2020 Electric Integrated Resource Plan

Technical Advisory Committee Meeting No. 6 Agenda

Tuesday, November 19, 2019
Conference Room 130

Topic	Time	Staff
Introductions and TAC 5 Recap	9:30	Lyons
Review of PRS	9:45	Gall
Break	10:45	
Portfolio Scenario Results	11:00	Gall
Lunch	12:00	
Portfolio Scenario Results Continued	1:00	Gall
Break	2:00	
2020 IRP Action Items & Overview	2:15	Lyons
Adjourn	3:00	

2020 Electric IRP
TAC Meeting Introductions and Recap

John Lyons, Ph.D.
Sixth Technical Advisory Committee Meeting
November 19, 2019

Integrated Resource Planning

The Integrated Resource Plan (IRP):

- Required by Idaho and Washington every other year
- Guides resource strategy over the next twenty years
- Current and projected load & resource position
- Resource strategies under different future policies
  - Generation resource choices
  - Conservation / demand response
  - Transmission and distribution integration
  - Avoided costs
- Market and portfolio scenarios for uncertain future events and issues

Technical Advisory Committee

- The public process piece of the IRP – input on what to study, how to study, and review of assumptions and results
- Wide range of participants in all or some of the process
- Open forum while balancing need to get through all of the topics
- Welcome requests for studies or different assumptions.
  - Time or resources may limit the studies we can do
  - The earlier study requests are made, the more accommodating we can be
  - June 15, 2019 was the latest to be able to complete studies in time for publication
- Planning team is available by email or phone for questions or comments between the TAC meetings

TAC #5 Recap – October 15, 2019

- Introductions and TAC 4 Recap, Lyons
- Energy Imbalance Market Update, Kinney
- Storage and Ancillary Service Analysis, Shane
- Preliminary Preferred Resource Strategy, Gall
- Preliminary Portfolio Scenario Results, Gall

- Meeting minutes available on IRP web site at: https://www.myavista.com/about-us/our-company/integrated-resource-planning

Today's Agenda

9:30 – Introductions and TAC 5 Recap, Lyons

9:45 – Review of PRS, Gall

10:45 – Break

11:00 – Portfolio Scenario Results, Gall

Noon – Lunch

1:00 – Portfolio Scenario Results Continued, Gall

2:00 – Break

2:15 – 2020 IRP Action Items and Overview, Lyons

3:00 – Adjourn

2020 IRP and 2021 IRP Key Dates

- Draft IRP released to TAC members December 18, 2019
- Comments from TAC members are to be returned to Avista by January 15, 2020
- IRP team will be available to address comments with individual TAC members or the entire group if needed
- This IRP will be published February 28, 2020
- Washington IRP due date moved for all IOUs: draft due January 1, 2021 and final IRP due April 1, 2021 to allow time for CETA rule making

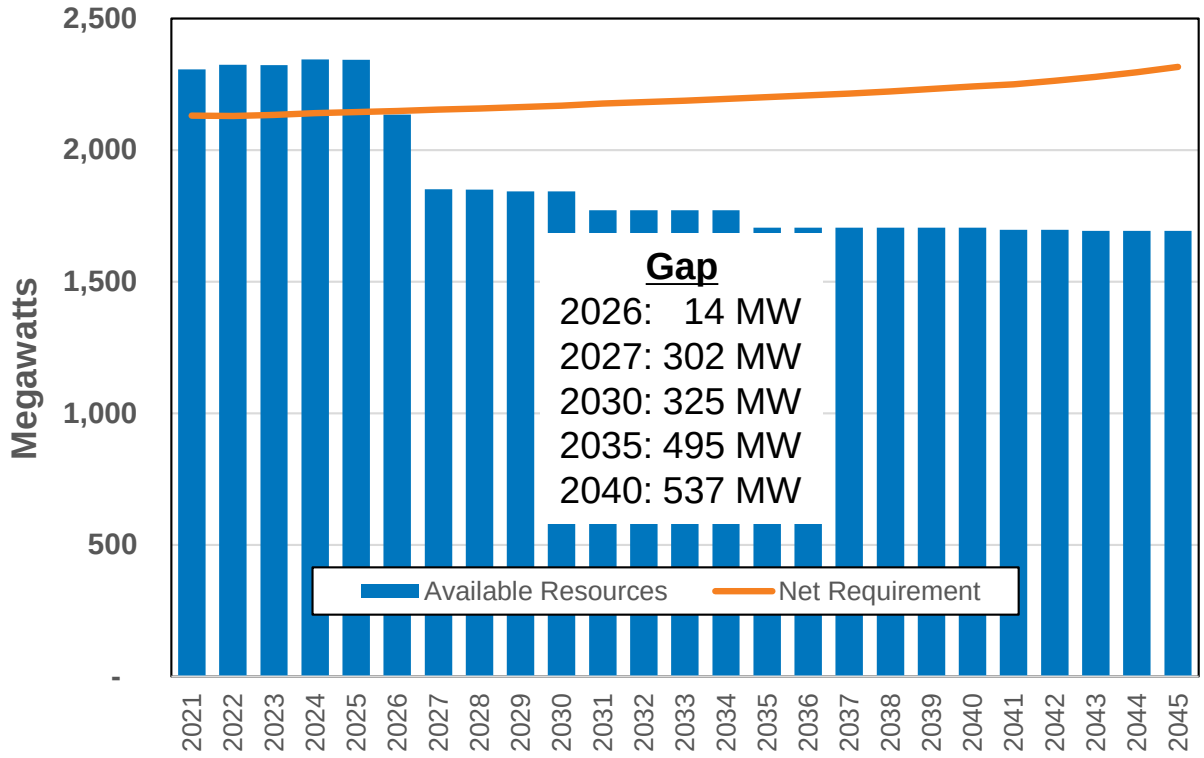
2020 Electric Integrated Resource Plan
“Preferred” Resource Strategy

James Gall, IRP Manager
Sixth Technical Advisory Committee Meeting
November 19, 2019

What Are Avista's Physical Resource Needs?

Main focus: Winter Peak:

Includes 14% Planning Margin + Reserves



Key Losses:

Colstrip: 2025*

Lancaster: 2026

Mid-C: 2030

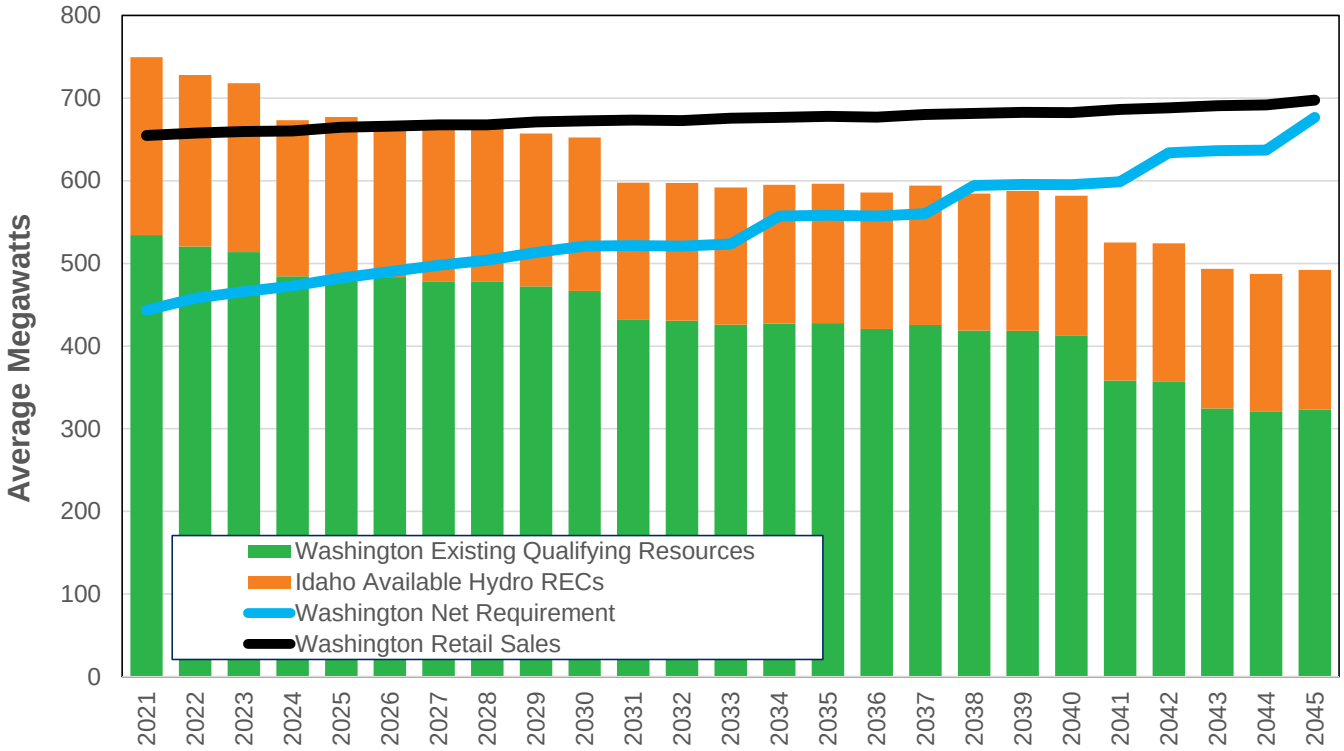
Northeast: 2035

Avista is also short in summer and on an annual average basis beginning in 2027

* Colstrip is assumed offline at the end of 2025 for planning purposes only. Avista's ultimate decisions regarding Colstrip are still to be determined.

Washington SB5116 Clean Requirements

2026: Colstrip can no longer serve Washington Load
2030: 80% energy delivered over a four-year period is clean and 20% can be RECs
2045: Goal to be 100% clean (will require new technology to stay under cost cap)



Gap

2030: 54 aMW
2035: 130 aMW
2040: 182 aMW
2045: 353 aMW

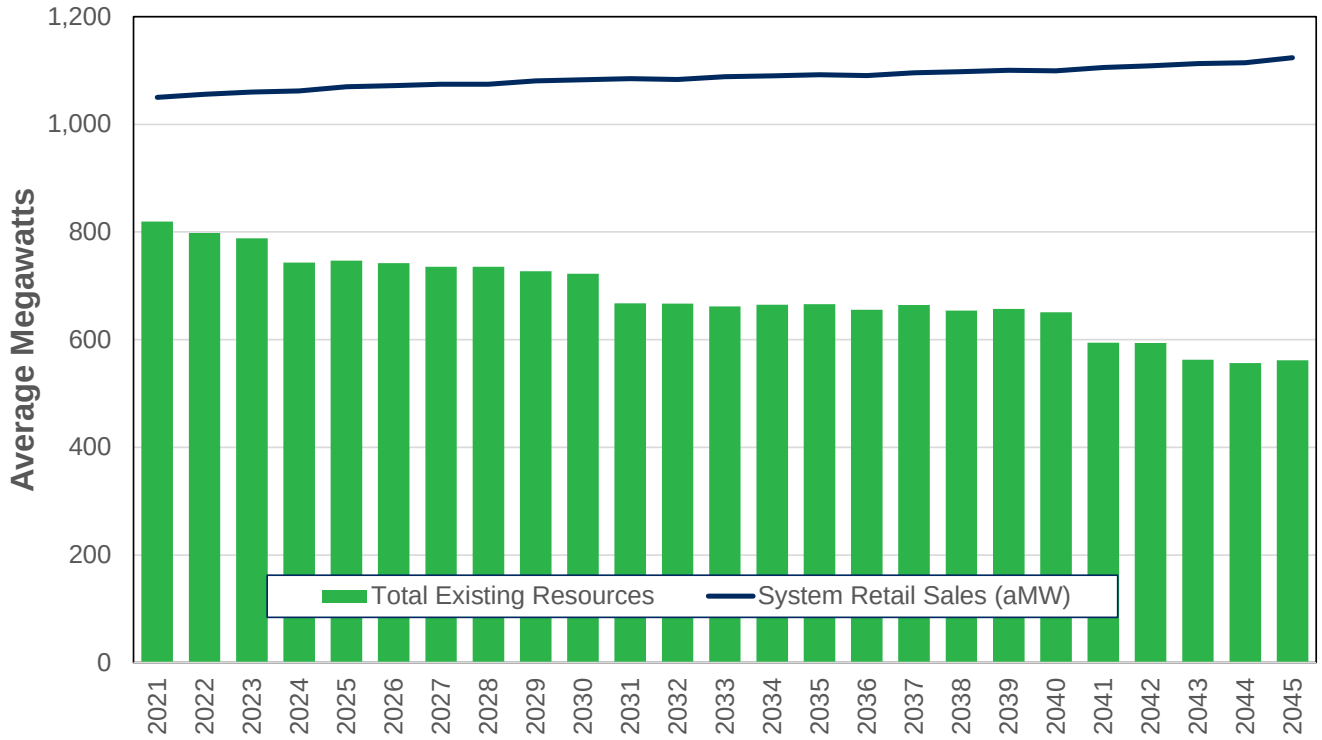
Key Losses:

Mid-C: 2030
Lind: 2039
Rattlesnake: 2040
Palouse: 2043

Assumes: Idaho customers sell offsets to Washington Customers

Avista's Clean Electricity Goal

2027: 100% net clean portfolio wide (cost effective considerations)
2045: 100% clean (cost effective considerations and technology)



Gap

2027: 339 aMW
2030: 360 aMW
2035: 426 aMW
2040: 448 aMW
2045: 562 aMW

Resource Options

Clean

- Wind (WA/OR/MT)
- Solar (WA/ID/OR)
- Biomass (WA/ID)
- Hydro Upgrades (MS, LL)
- Hydro (Mid-C)
- ~~Hydro (BPA)~~
- Geothermal
- Nuclear
- Energy Efficiency
- Demand Response

Other

- Natural Gas CT
- Natural Gas CCCT
- Storage
  - Pumped hydro
  - Lithium-ion batteries
  - Liquid air
  - Hydrogen
  - Flow batteries
- ~~Regional Transmission~~

Preferred Resource Strategy Decision Process

- Uses Mixed Integer Program (MIP) to find least cost solution meeting capacity, energy, and renewable constraints for the system between 2021 and 2045.

- Only known model with full co-optimization of energy efficiency and demand response with supply side resources.
  - Capable of co-optimization of T&D system with power system

- Accounts for societal preference Washington state planning criteria
  - (Social Cost of Carbon, 10% cost advantage from energy efficiency, upstream pipeline emissions, etc.)

- Non-modeled utility revenue requirements assumes an increase of two percent per year.

Changes Since Last TAC meeting

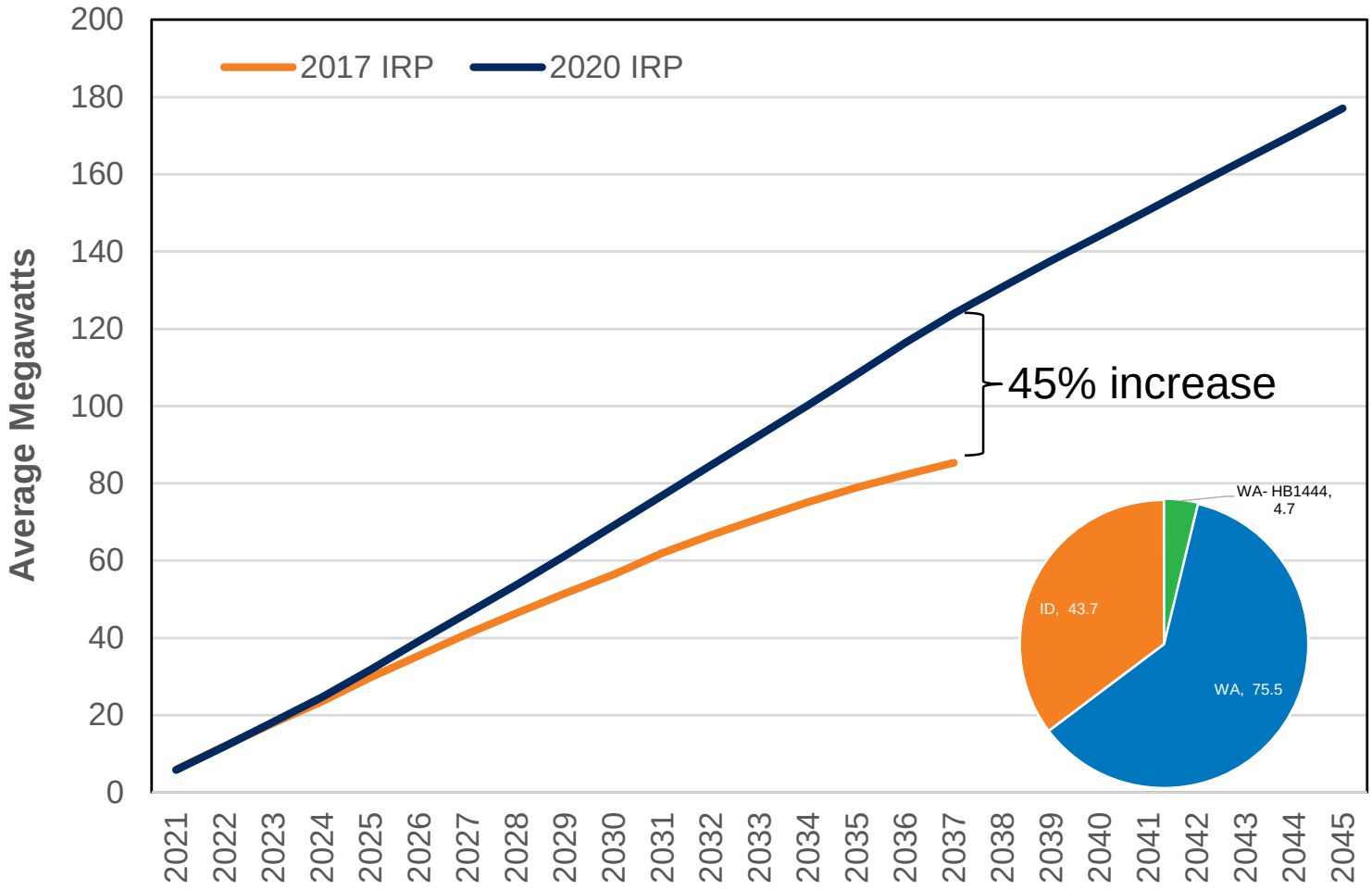
- Lowered Montana wind peak contribution due to transmission losses
- Increased long-duration pumped storage capacity contribution
- Increased planning margin in PRiSM to end with a reliable system

Reliability Study Results

- 22.6% planning margin (14% + reserves) without Colstrip and non-dispatchable resources is too low.
- The resulting draft reliability metrics for the PRS required an equivalent 24.6% planning margin (equivalent to 350 MW of CTs):

Reliability Metric	PRS (TAC 6)	PRS (TAC 5)	Updated Adequate System (w/o Colstrip & w/ CTs)	TAC 2 Adequate System Result (w/ Colstrip & CTs)
LOLP	5.3%	7.0%	5.2%	4.9%
LOLH	2.02	3.10	1.79	1.85
LOLE	0.17	0.25	0.14	0.16
EUE	330 MWh	552 MWh	264 MWh	318.7 MWh

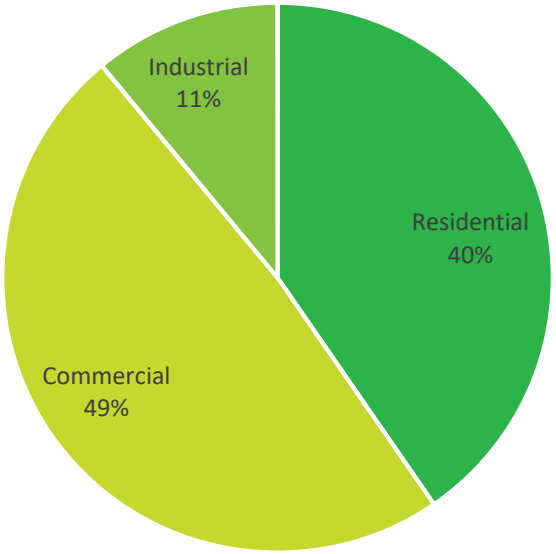
Energy Efficiency Results



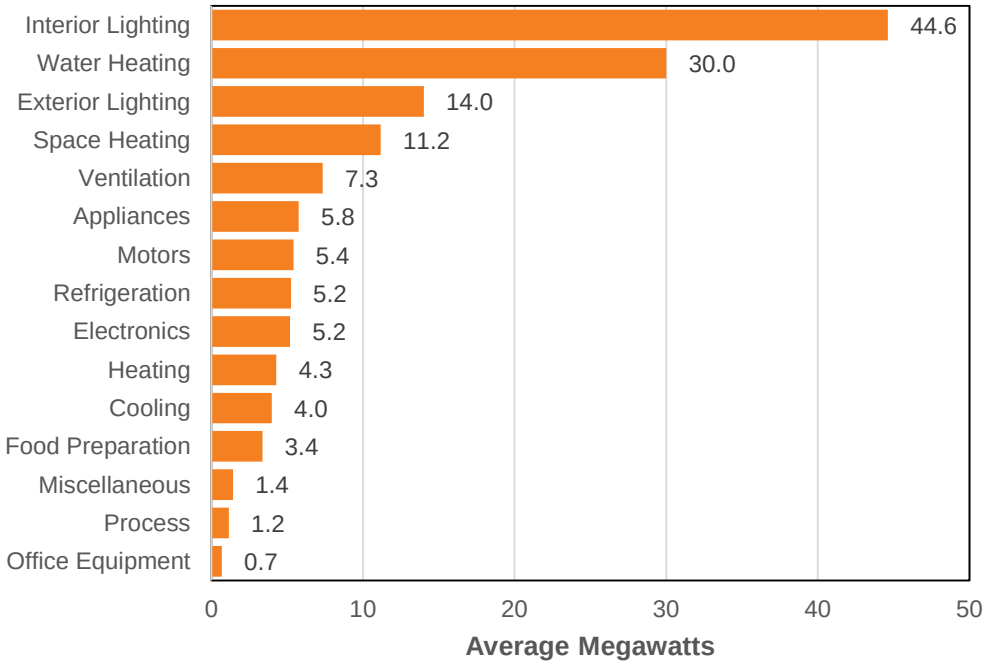
Note: excludes T&D losses

Where is the Cost Effective Energy Efficiency Savings?

