



2025 Electric Integrated Resource Plan
Technical Advisory Committee Meeting No. 3 Agenda
Tuesday, March 21, 2024
Virtual Meeting – 8:30 am to 10:00 am PTZ

Topic

Introductions

Review of January Cold Weather Event

Wholesale Price Forecasts – Natural Gas and Electric

Portfolio and Market Scenarios Options

Staff

John Lyons

James Gall

Planning Team

James Gall



2025 IRP TAC 3 Introductions

John Lyons, Ph.D.
Technical Advisory Committee Meeting No. 3
March 21, 2024

Today's Agenda

Introductions, John Lyons

Review of January Cold Weather Event, James Gall

Wholesale Price Forecasts – Natural Gas and Electric, Planning Team

Portfolio and Market Scenarios Options, James Gall

Remaining 2025 Electric IRP TAC Schedule

- **TAC 4: April 9, 2024: 8:30 to 10:00 (PTZ)**
 - Future Climate Analysis
 - Economic Forecast & Five-Year Load Forecast
- **TAC 5: April 23, 2024: 8:30 to 10:00 (PTZ)**
 - Long Run Load Forecast (AEG)
 - Review Planned Scenario Analysis
- **TAC 6: May 7, 2024: 8:30 to 10:00 (PTZ)**
 - Conservation Potential Assessment (AEG)
 - Demand Response Potential Assessment (AEG)
- **TAC 7: May 21, 2024: 8:30 to 10:00 (PTZ)**
 - Variable Energy Resource Study
 - Portfolio/Market Scenarios
- **TAC 8: June 4, 2024: 8:30 to 10:00 (PTZ)**
 - Load & Resource Balance and Methodology
 - Loss of Load Probability Study
 - New Resources Options Costs and Assumptions

Remaining 2025 Electric IRP TAC Schedule

- **TAC 9: June 18, 2024: 8:30 to 10:00 (PTZ)**
 - IRP Generation Option Transmission Planning Studies
 - Distribution System Planning within the IRP & DPAG update
- **Technical Modeling Workshop: June 25, 2024: 9:00 am to 12:00pm (PTZ)**
 - PRiSM Model Tour
 - ARAM Model Tour
 - New Resource Cost Model
- **TAC 10: July 16, 2024: 8:30 to 10:00 (PTZ)**
 - Preferred Resource Strategy Results
 - Washington Customer Benefit Indicator Impacts
 - Resiliency Metrics
- **TAC 11: July 30, 2024: 8:30 to 10:00 (PTZ)**
 - Preferred Resource Strategy Results
 - Portfolio Scenario Analysis
 - LOLP Study Results

Remaining 2025 Electric IRP TAC Schedule

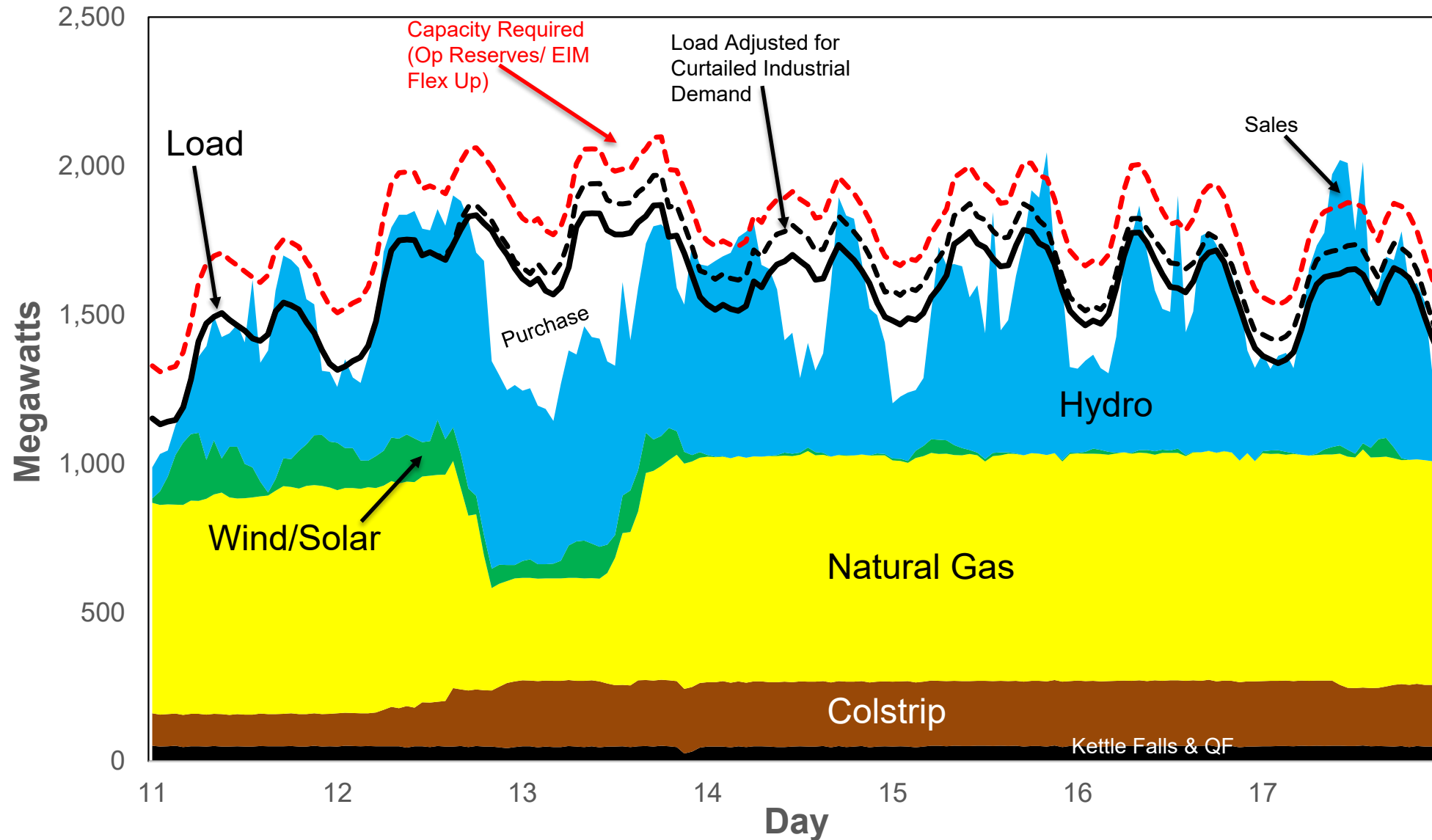
- **TAC 12: August 13, 2024: 8:30 to 10:00 (PTZ)**
 - Preferred Resource Strategy Results (continued)
 - Portfolio Scenario Analysis (continued)
 - LOLP Study Results (continued)
 - QF Avoided Cost
- **September 2, 2024- Draft IRP Released to TAC.**
- **Virtual Public Meeting- Natural Gas & Electric IRP (September 2024)**
 - Recorded presentation
 - Daytime comment and question session (12pm to 1pm- PST)
 - Evening comment and question session (6pm to 7pm- PST)



MLK Weekend 2024 Weather Event

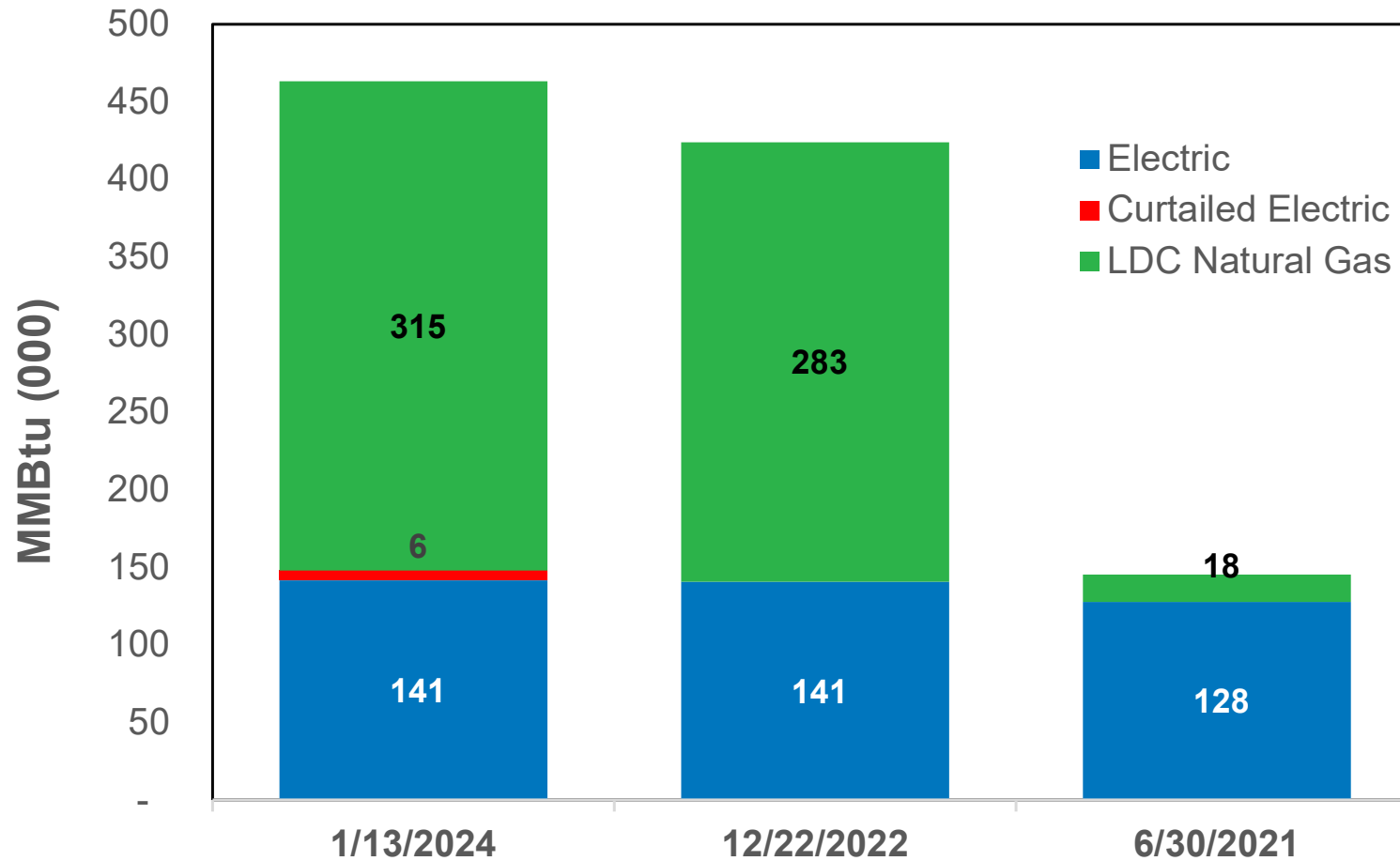
James Gall, Manager of Integrated Resource Planning
Technical Advisory Committee Meeting No. 3
March 21, 2024

Loads and Resources



Gas vs. Electric Demand

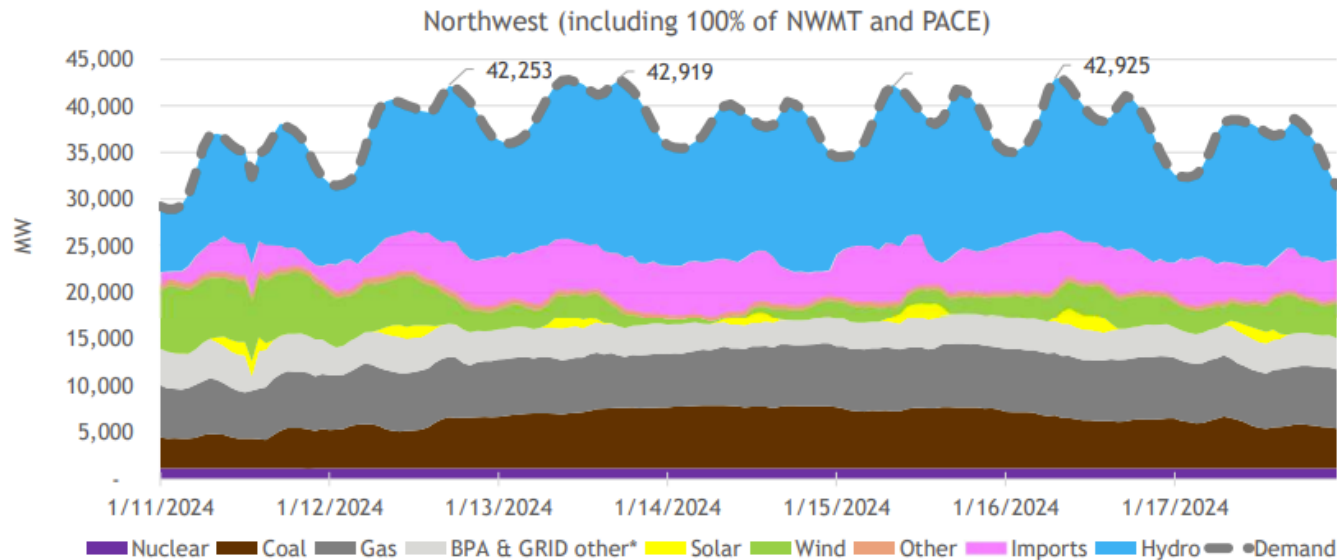
Total MMBTU of Daily Demand



Daily electric MWh multiplied by 3.412

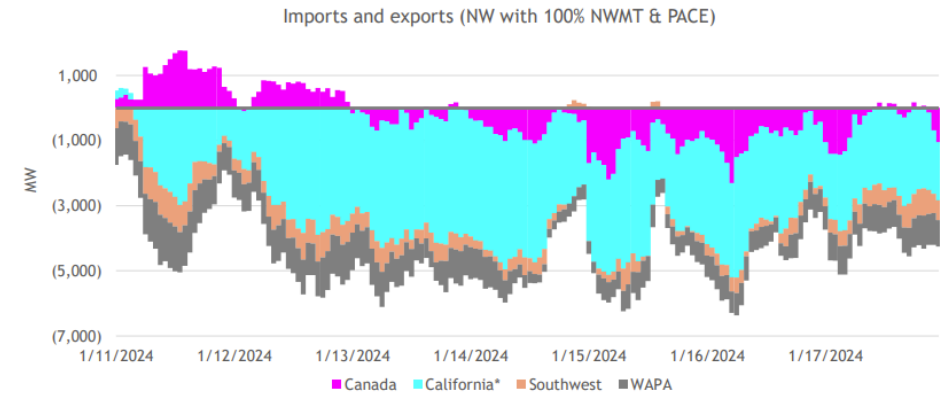
Regional Power Challenges

Resource stack (*approximate*)



*"BPA & GRID other" is likely mostly natural gas plants

Flows into the Northwest



Some of the WAPA & Southwest imports are NW resources located out-of-region

*Graph shows flows, not power origin: California was net importing from the Southwest while also exporting to the Northwest

Northwest Power and Conservation Council EIA form 930 data. Data have been edited to address discrepancies; some discrepancies may still exist. Canada includes interchange with BC & AESO; California includes the AC line & power flowing into PACE; Southwest is NEVP & AZPS; WAPA is WALUW & WACM. 8

Potential Resource Adequacy Changes

- ✓ Update load forecast dataset to include new event.
- ✓ EIM Uncertainty Flex Ramp Up will be additional planning requirement.
- ✓ If planning margin is less than the single largest contingency resource, the planning margin will be adjusted to this level.
- Should we assume a low water for storage hydro resources QCC?
- Is a lower Loss of Load Probability (5%) target more prudent?
- Can Avista depend on the market in extreme events (330 MW)?
- Should we plan for meeting an extreme day such as this as a minimum resource adequacy standard vs LOLP method?

