2023 Electric Integrated Resource Plan

Technical Advisory Committee Meeting No. 7 Agenda

Tuesday, October 11, 2022
Microsoft Teams Virtual Meeting
With an in-Person Option

Topic	Time	Staff
Introductions	9:00	John Lyons
DER Potential Study Scope	9:15	James Gall
Load Forecast Update	9:45	Grant Forsyth
Break	10:30	
Load & Resource Balance (Resource Need)	10:40	Lori Hermanson
Natural Gas Market Dynamics	11:00	Tom Pardee/ Michael Brutocao
Lunch	11:30	
Wholesale Electric Price Forecast	12:30	Lori Hermanson
WRAP Update	1:00	James Gall
Clean Energy Implementation Plan (CEIP) Update & Customer Benefit Indicator's (CBI) use in the IRP	1:30	Annette Brandon
Break	2:30	
Portfolio & Market Scenario Options	2:40	James Gall
Adjourn	3:30	

IRP Introduction

2023 Avista Electric IRP

TAC 7 – October 11, 2022

John Lyons, Ph.D. Senior Resource Policy Analyst

Meeting Guidelines

- IRP team is working remotely and is available for questions and comments
- Stakeholder feedback form
  - Responses shared with TAC at meetings, by email and in Appendix
  - Would a form and/or section on the web site be helpful?
- IRP data posted to web site – updated descriptions and navigation are in development
- Virtual IRP meetings on Microsoft Teams until able to hold large meetings again
- TAC presentations and meeting notes posted on IRP page
- This meeting is being recorded and an automated transcript made

Virtual TAC Meeting Reminders

- Please mute mics unless commenting or asking a question
- Raise hand or use the chat box for questions or comments
- Respect the pause
- Please try not to speak over the presenter or a speaker
- Please state your name before commenting
- Public advisory meeting – comments will be documented and recorded

Integrated Resource Planning

The Integrated Resource Plan (IRP):

- Required by Idaho and Washington* every other year
  - Washington requires IRP every four years and update at two years
- 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

- Public process of the IRP – input on what to study, how to study, and review of assumptions and results
- Wide range of participants involved in all or parts of the process
  - Please ask questions
  - Always soliciting new TAC members
- Open forum while balancing need to get through topics
- Welcome requests for new studies or different modeling assumptions.
- Available by email or phone for questions or comments between meetings
- Due date for study requests from TAC members – October 1, 2022
- External IRP draft released to TAC – March 17, 2023, public comments due – May 12, 2023
- Final 2023 IRP submission to Commissions and TAC – June 1, 2023

Remaining 2023 Electric IRP TAC Meeting Schedule

- Technical Modeling Workshop: October 20, 2022 (9 am to 12 pm PST)
- Washington Progress Report Workshop: December 14, 2022 (9 am to 10:30 am PST)
- TAC 8: February 16, 2023 (9 am to 4 pm PST)
- Virtual Public Meeting Gas & Electric IRPs: March 8, 2023 (12 to 1 pm and 5:30 to 6:30 pm PST)
- TAC 9: March 22, 2023 (9 am to 4 pm PST)

Today's Agenda

9:00	Introductions, John Lyons
9:15	DER Potential Study Scope, James Gall
9:45	Load forecast Update, Grant Forsyth
10:30	Break
10:40	Load & Resource Balance (Resource Need), Lori Hermanson
11:00	Wholesale Price Forecast Natural Gas & Electric, Avista IRP Team
11:30	Lunch
12:30	Wholesale Price Forecast Natural Gas & Electric (continued)
1:00	WRAP Update
1:30	Clean Energy Implementation Plan Update & Customer Benefit Indicator's Use in the IRP, Annette Brandon
2:30	Break
2:40	Portfolio & Market Scenario Options, James Gall
3:30	Adjourn

Distributed Energy Resource Potential Study

James Gall, Integrated Resource Planning Manager
Electric IRP, Seventh Technical Advisory Committee Meeting
October 11, 2022

CEIP Commitment #14

- Avista will include a Distributed Energy Resources (DERs) potential assessment for each distribution feeder no later than its 2025 electric IRP.
- Avista will develop a scope of work for this project no later than the end of 2022, including input from the IRP TAC, EEAG, and DPAG.
- The assessment will include a low-income DER potential assessment.
- Avista will document its DER potential assessment work in the Company's 2023 IRP Progress Report in the form of a project plan, including project schedule, interim milestones, and explanations of how these efforts address WAC 480-100-620(3)(b)(iii) and (iv).

WAC 480-100-620(3)(b)(iii) and (iv).

(iii) Energy assistance potential assessment – The IRP must include distributed energy programs and mechanisms identified pursuant to RCW 19.405.120, which pertains to energy assistance and progress toward meeting energy assistance need; and

(iv) Other distributed energy resource potential assessments – The IRP must assess other distributed energy resources that may be installed by the utility or the utility's customers including, but not limited to, energy storage, electric vehicles, and photovoltaics. Any such assessment must include the effect of distributed energy resources on the utility's load and operations.

Distributed Energy Resource

- Forecast for each distribution feeder (361 originating in Washington)
- Washington only study
- New Generation & Storage
  - Residential and Commercial Solar
  - Residential and Commercial Storage
  - Other Renewables (i.e. wind, small hydro, fuel cell, ICE)
- Load Management
  - Energy Efficiency
  - Demand Response
    - Includes electric vehicles
    - Should we conduct a study future locations for electric vehicles (MDV, HDV, LDV)?

New Generation & Storage

- Potential assessment for each option for each year between 2025 and 2045
  - Forecast should consider existing policies and cost/pricing outlooks for the customer demographics and building potential.
  - A scenario for future customer electrification impacting its demand should be included to the extent it could affect generation.
- The analysis shall include a scenario for feeders within Highly Impacted or Vulnerable Population area identifying the upper bound limits excluding financial limitations of the customer.

Load Management

- Uses current potential assessment for energy efficiency and demand response.
  - Low-income efficiency is addressed in the energy efficiency CPAs.
- Requirement is a geographic dispersion assessment by feeder for each calendar year for each load management resource type.
- Building space and water heating electrification scenario.

Schedule and Tasks

Task 1: July 2023

- A survey of other utility or other entity efforts to conduct similar DER potential studies. The study shall include comparison of the other utility's size, rates, climate, and customer demographics.
- A summary of best practices for development of future adoption of new DER technologies.
- An overview of Avista's current DER resources (i.e., 2022 baseline).

Task 2: September 2023

- A description of the methodology used to develop the estimates for each DER and related scenarios.

Task 3: Draft March 2024 and Final May 2024

- Matrix including each feeder and the amount of DER resources in kW and/or kWh for each resource type by year and customer class.

Task 4: 2024 Q2

- Present draft results of study to Electric and Natural Gas Integrated Resource Planning Technical Advisory Committee, Energy Efficiency Advisory Group, and the Distribution Planning Advisory Group.

Task 5: Draft April 2024, Final Report June 2024

- Final report including tasks 1 through 4.
- Summary of comments and suggestions from non-Avista parties and how they are addressed in the final report.
- Recommendations for future studies.
- Documentation of methods and procedures to transition Avista to be able to update these forecasts for future use.

TAC Meeting
October 11, 2022

2023 IRP: Updated Energy and Peak Forecasts

Grant Forsyth, Ph.D.
Chief Economist
Grant.Forsyth@avistacorp.com

Outline

- Significant Model Updates
- Long-run Energy Forecast Update
- Peak Load Forecast Update

The world since February 2020:

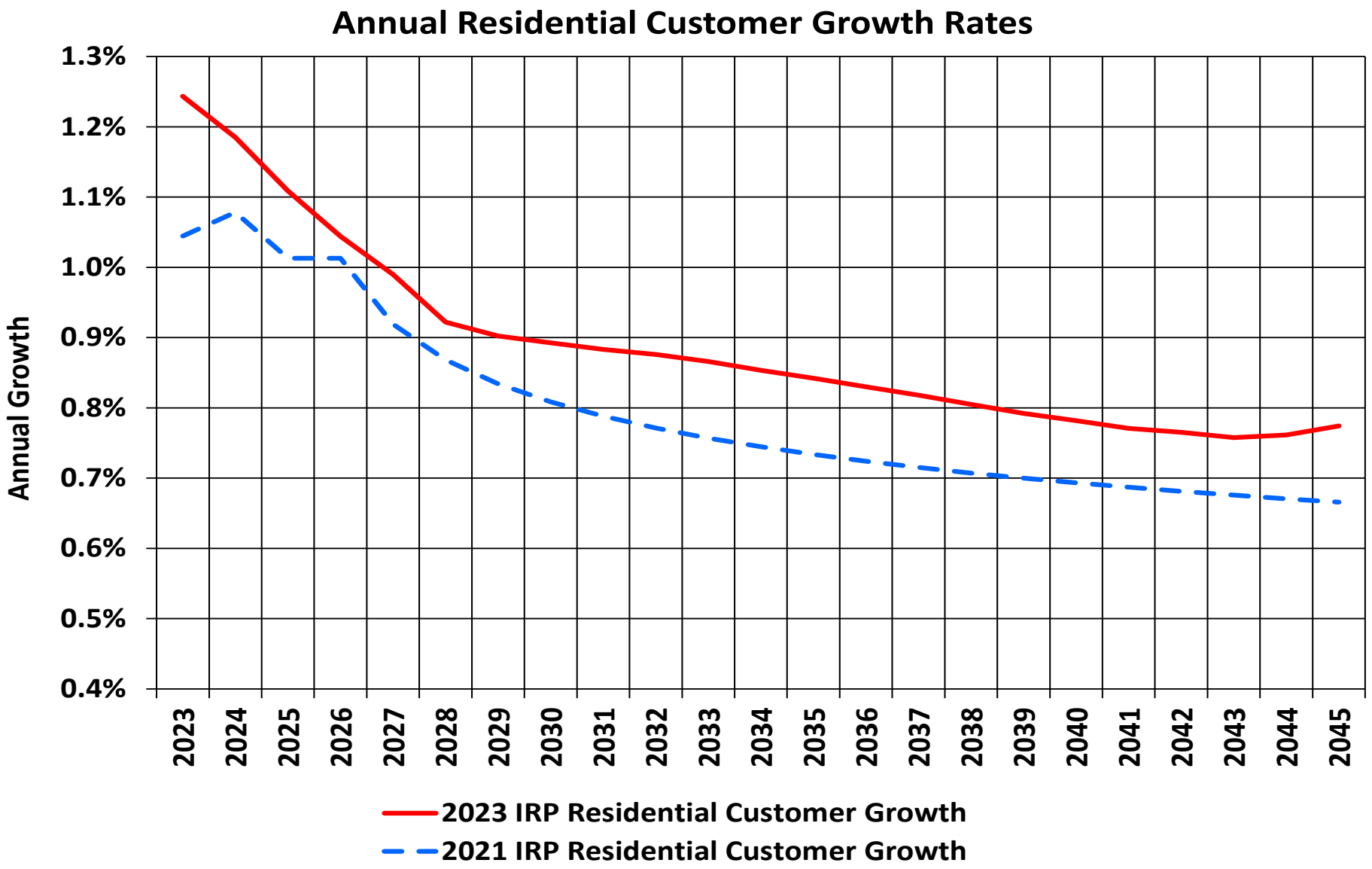
“…all are punish’d.”

- The Prince, Romeo and Juliet, Act 5, Scene 3

Significant Model Updates

- More aggressive EV forecast with an explicit separation between residential and commercial schedules.
- LDV EV forecast out to 2030/31 lines up with Avista's EV transportation plan in terms of forecasted percent of sales. Assumes WA-ID combined reaches 15% of sales by 2030/31 and 38% by 2045.
- MDV forecast for commercial assumes WA-ID combined reaches 25% of sales by 2045.
- More aggressive solar forecast with an explicit separation of residential and commercial solar customers.
- Climate change is in the base-line energy and peak forecasts using RCP 4.5.
- Energy and peak adjustments for WA's newly announced restrictions on commercial gas connects.
- Long-term GDP growth is an explicit choice variable after 2026.
- Improved treatment of energy load profiles for climate, solar, EVs, and gas restriction impacts.
- Higher residential customer growth for the 2023-2028 period.

Long-term Energy Forecast: Residential Customer Growth

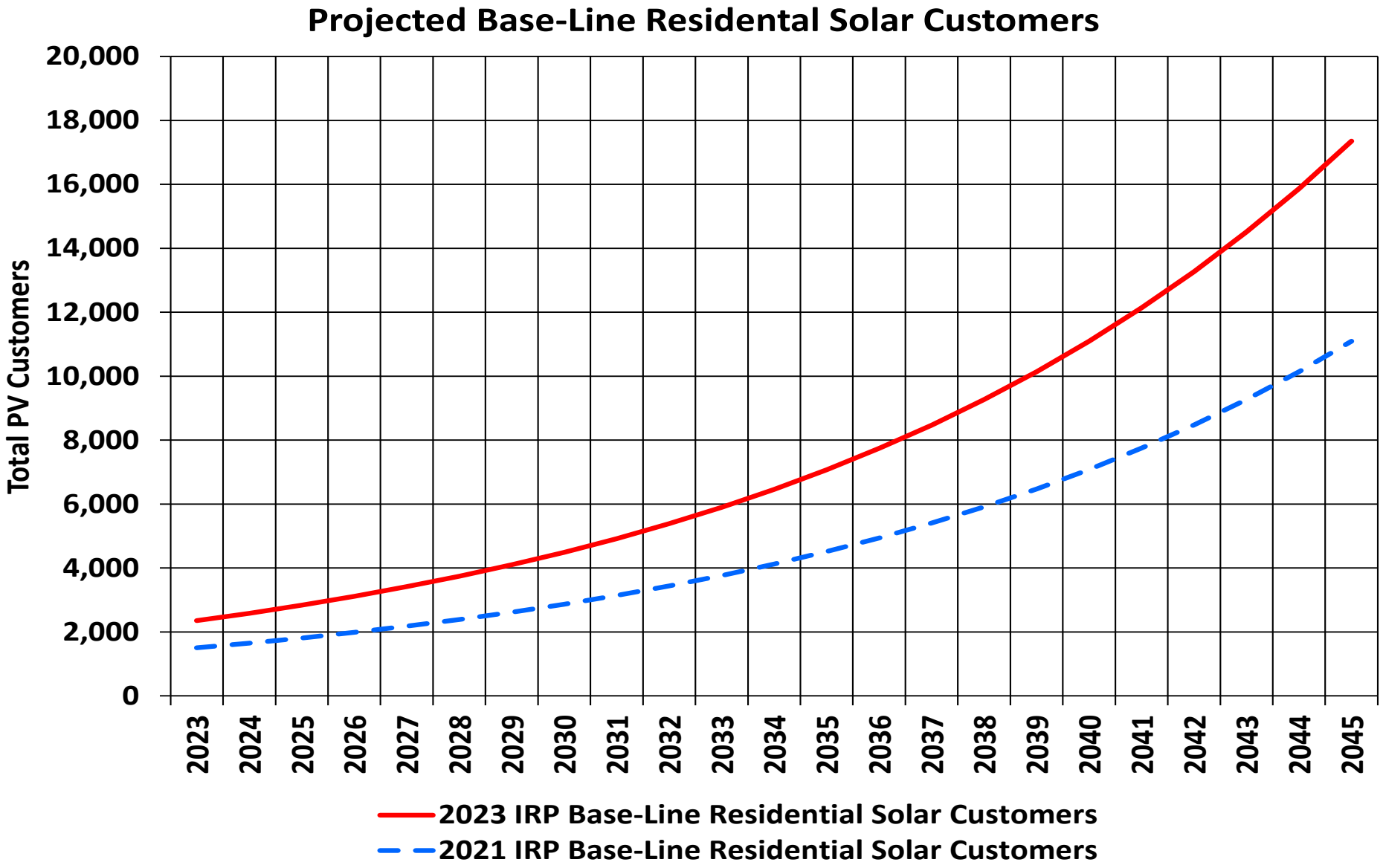


IRP	Avg. Annual Growth
2021 IRP	0.80%
2023 IRP	0.89%
2023 WA	0.69%
2023 ID	1.25%

Comments

- From 2027 on, the time-path reflects IHS population forecasts.
- The higher growth rate in this IRP reflects higher forecasted growth in ID.

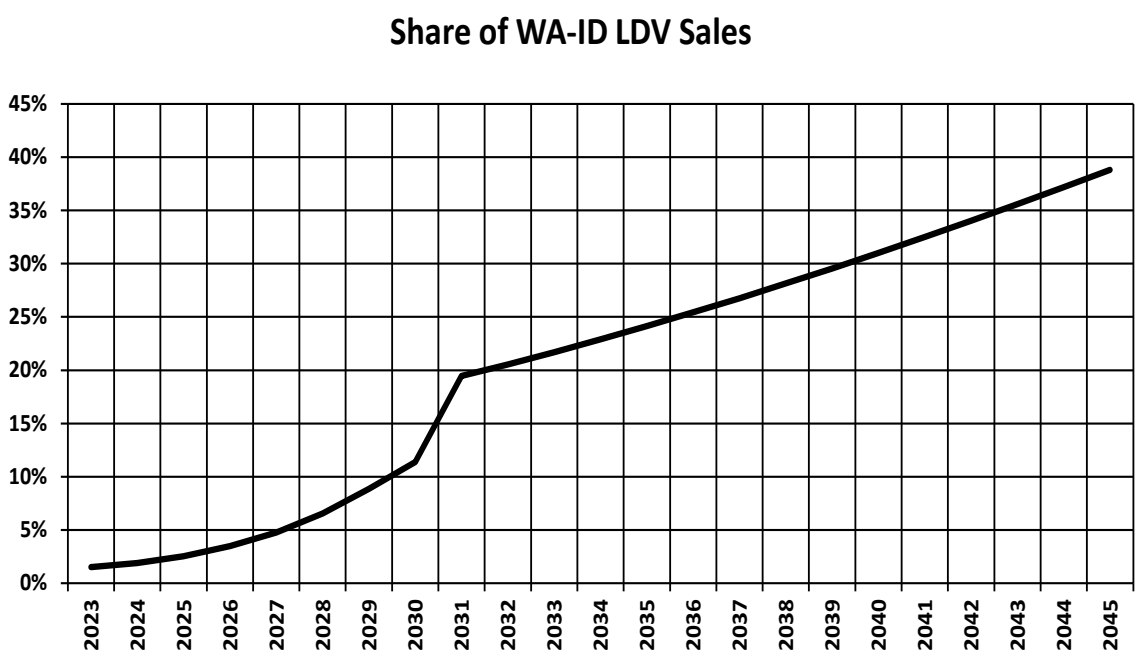
Long-term Energy Forecast: Residential Solar Penetration

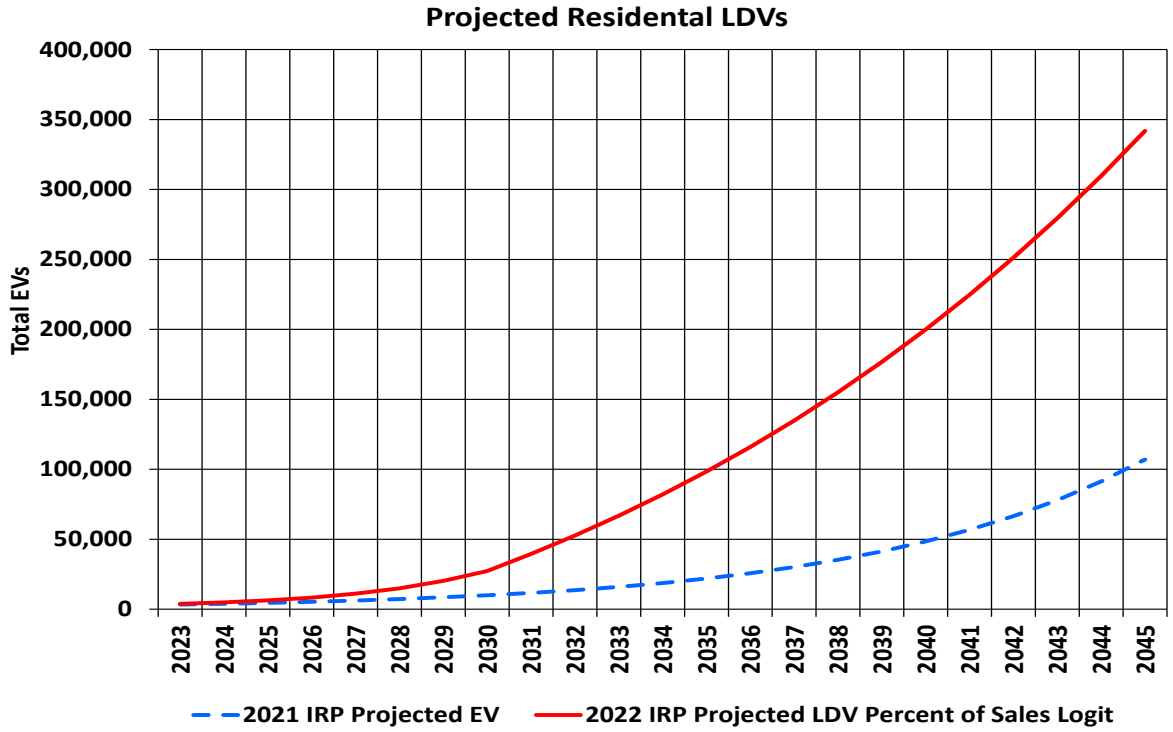


Comments

- Solar penetration now higher than 2021 IRP.
- Current penetration is 0.6% of residential customers. This is projected to grow to 4% by 2045.
- Current system size is around 7,000 watts, with the assumption of 8,900 watts by 2045
- This remains a highly uncertain projection given on-going changes to public policy.

Long-term Energy Forecast: Light Duty EVs, 2023-2045

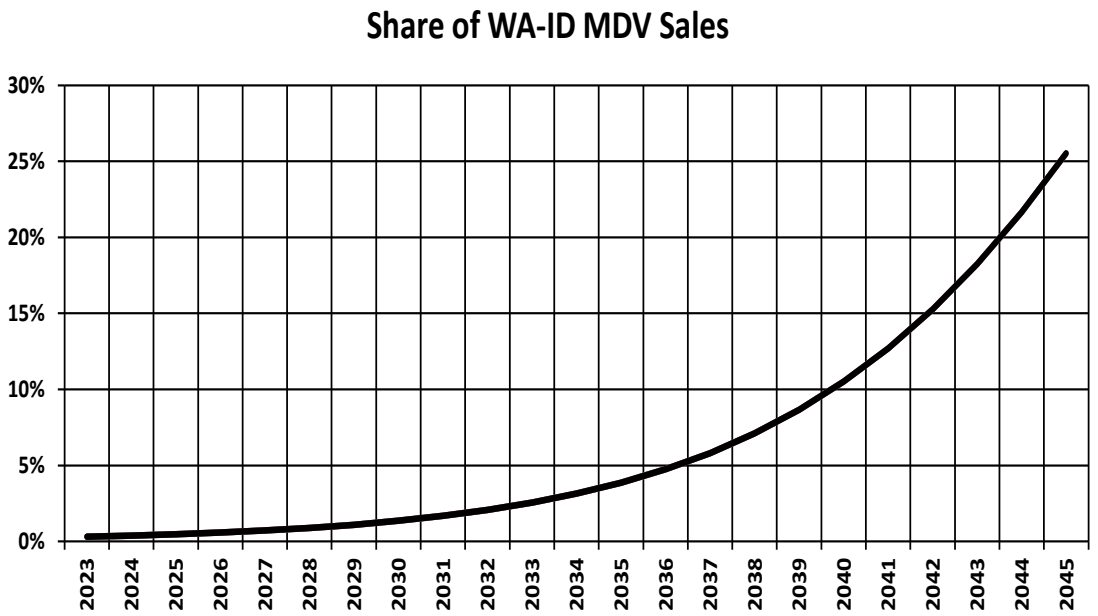


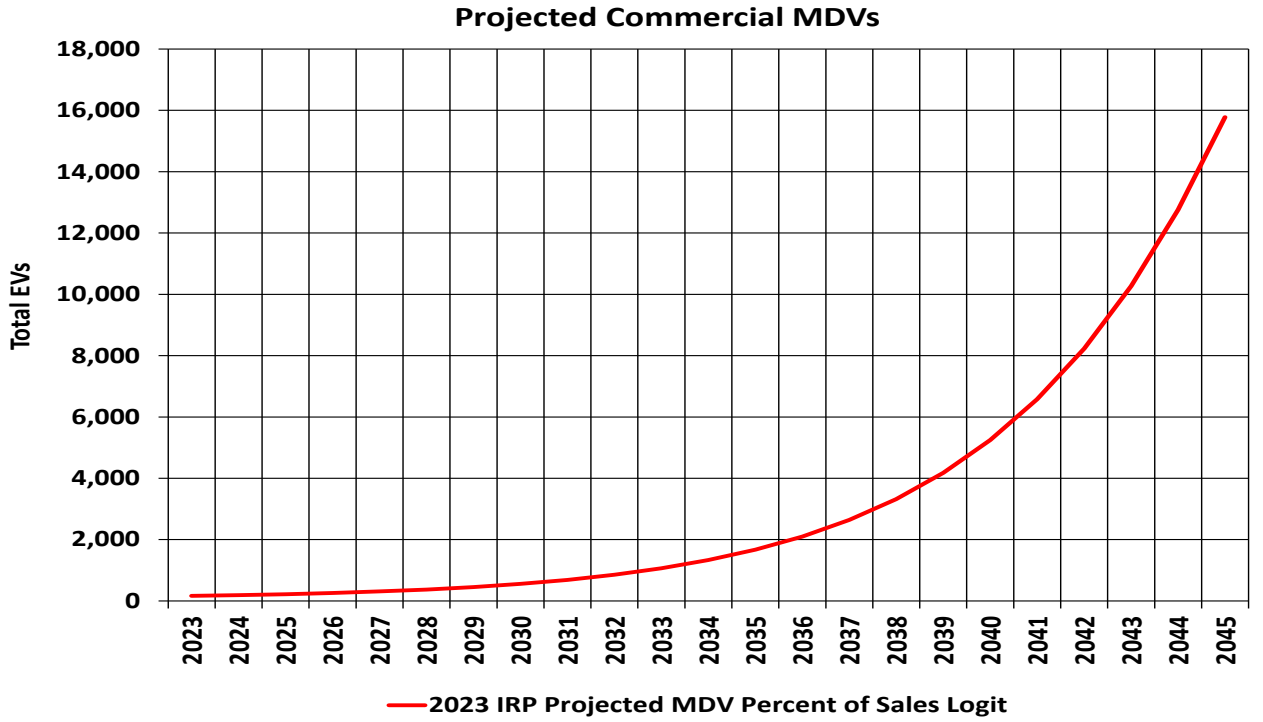


Comments

- **Current light duty EVs are around 3,900. This is projected to grow to 342,000 by 2045—nearly 40% of all LDV sales.**
- **Current penetration is 0.5% of household vehicles. This is projected to grow to 27% by 2045.**
- **This remains a highly uncertain forecast given on-going changes in the EV industry and public policy.**

Long-term Energy Forecast: Medium Duty EVs, 2023-2045

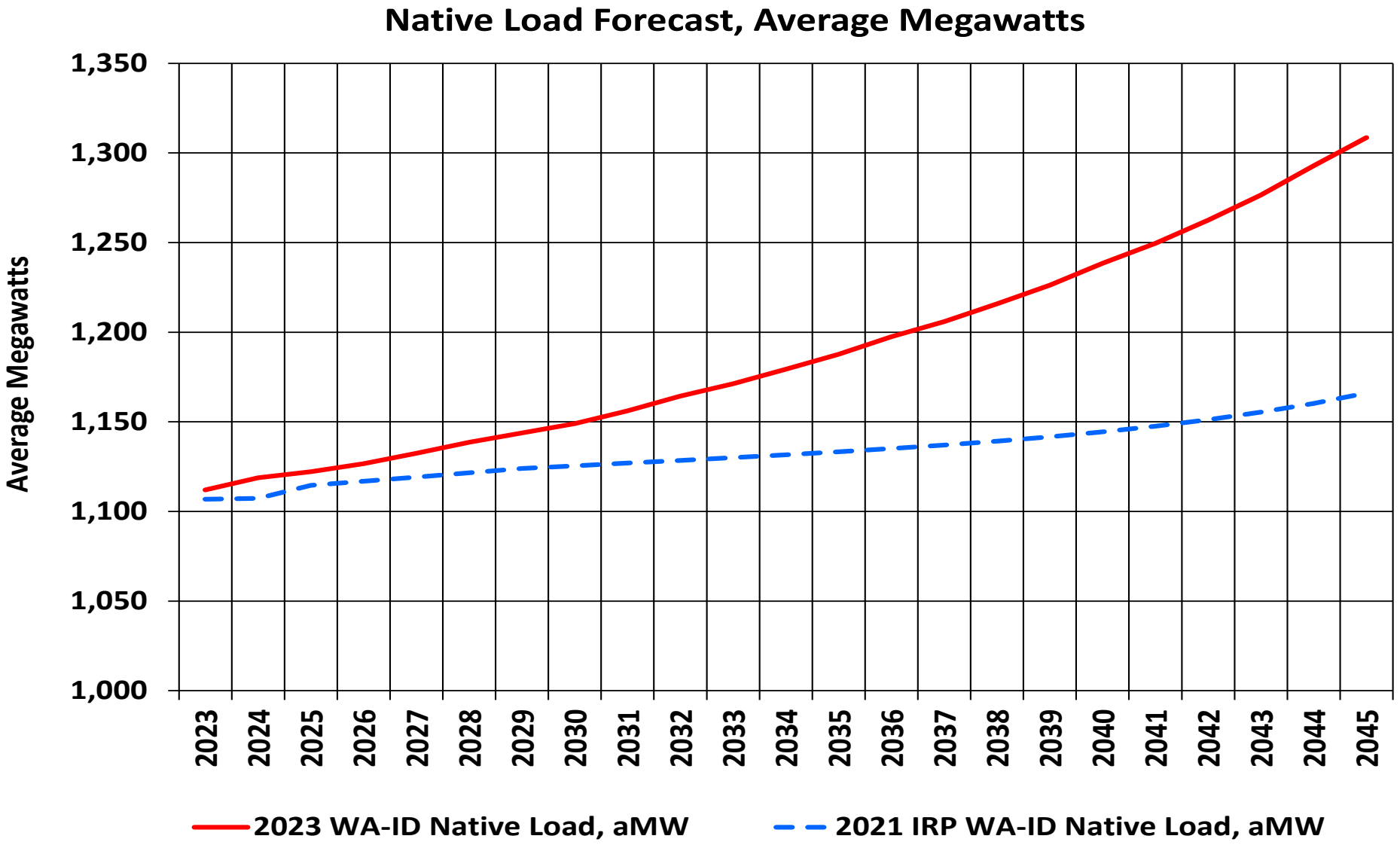




Comments

- **Current medium EVs are approximately 170 (very rough estimate). This is projected to grow to over 15,000 by 2045—just over 25% of all MDV sales.**
- **Current penetration is 0.25% of all commercial vehicles (very rough estimate). This is projected to grow to 13% by 2045.**
- **Even more so than LDV, the MDV forecast is highly uncertain given on-going changes in the EV industry and public policy.**

Long-term Energy Forecast: Native Load

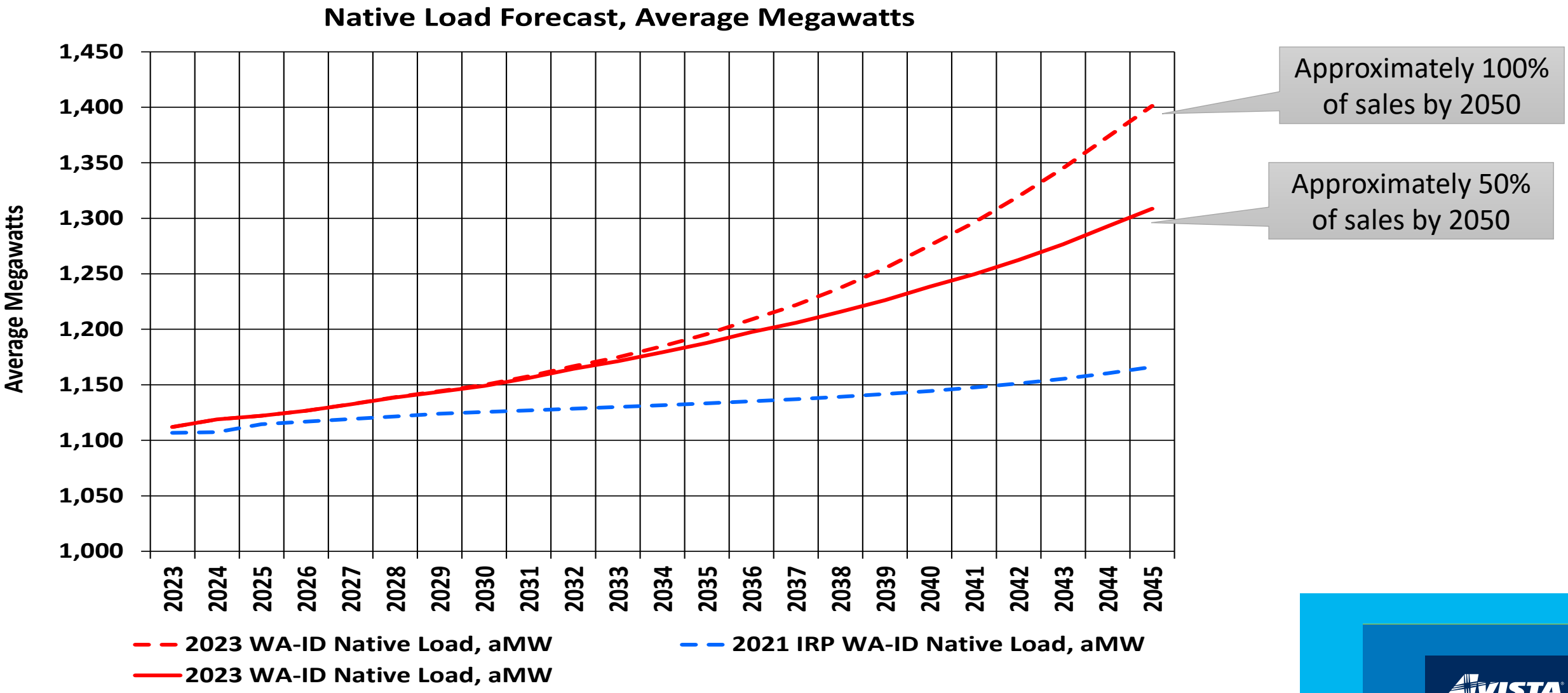


IRP	Avg. Annual Growth
2021 IRP	0.24%
2023 IRP	0.74%
2023 WA	0.72%
2023 ID	0.77%

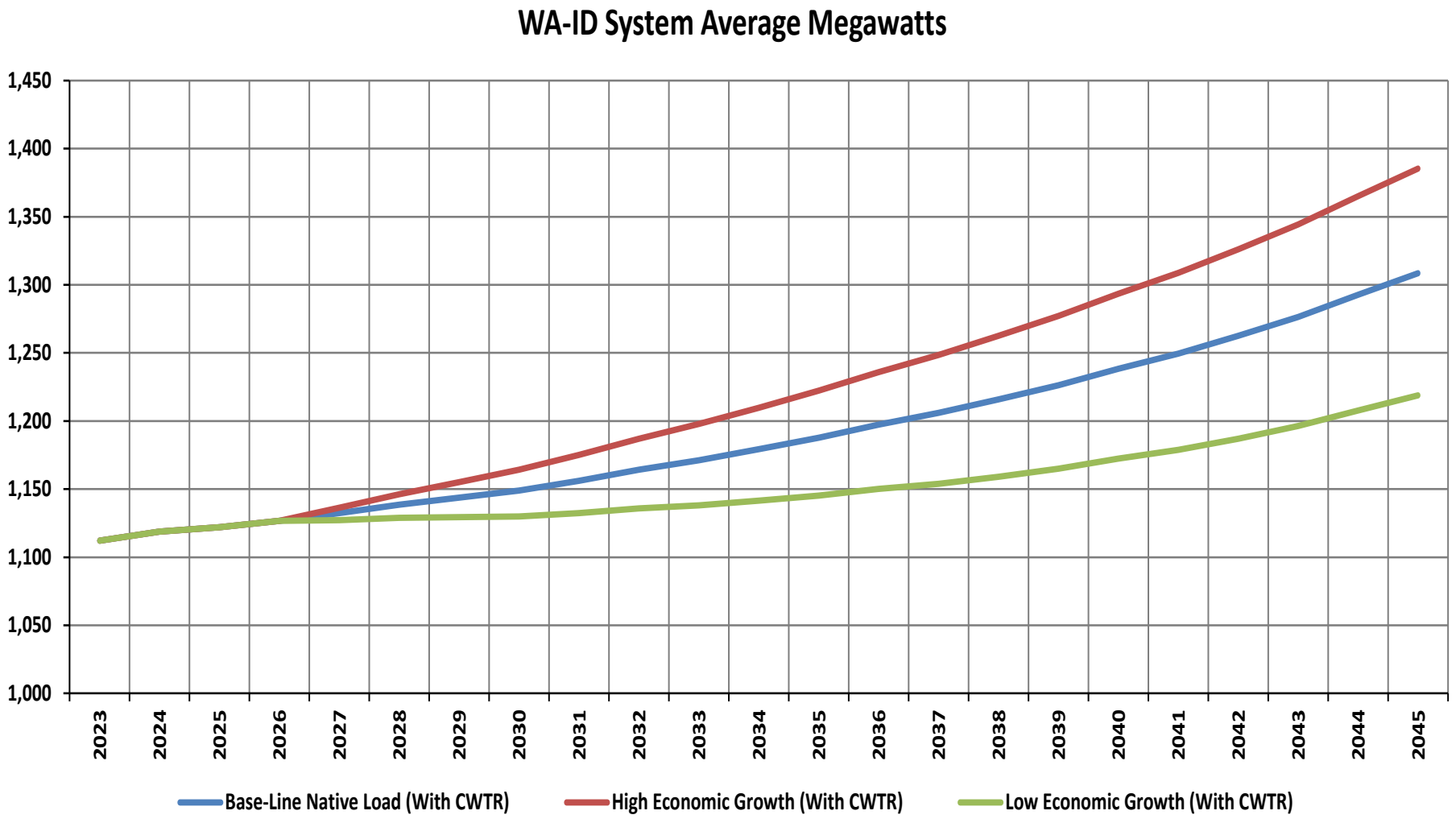
Comments

- Higher load because of stronger customer growth, a lot more EVs, and adjustments for gas.
- Most of the change reflects EVs

Long-term Energy Forecast: Native Load with MDV EVs



Long-term Energy Forecast: High-Low Based on Economics

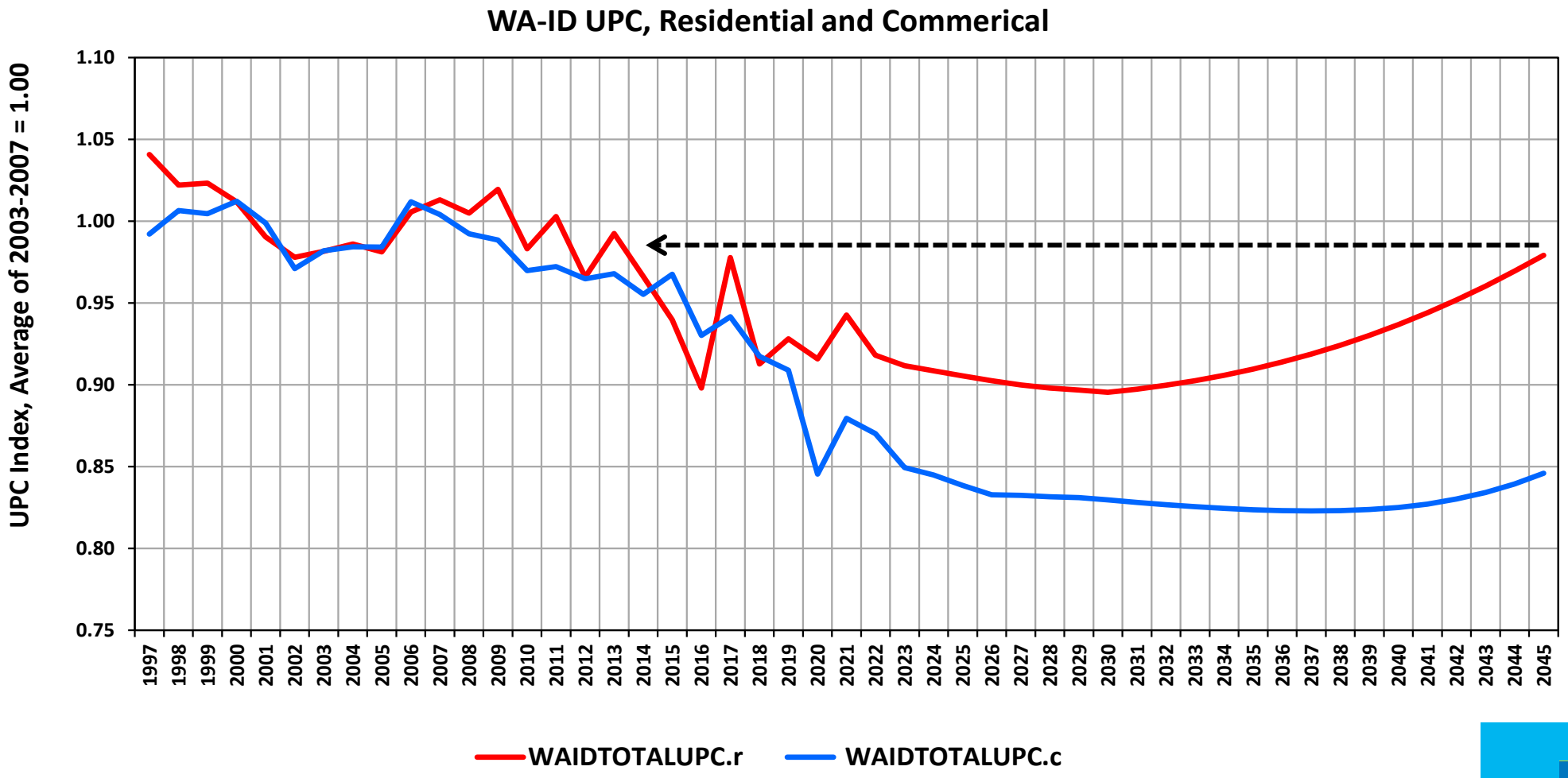


Variable	Base-Line	High	Low
GDP Growth	1.80%	2.40%	1.20%
WA Avg. Annual Res. Cus. Growth	0.69%	0.83%	0.47%
ID Avg. Annual Res. Cus. Growth	1.25%	1.55%	0.86%
WA-ID Avg. Annual Res. Cus. Growth	0.89%	1.09%	0.61%

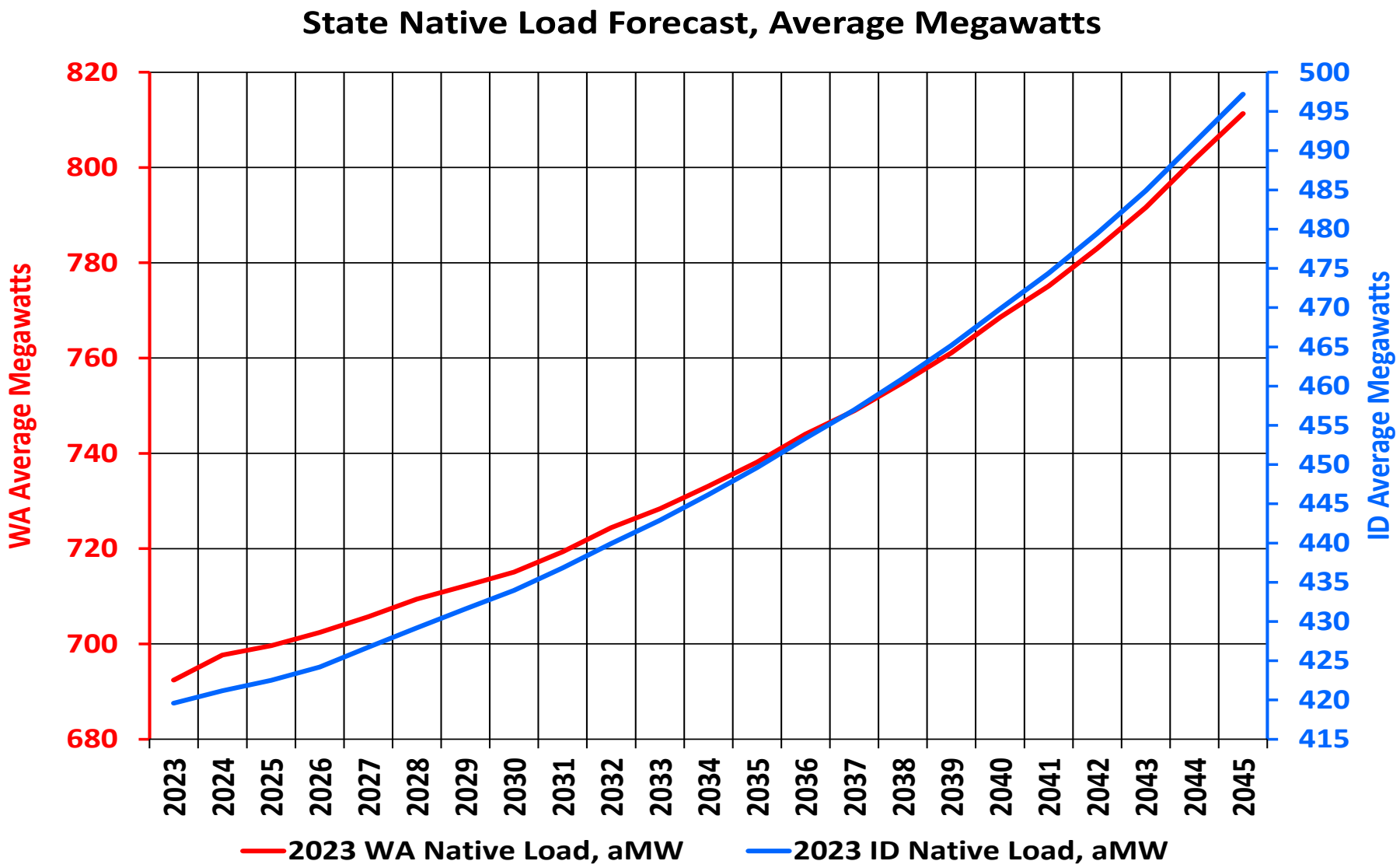
Comments

- Base-line GDP growth is the Fed's estimate.
- Historically, the stronger U.S. growth, the stronger population growth to our service areas.

