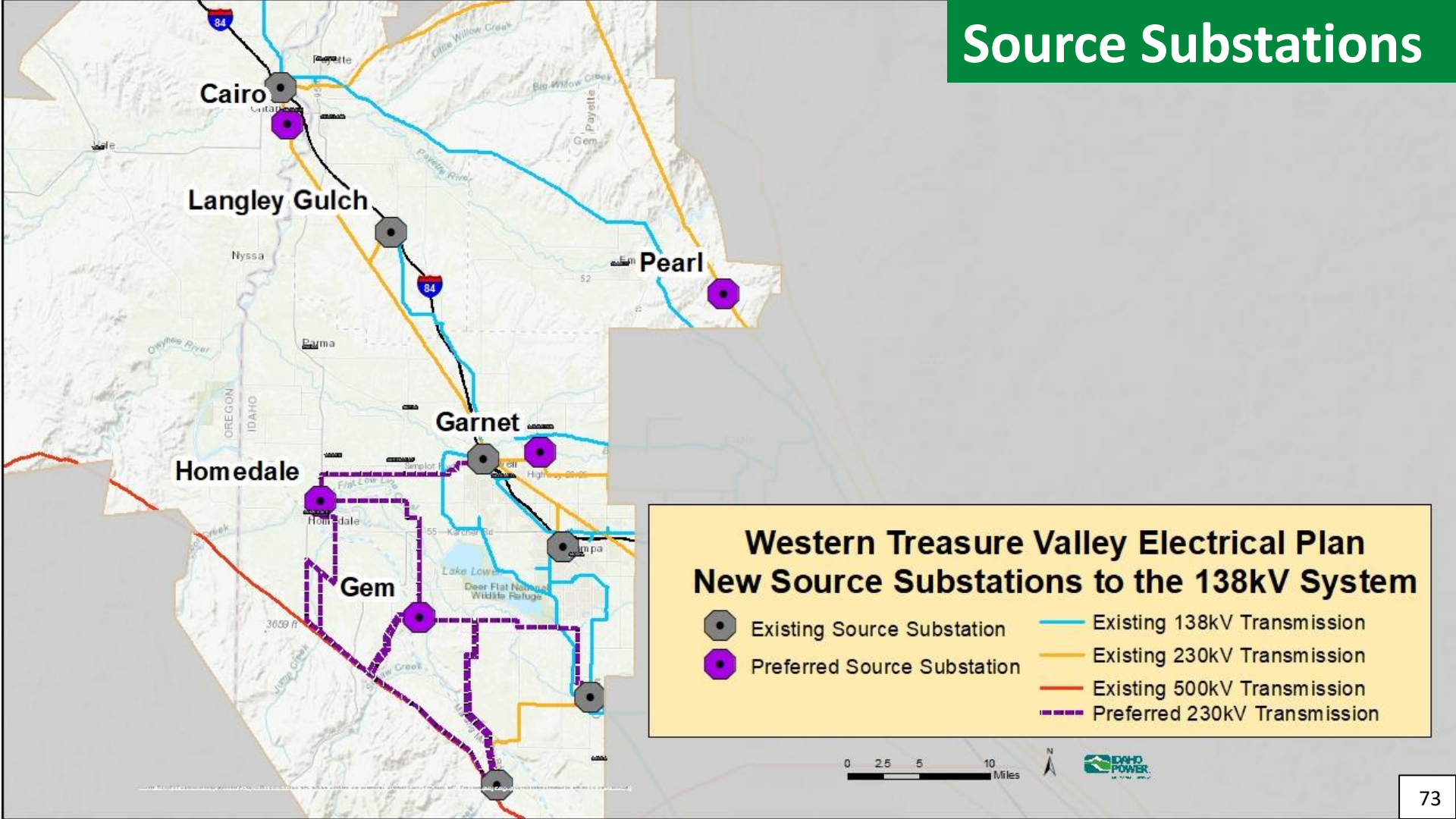
2011 West Treasure Valley Loads by Jurisdiction

County	2011 Load (MW)	Buildout Load (MW)
Canyon	422	1831
Gem	26	181
Malheur	86	336
Owyhee	24	252
Payette	74	325
Washington	35	55
Total	**667**	**2980**