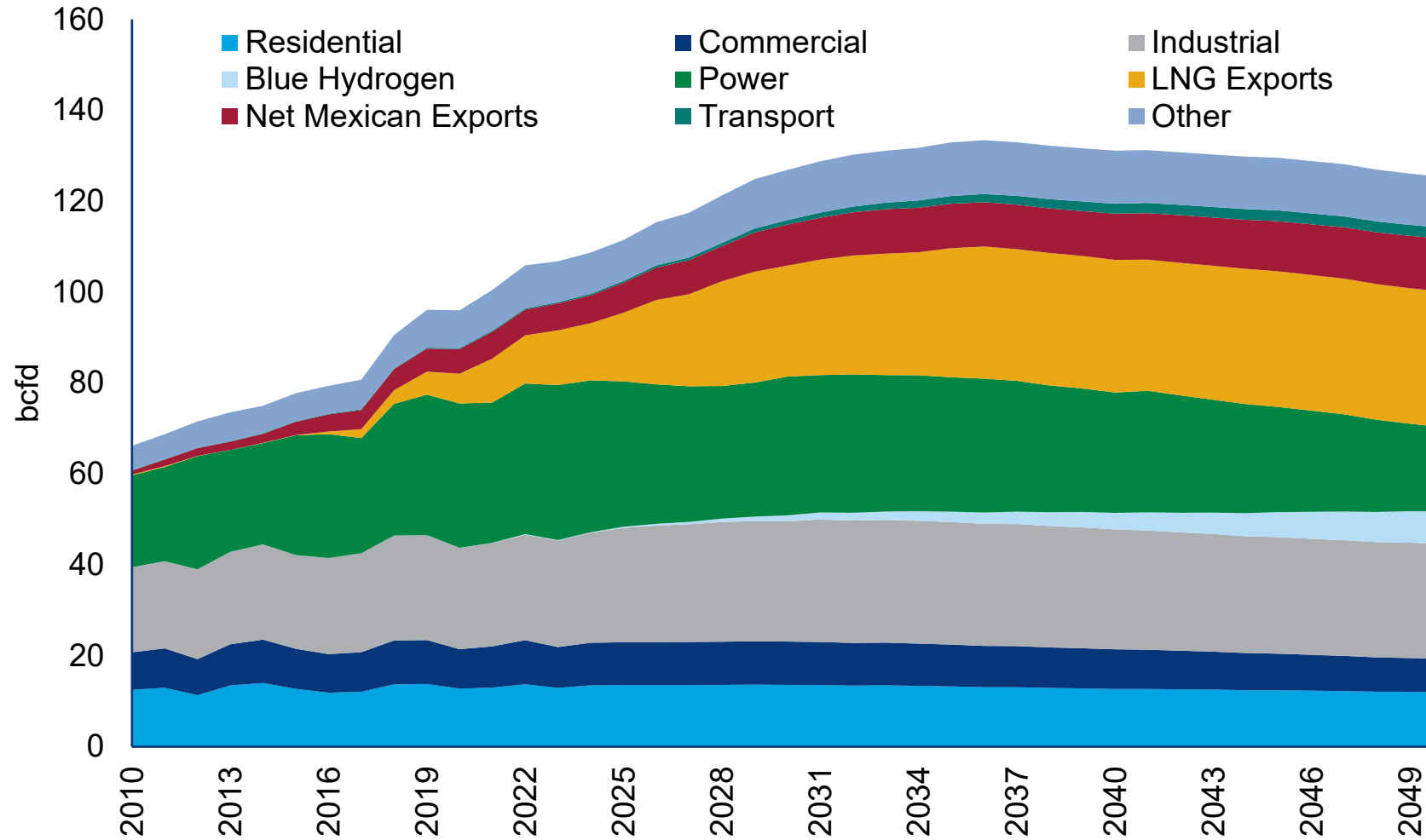


Natural Gas Fundamental Forecast

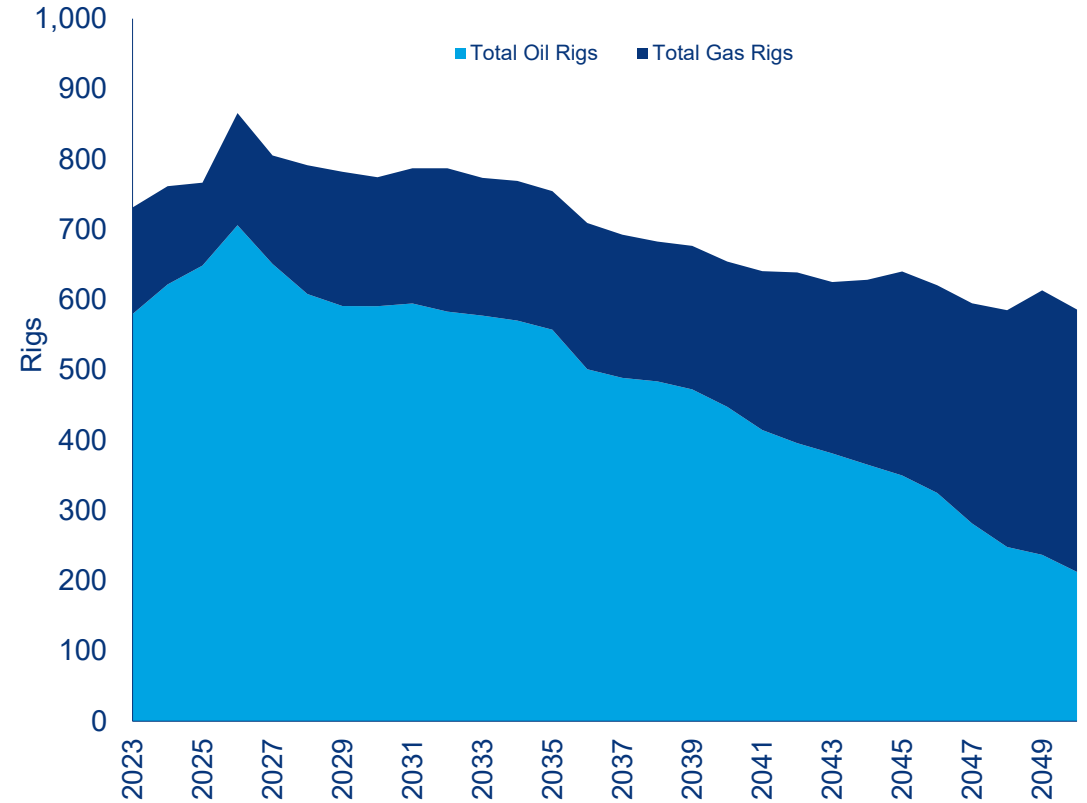
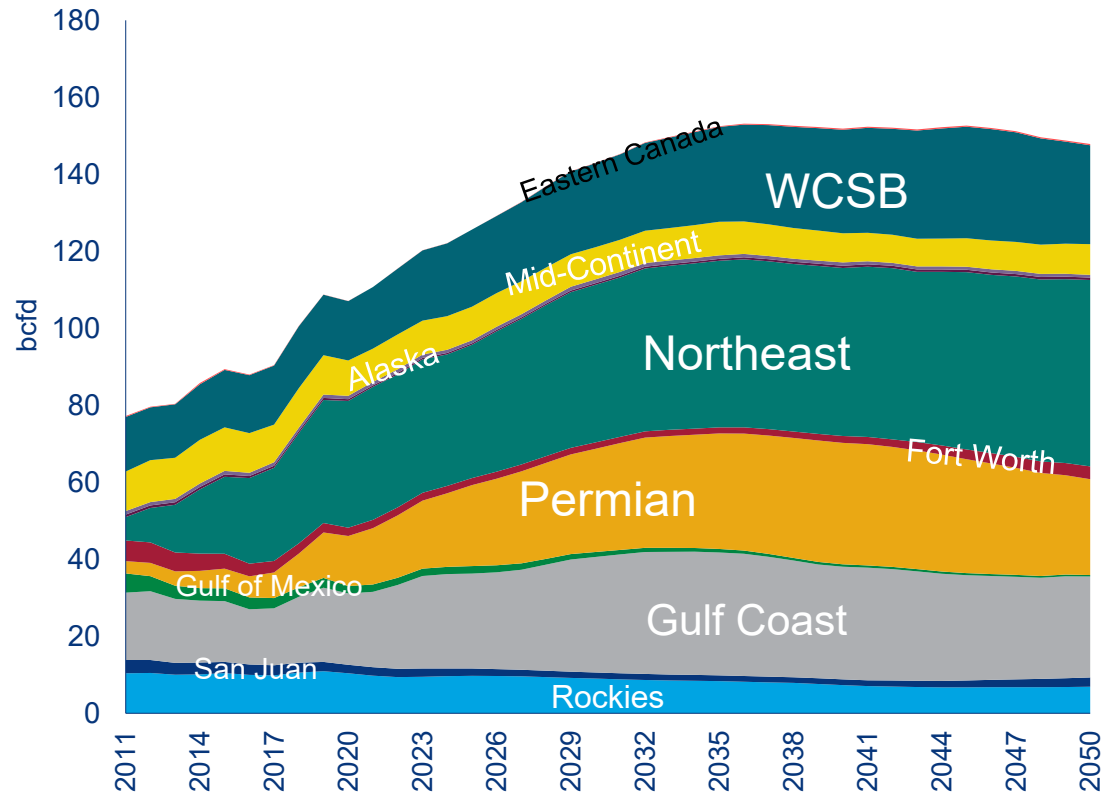
Wood Mackenzie

2025 – Electric IRP
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Lower 48 Demand



