

2028 IRP Inputs and Assumptions

May 7, 2026: External Advisory Panel



SCL Sponsors and Contributors

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SCL Sponsors and Contributors

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External Advisory Panel Members

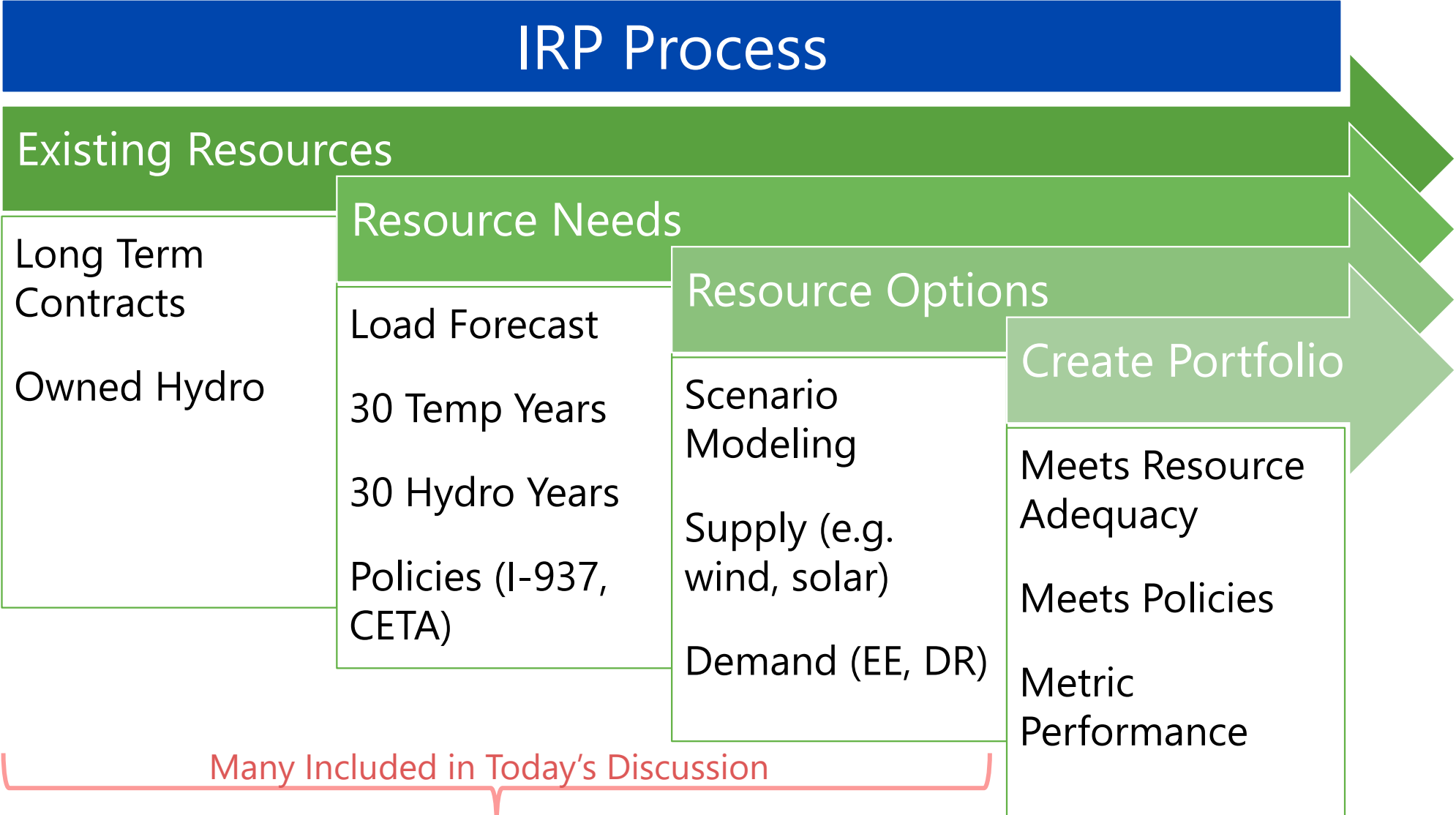
Name	Title	Organization
Chen-Ching Liu	Retired	University of Washington Electrical Engineering (Power Systems)
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Mike Ruby	President	Envirometrics, Inc.
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Kevin Schneider	Laboratory Fellow/Sub-Sector Manager for Office of Electricity	Pacific Northwest National Laboratory
Terry Sullivan	Buildings and Energy Manager	King County
Charlee Thompson	Policy Associate	Northwest Energy Coalition

Agenda

- Overview (5 min)
 - Modeling Philosophy
 - Scenarios
- Inputs (75 min)
 - Climate Change and Related Regulations
 - Resources
 - Transmission
 - Wholesale Energy Market
- Next Steps (2 min)



Elements of the 2028 IRP



Overview



Modeling Philosophy

- **Goal of IRP modeling:** forecast generation, storage, and transmission needs over 20-year horizon
- **The key question:** given uncertainty in future conditions, what resources most consistently provide long-term system value?
- **Develop reasonable inputs:**
 - Represent reasonable future expectations
 - Capture a broad range of uncertainty for inputs with greatest effect
 - Simplify for inputs with little effect
 - Be deliberate when it comes to risk tolerance

Scenarios

Input	Baseline	High Electrification	Constrained World
Load	Base	High	Base
DSM	Base	High	Base
Price	Mid	High	High
Market Availability	Base	Base	Low
Transmission Flexibility	Base	Base	Low

Inputs



Climate Change And Related Regulations



Goal

Effects of climate change should be incorporated where feasible. Related policies should be modeled as accurately as possible.