Long-term Energy Forecast: UPC Trends

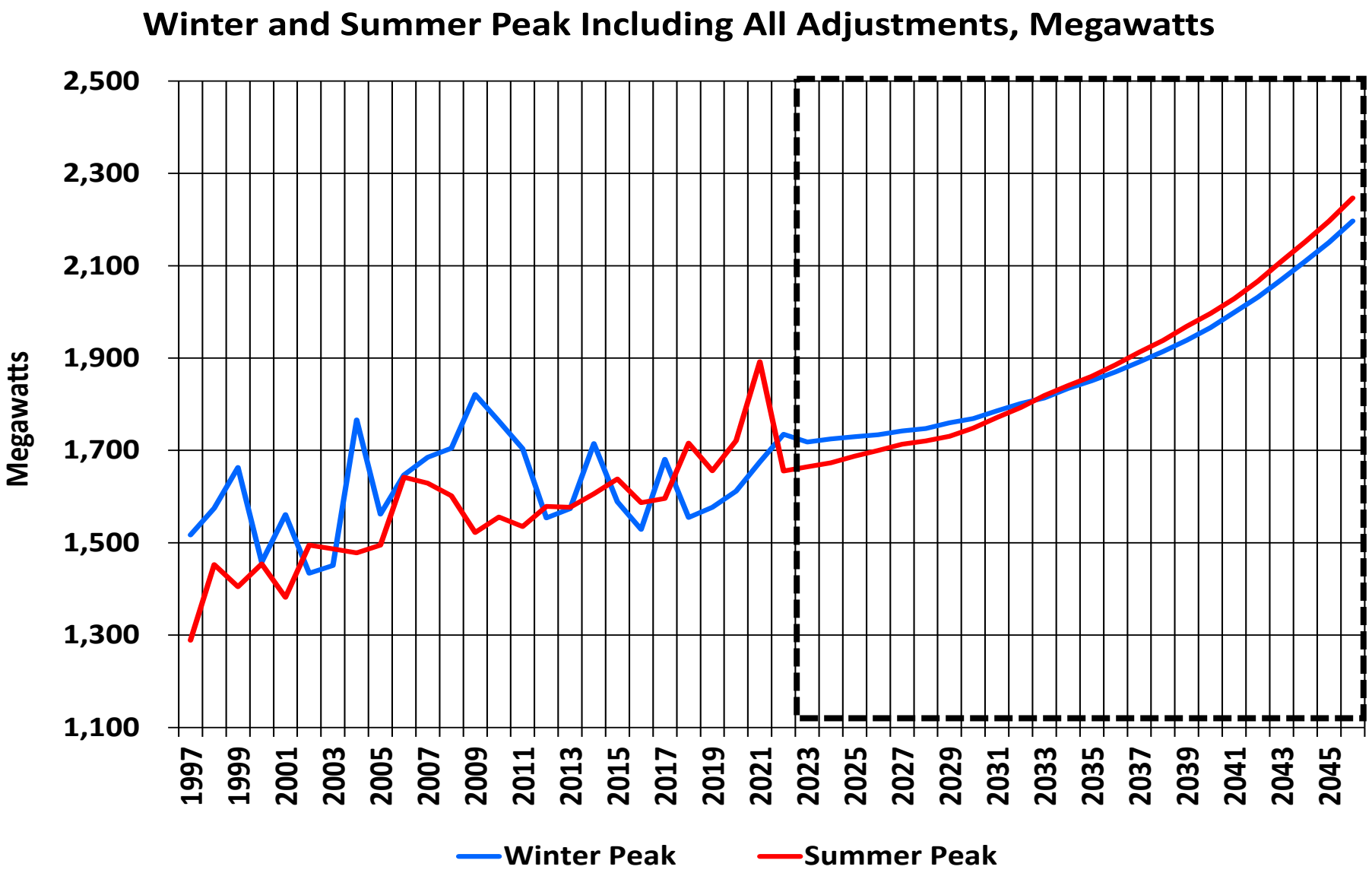


Long-term Energy Forecast: State Native Load



IRP	Avg. Annual Growth
2023 IRP	0.74%
2023 WA	0.72%
2023 ID	0.77%

Peak Load Forecast: Winter and Summer Forecast

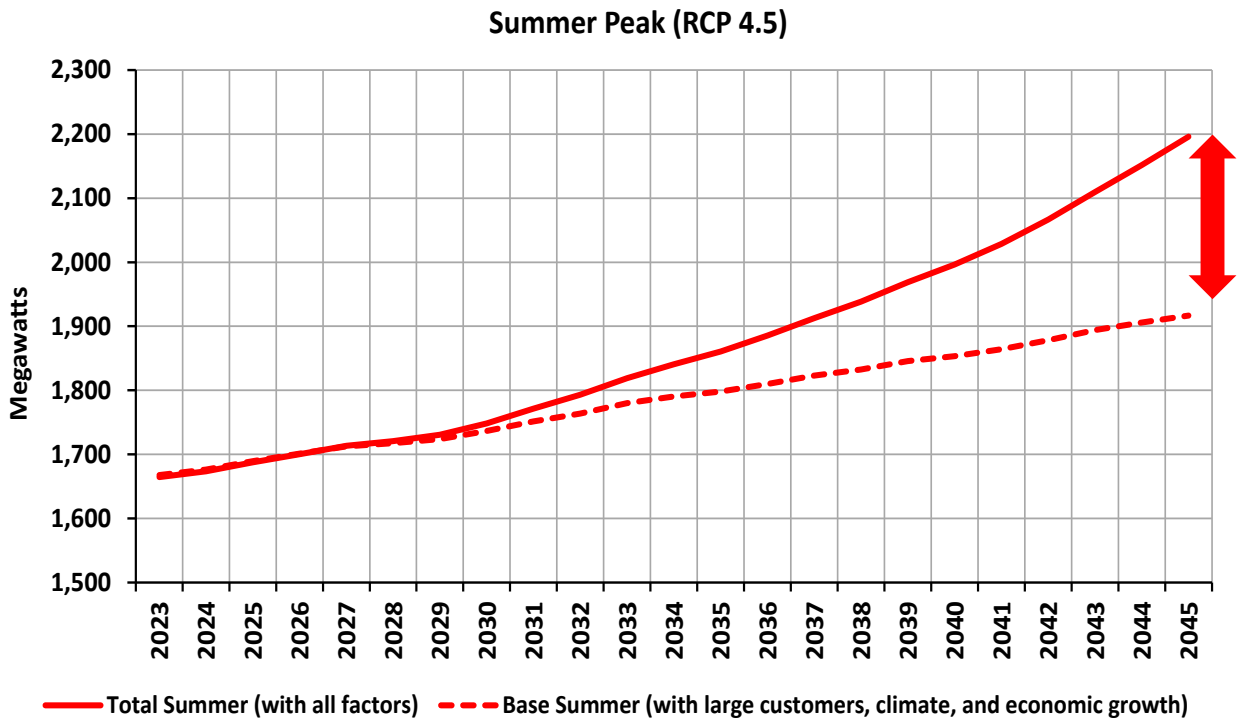


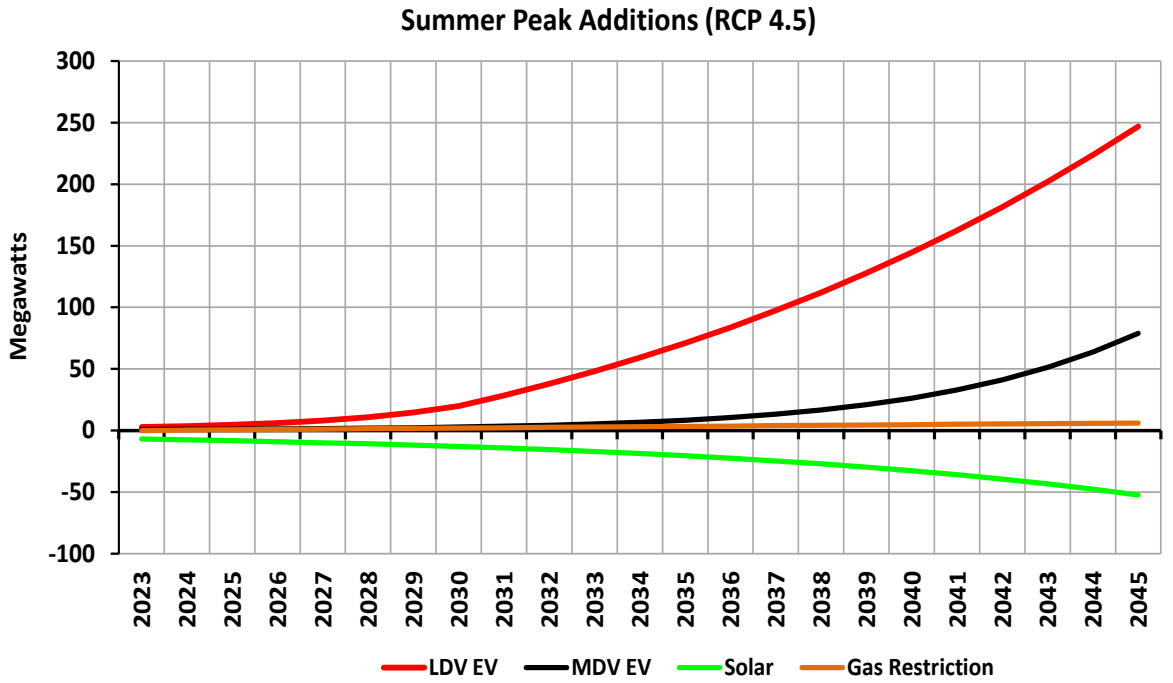
Peak	Avg. Growth 2023-45
Winter	1.02%
Summer	1.25%

Comments

- Reflects RCP 4.5.
- Over the forecast horizon, winter and summer peaks will be closer than previous IRPs. This largely reflects the impact of EVs and gas restrictions.

Peak Load Forecast: Change in IRP Summer Peak

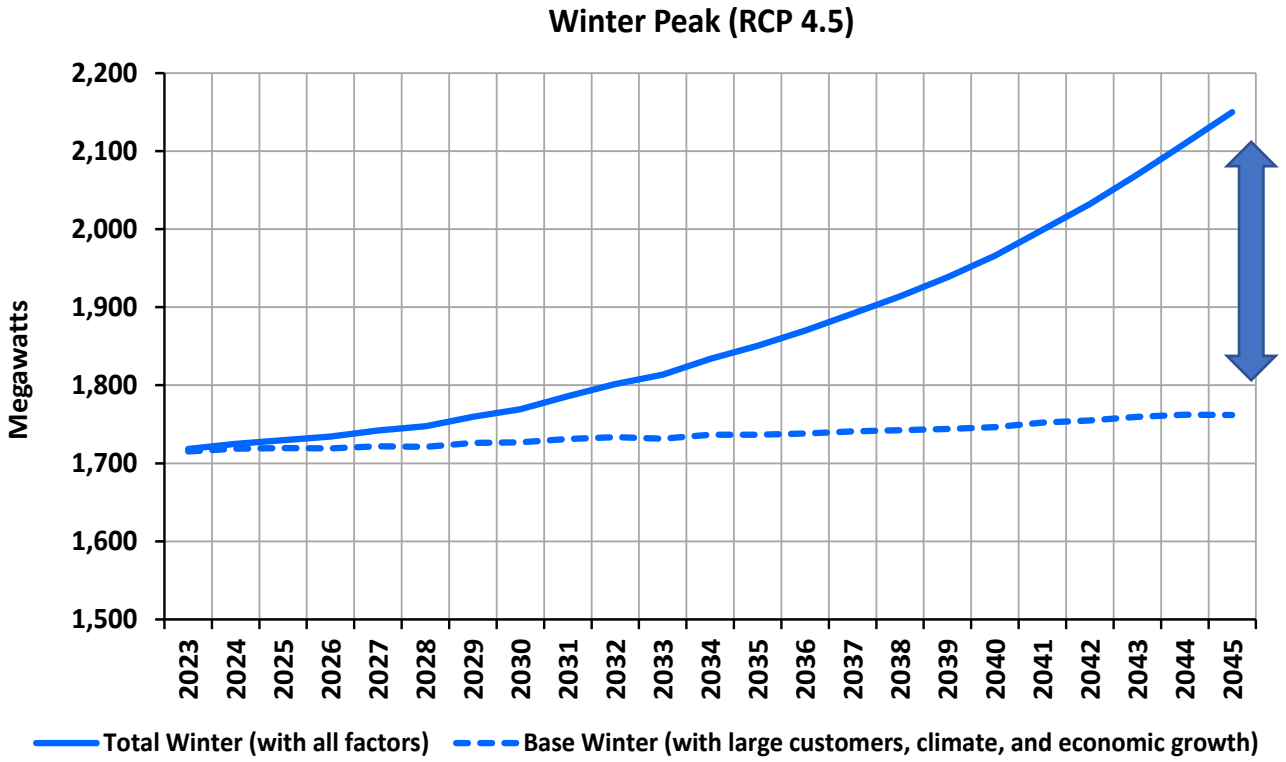


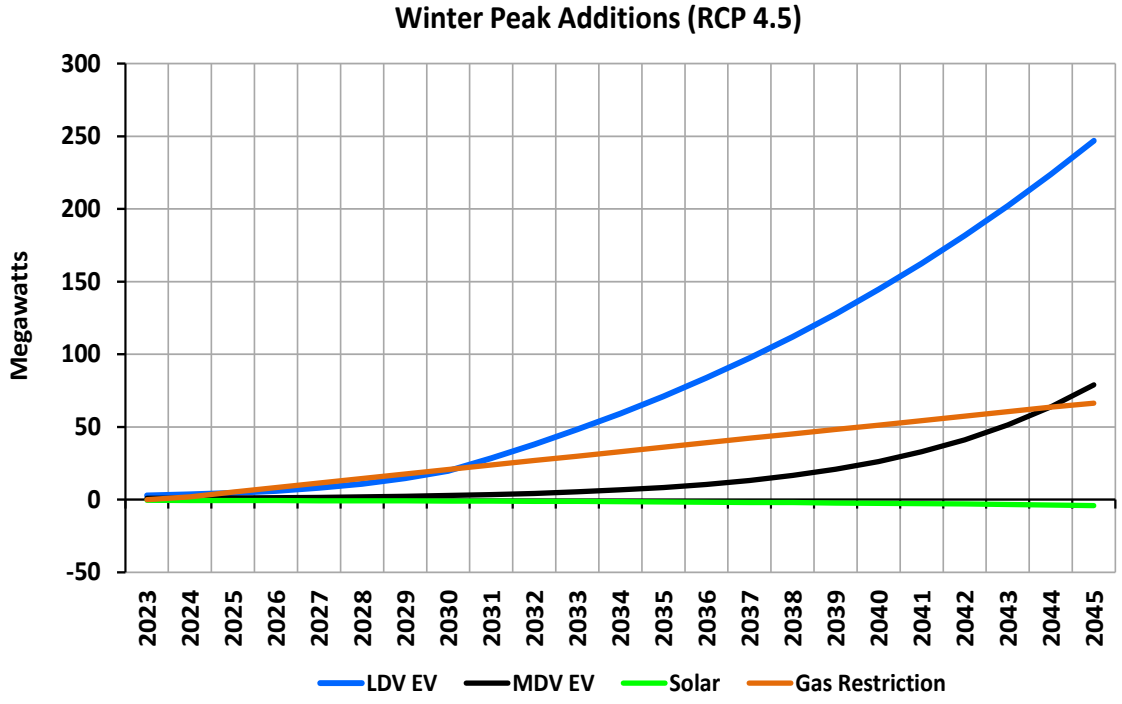


Comments

- Economic growth and climate impacts are being dominated by EV additions.
- By 2045, 117% of additions over the base summer peak are from EVs (both LDVs and MDVs). The 117% reflects a significant negative impact from solar by 2045.
- Gas restriction impacts are modest and solar is not significant late 2030s.

Peak Load Forecast: Change in IRP Winter Peak

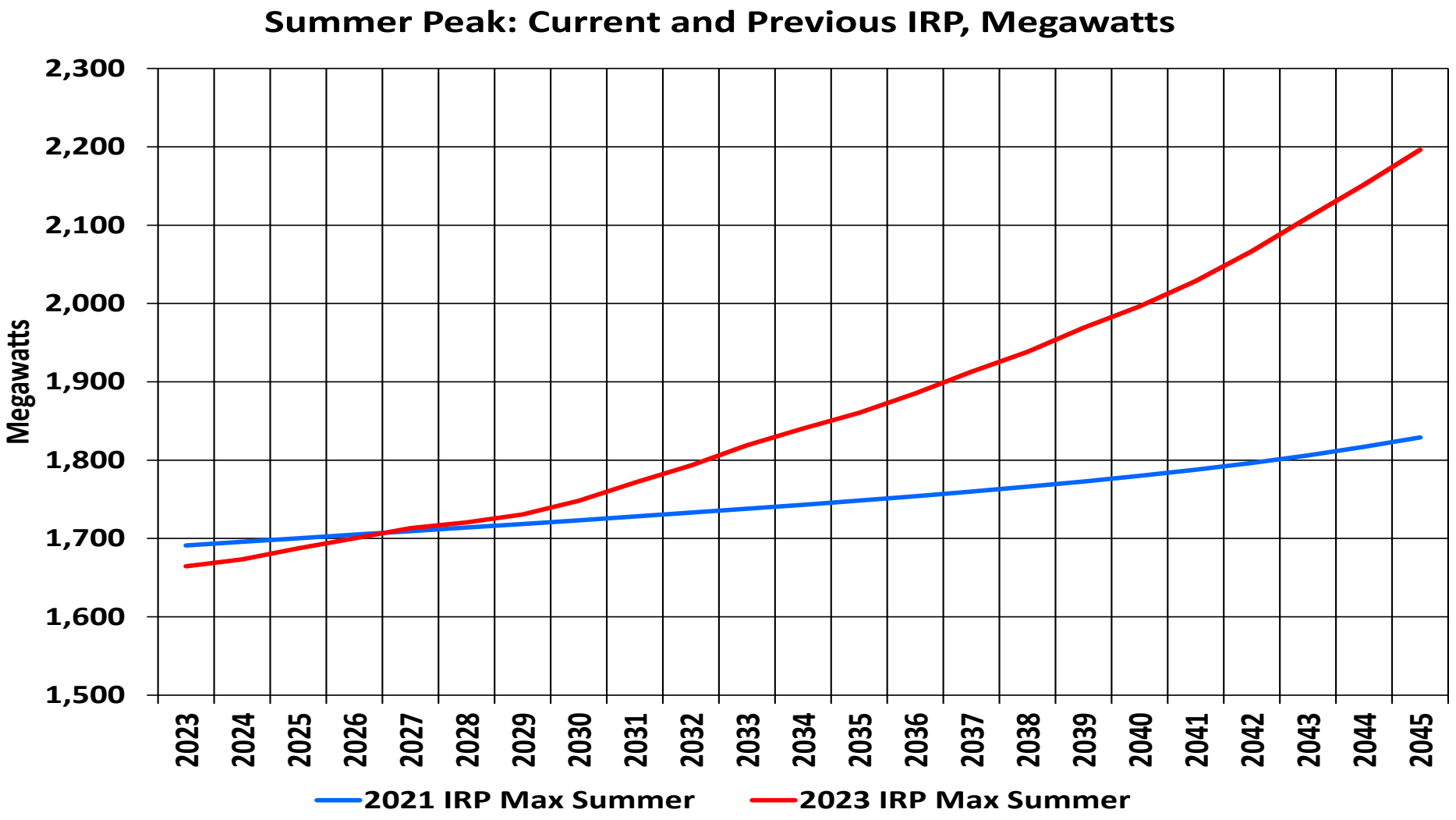




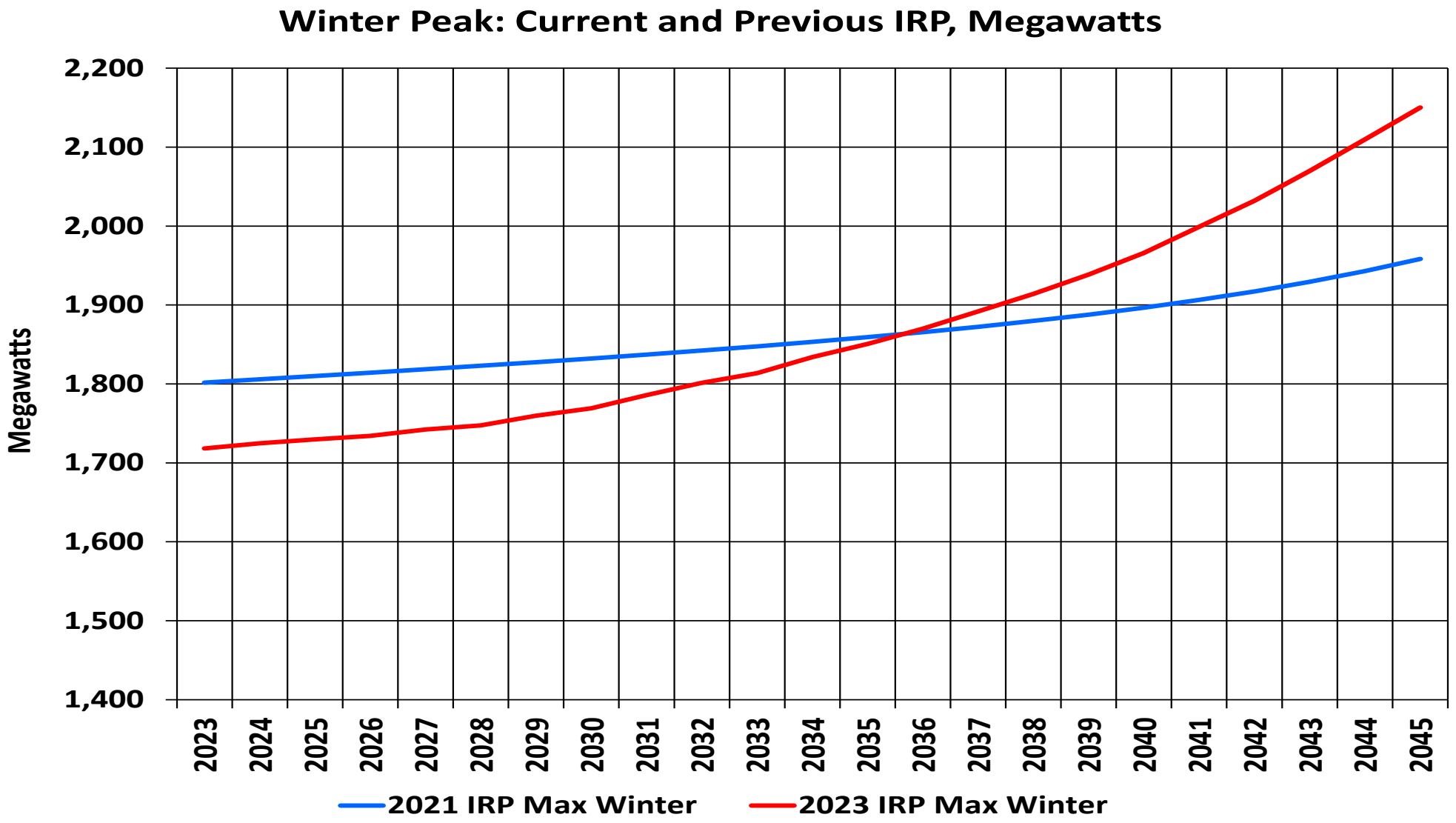
Comments

- Economic growth and climate impacts are being dominated by EV additions.
- By 2045, 84% of additions over the base winter peak are from EVs (both LDVs and MDVs).
- Gas restriction impacts are significant by early 2030s, and solar is never significant.

Peak Load Forecast: Change in IRP Summer Peak



Peak Load Forecast: Change in IRP Winter Peak



Questions?

Loads & Resources Update

2023 Avista Electric IRP

TAC 7 – October 11, 2022

Lori Hermanson, Senior Power Supply Analyst

Major L&R Changes Since 2021 IRP

- Load forecast
- Incorporates climate change impacts – hydro & loads
- Used WRAP QCCs for peak capacity contributions
- 30 MW industrial demand response (Washington Rate Case Settlement)
- Chelan County PUD purchase
- Assumed retirement dates for Colstrip (2025), Northeast (2035), Boulder Park and Kettle Falls CT (2040)
- Additional RFP resources - not included

Peak Planning Assumptions

- Peak load forecast
- Planning reserve margins
  - Winter – 22%
  - Summer – 13%
- Regulation – 16 MW
- Operating reserves for borderline contracts – average 16 MW (varies by month)
- Use WRAP's Qualifying Capacity Credits (QCC) for generation and demand response resources
  - Not incorporating the WRAP's planning reserve margins, but will share the impacts of these PRMs (slide 7)

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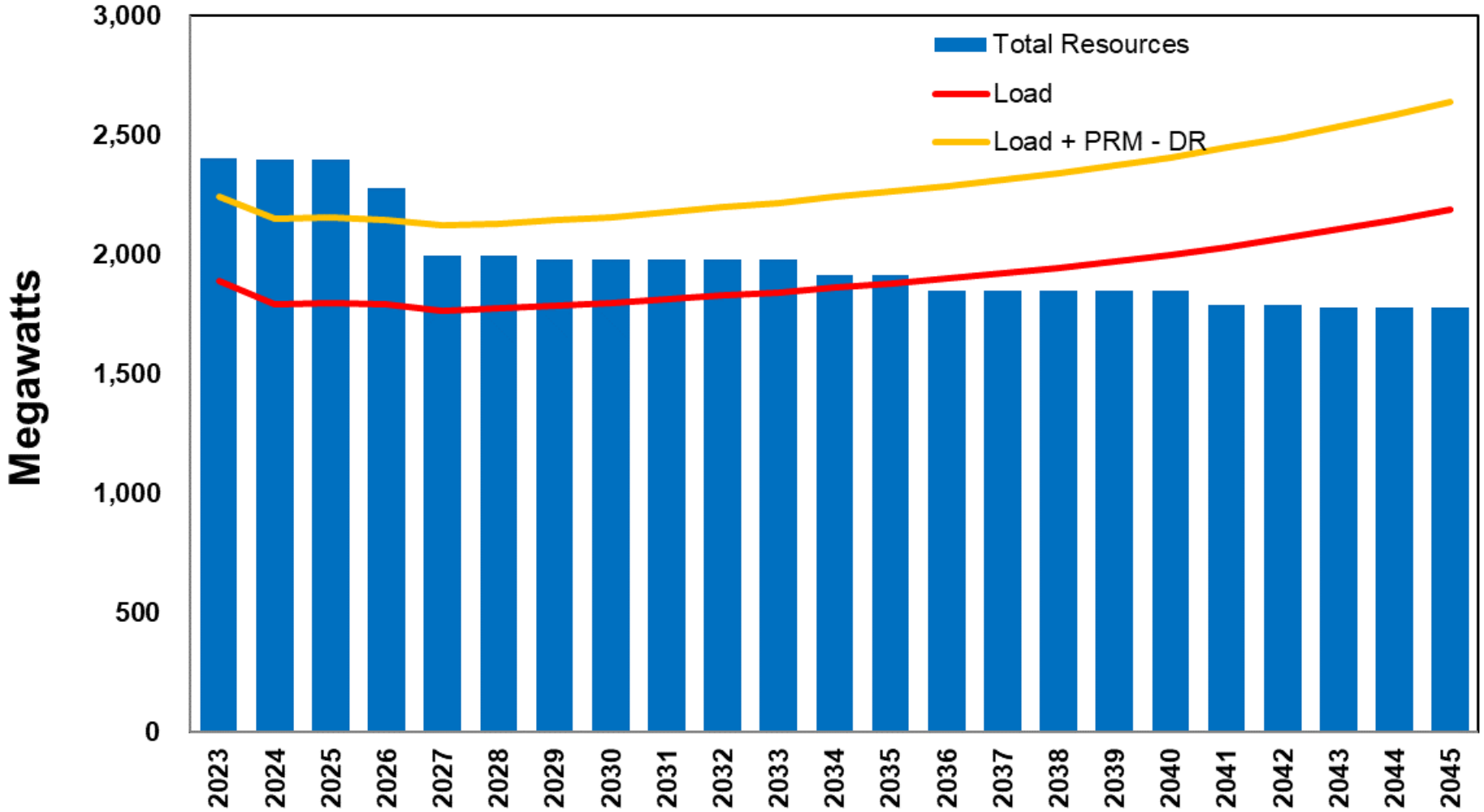
Winter Peak Load & Resource Balance



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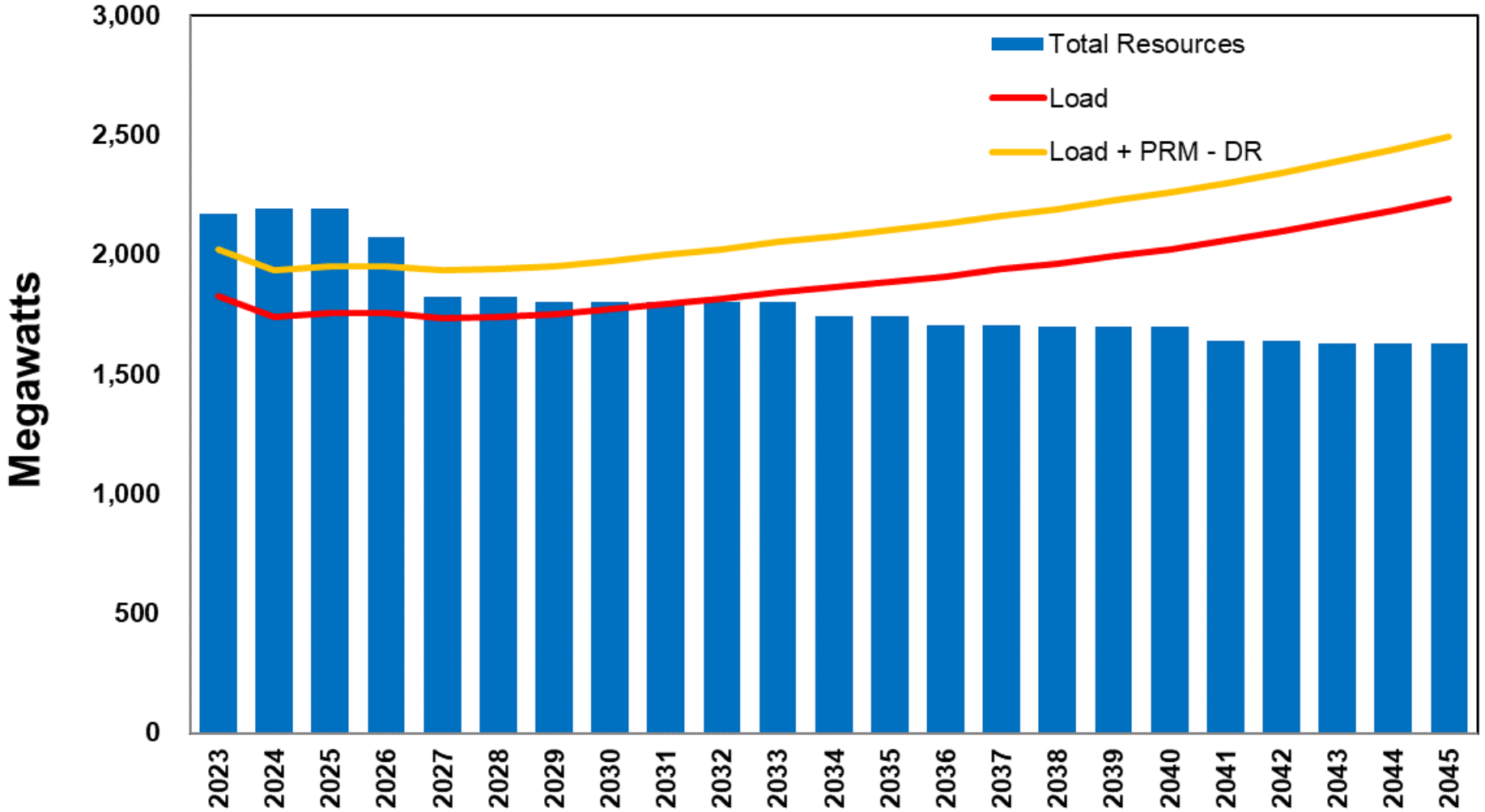
Summer Peak Load & Resource Balance



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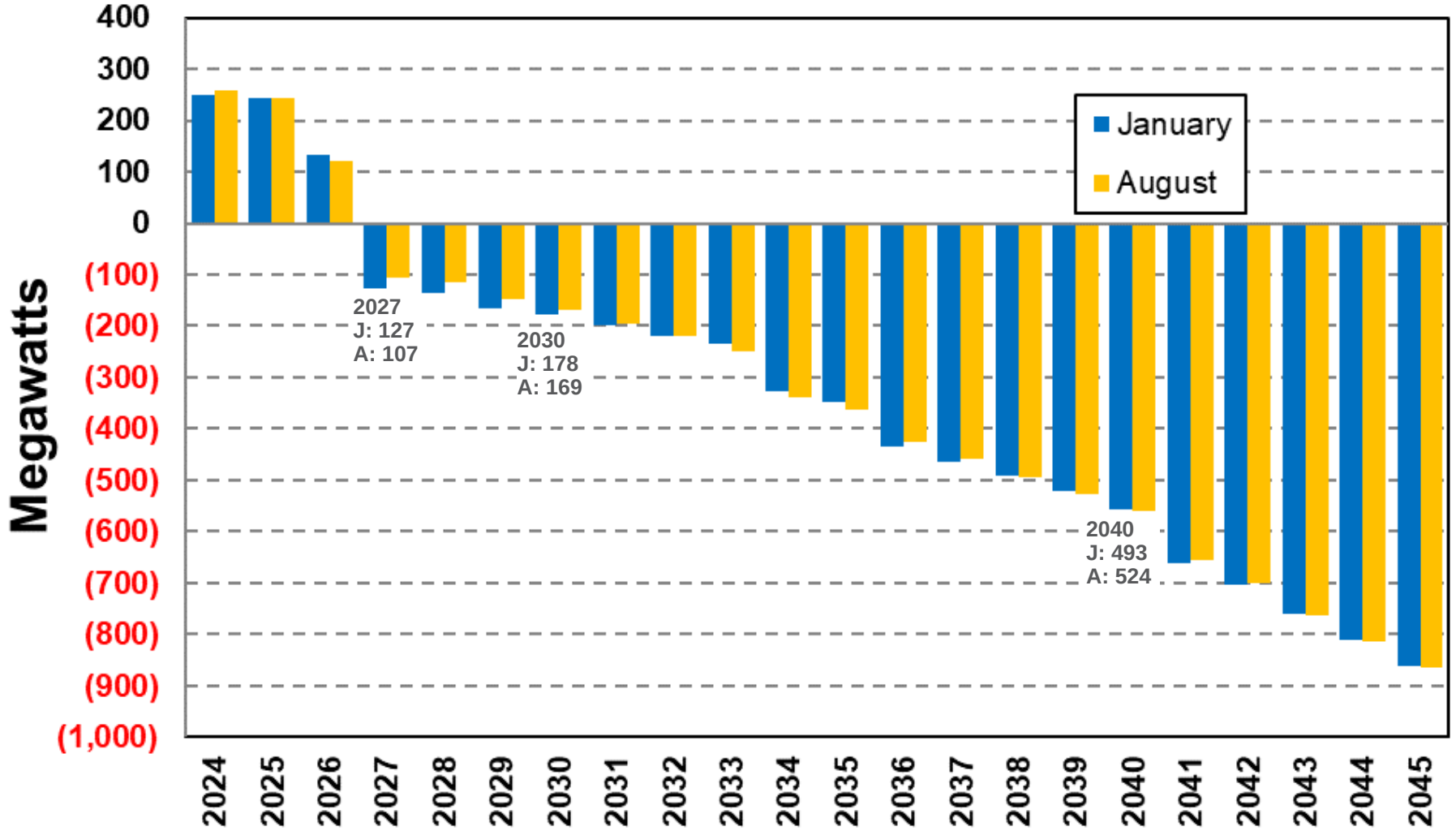
System Peak Capacity Position

Using historical peak planning criteria



Seasonal winter/summer peak not included at this time, short position begins in Dec 1, 2026

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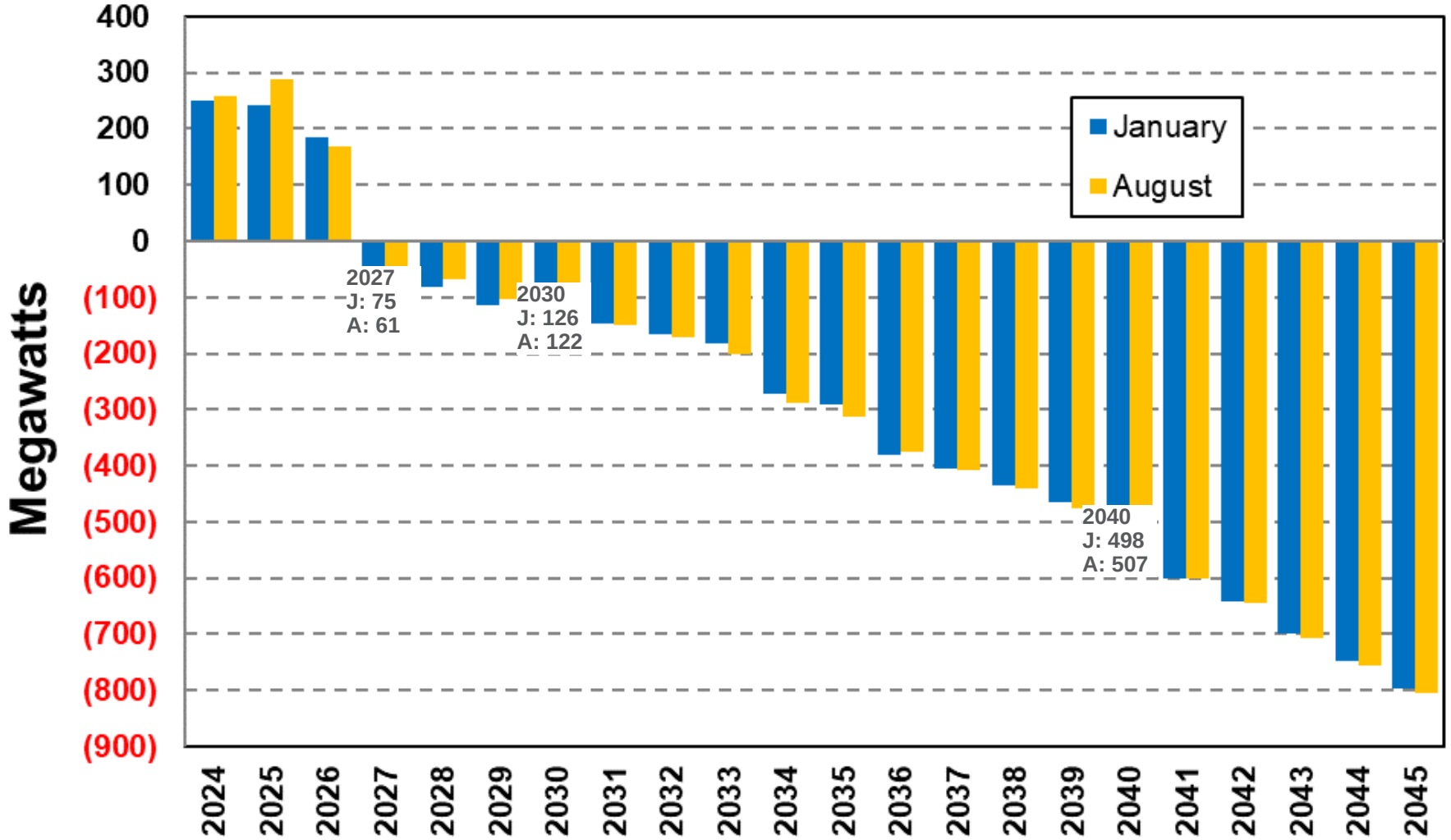
System Capacity Position

Using Western Resource Adequacy Program Planning Reserve Margins



Seasonal winter/summer peak not included at this time, short position begins in Jan 1, 2027

Energy Planning

- Expected energy load forecast
- Production capability generation forecast
  - Normal weather conditions
  - Machine hour limits
  - Maintenance and forced outages
- Incorporates climate change impacts – hydro & loads
- Includes contingency for changes in load and variable generations

Energy Contingency

- Difference between average generation and load conditions with extreme conditions.