2040 Customer Class Savings



2040 Cumulative Savings



Preferred Resource Strategy

Load reduction of 187 aMW due to Energy Efficiency by 2045

2021-2030

2022: 100 MW, MT Wind
2022: 100 MW, NW Wind
2023: 100 MW, NW Wind
2024: 12 MW, Kettle Falls Upgrade
2026: 222 MW, Colstrip removed
2026: 175 MW, Pumped Hydro
2026: 24 MW, Rathdrum Upgrade
2026: 257 MW, Lancaster PPA expires
2025-2030: 76 MW, Demand Response
2026/27: 200 MW, MT Wind
2027: 8 MW, Post Falls Upgrade

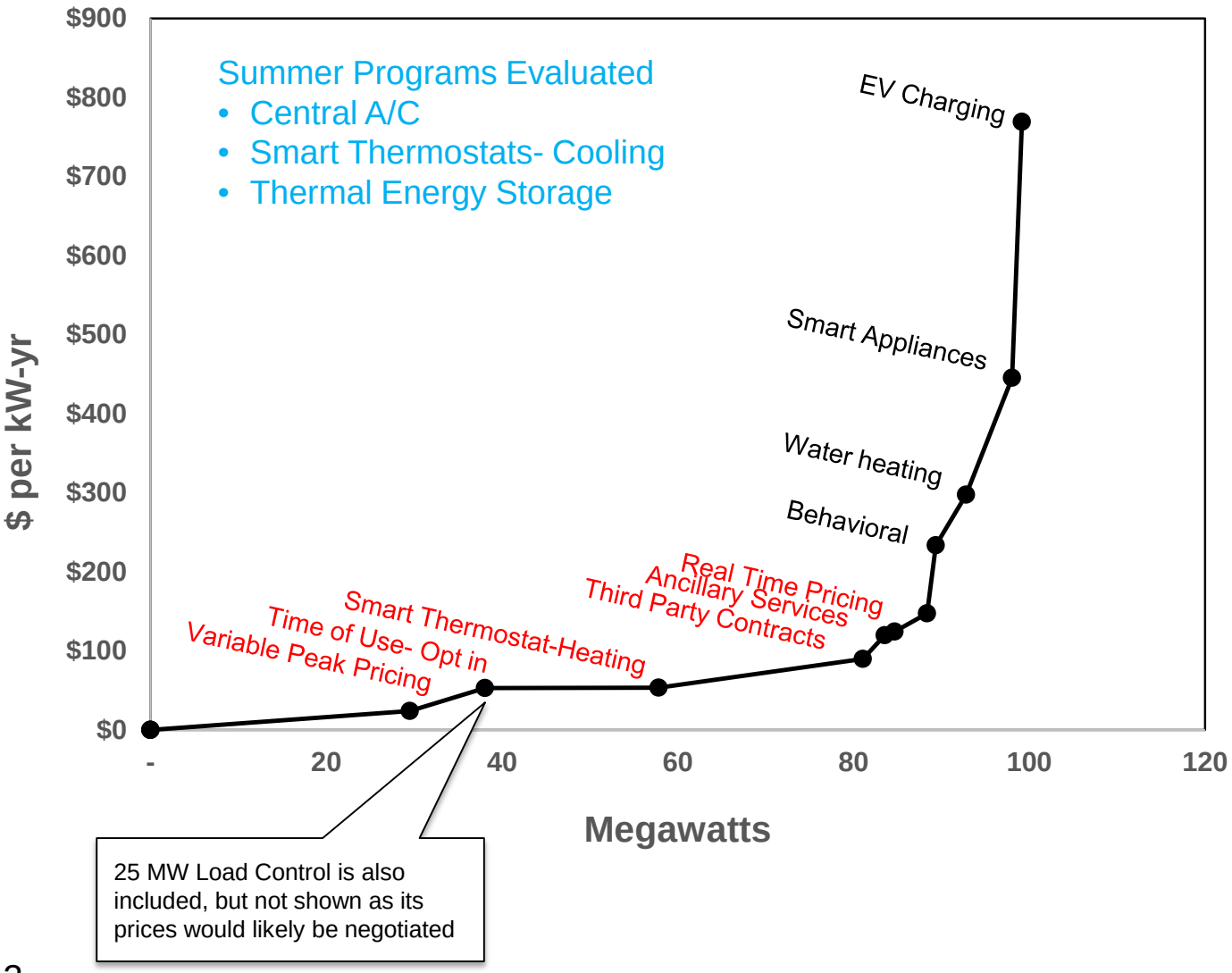
2031-2040

2031: 75 MW, Mid-C PPA Renew
2032: 32 MW, Demand Response
2035: 55 MW, Northeast CT retires
2035: 68 MW, Long Lake 2nd Powerhouse
2036-40: 75 MW x 16 hr, Liquid Air Storage
2037: 1 MW Demand Response

2041-2045

2041: 25 MW x 16 hr, Liquid Air Storage
2042: 2.5 MW, Demand Response
2042-2045: 300 MW Wind PPA Renew
2042-2045: 300 MW x 4 hr, Lithium-ion
2044: 55 MW, Solar w/ 50 MW x 4hr, Storage

Demand Response



Cost Effective Start Dates Shown in Red

2025: Variable Peak Pricing
2029: Smart Thermostats
2029: Industrial Load Control
2031: Time of Use
2031: Third Party Contracts
2037: Real Time Pricing
2042: Ancillary Services

2022-2025 Generation Action Plan

- 2022- 2023 RFP
  - Early acquisition to take advantage of federal tax credits
  - Anticipate 300 MW Wind PPA (84 aMW)
    - 100 MW in MT and 200 MW in NW
    - locations depend on transmission availability/price
  - Solar could replace wind depending on pricing and future price shape forecasts
  - Potential for additional resource acquisitions in support of Avista's clean electricity goal subject to reliability and affordability considerations.
- 2024: Kettle Falls Upgrade
  - Incrementally increase Kettle Falls generating capability by installing larger sized equipment as part of modernization
- 2025: 222 MW, Colstrip removed
  - Per CETA, Colstrip will not serve Washington loads after 12/31/2025
  - The plants future for Idaho customers or wholesale transactions is yet to be determined

2026-2030 Generation Action Plan

- 2026: 175 MW, Pumped Hydro
  - Assumes low cost, long duration pumped hydro solution is available.
  - If resource is not available or price exceeds cost effectiveness tests, siting a similar sized NG peaker is the next least cost option.
  - Sizing will depend on reliability requirements of future power supply system.
- 2026: 24 MW, Rathdrum Upgrade
  - Increases each unit by 12 MW using a supplemental compression technology or alternative technology.
- 2026: Lancaster PPA expires in October
- 2026/27: 200 MW, MT Wind
  - Utilizes Colstrip transmission,
  - If not available, additional NG and renewables are required.
- 2027: 8 MW, Post Falls Upgrade
  - Increase generating capability as part of modernization project to maintain FERC licensing requirements.

2031-2040 Generation Action Plan

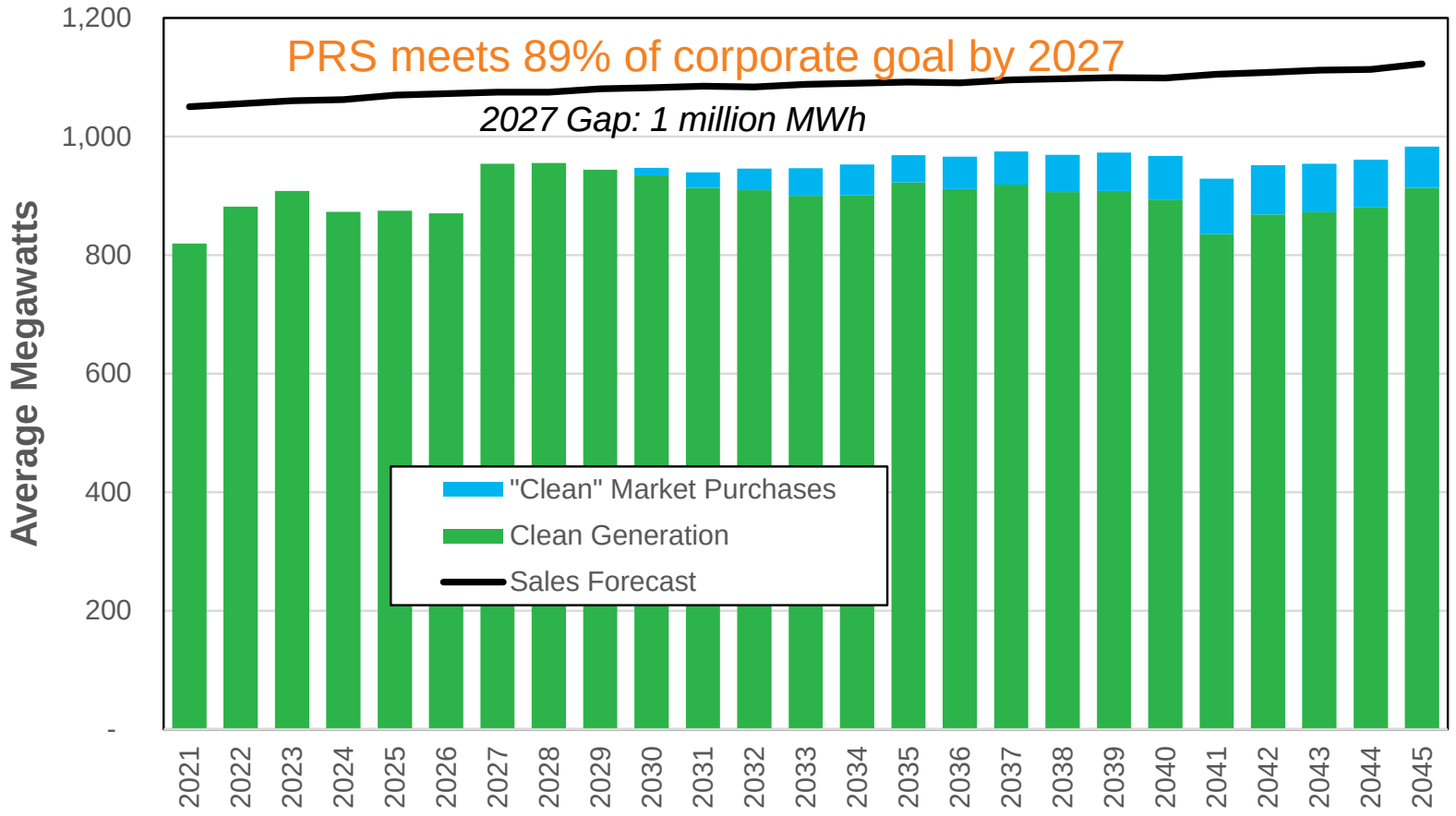
- 2031: Attempt to renew Mid-C PPA contracts
- 2035: Northeast CT retires
- 2035: 68 MW Long Lake 2nd Powerhouse
  - Seek CETA certification as an eligible resource
    - either as 2nd powerhouse and/or reconfiguration of single new powerhouse.
  - Begin licensing process
  - Optimize the site for cost, capacity, and environmental concerns
  - Earlier on-line date may be possible
  - NG Peaker and renewable resource would be alternative to this project
- 2036: 25 MW x 16 hour Liquid Air Storage (or lowest cost alternative)
- 2038: 25 MW x 16 hour Liquid Air Storage (or lowest cost alternative)
- 2040: 25 MW x 16 hour Liquid Air Storage (or lowest cost alternative)

2040-45 Generation Action Plan

- 2041: 25 MW x 16 hour Liquid Air Storage (or lowest cost alternative)
- 2042-2045: 300 MW Wind PPA Replacement
  - Existing PPAs begin to expire
  - Repowering is likely necessary
- 2042-2045: 300 MW x 4 hour, Lithium-ion (or lowest cost alternative)
- 2044: 55 MW, solar w/ 50 MW x 4 hour storage

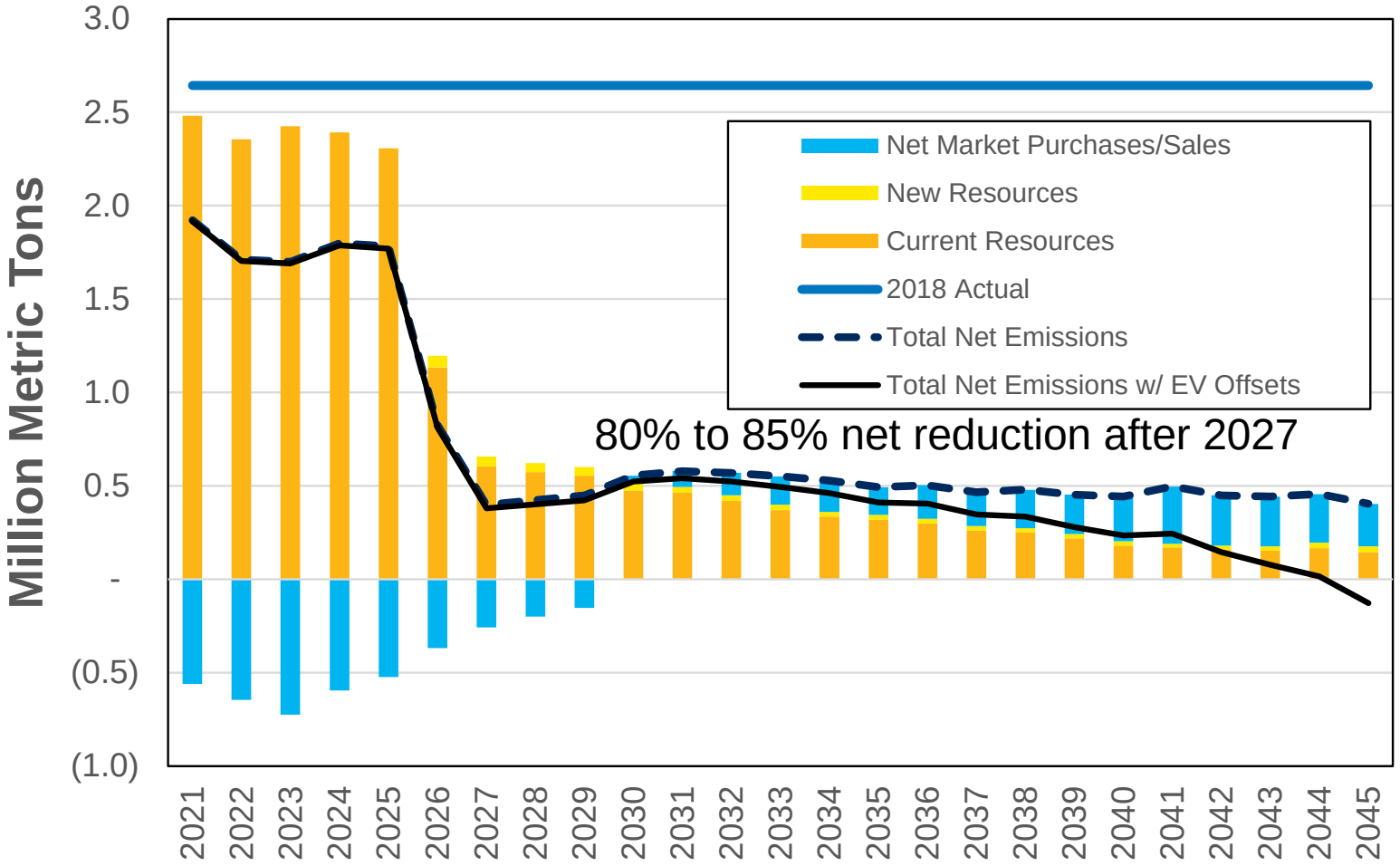
PRS Comparison to Corporate Clean Electricity Goal

Goal: Serve customers with 100% cost effective clean electricity



Notes:
1) Prior to 2030, Avista is a net energy seller to the market
2) "Clean" market purchases is measured as the regional generation mix's CO_2 mix compared to a CCCT

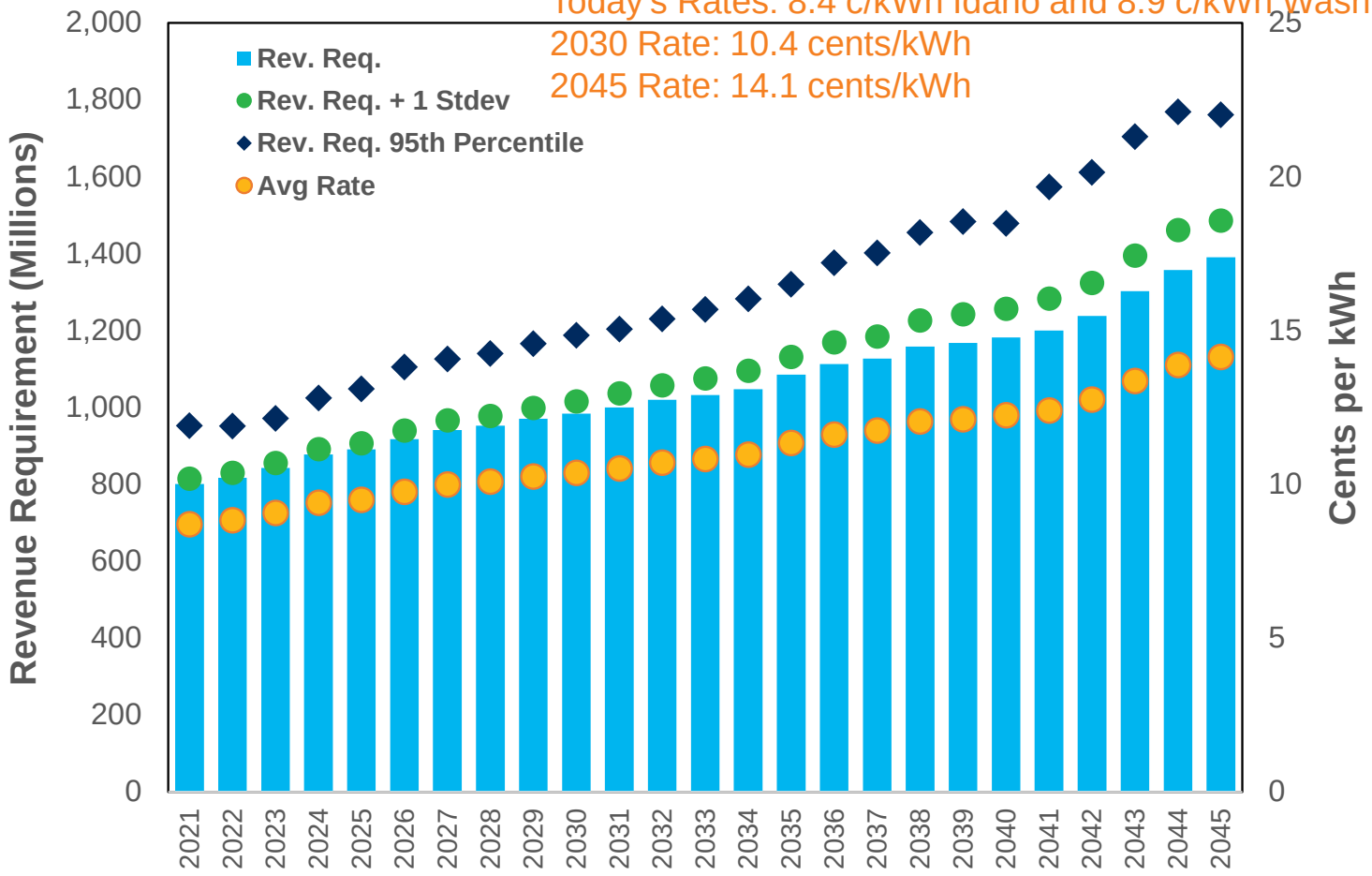
PRS: Greenhouse Gas Emissions Forecast



Note: Electrification of transportation lowers Avista's emissions below zero as offsetting petroleum emissions are lower then Avista's power related emissions

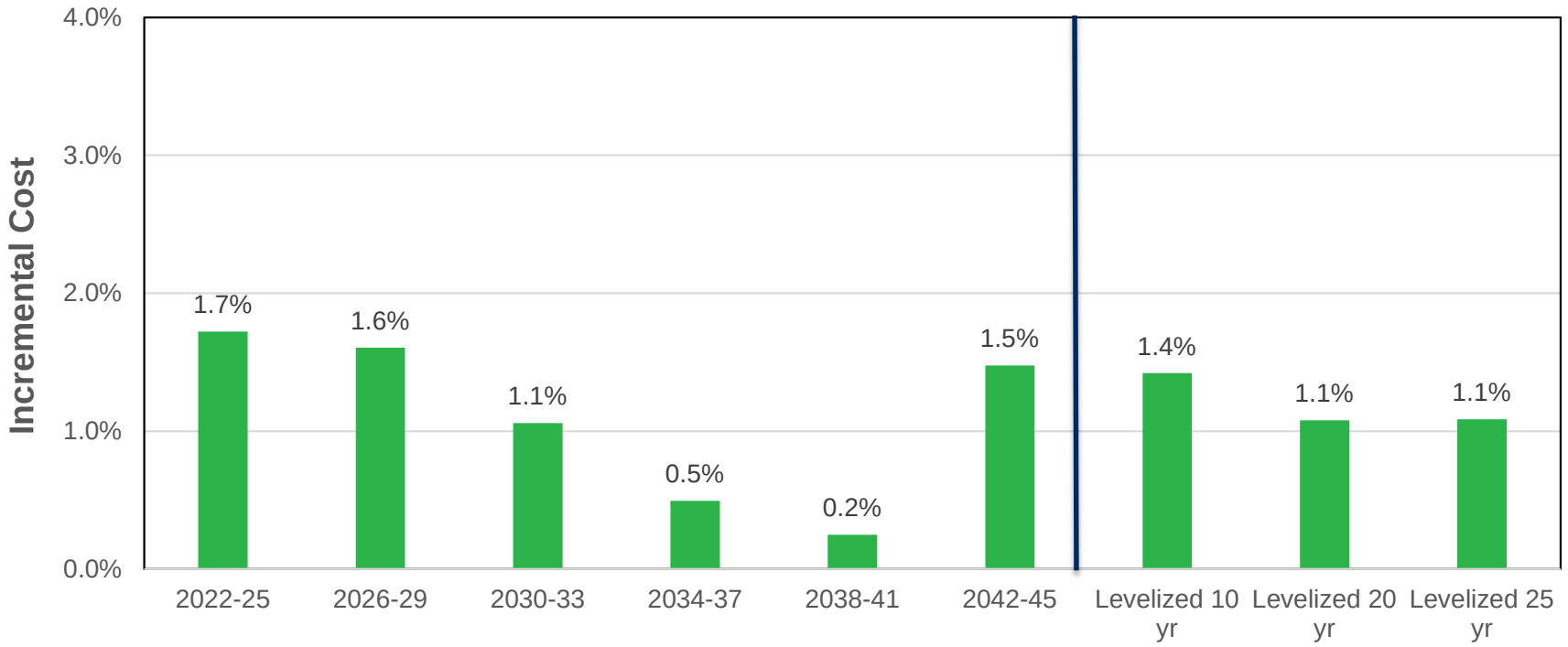
PRS: Cost/Rate Forecast

System PVRR: $11.83 billion
Today's Rates: 8.4 c/kWh Idaho and 8.9 c/kWh Washington
2030 Rate: 10.4 cents/kWh
2045 Rate: 14.1 cents/kWh



Note: Assumes non-power supply modelled costs escalate at 2 percent per year

Cost Comparison between PRS and LC Portfolio w/o CETA



Note: State allocation factors and resource designation will affect these results for each state

Avoided Costs- Power

Year	Energy Flat ($/MWh)	Energy On-Peak ($/MWh)	Energy Off-Peak ($/MWh)	Clean Premium ($/MWh)	Clean Premium (w/ Tax Incentive) ($/MWh)	Capacity ($/kW-Yr)
2021	19.67	22.64	15.71	0.00	0.00	0.0
2022	19.98	22.75	16.28	11.75	3.44	0.0
2023	20.44	23.05	16.98	11.99	3.50	0.0
2024	21.61	24.09	18.28	12.23	3.57	0.0
2025	22.76	25.19	19.50	12.47	3.65	0.0
2026	24.27	26.40	21.43	12.72	3.72	107.7
2027	23.57	25.27	21.30	12.97	3.79	109.9
2028	25.02	26.26	23.35	13.23	3.87	112.1
2029	25.92	26.80	24.73	13.50	3.95	114.3
2030	26.72	27.08	26.25	13.77	4.03	116.6
2031	29.46	29.66	29.21	14.04	4.11	118.9
2032	29.78	29.95	29.54	14.32	4.19	121.3
2033	31.22	30.74	31.89	14.61	4.27	123.7
2034	32.83	31.94	34.06	14.90	4.36	126.2
2035	33.66	32.64	35.05	15.20	4.44	128.7
2036	35.82	34.82	37.16	15.51	4.53	131.3
2037	36.12	34.58	38.19	15.82	4.62	133.9
2038	38.81	37.40	40.76	16.13	4.72	136.6
2039	38.60	37.13	40.57	16.45	4.81	139.3
2040	38.52	36.80	40.84	16.78	4.91	142.1
2041	39.09	37.74	40.92	17.12	5.01	145.0
2042	38.98	37.99	40.31	17.46	5.11	147.9
2043	40.24	39.51	41.21	17.81	5.21	150.8
2044	46.10	45.29	47.15	18.17	5.31	153.9
2045	43.94	43.11	45.05	18.53	5.42	156.9
15 yr Levelized	24.58	26.11	22.55	11.81	3.45	64.8
20 yr Levelized	26.44	27.55	24.98	12.43	3.63	75.1
25 yr Levelized	27.86	28.77	26.66	12.93	3.78	82.2

Methodology

Energy Prices: Electric market price forecast

Capacity Price: Cost difference between building resources to meet capacity needs as compared to not building any new capacity. This cost is divided by the amount of added capacity and is levelized and tilted (2% inflation) based on the first capacity deficit year.