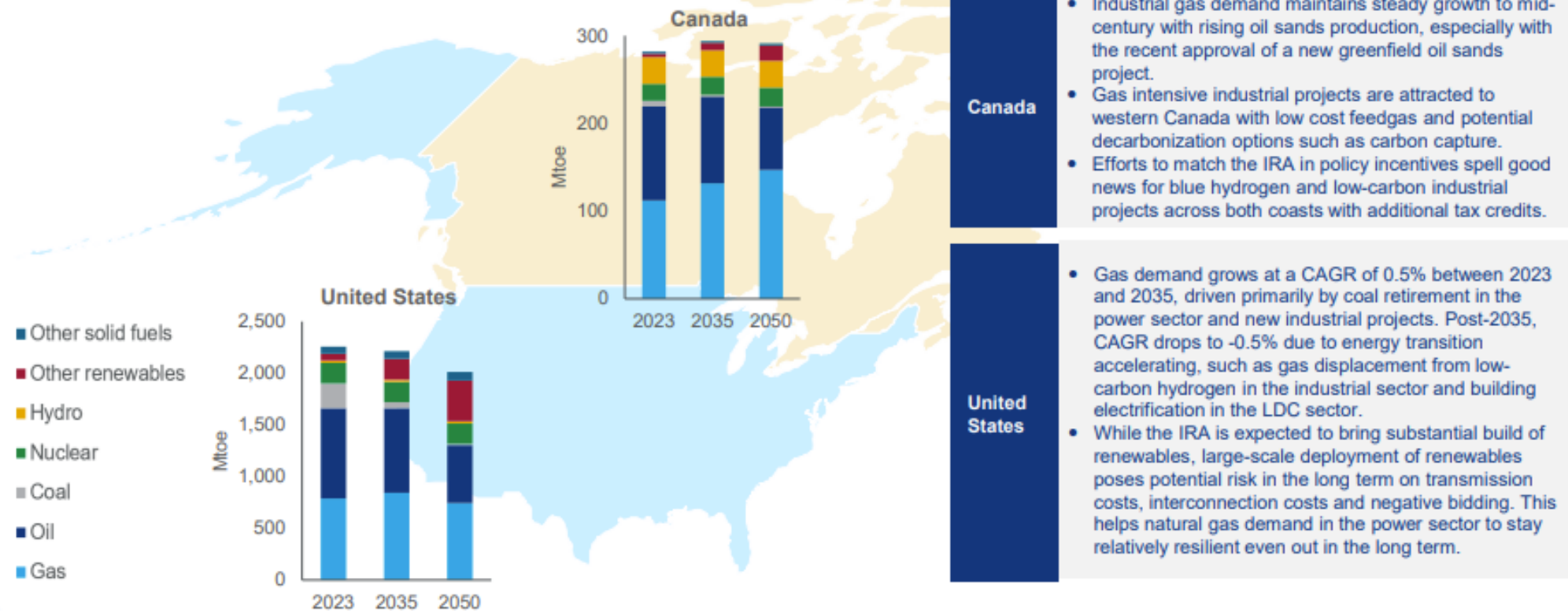
North American Supply



Natural gas' share of total energy demand increases over time

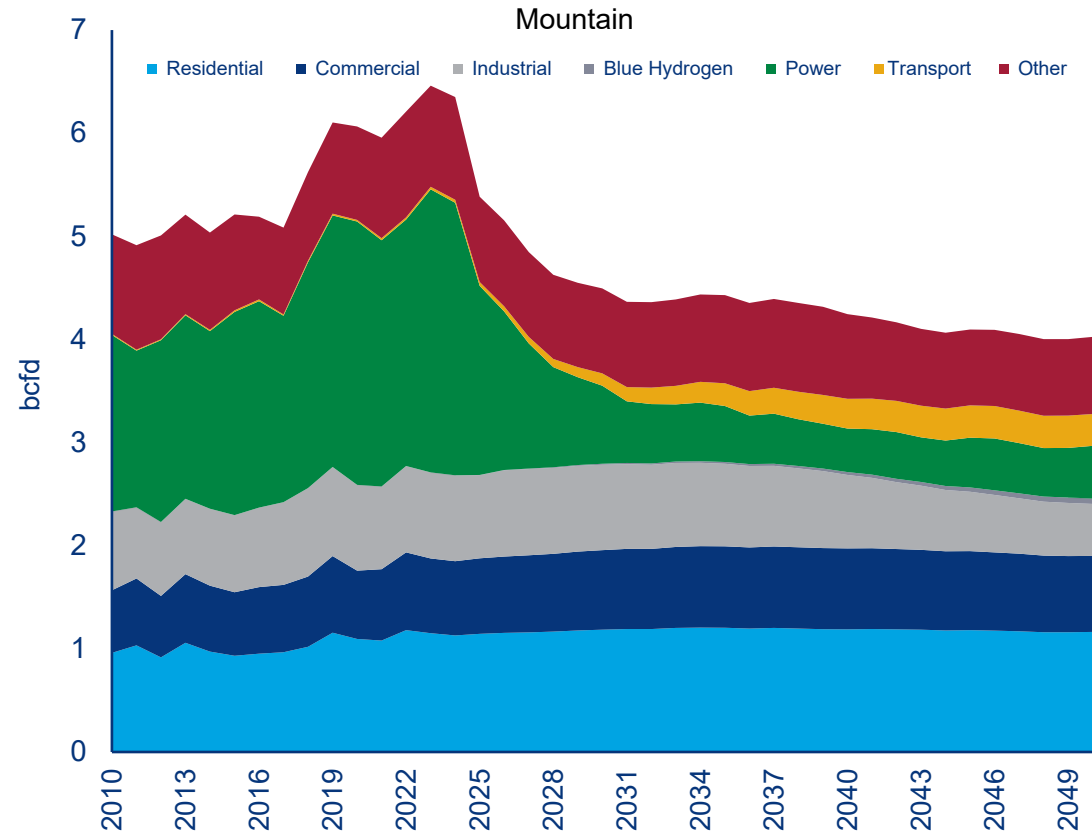
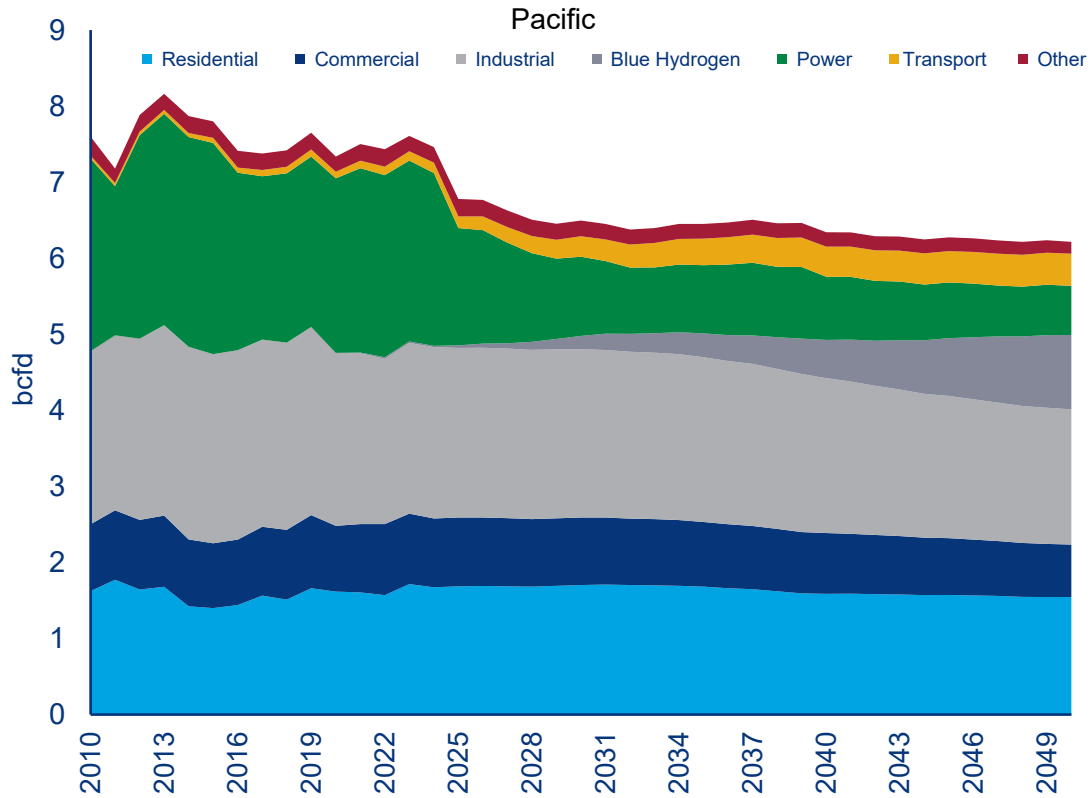
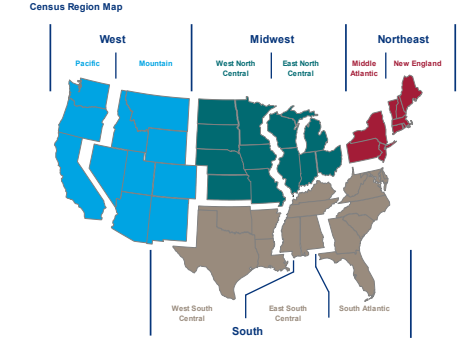
Gas plays a crucial role for energy security even through energy transition

Primary energy demand mix* in North America



*Gas is based on Wood Mackenzie 2023 North America gas strategic planning outlook. Other commodities are based on Wood Mackenzie's 2022 investment horizon.
Source: Wood Mackenzie Energy Transition Tool

Regional Demand

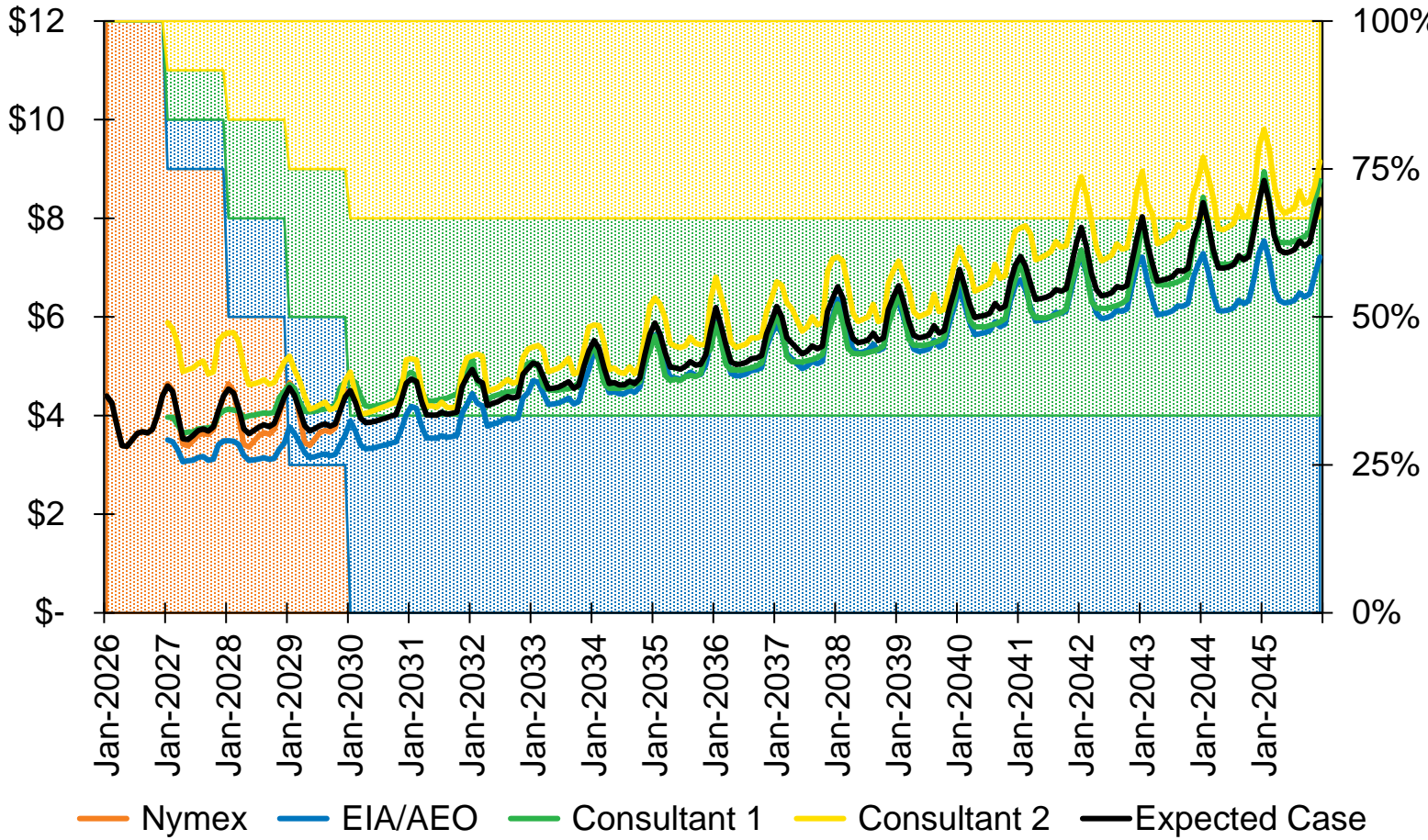




Natural Gas Market Price Forecast

Michael Brutocao, Natural Gas Supply Analyst
Technical Advisory Committee Meeting No. 3
March 21, 2024

Henry Hub Expected Case Price Forecast



- Levelized Price: \$4.99
- Data Sources
 - NYMEX forward market prices on December 15, 2023
 - Annual Energy Outlook 2023
 - Consultants 1 & 2 monthly price forecast
- Methodology
 - Average price of forecasts
 - Decreasing blend of NYMEX

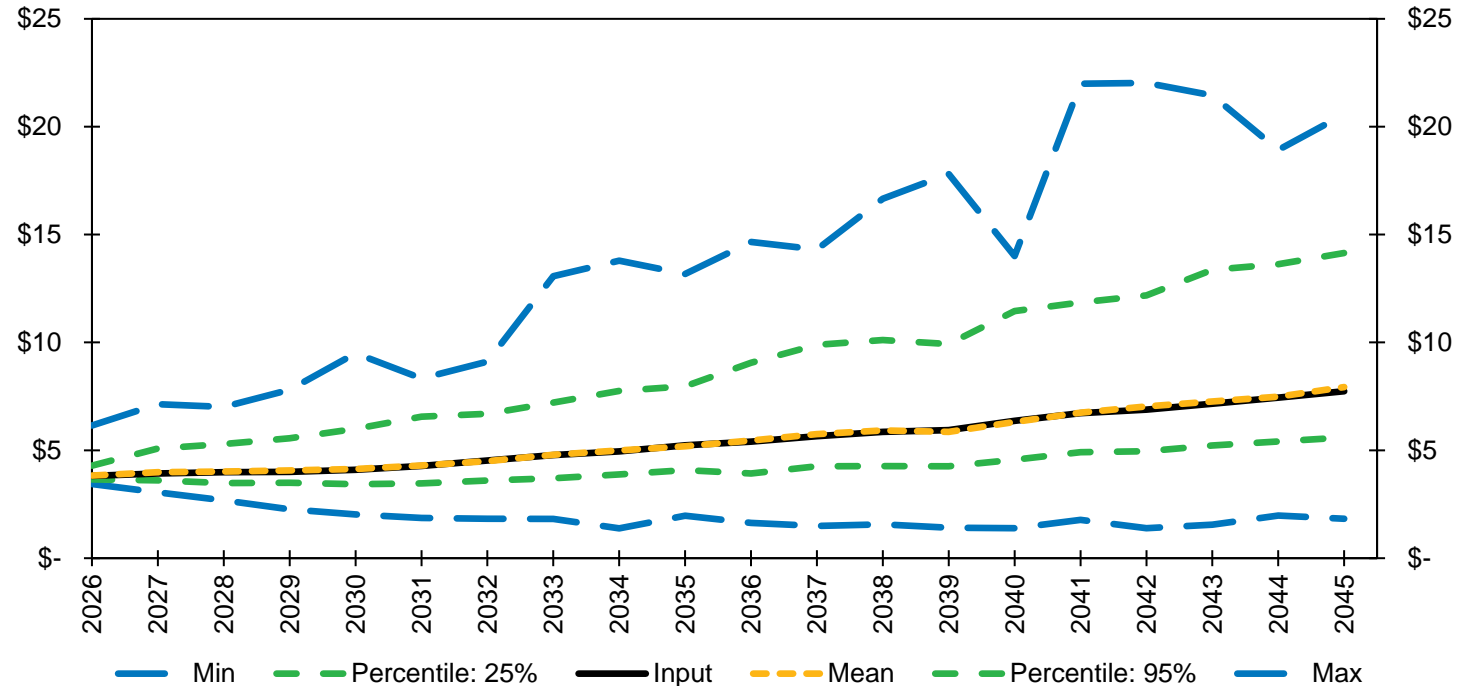
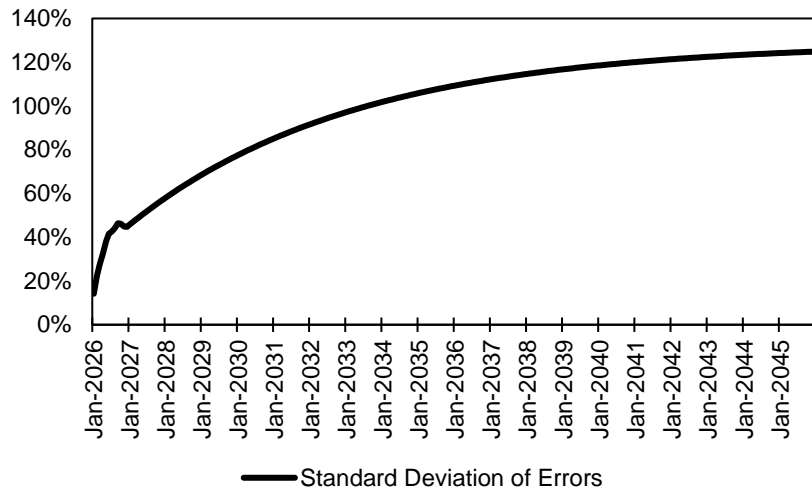
	NYMEX	Other
2026	100%	0%
2027	75%	25%
2028	50%	50%
2029	25%	75%
2030 - 2045	0%	100%



Henry Hub Stochastic Price Forecast

- Stochastic Inputs

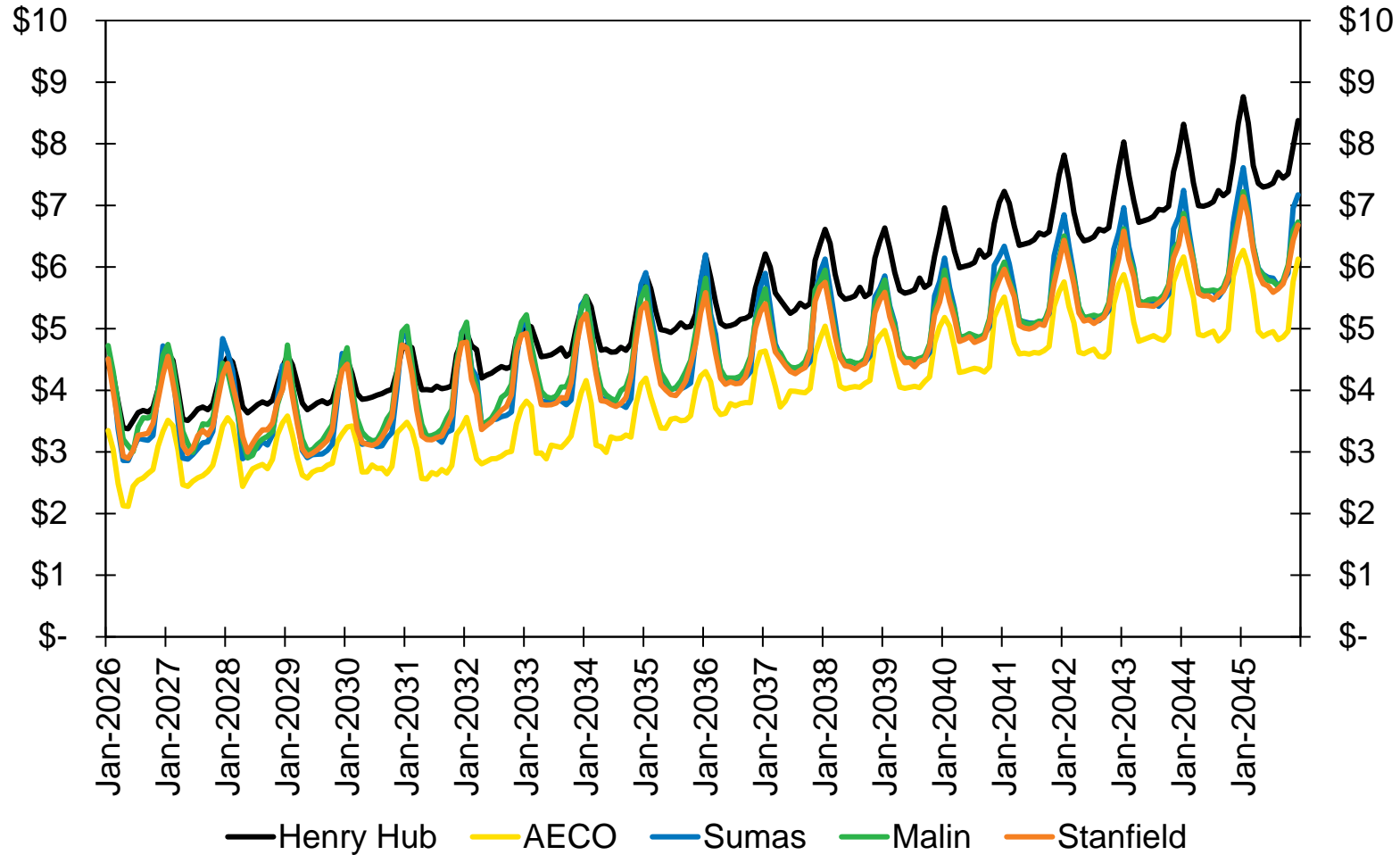
- Expected Case Forecast
 - Data Source: See previous slide
- Autocorrelation (94.16%)
 - Data Source: Historical monthly prices at Henry Hub
- Standard Deviation of Errors
 - Data Source: Historical daily NYMEX forward market prices
 - Data Source: Historical monthly prices at Henry Hub