- Previous IRP
  - Difference between 90th percentile of load and average load + difference between 10th percentile of hydro generation and average generation

- 2023 IRP
  - Developed a dataset of load and renewables generation (varying hydro, wind and solar) for the period 1948-2019
  - Used average minus 95th percentile of the net of load minus renewable generation

Energy Contingency for Load and Renewable Variability 2023 (aMW)

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Avg
Previous IRP	209	240	244	227	196	291	307	171	118	117	168	175	205
2023 IRP	227	216	211	253	186	320	306	170	118	120	170	125	202
Change	18	-24	-33	26	-10	29	-1	-1	0	3	2	-50	-3

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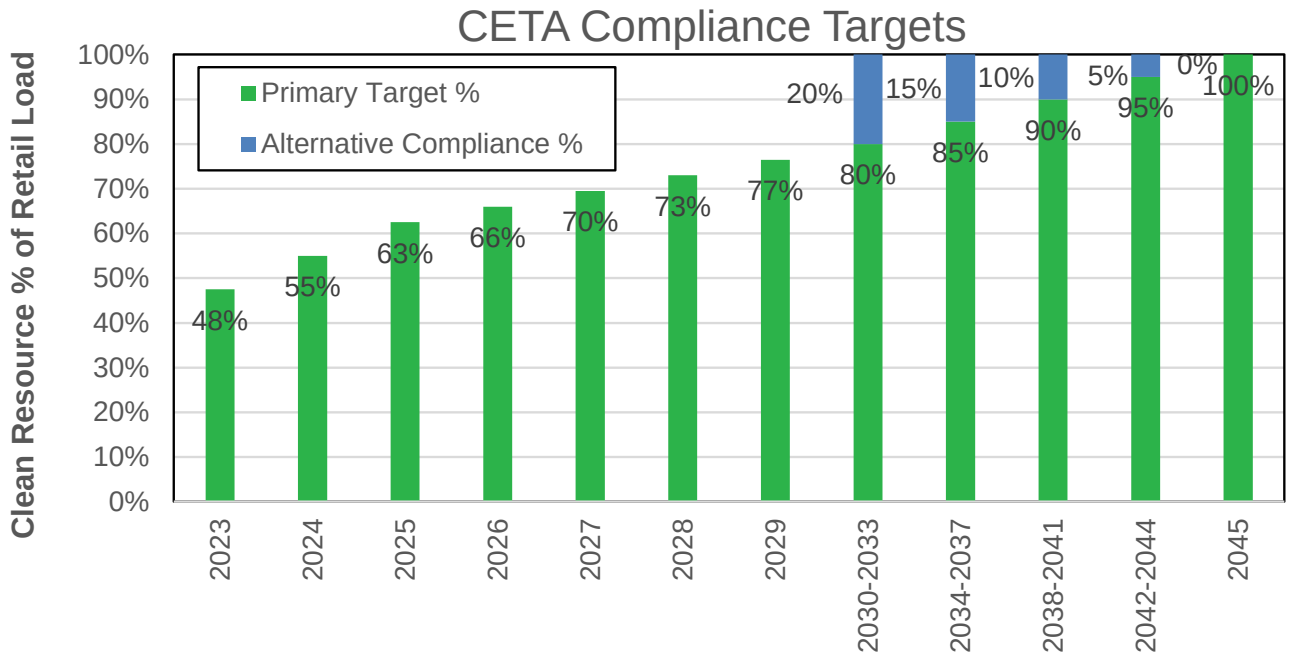
System Planning Energy Position – Monthly (aMW)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2024	204	185	347	429	422	485	292	176	276	290	259	292
2025	212	207	360	375	507	590	298	175	275	286	259	293
2026	91	59	208	332	355	397	126	28	113	131	(130)	(120)
2027	(197)	(204)	(53)	149	296	299	(117)	(215)	(137)	(119)	(149)	(141)
2028	(203)	(221)	(57)	123	288	286	(139)	(229)	(140)	(131)	(163)	(159)
2029	(202)	(204)	(39)	138	334	273	(150)	(249)	(151)	(132)	(164)	(151)
2030	(204)	(208)	(30)	136	220	267	(158)	(259)	(158)	(133)	(169)	(158)
2031	(211)	(208)	(22)	123	291	268	(150)	(261)	(154)	(136)	(176)	(163)
2032	(203)	(218)	(22)	118	307	271	(146)	(262)	(156)	(139)	(181)	(167)
2033	(209)	(211)	(22)	126	359	260	(157)	(272)	(156)	(145)	(179)	(170)

Proposed CETA Compliance Methodology

- CEIP outlines 2023-2025 clean energy targets
- 2026-2029 target continue trend to 2030
- “Use” rules for CETA compliance not complete
  - If clean generation exceeds monthly “net” retail sales, it qualifies as alterative compliance after 2030
  - Renewable energy can be sourced from allocated Washington share or purchased from Idaho customers (wind/new PPA hydro)
  - Assumes Idaho allocated hydro available after 2030 for alternative compliance



Production/Load risk still needs to be accounted for with compliance windows

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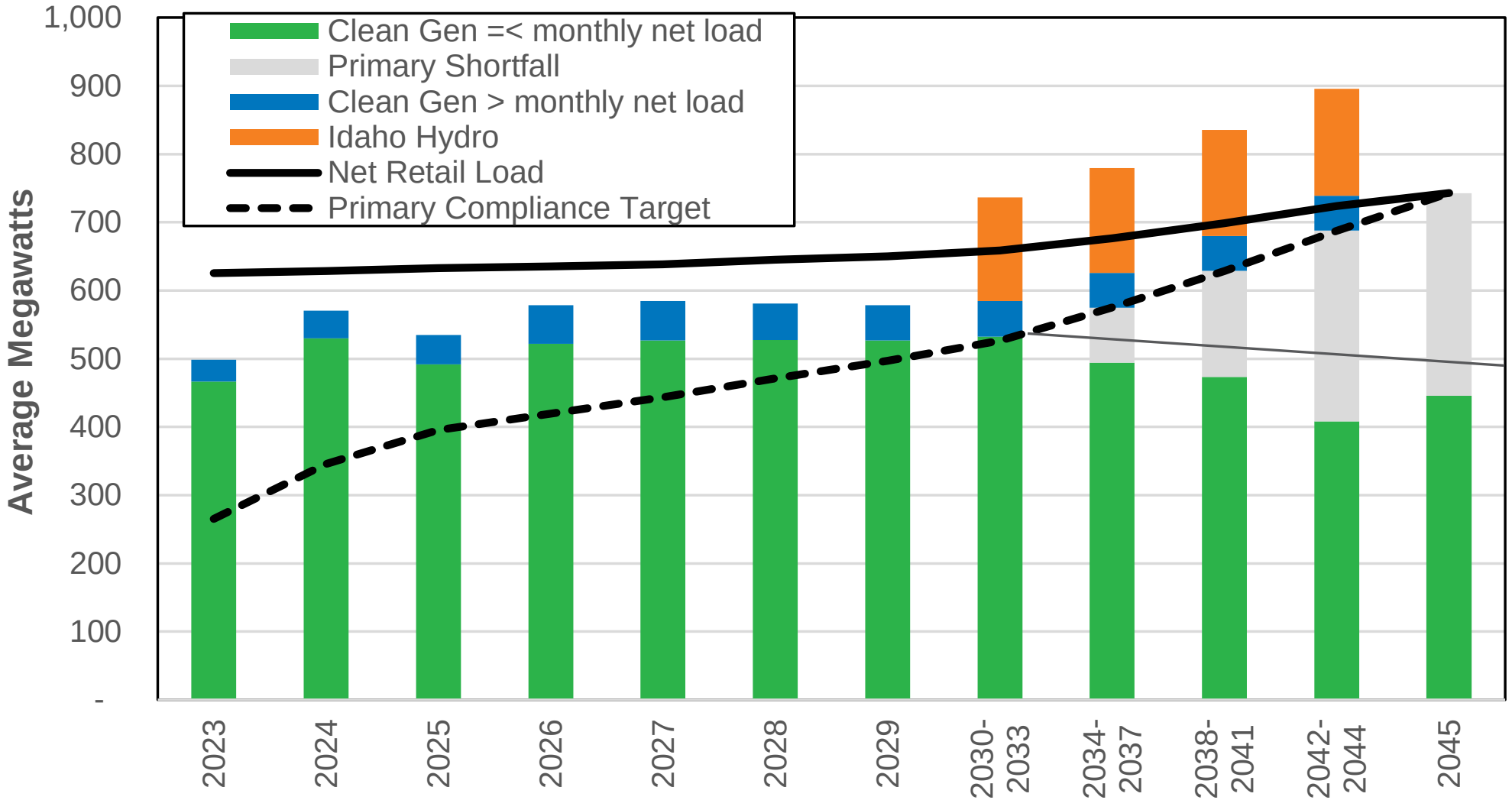
Washington Clean Energy Position



Primary Compliance Position aMW

2030-33: +6
2034-37: -81
2038-41: -155
2042-44: -279

Natural Gas Market Dynamics and Prices

Michael Brutocao

Tom Pardee

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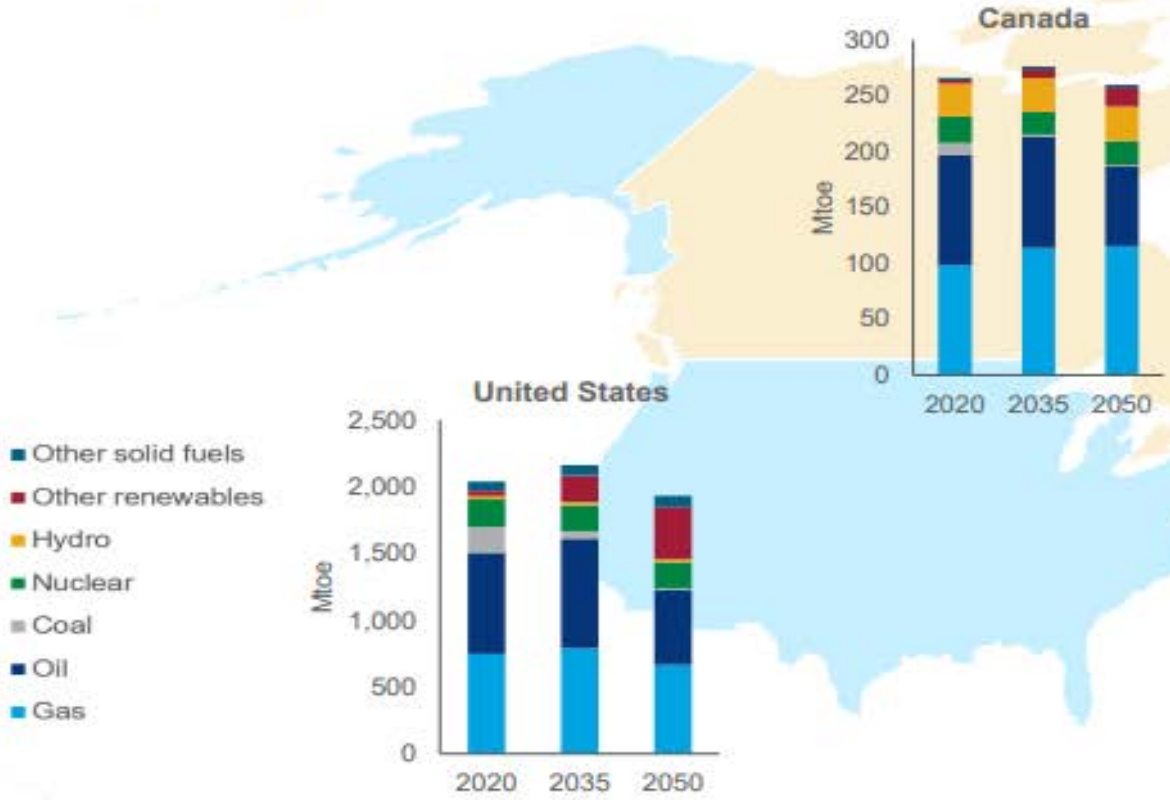
Wood Mackenzie – Legal Disclaimer

The foregoing [chart/graph/table/information] was obtained from the North America Gas Service™, a product of Wood Mackenzie.” Any Information disclosed pursuant to this agreement shall further include the following disclaimer: "The data and information provided by Wood Mackenzie should not be interpreted as advice and you should not rely on it for any purpose. You may not copy or use this data and information except as expressly permitted by Wood Mackenzie in writing. To the fullest extent permitted by law, Wood Mackenzie accepts no responsibility for your use of this data and information except as specified in a written agreement you have entered into with Wood Mackenzie for the provision of such of such data and information."

Natural gas remains strategically important in North America as it represents at least a third of total energy demand over the next 30 years

The pace of energy transition threatens gas demand growth as fossil fuel demand wanes in the long term

Primary energy demand mix in North America



Canada

- Domestic gas demand is expected to grow mainly due to rising blue hydrogen demand as local and federal governments support the development of CCS industry.
- The oil sands sector could drive incremental industrial demand growth but the future role of oil in the energy mix limits market potential beyond 2035.
- Rising renewable penetration will impact gas demand in the power sector post 2040 but the impact of displacement is less severe than the US due to renewable resource potential.

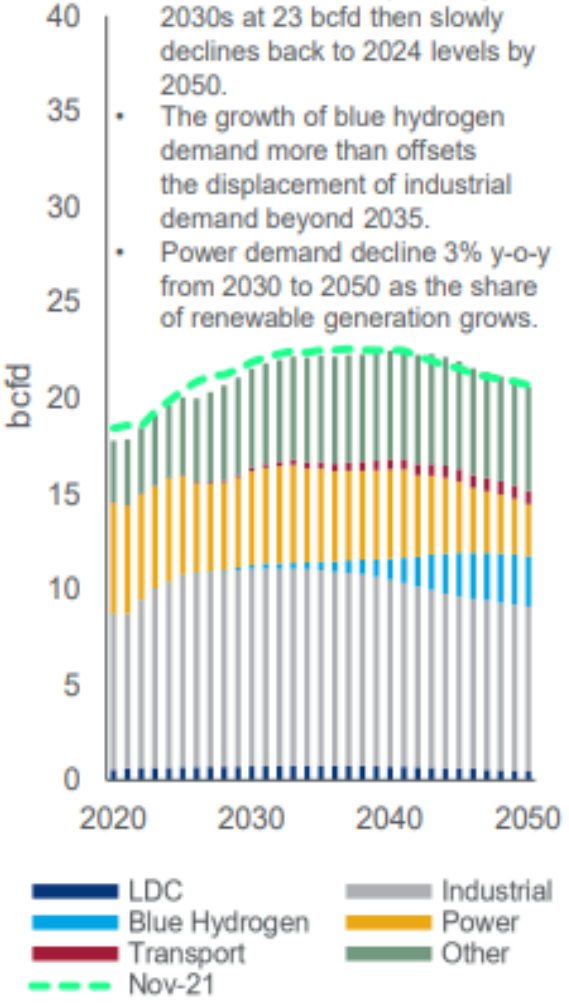
United States

- Gas continues to play a vital role in the United States even as the economy announces emissions reduction targets for 2030
- Industrial demand and other demand lead growth in the mid-term to 2035 while blue hydrogen demand reaches 1 bcfd by 2030 and accelerates to the end of our outlook
- Post 2024, power demand falls due to higher renewable penetration, resulting from policies that support low-carbon generation

US regional demand: the Gulf Coast stands out as domestic demand increases despite peaking in late 2030s

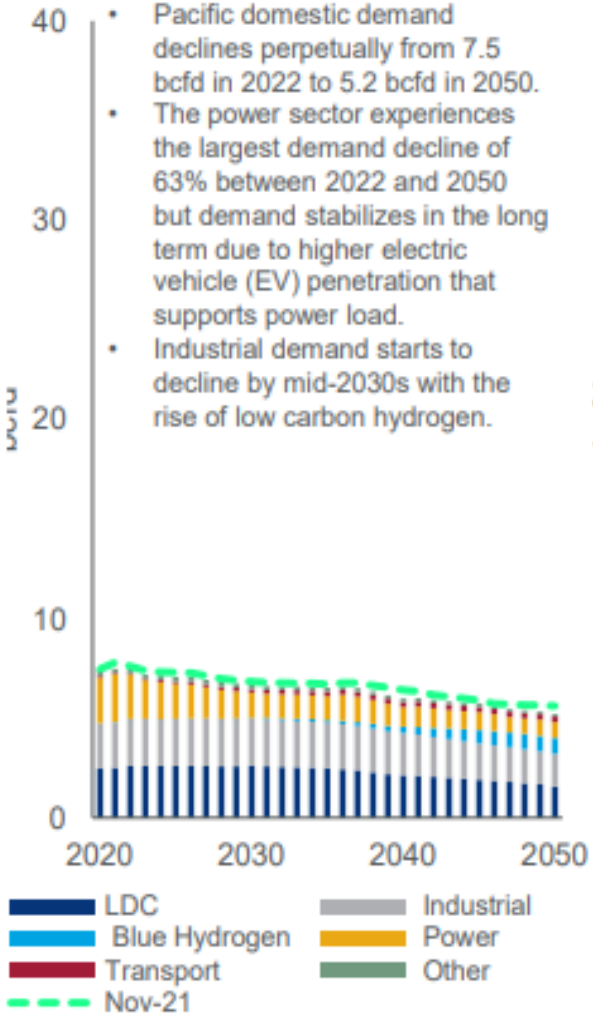
Gulf Coast

- Domestic demand peaks by late 2030s at 23 bcfd then slowly declines back to 2024 levels by 2050.
- The growth of blue hydrogen demand more than offsets the displacement of industrial demand beyond 2035.
- Power demand decline 3% y-o-y from 2030 to 2050 as the share of renewable generation grows.



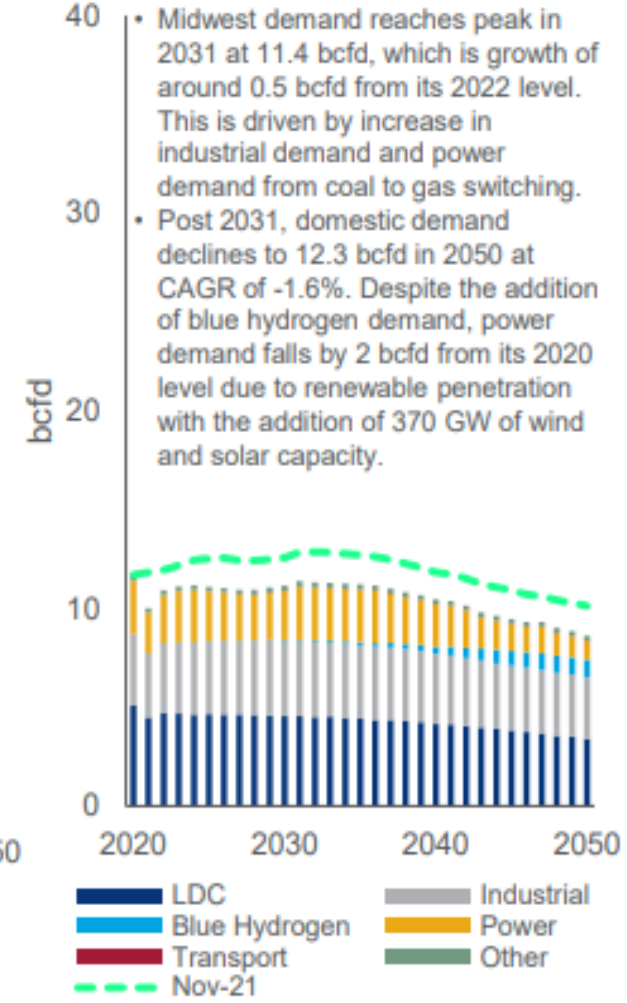
Pacific

- Pacific domestic demand declines perpetually from 7.5 bcfd in 2022 to 5.2 bcfd in 2050.
- The power sector experiences the largest demand decline of 63% between 2022 and 2050 but demand stabilizes in the long term due to higher electric vehicle (EV) penetration that supports power load.
- Industrial demand starts to decline by mid-2030s with the rise of low carbon hydrogen.



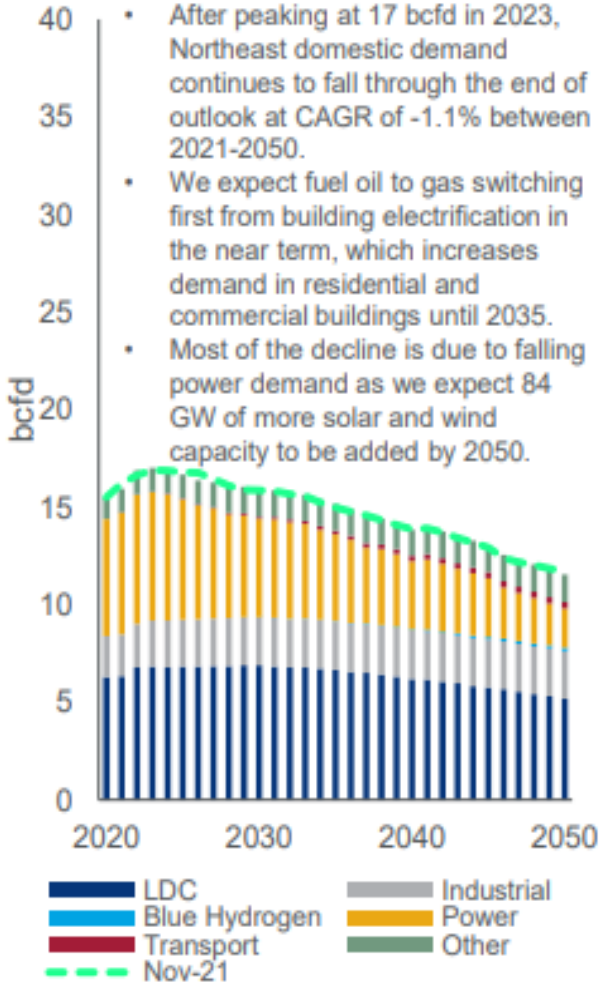
Midwest

- Midwest demand reaches peak in 2031 at 11.4 bcfd, which is growth of around 0.5 bcfd from its 2022 level. This is driven by increase in industrial demand and power demand from coal to gas switching.
- Post 2031, domestic demand declines to 12.3 bcfd in 2050 at CAGR of -1.6%. Despite the addition of blue hydrogen demand, power demand falls by 2 bcfd from its 2020 level due to renewable penetration with the addition of 370 GW of wind and solar capacity.



Northeast

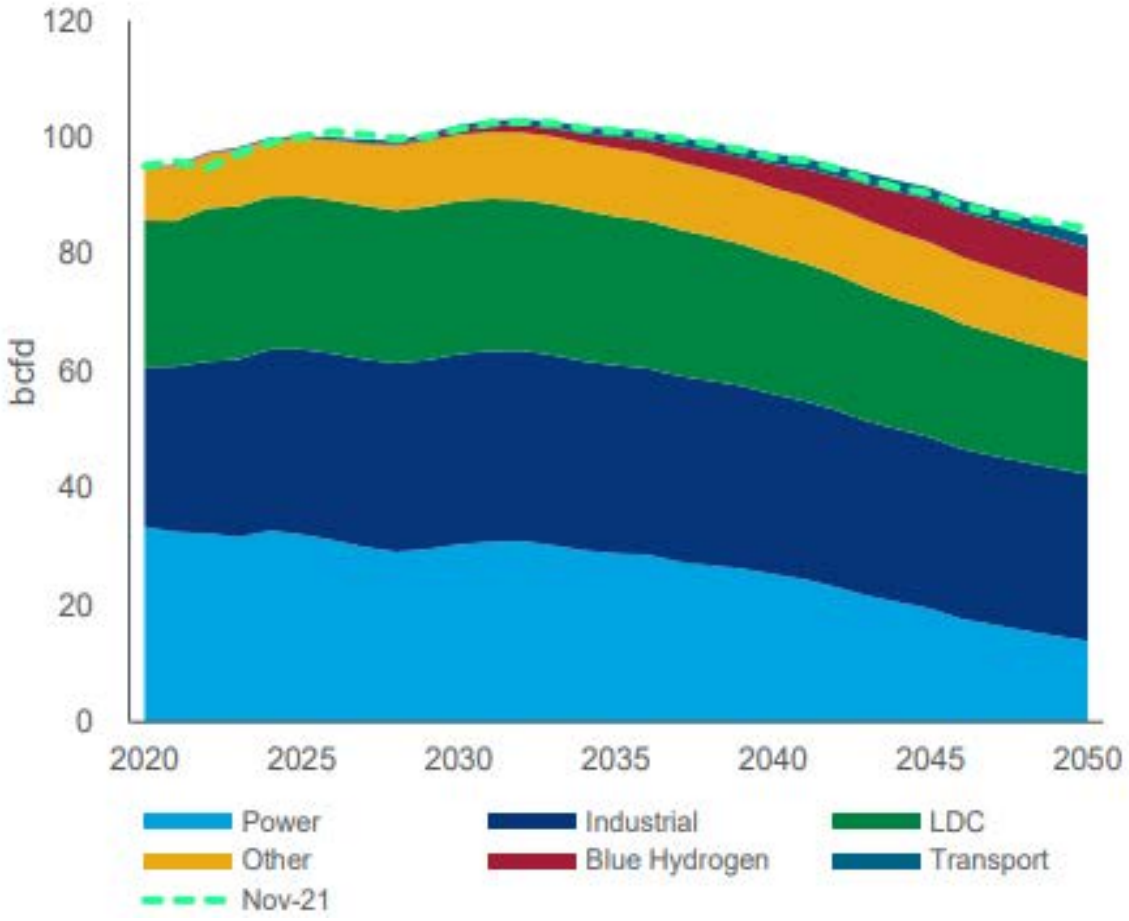
- After peaking at 17 bcfd in 2023, Northeast domestic demand continues to fall through the end of outlook at CAGR of -1.1% between 2021-2050.
- We expect fuel oil to gas switching first from building electrification in the near term, which increases demand in residential and commercial buildings until 2035.
- Most of the decline is due to falling power demand as we expect 84 GW of more solar and wind capacity to be added by 2050.



North American domestic demand reaches its peak in the early 2030s; longer term growth only from blue hydrogen and transport sectors

Energy transition impacts power demand the most with demand falling by almost two thirds between 2022 and 2050

North America gas demand by sector



Transport

Transportation demand includes gas consumed in natural gas vehicles (NGV) and small-scale bunkers. Most of the growth is attributed to NGV demand, driven by heavy long-haul trucks and freight rails

Blue hydrogen

Low-cost natural gas supply in both US and Canada support blue hydrogen projects where demand grows to 8.5 bcfd by 2050. We expect clean energy policies, such as Canada's federal carbon price and US 45Q incentive, to drive its growth.

Other

Other demand includes lease & plant fuel and pipeline losses, which is the gas used within the industry. The two biggest components to its growth are supply and LNG export losses

LDC

Residential and commercial demand reach a peak in 2029 and declines as hydrogen and building electrification accelerate to displace gas in the long-term. Heating electrification in the US will reach 68% penetration by 2050.

Industrial

Post 2031, industrial demand deviates from GDP growth and continues to decline as we expect net zero targets and clean energy policies to drive low-carbon hydrogen to replace grey hydrogen from Steam Methane Reformers (SMRs) in the ammonia, refining, and methanol sectors.

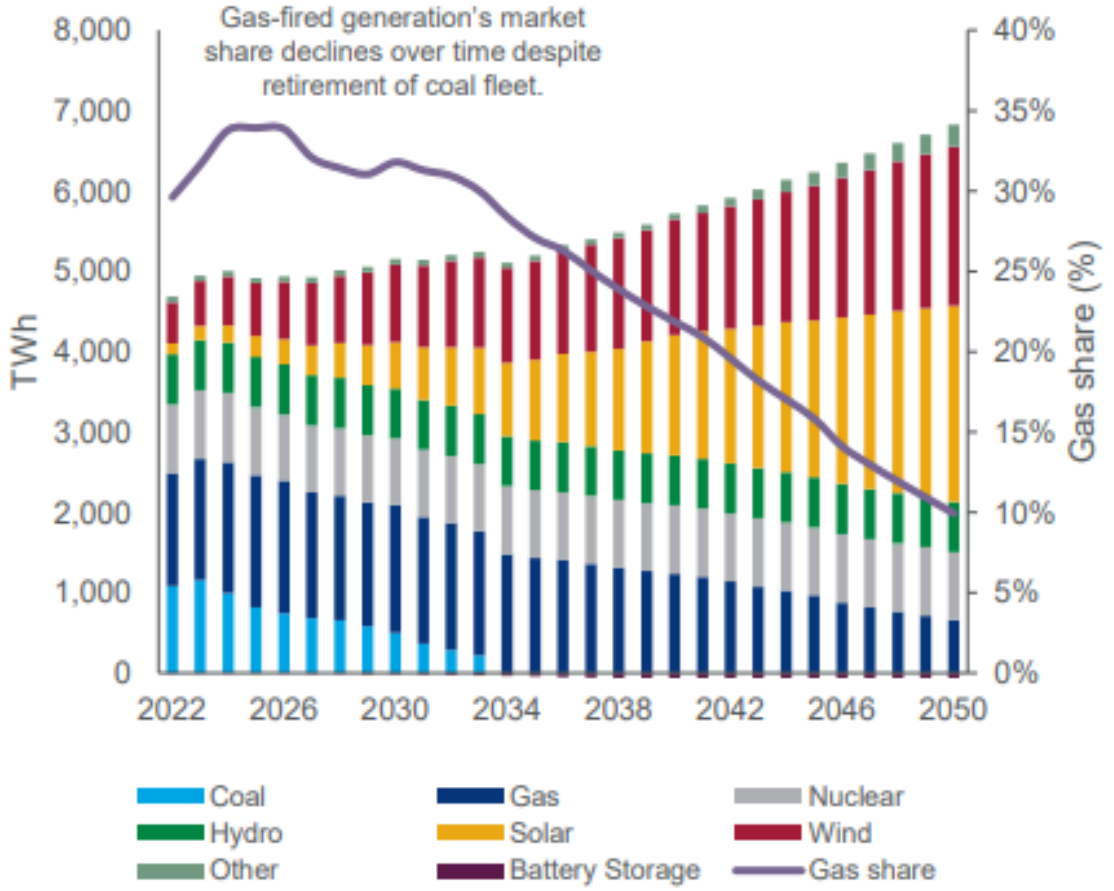
Power

In the near term out to 2024, power demand grows due to coal-to-gas switching and retirements. Post-2024, gas demand in the power sector starts to structurally decline with the accelerated renewable build-out spurred by policy incentives.

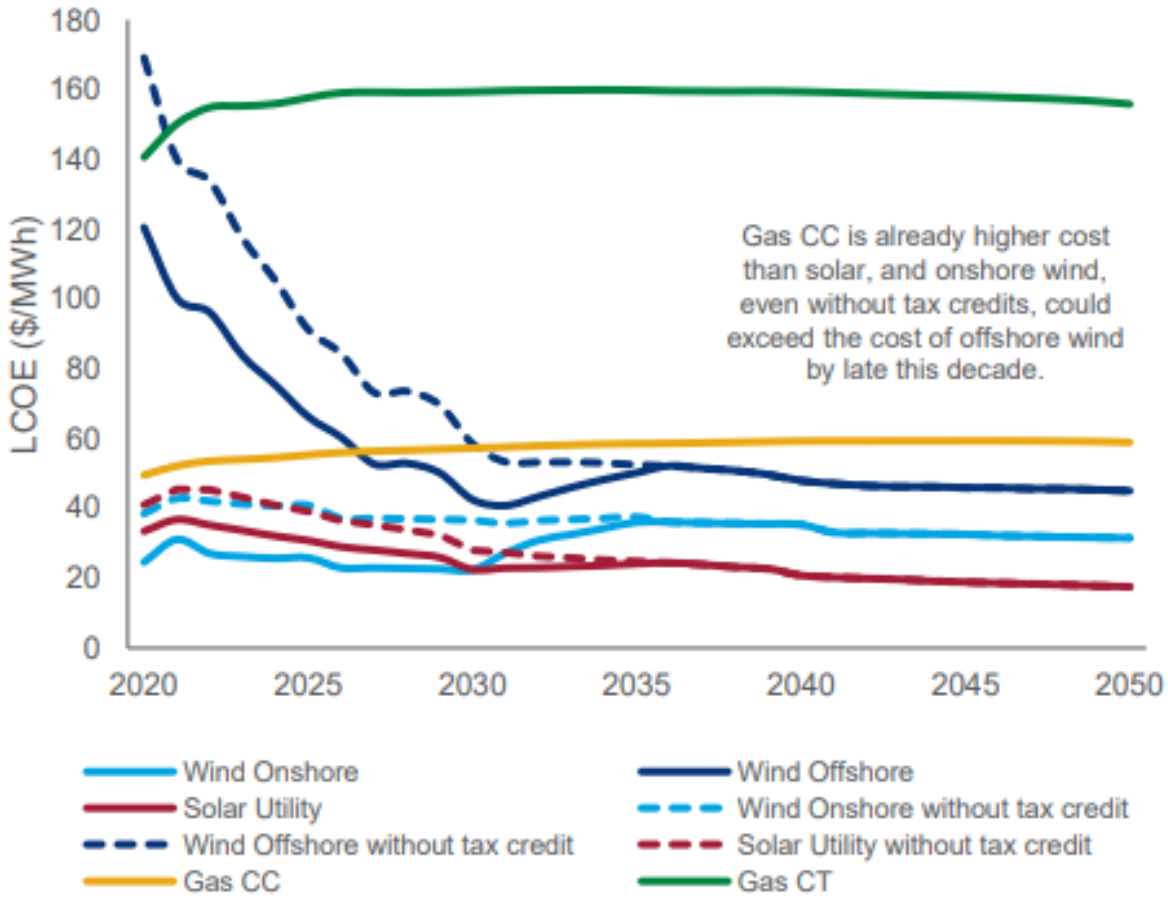
Accelerated coal retirements allows for more coal-to-gas switching in the 2020s but gas burns decline over time with higher renewable penetration

Power load has been revised higher mostly in the late 2040s due to higher EV conversion, heating electrification and stronger industrial requirements

North America power generation by type



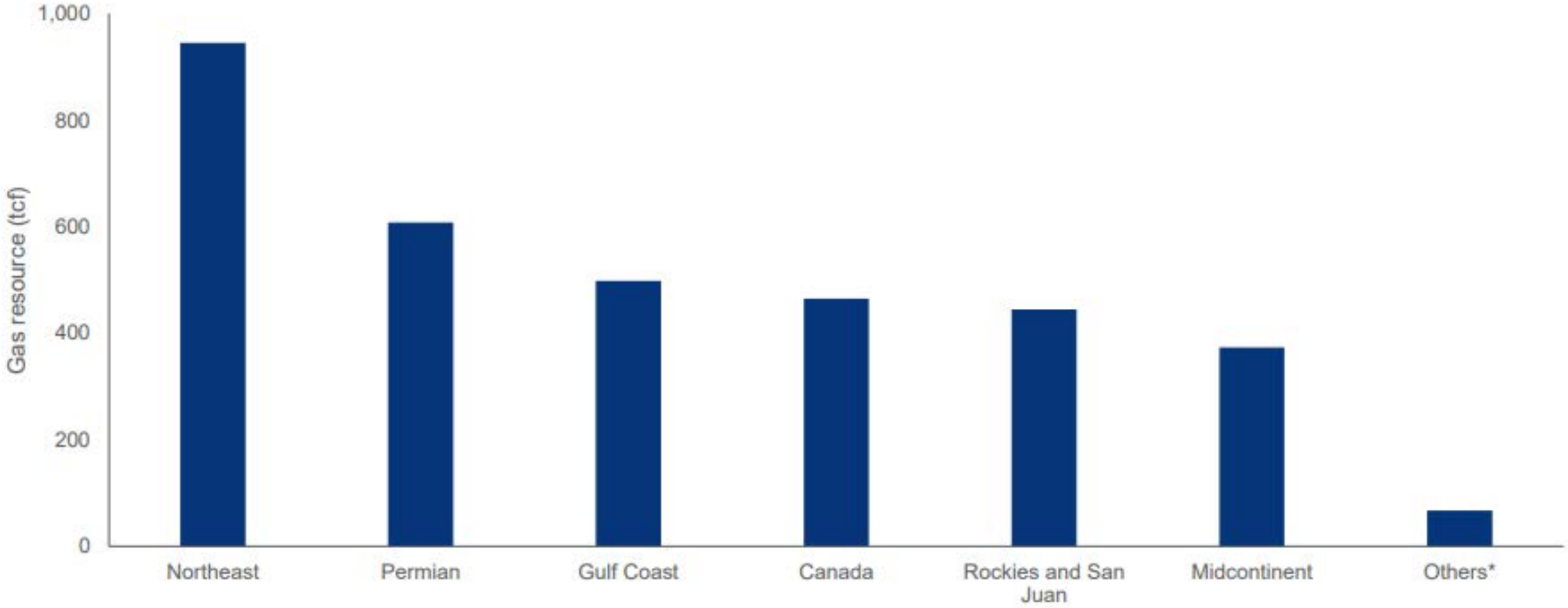
Levelized cost of energy (LCOE)



North America has large quantities of gas resources available

In addition to commodity prices, factors such as well economics, infrastructure development, and investor sentiment will dictate how much resource is ultimately produced

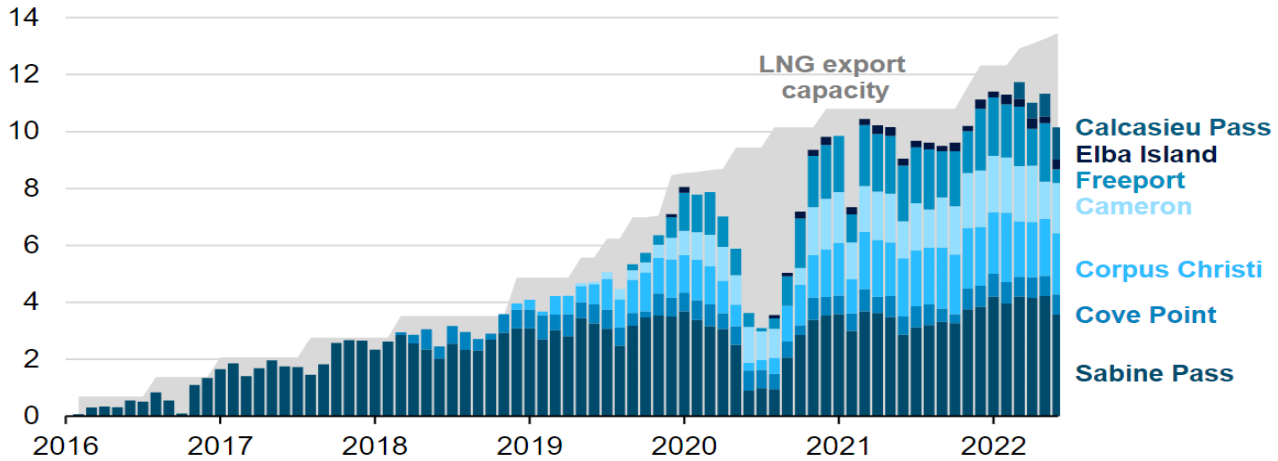
Remaining gas resources for key onshore North America regions



LNG Exports

The United States became the world's largest LNG exporter in the first half of 2022

Monthly U.S. liquefied natural gas (LNG) exports (Jan 2016–Jun 2022)
billion cubic feet per day



Data source: U.S. Energy Information Administration, *Liquefaction Capacity Table*, and U.S. Department of Energy *LNG reports*
Note: June 2022 LNG exports are EIA estimates based on tanker shipping data. LNG export capacity is an estimated peak LNG production capacity of all operational U.S. LNG export facilities.

US exports more LNG to Europe, less to Asia, Brazil, Mexico.

Exports of U.S. liquified natural gas, first half 2021 vs. first half 2022.