Clean Premium: Difference in total cost of the PRS and the Least Cost Portfolio to meet capacity. This cost is divided by the amount of additional dispatch energy and is levelized and tilted (2% inflation) starting with the first year of renewable acquisition.

Clean Premium (w/ Tax Incentive): This shows the premium associated with renewables assuming the resource includes either the PTC or ITC.

2020 Electric Integrated Resource Plan Scenario and Sensitivity Analysis

James Gall, IRP Manager
Sixth Technical Advisory Committee Meeting
November 19, 2019

Agenda

- Portfolio analysis using the stochastic “expected case” market forecast
- Portfolio analysis with alternative market prices (deterministic)- sensitivity analysis
- Electrification scenario

Portfolio Scenarios

Portfolio Scenario Overview

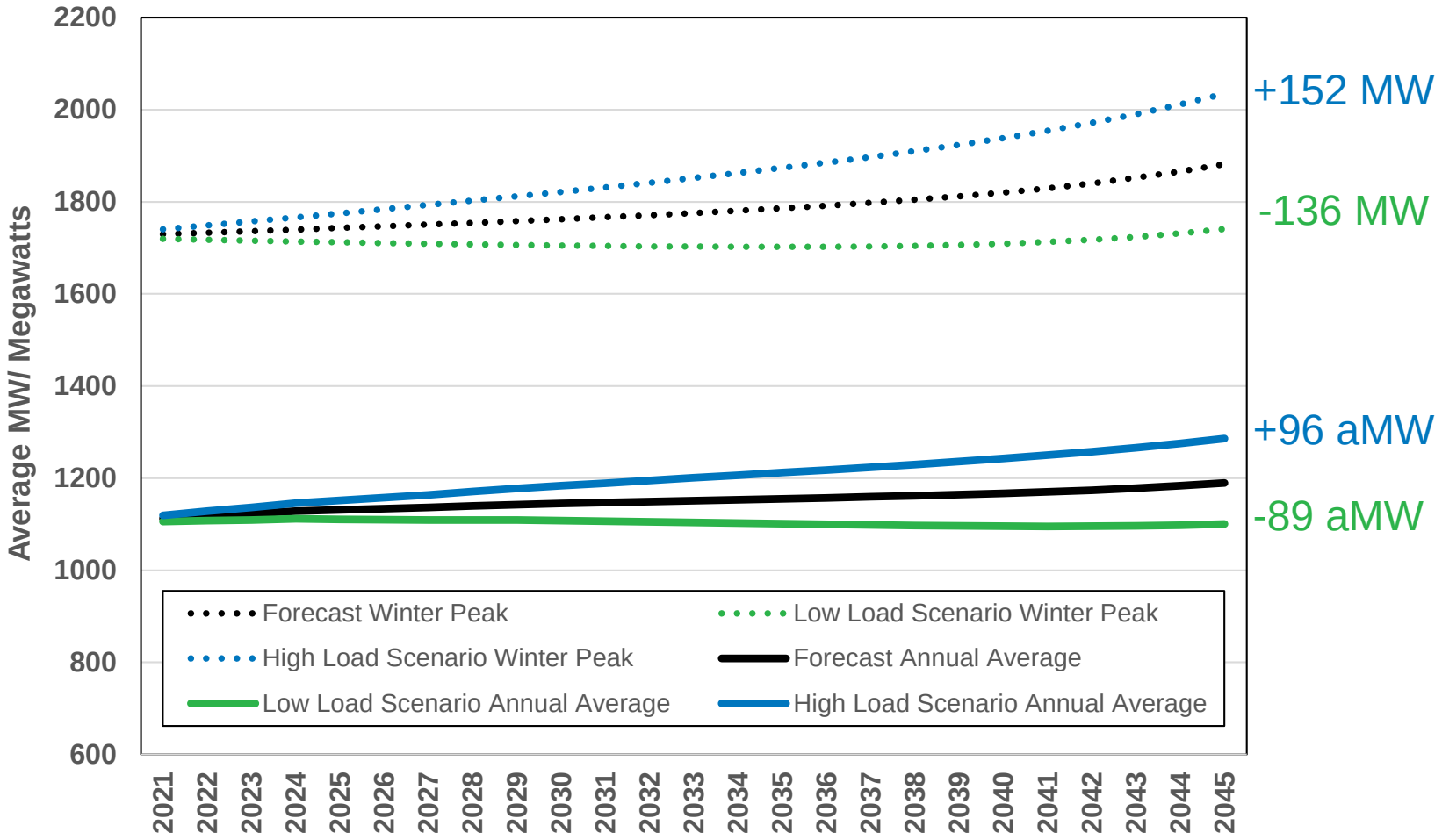
- Uses same electric price forecast, but different resource assumptions.
- Use optimization to create portfolio, but use different constraints for each scenario.
- View financial results of each portfolio along with resource selection.
- No reliability analyses are completed for portfolio scenarios.

Scenarios

1. Preferred Resource Strategy
2. Least Cost Plan- without CETA
3. Clean Resource Plan: 100% net clean by 2027
4. Rely on energy markets only (no capacity or renewable additions) without CETA
5. 100% net clean by 2027, and no CTs by 2045
6. Least Cost Plan without pumped storage or Long Lake as options
7. Colstrip extended to 2035 without CETA
8. Colstrip extended to 2035 with CETA
9. Least Cost Plan with higher pumped storage cost
10. Least Cost with federal tax credits extended
11. Clean Resource Plan with federal tax credits extended
12. Least Cost Plan with low load growth (flat loads- low economic/population growth)
13. Least Cost Plan with high load growth (high economic/population growth)
14. Least Cost Plan with Lancaster PPA extended five years *(financials will not be public)*
15. Least Cost Plan with one Colstrip unit operating through 2035

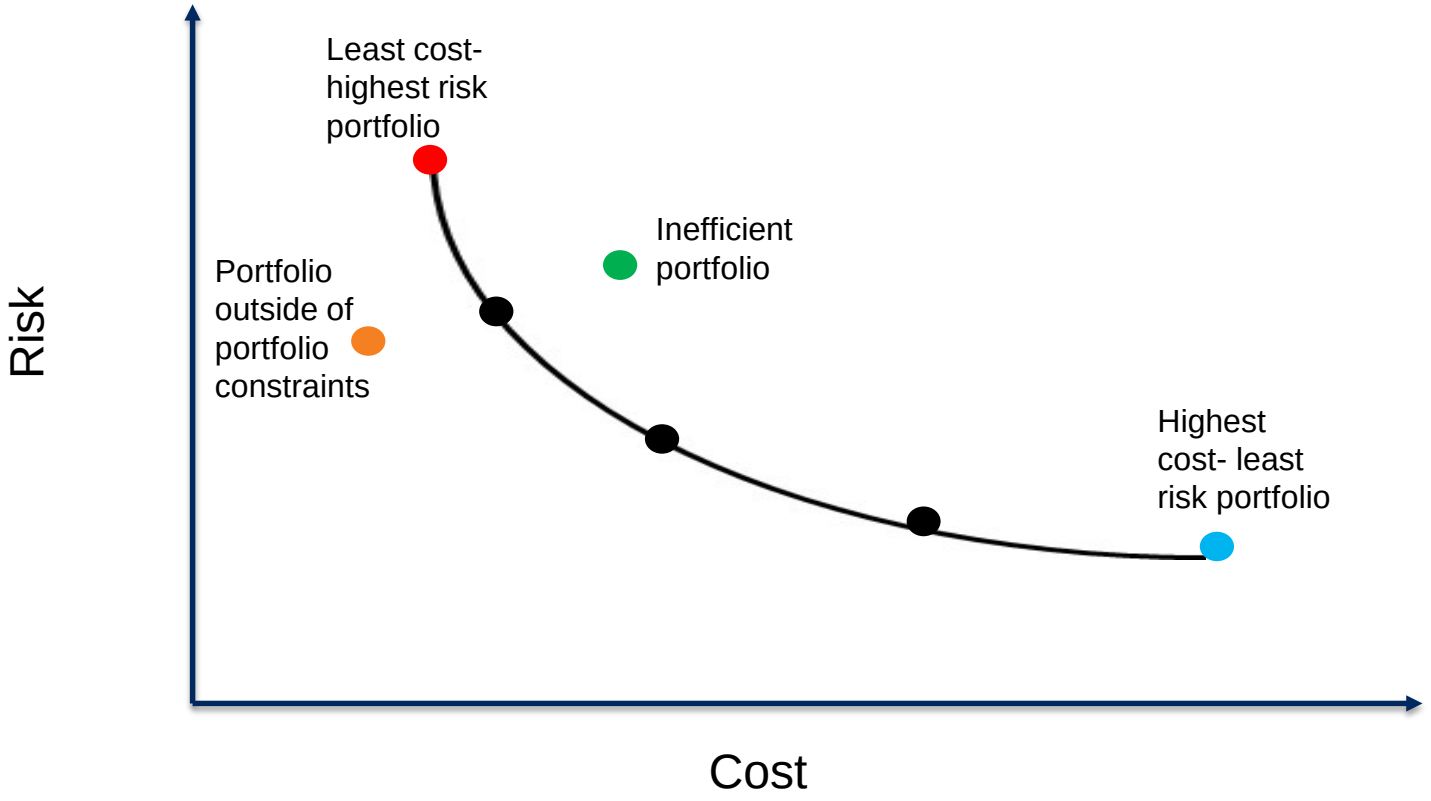
Others: Efficient Frontier portfolio (least risk, 75/25, 50/50, and 25/75)

Load Scenarios

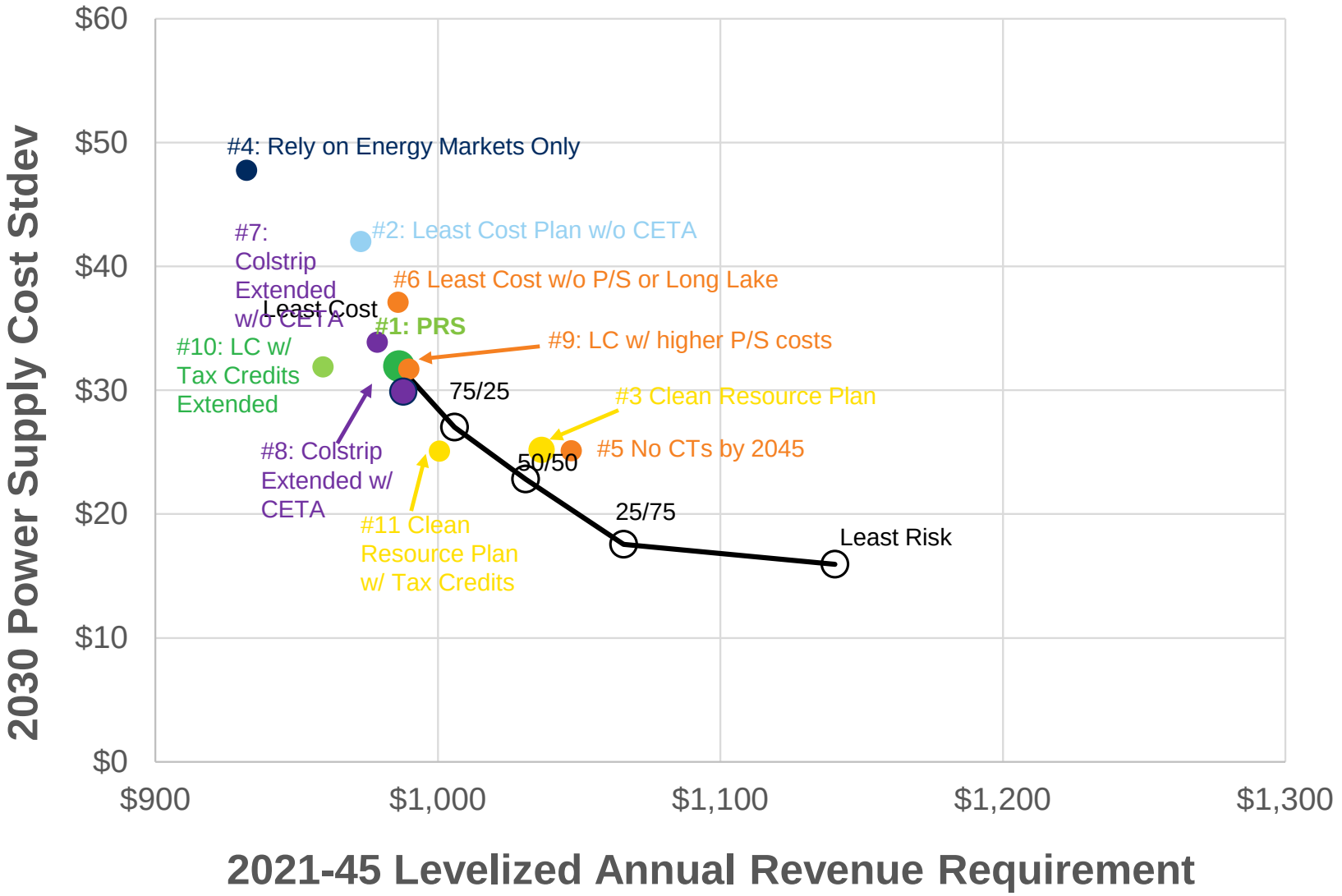


Scenarios are based on changing GDP assumptions: The change effects employment and population growth leading to load changes.