- Methodology

- Start from Expected Case Forecast
- Perform adjustment for Autocorrelation to prior month
- Randomly draw from prices with lognormally distributed standard deviation of errors

All Basins Expected Case Price Forecast



Levelized Prices	
Henry Hub	\$4.99
AECO	\$3.58
Sumas	\$4.31
Malin	\$4.37
Stanfield	\$4.26

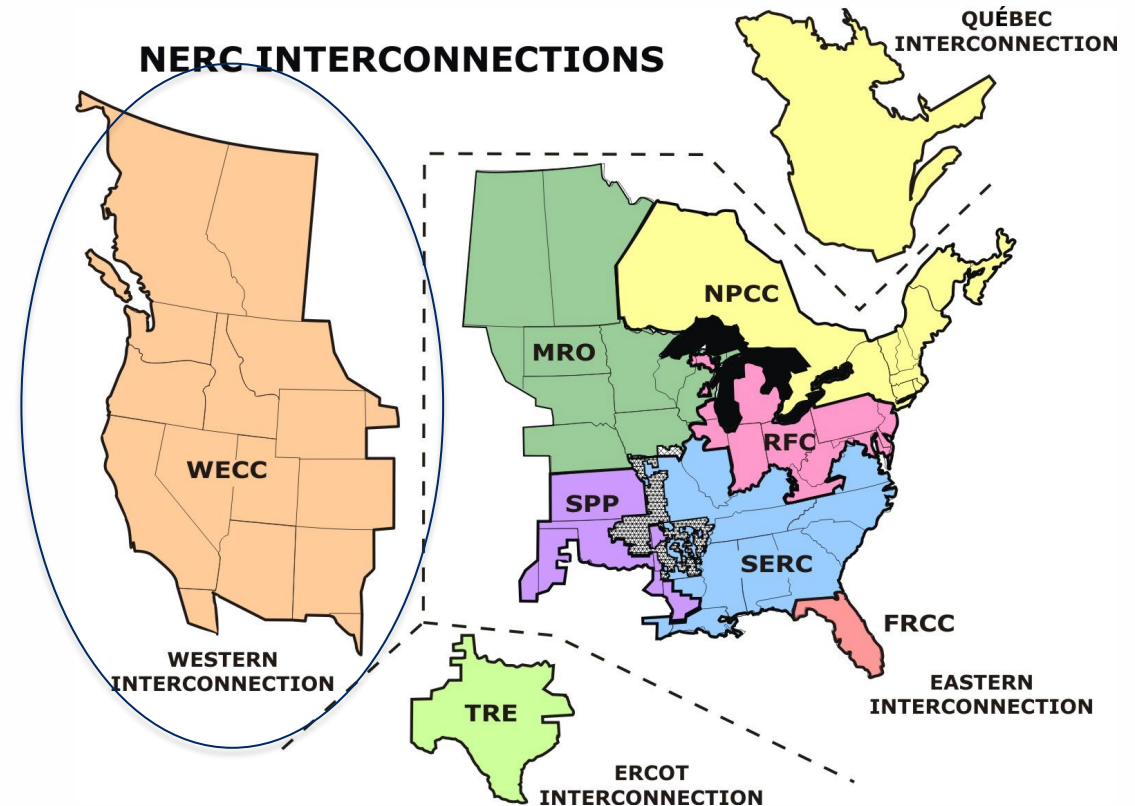


Wholesale Electric Market Price Forecast

Lori Hermanson, Senior Resource Analyst
Technical Advisory Committee Meeting No. 3
March 21, 2024

Market Price Forecast – Purpose

- Estimate “market value” of resource 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



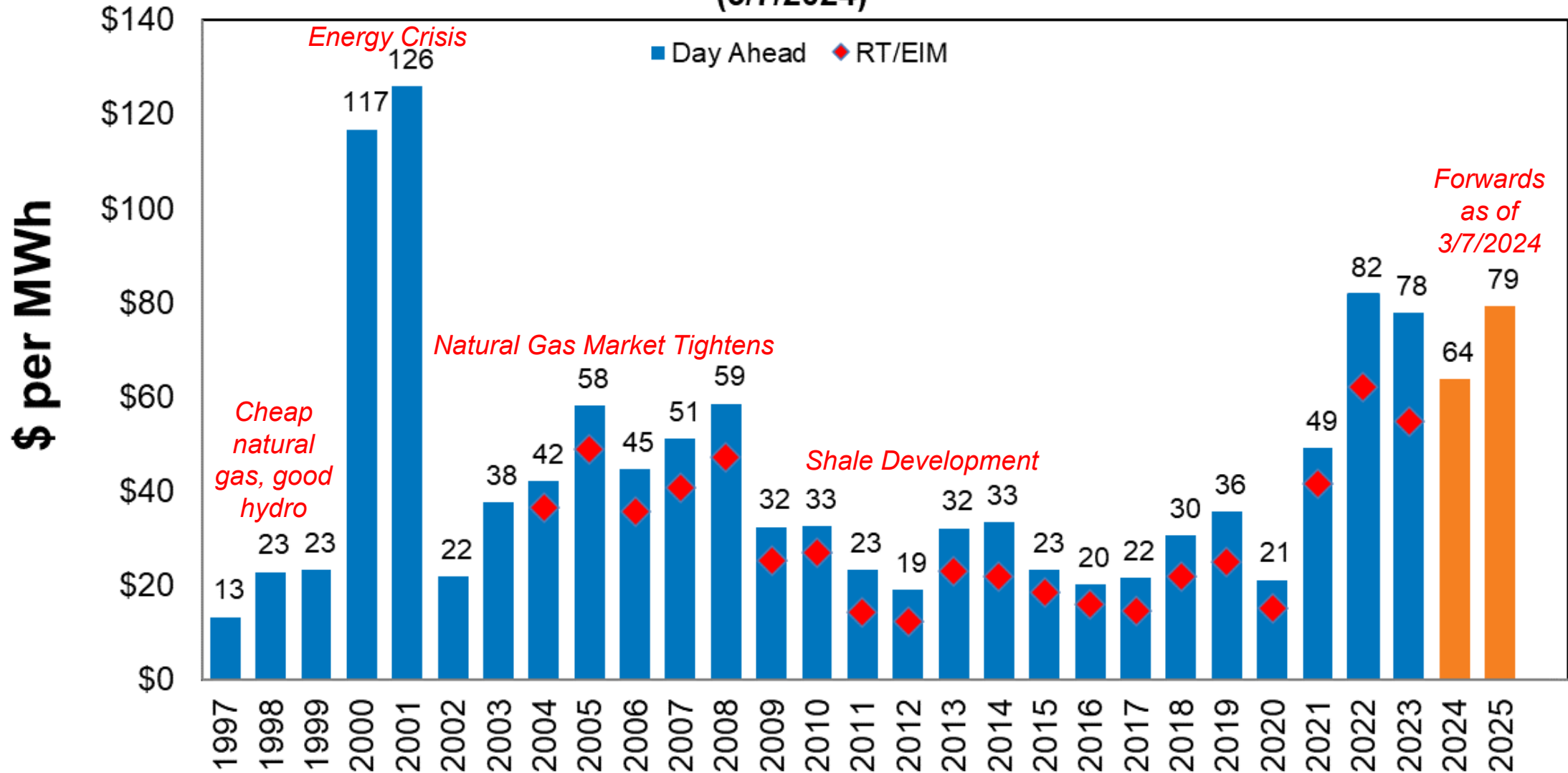
Source: NERC

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 stack
 - Transmission usage
 - Greenhouse gas emissions and cost
 - Power plant margins, generation levels, and fuel costs
 - Avista's variable power supply costs

Wholesale Mid-C Electric Market Price History

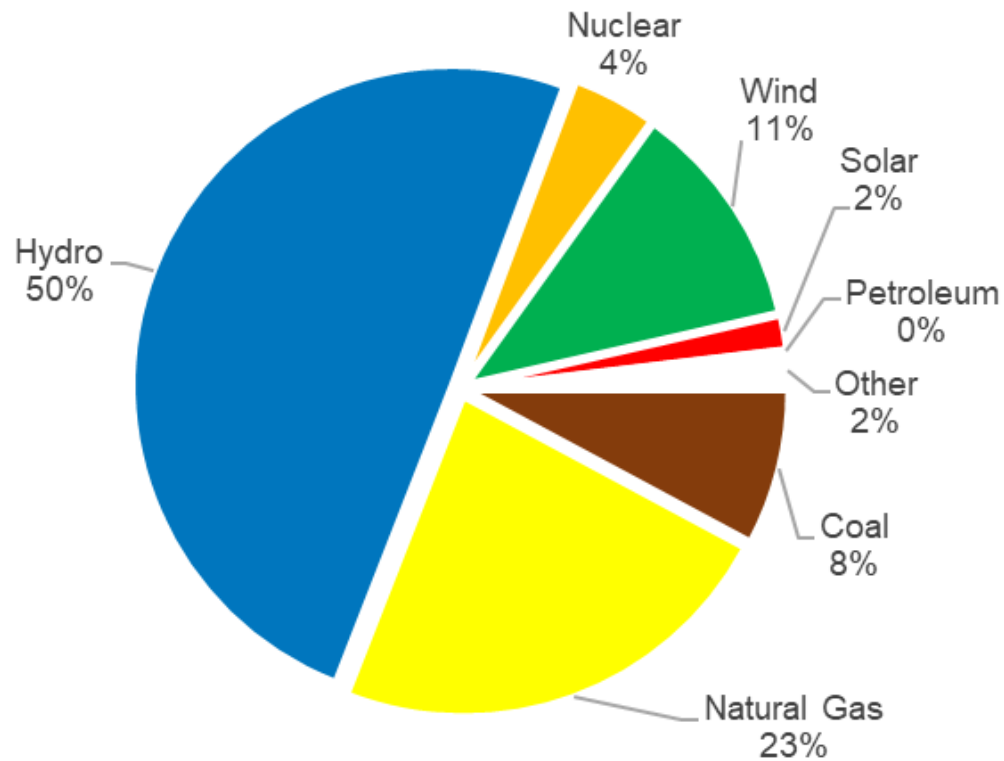
Mid Columbia Electric Prices (3/7/2024)