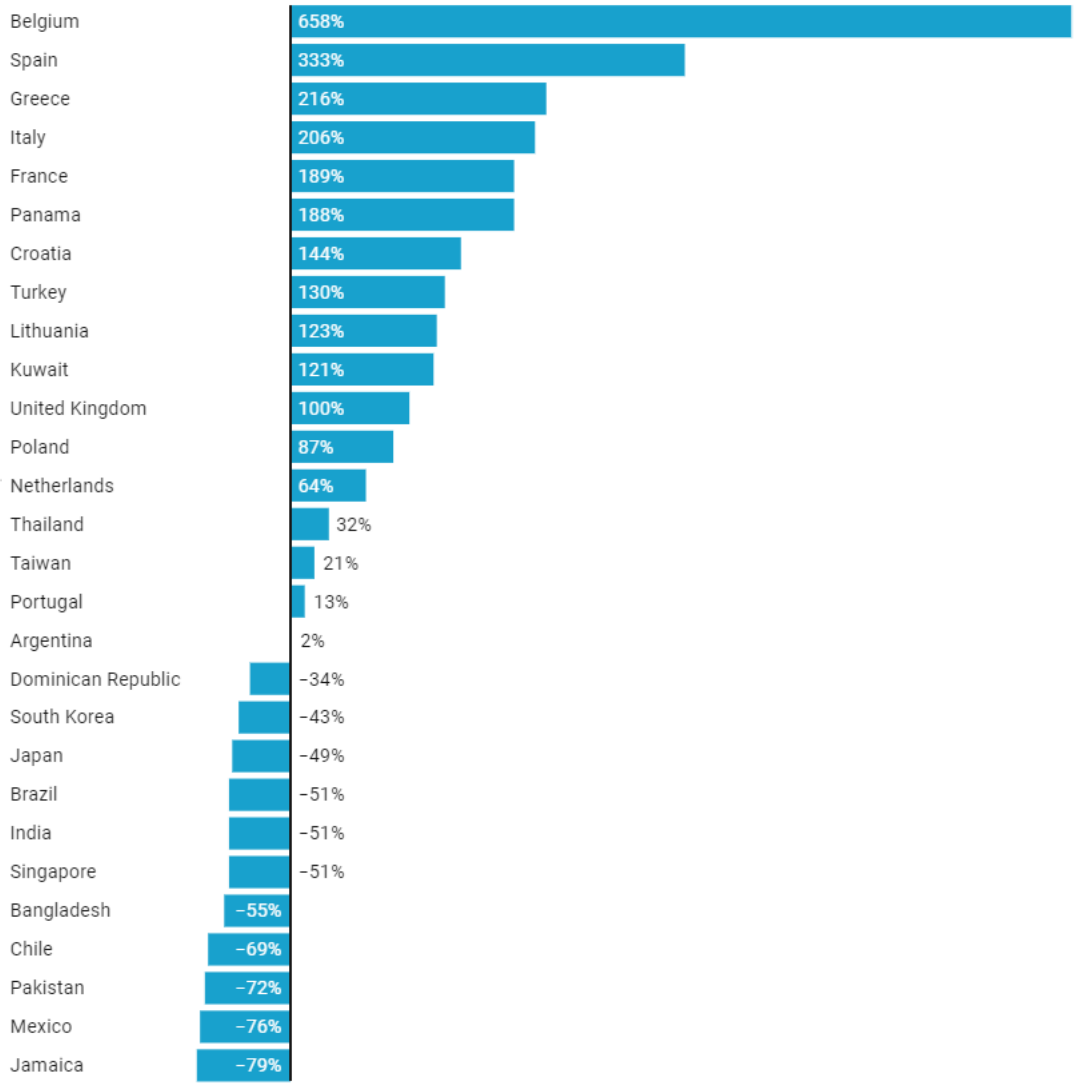


Chart: Reuters staff • Source: Refinitiv • Get the data

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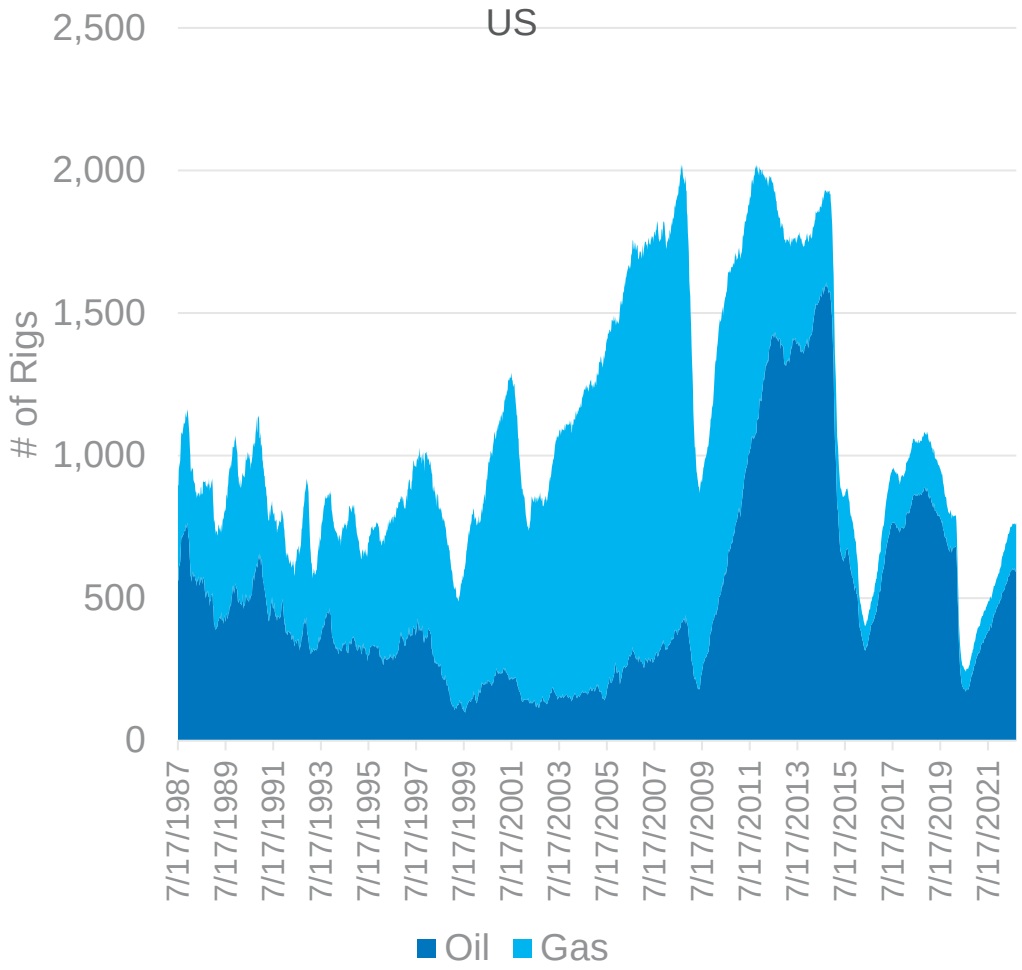
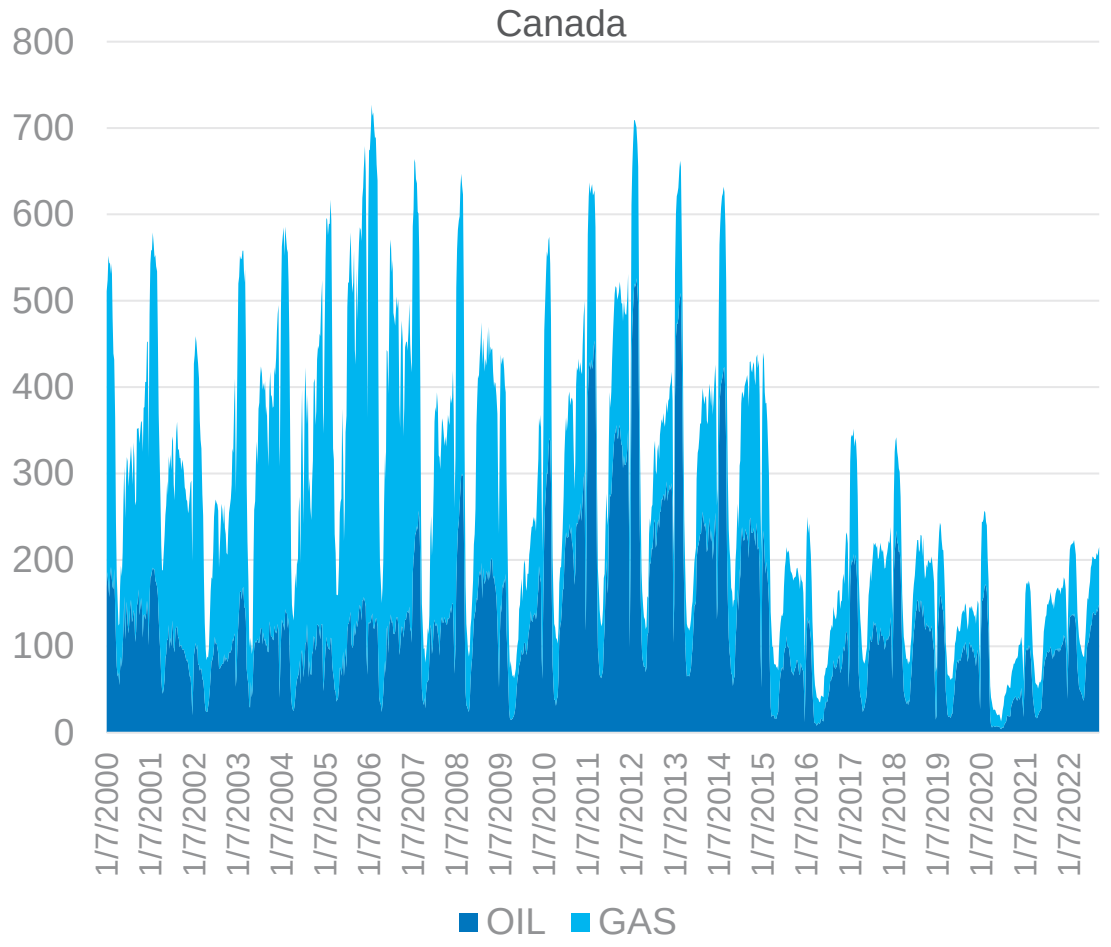
North American Rig Count





Source: Baker Hughes

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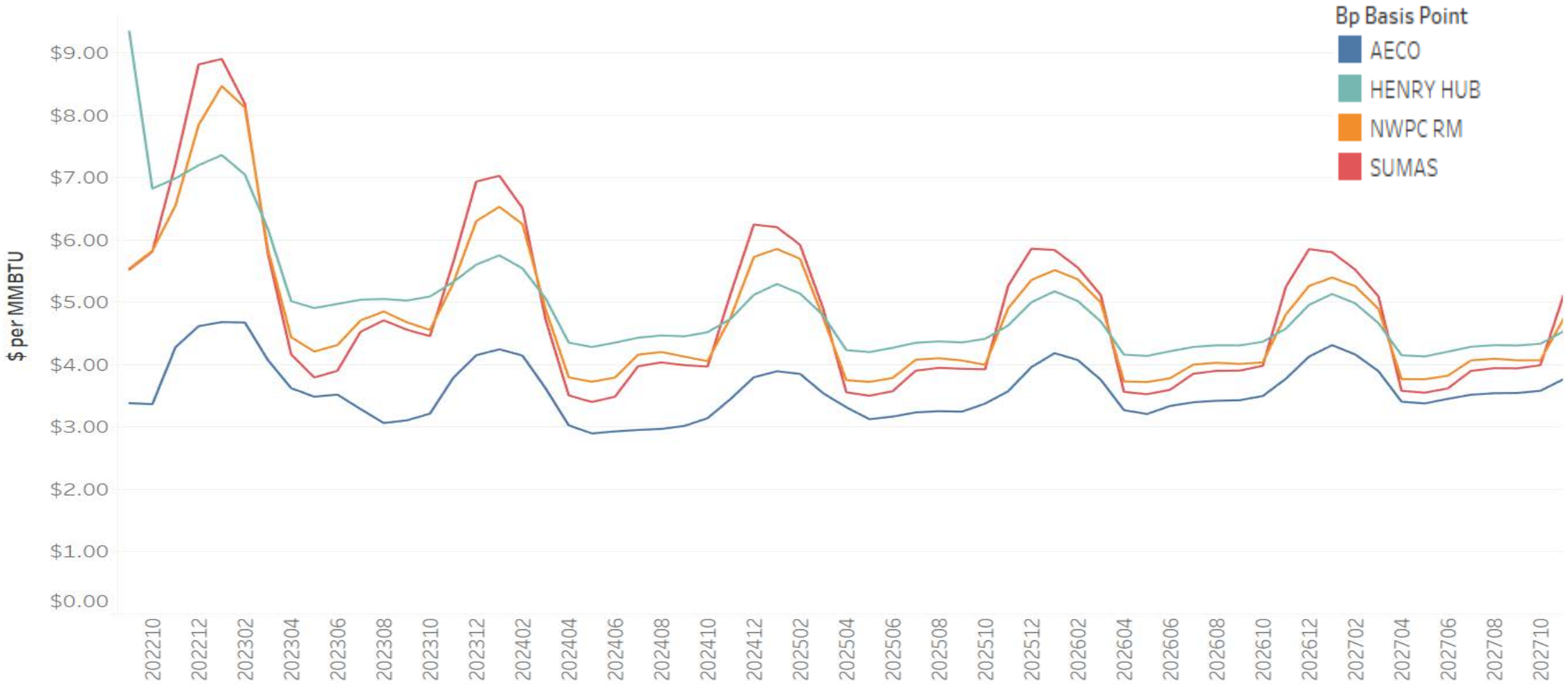
Forward Prices (9/23/2022)



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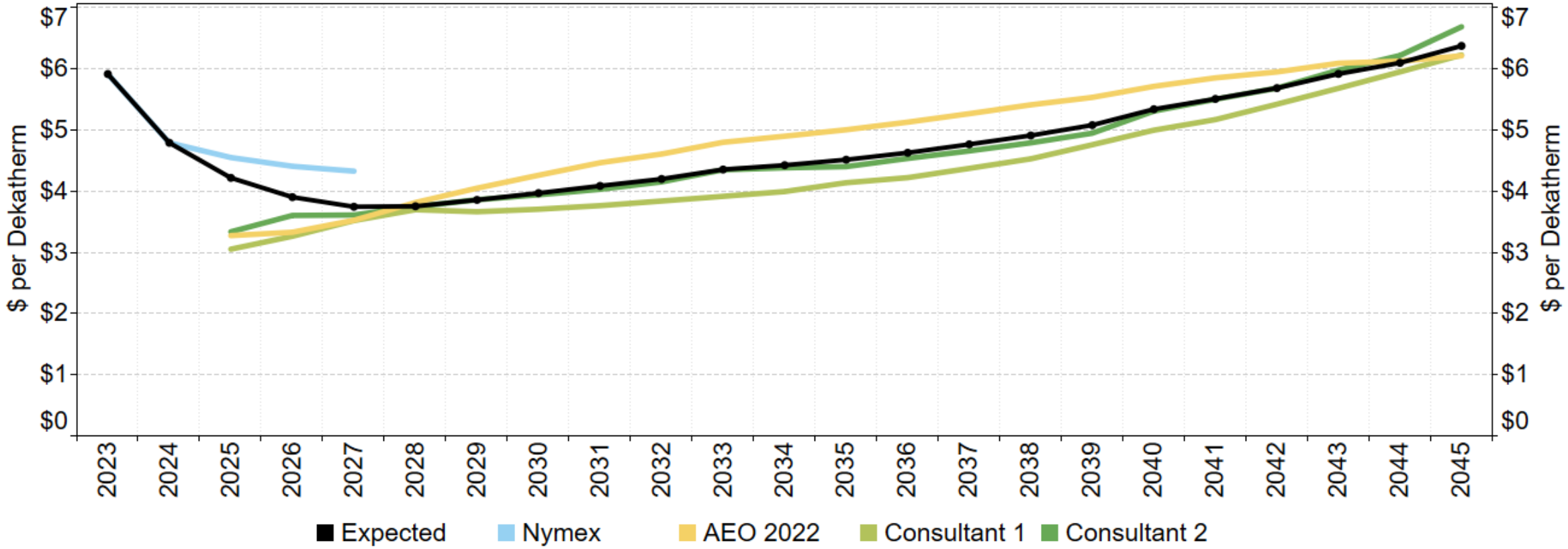
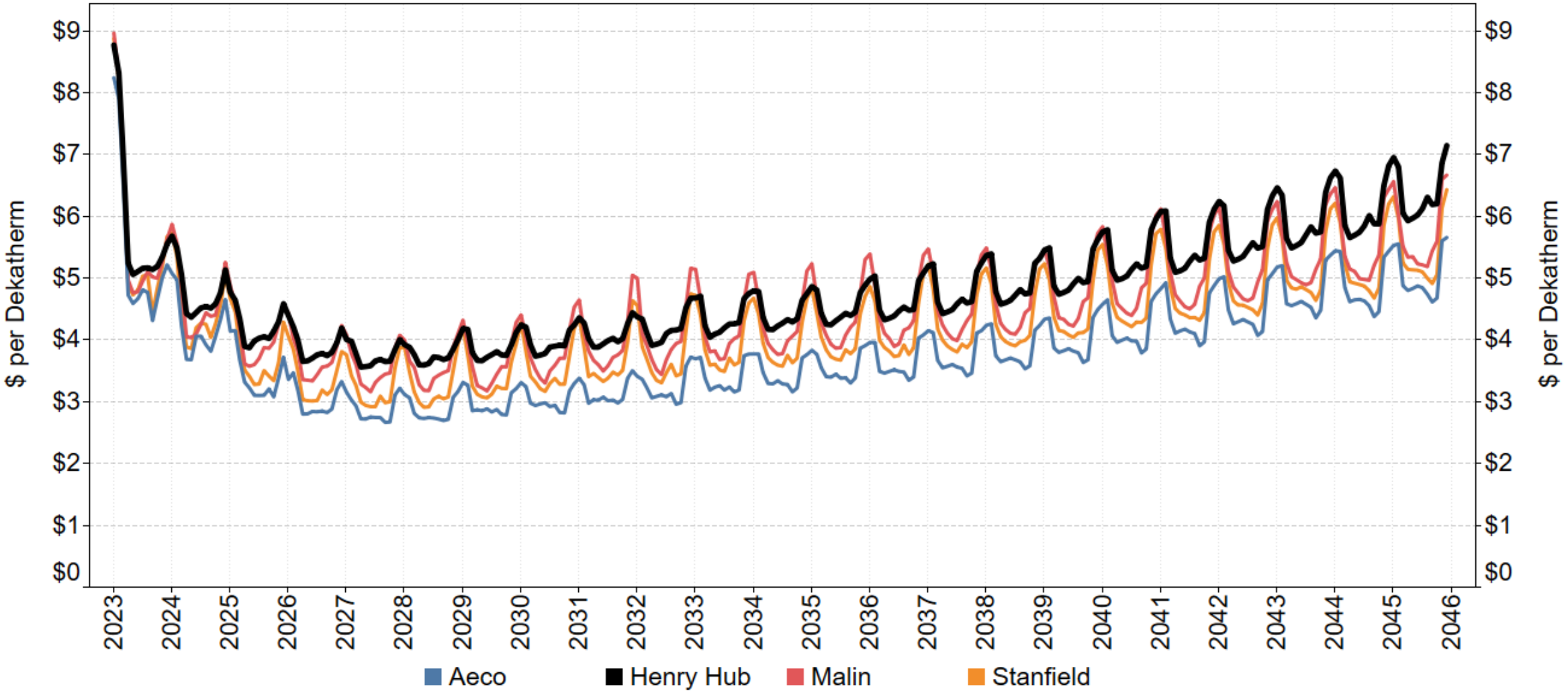
Price Forecast Blending

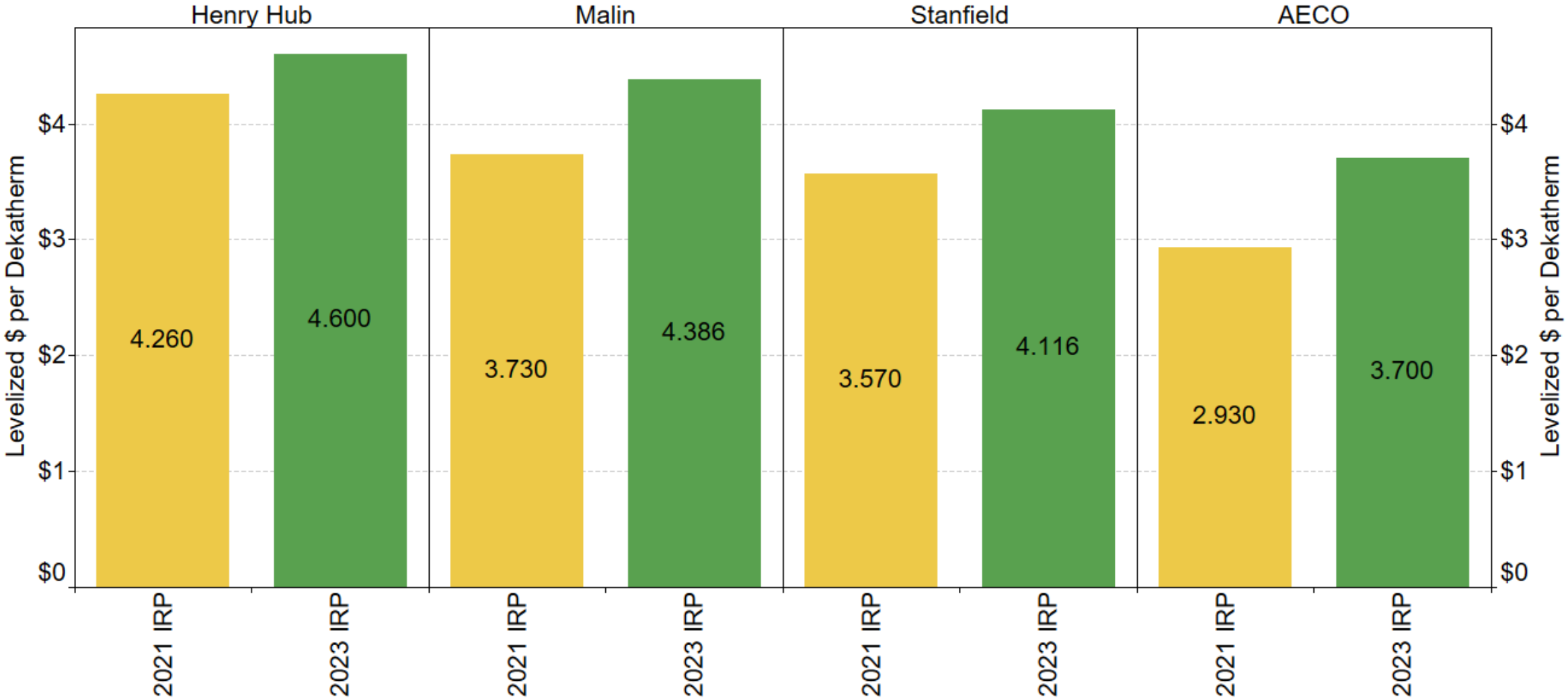


	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
NYMEX	100%	100%	75%	50%	25%																		
AEO 2022			8%	17%	25%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%
Consultant 1			8%	17%	25%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%
Consultant 2			8%	17%	25%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%

Expected Case Price Forecasts



Levelized Costs (2023 – 2045)



PLEXOS Stochastics

4.3.1. Autocorrelation Model

In the autocorrelation model, the differential equation is:

$$e_t = a \times e_{t-1} + (1-a) \times r_t \times P_t \times S$$

where:

e_t is the error for time period t

a is the autocorrelation parameter (between 0 and 1)

r_t is a normal distributed random number

P_t is the expected value (profile value) in period t

S is the error standard deviation

The input parameters here are the Autocorrelation and the Error Std Dev (alternatively Abs Error Std Dev. Autocorrelation is expressed as percentage value (between 0 and 100). The higher the autocorrelation, the more the 'randomness' of the errors is dampened and smoothed out over time. The higher the standard deviation, the greater the volatility of the errors. Because the error function can produce any positive or negative value (at least in theory) it is often necessary to bound the profile sample values produced by this method. The Variable properties Min Value and Max Value are used for this purpose. The actual sample value used at any time is simply the sum of the profile value and the error (which may be positive or negative) bounded by the min and max values.

Table 2 shows some simple example input where the profile value is static but has an error function with standard deviation of 28%. In a real application the profile value would change across time *e.g.* read from a flat file. Figure 6 shows the resulting distribution of sample values from 1000 samples, which follows a normal distribution. Figures 7 and 8 shows the output sample 1 profiles with the autocorrelation parameter set to 0% and 75% respectively. Note that the overall distribution of the sample values is still normal as in Figure 6, but the individual sample volatility is damped.

PLEXOS Stochastics Continued

Without Autocorrelation

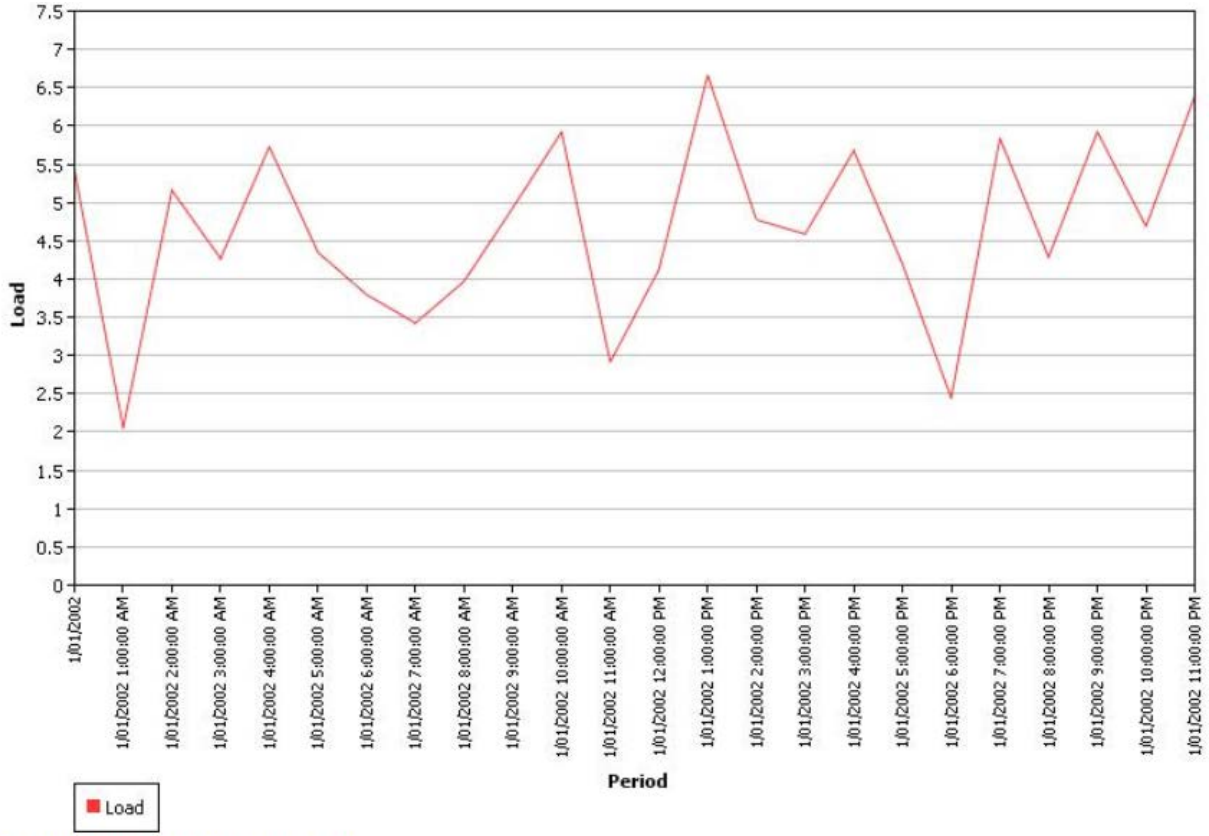


Figure 7: Sample 1 Profile with No Autocorrelation

With Autocorrelation

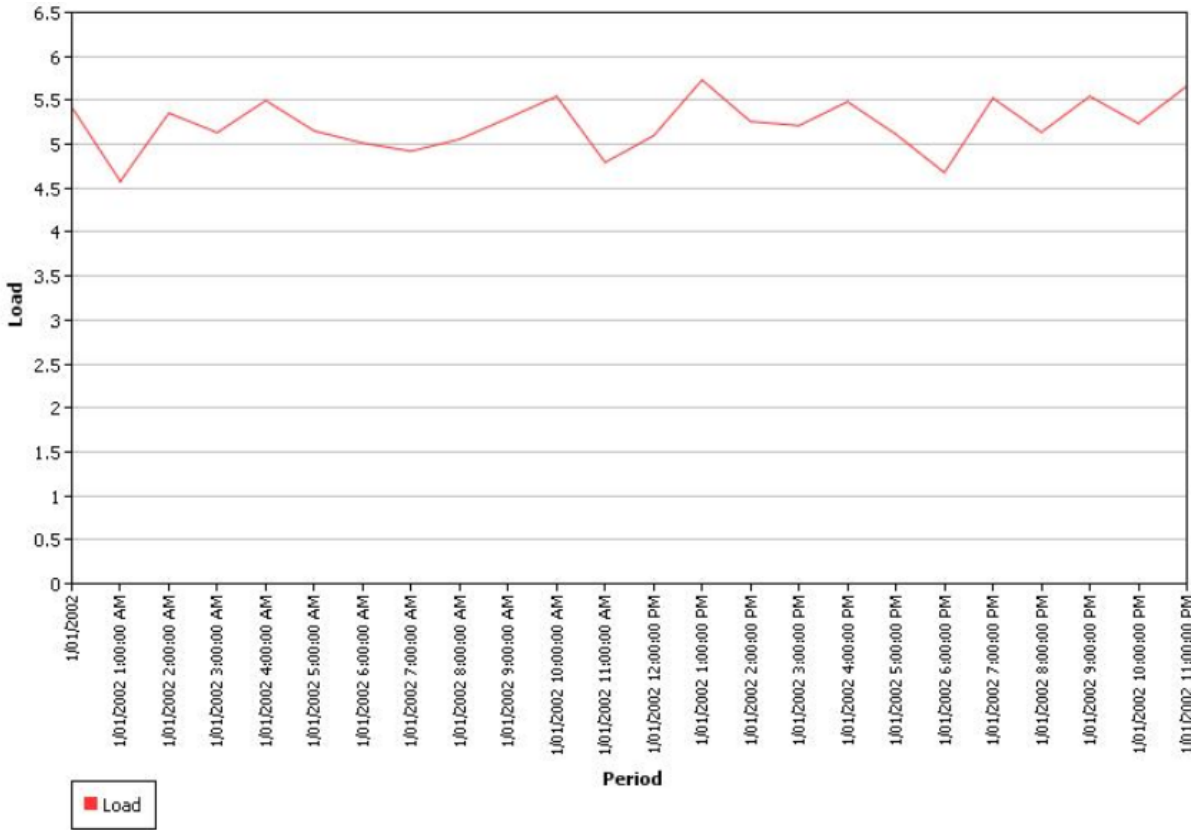
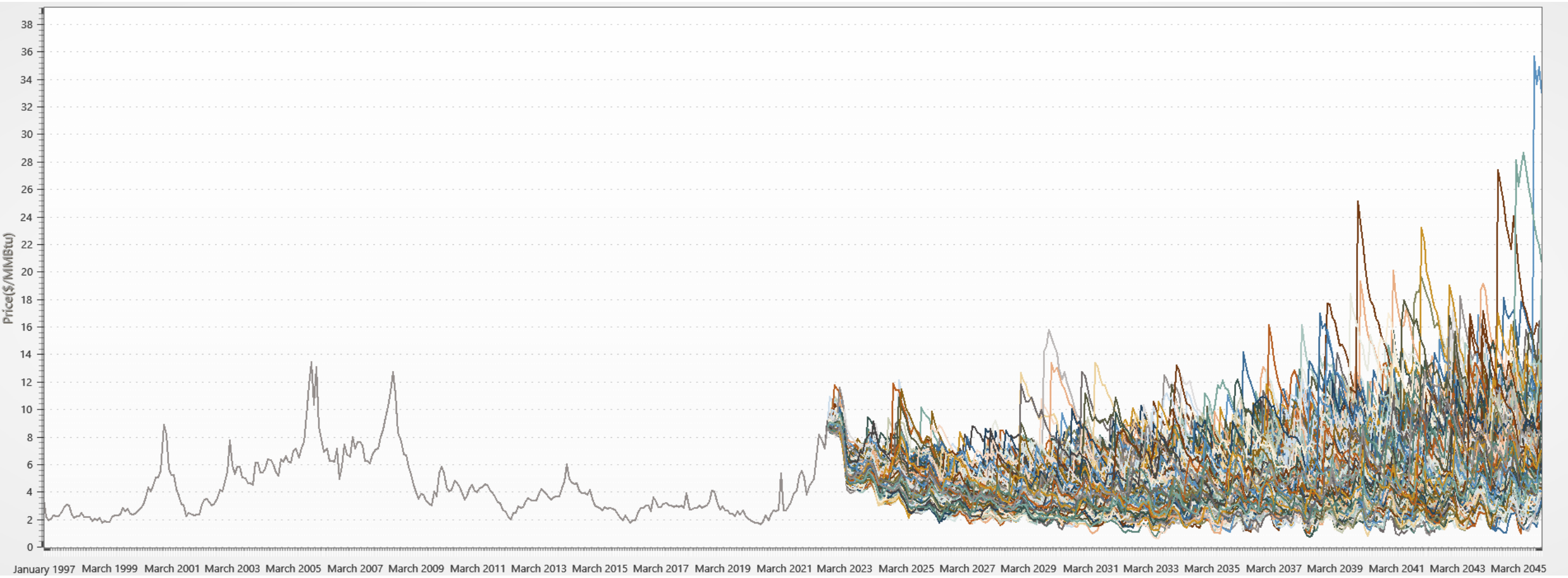


Figure 8: Sample 1 Profile with 75% Autocorrelation

Stochastics: Henry Hub (300 Draws)



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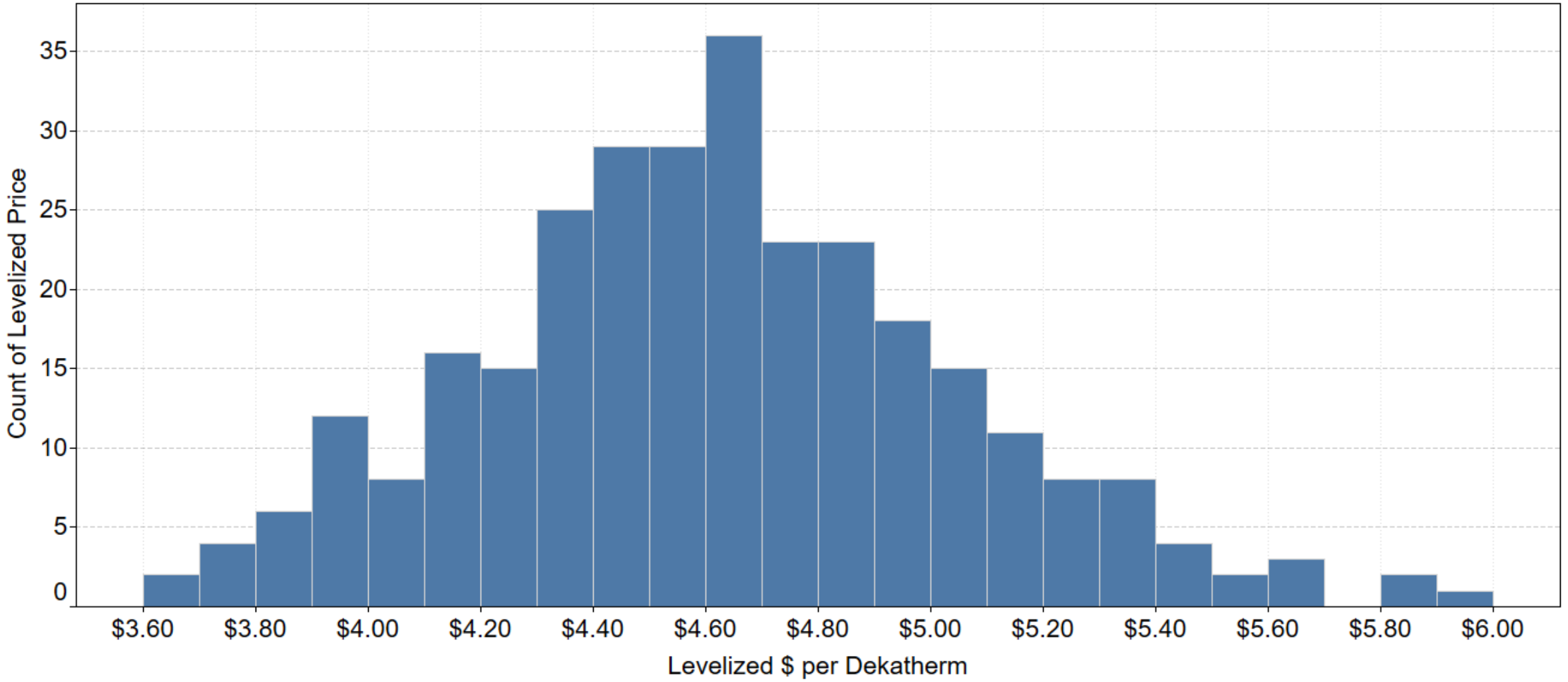
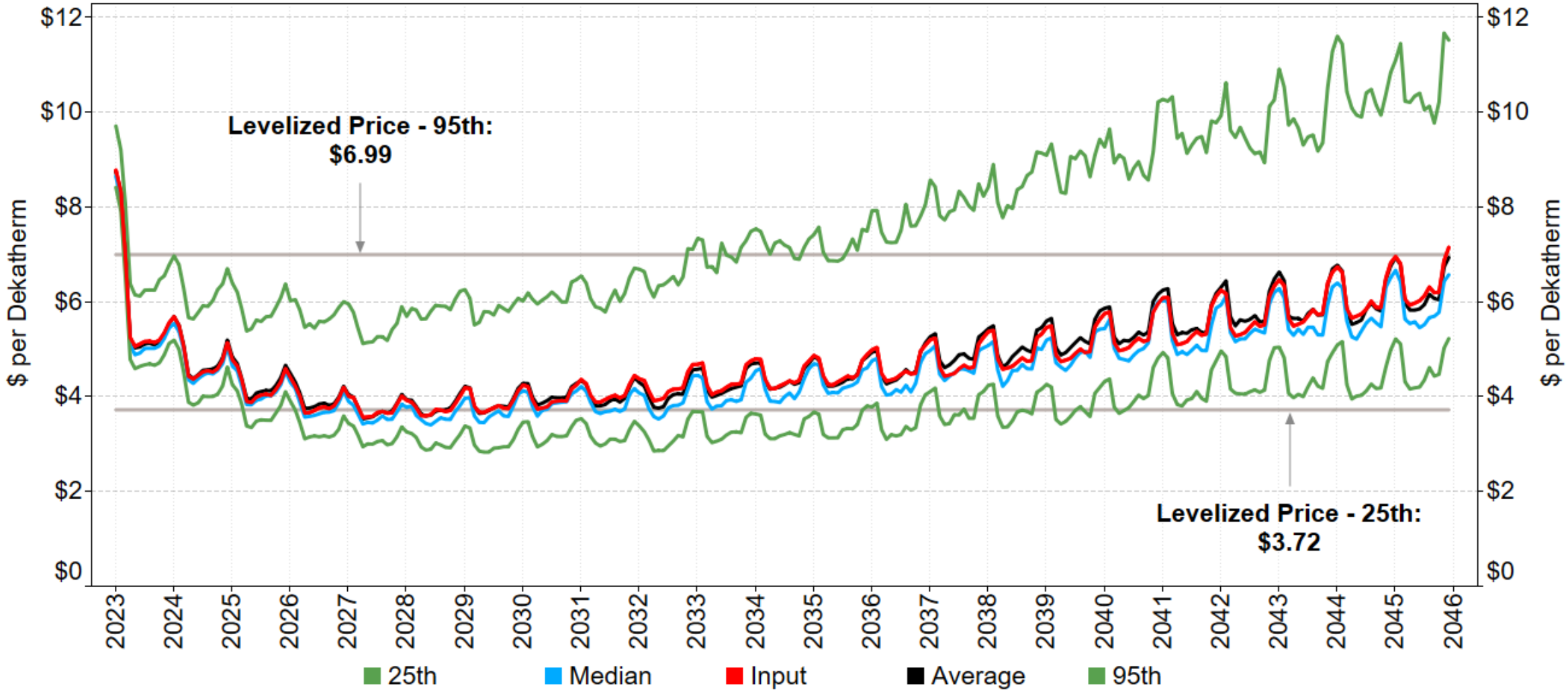
Stochastics: Henry Hub Levelized Prices (300 Draws)

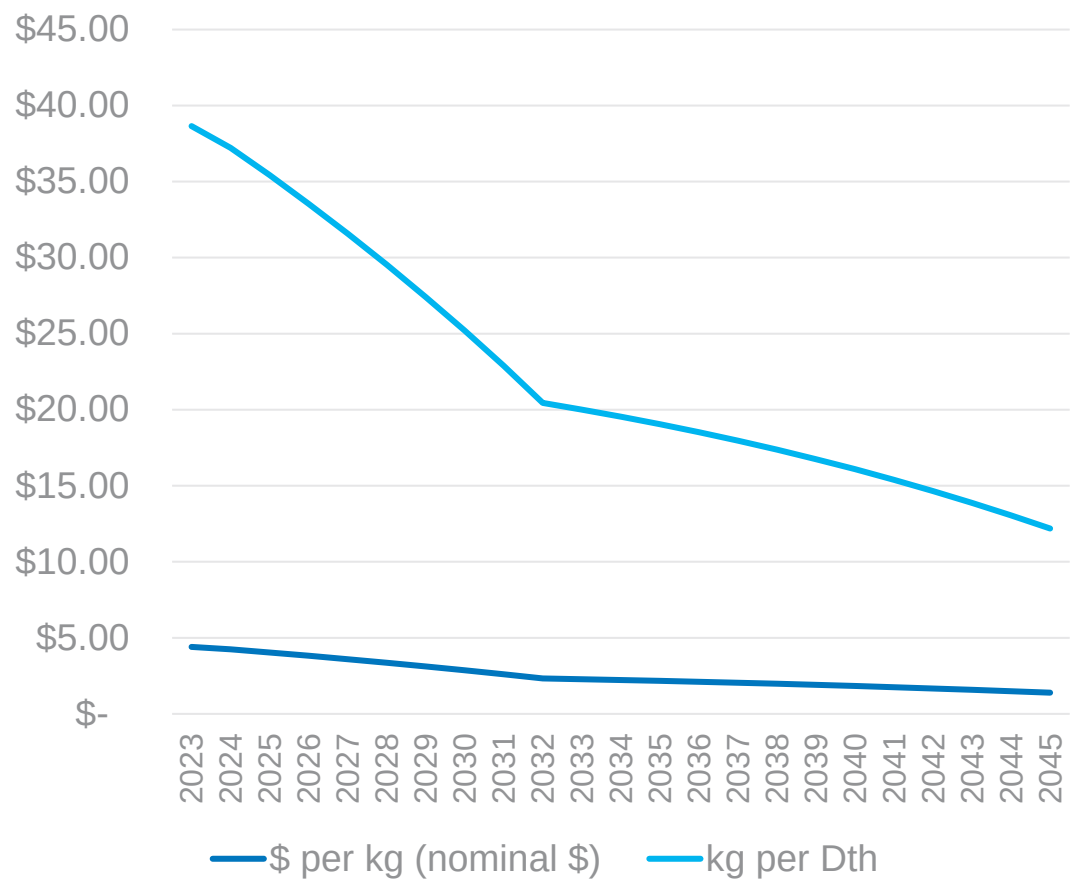


Results: Henry Hub Stochastics (300 Draws)



Green Hydrogen (H2)

- Hydrogen is the most abundant element in the universe
- The lightest element and wants to escape making it harder to contain
- Highly combustible
- Tax credits from IRA assumed at a levelized credit for the full $3 per kg incentive from green H2



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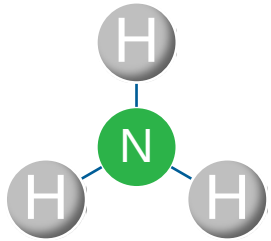
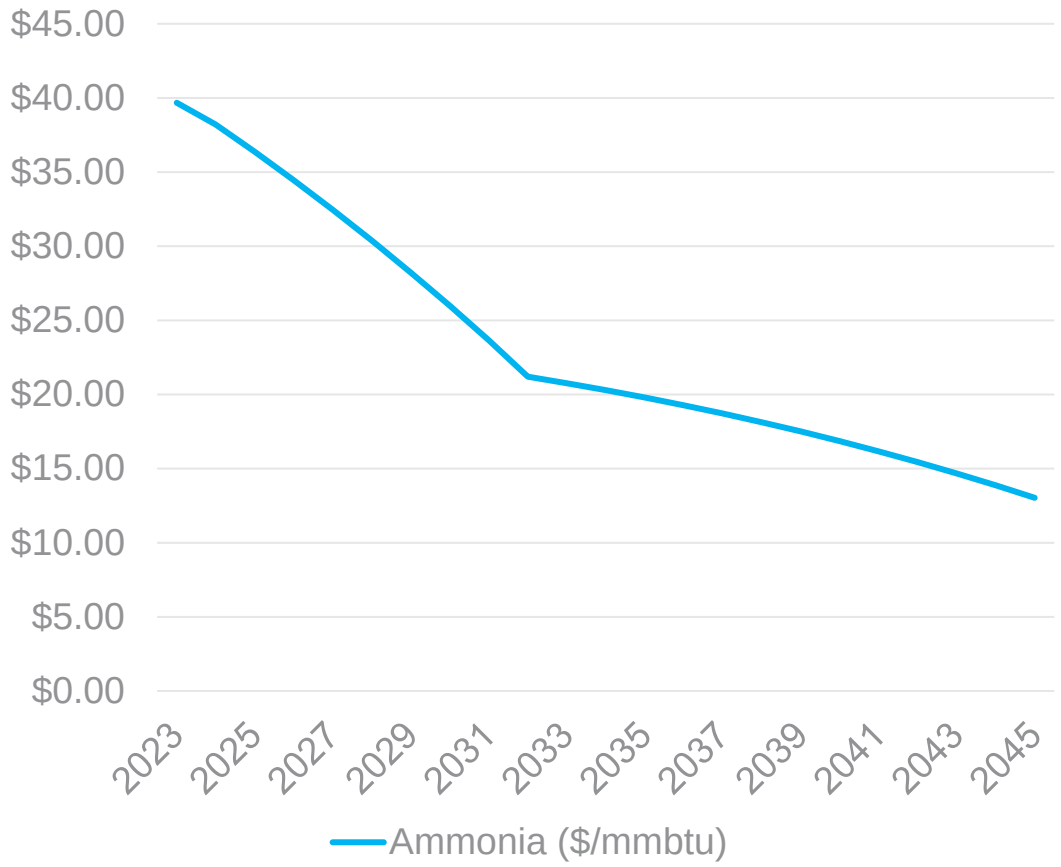
Ammonia