Efficient Frontier Overview

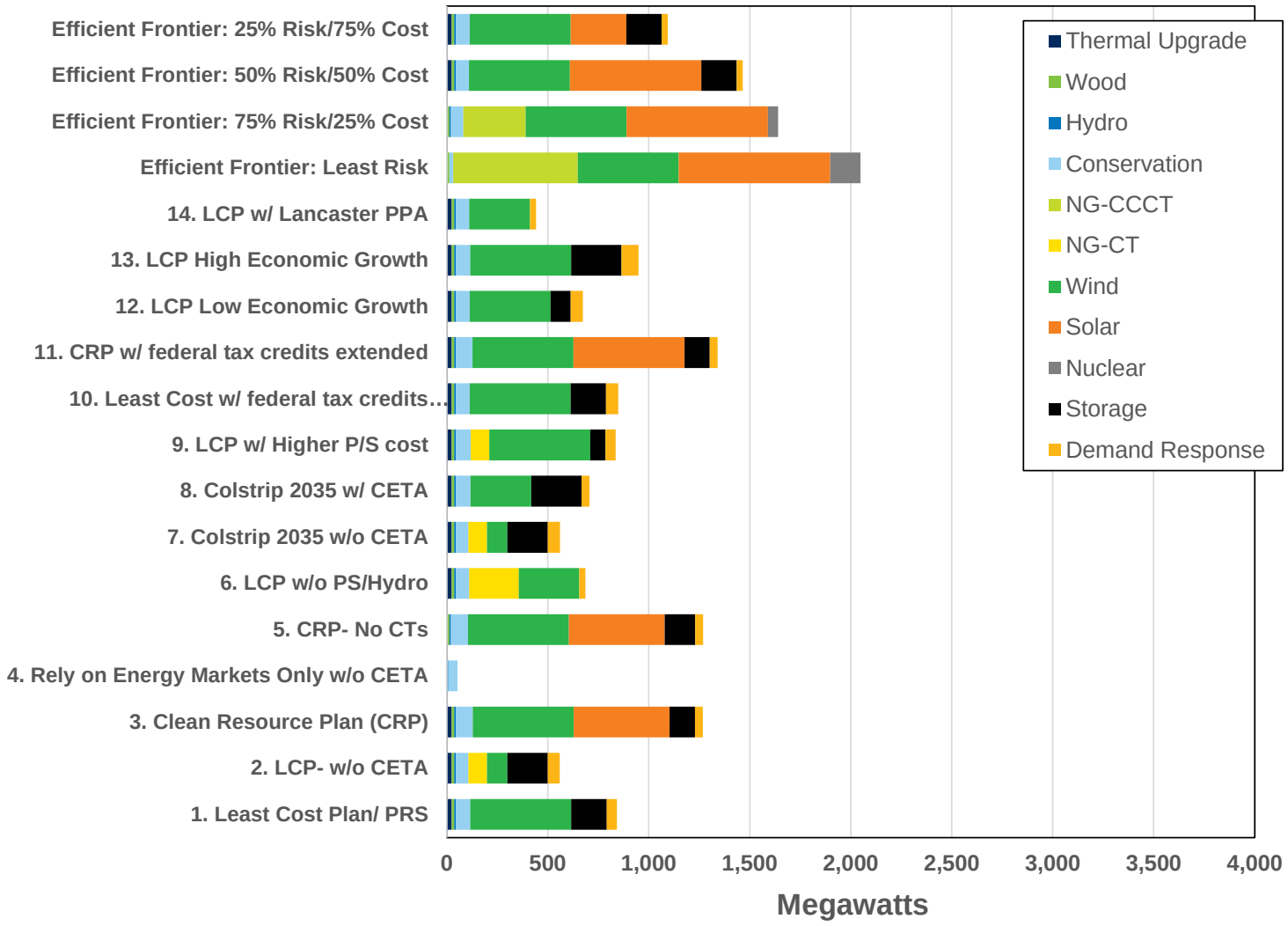


Efficient Frontier Results

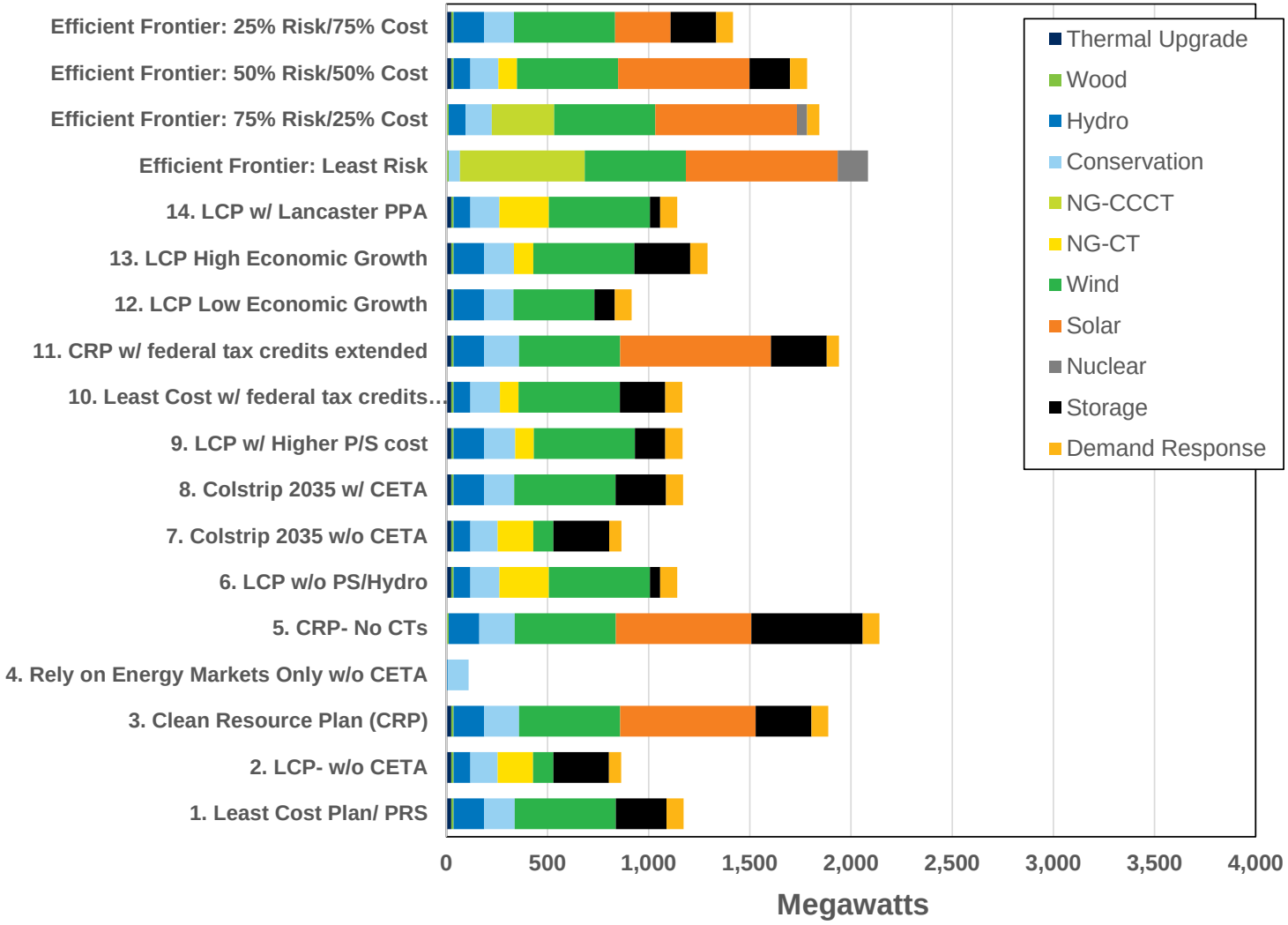


Note: excludes portfolios after #12

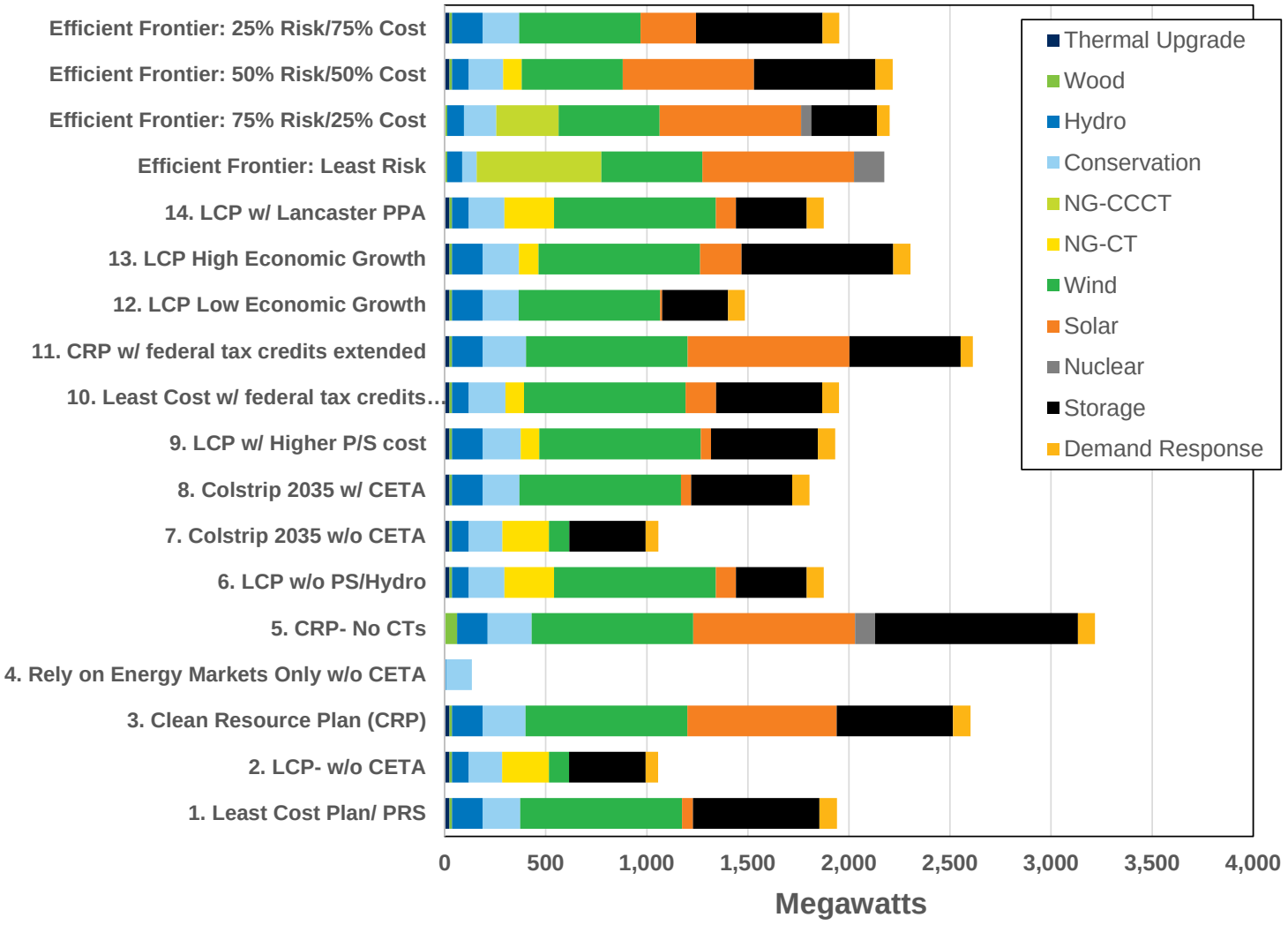
2030 Portfolio Resource Selection



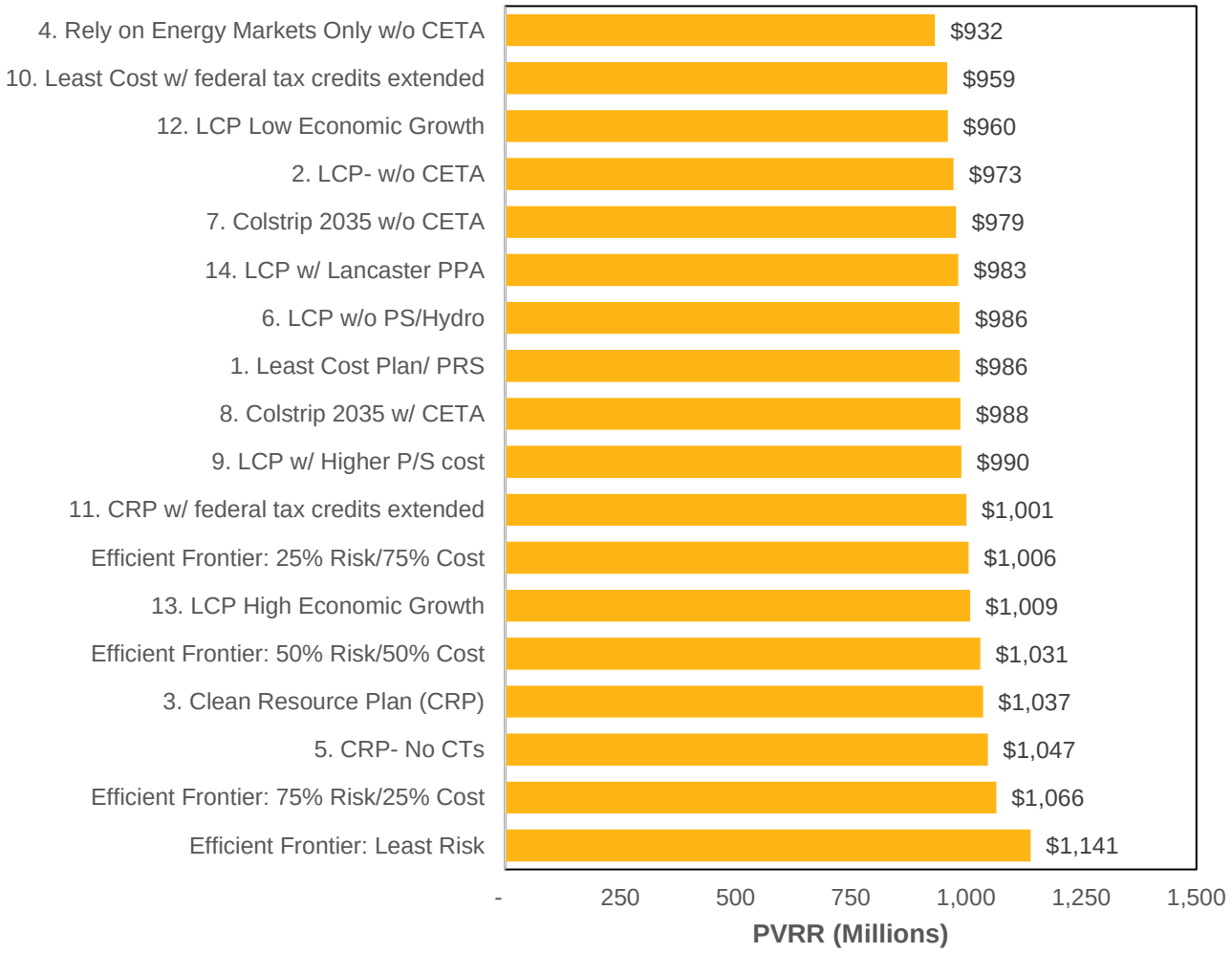
2040 Portfolio Resource Selection



2045 Portfolio Resource Selection

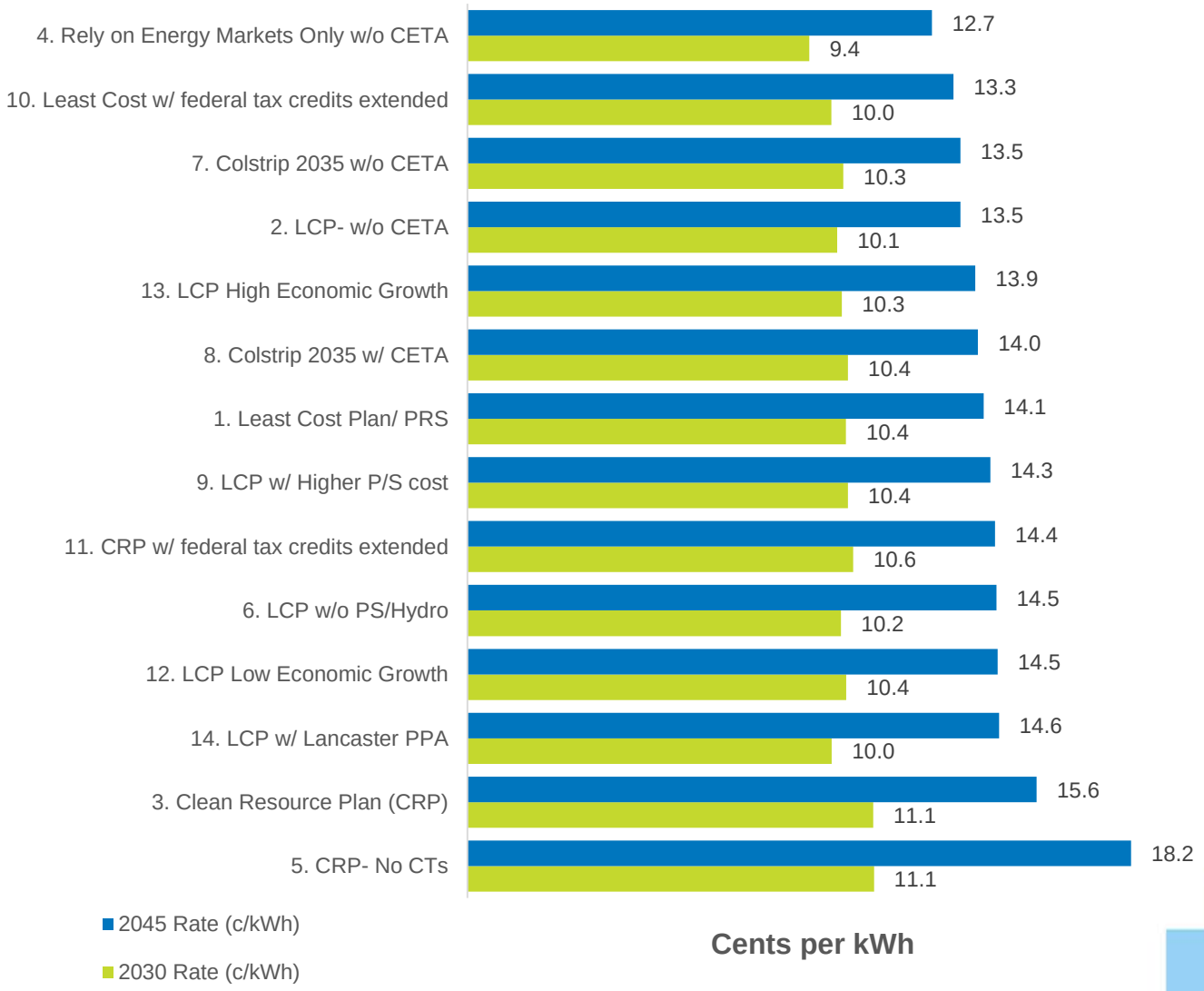


Annual Cost Comparison



Rate Comparison

sorted by 2045 rates

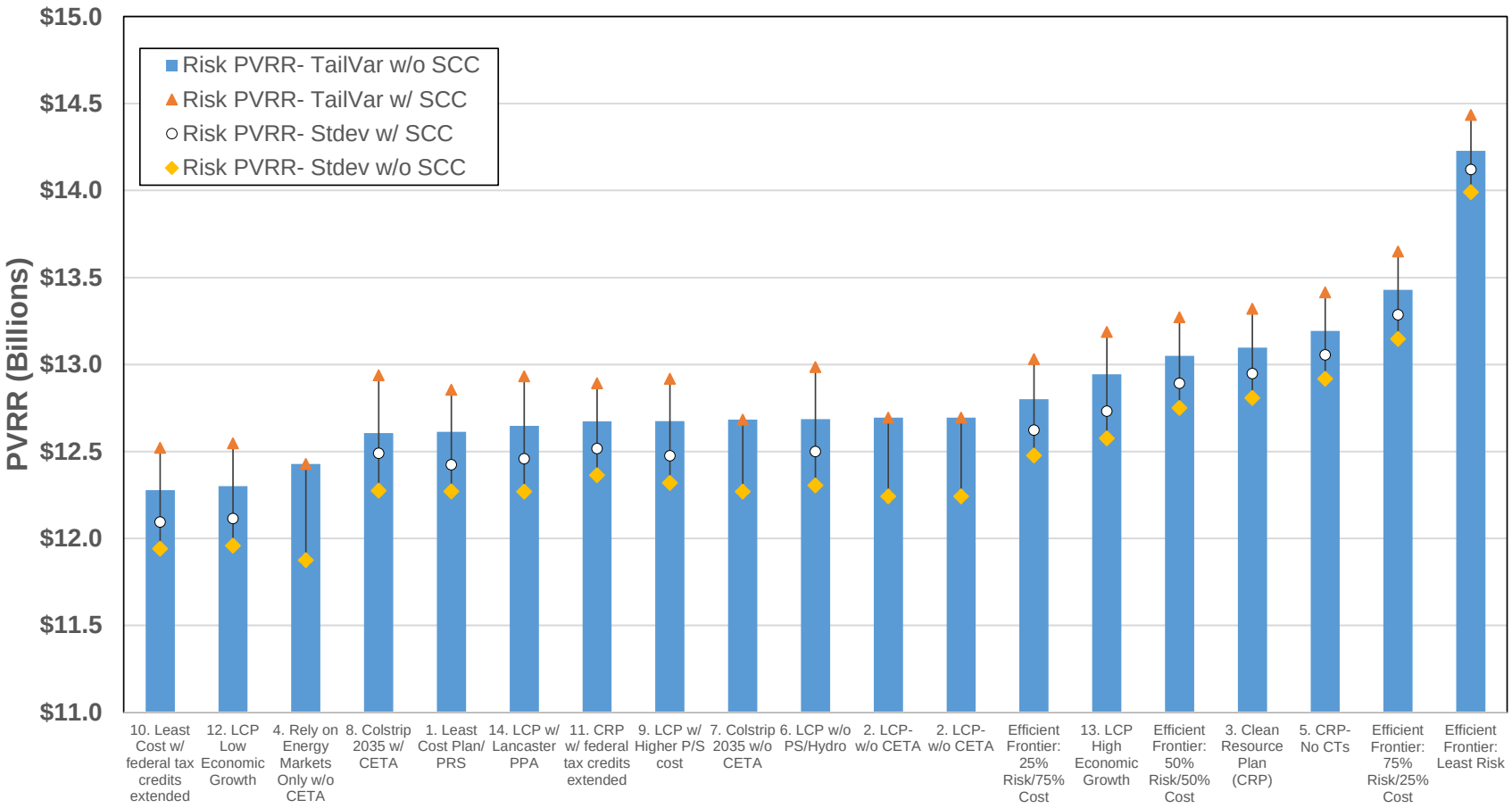


Portfolio Tail Risk

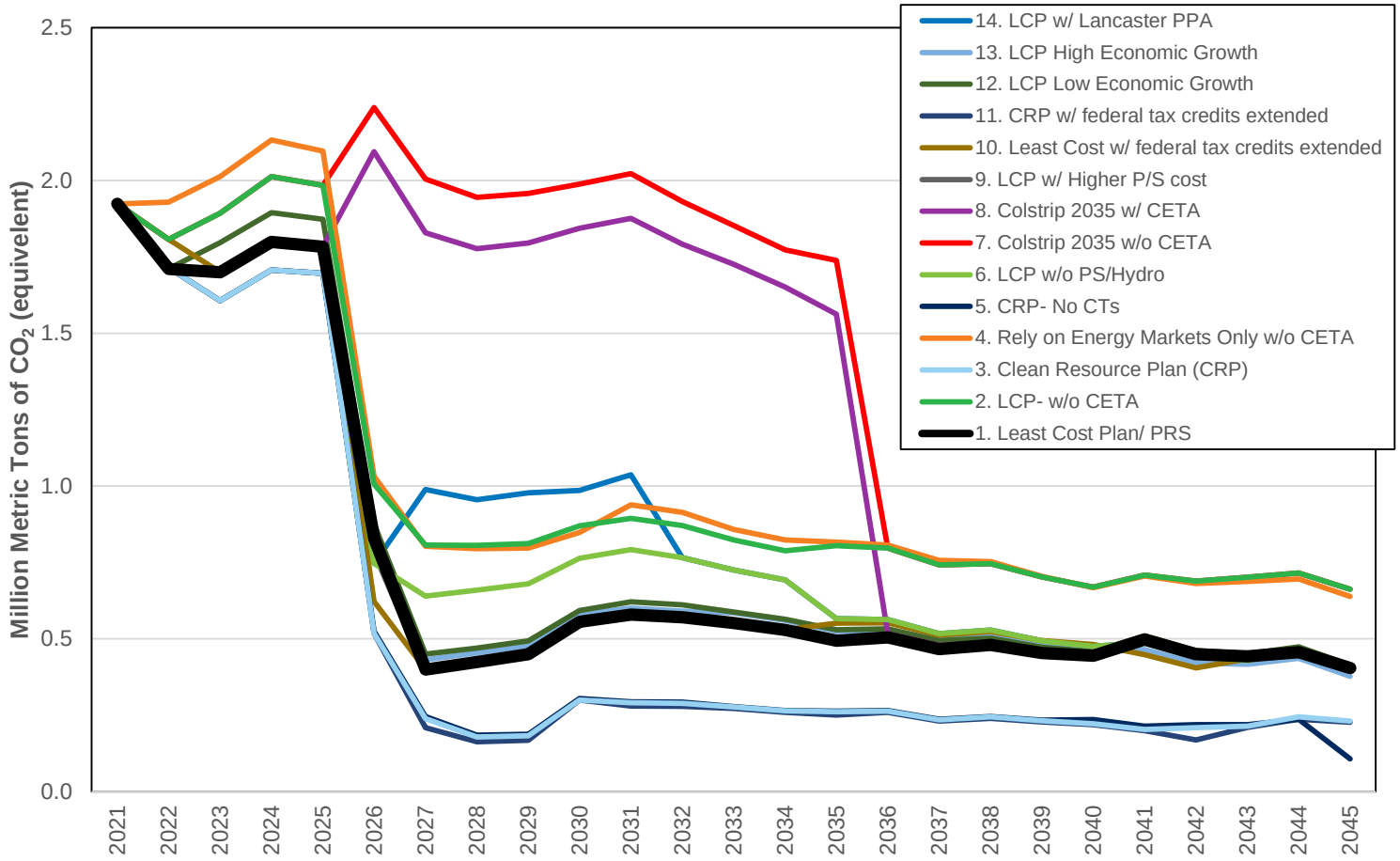
(95th percentile minus expected cost, excludes Social Cost of Carbon)

PVRR Risk Adjusted Comparison

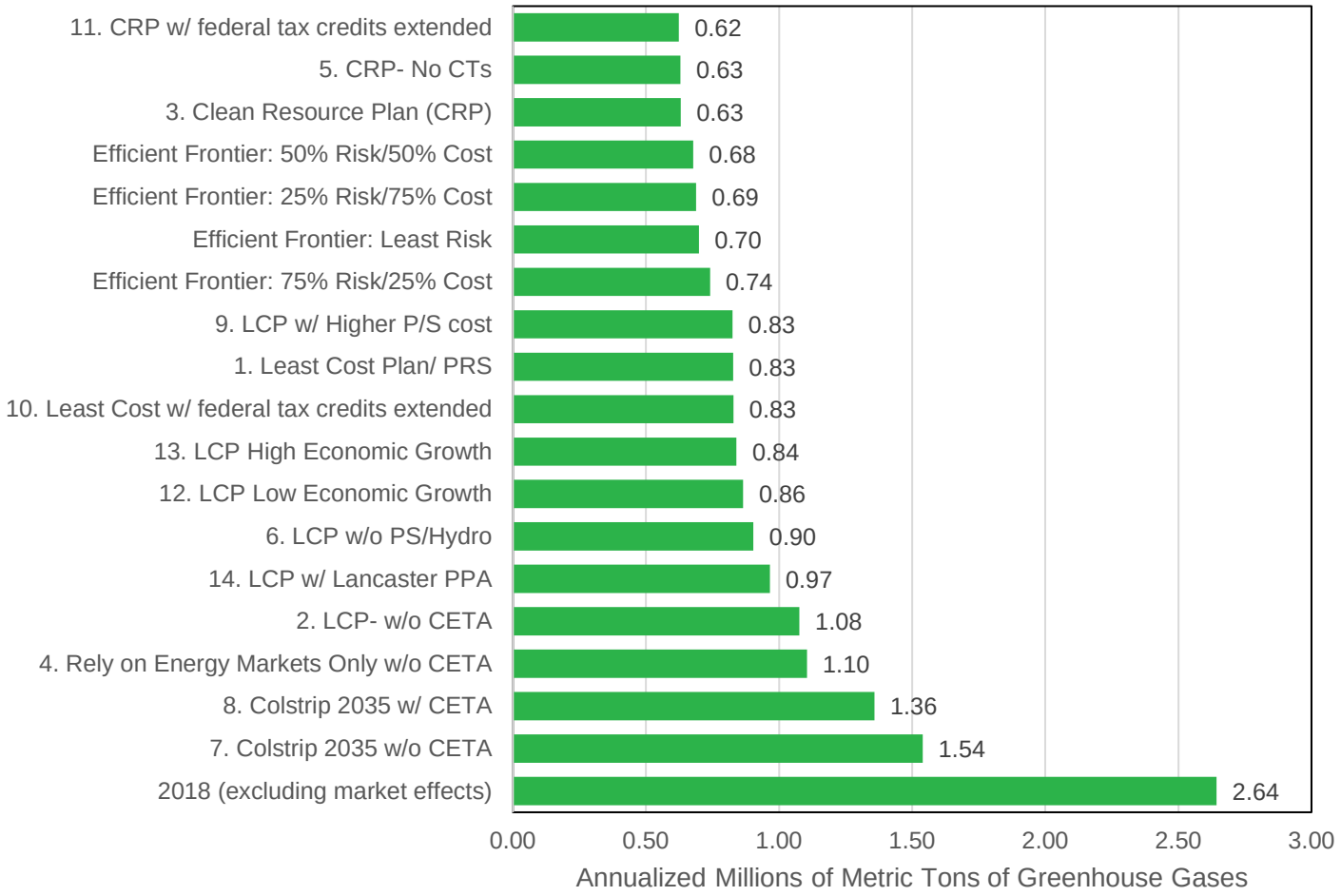
Sorted by TailVar without Social Cost of Carbon (SCC)