- Review how climate change is incorporated into the 2028 IRP
- Review how regulatory requirements are modeled in the 2028 IRP

Climate Change

- Load Forecast
 - Saturation of cooling equipment will increase
 - Average temperatures will increase
- Hydro Forecasts
 - Inflows at Boundary and Skagit
- Market Prices
 - Shape is correlated to Hydro Forecasts

Regulatory Requirements

- CETA
 - Apply constraint requiring 2030 and 2045 milestones are met
 - 2030: 100% GHG neutral, 80% GHG free
 - 2045: 100% GHG free
 - Include the Social Cost of Greenhouse Gas (SCGHG)
- I-937
 - Apply constraint that requires meeting 15% of load with qualifying generation plus RECs

Resources



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Goal

Resource assumptions should reasonably reflect future expectations.

- Review City Light's current portfolio
- Review what resource options will be available to the model
- Request feedback on resource assumptions:
 - Cost
 - Location
 - Timing
 - Availability

Existing Resources



Existing Resources

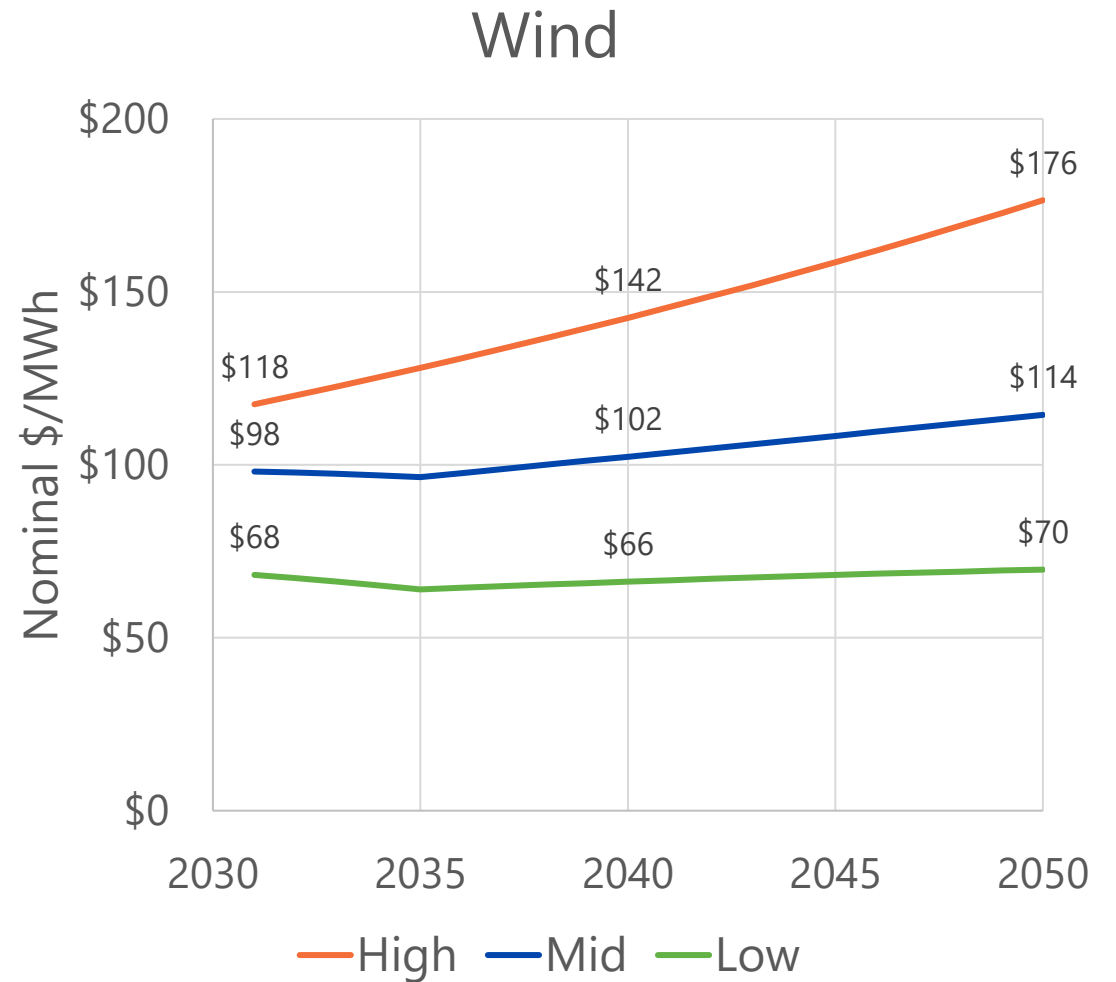
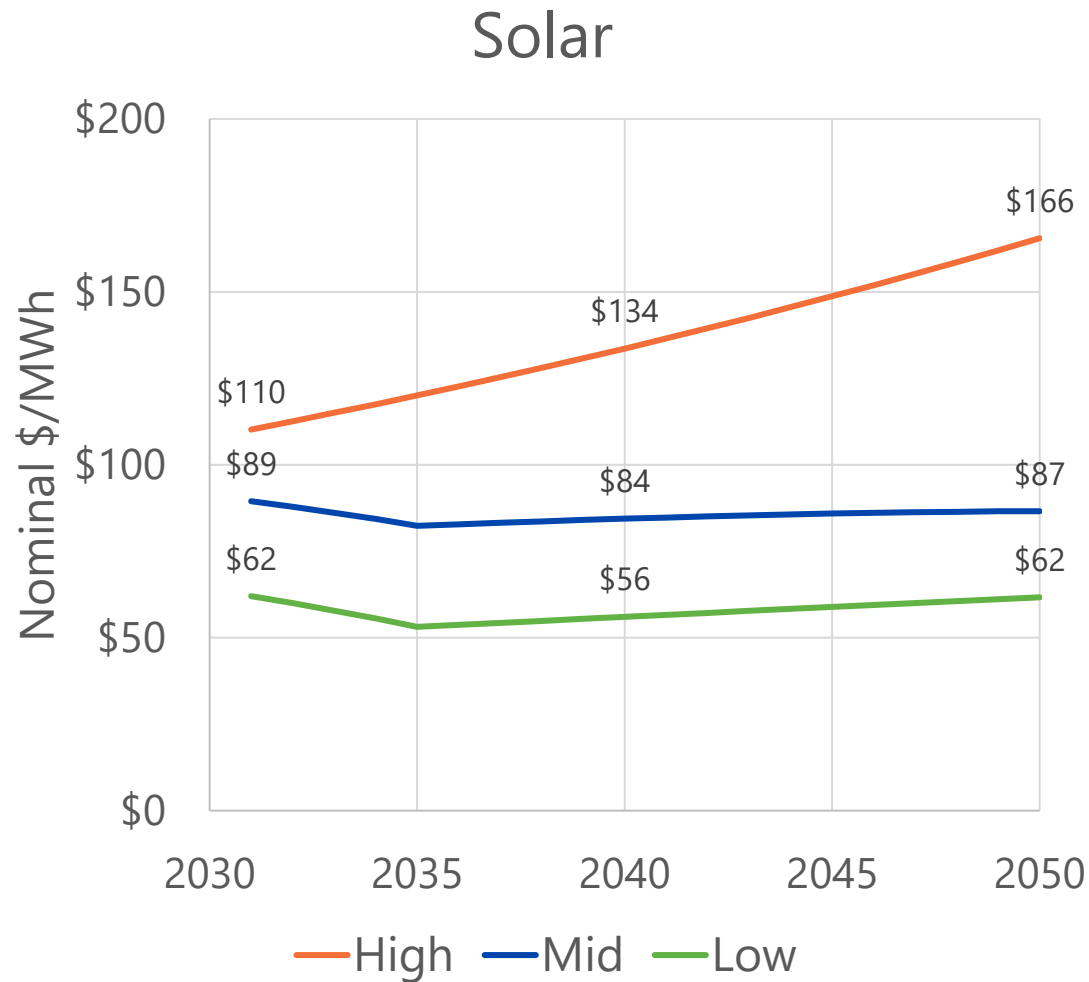
Resources	2025 Energy Produced (MWh)	% of Grand Total	Year Contract Expires
<i>Owned Generation</i>			
Boundary	3,105,237	30.1%	
Gorge	769,960	7.5%	
Diablo	519,627	5.0%	
Ross	533,143	5.2%	
Cedar Falls	53,949	0.5%	
South Fork Tolt	48,852	0.5%	
TOTAL OWNED	5,030,768	48.8%	
<i>Contracts</i>			
BPA Block	4,326,469	42.0%	2028
Priest Rapids	163,233	1.6%	2052
High Ross	311,328	3.0%	2066
Lucky Peak	311,147	3.0%	2038
King County WW	14,461	0.1%	2033
Condon Wind	71,153	0.7%	2028
<i>Expiring Resources</i>	75,119	0.7%	2025-2027
<i>New Oregon Solar</i>	Starts 2026		2044
TOTAL CONTRACTS	5,272,910	51.2%	
GRAND TOTAL	10,303,678	100.0%	