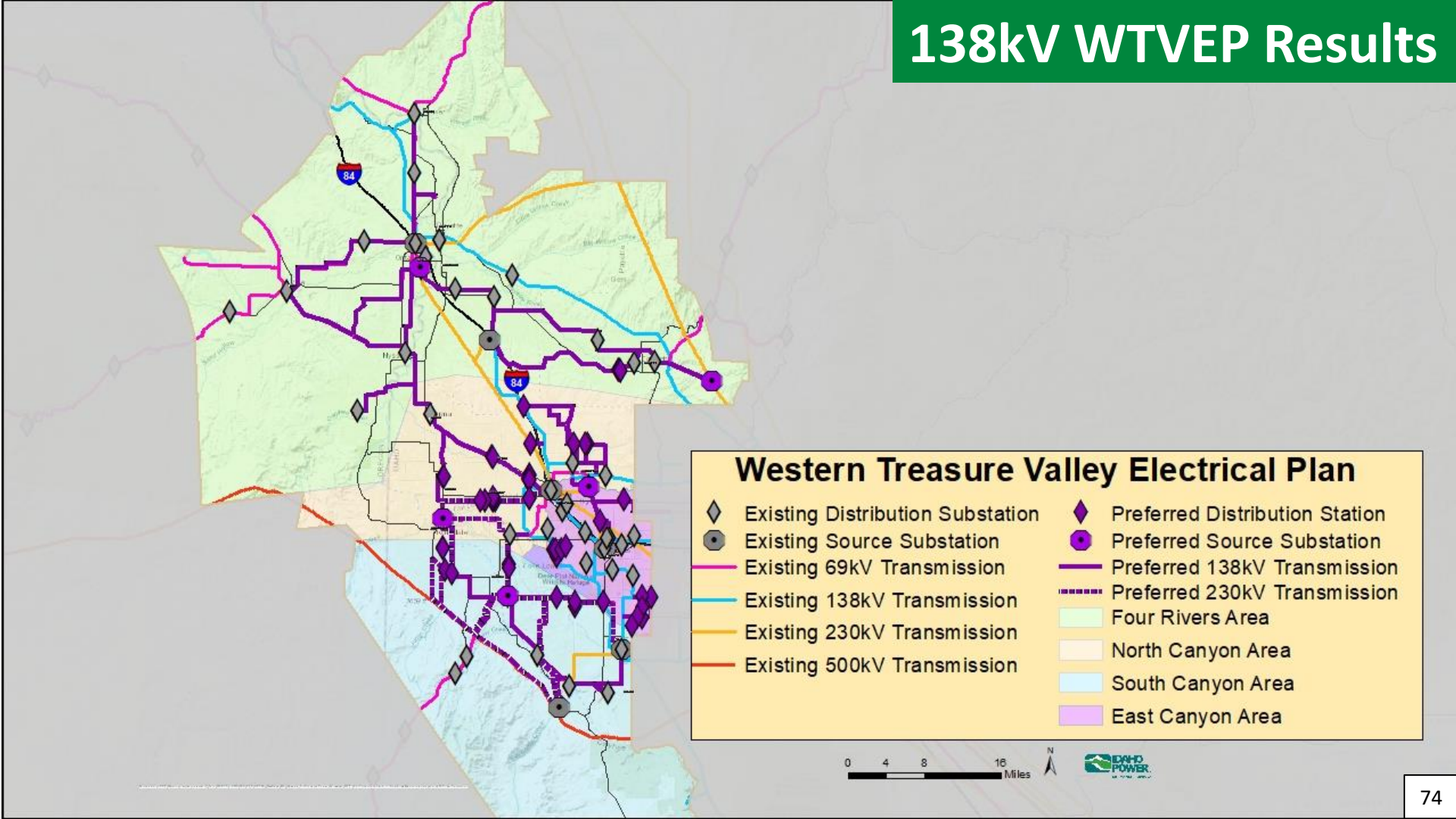
Source Substations



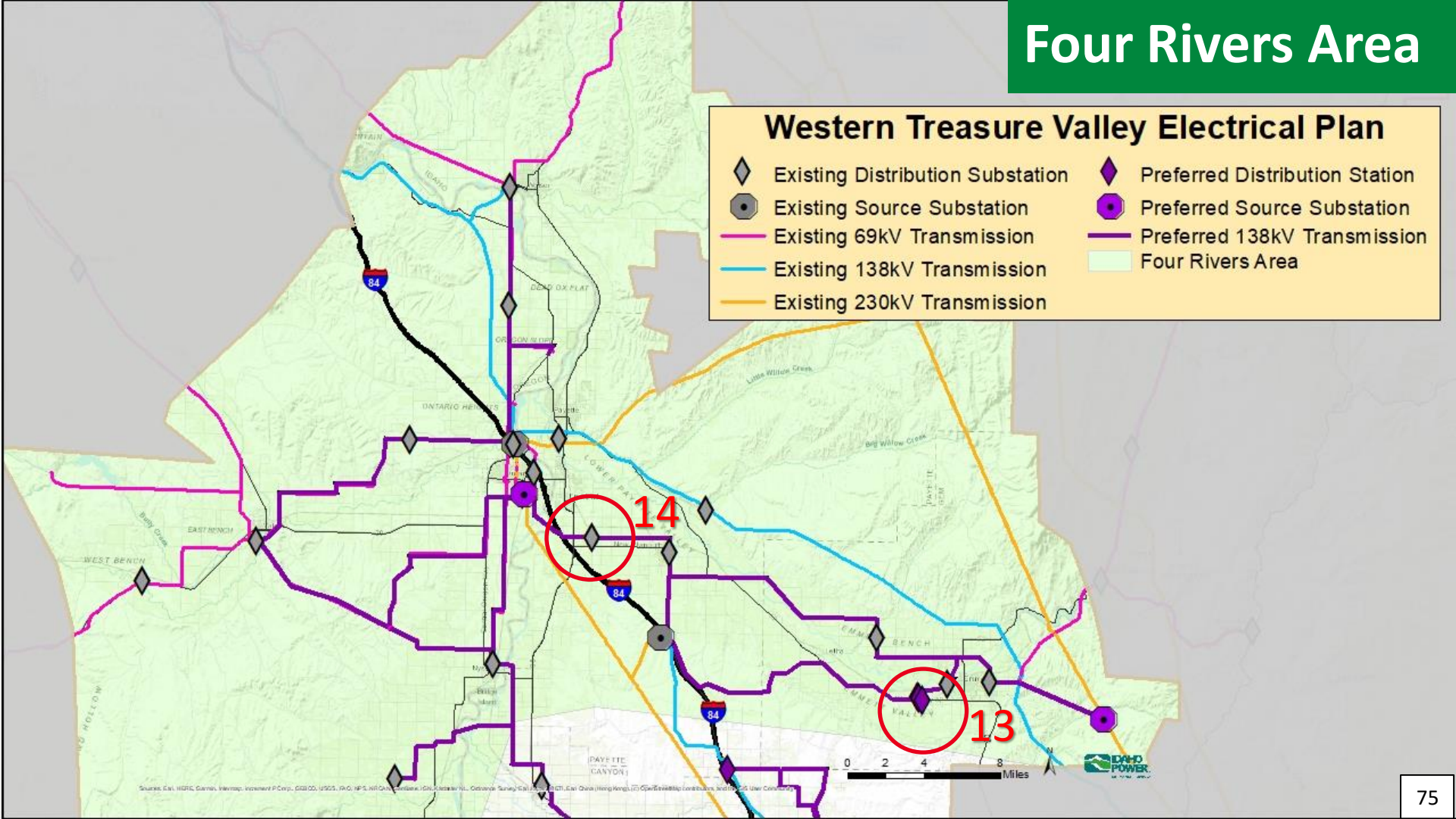
Source Substations



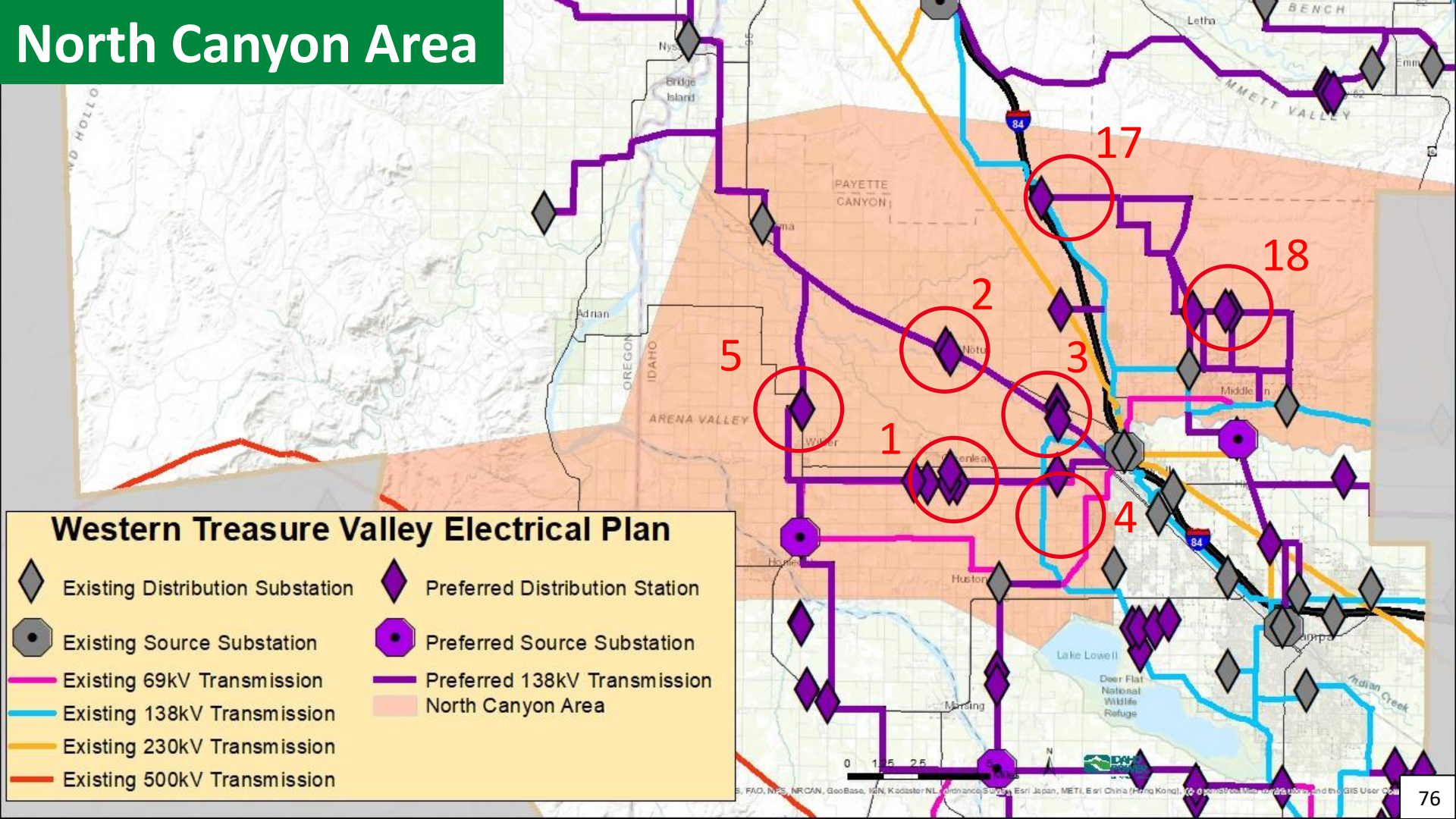
138kV WTVEP Results



Four Rivers Area



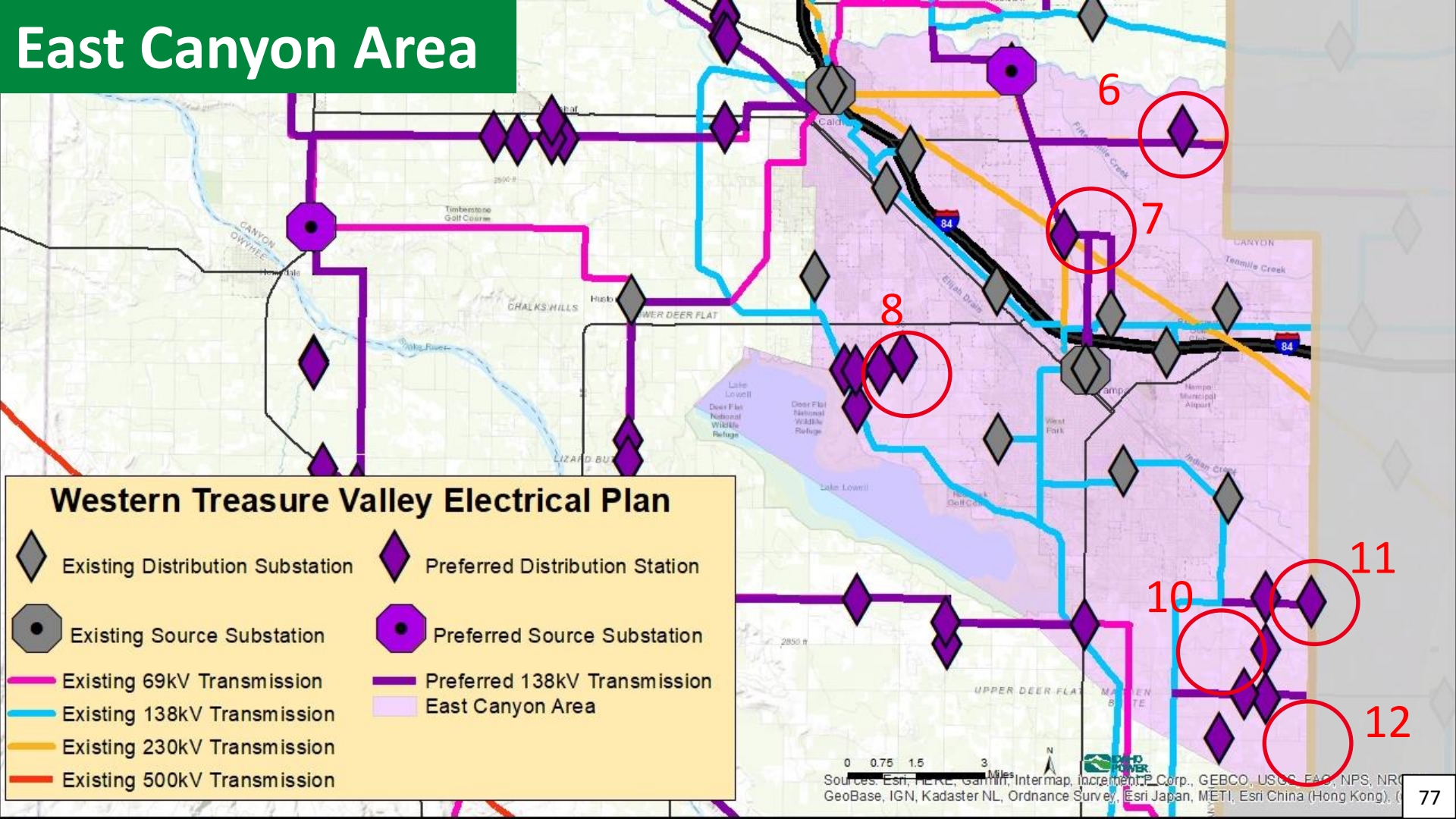
North Canyon Area



Western Treasure Valley Electrical Plan

- Existing Distribution Substation
- Preferred Distribution Station
- Existing Source Substation
- Preferred Source Substation
- Existing 69kV Transmission
- Preferred 138kV Transmission
- Existing 138kV Transmission
- North Canyon Area
- Existing 230kV Transmission
- Existing 500kV Transmission