2023 Fuel Mix

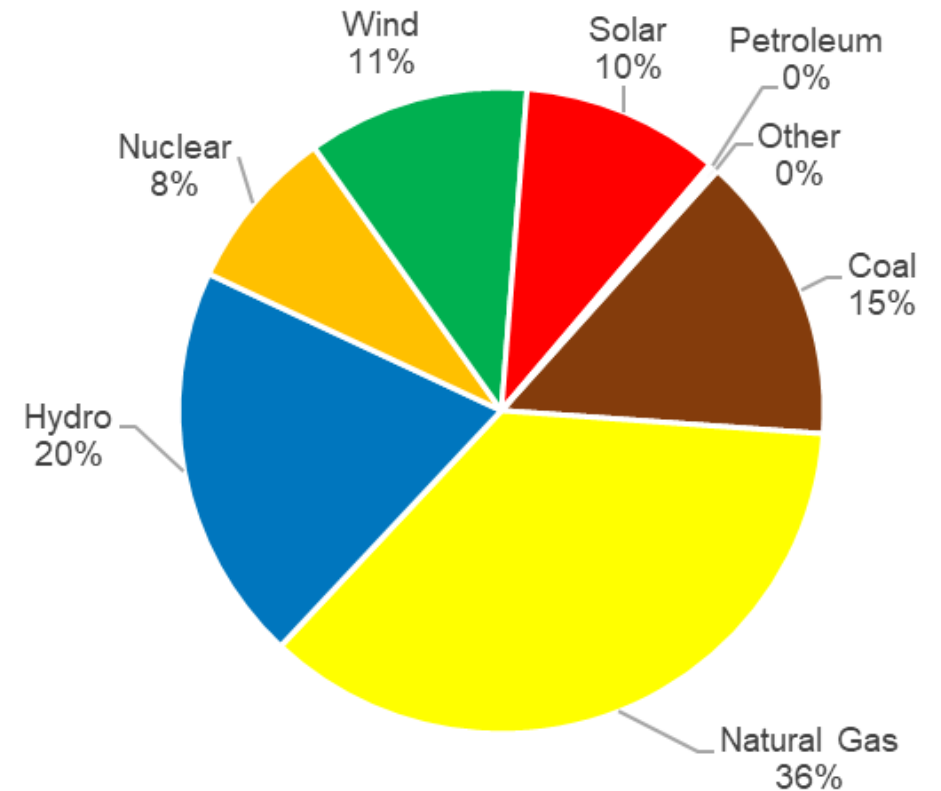
Northwest

69% GHG Emission Free



U.S. Western Interconnect

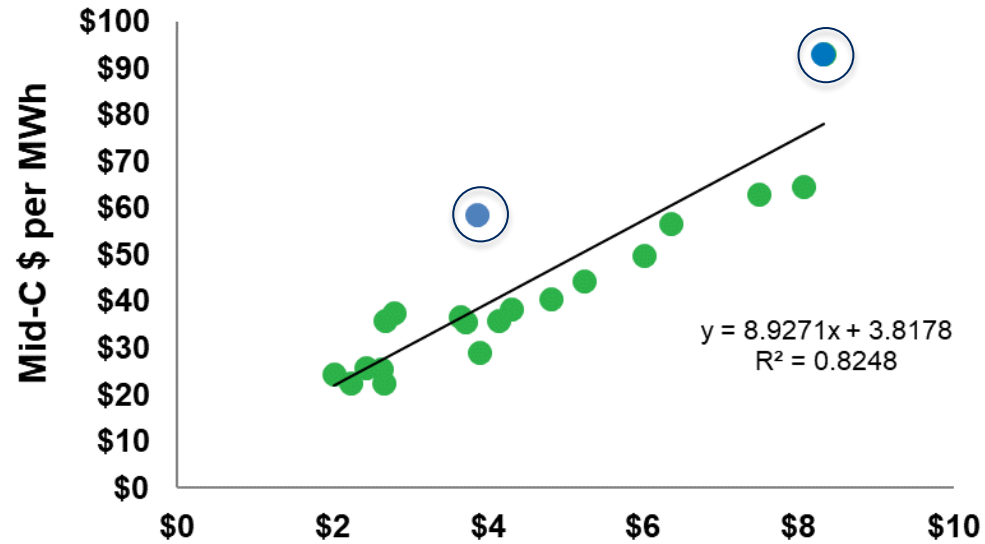
47% GHG Emission Free



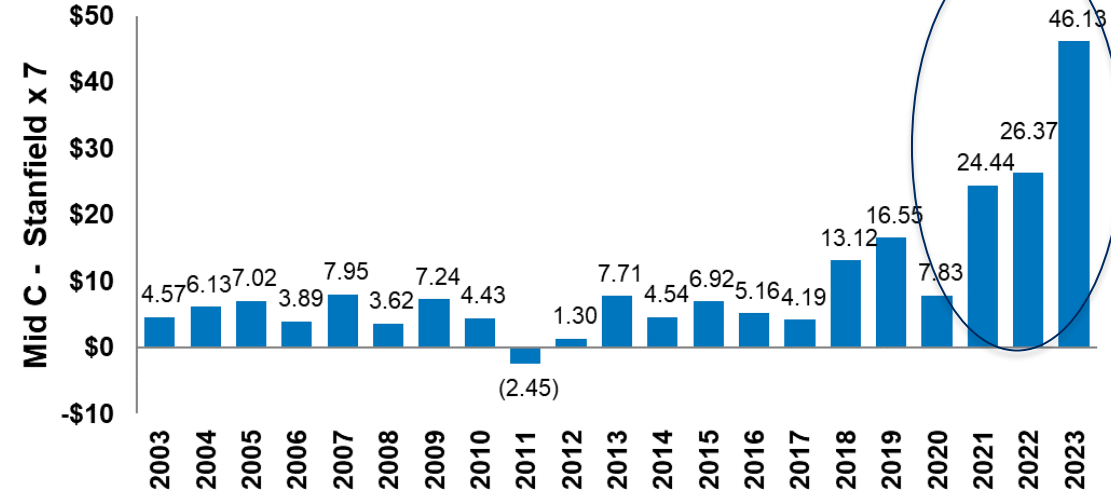
Source: EIA

Market Indicators- Market is Tightening

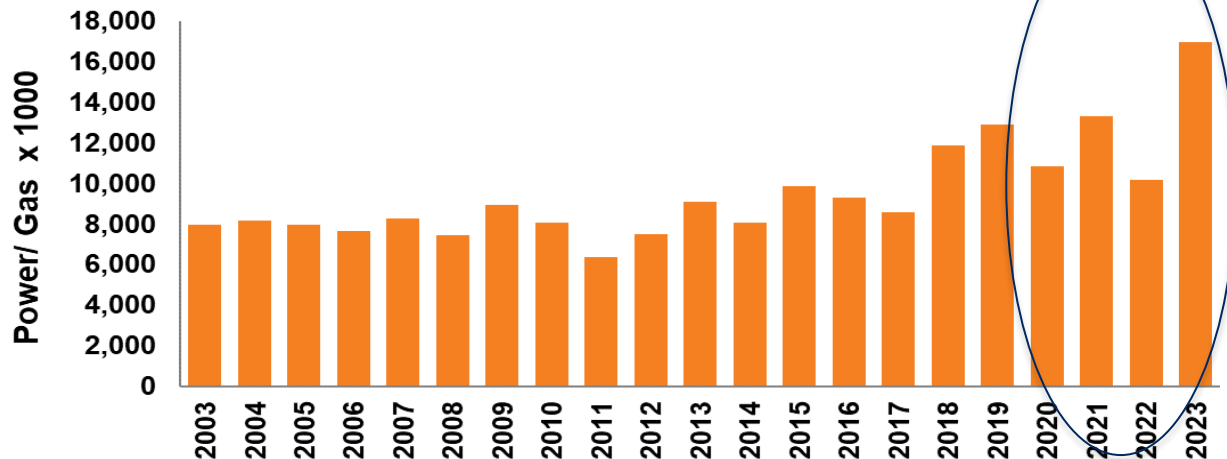
Daily NG vs On-Peak Electric



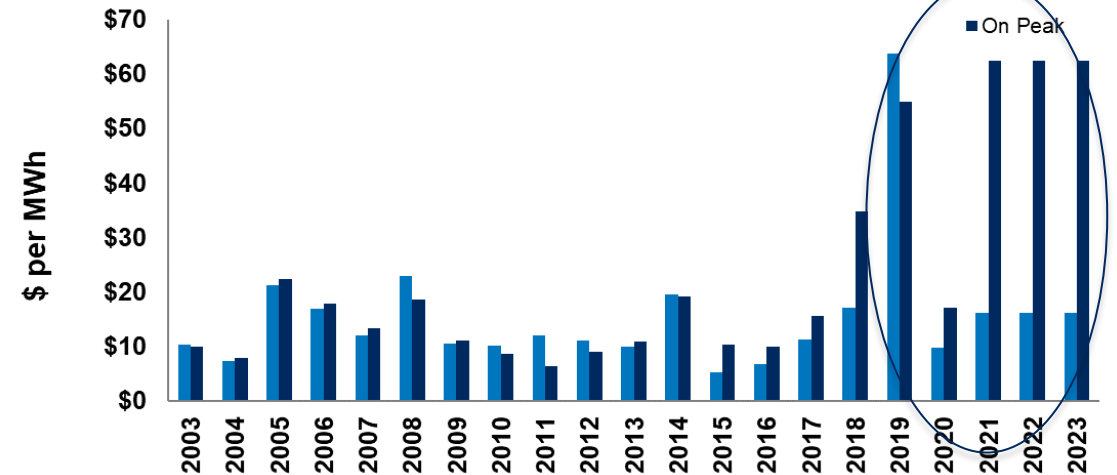
Spark Spread



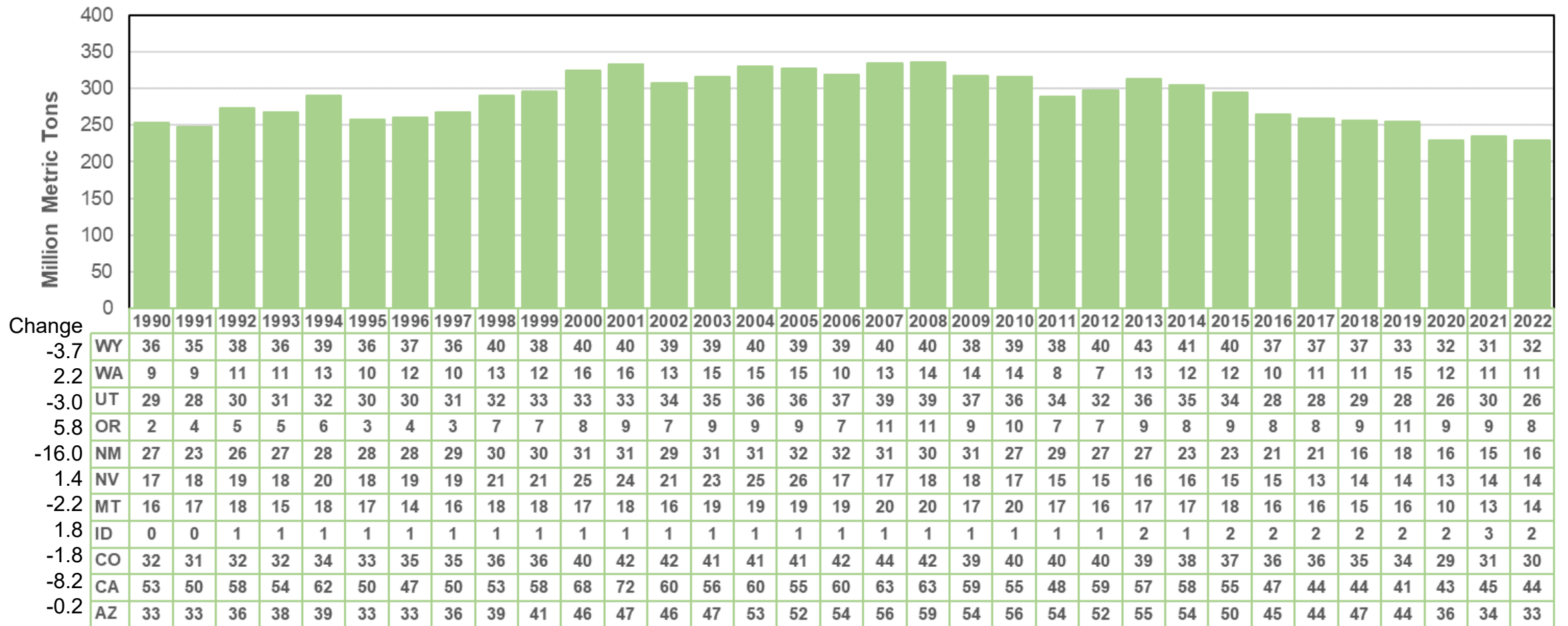
Implied Market Heat Rate



Daily Mid-C Price Standard Deviation



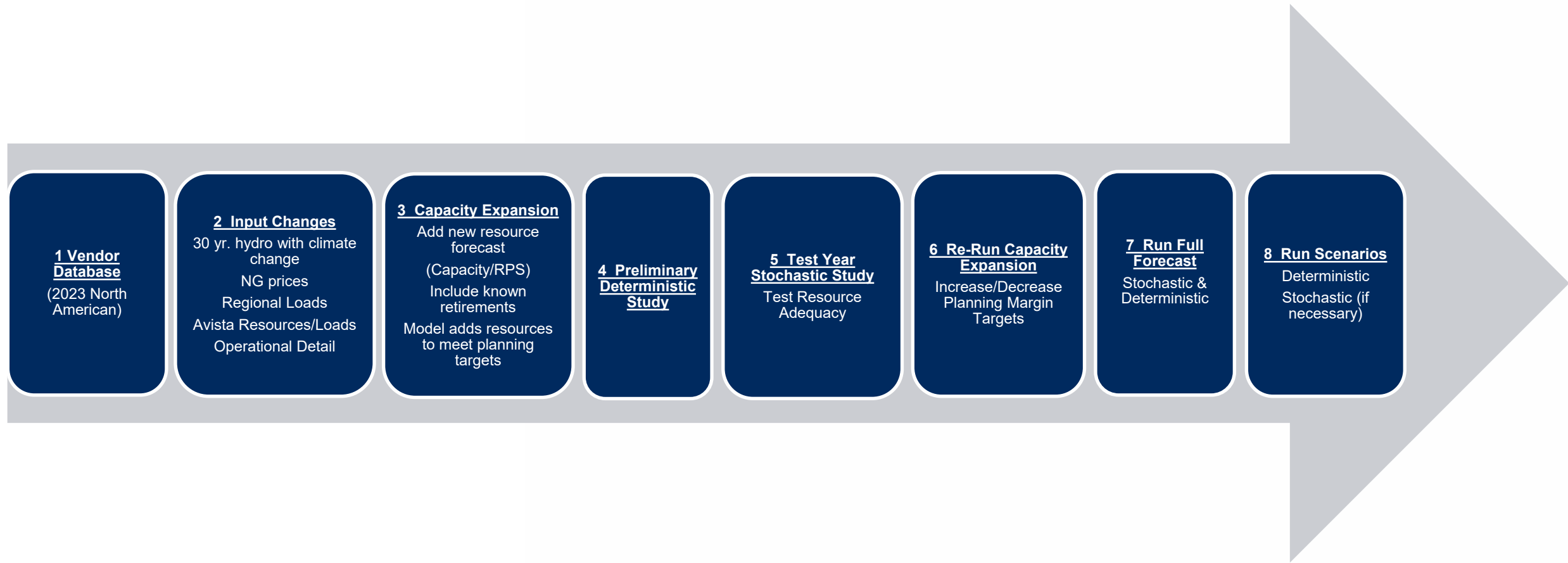
Electric Greenhouse Gas Emissions U.S. Western Interconnect



Source: EIA

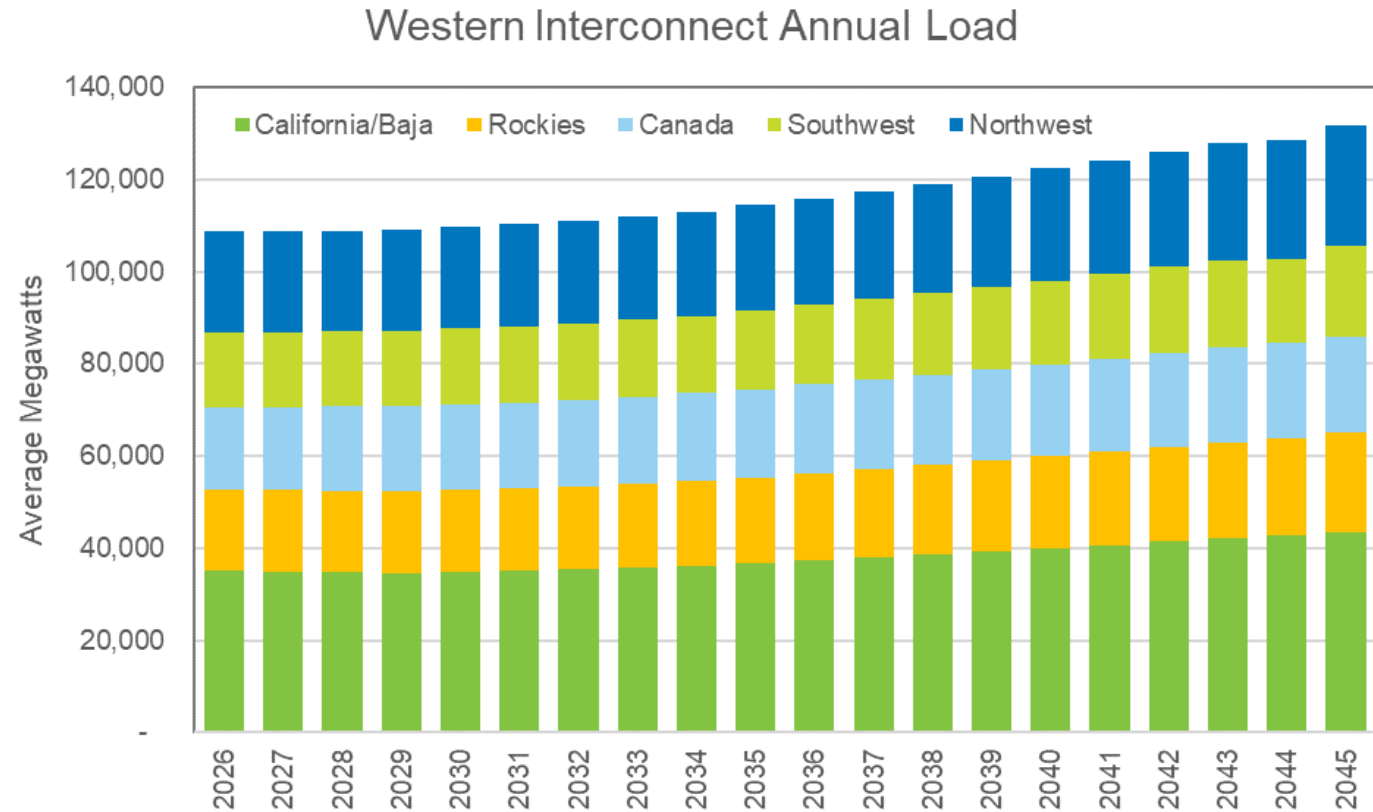
Emissions are adjusted for generation within the Western Interconnect