Candidate Resources

Established Technology

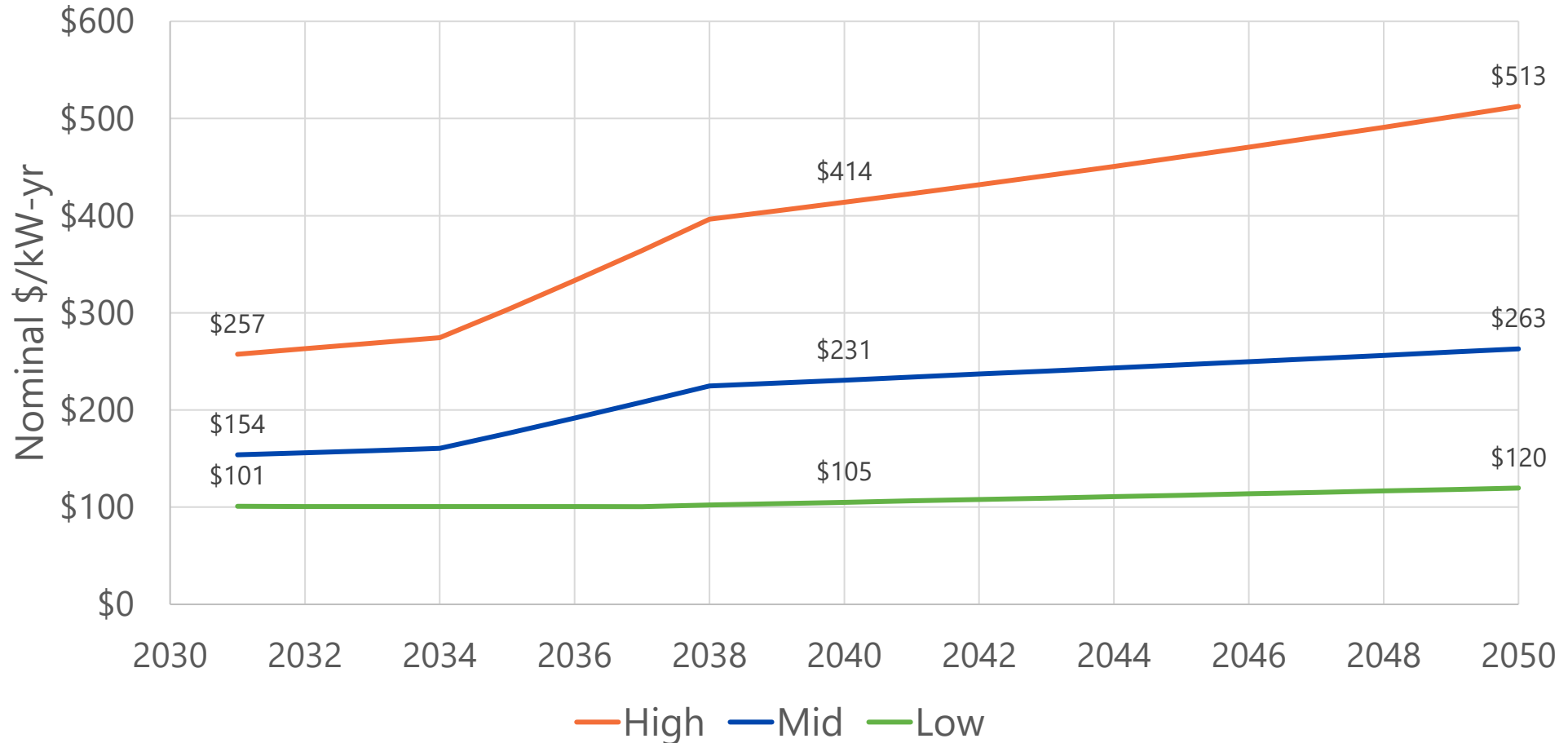


Solar and Wind Price Assumptions



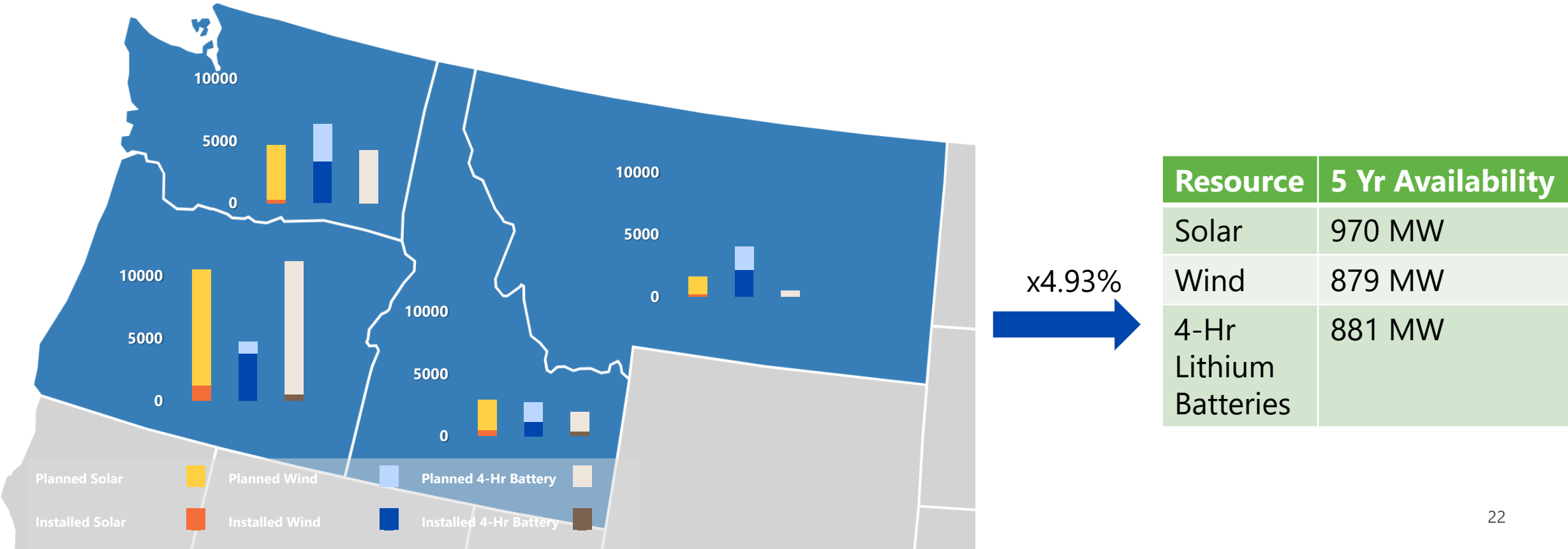
4-hr Battery Price Assumptions

4-Hr Lithium Batteries



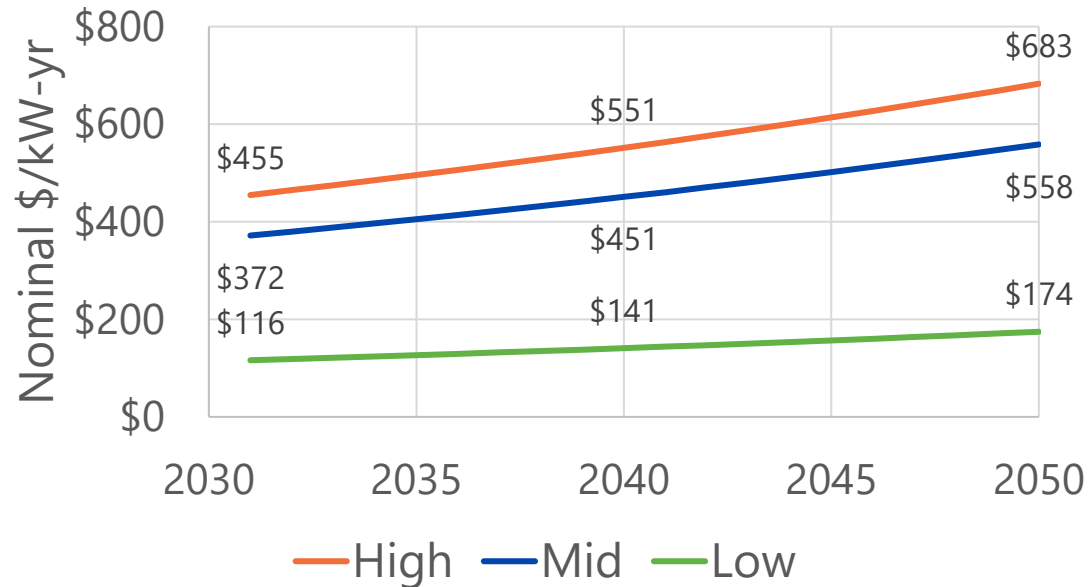
Established Tech Resource Availability

- SCL % Share of Regional Load: 4.93%
- Pro rata share of regional installed + planned through 2035