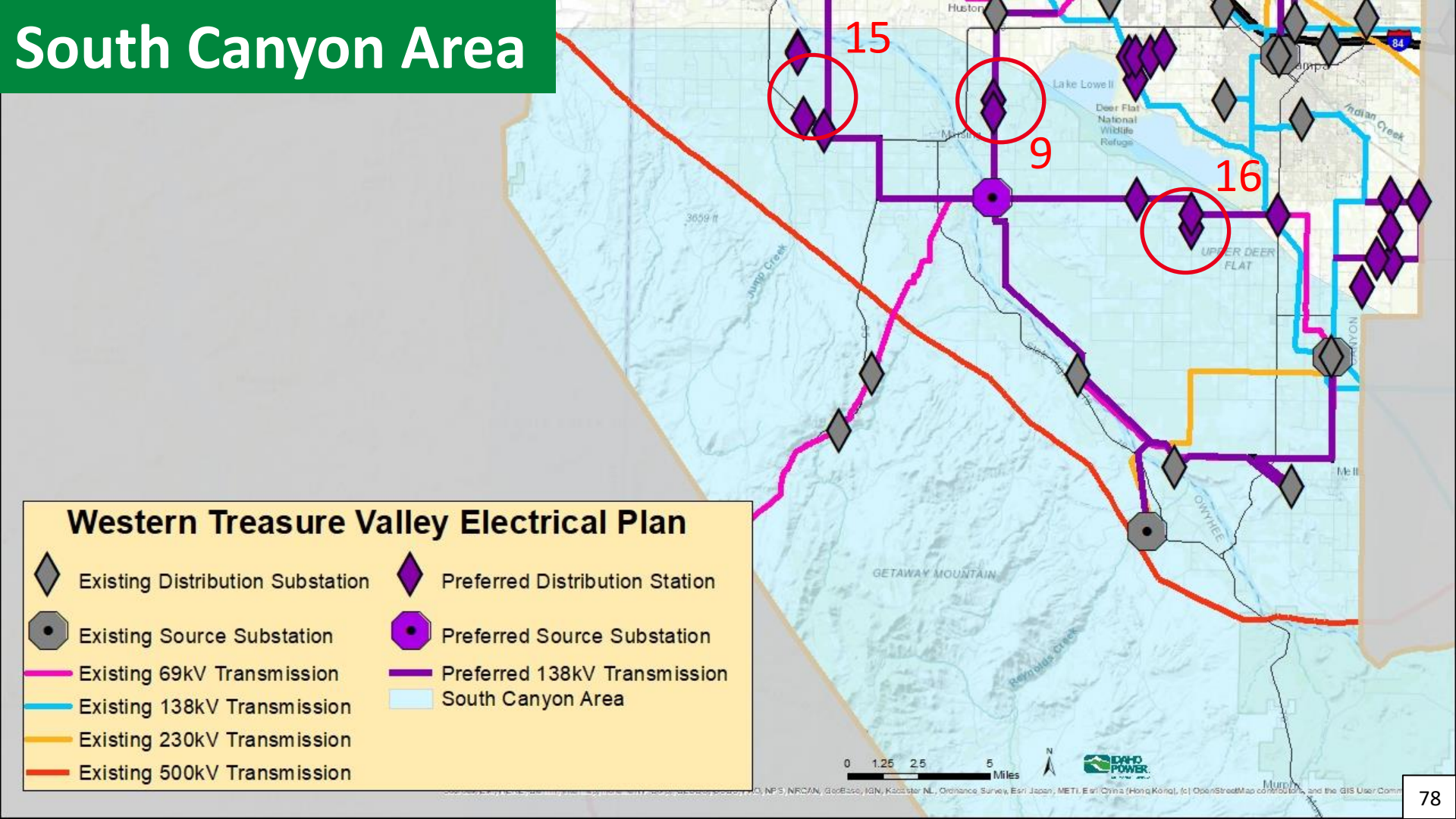
East Canyon Area



Western Treasure Valley Electrical Plan

- Existing Distribution Substation
- Preferred Distribution Station
- Existing Source Substation
- Preferred Source Substation
- Existing 69kV Transmission
- Existing 138kV Transmission
- Existing 230kV Transmission
- Existing 500kV Transmission
- Preferred 138kV Transmission
- East Canyon Area

South Canyon Area

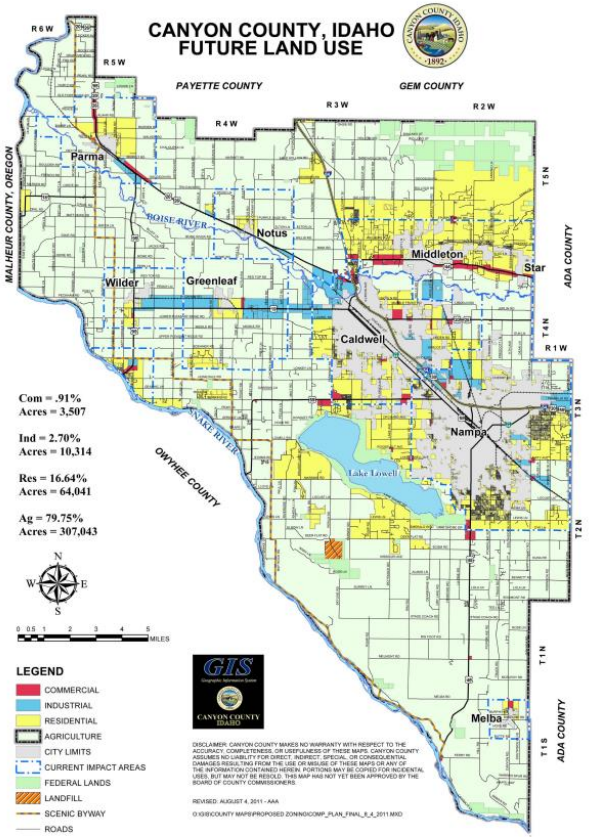


Western Treasure Valley Electrical Plan Update

Current Conditions

Rebecca Irwin
Senior Planning Engineer
Electrical Plan Project Leader
Idaho Power

Why Update the WTVEP?