Modeling Process



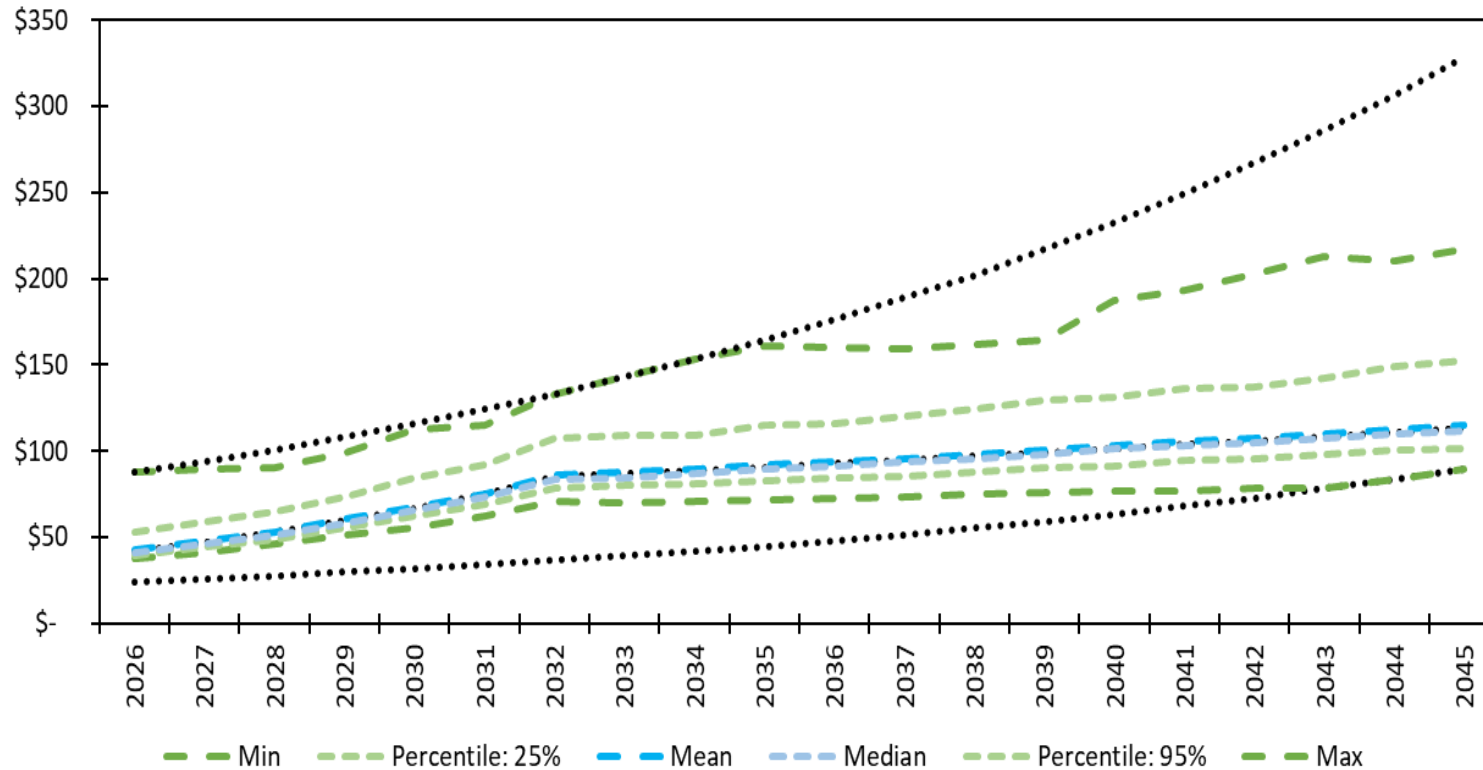
Load Forecast

- 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



Carbon Pricing Assumptions

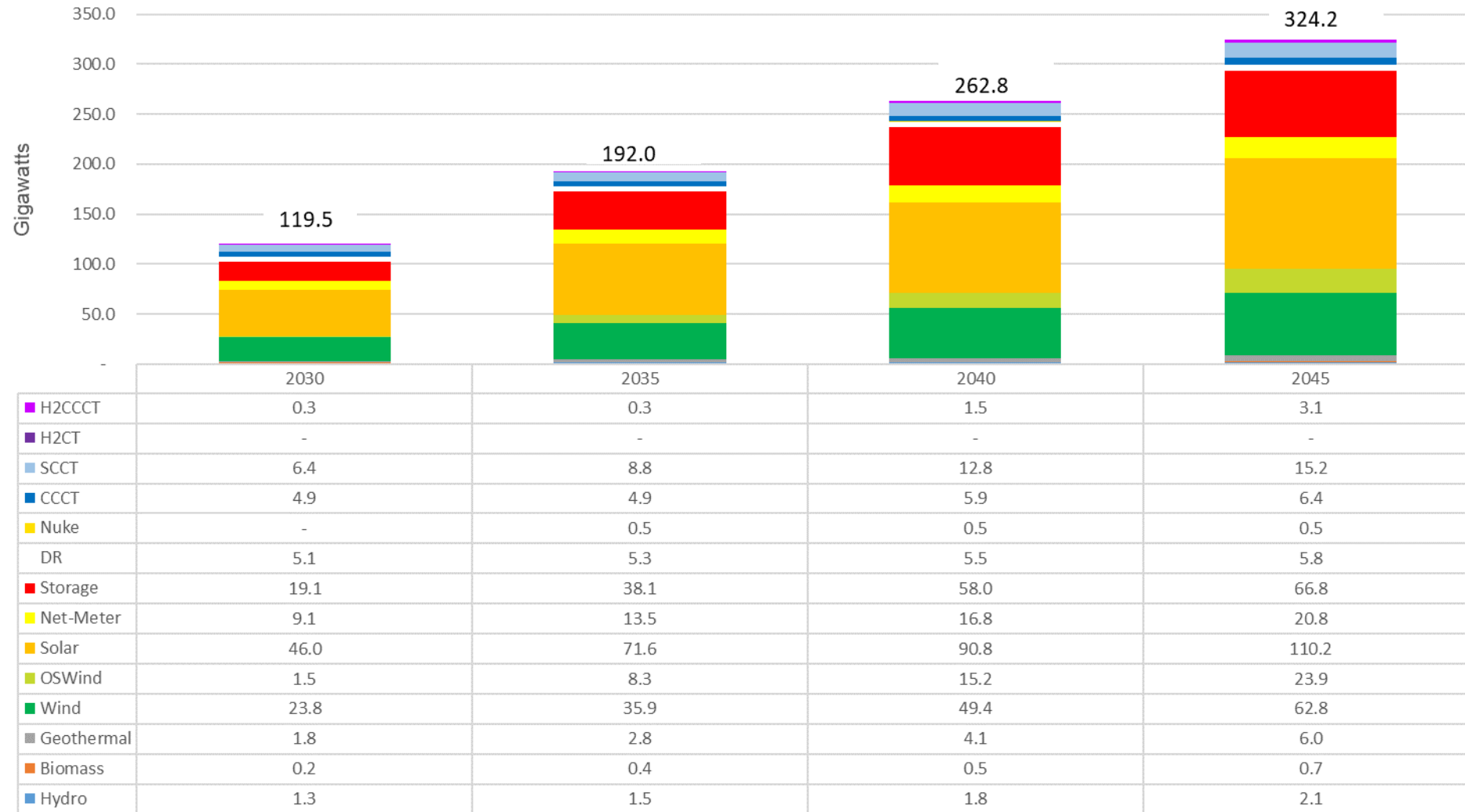
Nominal Price per MTCO₂e



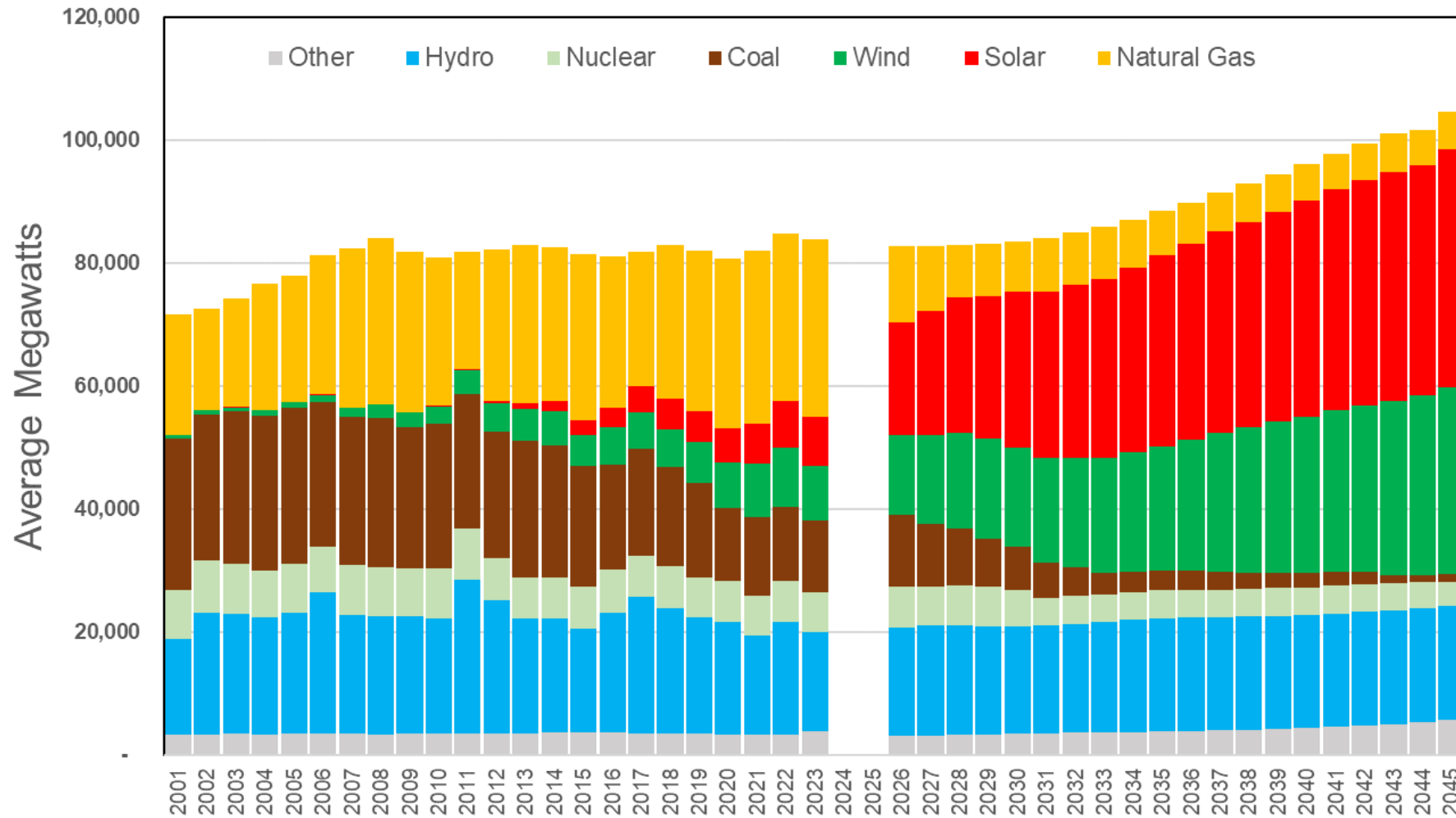
- Used consultant’s carbon pricing
- \$85.32 levelized carbon price
- Modeling CCA and CA/Quebec as a joint market; assume no national carbon price
- Regions importing into CA or WA incur a carbon price adder to transfer power
- Assumes carbon cost in dispatch for all resources beginning in 2031
- Stochastics – will use 300 random draws

New Resource Forecast (Western Interconnect)

Draft forecast



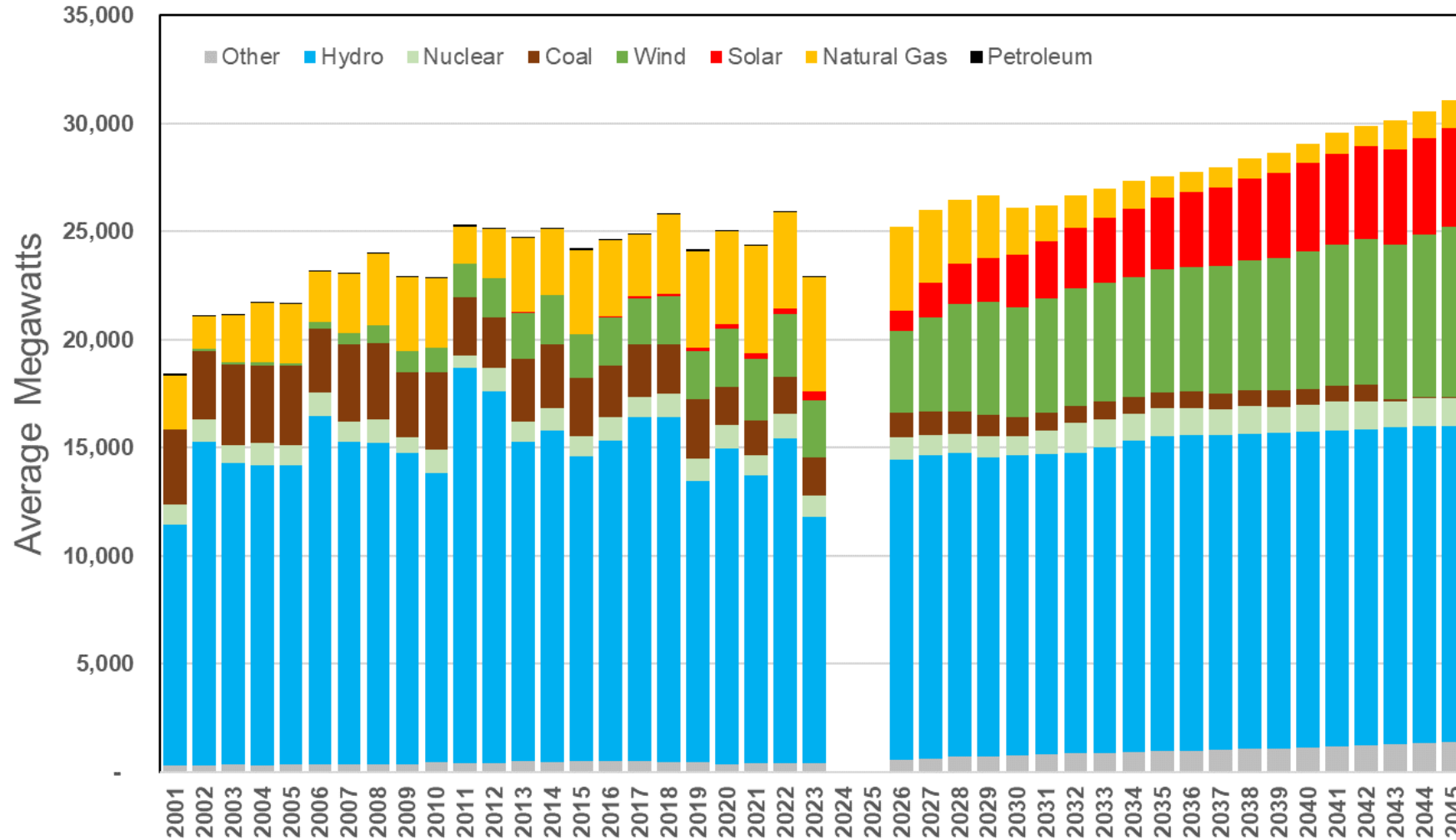
U.S. West Resource Type Forecast



Significant changes
2045 to 2026 (aGW)