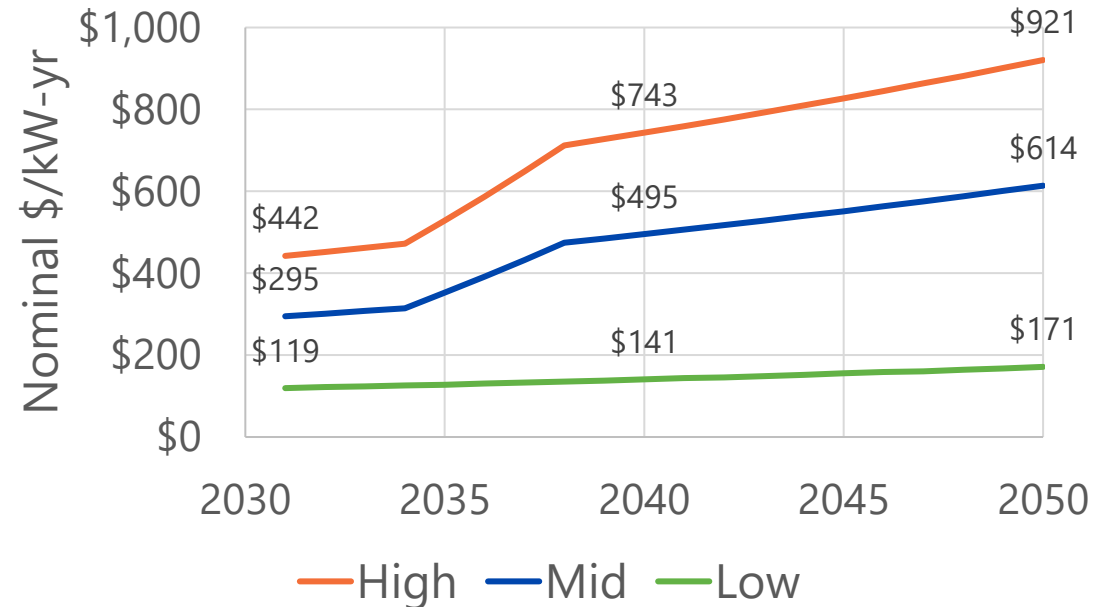


Candidate Resources: Uncommon Established Tech

Renewable Peaker



Pumped Hydro Storage



- Availability: 200 MW in 2032, 300 MW 2037+
 - Possible x0, x2 availability sensitivities
- Ops: Flexible start/stop/ramp. Startup energy cost, min operating MW 50% of nameplate

- Availability: 500 MW starting in 2035
 - Possible x0, x2 availability sensitivities
- Ops: 12-hr storage, otherwise same as existing hydro?