- One of the most produced chemicals in the United States
- Usually shipped as a compressed liquid in steel containers
- Not highly flammable
- Can be used as a fuel in emission-free fuel cells and turbines
- Can be made using green H2 from water electrolysis and nitrogen separated from the air
    - Fed into the “Haber Process” and combined at high temperatures and pressures to produce ammonia



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Electric Wholesale Market Price Forecast

Lori Hermanson, Senior Resource Analyst
Electric IRP, Seventh Technical Advisory Committee Meeting
October 11, 2022

Overview

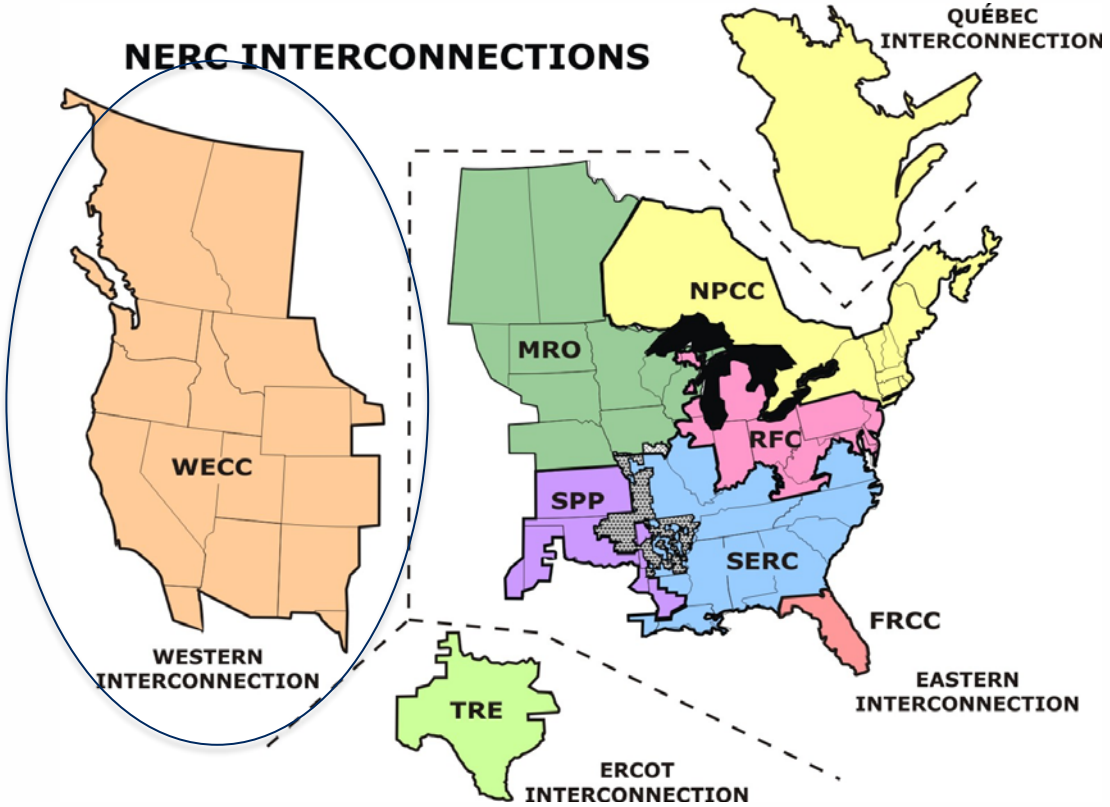
- This market price forecast will be used in the IRP

- Updated from draft price forecast presented in March
  - Loads
  - Climate impacts for hydro and loads
  - Natural gas and carbon prices
  - Consultant inputs

- Stochastics electric price modeling in process

Market Price Forecast – Purpose

- Estimate “market value” of resources options for the IRP
- Estimate dispatch of “dispatchable” resources
- Informs avoided costs
- May change resource selection if resource production is counter to needs of the wholesale market

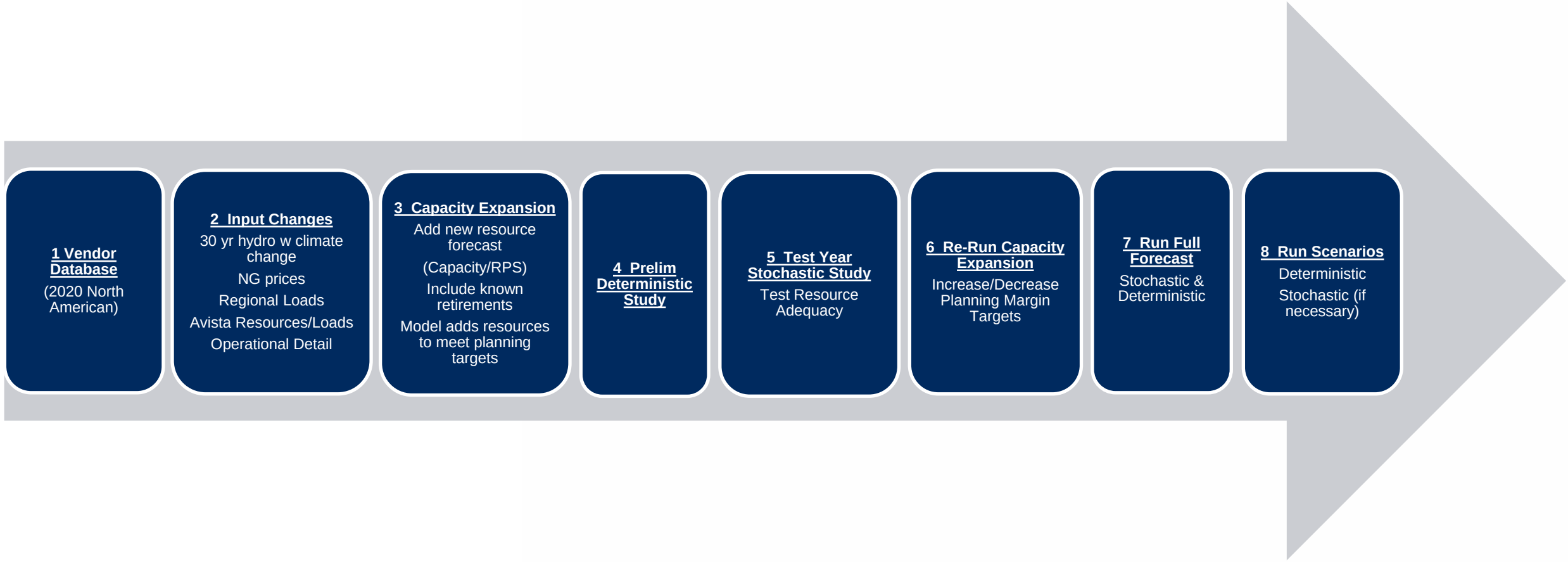


Source: NERC

Methodology

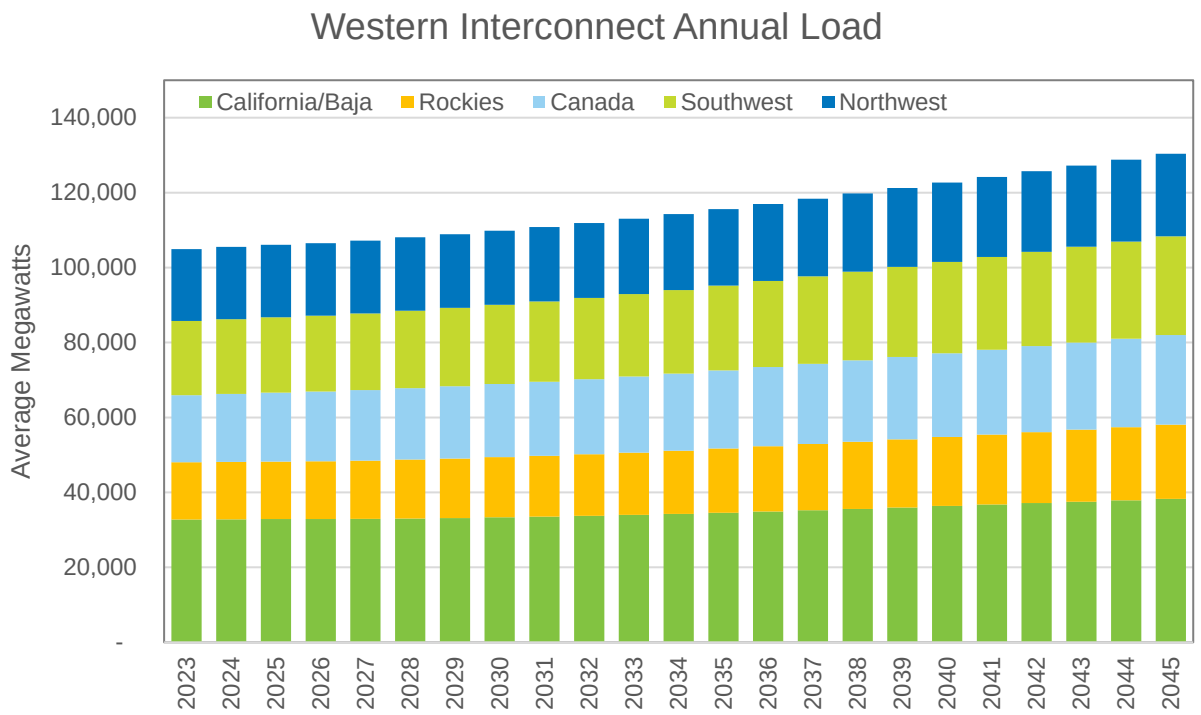
- 3rd party software - Aurora by Energy Exemplar
- Electric market fundamentals - production cost model
- Simulates generation dispatch to meet regional load
- Outputs:
  - Market prices (electric)
  - Regional energy mix
  - Transmission usage
  - Greenhouse gas emissions
  - Power plant margins, generation levels, fuel costs
  - Avista's variable power supply costs

Modeling Process



Load Forecast

- Regional load forecast from IHS
  - Forecast includes energy efficiency
- Add net meter resource forecast
  - Annual input with hourly shape
- Add electric vehicle forecast
  - Annual input with hourly shape
- Future load shape differs from today's load shape

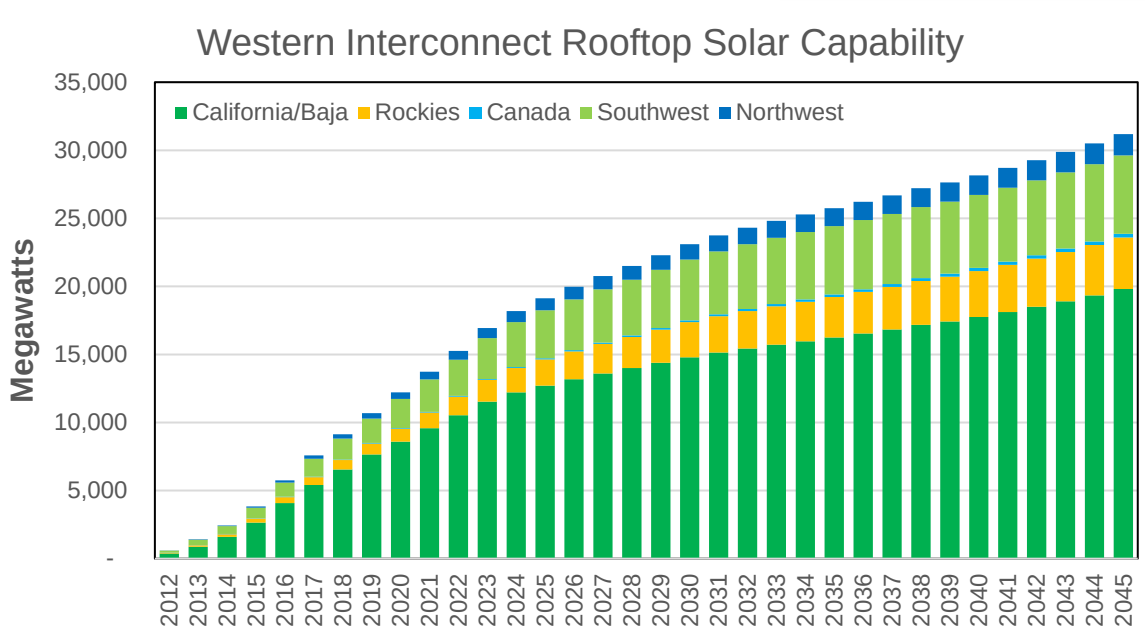


Draft Forecast

Electric Vehicle and Solar Adjustments

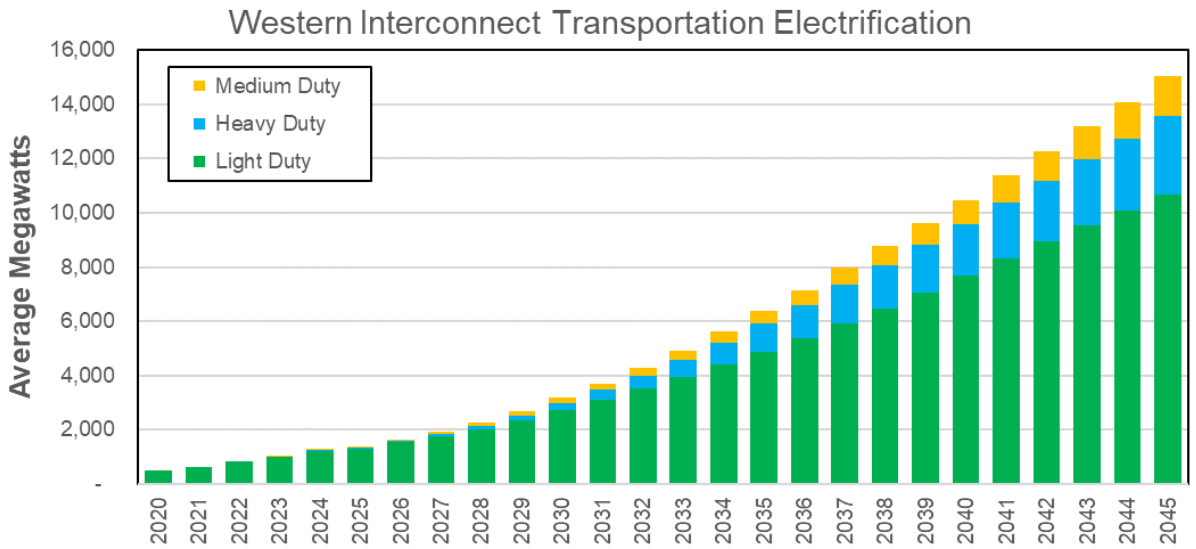
Roof Top Solar

- EIA existing estimates for history
- IHS regional growth rates



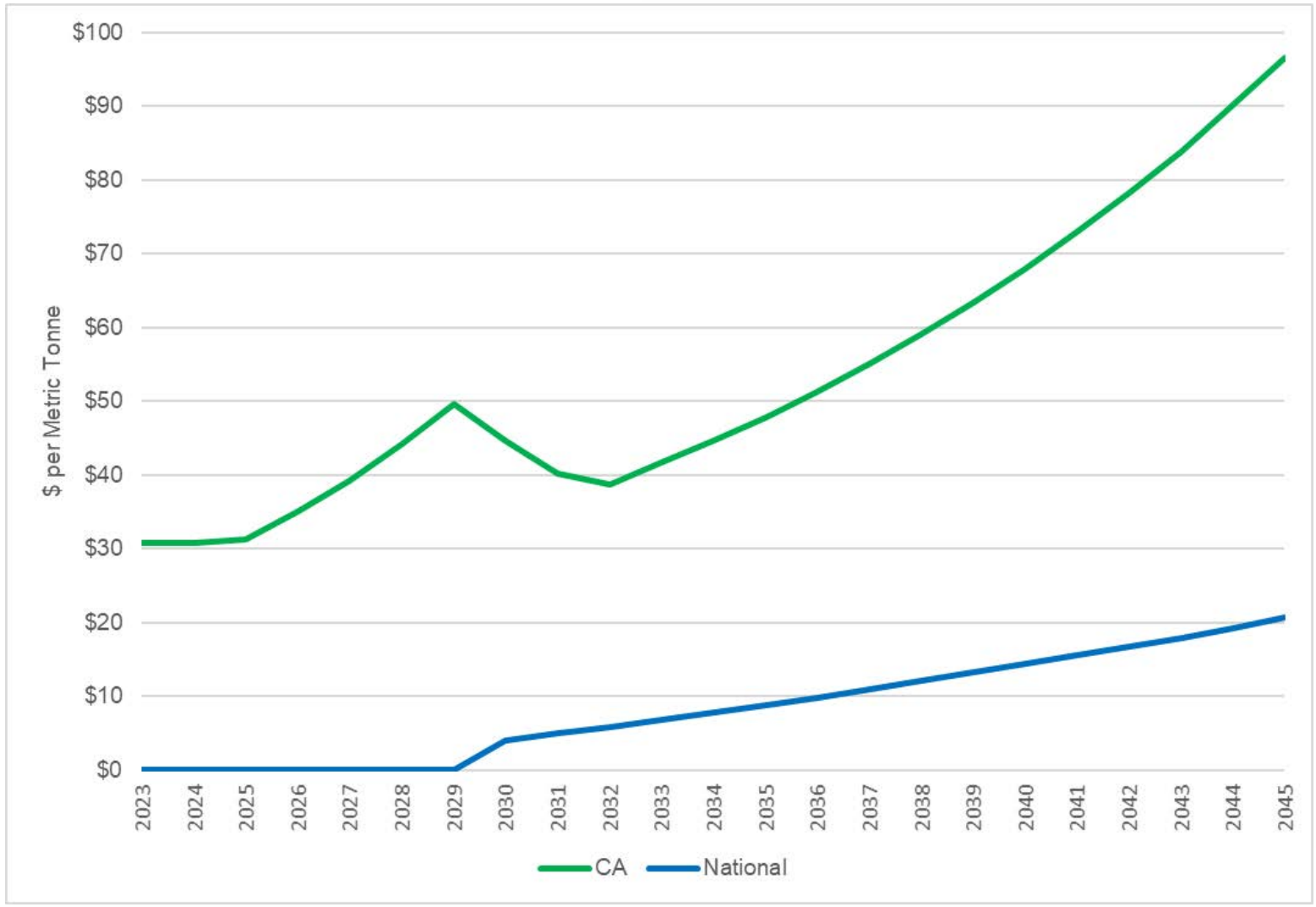
Electric Vehicles

- Penetration rates increase each year
- 15-65% light duty (2040)
- 12-15% medium duty (2040)
- 5% heavy duty (2040)



Draft Forecast

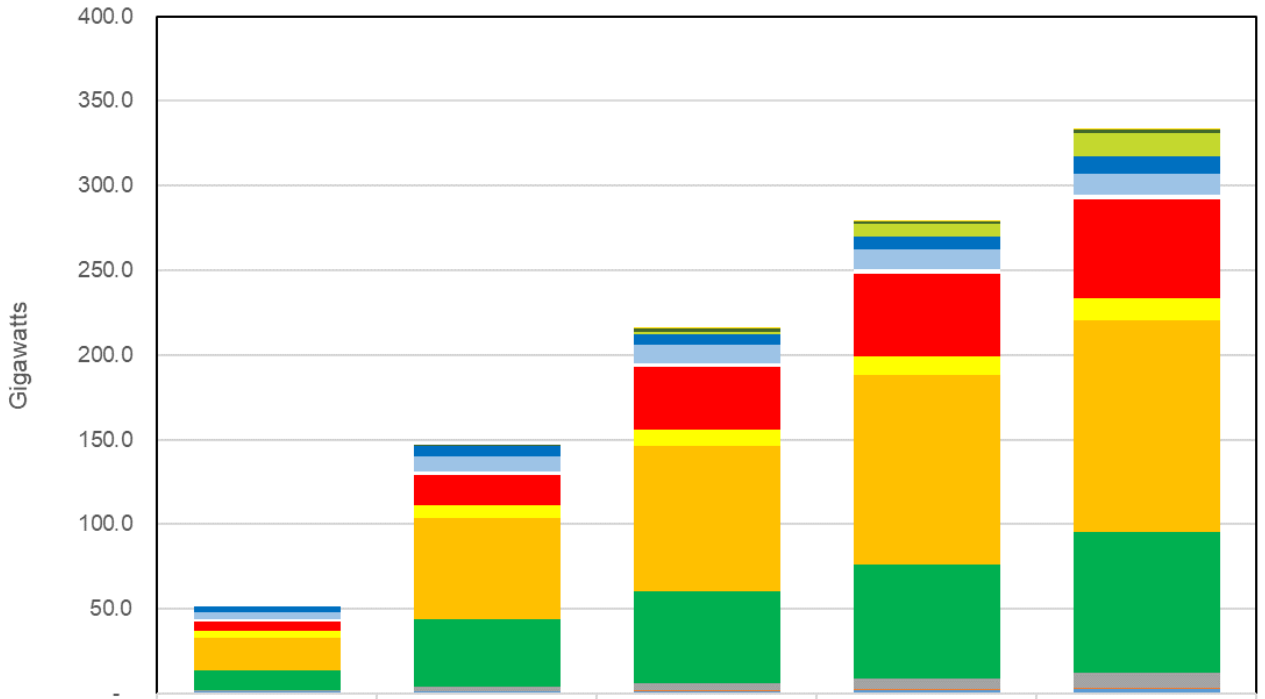
WECC Weighted GHG Emission Prices



- CA current prices + 2030 national carbon price
- $5.43 levelized per Metric Tonnes (WA)
- Revised 2019 IEPR Carbon Price Projections (CA) and national price estimate (consultant)
- To address imports, exporting region incurs a carbon price adder to transfer power
- CCA rules are not final; still determining the price forecast impact from CCA; will publicize final price forecast when complete

New Resource Forecast (Western Interconnect)

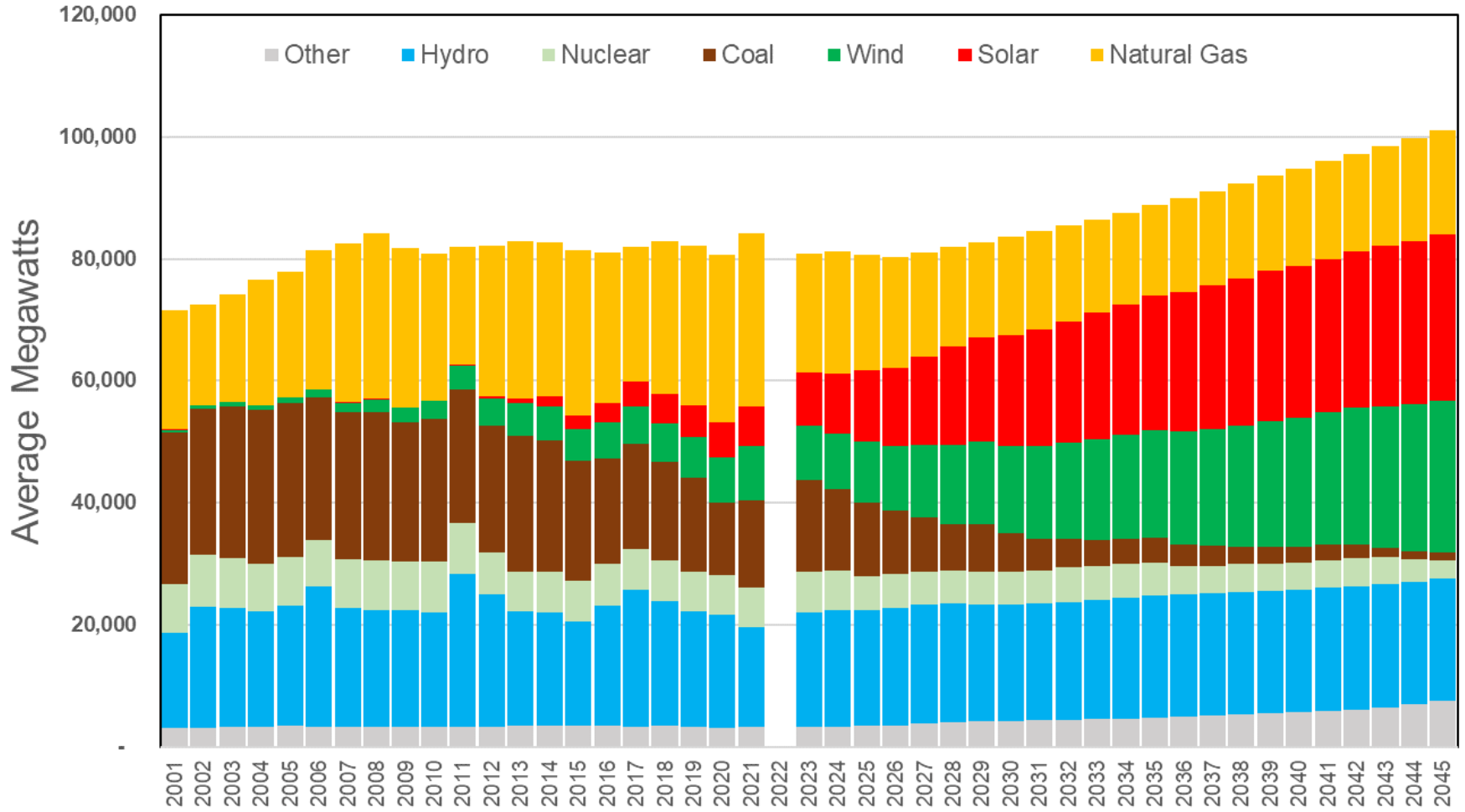
Draft Forecast



	2025	2030	2035	2040	2045
Nuclear	-	-	0.5	0.5	0.5
H2CT	-	0.5	1.4	1.7	2.4
OSWind	-	-	1.5	7.1	13.7
CCCT	3.8	6.2	6.2	7.9	10.0
SCCT	3.6	8.9	11.1	11.8	12.8
DR	1.5	2.1	2.3	2.5	2.8
Storage	5.2	18.3	37.0	48.7	58.1
Net-Meter	4.5	7.6	9.5	11.1	12.8
Solar	19.0	59.4	85.8	111.5	125.4
Wind	11.9	39.8	54.2	67.5	83.2
Geothermal	0.7	2.5	4.1	6.2	8.9
Biomass	0.1	0.3	0.5	0.7	0.8
Hydro	1.3	1.5	1.8	2.1	2.5

Draft Forecast

U.S. West Resource Type Forecast

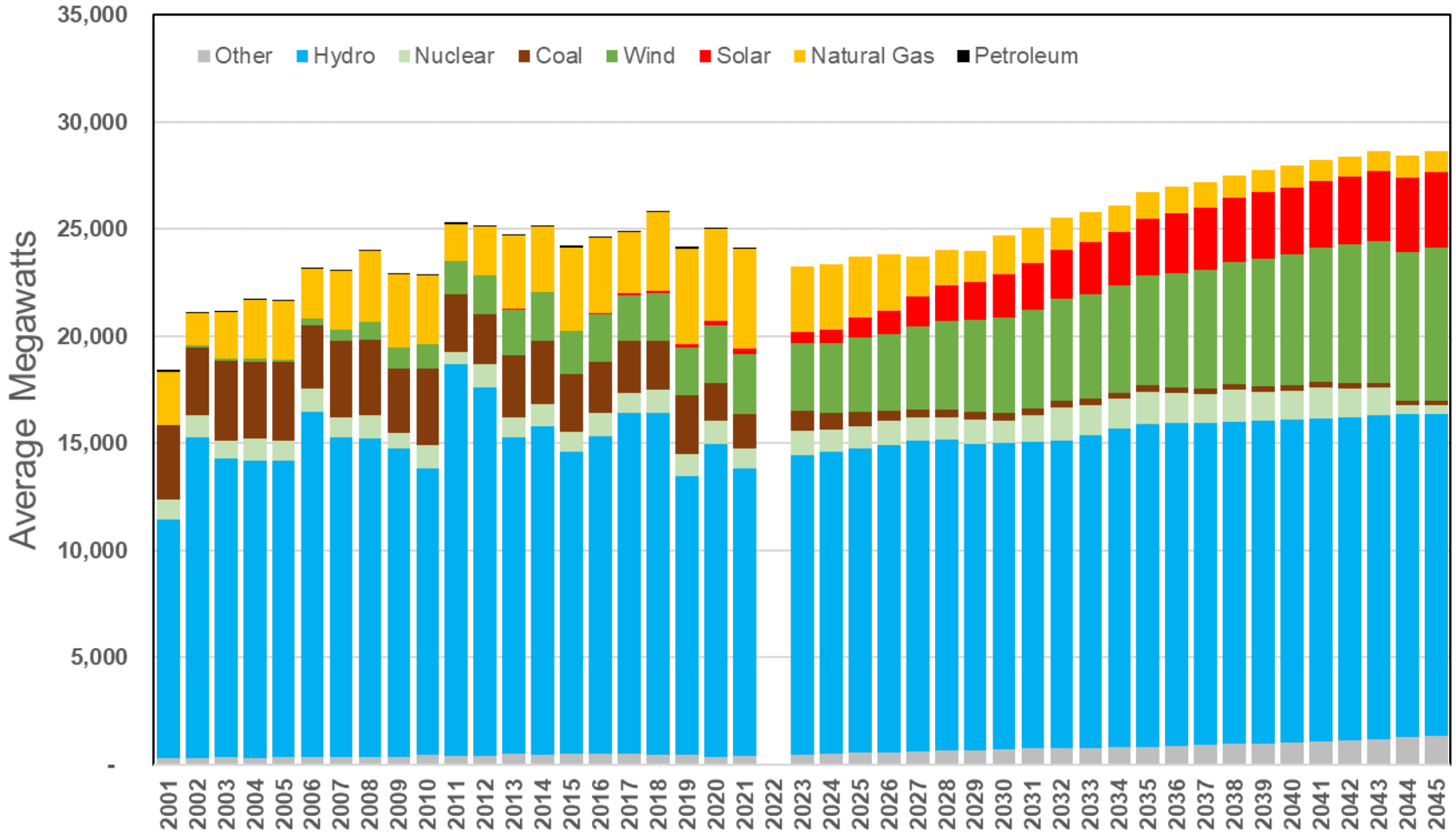


Significant changes
2045 to 2023 (aGW)

Solar:	+ 18.4
Wind:	+ 16.0
Nat Gas:	- 2.4
Coal:	- 13.6
Nuclear:	- 3.9
Other:	+ 5.7
Total:	+ 20.2

Draft Forecast

Northwest Resource Type Forecast

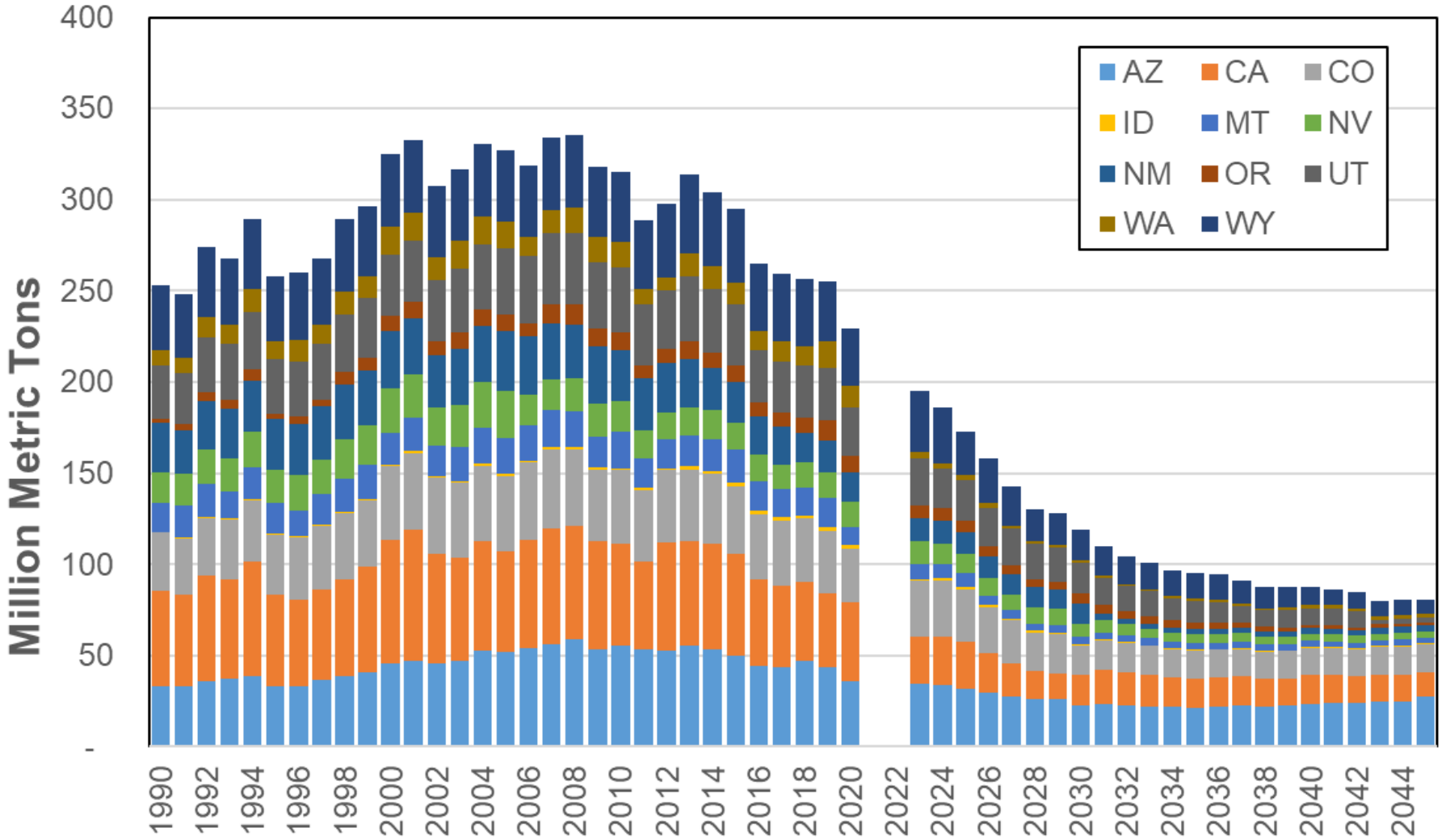


Significant changes (aGW)
2045 to 2023

Solar:	+ 3.0
Wind:	+ 4.0
Nat Gas:	- 2.1
Coal:	- 0.7
Other:	+ 0.2
Nuclear:	- 0.8
Total:	+ 5.4

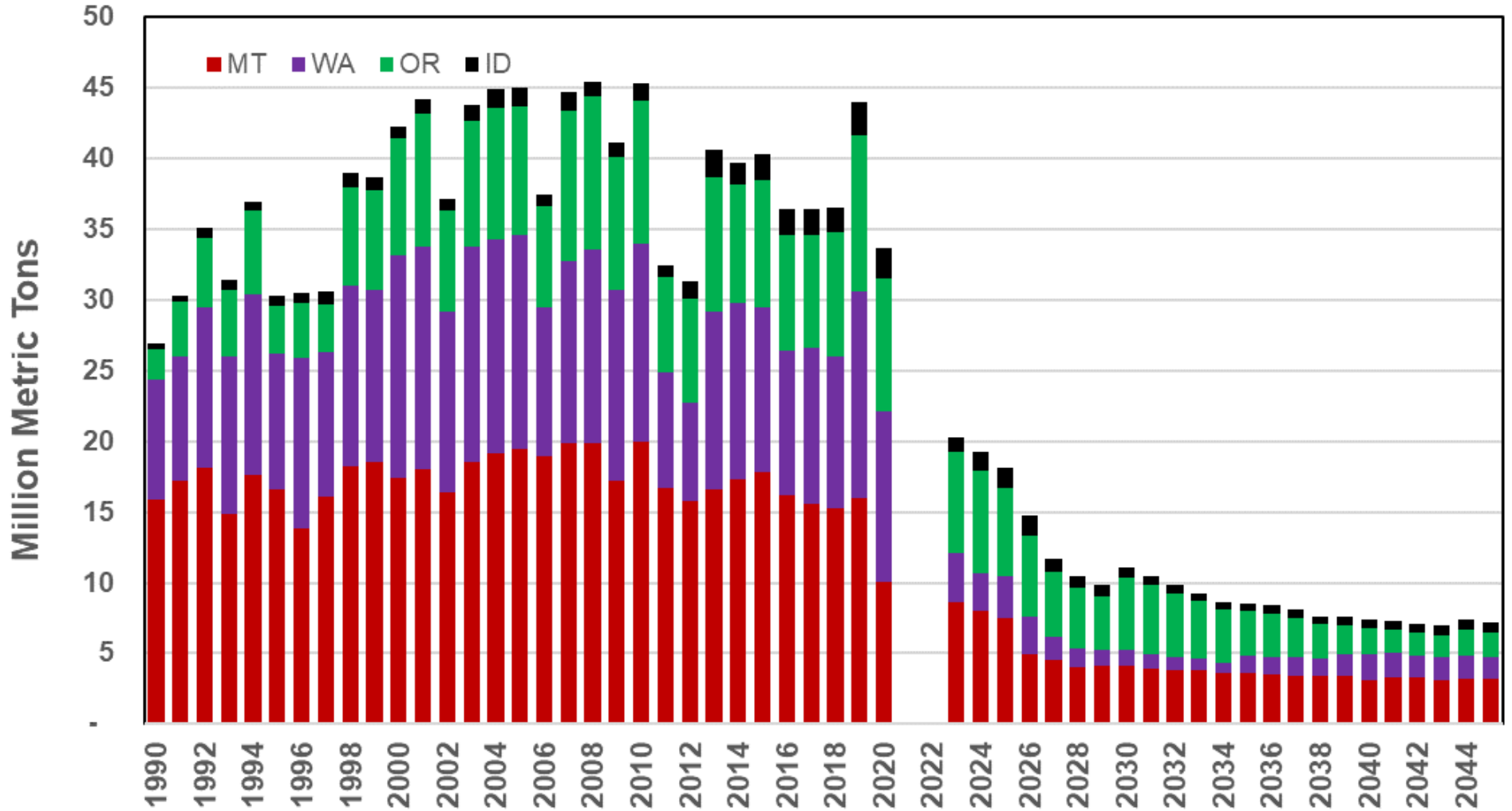
Greenhouse Gas Forecast
U.S. Western Interconnect

Draft Forecast



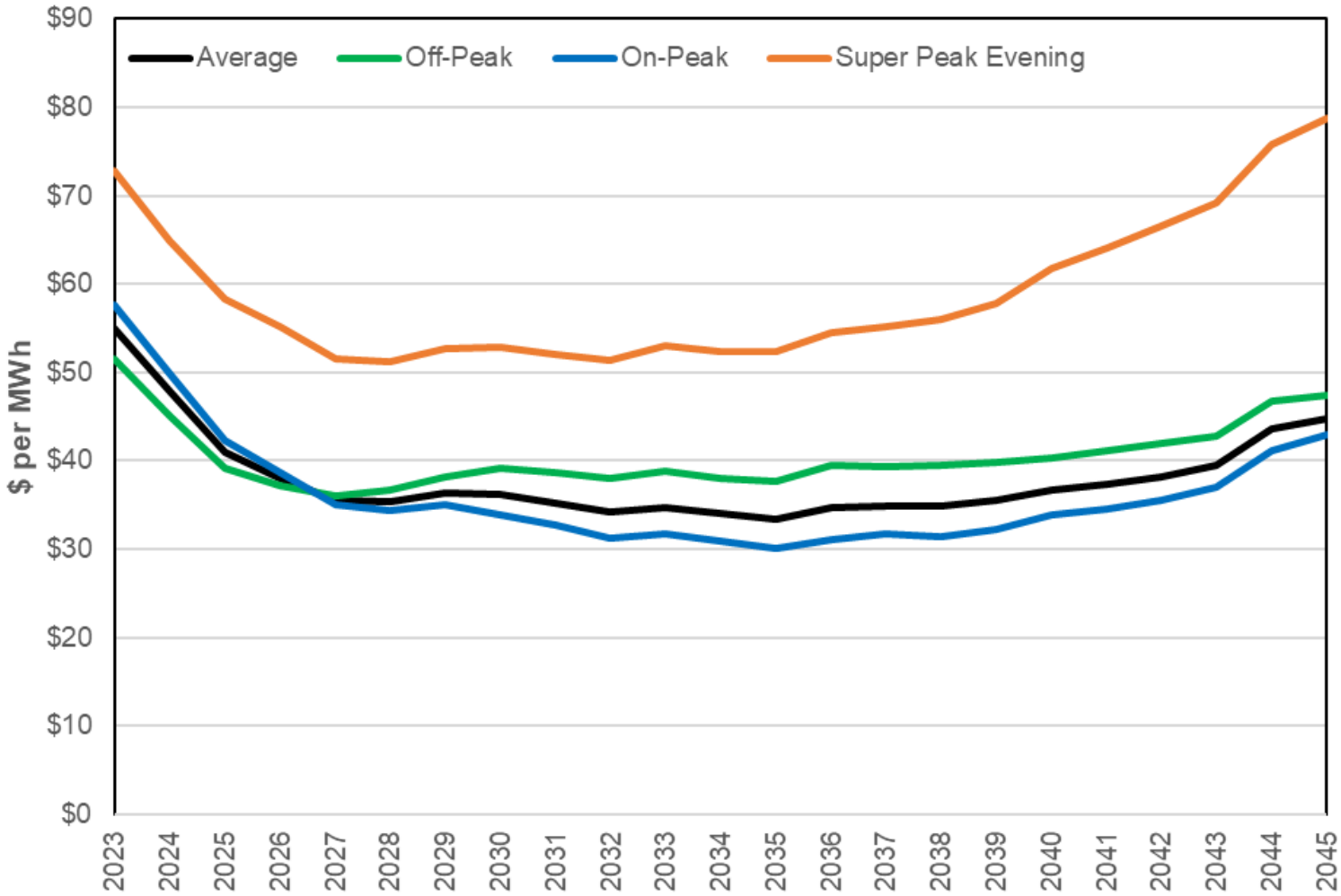
Greenhouse Gas Forecast
Northwest States