- Solar: + 19.7
- Wind: + 17.6
- Nat Gas: - 7.1
- Coal: - 8.1
- Nuclear: - 2.8
- Other: + 0.6
- Total: + 20.0

Northwest Resource Type Forecast

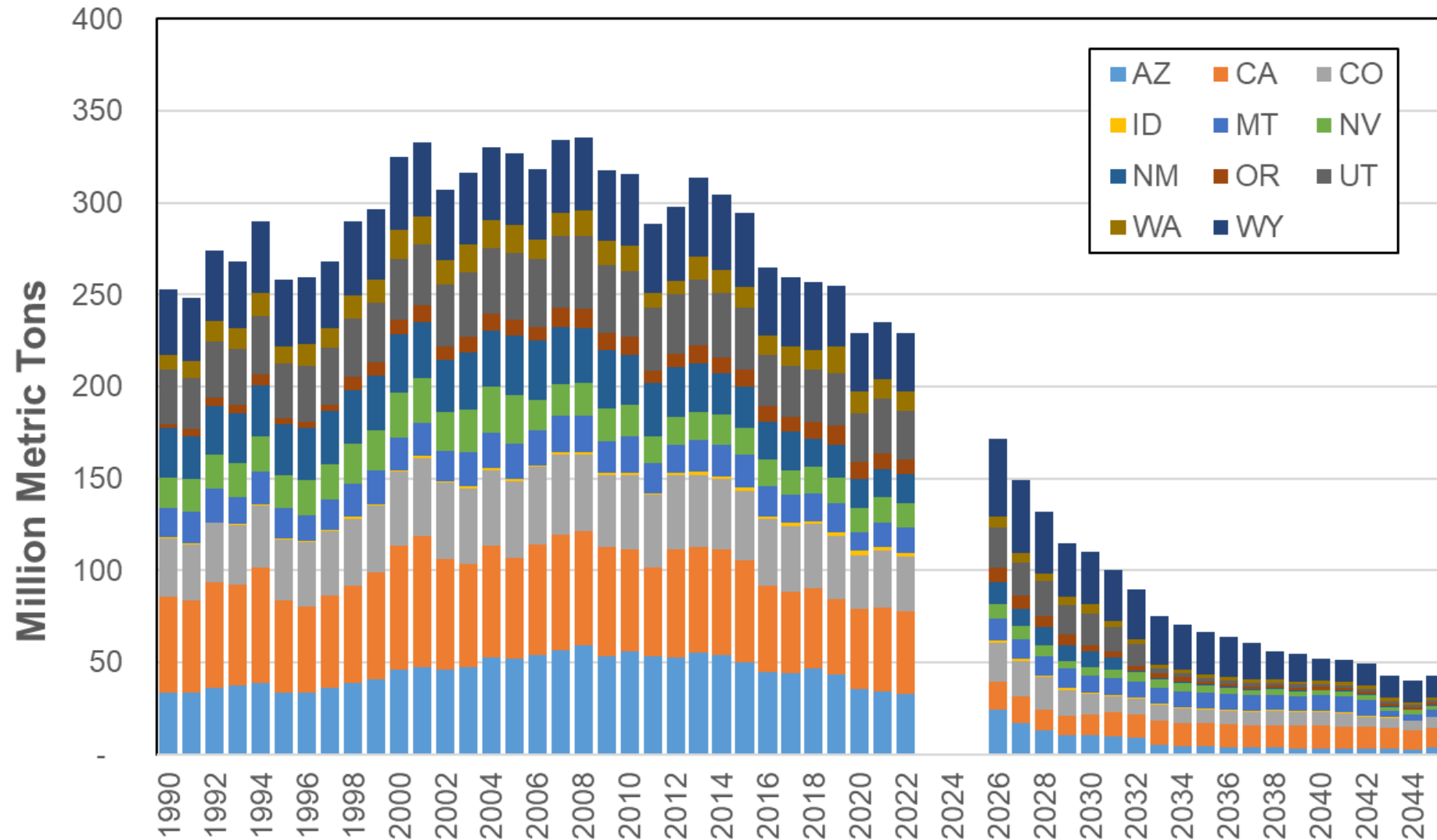


Significant changes (aGW)
2045 to 2023

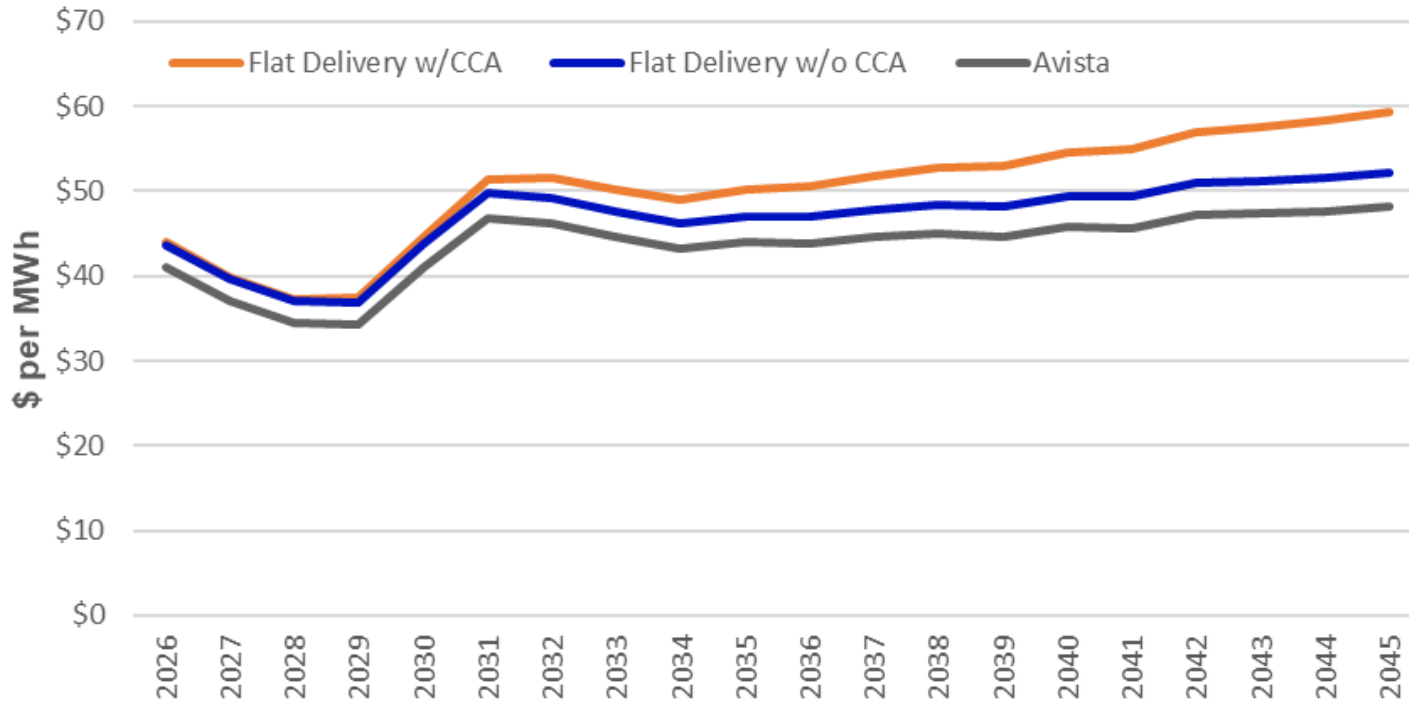
Solar:	+ 3.6
Wind:	+ 4.1
Nat Gas:	- 2.6
Coal:	- 1.1
Other:	+ 0.8
Nuclear:	+ 0.2
Total:	+ 5.1

Greenhouse Gas Forecast U.S. Western Interconnect

Draft forecast



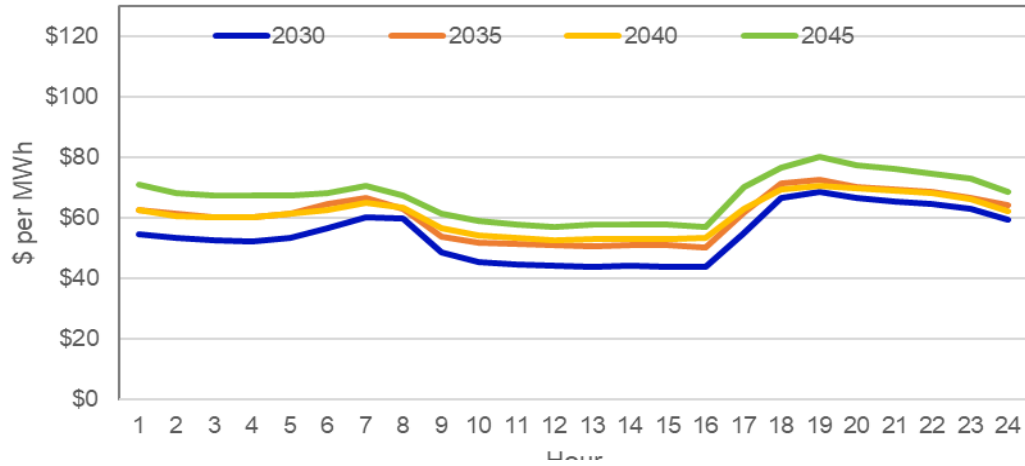
Mid-C Electric Price Forecast



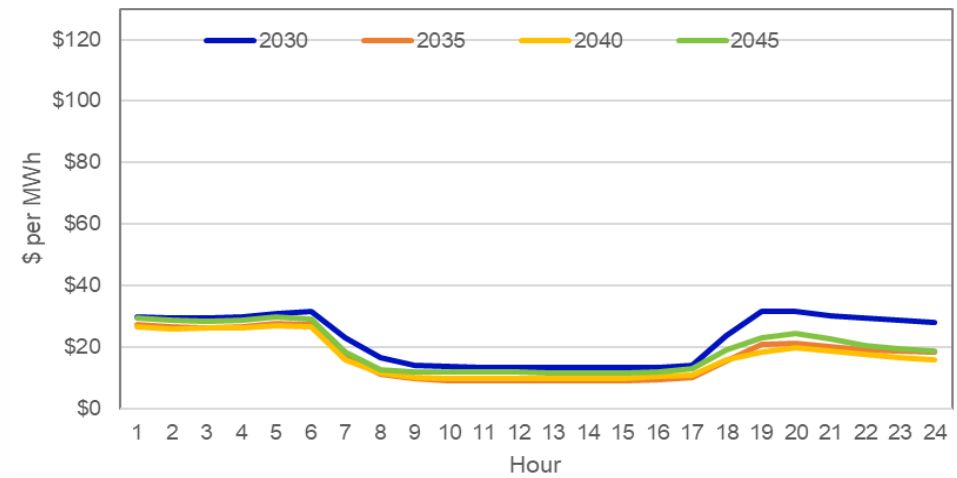
- Levelized Prices:
 - \$48.12/MWh w/CCA
 - \$45.52/MWh w/o CCA
 - \$42.56/MWh Avista
- Forecast includes expected resource additions
- Potential for increased prices if new resources don't come online