Candidate Resources

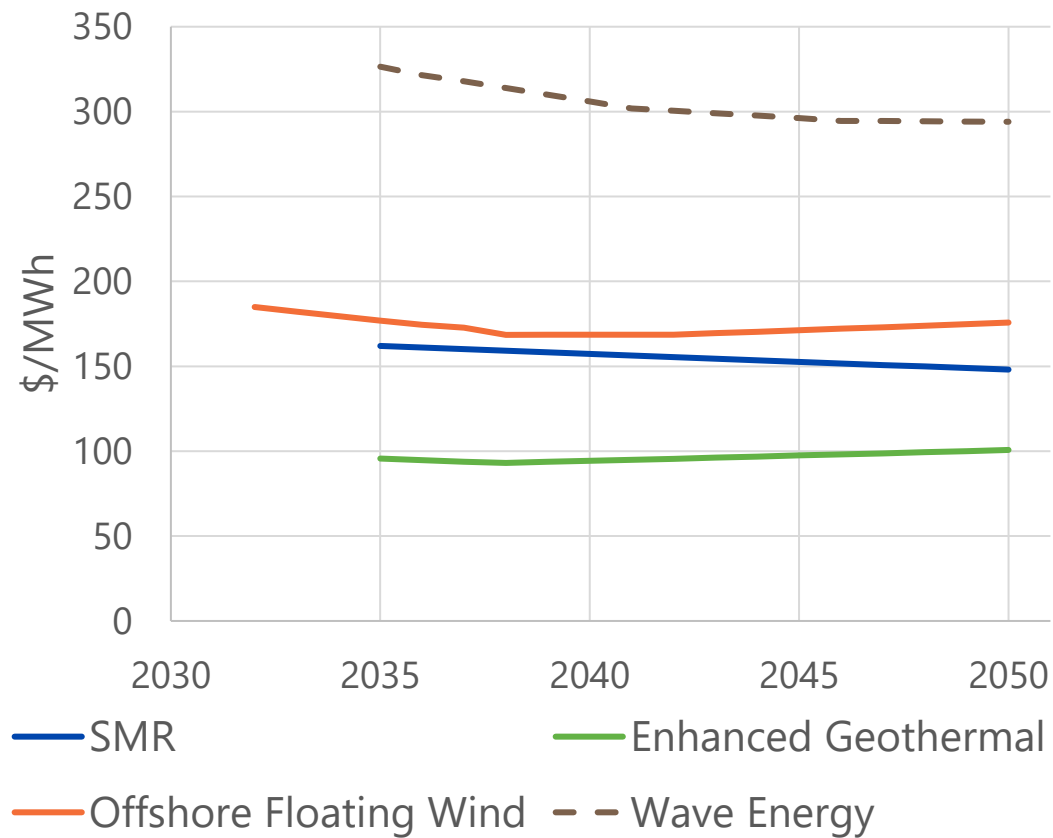
Advanced Technology



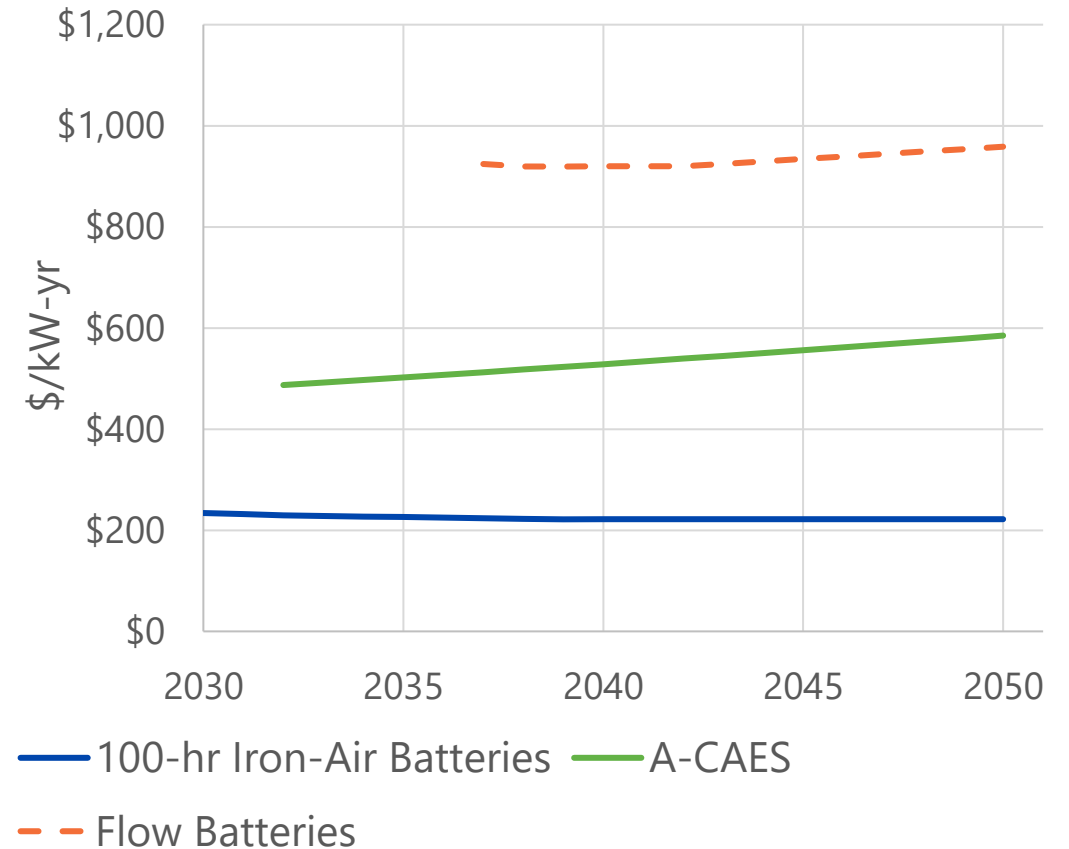
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