Draft Forecast



Draft forecast

Mid-C Electric Price Forecast

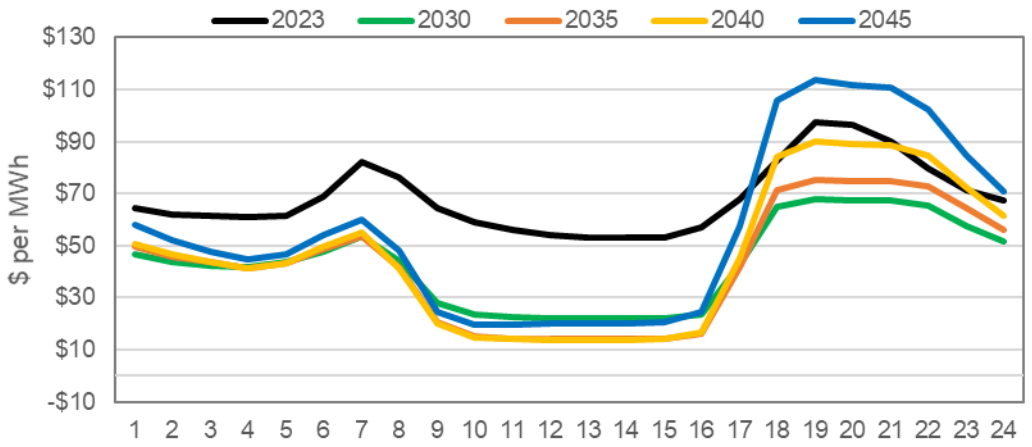


- Levelized Price:
  - 2023-45: $38.16/MWh
- Off-peak prices overtake on-peak in 2027 on an annual basis
- Super peak evening (4pm-10pm) prices remain high

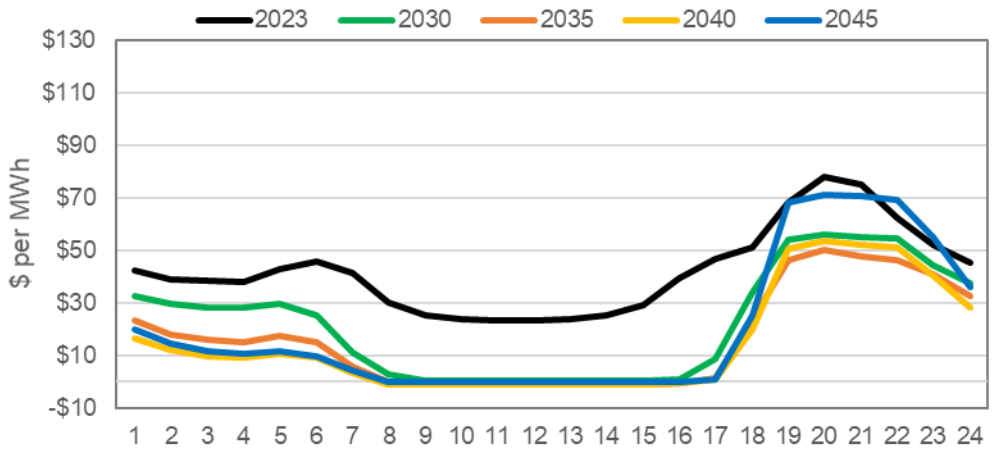
Draft Forecast

Hourly Wholesale Mid-C Electric Price Shapes

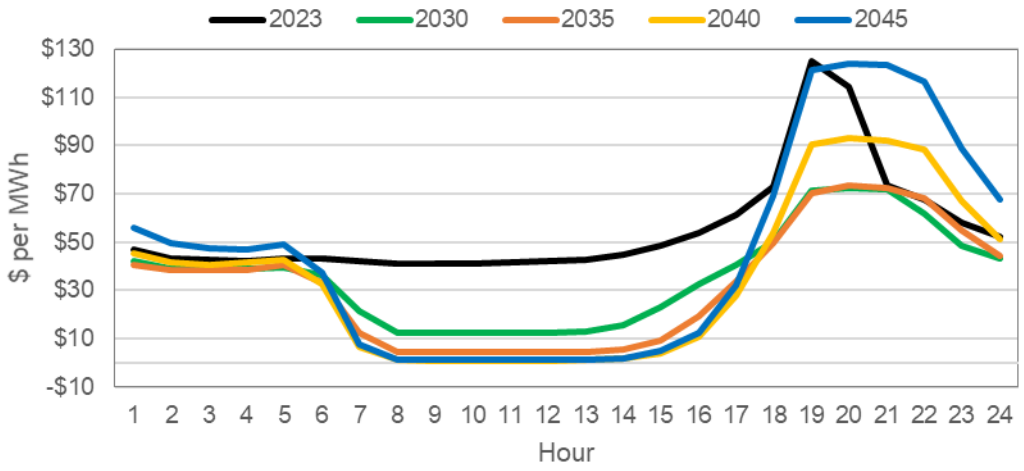
Winter: Dec 16 - Mar 15



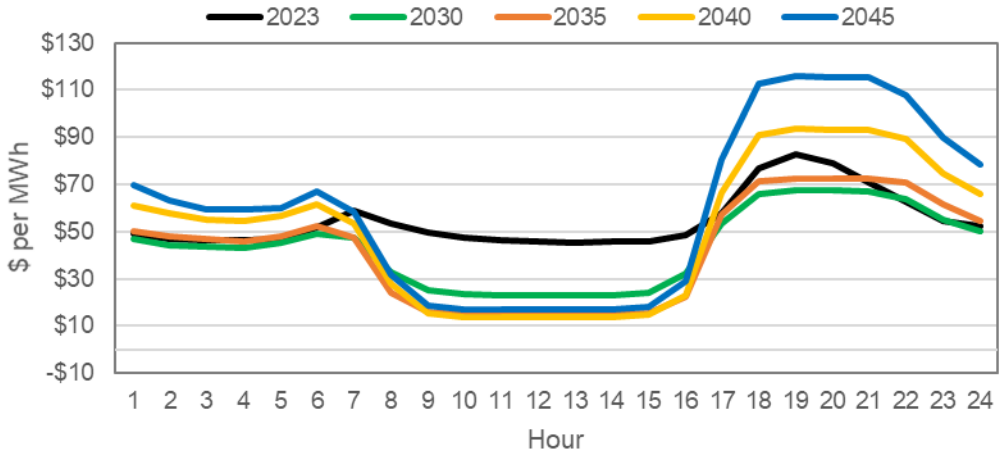
Spring: Mar 16 - Jun 15



Summer: Jun 16 - Sep 15



Fall: Sep 16 - Dec 15



Data Availability

Outputs

- Expected Case: annual Mid-C prices by iteration
- Expected Case: hourly Mid-C prices
- Regional resource dispatch
- Regional GHG emissions

WESTERN RESOURCE ADEQUACY PROGRAM

Review of preliminary, non-binding WRAP regional data for the current participating footprint

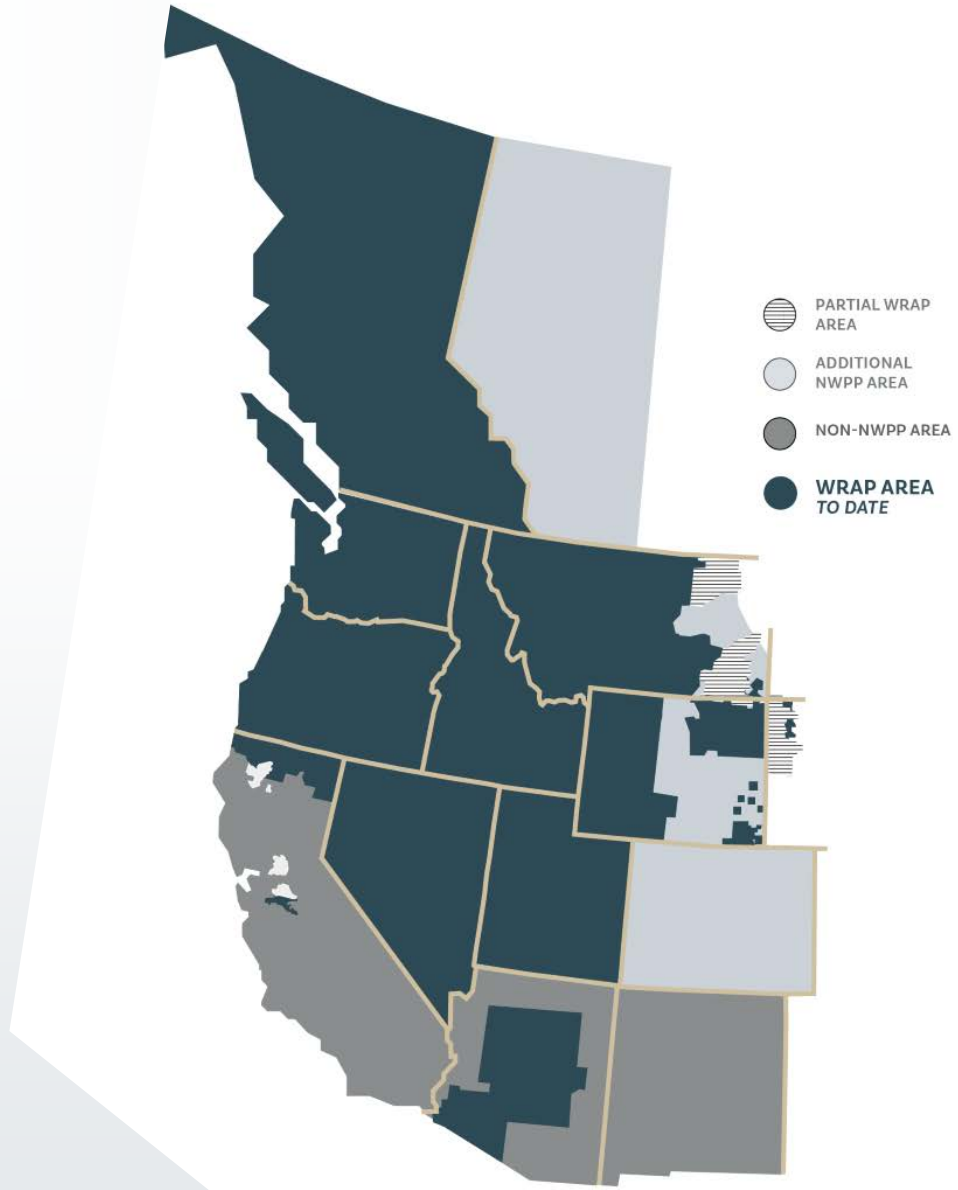
Avista IRP TAC Meeting

October 11, 2022

Link to public webinar

OVERVIEW

- *Reliability first!* Implementing a west-wide resource adequacy program must be a priority for the region as the regions resource mix changes
- Currently 26 utilities are participating in the WRAP non-binding program phase
- Western Power Pool is the Program Administrator and filed a tariff with FERC seeking program approval by the end of the year
- Southwest Power Pool is the Program Operator and performed all modeling and data analysis



WRAP
POWERED BY WPP

Today's Objectives

- Provide an overview of the loads and resources in the WRAP MW footprint
- Provide and overview of installations and nameplate for wind and solar
- Provide an overview of the QCC and ELCC values for each resource class
- Provide an overview of Planning Reserve Margin values (PRM)

WRAP
POWERED BY WPP

Before We Begin

- Modeling provided utilizes WRAP program design, assuming full binding implementation of the WRAP as designed
  - Metrics assume diversity benefit and a level of forward procurement on aggregate that is not presently expected without implementation of the WRAP
- Modeling was performed based on the current footprint of participants
  - Changes to WRAP participation in future phases will impact these metrics
  - These assessments cannot account for adequacy needs or activities of non-participating load or resources
- Be aware of the limits of drawing regional conclusions from aggregate information
  - Information is best applied at individual LREs; WRAP's scope does not include matching LREs in need of additional forward procurement with available resources
  - It cannot be assumed that all resources modeled in the loss of load expectation study will be available to the WRAP footprint

WRAP
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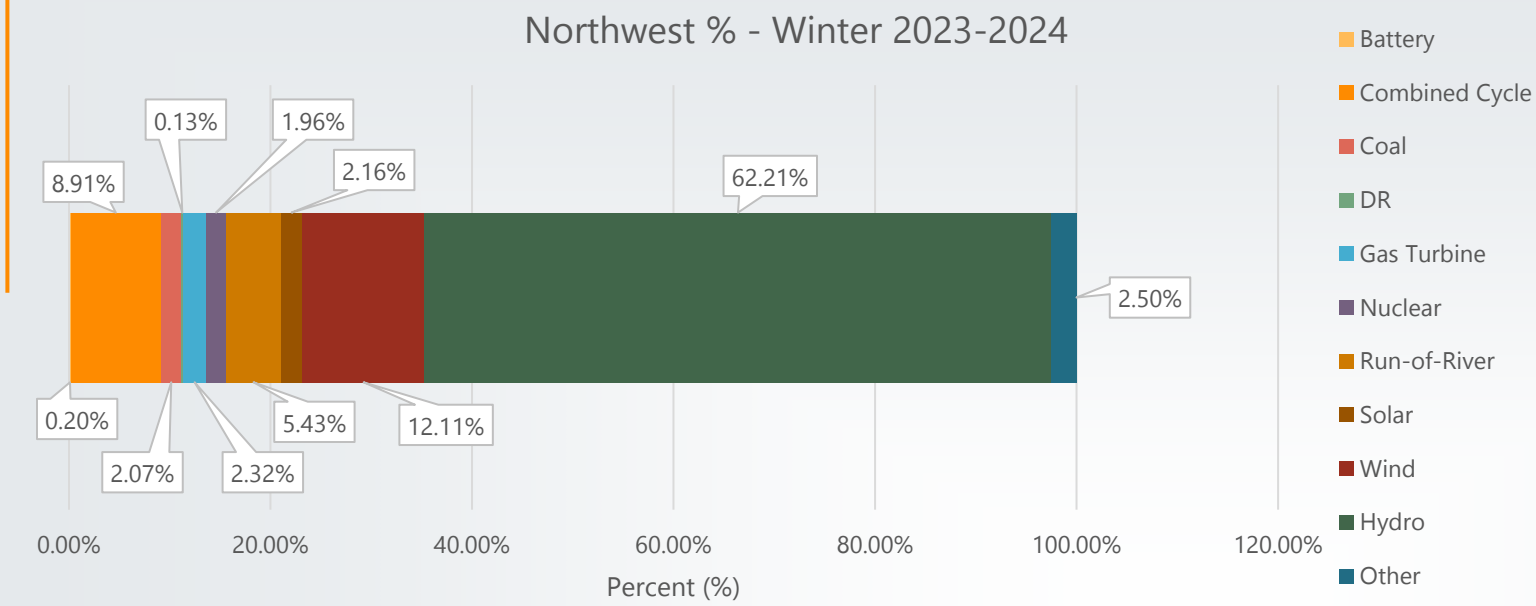
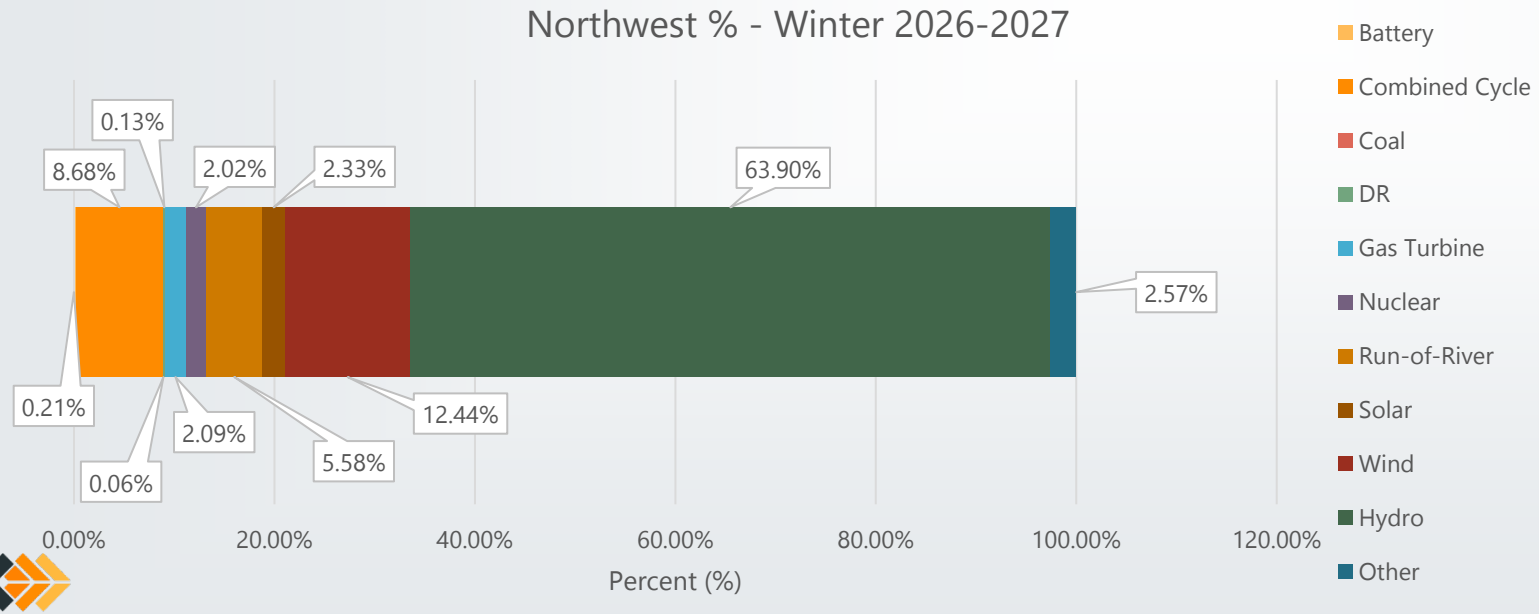
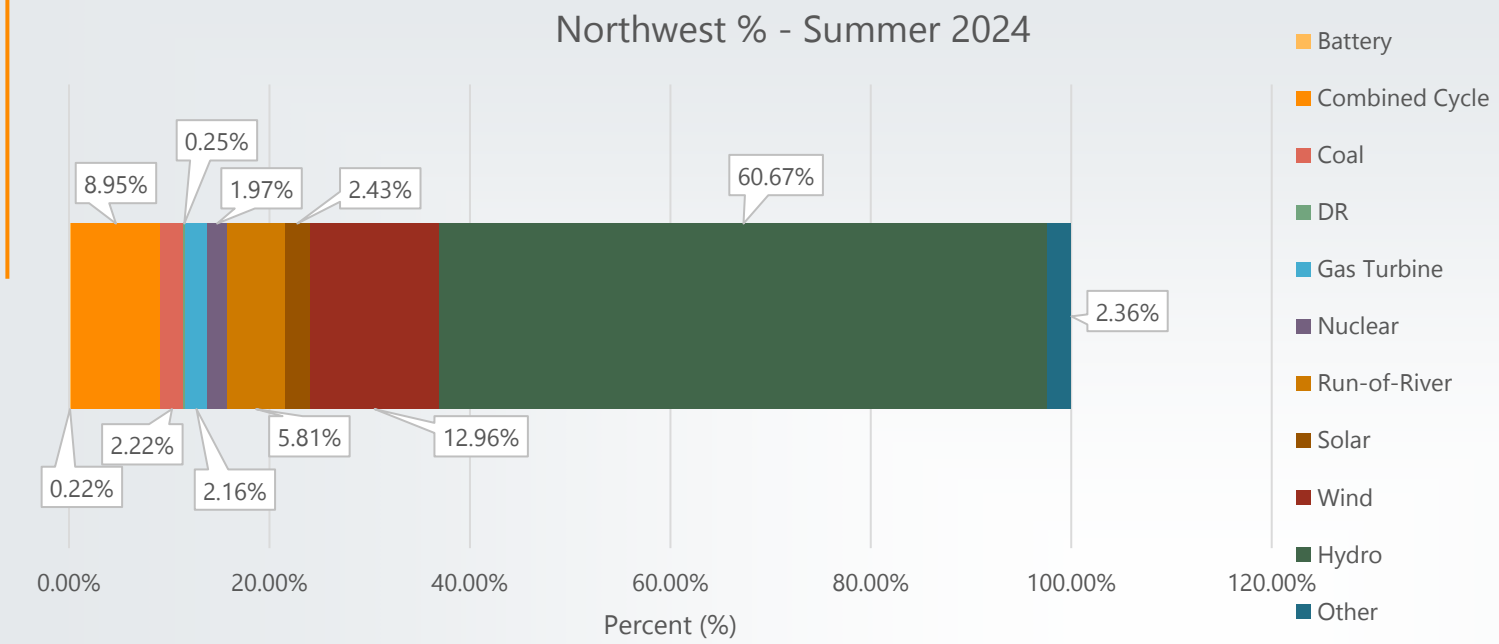
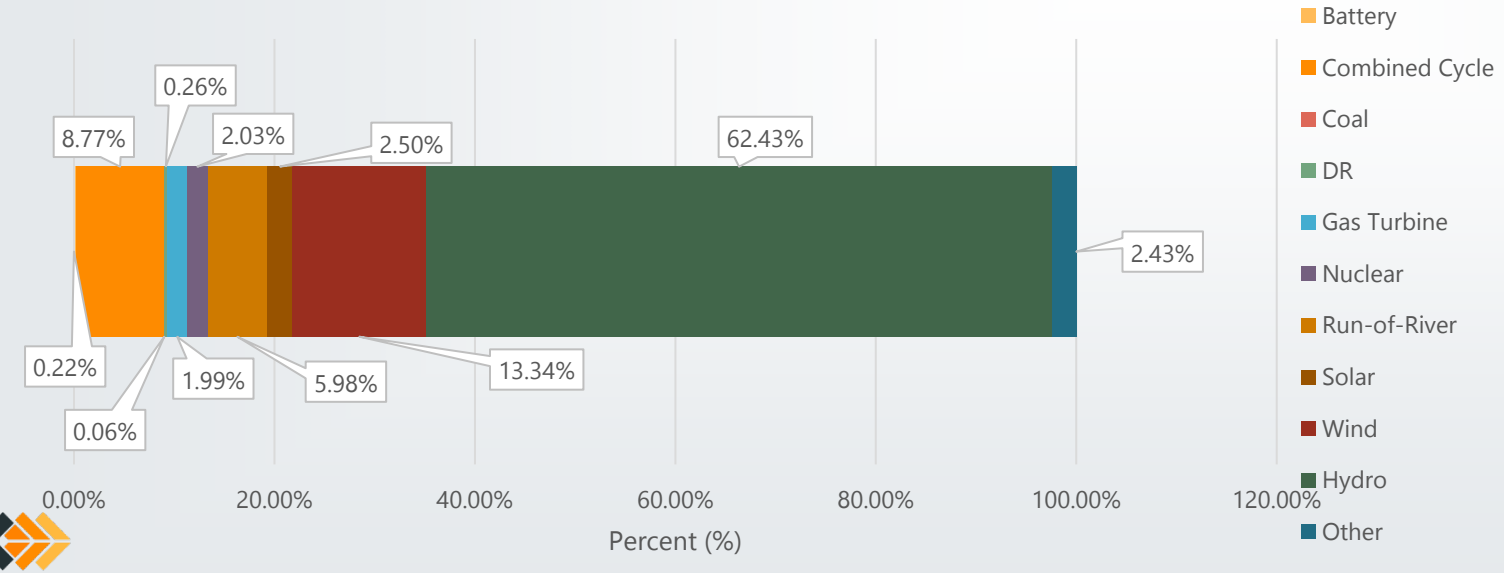




Northwest Winters

Percentage





Northwest Summers

Percentage

WRAP
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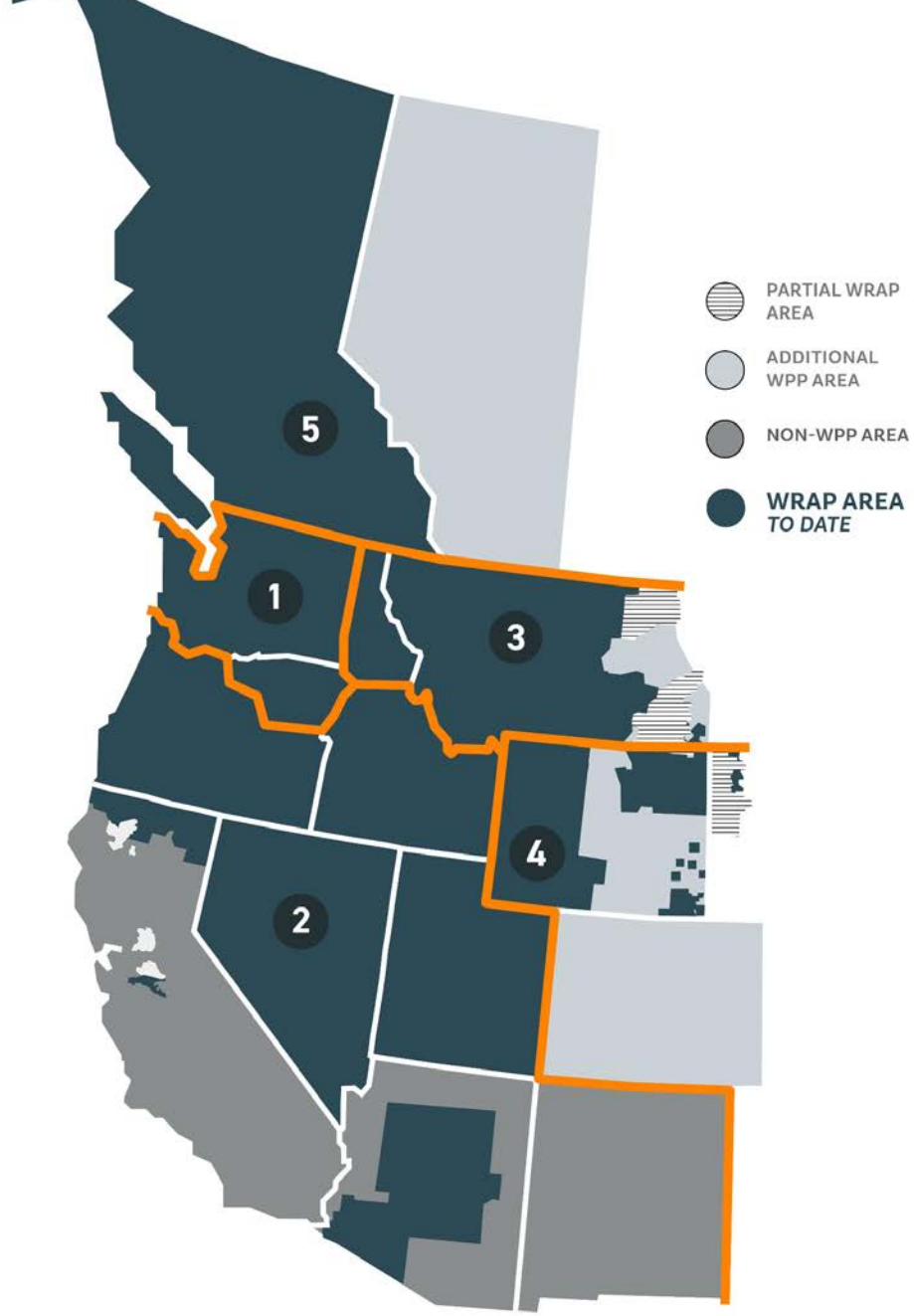
Key Reminders

- Not all resources shown in the preceding slides can be assumed to be available to the WRAP footprint for resource adequacy purposes
  - Planned outages are not considered; they will be managed by LREs from their surplus
  - Does not account for activities and needs of neighboring, non-participating regions or entities
  - Based on information and projections provided by participants
- Aggregate information does not give insight into whether individual participants have enough supply
  - WRAP motivates participants to acquire the necessary capacity
  - Cannot assume this has yet happened or will happen without binding implementation of WRAP

WRAP
POWERED BY WPP

WIND ZONES



Zone	# of Plants	Nameplate Capacity (MW)
Wind VER1	54	5,734
Wind VER2	44	2,400
Wind VER3	23	1,378
Wind VER4	24	2,429
Wind VER5	Aggregate	747
Total	**146**	**12,688**

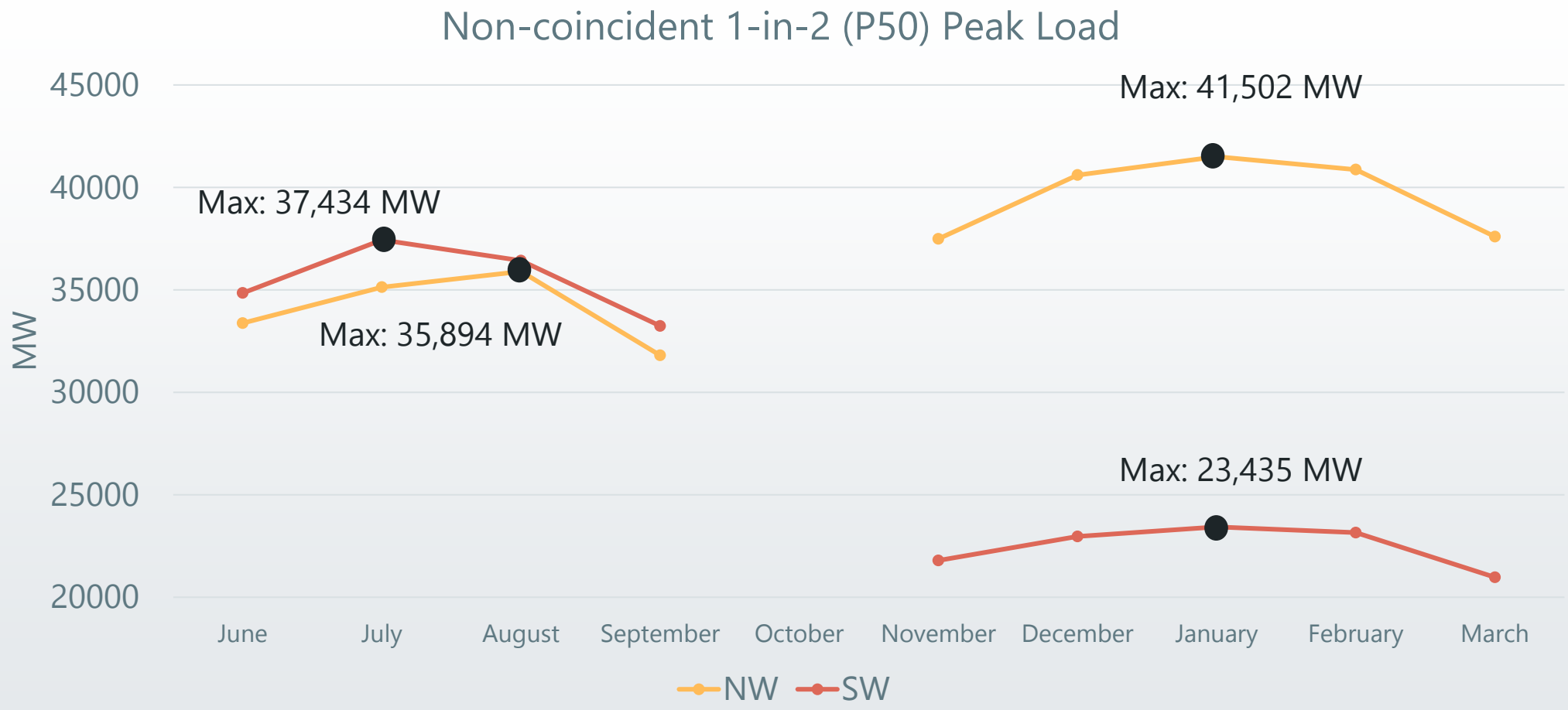
WRAP
POWERED BY WPP

SOLAR ZONES

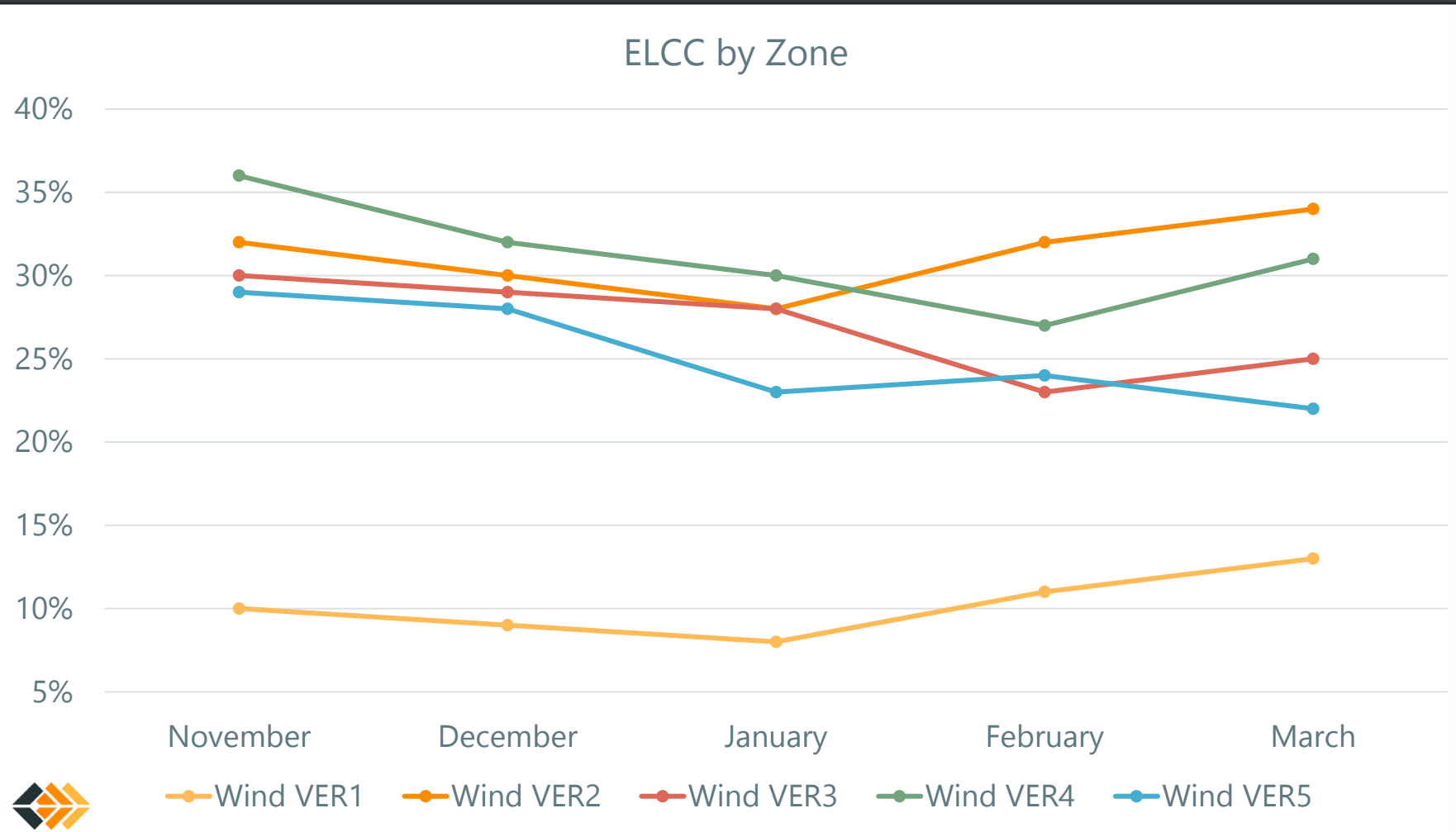
Zone	# of Plants	Nameplate Capacity (MW)
Solar VER1	159	2,138
Solar VER2	108	9,024
Total	**267**	**11,162**

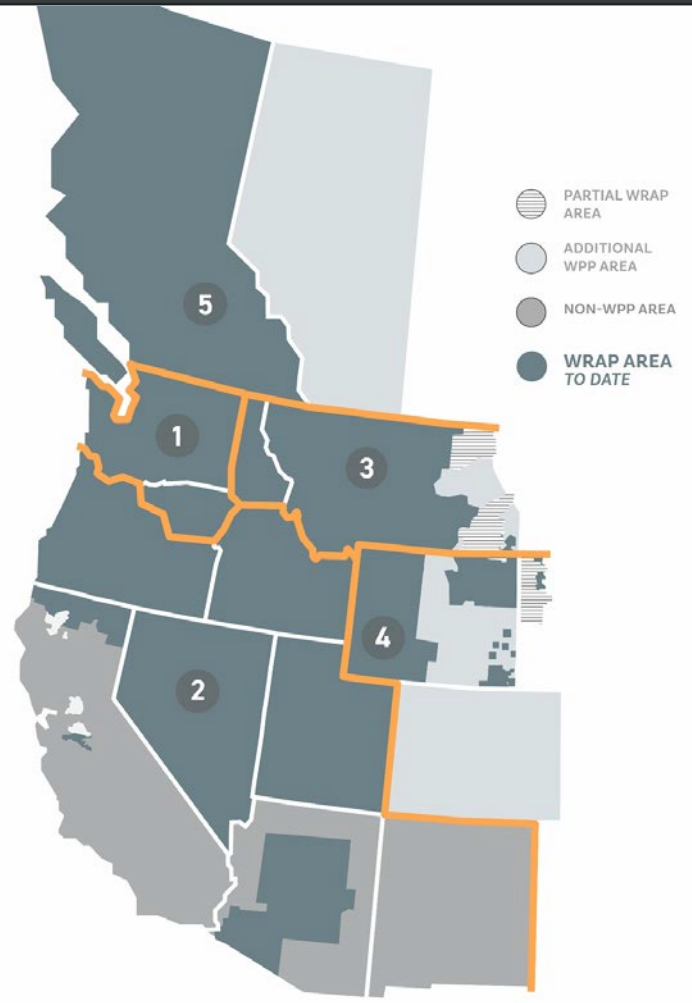
WRAP
POWERED BY WPP

Peak Load


Non-coincident 1-in-2 (P50) Peak Load
45000
40000
35000
30000
25000
20000
MW
Max: 41,502 MW
Max: 37,434 MW
Max: 35,894 MW
Max: 23,435 MW
June
July
August
September
October
November
December
January
February
March
NW
SW

Wind ELCC - Winter





WRAP
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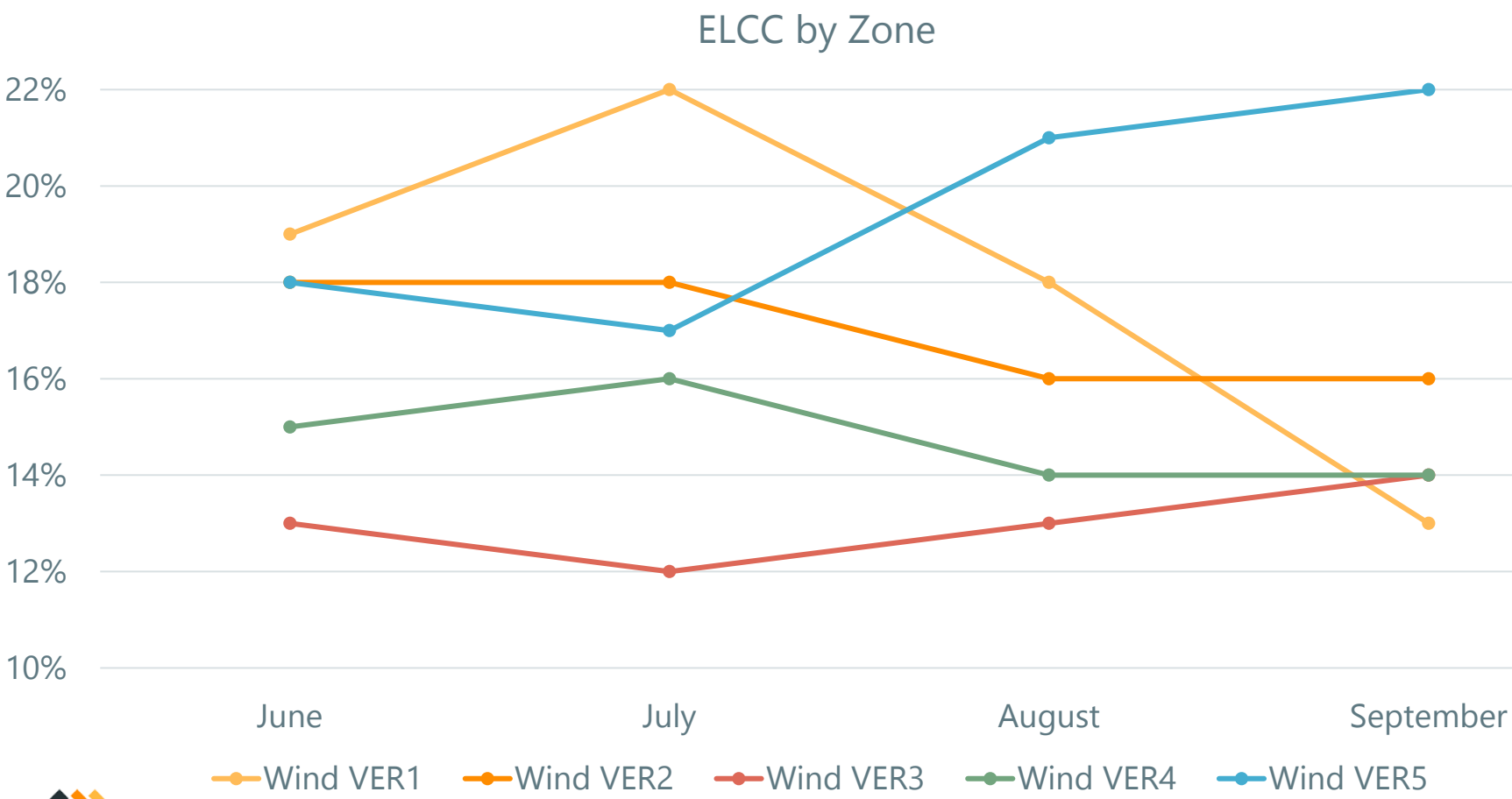
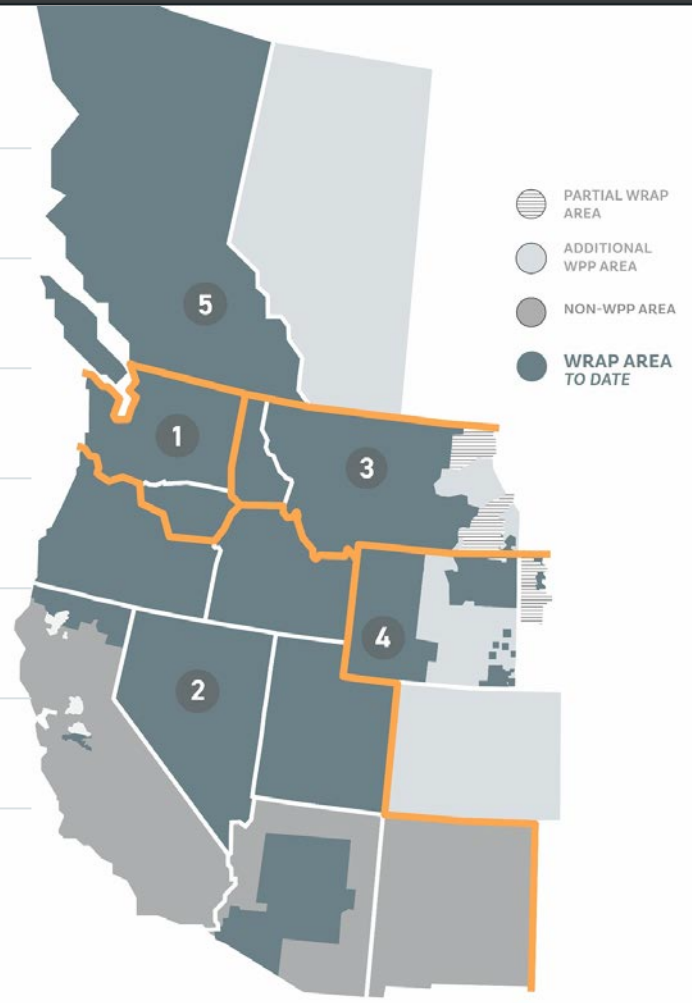
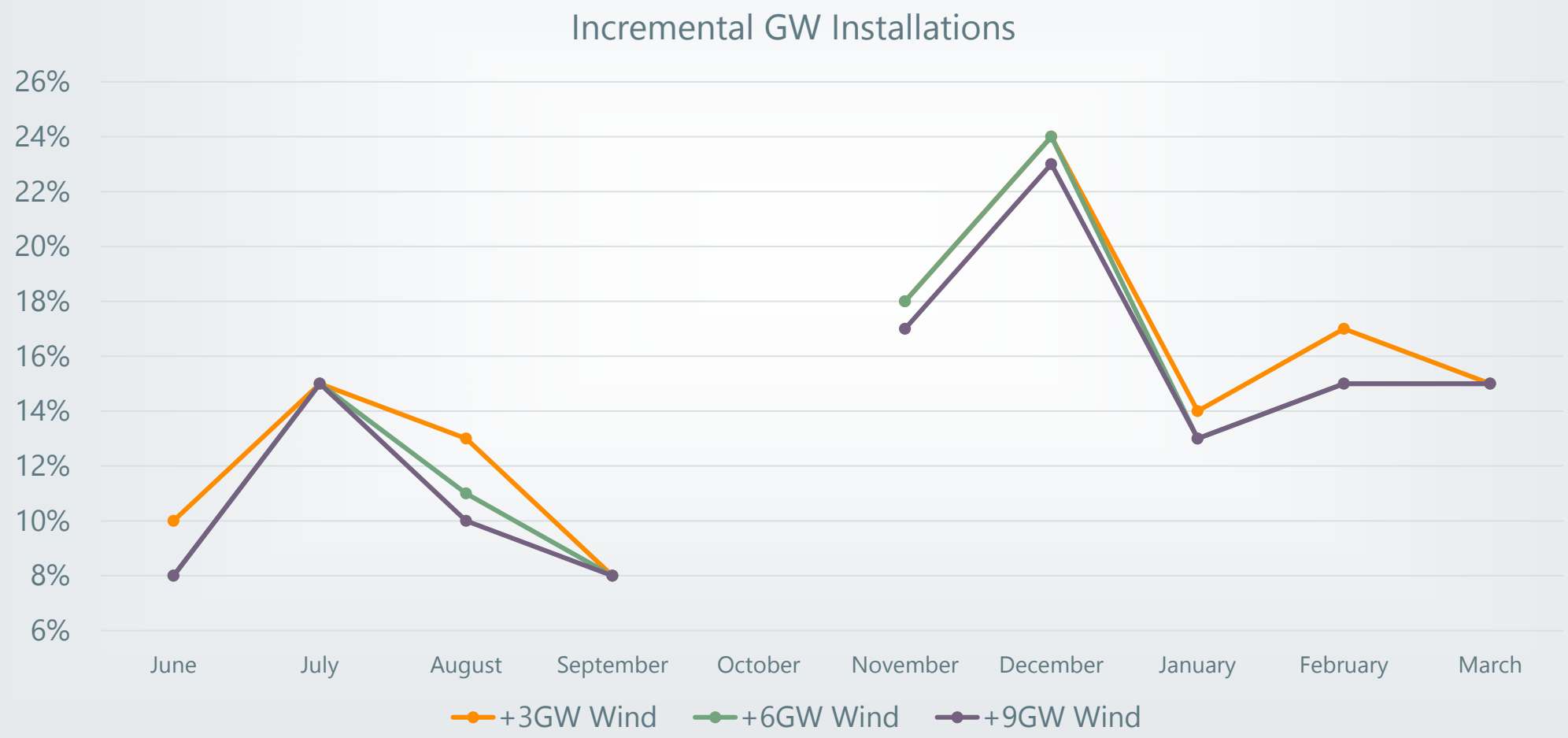
Wind ELCC - Summer