Hourly Wholesale Mid-C (w/o CCA) Electric Price Shapes

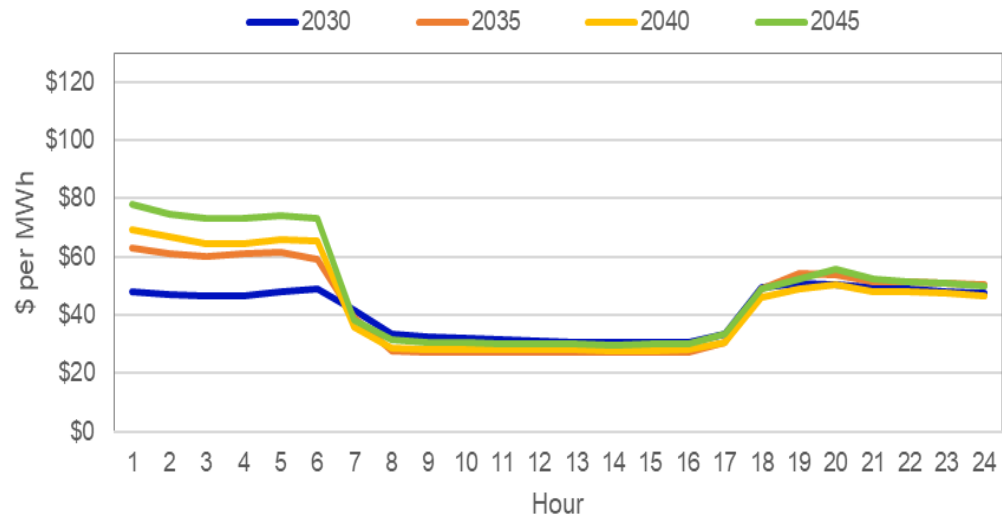
Winter: Dec 16 - Mar 15



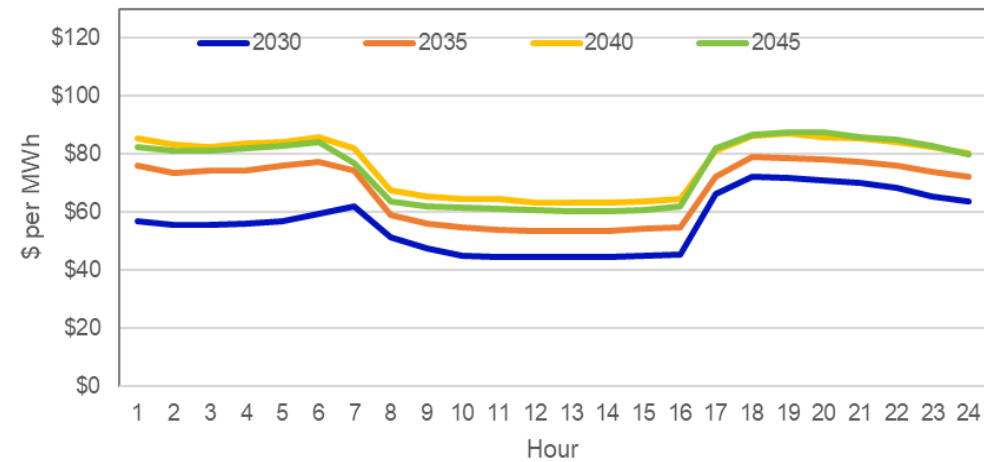
Spring: Mar 16 - Jun 15



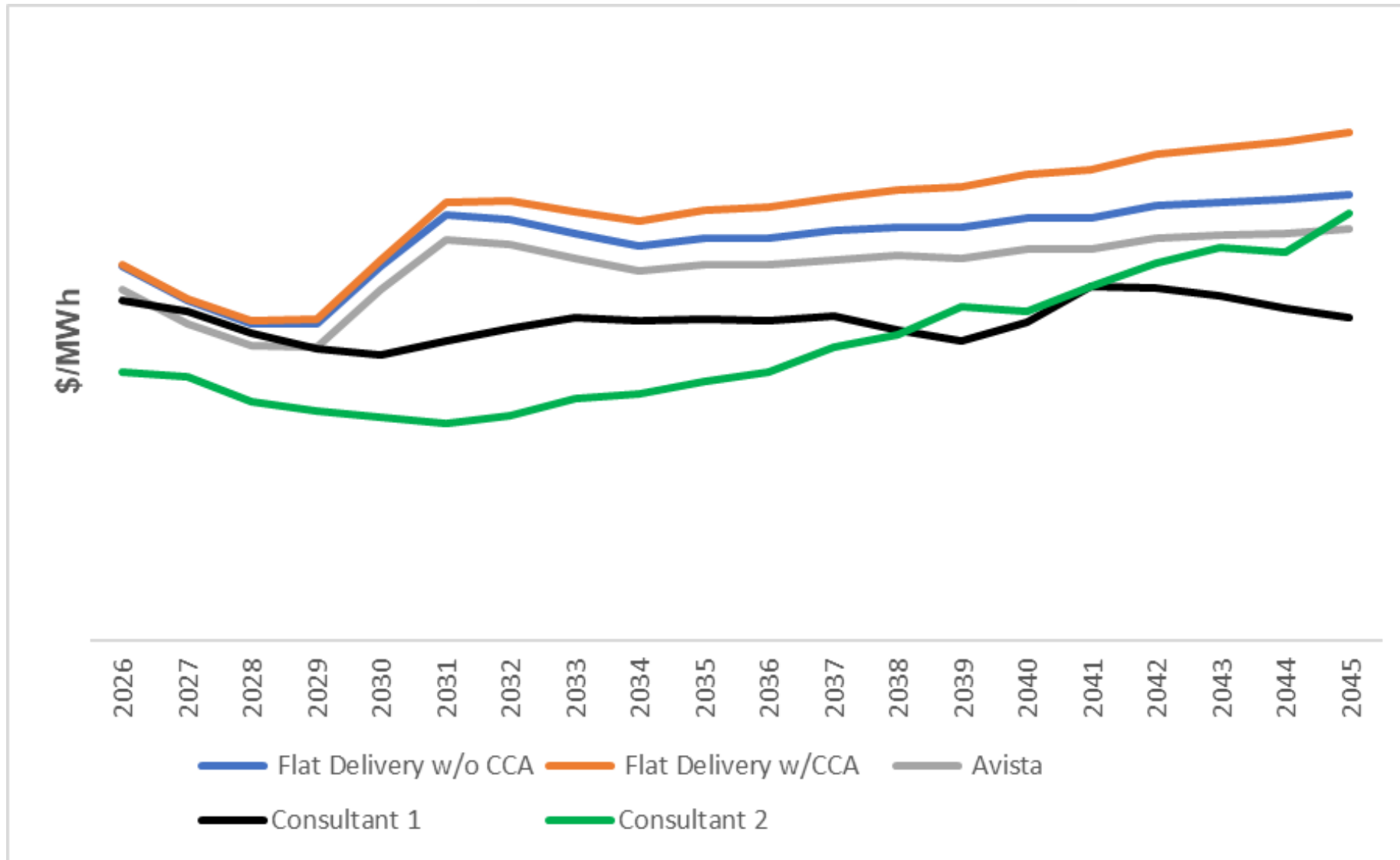
Summer: Jun 16 - Sep 15



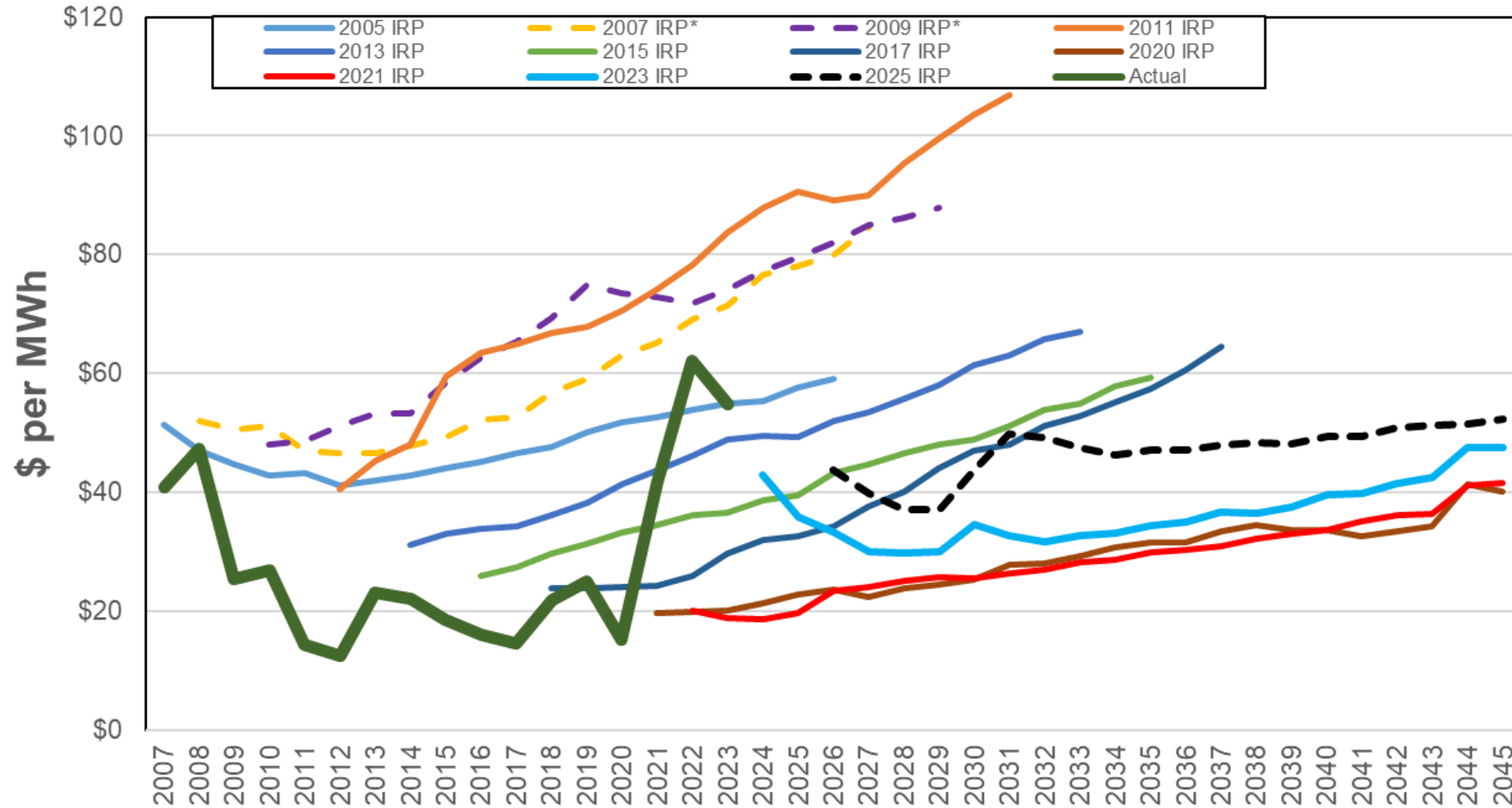
Fall: Sep 16 - Dec 15



Northwest Wholesale Electric Price Comparison



Mid-C Price Forecast History and Actuals



Next Steps

- Finalize deterministic case
- Conduct stochastic studies and verify resource adequacy
- Run scenarios (deterministic/stochastic as appropriate)

2025 Electric IRP Portfolio Proposed Scenario List

Scenario		Sensitivity	LOLP Study (2030)	LOLP Study (2045)
1	Preferred Resource Strategy	Deterministic Low NG Prices High NG Prices	X	X
2	Alternative Lowest Reasonable Cost			
3	Baseline: Least Cost Reliable Portfolio	Deterministic Low NG Prices High NG Prices	X	X
4	Clean Resource Portfolio by 2045	Deterministic Low NG Prices High NG Prices	X	X
5	Low Economic Growth (Low Load Growth)			
6	High Economic Growth (High Load Growth)			
7	80% Washington Building Electrification by 2045			
8	80% Washington Building Electrification by 2045 & High Transportation Electrification Scenario			
9	Extreme Building/Transportation Electrification for Washington & Idaho w/o new Natural Gas CTs			X
10	Maximum Washington Customer Benefits			
11	Least Cost + 500 MW Nuclear in 2040	Deterministic Low NG Prices High NG Prices		X
12	WRAP PRM		X	X
13	Least Cost + 0% LOLP		X	X
14	Power to Gas Unavailable			X
15	Minimal Viable CETA Target			
16	Maximum Viable CETA Target			
17	Preferred Resource Strategy w/ CCA repealed	No CCA Forecast		
18	Unconstrained Cost Preferred Resource Strategy			
19	High QCC on Demand Response (w/ minimum selection)		X	
	Avoided Cost Portfolios			
A	No Supply-Side Resource Additions			
B	Clean Capacity by 2045			

Other potential scenarios

- **RCP 8.5 Weather:** Given the expected case includes RCP 8.5 for summer, is it necessary to understand the impacts of lower winter capacity needs to warming temperatures?
- **20-year Weather:** Assumes the last 20-year average temperatures continue through the planning period to understand impacts of the warming temperatures.

Scenario Description:

- 1- **Preferred Resource Strategy:** Using the expected case load, resource, and stochastic price forecast, the model will determine the least cost resource strategy meeting each state's energy and capacity requirements. Portfolio will also track Customer Benefit Indicators in Washington and use Social Cost of Greenhouse Gas (SCGHG), Non-Energy Impacts, and Named Community Fund (NCIF) spending for Washington's portfolio optimization. Idaho's optimization will focus on least cost to meet energy and capacity requirements. Portfolio uses planning margin requirement to ensure 5% Loss of Load Probability (LOLP) in 2030. CETA targets are shown in Figure 1.
- 2- **Alternative Lowest Reasonable Cost:** Required study to determine CETA cost cap impacts. This scenario assumes no CETA clean energy requirements, no NCIF, but includes SCGHG for resource selection [in Washington] while meeting physical monthly energy/capacity requirements.
- 3- **Baseline: Least Cost Reliable Portfolio:** Determines the least cost portfolio to meet energy and capacity requirements based on economic decisions w/o SCGHG or CETA; same as the 'Alternative Lowest Cost Alternative' scenario w/o SCGHG prices for Washington. The portfolio will also be used to develop avoided costs as it separates portfolio costs by renewable and capacity premiums; quantifies the impacts of SCGHG.
- 4- **Clean Resource Portfolio by 2045:** Determines the portfolio to eliminate all greenhouse gas emitting generation resources in the portfolio by 2045. The resulting portfolio must meet all capacity and energy requirements.
- 5- **Low Economic Growth (Low Load Growth):** Studies the portfolio effects of loads not materializing due to lower growth than forecasted.
- 6- **High Economic Growth (High Load Growth):** Studies the portfolio effects of higher load levels materializing due to higher growth than forecasted.
- 7- **80% Washington Building Electrification by 2045:** Determines the least cost portfolio of converting 80% of Washington State natural gas residential and commercial demand to electric through heat/water conversions to heat pump and resistance technologies by 2045.
- 8- **80% Washington Building Electrification by 2045 & High Transportation Electrification Scenario:** Determines the least cost portfolio of converting 80% of Washington State natural gas demand to electric through heat/water conversions to heat pump and resistance technologies by 2045 along with a higher-than-expected electric transportation forecast.
- 9- **Extreme Building/Transportation Electrification w/o new Natural Gas CTs:** Determines the least cost portfolio of converting 80% of Washington & Idaho natural gas demand to electric through heat/water conversions to heat pump and resistance technologies by 2045 along with a higher-than-expected electric transportation forecast for both states. This scenario also assumes all natural gas resources are retired by 2045.
- 10- **Maximum Washington Customer Benefits:** Washington State required scenario to understand the portfolio and cost impacts of improving Customer Benefit Indicators. This portfolio will exclude non-Washington sited resources, air emitting resources and lower energy burden through additional energy efficiency and community solar for named communities. Higher named community penetration of roof-top solar and electric vehicles from the Distributed Energy Resource Study will also be considered.
- 11- **Least Cost + 500 MW Nuclear in 2040:** Uses the Preferred Resource Strategy assumptions with the addition of up to 500 MW of nuclear generation beginning in 2040.
- 12- **WRAP PRM:** Solves for the least cost portfolio meeting capacity, energy, and state policies using the Planning Reserve Margin currently required in the WRAP.
- 13- **Least Cost + 0% LOLP:** Solves for the least cost portfolio meeting capacity, energy, and state policies, but acquires generation to ensure the loss of load probability (LOLP) is zero rather than 5%.
- 14- **Power to Gas Unavailable:** Similar portfolio design as the "PRS" scenario without the option of using power to gas fuels such as Ammonia or Hydrogen.

- 15- Minimal Viable CETA Target:** Uses the same portfolio design as the “PRS” scenario except the CETA targets for clean energy use the minimal viable targets from Figure 1.
- 16- Maximum Viable CETA Target:** Uses the same portfolio design as the “PRS” scenario except the CETA targets for clean energy use the maximum viable targets from Figure 1.
- 17- Preferred Resource Strategy w/ CCA repealed:** This portfolio uses the No CCA market price forecast and estimates the portfolio if the CCA is repealed by voters in November 2024.
- 18- Unconstrained Cost Preferred Resource Strategy:** In the event the PRS scenario is constrained by the 2% cost cap, this portfolio illustrates the cost to comply with 2045 CETA regardless of cost.
- 19- High QCC on Demand Response (w/ minimum selection):** This portfolio will be optimized using a higher QCC for demand response programs than used in the PRS scenario. If the portfolio does not result in higher demand response, the lower cost program options will be included in the portfolio.

Avoided Costs Portfolios:

No Supply-Side Resource Additions: This “portfolio” is only used to estimate the capacity premium of the avoided cost calculation; uses same EE selections as ‘PRS’ scenario; uses same assumptions as ‘baseline’ scenario except uses market purchases to meet demand instead of acquiring new resources.

Clean Capacity by 2045: This portfolio is similar to the ‘baseline’ scenario except it does not allow for new natural gas generation, does not require the model to satisfy monthly energy targets and assumes Coyote Springs 2 is not available in Washington in 2045. The portfolio is used to determine the clean capacity credit for avoided cost calculations only.

Figure 1: CETA Target Scenarios