Advanced Technologies - Cost Assumptions

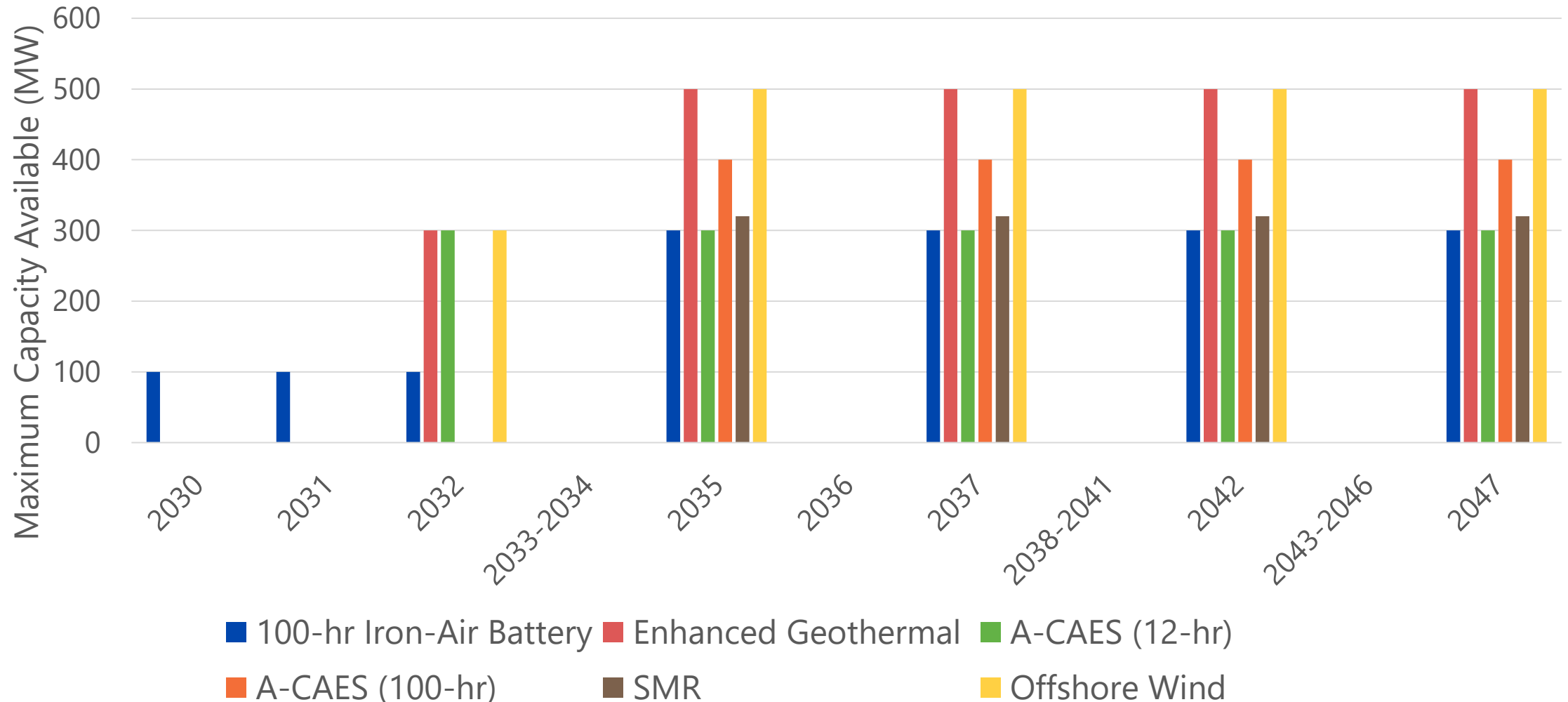
Generation Resources Cost Assumptions (Mid)
- Nominal \$/MWh