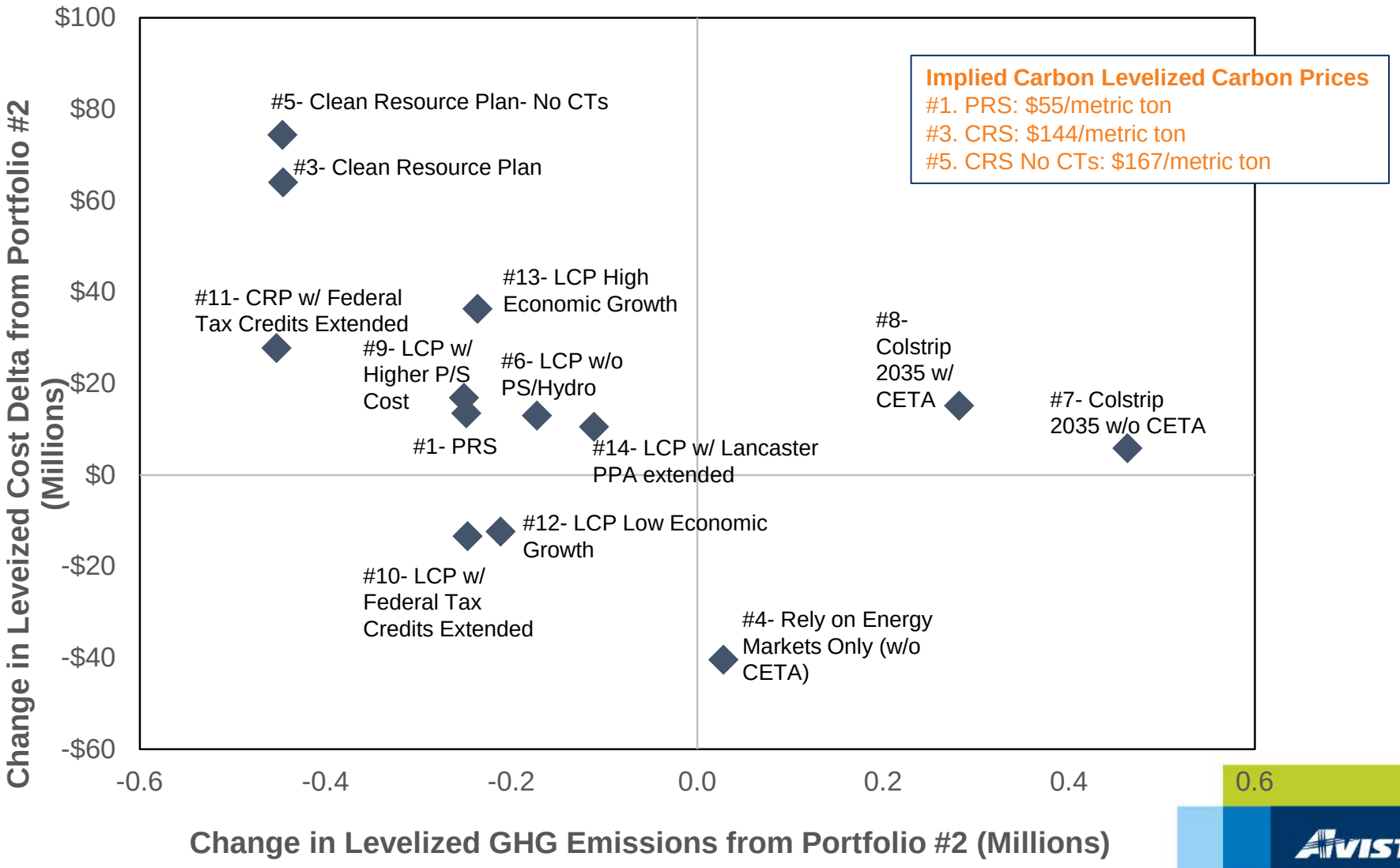
Annual Greenhouse Gas Comparison



Annualized Greenhouse Gas Emissions
(Levelized using 2.5% discount rate)



Cost vs. GHG Emissions



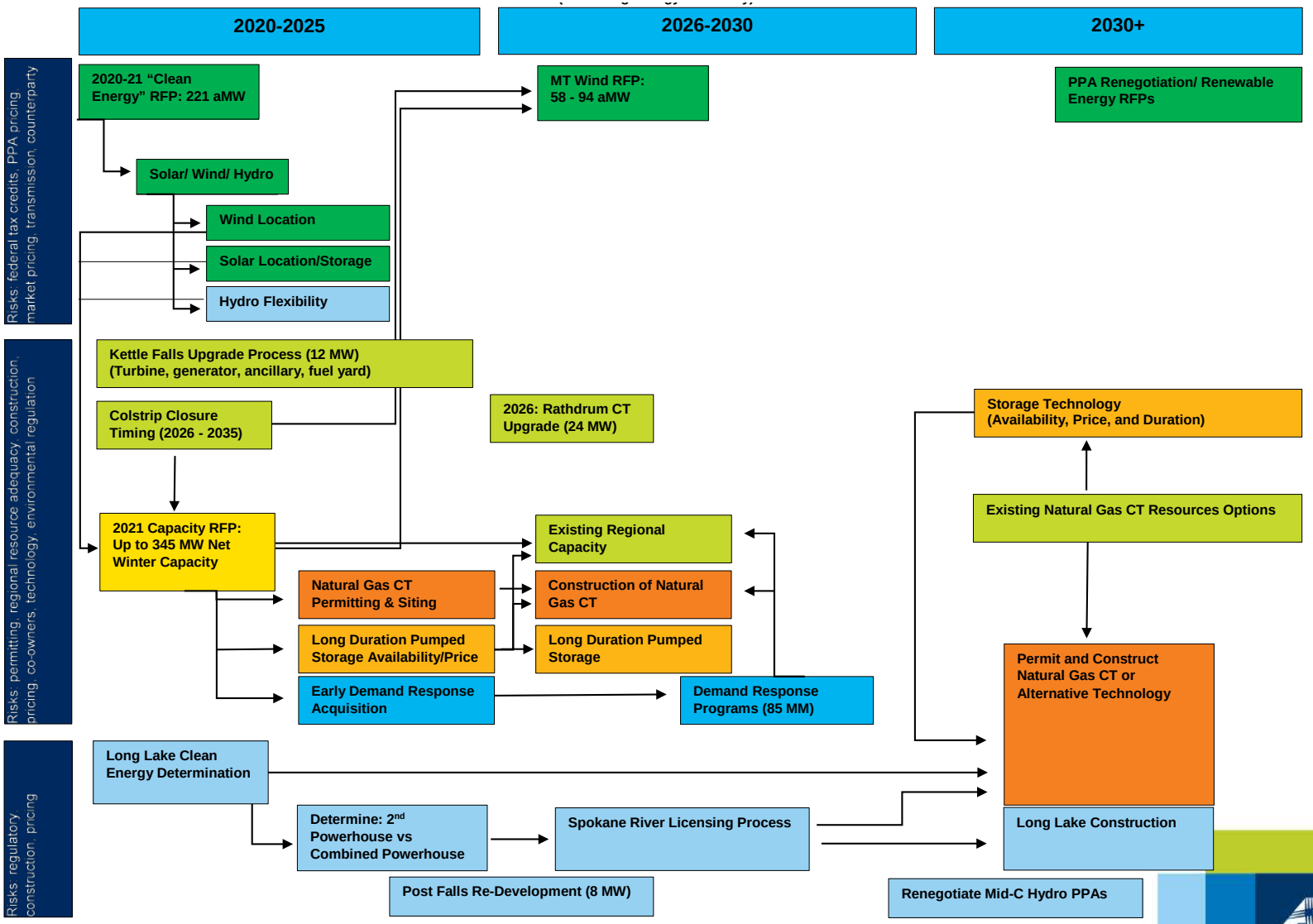
Scenario Results Summary Table

Portfolio Number	Portfolio name	Cost 2021-2045 (PVRR) (millions)	Cost 2021-2030 (PVRR) (millions)	2030 Risk (millions)	2030 Rate (c/kWh)	2045 Rate (c/KWh)	Levelized R.R.
1	Preferred Resource Strategy	$11,832	$6,329	$31.9	10.4	14.1	986.3
2	Least Cost Plan- w/o CETA	$11,670	$6,222	$42.0	10.1	13.5	972.7
3	Clean Resource Plan: 100% net clean by 2027	$12,439	$6,505	$25.2	11.1	15.6	1,036.8
4	Rely on Energy Markets Only (no capacity or renewable additions)	$11,185	$6,000	$47.8	9.4	12.7	932.3
5	100% net clean by 2027, and no CTs by 2045	$12,563	$6,511	$25.1	11.1	18.2	1,047.1
6	Least Cost Plan w/o pumped storage or Long Lake as options	$11,826	$6,270	$37.1	10.2	14.5	985.7
7	Colstrip extended to 2035 w/o CETA	$11,740	$6,252	$33.9	10.3	13.5	978.6
8	Colstrip extended to 2035 w/ CETA	$11,852	$6,346	$29.9	10.4	14.0	987.8
9	Least Cost Plan w/ higher pumped storage cost (+20%)	$11,873	$6,329	$31.7	10.4	14.3	989.6
10	Least Cost w/ federal tax credits extended	$11,510	$6,210	$31.9	10.0	13.3	959.4
11	Clean Resource Plan w/ federal tax credits extended	$12,004	$6,344	$25.1	10.6	14.4	1,000.5
12	Least Cost Plan w/ low economic growth	$11,521	$6,216	$31.9	10.4	14.5	960.3
13	Least Cost Plan w/ high economic growth	$12,106	$6,391	$34.4	10.3	13.9	1,009.1
15	Colstrip (Unit 4 until 2035)	$11,855	$6,343	$30.8	10.5	14.0	988.2

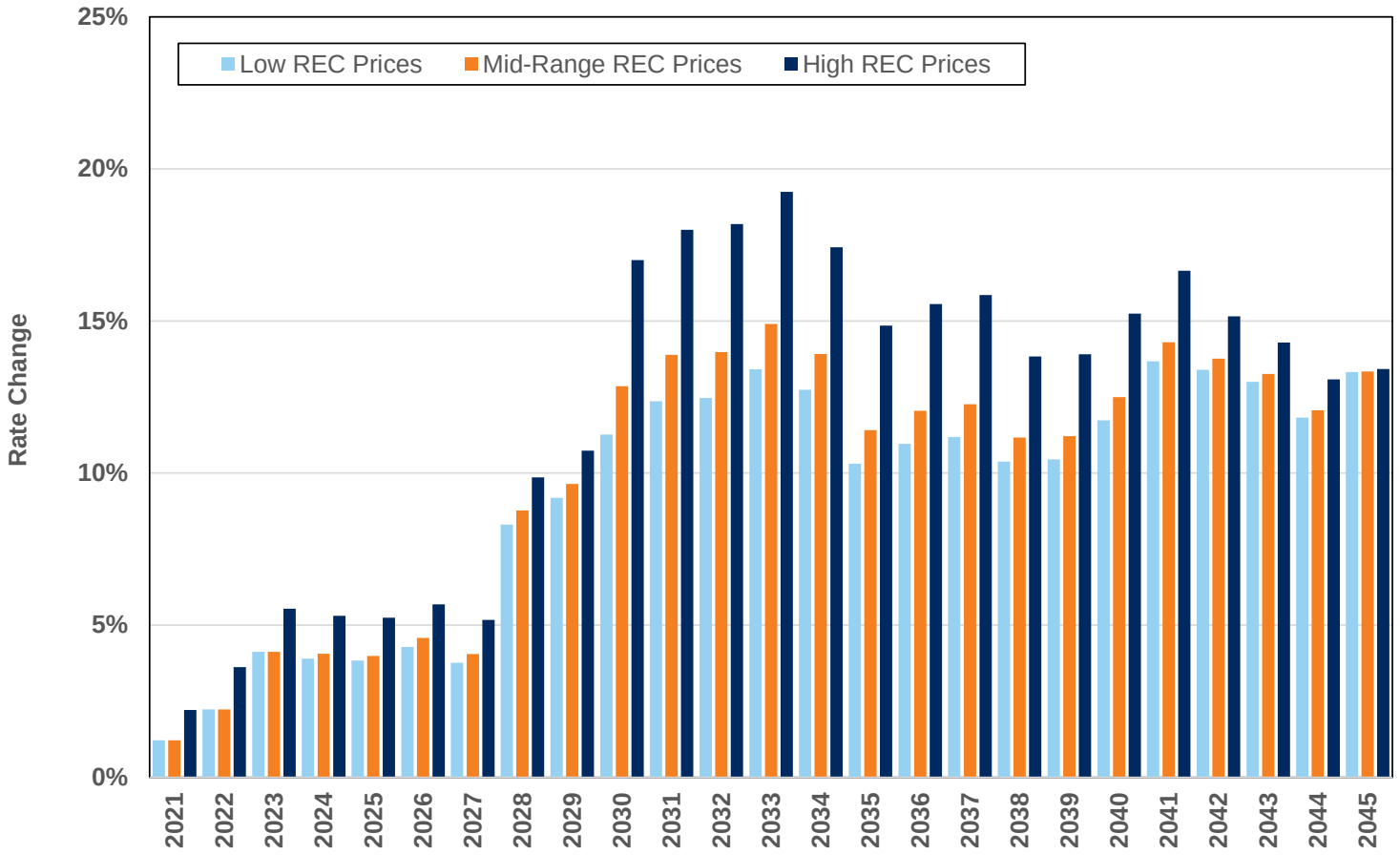
Note: Costs do not include Social Cost of Carbon, but included in optimization

Resource Acquisition Decision Chart

(Excluding Energy Efficiency)



Idaho Rate Impact for Clean Resource Strategy



Compares CRS (#3) cost to Idaho's LC strategy cost, then adjusts
Costs down for REC sales at three different prices
Average Prices: Low- $4/REC, Mid- $6.40/REC, High- $15.40/REC

Observations

- Resource acquisitions and decisions are highly dependent on resource availability to be determined in a RFP.
- Colstrip continuing to 2035 is 0.3% higher cost then operating until 2025, (but rate per kWh is slightly lower due to changes in conservation). Keeping one unit running does not improve economics.
- CETA cost caps are likely to be in place closer to 2045.
- Idaho rates will be impacted by REC prices from its sales potential and how resources are allocated between states.
- Avista's GHG emissions will lower, but the amount depends on timing of resources and method for accounting for regional emissions.
- Low load scenario illustrates resource need if greater energy efficiency is gained.

Market Price Sensitivities

Market Price Sensitivity Analysis

- Use different market prices for each of the 14 portfolios
- Results in 70 sensitivities
- Market sensitivities include:
  - Expected Case (deterministic)
  - No CETA
  - Low natural gas prices
  - High natural gas prices
  - Social cost of carbon (west-wide dispatch- tax method)

Change in Cost (PVRR)

Sensitivity as Compared to Expected Case

Portfolios	No CETA	Low NG Prices	High NG Prices	Social Cost of Carbon
1. Least Cost Plan/ PRS	0.6%	-3.0%	2.6%	10.5%
2. LCP- w/o CETA	0.8%	-4.4%	4.3%	15.5%
3. Clean Resource Plan (CRP)	0.1%	-2.3%	1.7%	7.6%
4. Rely on Energy Markets Only w/o CETA	0.4%	-5.8%	6.0%	19.5%
5. CRP- No CTs	0.2%	-2.0%	1.5%	7.6%
6. LCP w/o PS/Hydro	0.3%	-3.7%	3.5%	12.4%
7. Colstrip 2035 w/o CETA	0.7%	-3.8%	3.0%	14.8%
8. Colstrip 2035 w/ CETA	0.7%	-2.7%	2.2%	13.1%
9. LCP w/ Higher P/S cost	0.4%	-3.1%	2.8%	10.5%
10. Least Cost w/ federal tax credits extended	0.6%	-3.1%	5.4%	10.8%
11. CRP w/ federal tax credits extended	0.1%	-2.3%	1.8%	7.9%
12. LCP Low Economic Growth	0.4%	-3.0%	2.7%	11.3%
13. LCP High Economic Growth	0.8%	-3.2%	2.9%	10.9%
14. LCP w/ Lancaster PPA	0.2%	-3.7%	5.2%	12.6%
15. Colstrip Unit 4 through 2035	0.6%	-2.8%	2.4%	11.9%

Change in Cost (PVRR)

Portfolio as Compared to PRS

Portfolios	Expected Case (Stoch)	Expected Case (Det)	No CETA	Low NG Prices	High NG Prices	Social Cost of Carbon
2. LCP- w/o CETA	-1.4%	-1.8%	-1.6%	-3.3%	-0.1%	2.7%
3. Clean Resource Plan (CRP)	5.1%	5.3%	4.7%	6.0%	4.4%	2.5%
4. Rely on Energy Markets Only w/o CETA	-5.5%	-6.4%	-6.6%	-9.1%	-3.3%	1.2%
5. CRP- No CTs	6.2%	6.4%	5.9%	7.4%	5.2%	3.5%
6. LCP w/o PS/Hydro	-0.1%	0.0%	-0.3%	-0.8%	0.9%	1.8%
7. Colstrip 2035 w/o CETA	-0.8%	-1.0%	-1.0%	-1.9%	-0.6%	2.9%
8. Colstrip 2035 w/ CETA	0.2%	0.3%	0.4%	0.6%	-0.1%	2.7%
9. LCP w/ Higher P/S cost	0.3%	0.3%	0.1%	0.1%	0.4%	0.3%
10. Least Cost w/ federal tax credits extended	-2.7%	-2.7%	-2.7%	-2.8%	0.0%	-2.4%
11. CRP w/ federal tax credits extended	1.4%	1.7%	1.1%	2.4%	0.8%	-0.7%
12. LCP Low Economic Growth	-2.6%	-2.8%	-3.1%	-2.9%	-2.7%	-2.2%
13. LCP High Economic Growth	2.3%	2.5%	2.6%	2.2%	2.8%	2.8%
14. LCP w/ Lancaster PPA	-0.3%	-0.2%	-0.6%	-1.0%	2.3%	1.7%
15. Colstrip Unit 4 through 2035	0.2%	0.3%	0.3%	0.4%	0.1%	1.6%

Change in Levelized GHG Emissions

Sensitivity as Compared to Expected Case

Portfolios	No CETA	Low NG Prices	High NG Prices	Social Cost of Carbon
1. Least Cost Plan/ PRS	3.0%	8.7%	-1.1%	-36.8%
2. LCP- w/o CETA	5.2%	8.2%	-0.8%	-32.4%
3. Clean Resource Plan (CRP)	1.6%	11.2%	-1.1%	-43.9%
4. Rely on Energy Markets Only w/o CETA	2.7%	3.7%	-3.6%	-29.3%
5. CRP- No CTs	2.6%	11.2%	0.3%	-43.3%
6. LCP w/o PS/Hydro	1.9%	8.2%	-4.6%	-36.0%
7. Colstrip 2035 w/o CETA	4.2%	1.8%	0.0%	-53.6%
8. Colstrip 2035 w/ CETA	3.9%	2.0%	0.8%	-57.2%
9. LCP w/ Higher P/S cost	1.7%	7.9%	-2.9%	-37.2%
10. Least Cost w/ federal tax credits extended	2.7%	2.7%	-1.0%	-37.1%
11. CRP w/ federal tax credits extended	1.9%	11.6%	-0.8%	-44.3%
12. LCP Low Economic Growth	1.8%	6.8%	-2.7%	-35.3%
13. LCP High Economic Growth	4.0%	10.2%	4.0%	-37.4%
14. LCP w/ Lancaster PPA	2.6%	7.5%	-4.5%	-38.3%
15. Colstrip Unit 4 through 2035	3.6%	4.5%	0.2%	-49.8%

Change in Levelized GHG Emissions

Portfolio as Compared to PRS

Portfolios	Expected Case (Stoch)	Expected Case (Det)	No CETA	Low NG Prices	High NG Prices	Social Cost of Carbon
2. LCP- w/o CETA	30.0%	24.1%	26.8%	23.6%	24.4%	32.9%
3. Clean Resource Plan (CRP)	-23.8%	-20.4%	-21.5%	-18.6%	-20.5%	-29.3%
4. Rely on Energy Markets Only w/o CETA	33.5%	26.5%	26.2%	20.7%	23.3%	41.5%
5. CRP- No CTs	-23.9%	-20.7%	-21.0%	-18.9%	-19.6%	-28.8%
6. LCP w/o PS/Hydro	9.2%	8.0%	6.9%	7.5%	4.2%	9.3%
7. Colstrip 2035 w/o CETA	86.0%	88.2%	90.5%	76.3%	90.2%	38.2%
8. Colstrip 2035 w/ CETA	64.1%	71.3%	72.8%	60.7%	74.5%	15.9%
9. LCP w/ Higher P/S cost	-0.3%	-0.8%	-2.1%	-1.5%	-2.7%	-1.3%
10. Least Cost w/ federal tax credits extended	0.2%	-0.1%	-0.4%	-5.6%	0.0%	-0.6%
11. CRP w/ federal tax credits extended	-24.6%	-21.1%	-21.9%	-19.0%	-20.9%	-30.4%
12. LCP Low Economic Growth	4.5%	2.7%	1.5%	1.0%	1.0%	5.1%
13. LCP High Economic Growth	1.5%	1.5%	2.5%	2.9%	6.7%	0.5%
14. LCP w/ Lancaster PPA	16.6%	15.7%	15.2%	14.4%	11.6%	12.9%
15. Colstrip Unit 4 through 2035	33.0%	36.2%	37.0%	31.0%	37.9%	8.3%

Sensitivity Observations

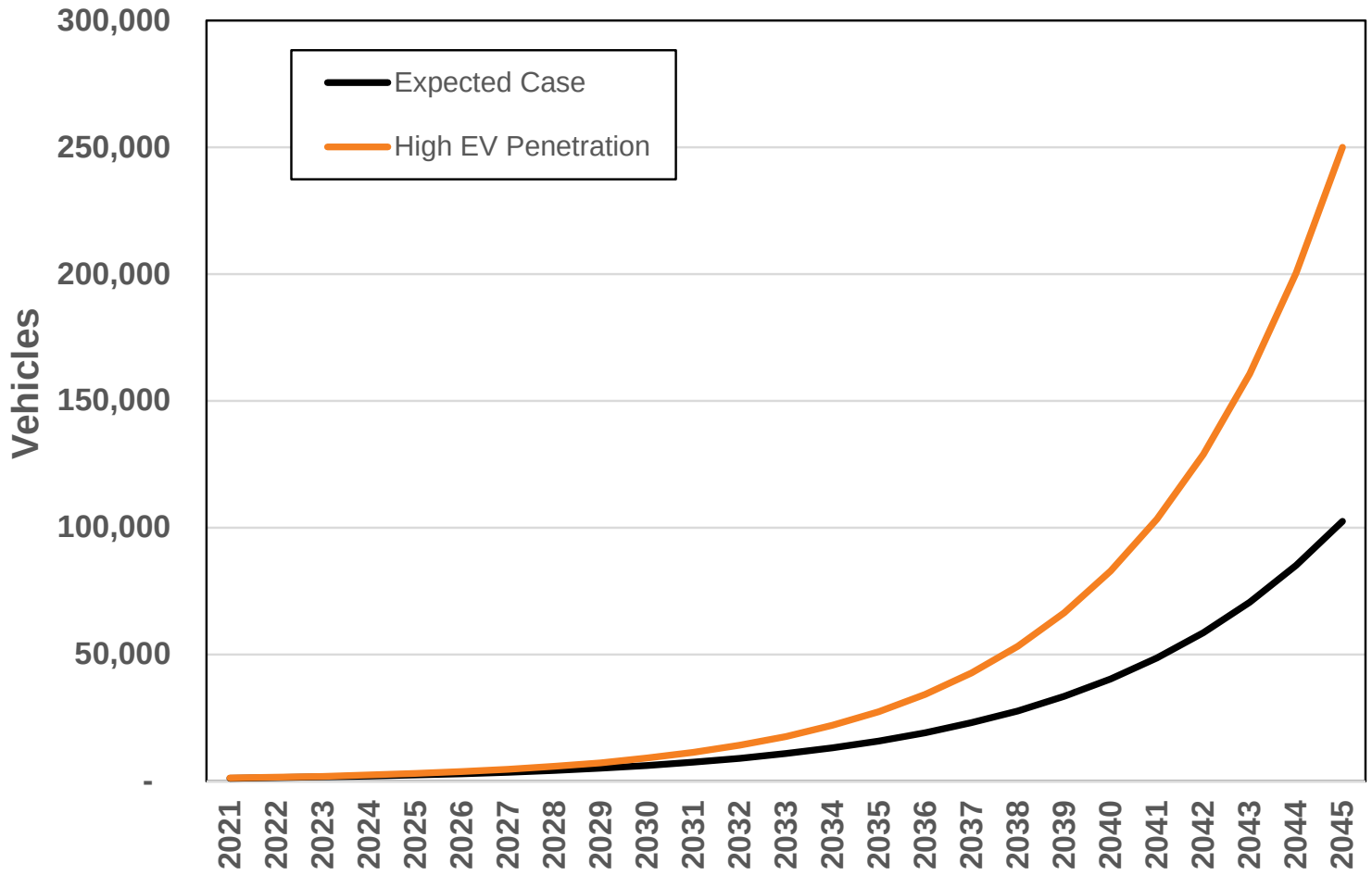
- Modeling the electric market place with and without CETA shows only modest changes in costs, but without CETA generally increases costs as electric market prices are higher.
- Low natural gas prices decrease portfolio costs and high natural gas prices increase costs, although scenarios with more gas turbines are more sensitive to gas prices changes- low natural gas prices are likely to increase Avista's GHG emissions, while higher prices may not for Avista, but could for other markets.
- Modeling SCC as a tax increases Avista's cost, but lowers Avista's emissions. The PRS is still a lower cost alternative then other scenarios in this sensitivity.