Past 11 Years

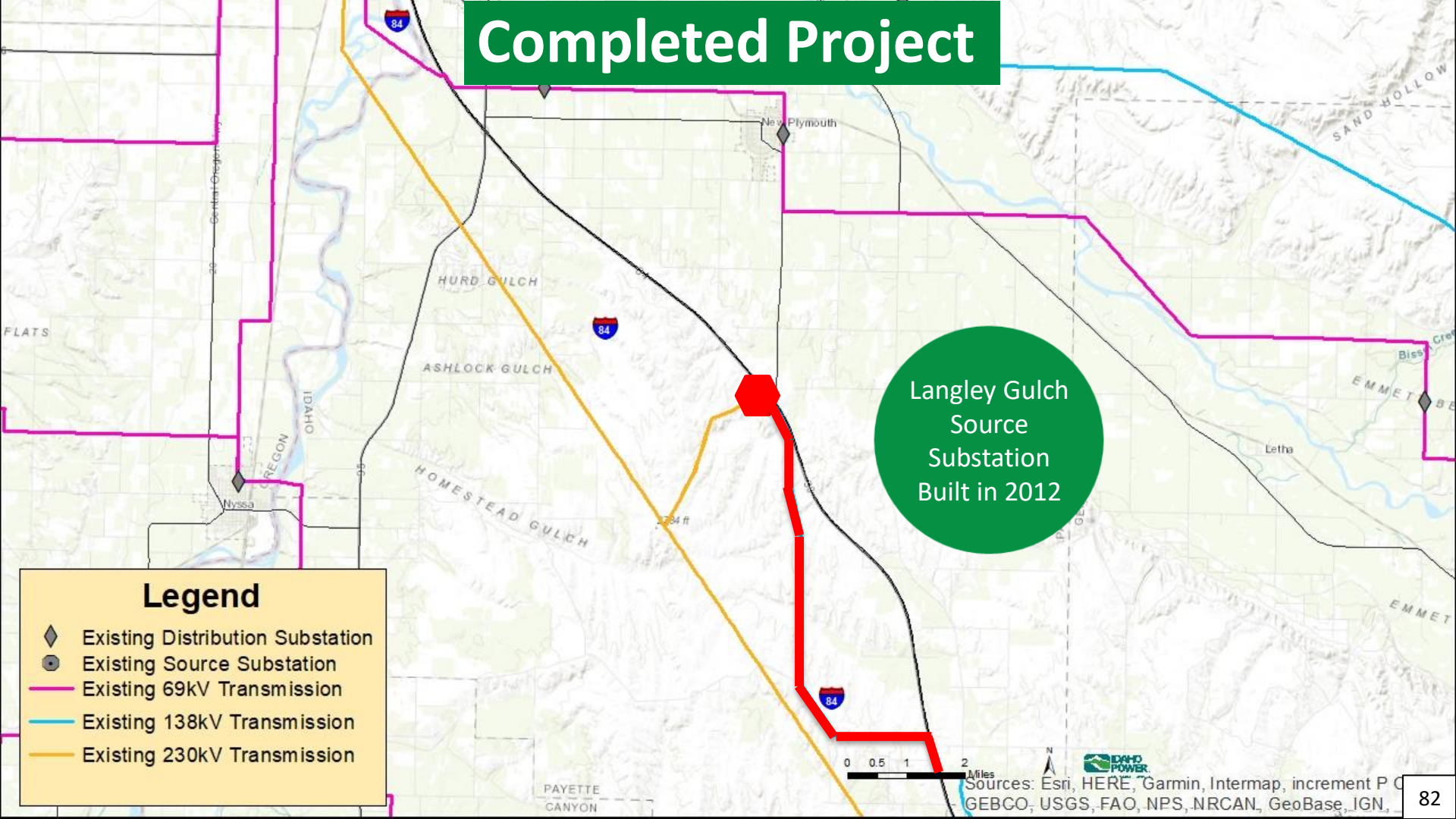
2011

$1.00

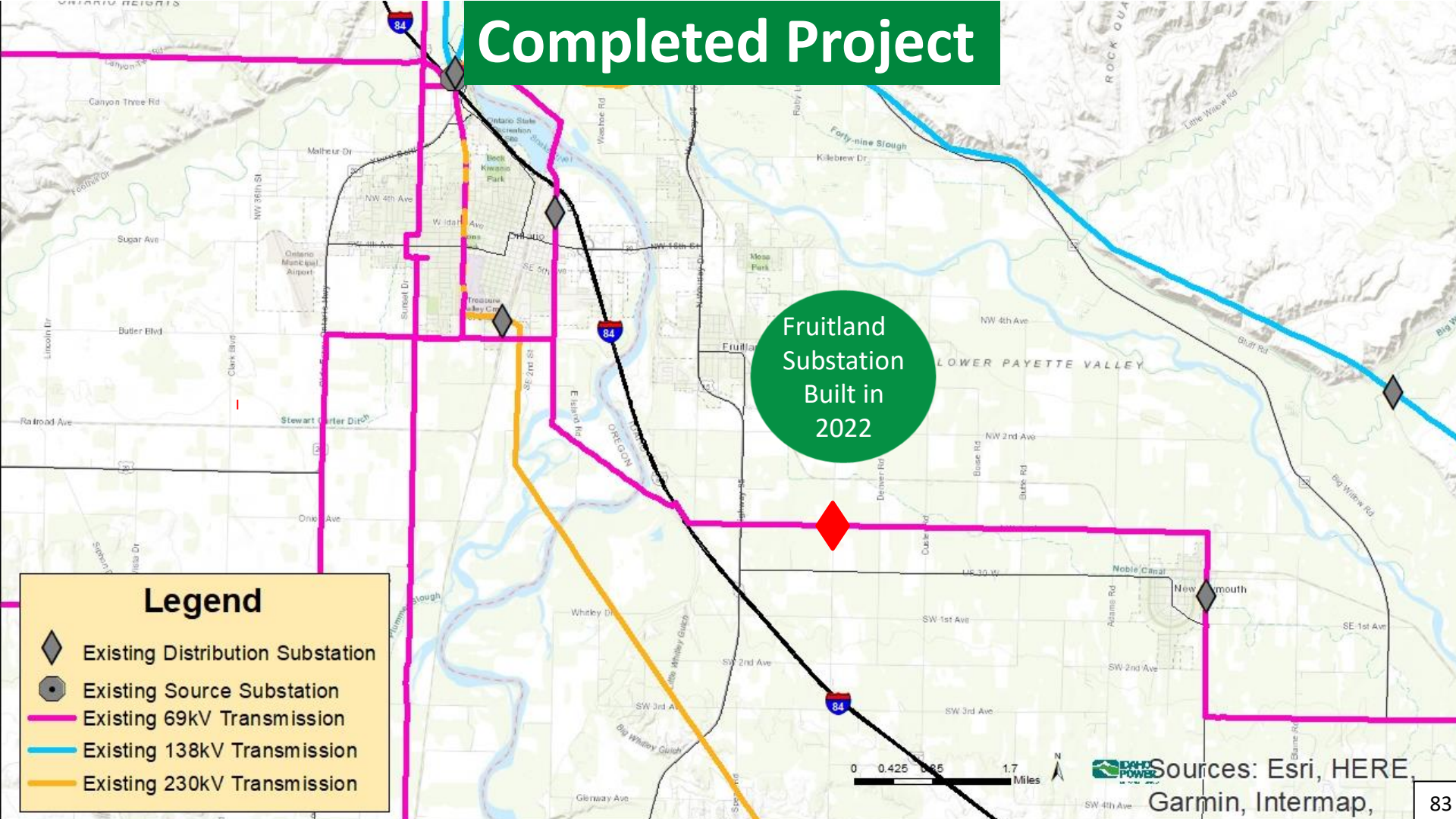
2022

$1.00

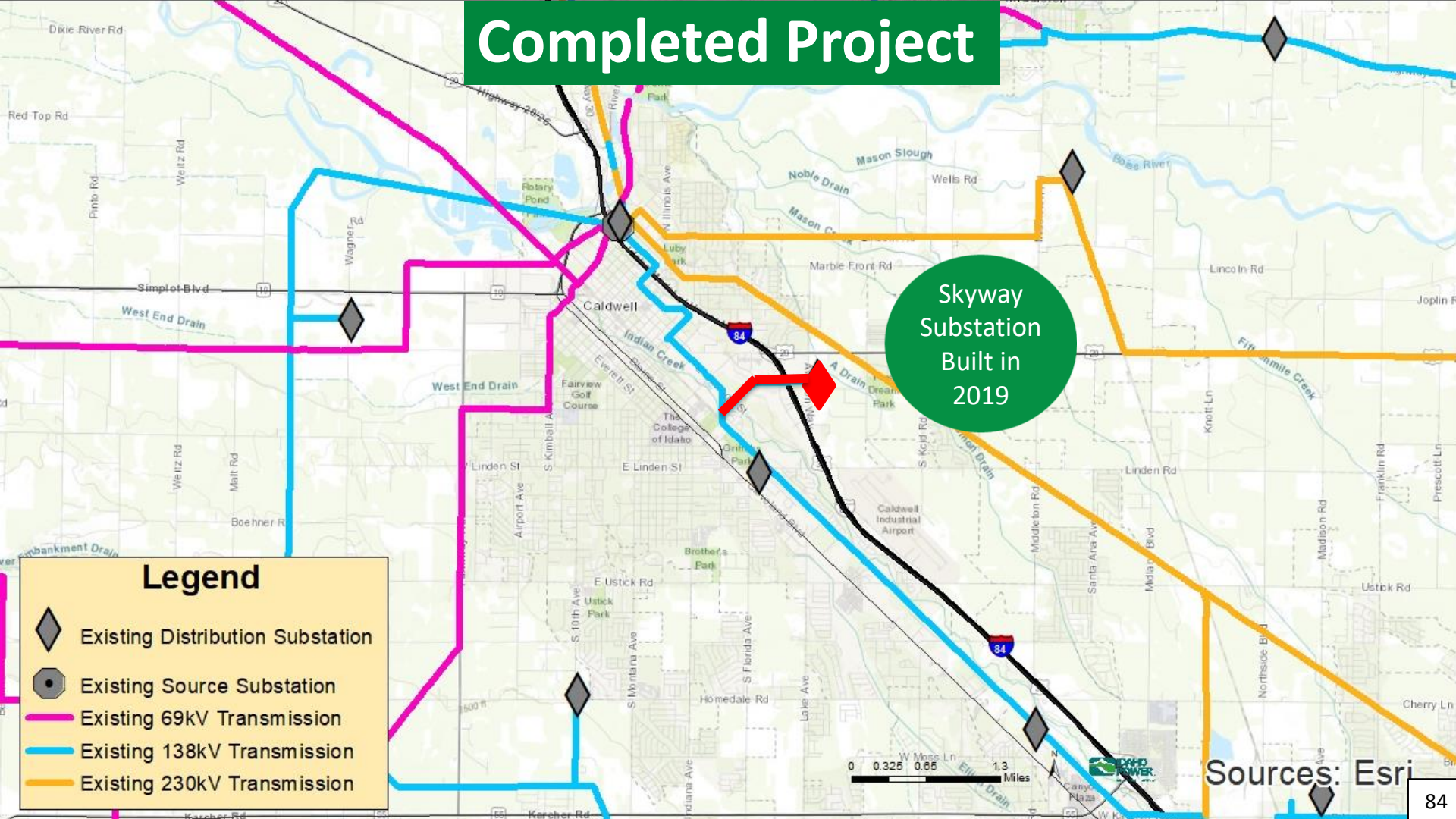
Completed Project



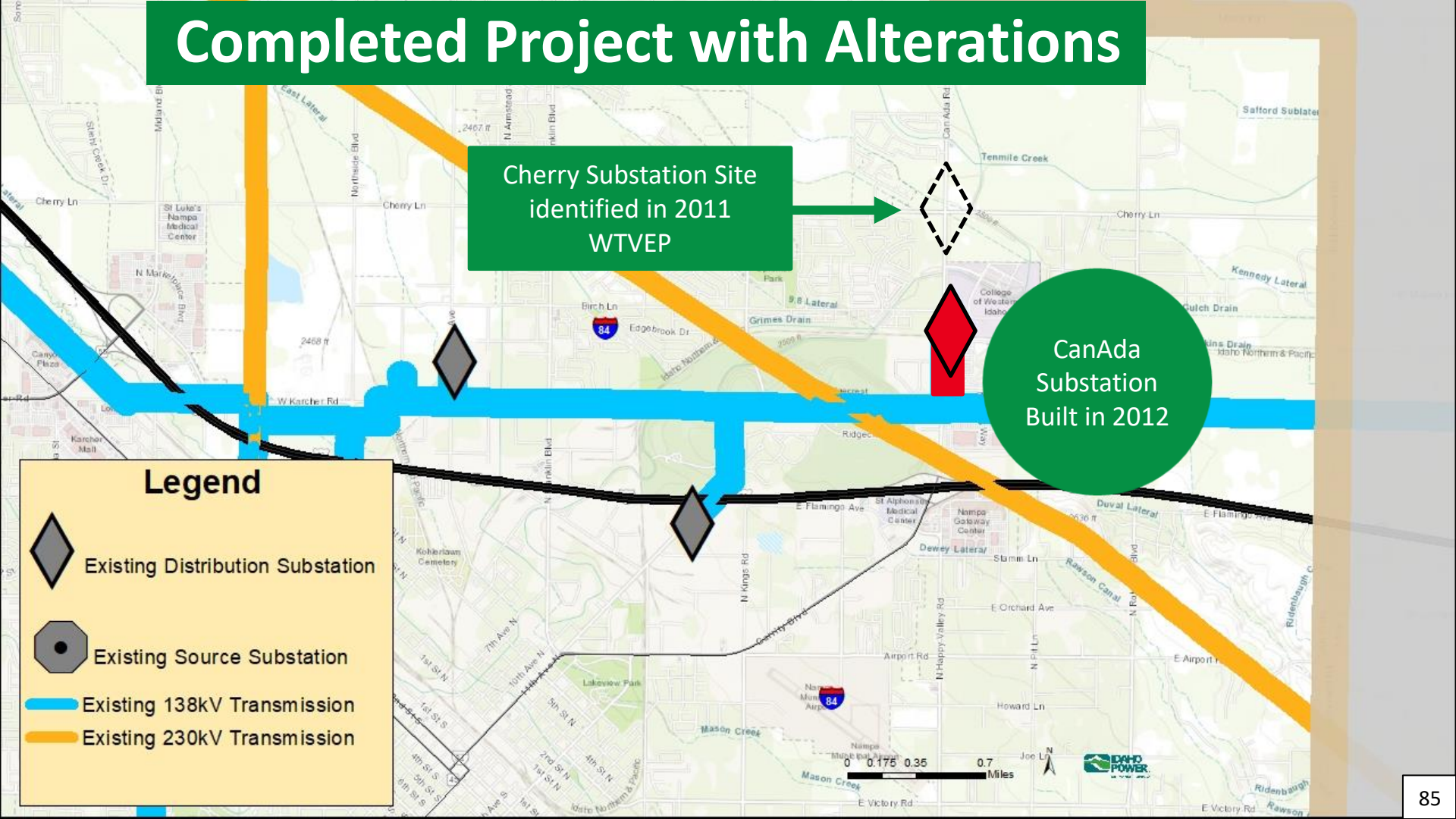
Completed Project



Completed Project

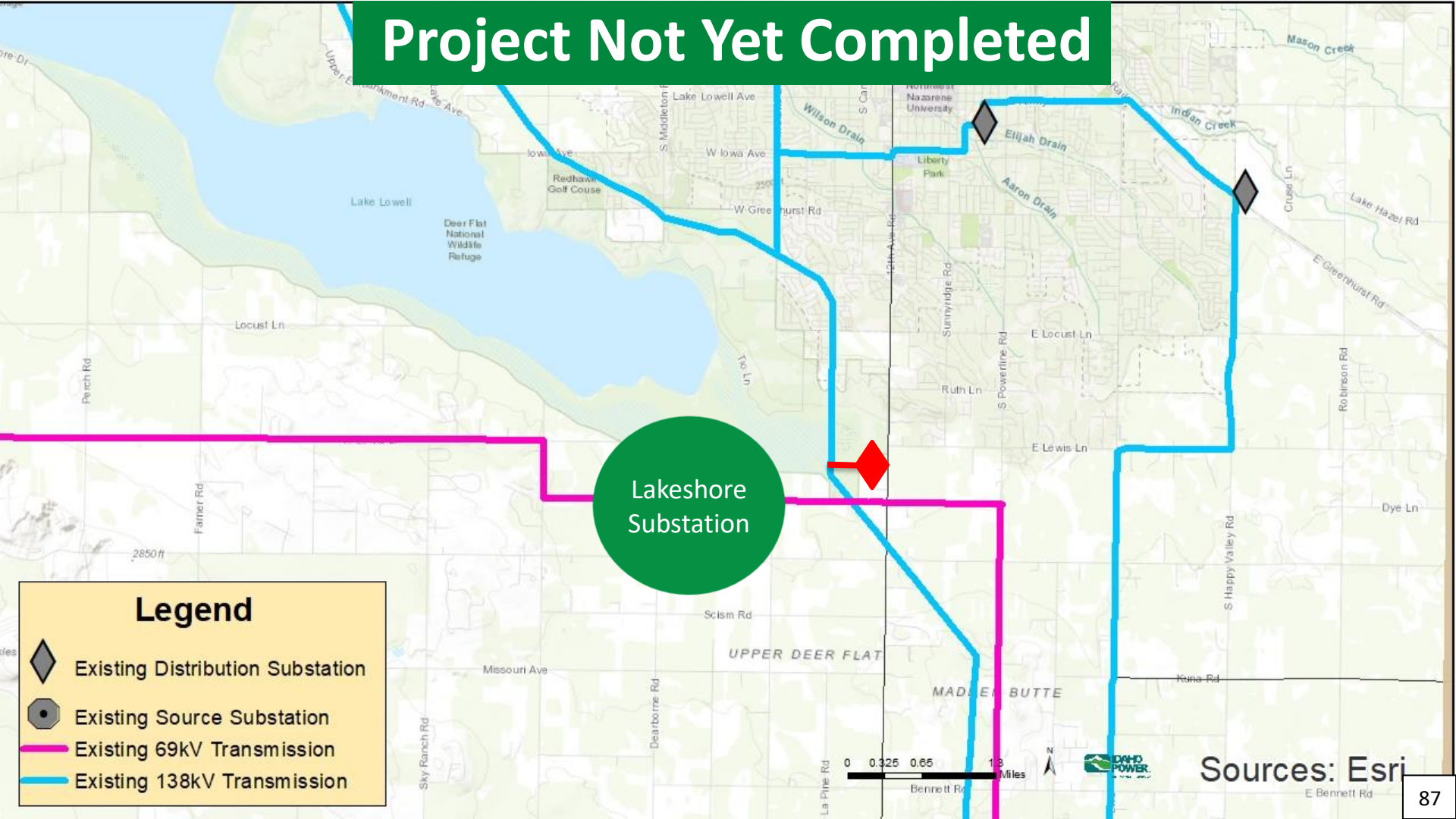


Completed Project with Alterations

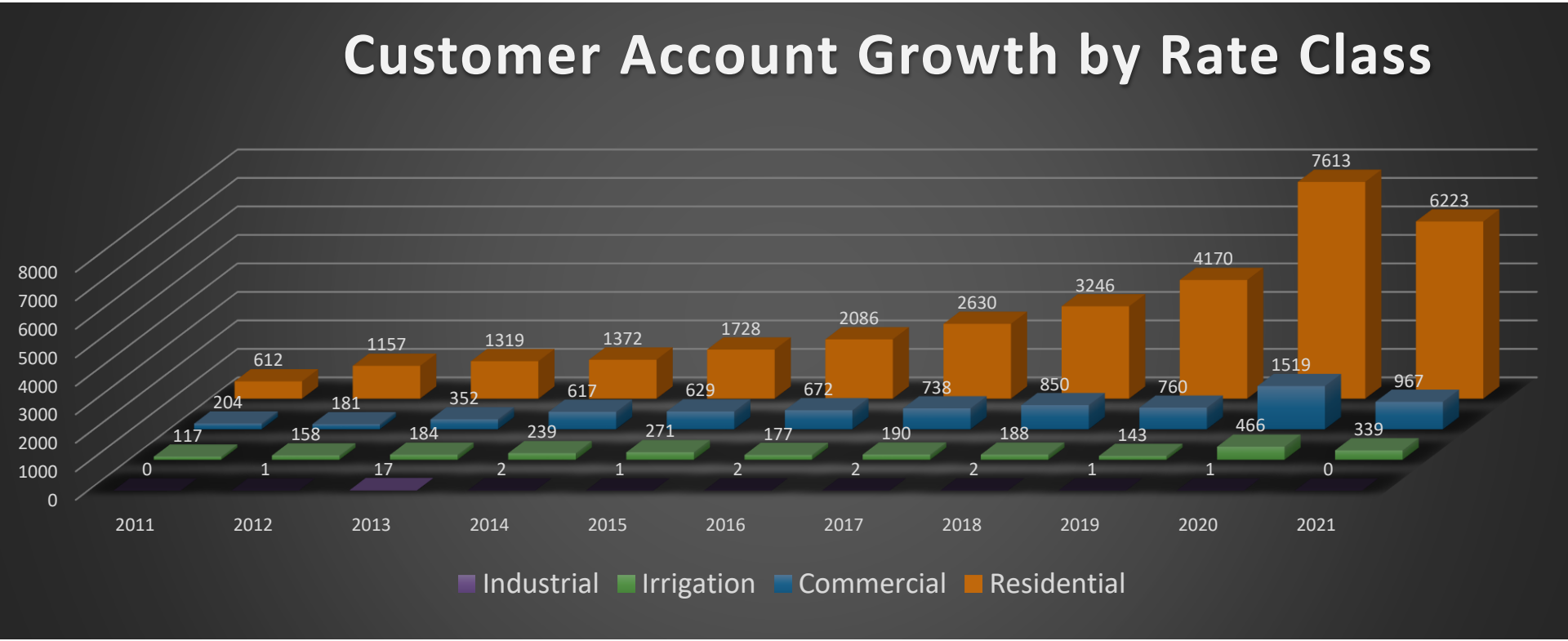


2024 Planned Project

Project Not Yet Completed



Customer Growth



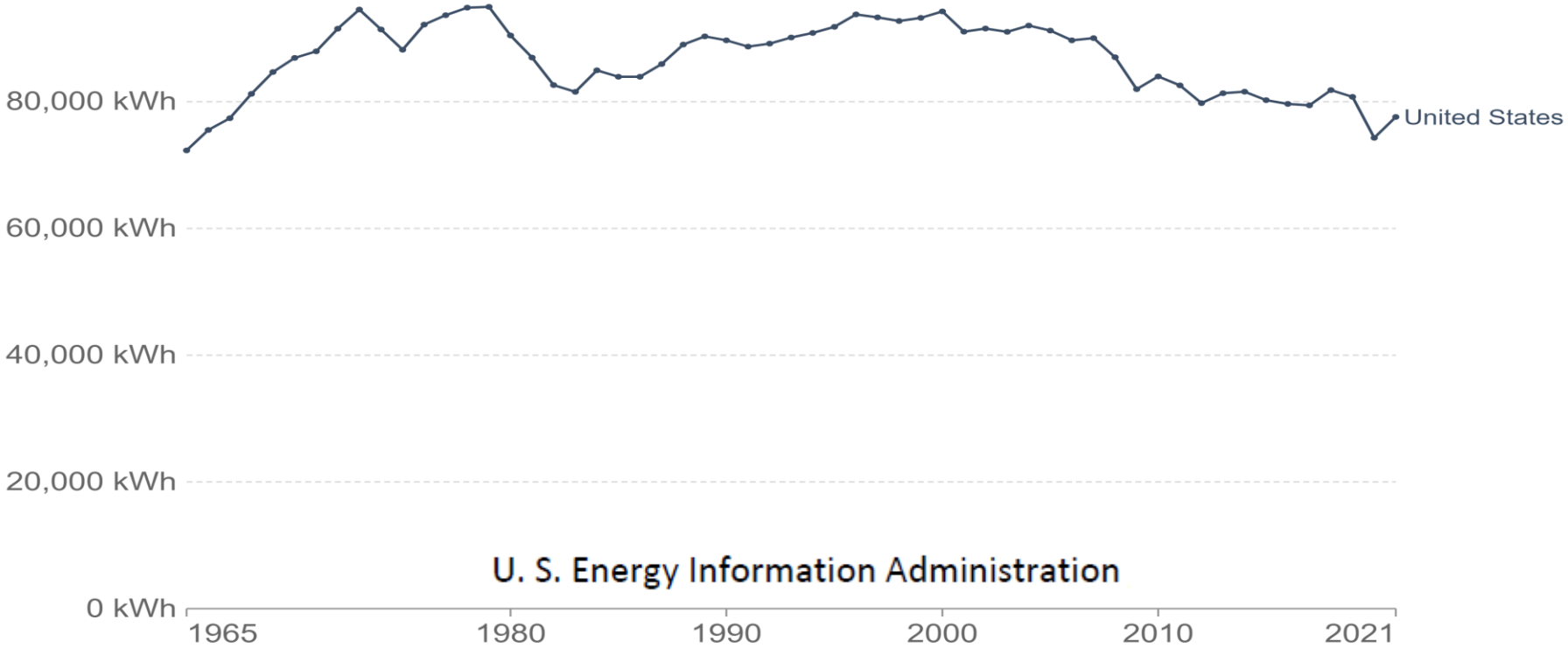