Storage Resources Cost Assumptions (Mid) -
Nominal \$/kW-yr



Advanced Technologies – Capacity Available & Timing



Transmission



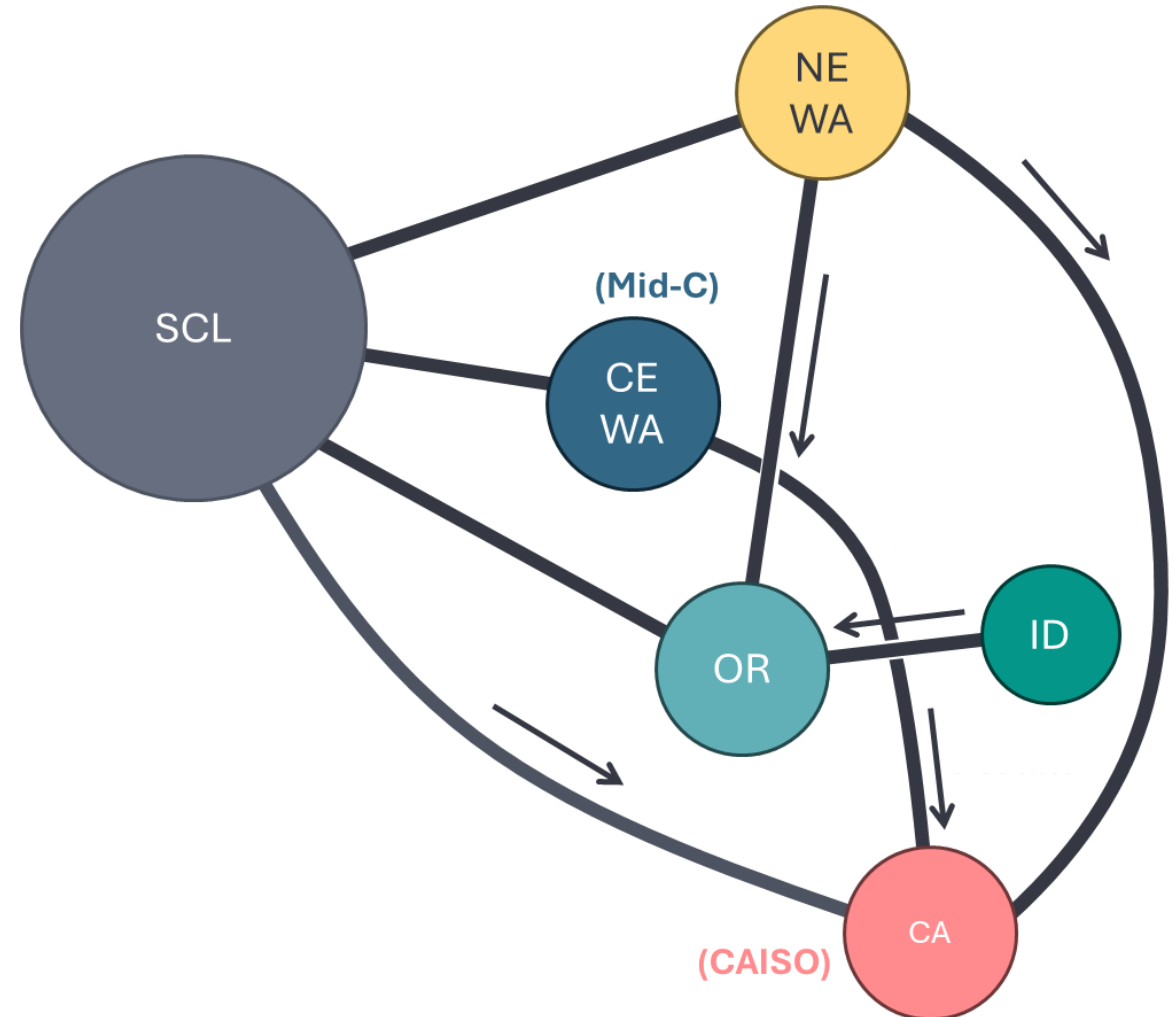
Goal

Modeled transmission should approximate contractual constraints for SCL, physical constraints in the region, and expected transmission buildout.

- Review transmission methodology
- Review proposal for transmission availability

Methodology Summary

- Model zonal transmission between SCL and key resource regions
- Beginning in 2032, the model will be able to select additional transmission.
- In considering transmission additions, the model will account for the costs and/or benefits of alternatives, including:
 - Renewable curtailment
 - Market access limitations
 - On-system generation
 - Demand-side management



New Transmission Proposal

- **Existing Tx:** Transmission capacity provided by BPA via long-term firm contracts (~2,240 MW).
- **Requested Tx:** Pending BPA requests for additional long-term firm capacity (~2,000 MW). Timeline highly uncertain.
- **Proposed Modeled Assumptions:**
 - Assume that 25% of our BPA requests are available by 2032, 50% by 2037, and 100% by 2042.
 - Assume an additional 25% is available between 2042-2047.
 - Assume non-BPA options include a limited quantity via Idaho Power starting in 2032.
 - Assess the impact of no short-term flexibility, delayed BPA availability, and additional access to DSW resources.

Wholesale Energy Market

Availability and Prices



Seattle City Light



Market Modeling Goals

The IRP model should reflect typical marketing logic in the short-term while being risk-averse in the long-term.

- High arbitrage opportunities during non-constrained hours (buying and selling)
- More limited market opportunities during regionally-constrained hours
- Regionally-constrained hours increase over time (out to 2047) when we have less certainty
- Market price scenarios cover broad range of price uncertainty

Market Availability



Goal

Portfolios should not be built to overly rely on the market in the face of an increasingly uncertain future.