Electrification Scenario

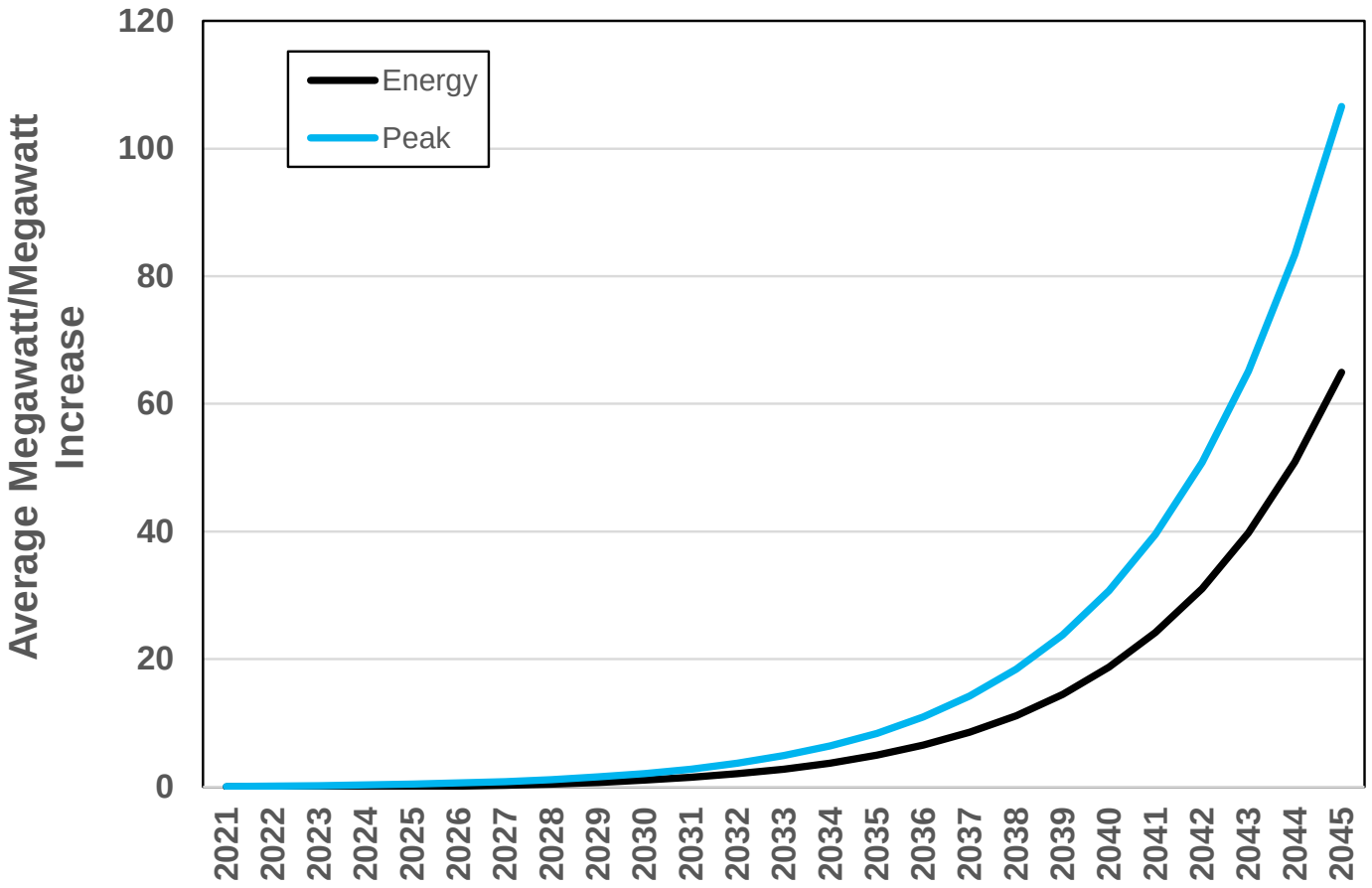
Electrification Scenario

- Increase electric vehicles
- Increase roof-top solar
- Reduction in end-use natural gas penetration

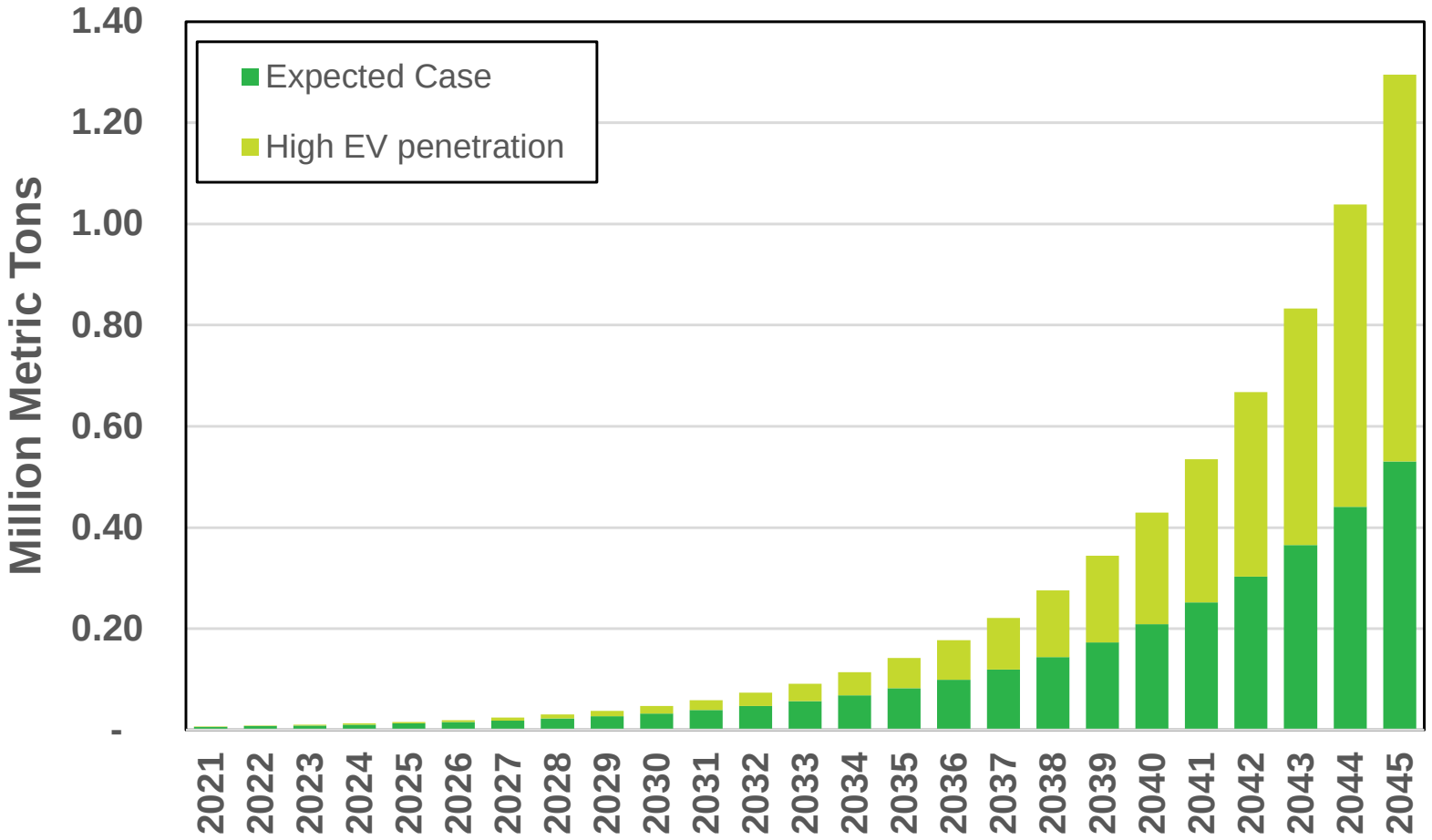
Service Territory Electric Vehicle Forecast



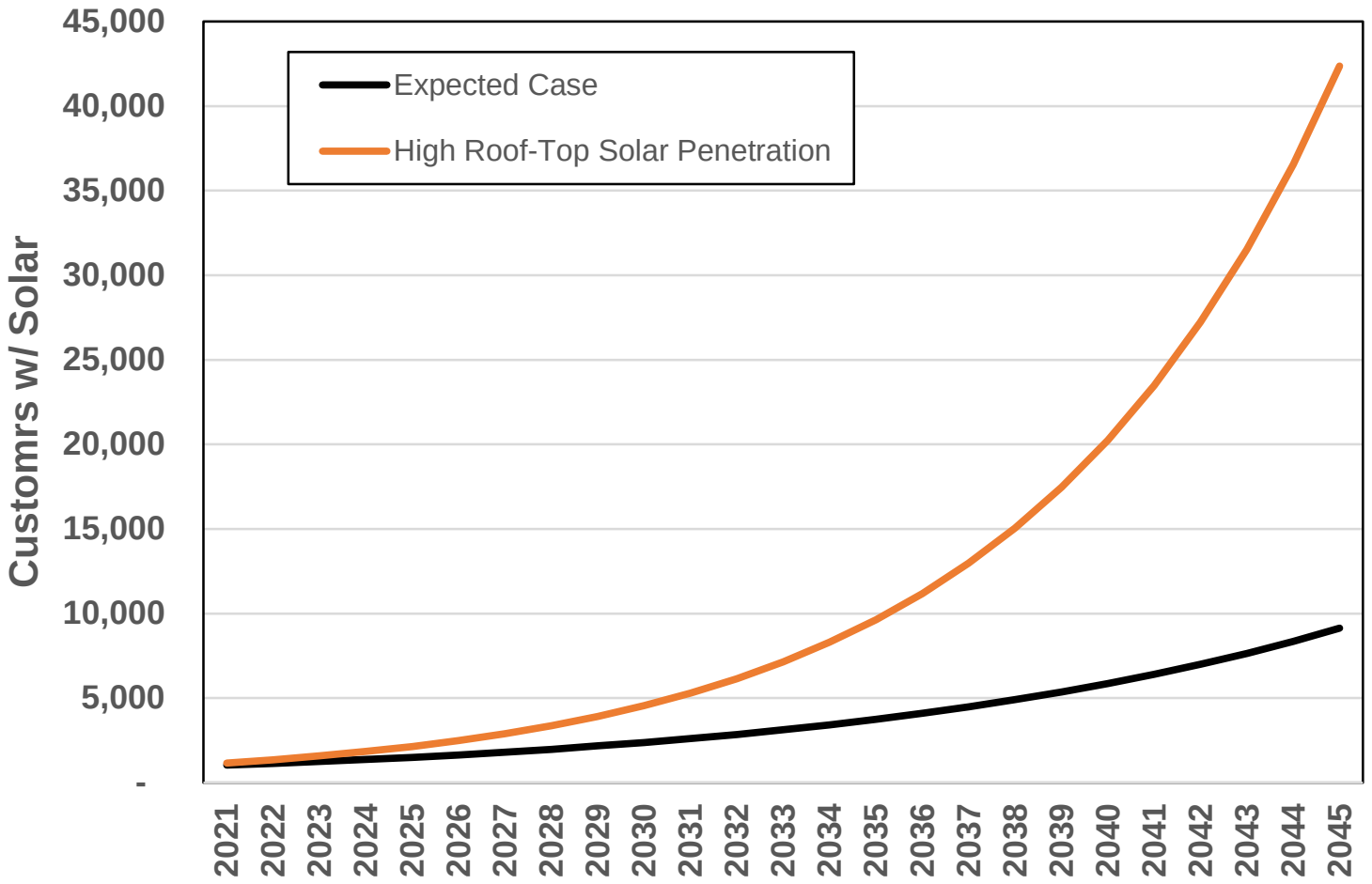
Electric Vehicle Impact to Peak & Energy Load Forecast