10-Year Average Annual Growth Rate = 2.6% (3900 new customer accounts per year)

Buildout Considerations


GABY
AND
SAM

Energy use per person

Energy use not only includes electricity, but also other areas of consumption including transport, heating and cooking.

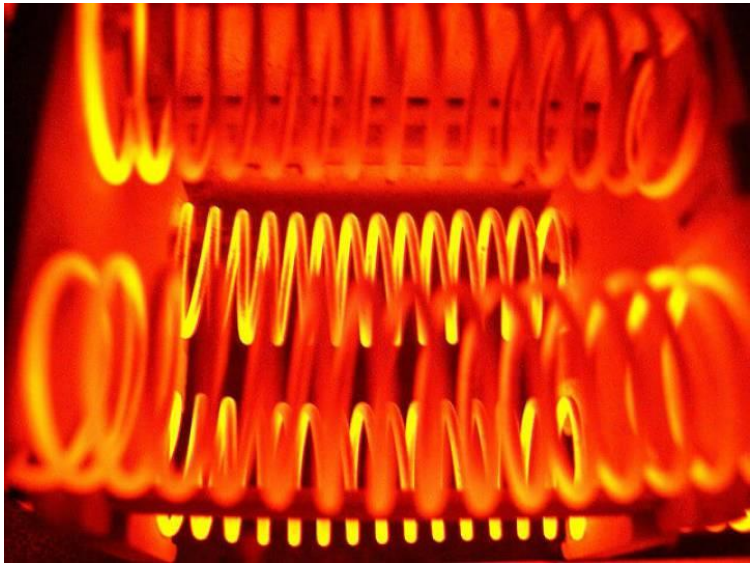


Source: Our World in Data based on BP & Shift Data Portal

OurWorldInData.org/energy • CC BY

Note: Energy refers to primary energy – the energy input before the transformation to forms of energy for end-use (such as electricity or petrol for transport).

Electrification



WTVEP Update

County	2011 WTVEP Buildout Load (MW)	2022 Update Buildout Load (MW)
Canyon	1831	2558
Gem	181	166
Malheur	336	430
Owyhee	252	202
Payette	325	439
Washington	55	118
Total	**2980**	**3913**

4 new Source Substations

17 new Distribution Substations

Western Treasure Valley Electrical Plan Update

Community Goals and Siting Criteria

Rebecca Irwin
Senior Planning Engineer
Electrical Plan Project Leader
Idaho Power

2011 Community Goals and Siting Criteria

- Siting and Design Goals
  - Cost
  - Economic Development
  - Energy Needs
  - Environment
  - Impacts
  - Planning
  - Reliability/Dependability
  - Siting
- Overarching Goals
  - Communication
  - Community/Political Support
  - Energy Efficiency/Conservation
  - Public Health
  - Environment
  - Marketing

Western Treasure Valley Electrical Plan Update

Next Steps

Jim Burdick
Engineering Leader
Idaho Power