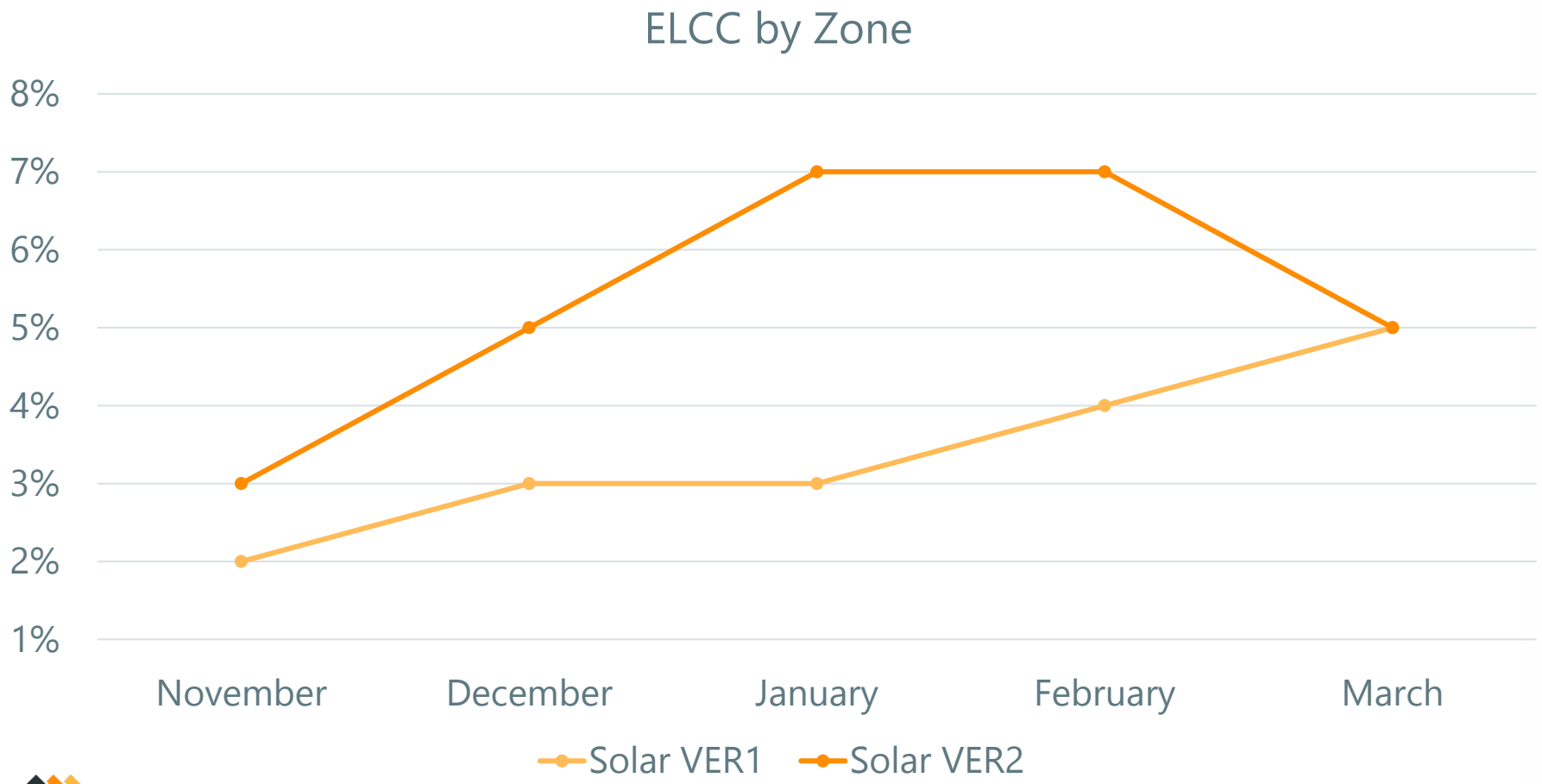




Wind ELCC –
Wind at Incremental GW Installations



Solar ELCC - Winter



WRAP
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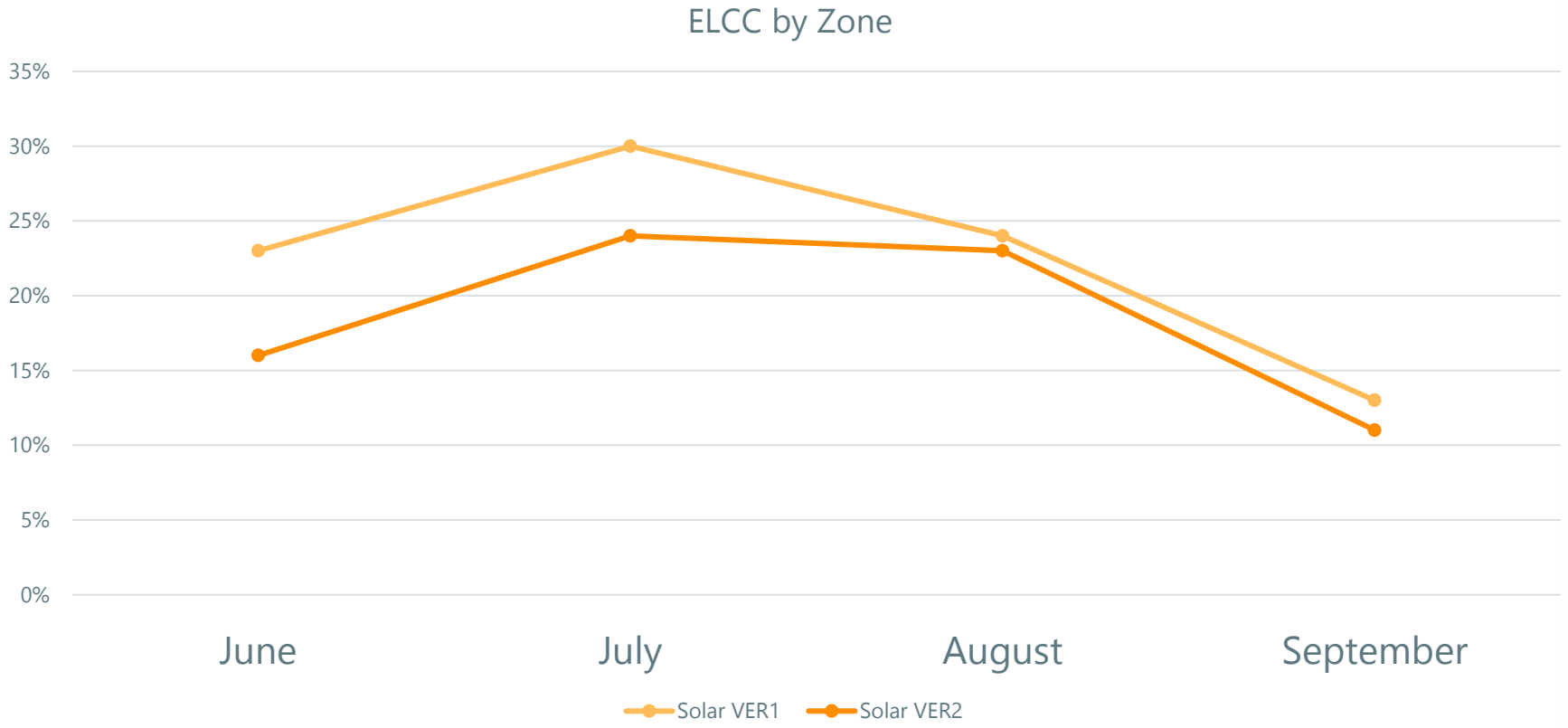
SOLAR ELCC - SUMMER



WRAP
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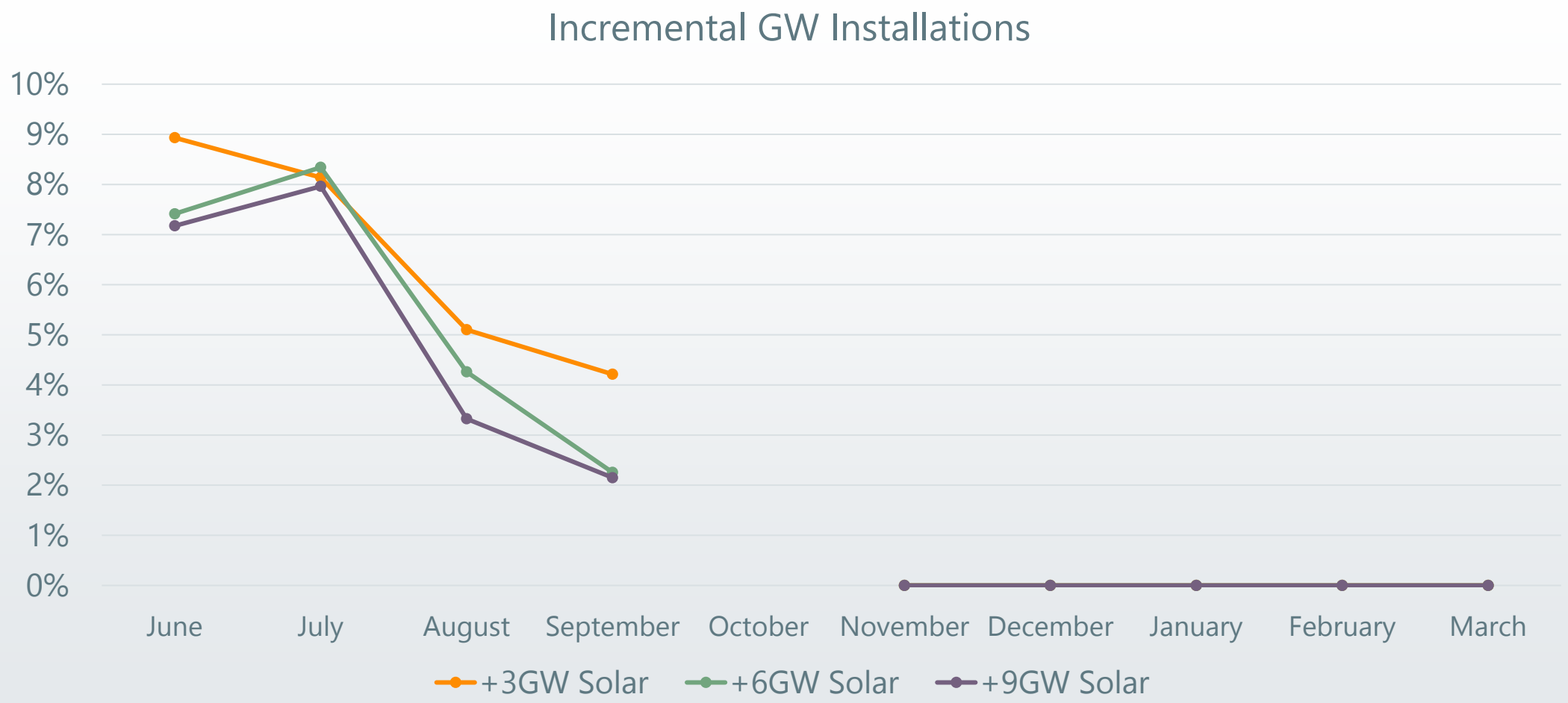
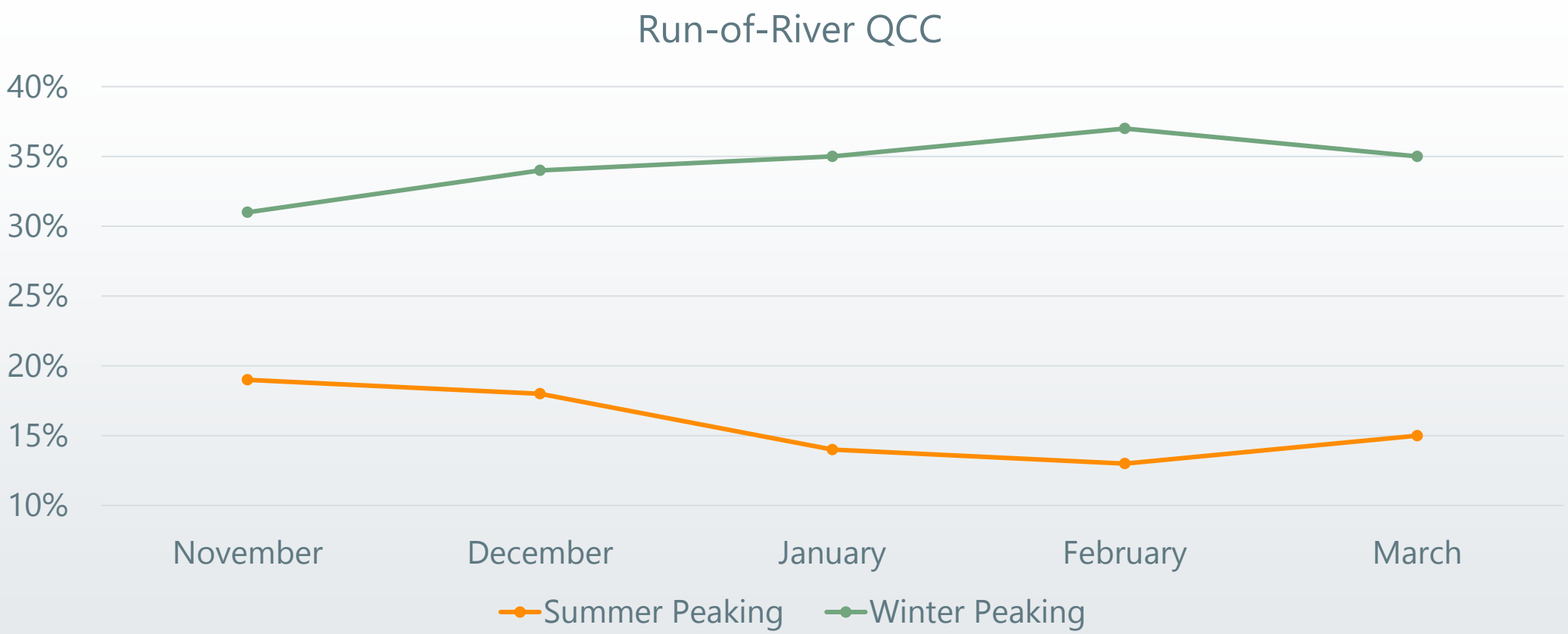
Solar ELCC –
Solar at Incremental GW Installations



Run-of-River QCC

Winter



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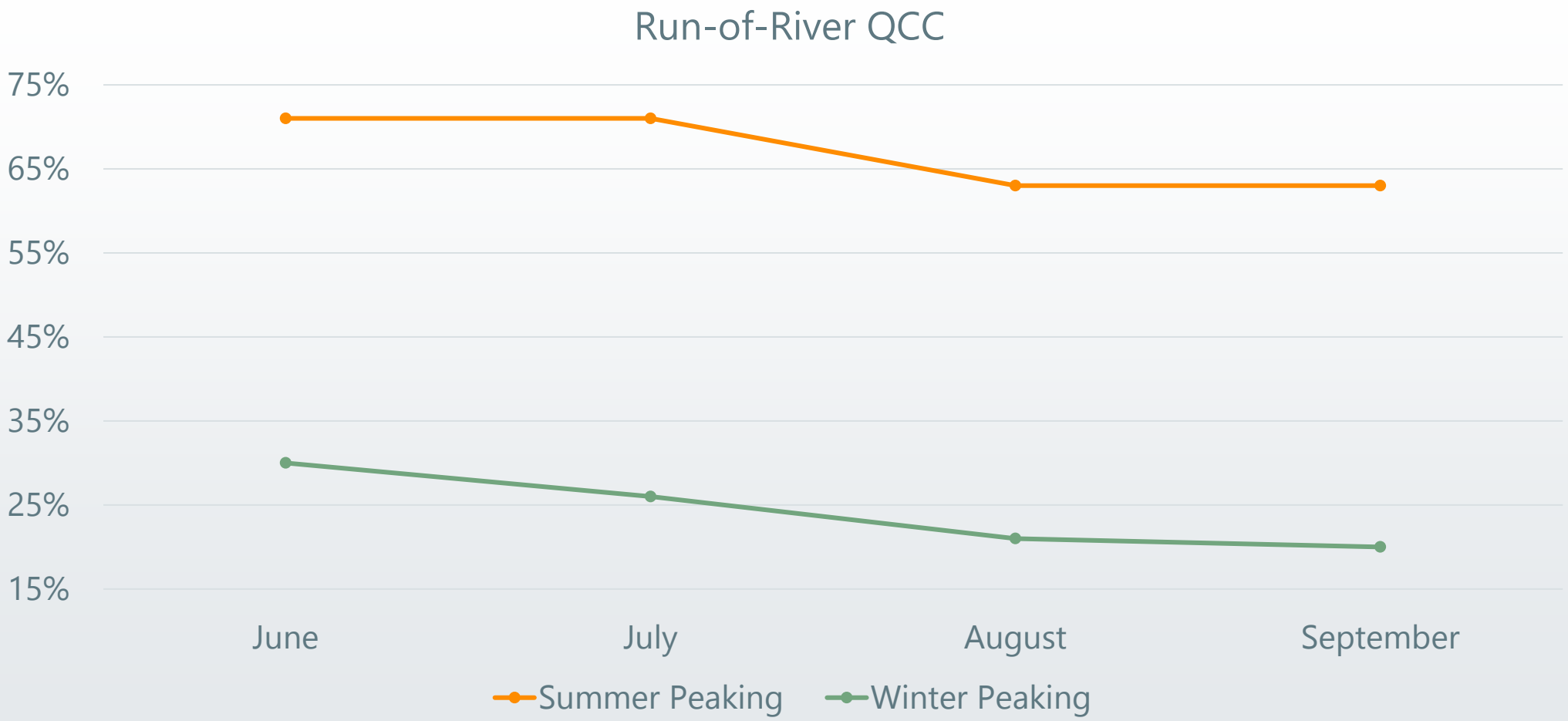
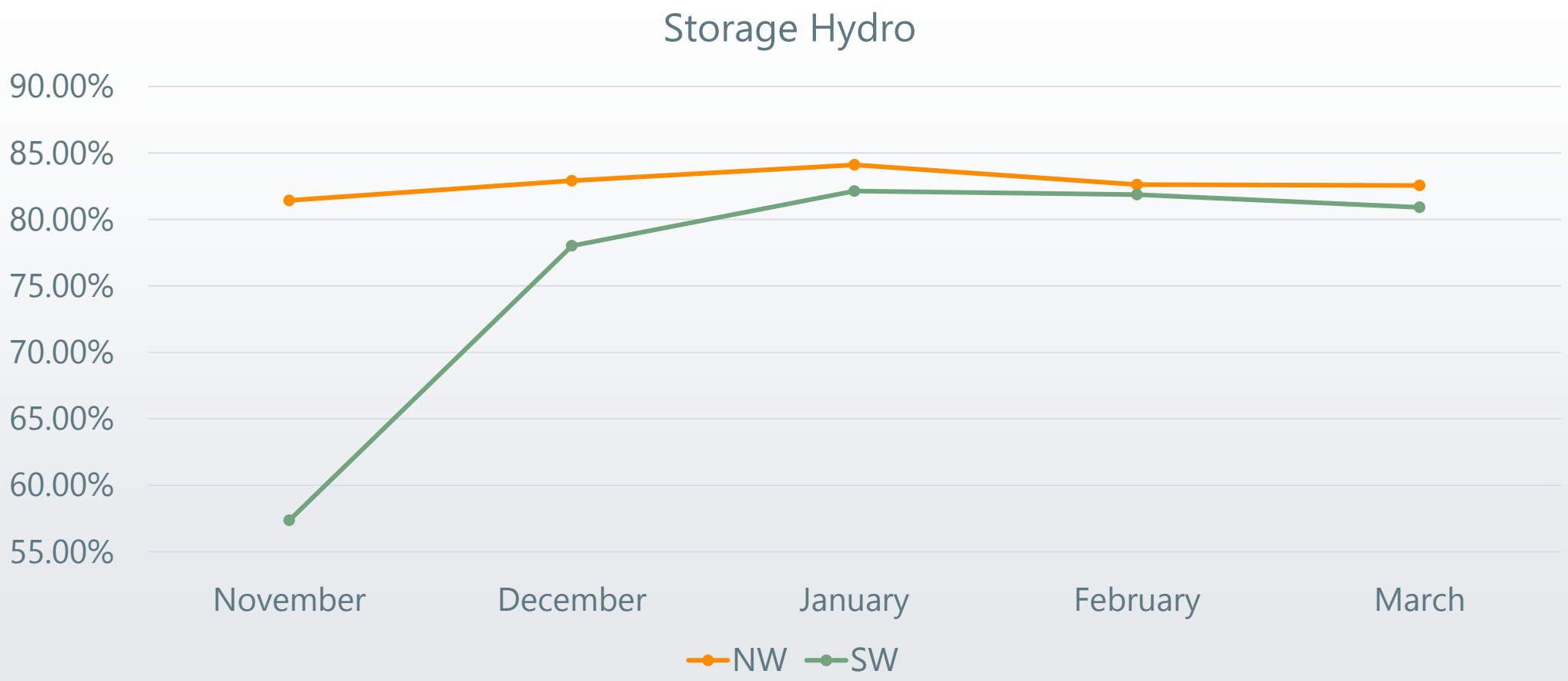
Run-of-River QCC

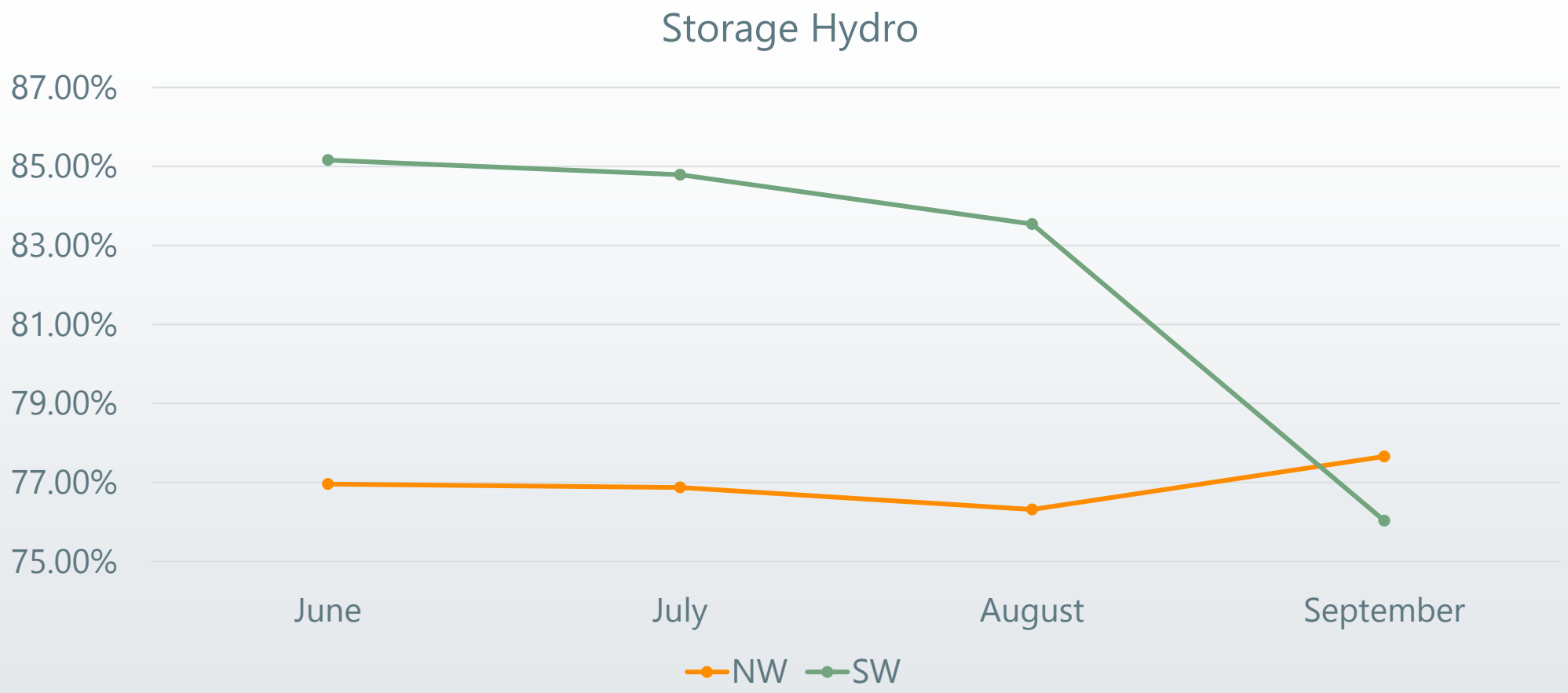
Summer



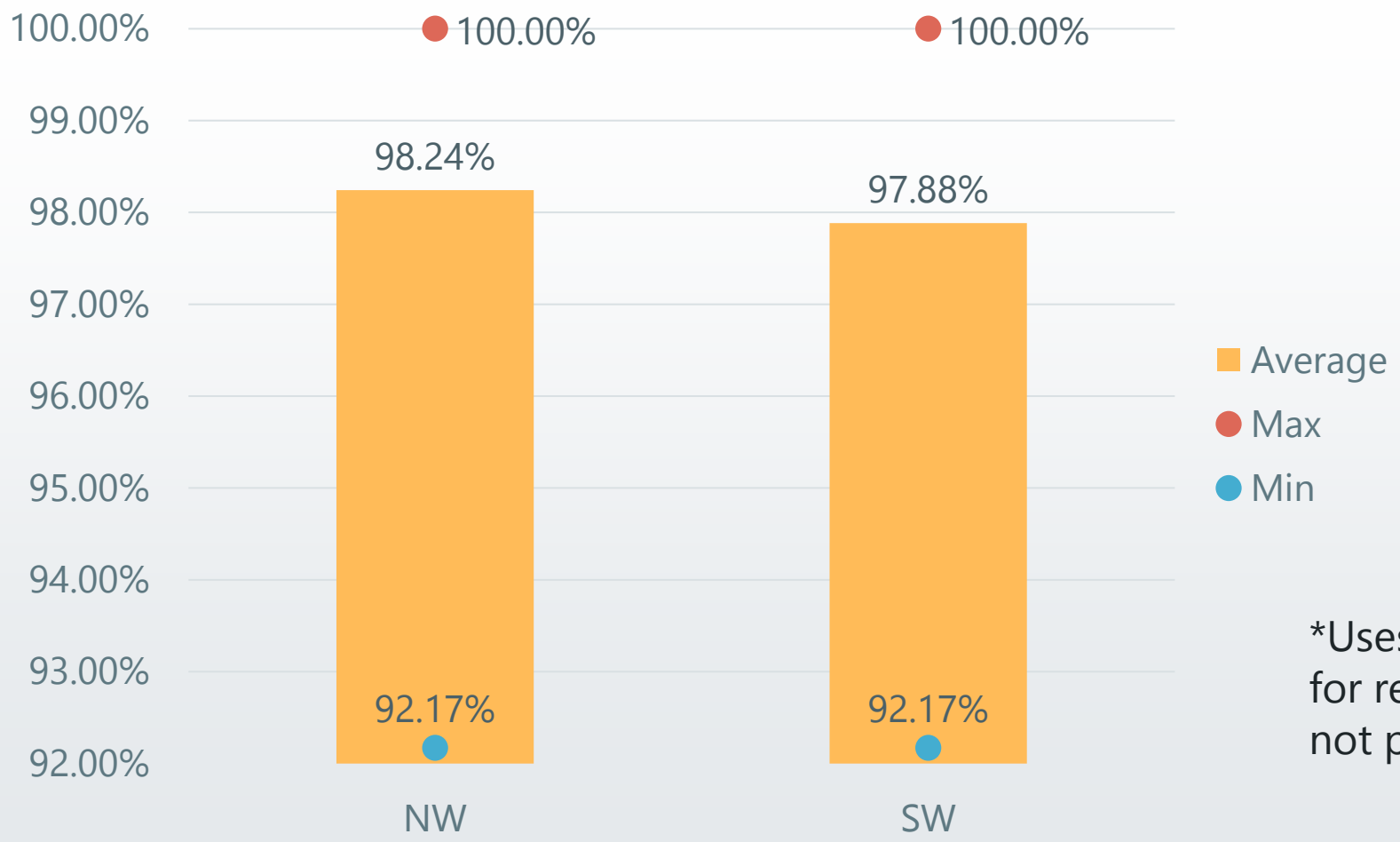
STORAGE HYDRO QCC - WINTER



Storage Hydro QCC - Summer

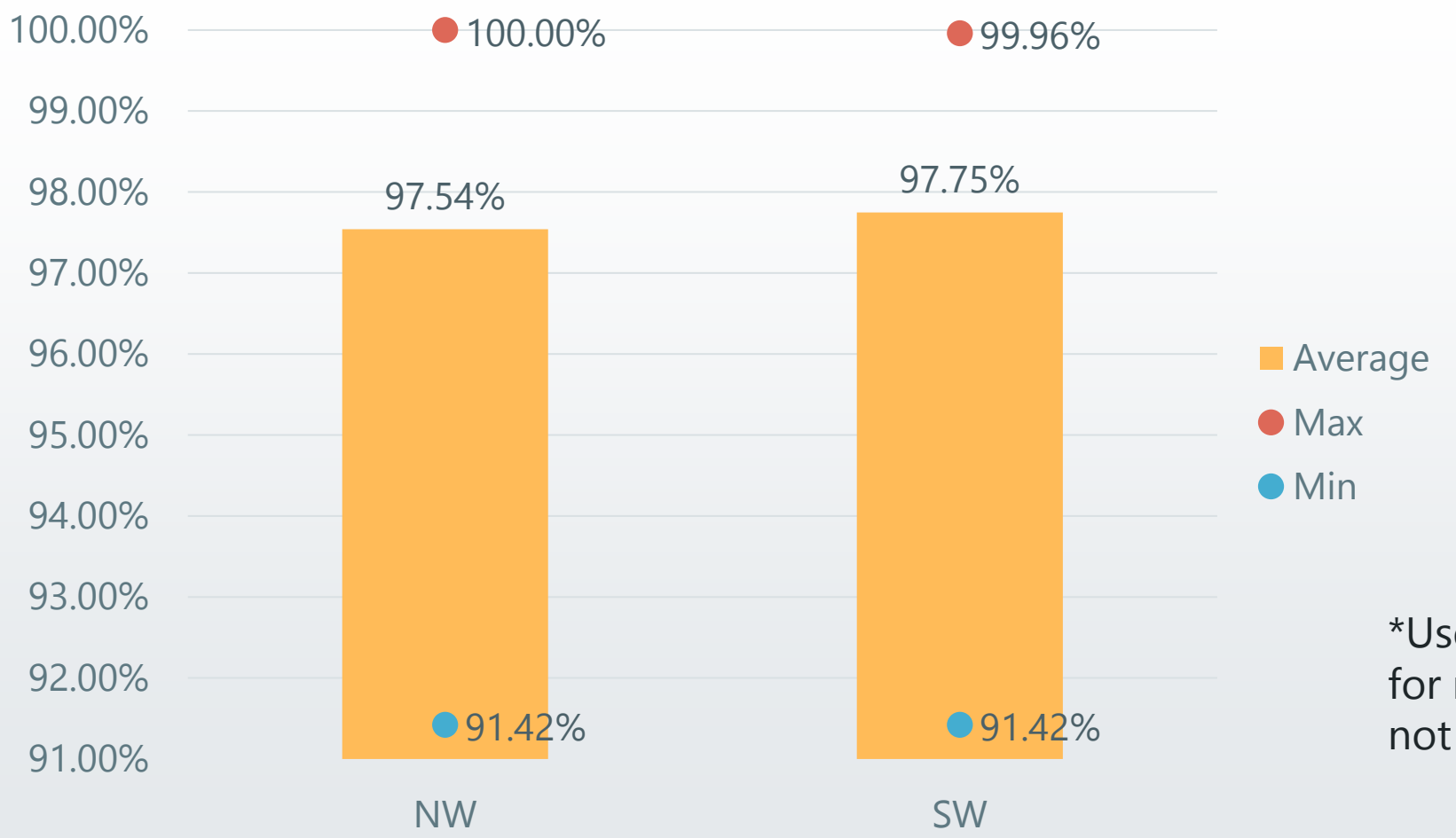


Thermal QCC- Winter



*Uses indicative values for resources that did not provide GADS data

Thermal QCC- Summer



*Uses indicative values for resources that did not provide GADS data

PRM Considerations

- Attempting to maintain 0.1 LOLE across the season
- Allow up to 0.01 LOLE in each individual month
- Non-Coincidental Peak load for a given month is a significant factor in calculation of PRM (lower load months will have higher PRM value)

WRAP
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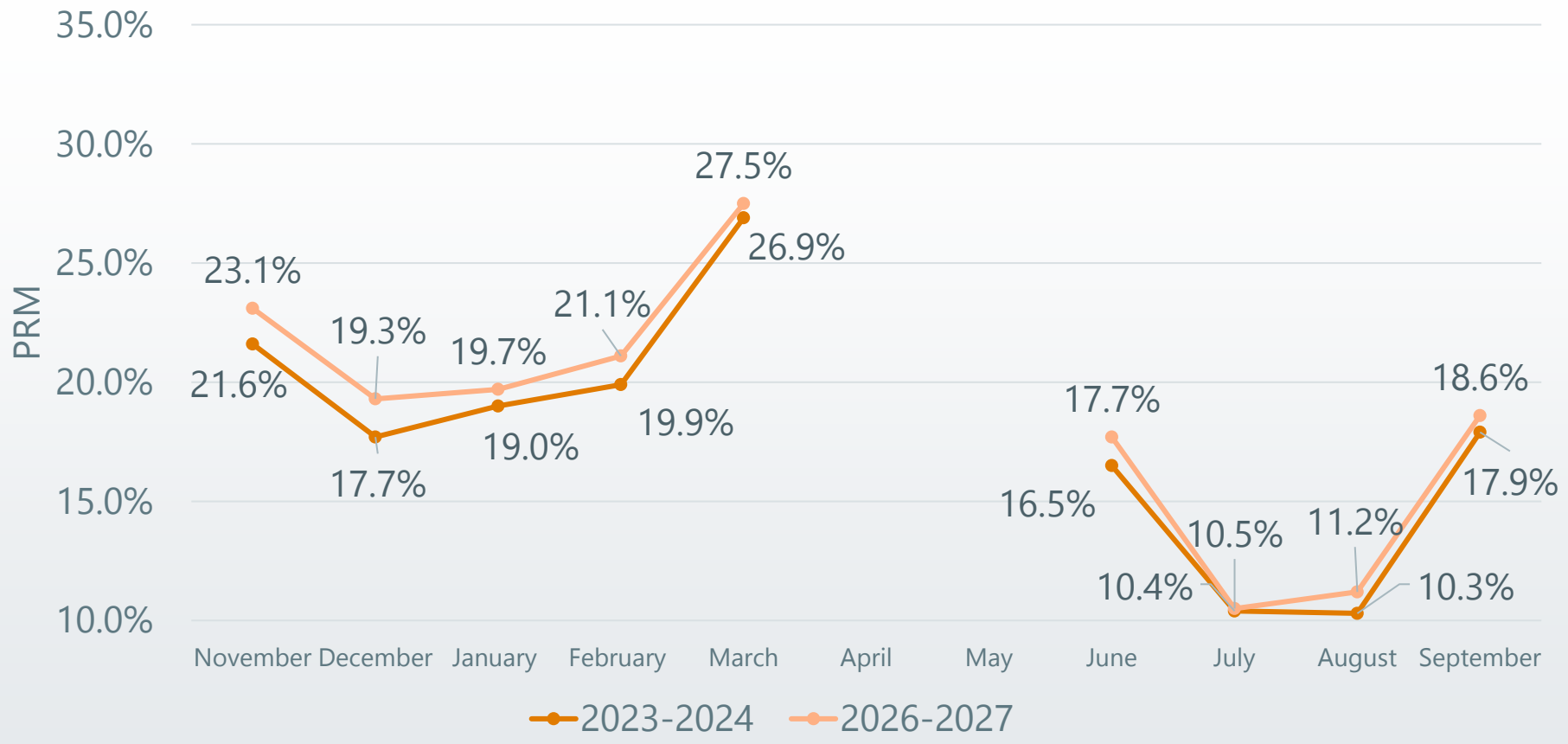
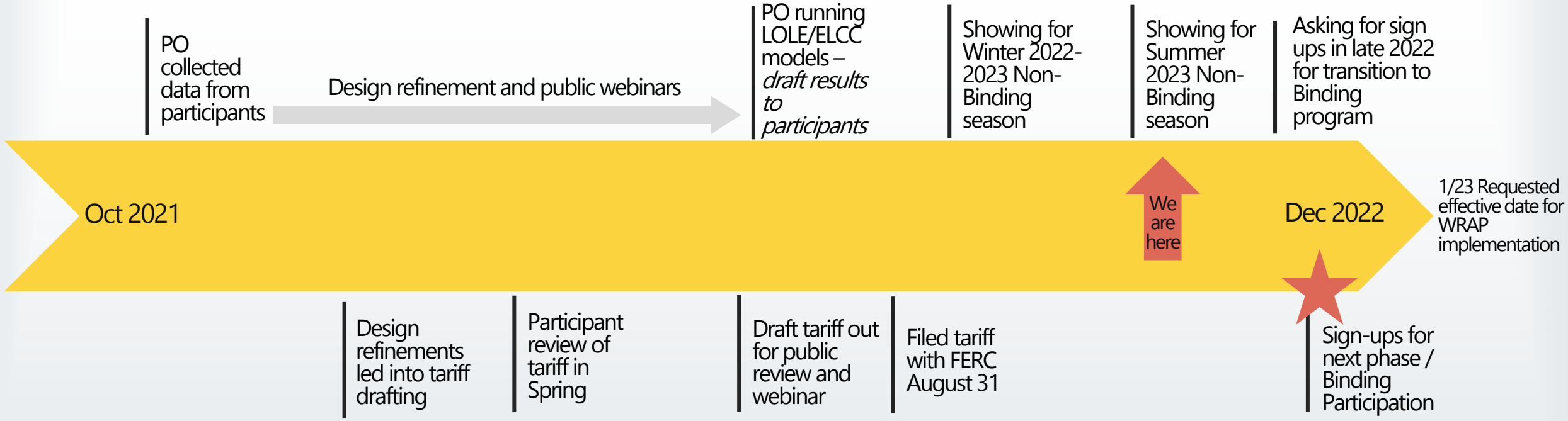
PRM – Northwest (UCAP)



Current Phase Activities

PO = Program Operator
LOLE = Loss of Load Expectation
ELCC = Expected Load Carrying Capacity



WRAP – Phased Roll Out

Non-Binding Forward Showing

Winter 22-23, Summer 23, Winter 23-24, Summer 24, Winter 24-25

Binding Program With Transition Provisions (FS and Ops)

Summer 25, Winter 25-26, Summer 26, Winter 26-27, Summer 27, Winter 27-28

Non-Binding Operations Program

Summer 23 (trial – will include testing scenarios), Winter 23-24, Summer 24, Winter 24-25

Binding Program Without Transition Provisions

Summer 28 and all seasons following

WRAP
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Thank You

For general inquiries or to be added to our mailing list:
wrap@westernpowerpool.org

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Washington Resource Selection & Customer Benefit Indicators

Annette Brandon, Wholesale Marketing Manager
Electric IRP, Seventh Technical Advisory Committee Meeting
October 11, 2022

CEIP Development

Integrated Resource Plan (IRP) – Filed final April 30, 2021

20+ year resource planning identifying customer future resource needs

Clean Energy Action Plan (CEAP) – Filed jointly with IRP

Sets **10-Year targets** for resources based on the lowest reasonable cost plan including; filed jointly with IRP

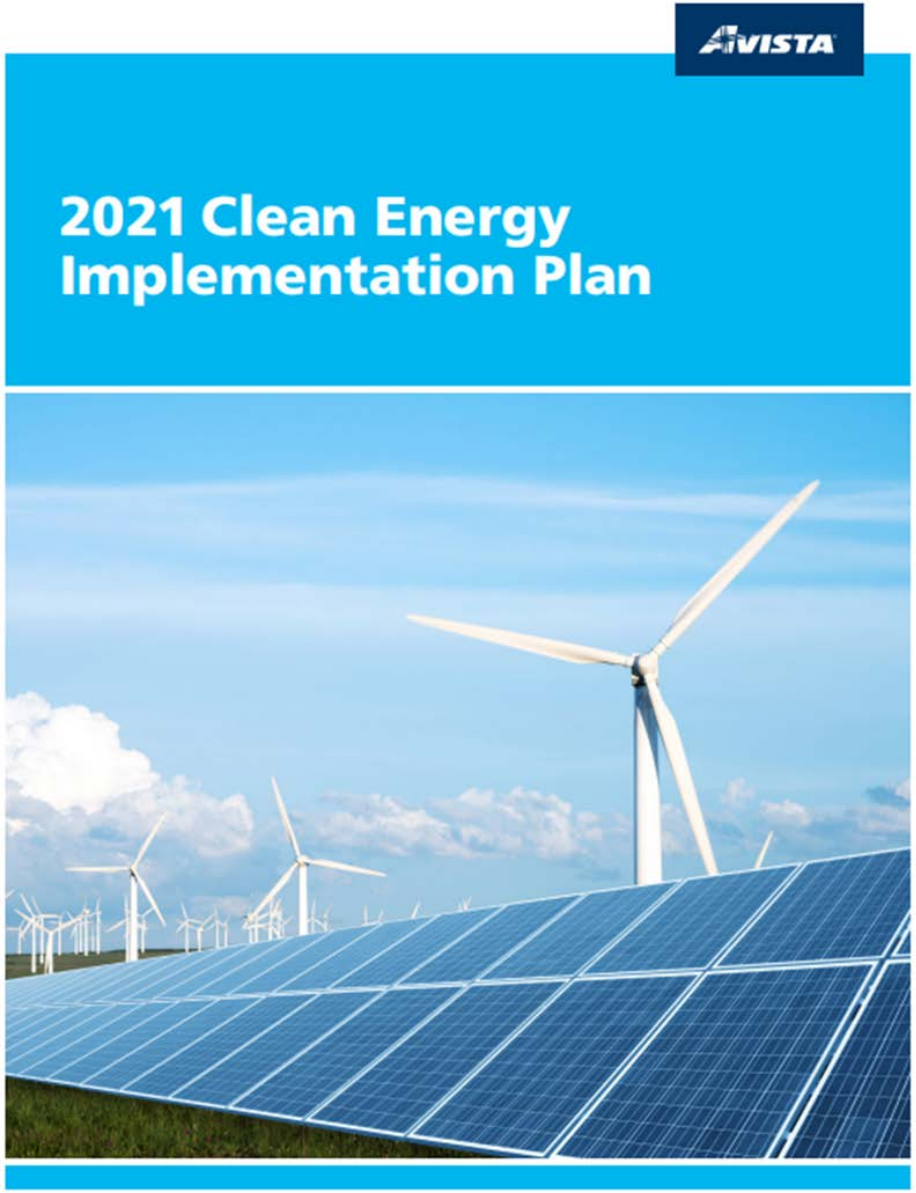
Public Participation Plan – May through September 2021

Provides **road map** for engagement and solicitation of input from customers, Equity Advisory Group, and existing Advisory Groups (including Stakeholders from public agencies)

Clean Energy Implementation Plan (CEIP) 2022-2025 – Filed October 1, 2021

CEIP establishes the **actions** the utility will take to comply with CETA goals over the next four years.