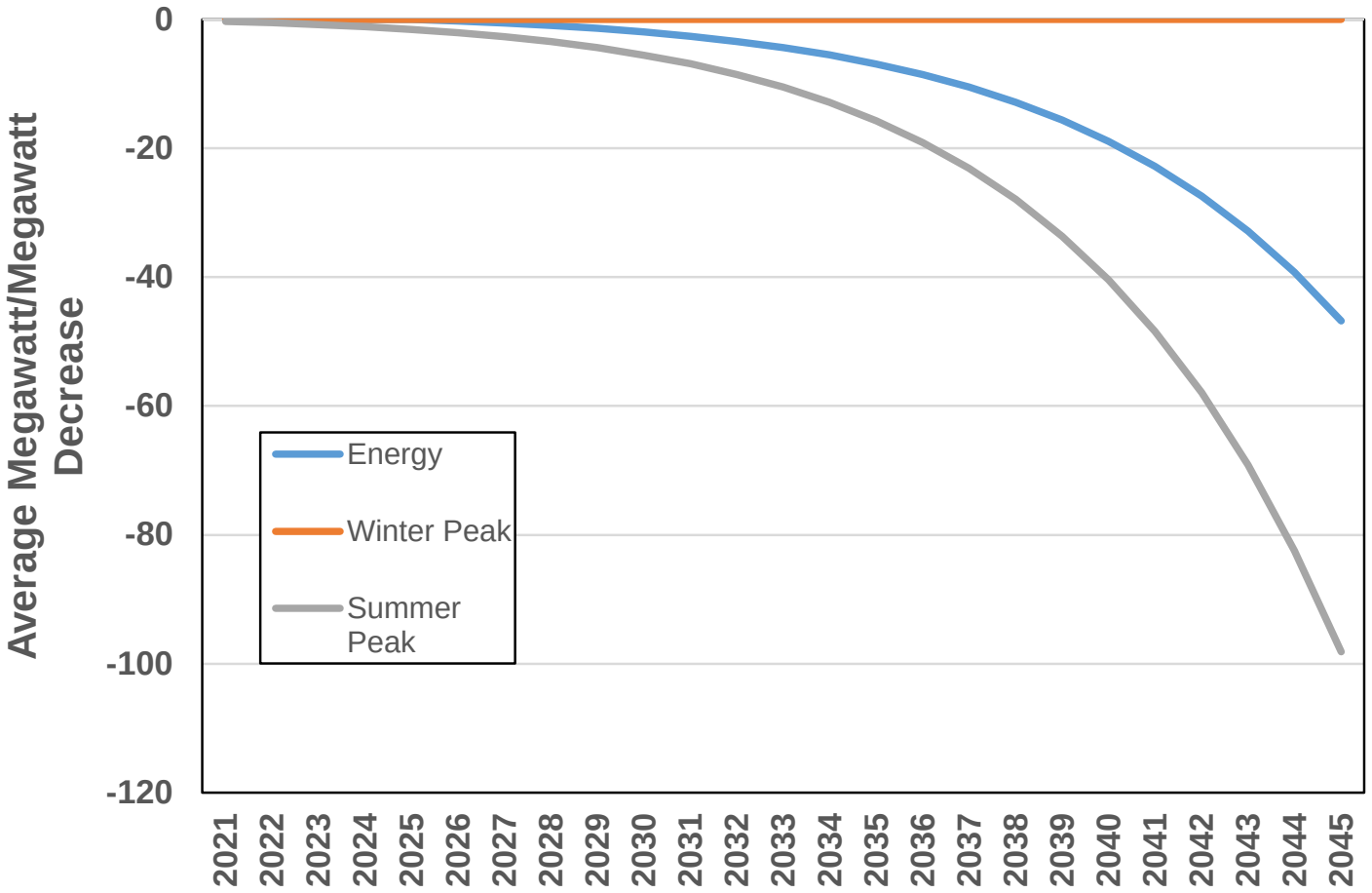
Avoided Direct Vehicle Emissions



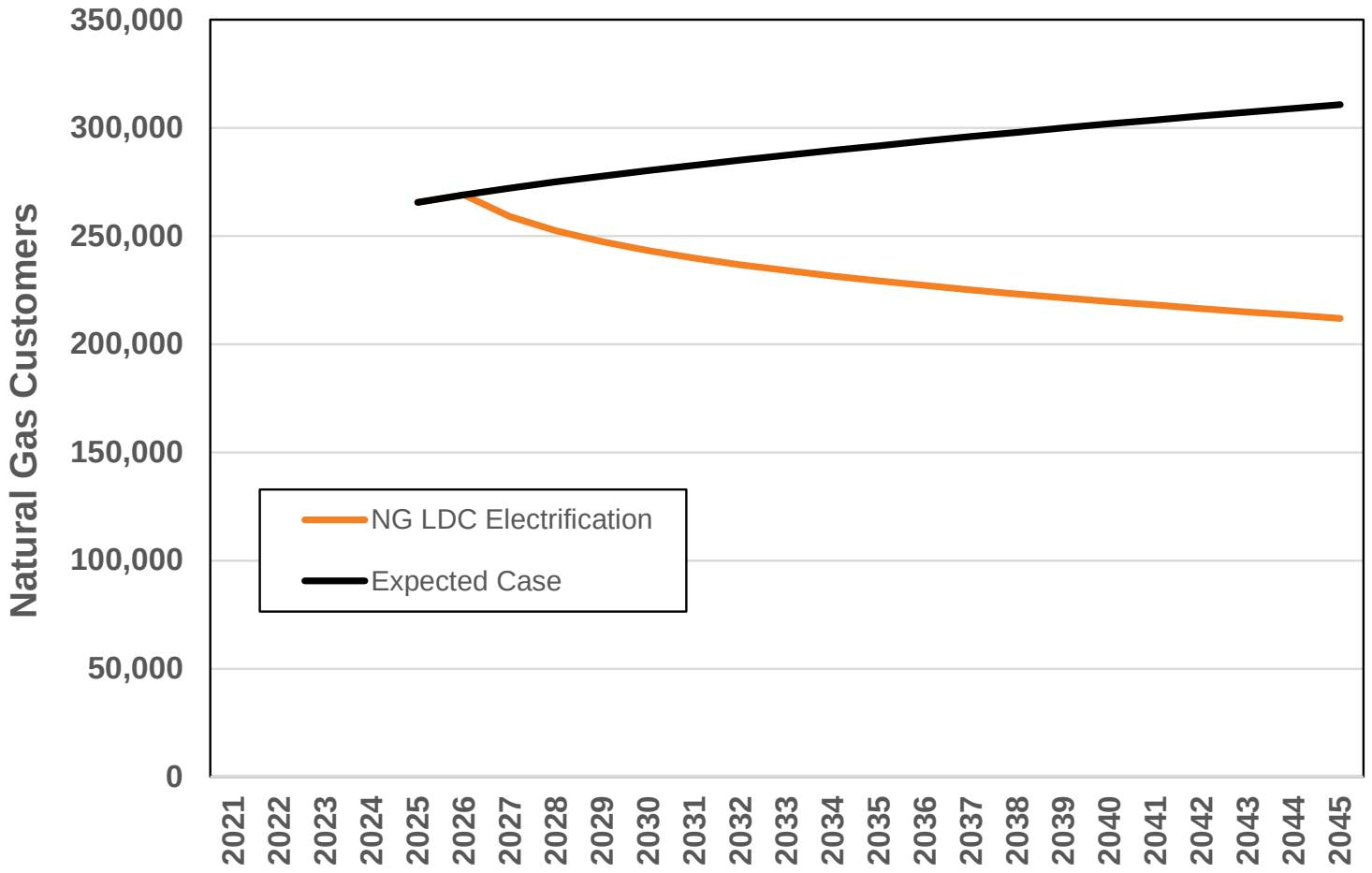
Customers with Roof-top Solar



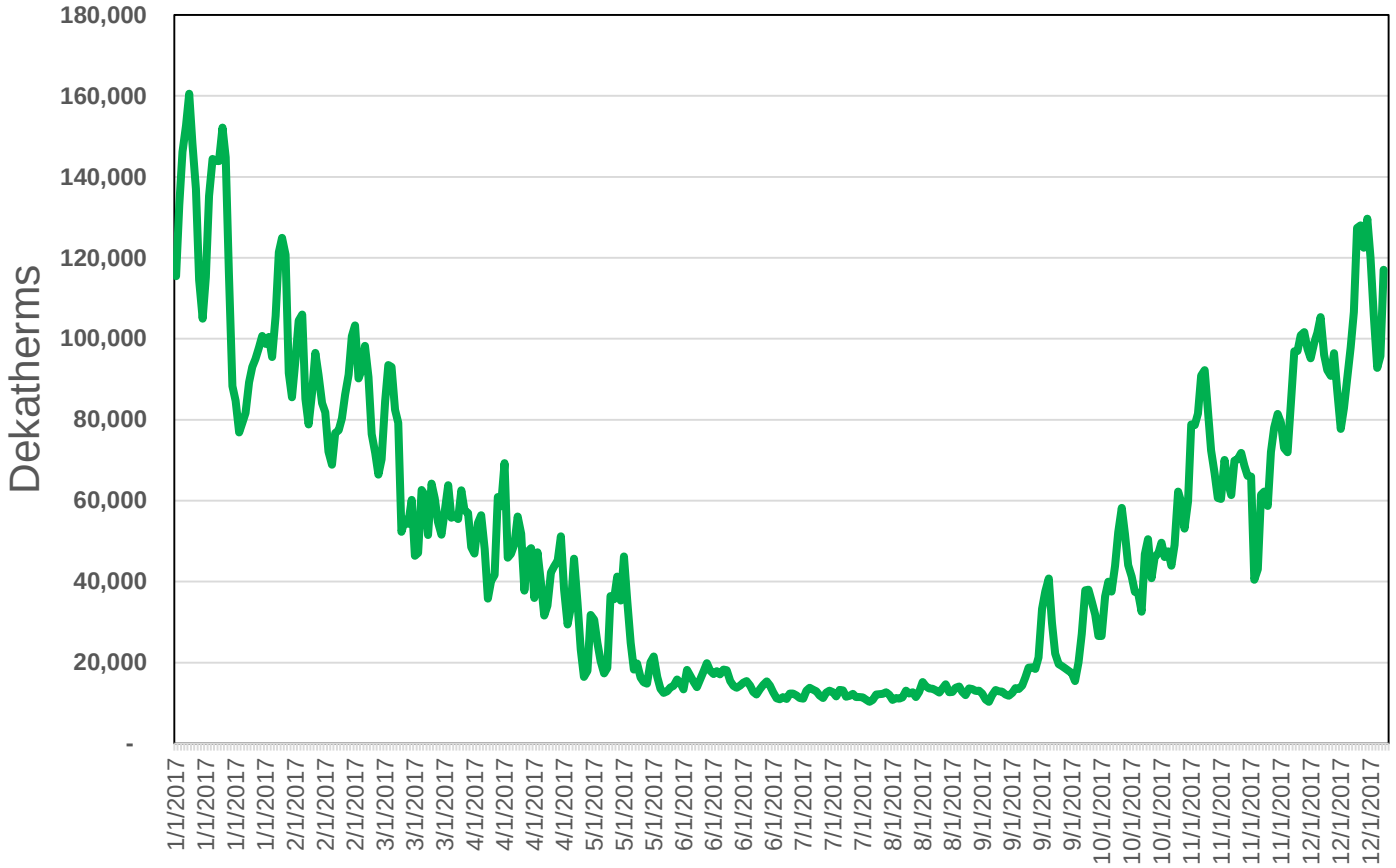
Roof-Top Solar Load Changes



End Use Natural Gas Penetration

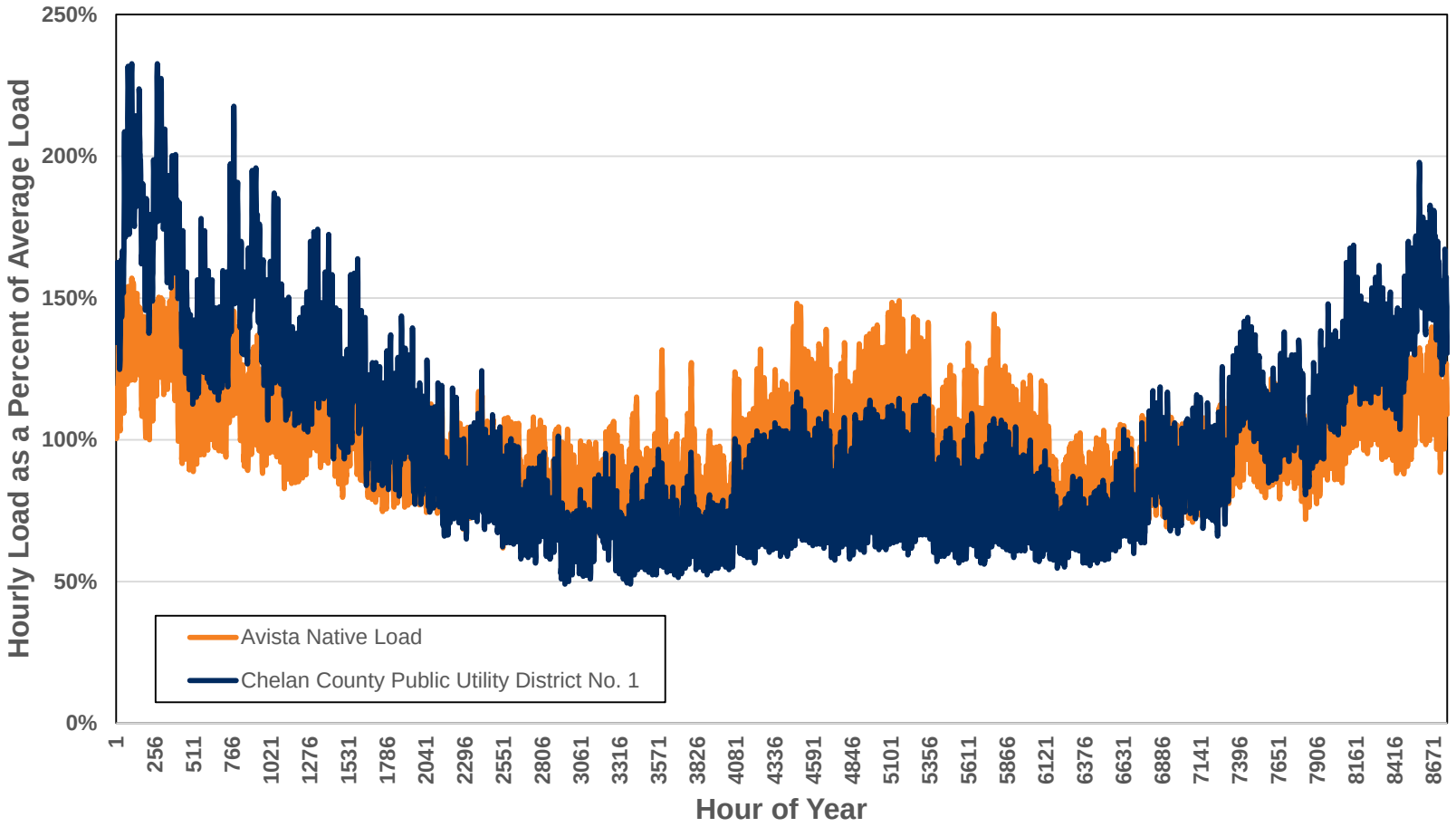


Avista's 2017 Natural Gas Daily Demand
(Core Washington Demand)



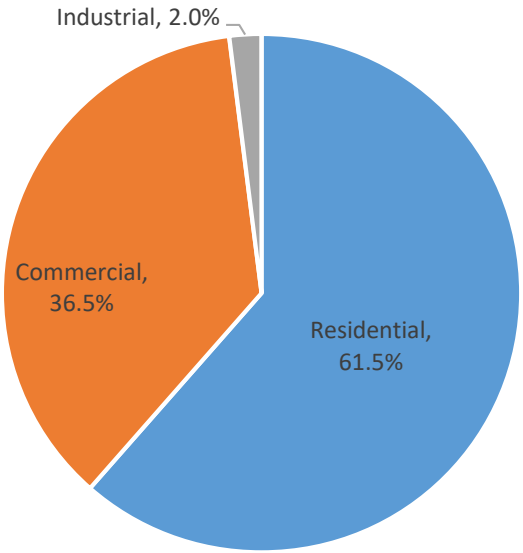
NW Electric Utility Load Shape

(All Electric vs. Mix Natural Gas/Electric)



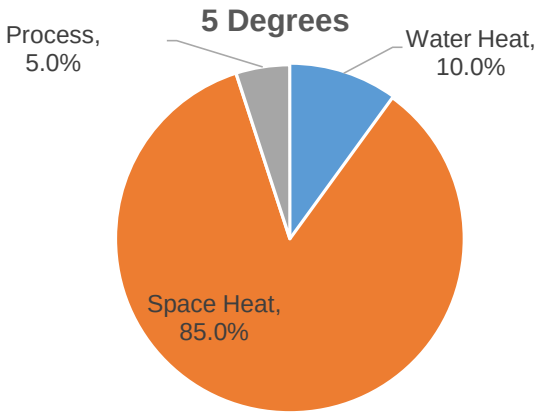
Converting Core Natural Gas to Electric

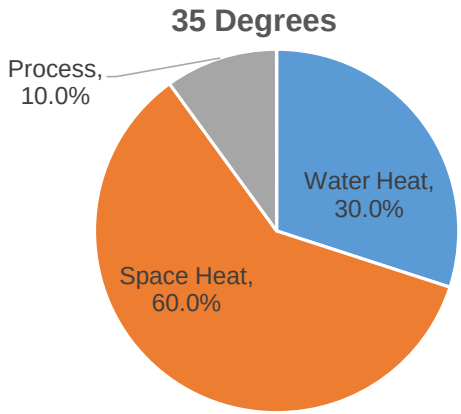
Annual customer type



End use by temperature

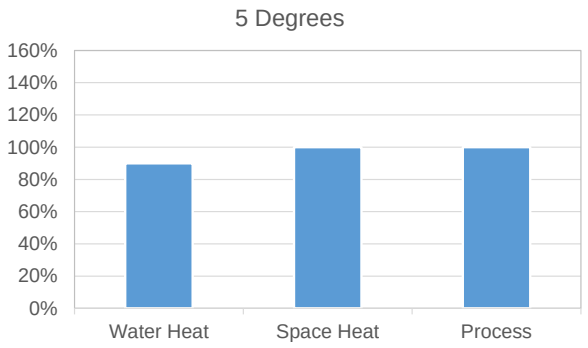
Residential Example

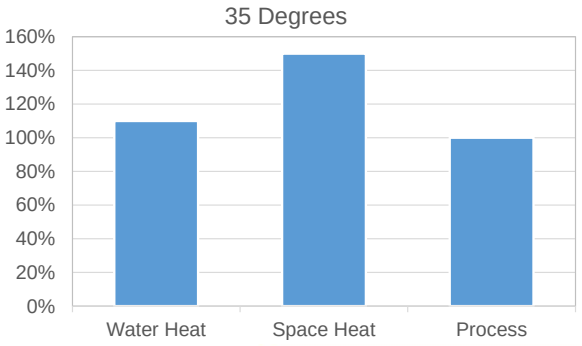




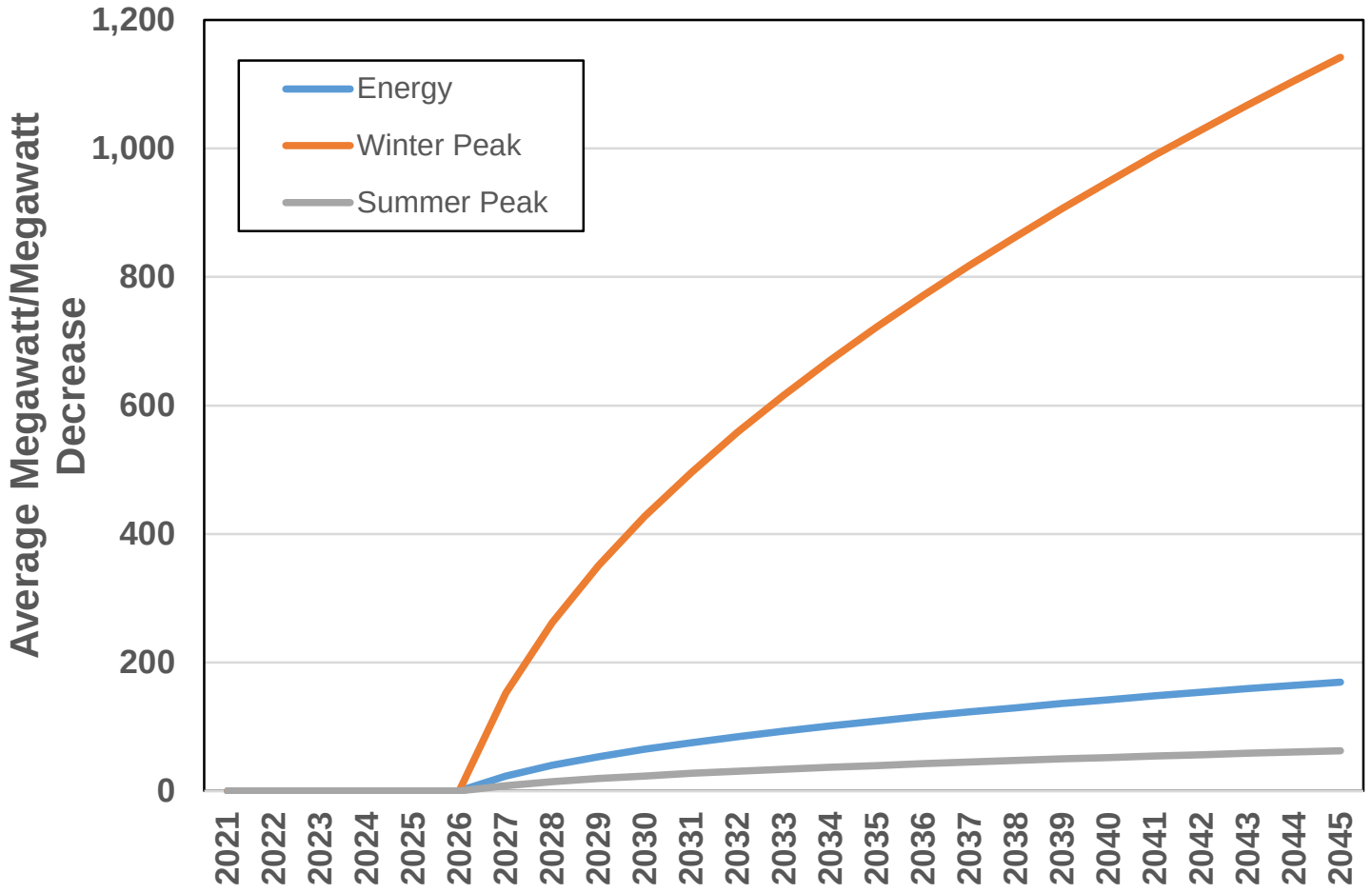
Efficiency by temperature

Residential Example



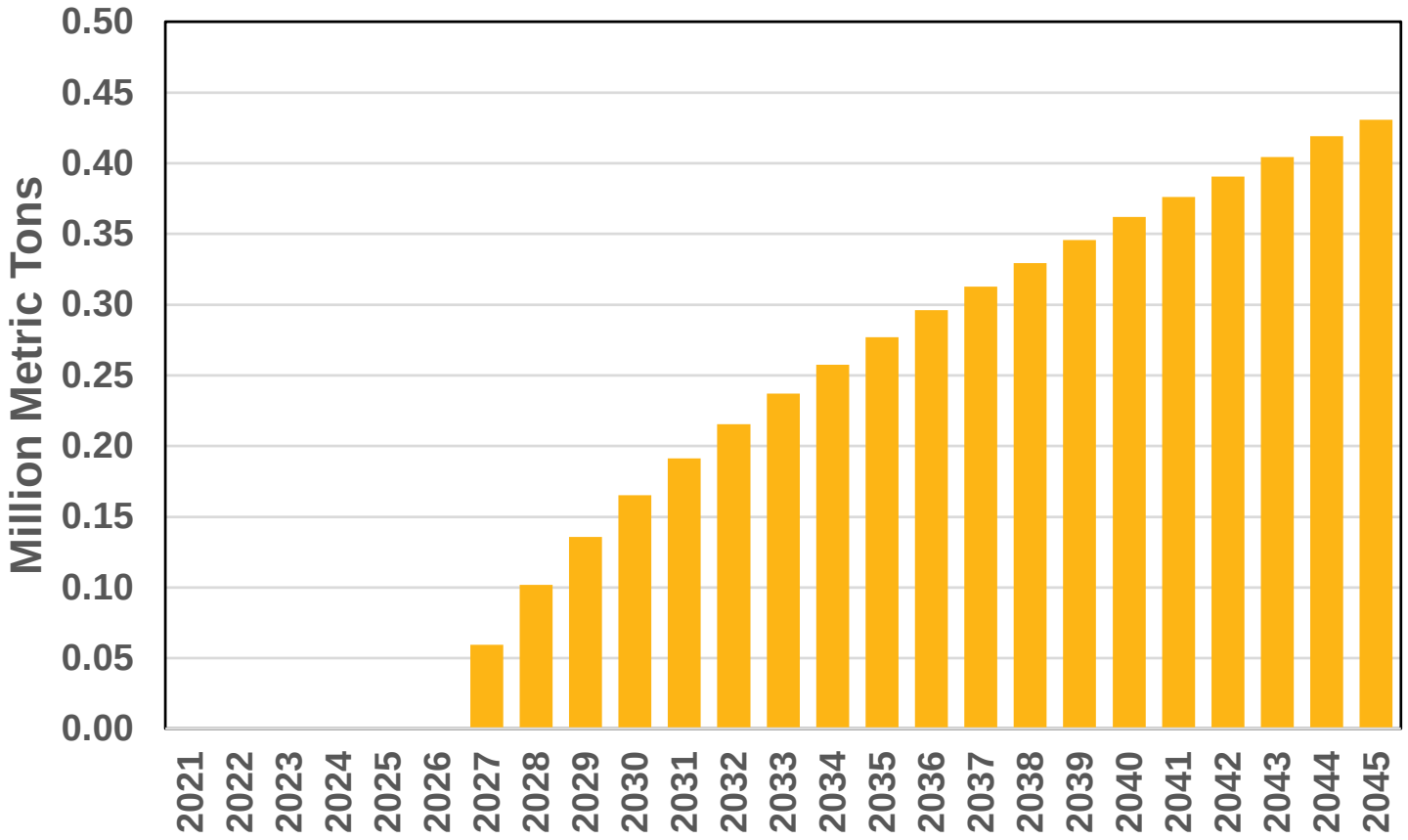


End-Use Natural Gas Load Changes

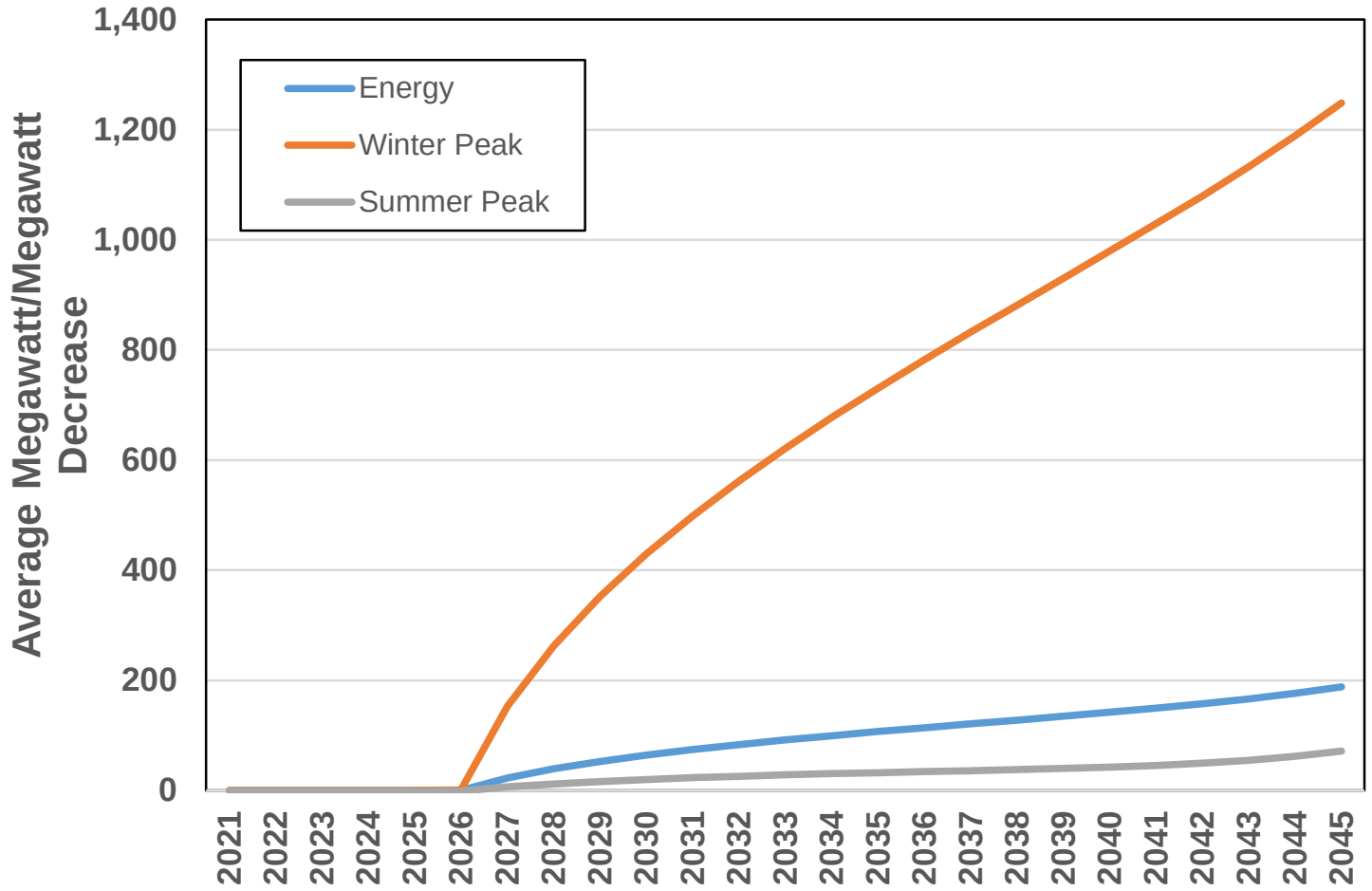


Associated Greenhouse Gas Emissions

From “Former” LDC Natural Gas Customers



Total Load Changes



2045 Cost Impacts

- Power System requires additional $365 million (25% increase)[1]
- Assumes an additional 1,080 MW new NG CT peakers, 520 MW Solar, 1,100 MW storage to meet new system peak load
- Greenhouse gas emissions

MMT	PRS + LDC NG	Electrification Scenario Change
Electric utility emissions	0.41	+0.28
Avoided petroleum emissions	-0.53	-0.76
LDC natural gas emissions	0.43	-0.43
Total emissions	0.31	-0.91

- Cost per metric ton: $397 per metric ton for the savings in 2045- over the 25 years the levelized cost of reduction is $1,942 per metric ton.
  - Does not include changes in Natural Gas LDC existing infrastructure costs
  - Does not include load related distribution/transmission investments (this will increase estimate)
  - Does not include EV incremental cost over petroleum alternative (this is unknown)
  - Does not include home owner equipment and wiring costs (this will increase estimate)

1) Estimate is net of natural gas commodity savings

Observations

- Electric vehicle penetration will have an impact on future resource needs- how customers use the energy will drive resource decisions.
- Electric vehicles will drive regional emissions lower, but Avista's emissions higher.
- Additional rooftop solar makes no material change in winter capacity planning, but lowers average energy and likely drives rates higher due to lower kWh sales.
- Electrification of natural gas space and water heating significantly increase winter load profiles.
- Additional heating electrification will likely result in natural gas peakers due to duration requirements and may costs result in modest savings of GHG emissions without significantly lowering storage costs.
- Heating electrification costs significantly exceed the Social Cost of Carbon.
- Externality costs can be significant: transmission, distribution, and direct home owner and should be considered in policy making.