- Informed by Public Participation Process
- Identifies the projects, programs and investments
- Ensures Customer Benefit are attributes of those actions.
- **Approved June 2022 with Conditions**



Public Participation Groups and Process

Equity is at the core of the transition to clean energy. Company must ensure the "equitable distribution of energy and nonenergy benefits and reductions of burdens to vulnerable populations and highly impacted communities" in development of CEIP.

Benefits/Barriers "Equity Areas"

- Benefits of Clean Energy
- Ensure benefits are equitably distributed
- Barriers to participation

Identify Named Communities

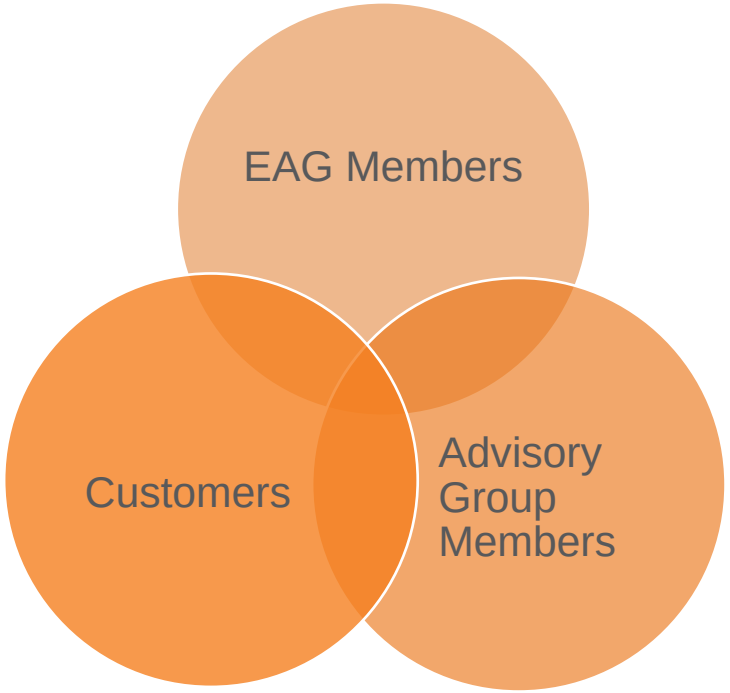
- Who is likely to be most impacted?
- Highly Impacted Communities
- Vulnerable Populations

Customer Benefit Indicators

- Ensure customers are receiving benefits of clean energy
- Measurements for accountability

Specific Actions – What specific steps will Avista take?

- Clean Energy resources – ensure CBIs are attributes mix of renewable, energy efficiency, demand response



What is a “Customer Benefit Indicator”?

“…is an attribute, either quantitative or qualitative, of resources or related distribution investments associated with customer benefits described in RCW 19.405.040(8).”

Equity

- Equitable distribution of energy and non-energy benefits and reductions of burdens (non-energy impacts) to vulnerable populations and highly impacted communities

Public Health / Environment

- Long-term and short-term public health and environmental benefits and reductions of costs and risks;
- Such as less air pollution which results in lower asthma rates

Energy Security and Resiliency

- Energy Security – strategic objective to maintain energy services and protecting against disruption
- Energy Resiliency – ability to adapt to challenging conditions from disruptions

Cost and Risk Reduction

- Lowers customer costs
- Reduces risk

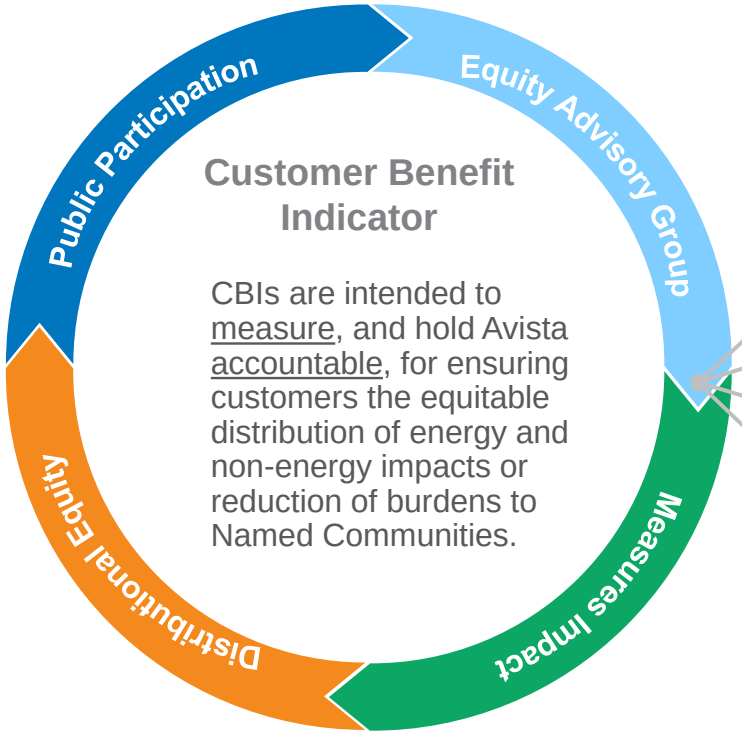
How can we ensure our customers benefit from the clean energy implementation actions we are taking?

Which resources or investment could provide benefits to our customers?

How can we measure how we are doing?

*RCW 19.405.040(8) “… through the equitable distribution of energy and nonenergy benefits and reduction of burdens to vulnerable populations and highly impacted communities; long-term and short-term public health and environmental benefits and reduction of costs and risks; and energy security and resiliency. “

Customer Benefit Indicator – Process



Public Participation
- Informed by a Public Participation Process in development of Clean Energy Implementation Plan

Equity Advisory Group (EAG)
- EAG provides equity lens applied to resources selection and CBIs part

Measurable and Accountable
- Each CBI will be compared against established base to ensure benefit of clean energy transition
- Initially Will be reported via Avista website quarterly

Distributional Equity / Named Communities
- Ensures that communities highly impacted by adverse socioeconomic conditions, pollution and climate change - or experience a disproportionate cumulative risk of environmental burdens benefit from of the clean energy transition.

Approved Customer Benefit Indicator (CBI) by Equity Area

- Participation in Company Programs
- Number of Households with high energy burden (>6%)

Affordability

- Outreach and Communication
- Transportation Electrification

Access

- Named Community Clean Energy
- Investment in Named Communities

Community Development

- Energy Availability
- Energy Generation Location
- Residential Arrearages and Disconnections

Energy Resiliency & Security

- Outdoor Air Quality
- Greenhouse Gas Emissions

Environmental

- Employee diversity
- Supplier diversity
- Indoor Air Quality

Public Health

Several Impact multiple benefit areas:

- Energy
- Non-energy
- Reduction of burdens
- Public Health and Environmental
- Energy Security and Resiliency
- Cost and Risk Reduction

*RCW 19.405.040(8) "… through the equitable distribution of energy and nonenergy benefits and reduction of burdens to vulnerable populations and highly impacted communities; long-term and short-term public health and environmental benefits and reduction of costs and risks; and energy security and resiliency. "

What is a Non-Energy Impact?

- **NEIs are at the vital intersection of energy and equity and central part of the metrics of equity**
- Non-energy impacts is a way to understand the total contribution of investments that goes beyond the simple energy and demand savings
- These impacts (either positive or negative) can come in the form of economic, social, and/or personal ways.
- Non-energy impacts can be called many things, but they all mean the same thing: non- energy impacts (NEIs), NEBs, co-benefits, etc.

Societal Benefits	
Public Health	Economic Development
Improved Air Quality	Increased Employment
Water quality and quantity	Energy Security
Benefits to Low Income families	

Participant Benefits	
O & M Savings	Employee Productivity Increase
Health Benefits	Property Value Increase
Comfort Increase	Benefits to Low Income Customers

Utility Benefits	
Peak Load Reduction	Less Debt Write Off
Transmission and Distribution Savings	Lower Collection Costs
Reduced arrearages	Fewer customer calls

Non-Energy Impacts in IRP

Supply-Side Resources

Public Health
PM2.5, SO2, NOx

Safety
Direct and indirect fatalities per GWh

Environment
Land use, water use, wildfire risk

Economic
Jobs, earnings, output, value add added

Demand-Side Resources*

Income & Health
Economic Develop. (income) less missed days of work

Health
Related to avoided costs such as medical

Property Value
Noise, visual air/temperature

Energy Burden
Reduction in costs related to utility bill

IRP Resource Selection

- Non-energy impacts quantified from DNV (third party) analysis in economic potential.
- Non-energy impacts quantified from DNV (third party) analysis in supply-side resource selection as adder.
- Not all NEIs are able to be quantified due to lack of data or difficultly in obtaining data.
- Additional study may be performed for Supply side resources.
- Phase II Demand Side Resource NEI Study to occur in 2022.

*for illustrative purposes – residential used on this slide

Customer Benefit Indicator and Non-Energy Impact Clean Energy Implementation Plan Condition #2

- Avista will apply Non-Energy Impacts (NEIs) and Customer Benefit Indicators (CBIs) to all resource and program selections in determining its Washington resource strategy

- Avista agrees to engage and consult with its applicable advisory groups (IRP Technical Advisory Committee (TAC) and Energy Efficiency Advisory Group (EEAG)) regarding an appropriate methodology for including NEIs and CBIs in its resource selection.

- Avista will consult with its EAG after the development of this methodology to ensure the methodology does not result in inequitable results

CBIs and Resource Measurements Not applicable to Resource Selection

The following CBIs are measurement tools for implementation of various resources or to address qualitative inequities primarily in Named Communities

(1) Participation in Company Programs

- Participation in Weatherization Programs
- Saturation rates for energy assistance
- Number of residential appliance and equipment rebates to Named Communities / rental units

- Measures impact of the success of execution of BCP
- Coordinated effort with CBI (3) Methods/Modes of Communication
- May be used in program prioritization

(2) Number of households with a high energy burden

- Number of households with a high energy burden (>6%) will be tracked separately for all electric customers, known low income, and Named communities
- Average Excess Burden per Household

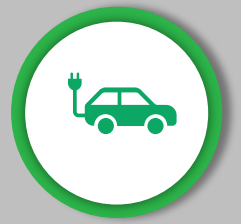
- IRP will forecast total cost and indirectly impacts to energy burden
- Not measured directly for EE. Embedded with NEI for bad debt, O & M (participant) and thermal comfort.

(3) Availability of Methods/Modes of Communication

- Number of contacts for each energy assistance and energy efficiency outreach event offered, and impressions from energy assistance and energy efficiency marketing
- Track increased availability of translation services

- Intended to address barriers to participation/access; not selection criteria

CBIs and Resource Measurements Not applicable to Resource Selection Continued

	**(4) Transportation Electrification** CBO – Community Based Organization	• Number of Trips provided by CBO • Number of annual passenger miles provided by CBOs • Number of Public Charging Stations located in Named Communities.	• Measurement of plan implementation In accordance with TE Plan
	**(6) Named Community Investments**	• Incremental annual spending of investments in Named Communities • Annual number of customers and/or CBOs • Quantification of annual energy and non-energy benefits from investments (if applicable)	• Results measurement of individual investments not identified in RFP
	**(11) Employee Diversity** **(12) Supplier Diversity**	• 11 – employee diversity equal to communities served by 2035 • 12 – Supplier Diversity of 11% by 2035	• Intended to address “public health threat” or other historical/current inequities resulting from systemic racism (or other inequities)
	**(14) Residential Arrearages and Disconnections for non-payment**	• Number and percent of residential electric disconnections for non-payment per month • Residential arrearages for residential electric data by month by known low income, vulnerable populations, highly impacted communities and all customers	• Indirectly associated with access to clean energy or programs which may impact affordability and energy burden. • Not directly related to specific action

CBIs and Resource Selection
Applicable CBIs and Metrics

CBIs which can be quantified for use in the Integrated Resource Plan

May be applicable to one or more resource type

(5) Named Community Clean Energy

- **Total MWh of DER 5 MW and under**
- **Total MWh of Energy Storage Resources**
- **Number of sites/projects of distributed renewable energy resources and energy storage resources**

→ All types considered in resource mix

(7) Energy Availability

- CAIDI (Customer average interruption indices)
- Total MWh of Energy Storage Resources
- CEMI (Customers experiencing multiple interruptions
- **Planning Reserve Margin (Resource Adequacy)**

→ IRP QCC values in PRS

(8) Energy Generation Location

- **Percent of generation located in Washington or Connected to Avista Transmission**

→ Supply-side NEIs associated with location

(9) Outdoor Air Quality

- Weighted average days exceeding healthy levels
- **SO2, NOx, Mercury, Volatile Organic Compounds from AVA generating plans**
- Wood heating reduction

→ Included in resource selection

(10) Greenhouse Gas Emissions

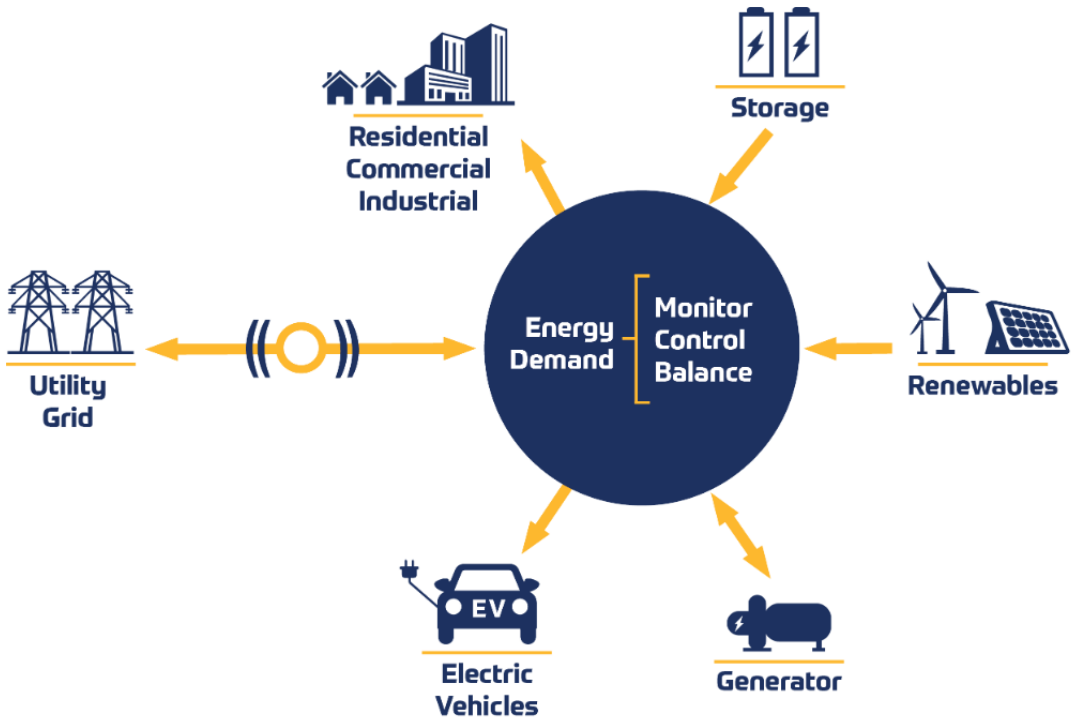
- **Regional GHG emissions**
- **Avista GHG emissions**

→ RESULT: Preferred Resource Strategy

CBIs and Resource Selection
Applicable CBIs and Metrics

(5) Named Community Clean Energy

- Total MWh of DER 5 MW and under
- Total MWh of Energy Storage Resources
- Number of sites/projects of distributed renewable energy resources and energy storage resources



- ✓ DER and Energy Storage included as options in the preferred resource strategy analysis.
- ✓ Baseline in development.
- ✓ Named Community Investment Fund may be additional method for incorporating into overall Business strategy

Source: Impact Power Solutions

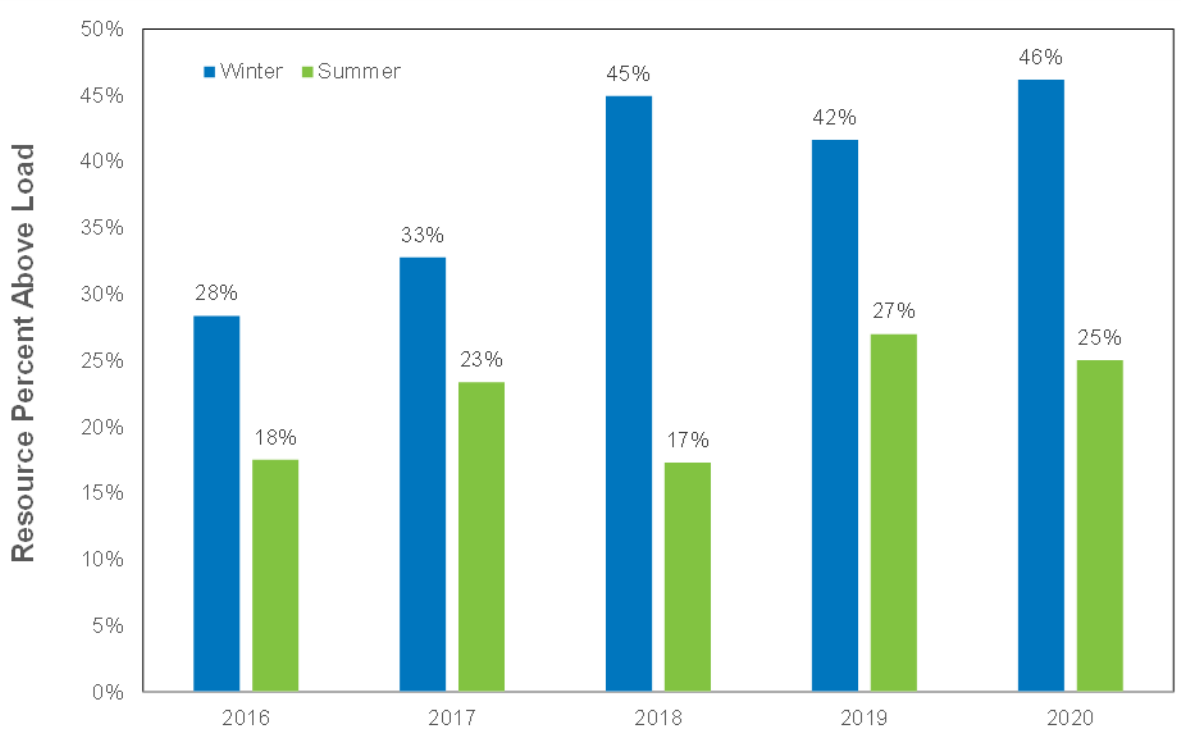
CBIs and Resource Selection
Applicable CBIs and Metrics

(7) Energy Availability

- Customer Average Interruption Duration (CAIDI)
- Frequency of outages for all customers, vulnerable populations, highly impacted communities. Avista will measure using IIEE Index, Customers experiencing multiple outages (CEMI)
- **Resource Adequacy – Planning Reserve Margin**

Baseline

Resource Adequacy Planning Margin



- ✓ CAIDI and CEMI reporting metrics
- ✓ **Resource Adequacy** – Avista will maintain its current planning margin targets of 22% winter and 13% summer until the Western Resource Adequacy Program (WRAP) is implemented

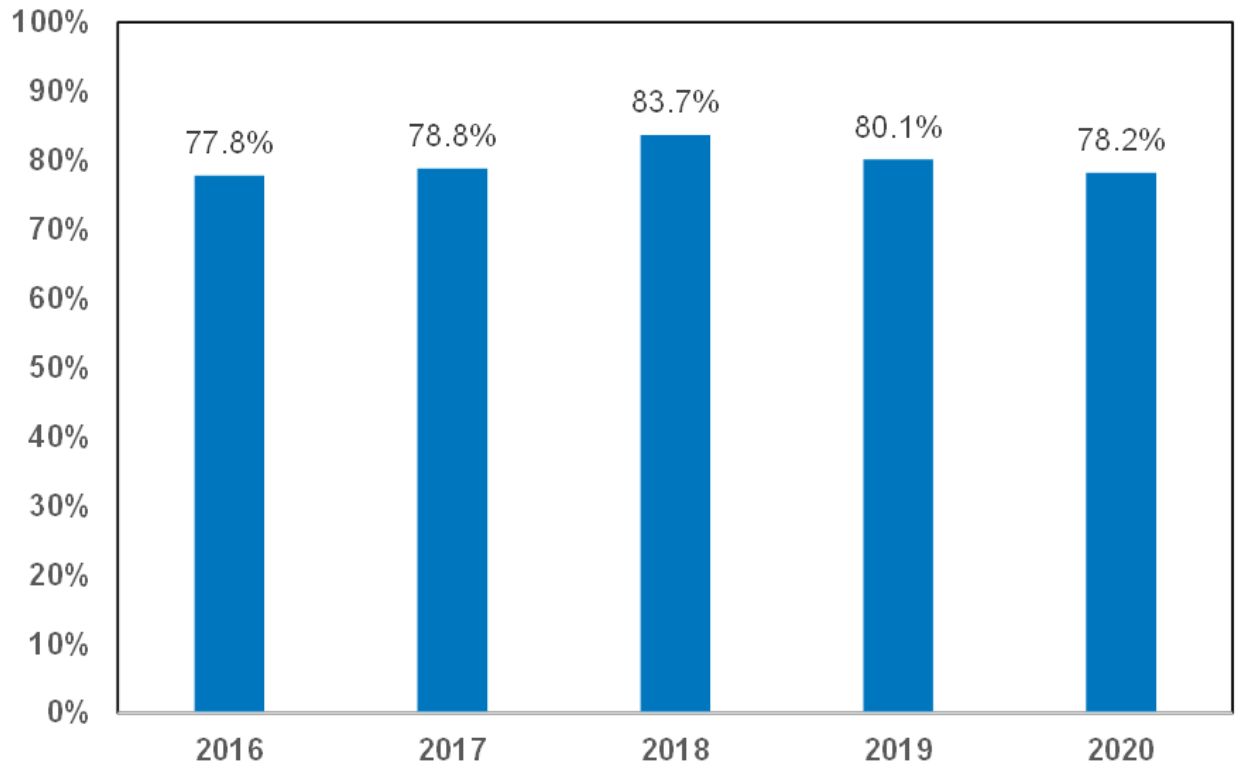
CBIs and Resource Selection
Applicable CBIs and Metrics

(8) Energy Generation Location

- % of Generation located in WA or AVA Transmission

Baseline

Percent of Generation located in Washington or Connected to Avista Transmission System



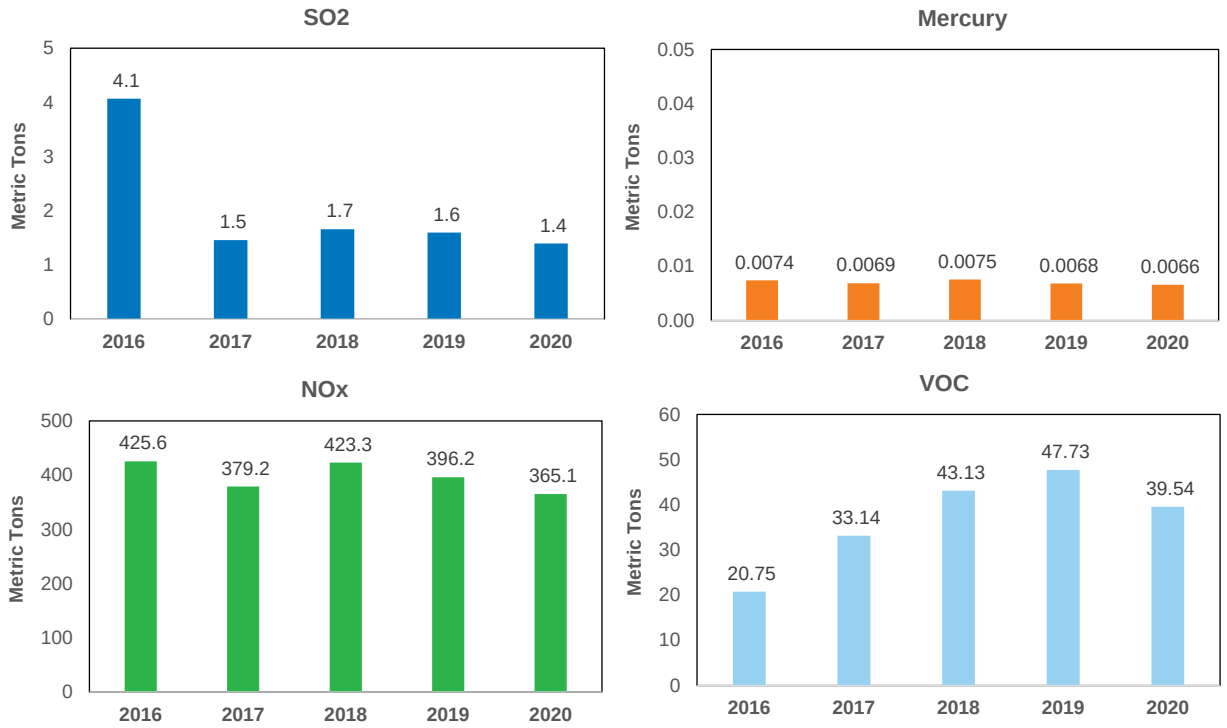
- Will track and have economic benefit of new resource options within Avista's service territory in IRP Selection Process
- Included in RFP Selection Criteria

CBIs and Resource Selection
Applicable CBIs and Metrics

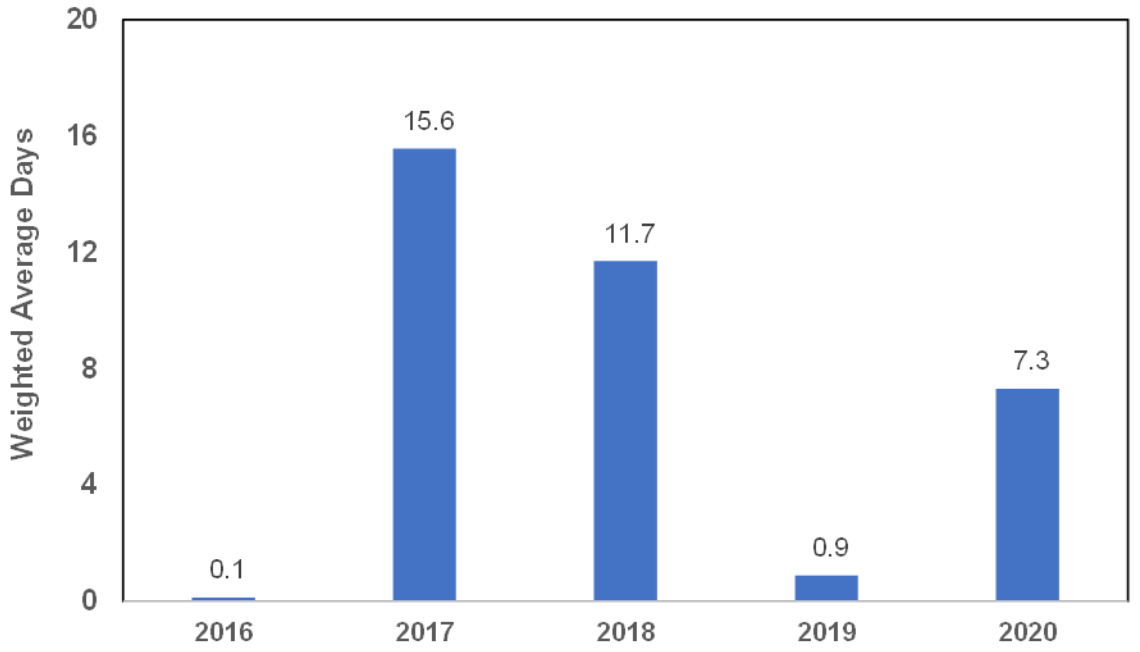
NEI will help to account for the impact of air emissions in new resource selection

(9) Outdoor Air Quality

- Weighted average days exceeding healthy levels
- **SO2, NOx, Mercury, Volatile Organic Compounds from AVA generating plans**
- Wood heating reduction



Baseline - Avista's Generation Outdoor Air Emissions



Baseline – Weighted Average Days Exceeding Healthy Levels

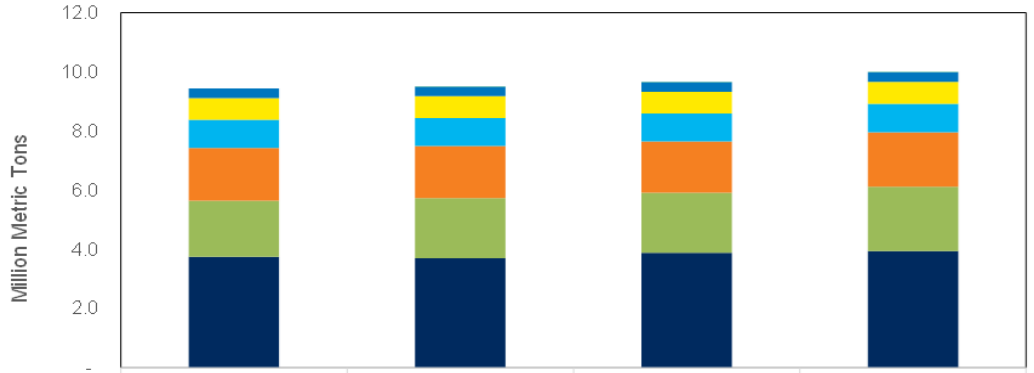
CBIs and Resource Selection
Applicable CBIs and Metrics

NEI will help to account for the impact of GHG Emissions

(10) Greenhouse Gas Emissions

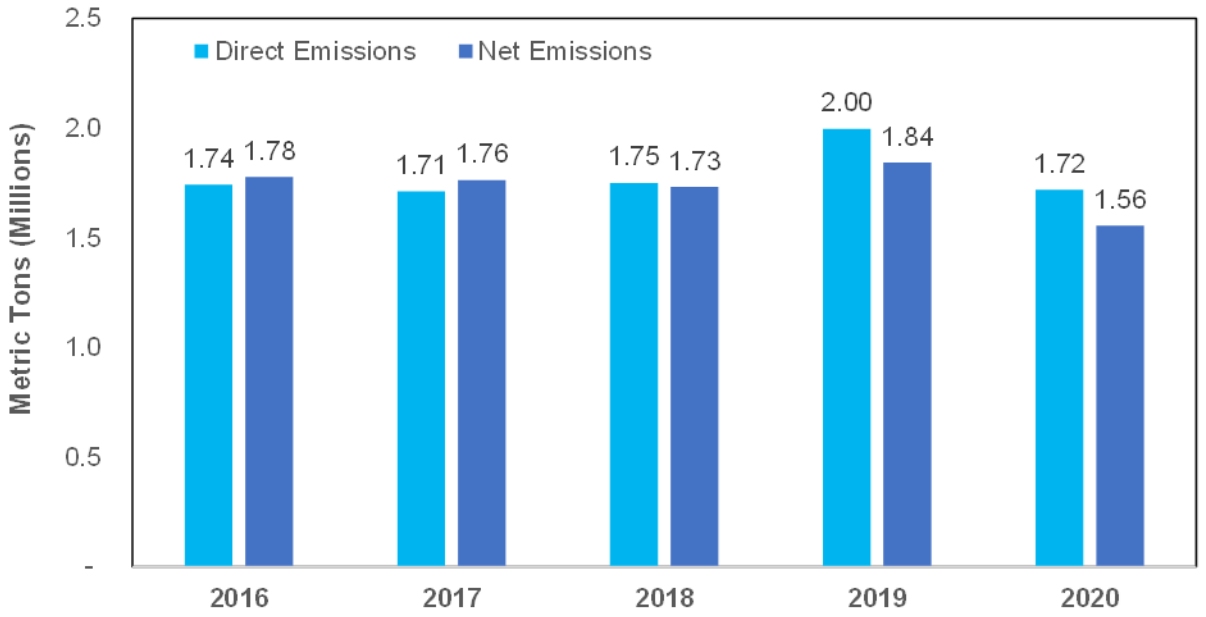
- Regional GHG emissions
- Avista GHG emissions

Baseline - Region GHG Emissions



	2016	2017	2018	2019
Electric Power Serving ID	0.01	0.01	0.01	0.01
Waste Management	0.33	0.32	0.32	0.32
Large Sources	0.73	0.74	0.73	0.75
Agriculture	0.96	0.95	0.95	0.95
Electric Power Serving WA	1.78	1.76	1.73	1.84
Res. & Com. Fuels	1.89	2.03	2.04	2.17
Transportation	3.76	3.71	3.89	3.95
Total	9.45	9.51	9.66	10.00

Baseline - Avista GHG Emissions



CBI in IRP / Progress Report Resource Selection

- Winter Resource Adequacy
- Summer Resource Adequacy
- Annual energy production
- Renewable Energy production
- Energy Efficiency Reductions

- Utility Scale Generation
- Distributed Energy Resources
- Energy Efficiency
- Demand Response

- Preferred Resource Strategy will include five identified CBIs (5, 7, 8, 9, 10)
- NEI study will prioritize selection based on quantified impact

- Compare resource options against energy market.
- Non-energy impact valuation and total resource cost for efficiency analysis.
- Social cost of greenhouse gas inclusion for fossil fuel resources.
- Resource selection must satisfy all resource requirement objectives.

- Renewable Energy
- Energy Efficiency
- Demand Response/ Distributed Energy Resource

Implementation

Implementation – Resource and Program Selection and Prioritization

- Several CBIs, while not utilized in IRP, will be utilized in program selection and/or prioritization.
- Other CBIs are more applicable to measurement of success of Company efforts in areas such as:
  - Access to clean energy – i.e. increased participation in programs
  - Overcoming barriers to participation – i.e. increased translation services
  - Methods and modes of Communication – i.e. reaching additional customers as measured in saturation rate for all and Named Communities

Named Community Investment Fund

40% or up to $2.0 million
- Supplement and support energy efficiency efforts targeted to Named Communities

20% or up to $1.0 million
- Investments in distribution resiliency efforts for Named Communities

20% or up to $1.0 million
- Incentives or grants to develop projects by local customers or third parties

10% or up to $500,000
- Used for newly developed targeted outreach and engagement efforts specifically for Named Communities.

10% or up to $500,000
- Used for other projects, programs or initiatives specific to Named Communities

May be used for:
- Distributed Energy Resources
- Economic Development
- Other – as identified by EAG or other Named Community members

Evaluation Process – All Source RFP

Initial Screen Evaluation Scoring Matrix

Weighting						
20%	40%	5%	20%	10%	5%	100%
Risk Management	**Financial Energy Impact***	**Price Risk**	**Electric Factors**	**Environmental**	**Non-Energy Impact****	**Total Score**
Developer Experience, Proven Technology, etc.	Financial Analysis of Price to include PPA/Ownership, capacity costs/value, transmission, cost of carbon, etc.	Potential for change in costs, fixed vs variable pricing, variable energy, etc.	Interconnection status and transmission plan	Permitting such as Conditional Use Permit, SEPA, Studies, etc.	Energy security, benefit to service territory, named communities, DEI, etc.	

**Financial evaluation based on highest score of Capacity or Energy.*

*** Non-Energy Impact includes impact of Clean Energy Implementation Plan Customer Benefit Indicators (where applicable).*

1st Yr. Customer Benefit

Energy Impact

Non-Energy Impact

Measure	Bill Savings	Energy Burden (NEI Only)	Air Quality	Named Community Investment	Total Benefit	NEI contribution to total benefit
LI-Building Envelope-Windows*	$0.60	$0.69	$1.95	$0.15	$3.39	82%
LI-Building Envelope-Energy Star Rated Doors	$16.19	$17.61	$48.63	$5.09	$87.52	81%
LI-Building Envelope-Attic Insulation*	$0.06	$0.03	$0.05	$0.03	$0.17	67%
LI-Building Envelope-Air Infiltration	$63.10	$33.79	$50.55	$23.92	$171.36	63%
LI-Building Envelope-Floor Insulation*	$0.12	$0.06	$0.06	$0.06	$0.29	60%
LI-Building Envelope-Wall Insulation*	$0.14	$0.07	$0.07	$0.07	$0.35	60%
LI-HVAC-Air Source Heat Pump	$87.84	$35.64	$35.59	$41.79	$200.86	56%
LI-HVAC-Ductless Heat Pump (w FAF)	$301.62	$133.65	$72.54	$142.76	$650.58	54%
LI-HVAC-Duct Insulation*	$0.27	$0.12	$0.01	$0.12	$0.52	48%
LI-HVAC-Duct Sealing	$70.99	$27.73	$1.53	$21.86	$122.12	42%
LI-Hot Water-Heat Pump Water Heater	$58.73	$19.08	$0.00	$17.23	$95.04	38%
LI-Lighting-Outreach/Direct Install LED	$0.10	$0.03	$0.00	$0.02	$0.16	35%

*Sq Ft.

2023 IRP Scenario Analysis

James Gall, Integrated Resource Planning Manager
Electric IRP, Seventh Technical Advisory Committee Meeting
October 11, 2022

2023 IRP vs 2023 Progress Report

- Washington Progress Report to be filed on January 3, 2023. This report includes only scenarios that estimate avoided costs.
  - Progress report will be based on a stochastic study of 300 potential futures with varying market drivers.
  - Due to the resource acquisition process, the progress report will have a “planning” portfolio based on IRP resource options to meet resource shortfalls rather then actual resources from the RFP.
- 2023 IRP will include the scenario analysis
  - 2023 IRP will have signed PPAs/projects from the RFP.
- 2023 IRP is an Idaho only filing, but due to portfolio impacts of Washington policy this IRP will consider scenarios related to Washington policy.

Proposed Market Scenarios

- 300 Stochastics
  - Load, fuel prices, wind, hydro, inflation
- High natural gas prices
- Low natural gas prices
- National greenhouse gas price
- No Climate Commitment Act
- Climate Commitment Act (CCA) dispatch pricing options for thermal units outside Washington (2023-2025)
  - No CCA Pricing
  - PT Ratio CCA Pricing
  - Full CCA Pricing

Proposed Portfolio Scenarios

Resource/Planning Margin Portfolios

- Idaho Colstrip exit selected by model
  - 1 or 2 units
  - PT ratio shares vs entire units
- WRAP planning reserve margin
- WRAP planning reserve margin + risk
- Market only (for avoided costs)
- No CETA (for avoided costs)
- No WA SCGHG (for avoided costs)
- Resource allocation (TBD)

Load Portfolios

- Low economic conditions
- High economic conditions
- Building electrification
  - Washington new residential construction only
  - All Washington customers transition by 2050
  - Space Heating Above 40 degree + Water Heat
- High transportation electrification