Appendix

Detailed Resource Portfolios

Preferred Resource Strategy

Load reduction of 187 aMW due to Energy Efficiency by 2045

2021-2030

2022: 100 MW, MT Wind
2022: 100 MW, NW Wind
2023: 100 MW, NW Wind
2024: 12 MW, Kettle Falls Upgrade
2026: 222 MW, Colstrip removed
2026: 175 MW, Pumped Hydro
2026: 24 MW, Rathdrum Upgrade
2026: 257 MW, Lancaster PPA expires
2025-2030: 76 MW, Demand Response
2026/27: 200 MW, MT Wind
2027: 8 MW, Post Falls Upgrade

2031-2040

2031: 75 MW, Mid-C PPA Renew
2032: 32 MW, Demand Response
2035: 55 MW, Northeast CT retires
2035: 68 MW, Long Lake 2nd Powerhouse
2036-40: 75 MW x 16 hr, Liquid Air Storage
2037: 1 MW Demand Response

2041-2045

2041: 25 MW x 16 hr, Liquid Air Storage
2042: 2.5 MW, Demand Response
2042-2045: 300 MW Wind PPA Renew
2042-2045: 300 MW x 4 hr, Lithium-ion
2044: 55 MW, Solar w/ 50 MW x 4hr, Storage

2) Least Cost Plan
without CETA

Load reduction of 166 aMW due to Energy Efficiency by 2045

2021-2030

2022: 100 MW, MT Wind
2026: 12 MW, Kettle Falls Upgrade
2026: 222 MW, Colstrip removed
2026: 24 MW, Rathdrum Upgrade
2026: 200 MW, Pumped Hydro
2026: 257 MW, Lancaster PPA expires
2026-2030: 85 MW, Demand Response
2027: 8 MW, Post Falls Upgrade
2027: 92 MW, Natural Gas CT

2031-2040

2031: 75 MW, Mid-C PPA Renew
2035: 55 MW, Northeast CT retired
2035: 84 MW, Natural Gas CT
2038: 25 MW x 16 hr, Liquid Air Storage
2039: 25 MW x 4 hr, Lithium-Ion
2040: 25 MW x 16 hr, Liquid Air Storage

2041-2045

2041-2042: 50 MW x 16 hr, Liquid Air Storage
2043: 55 MW Natural Gas CT
2045: 53 MW x 4 hr, Lithium-ion
2045: 3 MW Demand Response

3) Clean Resource Plan

100% net clean by 2030

Load reduction of 213 aMW due to Energy Efficiency by 2045

2021-2030

2022: 100 MW, MT Wind
2022: 150 MW, NW Solar
2023: 200 MW, NW Wind
2023-2027: 64 MW, Demand Response
2024: 12 MW, Kettle Falls Upgrade
2026: 222 MW, Colstrip removed
2026: 125 MW, Pumped Hydro
2026: 24 MW, Rathdrum Upgrade
2026: 200 MW, MT Wind
2026: 257 MW, Lancaster PPA expires
2027: 8 MW, Post Falls Upgrade
2027-2030: 325 MW, Solar
2029: 20 MW Geothermal

2031-2040

2031: 75 MW, Mid-C PPA Renew
2031: 68 MW Long Lake 2nd Powerhouse
2032: 21 MW Demand Response
2033-2040: 195 MW Solar w/ 150 MW x 4 hr. Storage
2035: 55 MW, Northeast CT retired
2037: 23 MW Demand Response

2041-2045

2041-2043: 300 MW Wind PPA Renew
2042: 25 MW x 16 hr Liquid Air Storage
2043-45: 225 MW x 4 hr, Lithium-ion
2040-45: 70 MW Solar w/ 50 MW x 4 hr. Storage
2045: 3 MW, Demand Response

4) Rely on Energy Markets Only
(no capacity or renewable additions)

Load reduction of 127 aMW due to Energy Efficiency by 2045

2021-2030

2026: 222 MW, Colstrip removed
2026: 257 MW, Lancaster PPA expires
2027: 8 MW, Post Falls Upgrade

2031-2040

2035: 55 MW, Northeast CT retired

2041-2045

5) 100% Net Clean by 2027
and No CTs by 2045

Load reduction of 214 aMW due to Energy Efficiency by 2045

2021-2030

2022: 150 MW, Solar
2022: 100 MW, MT Wind
2023: 200 MW, NW Wind
2024: 12 MW, Kettle Falls Upgrade
2026: 222 MW, Colstrip removed
2026: 150 MW, Pumped Hydro
2026: 200 MW, MT Wind
2026: 257 MW, Lancaster PPA expires
2025-2027: 64 MW, Demand Response
2027: 8 MW, Post Falls Upgrade
2027-2028: 275 MW, NW Solar
2030: 50 MW, NW Solar
2029: 20 MW, Geothermal

2031-2040

2031: 75 MW, Mid-C PPA Renew
2031: 68 MW, Long Lake 2nd Powerhouse
2031: 21 MW, Demand Response
2033: 55 MW, NW Solar
2035: 55 MW, Northeast CT retired
2036-2040: 140 MW Solar w/ 125 MW x 4 hr, Storage
2037: 23 MW, Demand Response
2040: 200 MW x 16 hr Liquid Air Storage
2040: 75 MW Pumped Hydro
2035: 154 MW, Rathdrum CTs removed

2041-2045

2041-2043: 300 MW Wind PPA Renew
2043: 9 MW, Kettle Falls CT removed
2043: 25 MW, Boulder Park removed
2042-2044: 125 MW x 16 hr Liquid Air Storage
2043-45: 28 MW x 4 hr, Lithium-ion
2045: 302 MW, Coyote Springs 2 removed
2045: 130 MW Solar w/ 75 MW x 4 hr, Storage
2045: 225 MW Pumped Hydro
2045: 100 MW Small Nuclear
2045: 50 MW Biomass

6) Least Cost Plan

w/o pumped storage or Long Lake, meeting CETA

Load reduction of 177 aMW due to Energy Efficiency by 2045

2021-2030

2022: 100 MW, MT Wind
2022: 100 MW, NW Wind
2023: 100 MW, NW Wind
2024: 12 MW, Kettle Falls Upgrade
2026: 222 MW, Colstrip removed
2026: 24 MW, Rathdrum Upgrade
2026: 257 MW, Lancaster PPA expires
2027: 245 MW, Natural Gas CT
2027: 55 MW, Demand Response
2027: 8 MW, Post Falls Upgrade

2031-2040

2031: 75 MW, Mid-C PPA Renew
2031-2035: 53 MW, Demand Response
2035: 55 MW, Northeast CT retired
2035: 200 MW, MT Wind
2038: 25 MW x 16 hr Liquid Air Storage
2040: 25 MW x 16 hr Liquid Air Storage

2041-2045

2041-2045: 300 MW Wind PPA Renew
2041: 25 MW x 16 hr, Liquid Air Storage
2044-2045: 150 MW x 4 hr, Lithium-ion
2044: 25 MW x 16 hr Liquid Air Storage
2045: 100 MW Solar w/ 100 MW x 4 hr, Storage
2045: 20 MW, Geothermal

7) Colstrip Extended to 2035 w/o CETA

Load reduction of 166 aMW due to Energy Efficiency by 2045

2021-2030

2022: 100 MW, MT Wind
2026: 12 MW, Kettle Falls Upgrade
2026: 200 MW, Pumped Hydro
2026: 24 MW, Rathdrum Upgrade
2026: 257 MW, Lancaster PPA expires
2027: 92 MW, Natural Gas CT
2027: 8 MW, Post Falls Upgrade
2028-2030: 85 MW, Demand Response

2031-2040

2031: 75 MW, Mid-C PPA Renew
2035: 55 MW, Northeast CT retired
2035: 222 MW, Colstrip removed
2035: 84 MW, Natural Gas CT
2038: 25 MW x 16 hr Liquid Air Storage
2039: 25 MW x 4 hr, Lithium-ion
2040: 25 MW x 16 hr Liquid Air Storage

2041-2045

2041: 25 MW x 16 hr Liquid Air Storage
2042: 25 MW x 16 hr Liquid Air Storage
2043: 55 MW, Natural Gas CT
2045: 53 MW x 4 hr, Lithium-ion
2045: 3 MW, Demand Response

8) Colstrip Extended to 2035 w/ CETA

Load reduction of 182 aMW due to Energy Efficiency by 2045

2021-2030

2022: 100 MW, MT Wind
2022: 100 MW, NW Wind
2023: 100 MW, NW Wind
2024: 12 MW, Kettle Falls Upgrade
2026: 250 MW, Pumped Hydro
2026: 24 MW, Rathdrum Upgrade
2026: 257 MW, Lancaster PPA expires
2027: 8 MW, Post Falls Upgrade
2028: 64 MW, Demand Response

2031-2040

2031: 75 MW, Mid-C PPA Renew
2031-2032: 45 MW, Demand Response
2035: 55 MW, Northeast CT retired
2035: 222 MW, Colstrip removed
2035: 68 MW, Long Lake 2nd Powerhouse
2036: 200 MW, MT Wind

2041-2045

2042-2045: 300 MW Wind PPA Renew
2043: 25 MW x 16 hr Liquid Air Storage
2044: 50 MW, Solar w/ 50 MW x 4 hr, Storage
2045: 175 MW x 4 hr Lithium-ion
2045: 3 MW, Demand Response

9) Least Cost Plan

w/ 30 Percent higher pumped storage cost

Load reduction of 189 aMW due to Energy Efficiency by 2045

2021-2030

2022: 100 MW, MT Wind
2022: 100 MW, NW Wind
2023: 100 MW, NW Wind
2024: 12 MW, Kettle Falls Upgrade
2026: 222 MW, Colstrip removed
2026: 24 MW, Rathdrum Upgrade
2026: 257 MW, Lancaster PPA expires
2027: 75 MW, Pumped Storage
2027: 92 MW, Natural Gas CT
2027: 200 MW, MT Wind
2027: 8 MW, Post Falls Upgrade
2027-2030: 76 MW, Demand Response

2031-2040

2031: 75 MW, Mid-C PPA Renew
2031-32: 32 MW, Demand Response
2035: 55 MW, Northeast CT retired
2035: 68 MW, Long Lake 2nd Powerhouse
2036-2040: 75 MW x 16 hr Liquid Air Storage
2039: 3 MW, Demand Resonse

2041-2045

2041: 25 MW x 16 hr Liquid Air Storage
2042-2045: 300 MW, Wind PPA Renew
2042-45: 303 MW x 4 hr, Lithium-ion
2044: 50 MW Solar w/ 50 MW x 4 hr Storage

10) Least Cost Plan

w/ Federal Tax Credits Extended

Load reduction of 181 aMW due to Energy Efficiency by 2045

2021-2030

2022: 100 MW, MT Wind
2023: 200 MW, NW Wind
2024: 12 MW, Kettle Falls Upgrade
2026: 222 MW, Colstrip removed
2026: 24 MW, Rathdrum Upgrade
2026: 200 MW, MT Wind
2026: 175 MW Pumped Hydro
2026: 283 MW, Lancaster PPA expires
2027: 8 MW, Post Falls Upgrade
2025-2030: 85 MW, Demand Response

2031-2040

2031: 75 MW, Mid-C PPA Renew
2031: 23 MW, Demand Response
2035: 92 MW, Natural Gas CT
2035: 55 MW, Northeast CT retired
2038: 25 MW x 16 hr Liquid Air Storage
2040: 25 MW x 16 hr Liquid Air Storage

2041-2045

2041-2042: 300 MW, Wind PPA Renew
2042: 25 MW x 16 hr Liquid Air Storage
2043: 25 MW x 16 hr Liquid Air Storage
2044-2045: 150 MW, Solar w/ 150 MW x 4 hr Storage
2043-2045: 100 MW x 4 hr, Lithium-ion

11) Clean Resource Plan

w/ Federal Tax Credits Extended

Load reduction of 203 aMW due to Energy Efficiency by 2045

2021-2030

2022: 100 MW, MT Wind
2022: 150 MW, NW Solar
2023: 200 MW, NW Wind
2024: 12 MW, Kettle Falls Upgrade
2025-2027: 76 MW, Demand Response
2026: 222 MW, Colstrip removed
2026: 200 MW, MT Wind
2026: 125 MW, Pumped Hydro
2026: 24 MW, Rathdrum Upgrade
2026: 257 MW, Lancaster PPA expires
2027-2028: 300 MW, NW Solar
2027: 8 MW, Post Falls Upgrade
2029: 20 MW, Geothermal
2030: 25 MW, Solar

2031-2040

2031: 75 MW, Mid-C PPA Renew
2031: 68 MW, Long Lake 2nd Powerhouse
2033-2035: 32 MW, Demand Response
2035: 55 MW, Northeast CT retired
2033-2040: 250 MW, Solar w/ 225 MW x 4 hr Storage

2041-2045

2041-2042: 300 MW Wind PPA Renew
2043: 25 MW x 16 hr Liquid Air Storage
2042-2045: 225 MW x 4 hr, Lithium-ion
2044: 3 MW, Demand Response
2044-45: 75 MW, Solar w/ 75 MW x 4 hr of Storage

12) Least Cost Plan
with Low Economic Growth

Load reduction of 180 aMW due to Energy Efficiency by 2045

2021-2030

2022: 100 MW, MT Wind
2022: 100 MW, NW Wind
2024: 12 MW, Kettle Falls Upgrade
2025-2027: 85 MW, Demand Response
2026: 222 MW, Colstrip removed
2026: 100 MW, Pumped Hydro
2026: 24 MW, Rathdrum Upgrade
2026: 257 MW, Lancaster PPA expires
2027: 200 MW, MT Wind
2027: 8 MW, Post Falls Upgrade

2031-2040

2031: 75 MW, Mid-C PPA Renew
2035: 55 MW, Northeast CT retired
2035: 68 MW Long Lake 2nd Powerhouse
2038: 23 MW Demand Response

2041-2045

2042-2045: 300 MW Wind PPA Renew
2041-2045: 225 MW x 4 hr Storage
2045: 10 MW, Solar

13) Least Cost Plan
with High Economic Growth

Load reduction of 181 aMW due to Energy Efficiency by 2045

2021-2030

2022: 100 MW, MT Wind
2022: 100 MW, NW Wind
2023: 100 MW, NW Wind
2024: 12 MW, Kettle Falls Upgrade
2025-2040: 109 MW, Demand Response
2026: 111 MW, Colstrip Unit 3 removed
2026: 250 MW, Pumped Hydro
2026: 24 MW, Rathdrum Upgrade
2026: 257 MW, Lancaster PPA expires
2027: 200 MW, MT Wind
2027: 8 MW, Post Falls Upgrade

2031-2040

2031-2033: 75 MW, Mid-C PPA Renew
2033: 48 MW Natural Gas CT
2035: 68 MW Long Lake 2nd Powerhouse
2035: 55 MW, Northeast CT retired
2035: 111 MW, Colstrip Unit 4 removed
2037: 48 MW Natural Gas CT
2040: 25 MW x 16 hr Liquid Air Storage
2040: 3 MW, Demand Response

2041-2045

2041-43: 75 MW x 16 hr Liquid Air Storage
2041-2045: 205 MW Solar w/ 200 MW x 4 hr Storage
2042-2045: 300 MW Wind PPA Renew
2043-2044: 200 MW x 4 hr, Lithium-ion
2045: 20 MW, Geothermal

14) Least Cost Plan with Lancaster PPA Extended Five Years

Load reduction of 177 aMW due to Energy Efficiency by 2045

2021-2030

2022: 100 MW, MT Wind
2022: 100 MW, NW Wind
2023: 100 MW, NW Wind
2024: 12 MW, Kettle Falls Upgrade
2026: 222 MW, Colstrip removed
2026: 24 MW, Rathdrum Upgrade
2027: 8 MW, Post Falls Upgrade
2030: 30 MW, Demand Response

2031-2040

2031-2032: 75 MW, Mid-C PPA Renew
2031-2035: 78 MW Demand Response
2032: 257 MW, Lancaster PPA expires
2032: 245 MW Natural Gas CT
2035: 55 MW, Northeast CT retired
2035: 200 MW MT Wind
2038: 25 MW x 16 hr Liquid Air Storage
2040: 25 MW x 16 hr Liquid Air Storage

2041-2045

2041-2045: 300 MW, Wind PPA Renew
2042-2044: 150 MW x 4 hr, Lithium-ion
2041: 25 MW x 16 hr Liquid Air Storage
2043: 25 MW x 16 hr Liquid Air Storage
2045: 100 MW, Solar w/ 100 MW x 4 hr Storage
2045: 20 MW, Geothermal

15) Least Cost Plan with Colstrip Unit #4 extended until 2035

Load reduction of 178 aMW due to Energy Efficiency by 2045

2021-2030

2022: 100 MW, MT Wind
2022: 100 MW, NW Wind
2023: 100 MW, NW Wind
2024: 12 MW, Kettle Falls Upgrade
2026: 211 MW, Colstrip removed
2026: 24 MW, Rathdrum Upgrade
2027: 8 MW, Post Falls Upgrade
2030: 30 MW, Demand Response

2031-2040

2031-2032: 75 MW, Mid-C PPA Renew
2031-2035: 78 MW Demand Response
2032: 257 MW, Lancaster PPA expires
2032: 245 MW Natural Gas CT
2035: 55 MW, Northeast CT retired
2035: 200 MW MT Wind
2038: 25 MW x 16 hr Liquid Air Storage
2040: 25 MW x 16 hr Liquid Air Storage

2041-2045

2041-2045: 300 MW, Wind PPA Renew
2042-2044: 150 MW x 4 hr, Lithium-ion
2041: 25 MW x 16 hr Liquid Air Storage
2043: 25 MW x 16 hr Liquid Air Storage
2045: 100 MW, Solar w/ 100 MW x 4 hr Storage
2045: 20 MW, Geothermal

2020 Electric IRP
Action Items and IRP Chapter Overview

John Lyons, Ph.D.
Sixth Technical Advisory Committee Meeting
November 19, 2019

Analytical Action Items

- Determine ancillary services costs and benefits for intermittent and storage resources
- Research emission profiles for different types of resource construction and manufacturing
- Research the purchase of a third-party electric price forecast and then use that forecast to run our own dispatch analysis
- CETA issues and rulemaking:
  - Low income issues
  - Greenhouse gas emissions reporting
  - IRP requirements and future reporting
- Consider if IRP needs to be split between states because of timing and new requirements
- Consider the combination of the electric and natural gas IRPs
- Continued analysis for Colstrip post 2025

Resource Action Items

- Determine plan for Long Lake expansion and file with appropriate agencies concerning if the project meets CETA and licensing issues
- Continued pursuing pumped storage opportunities
- Conduct further transmission network studies for integration of renewables and contingency CTs
- 2020 RFP for renewable energy capacity (2022-2023 online)
- 2021 RFP for capacity resources (on-line by 2026)
- Additional studies for the eventual shutdown of Northeast CT

Other 2020 Action Items

- Other areas of concern or suggestions?
- Please call or email the planning team with any suggestions or added Action Items

2020 Electric IRP Chapters

1. Executive Summary
2. Introduction, IRP Requirements, and Stakeholder Involvement
3. Economic and Load Forecast
4. Existing Supply Resources
5. Energy Efficiency and Demand Response
6. Long-Term Position
7. Transmission & Distribution Planning
8. Generation and Storage Resource Options
9. Market Analysis
10. Preferred Resource Strategy
11. Portfolio Scenarios
12. Action Plan

2020 Electric IRP Chapters 1 – 3

- Chapter 1: Executive Summary
  - High level summary of 2020 IRP and PRS
- Chapter 2: Introduction, IRP Requirements, Stakeholder Involvement
  - TAC overview and rules guiding IRP development
- Chapter 3: Economic and Load Forecast
  - Economic conditions in Avista's service territory
  - Avista's energy and peak forecasts
  - Load forecast scenarios

2020 Electric IRP Chapters Ch. 4 – 6

- Chapter 4: Existing Supply Resources
  - Avista's resources
  - Contractual resources and obligations
  - Avista's natural gas pipeline overview

- Chapter 5: Energy Efficiency and Demand Response
  - Conservation Potential Assessment
  - Greenhouse gas offset calculation
  - Demand response opportunities

- Chapter 6: Long-Term Position
  - Reliability adequacy and reserve margins
  - Resource requirements
  - Reserves and flexibility requirements

2020 Electric IRP Chapters Ch. 7 – 8

- Chapter 7: Transmission and Distribution Planning
  - Overview of Avista's Transmission System
  - Future Upgrades and Interconnections
  - Transmission Construction Costs and Integration
  - Merchant Transmission Plan
  - Overview of Avista's Distribution System
  - Future Upgrades and Interconnections (includes project evaluated with DER alternative)

2020 Electric IRP Chapters Ch. 8 – 9

- Chapter 8: Generation and Storage Resource Options
  - New Resource Options
  - Avista Plant Upgrades

- Chapter 9: Market Analysis
  - Marketplace
  - Federal and State Environmental Policies
  - Fuel Price Forecasts
  - Market Price Forecast
  - Scenario Analysis

2020 Electric IRP Chapters Ch. 10 – 12

- Chapter 10: Preferred Resource Strategy
  - Resource Selection Process
  - Preferred Resource Strategy
  - Efficient Frontier Analysis
- Chapter 11: Portfolio Scenarios
  - Portfolio Scenarios
  - Resource Avoided Cost
- Chapter 12: Action Plan
  - 2017 Action Plan Summary
  - 2020 Action Plan

Remaining 2020 IRP Schedule

- December 18, 2019 – external draft released to TAC
- January 15, 2020 – external draft comments due
- February 28, 2020 – 2020 Electric IRP published and available to the public on Avista's web site
- Public comments period determined by the Commissions and posted on their respective web sites
- January 4, 2021 – Draft IRP due for Washington
- April 1, 2021 – File 2021 IRP in Washington
- Aug 31, 2021- File 2021 IRP in Idaho
- TAC schedule for next IRP(s) will be available after we determine if the IRP needs to be bifurcated between Idaho and Washington