- Review proposal for market availability
 - Acknowledge arbitrage opportunities inherent in the model
- Consider risk tolerance for relying on the market

Market Availability Assumptions

Time of Year	Hours	Purchases Cap (MW)	Sales Cap (MW)
All non-peak months	All hours	1,000	1,000
July - September	Constrained hours	200	1,000
July - September	All other hours	800	1,000
December - February	Constrained hours	200	1,000
December - February	All other hours	500	1,000

Regionally- Constrained Hours



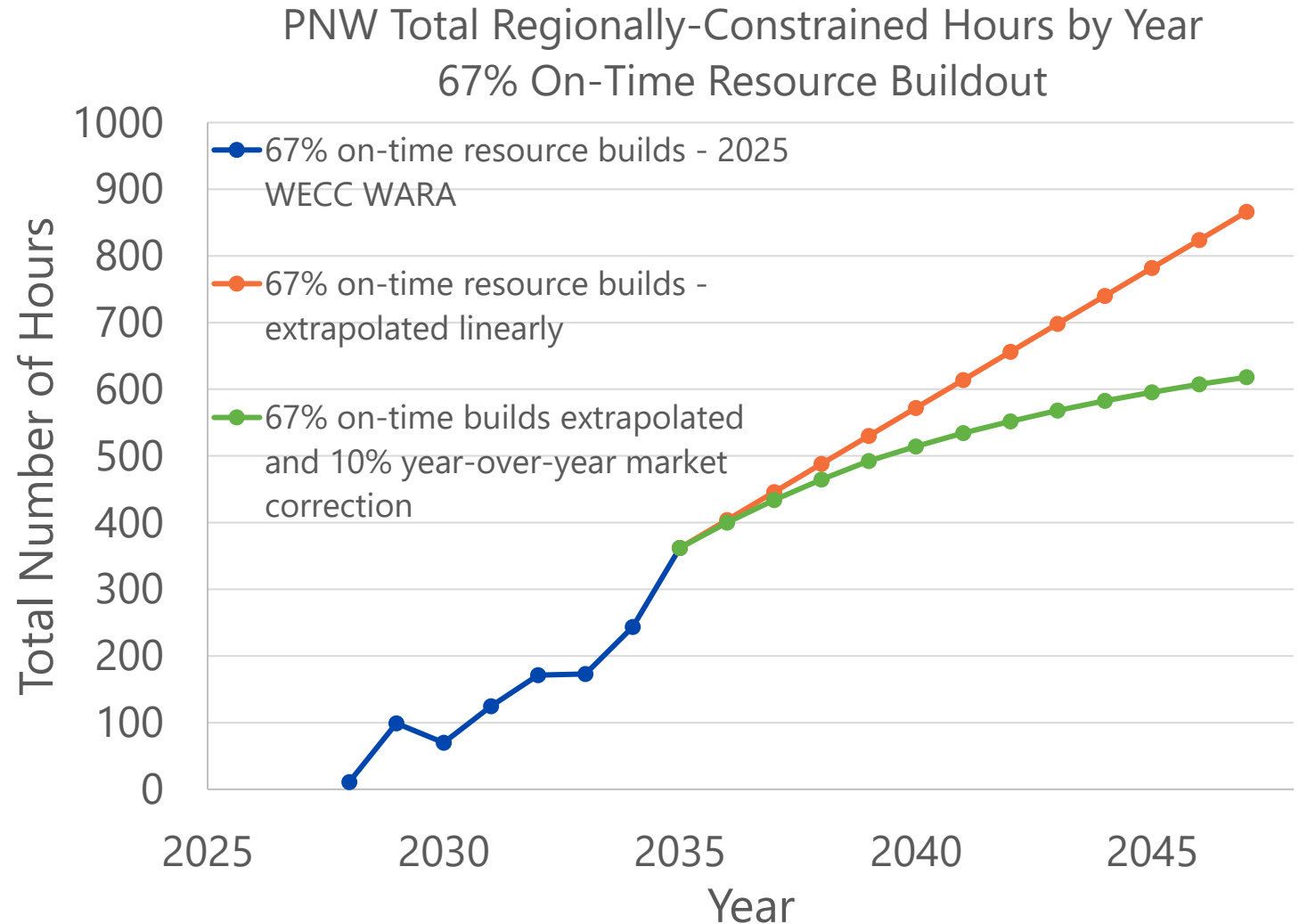
Goal

Portfolios should not be built to overly rely on the market in the face of an increasingly uncertain future.

- Review proposal for regionally-constrained hours (where market purchases are capped)
 - How many hours should be constrained in each future year?
 - How should those hours be applied over the year?
- Request feedback on methodology and proposal

Constrained Month/Hour Selection - Baseline

- Total number of regionally constrained hours by year are derived from the WECC WARA 2025
- Use scenario assuming 67% of planned resources are built on time
- After WARA study years, extrapolate this trajectory (orange line) and add market correction 10% year-over-year (green line)



Regionally-Constrained Month/Hour Selection

- High-risk windows identified from WECC WARA results and SCL subject matter experts
- Use **seasonal averages** of WECC WARA 2035 LOLHs within high-risk windows as “risk factor” for two high risk months per season
 - Halve risk factor for lower risk months in seasons
- Add small weights to allow expansion of high-risk windows in future years

Hour ending	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
4	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
5	0.5%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%
6	0.9%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%
7	2.3%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%
8	2.6%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.6%
9	2.3%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%
10	1.2%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%
11	1.1%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%
12	0.5%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%
13	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.2%	0.2%	0.1%	0.0%	0.0%	0.3%
14	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.3%	0.3%	0.2%	0.0%	0.0%	0.2%
15	0.5%	0.2%	0.0%	0.0%	0.0%	0.0%	0.6%	0.6%	0.5%	0.0%	0.0%	0.5%
16	0.9%	0.5%	0.0%	0.0%	0.0%	0.0%	1.2%	1.2%	0.9%	0.0%	0.0%	0.9%
17	2.3%	1.1%	0.0%	0.0%	0.0%	0.0%	1.7%	1.7%	1.3%	0.0%	0.0%	2.3%
18	3.6%	1.8%	0.0%	0.0%	0.0%	0.0%	2.1%	2.1%	1.8%	0.0%	0.0%	3.6%
19	2.4%	1.2%	0.0%	0.0%	0.0%	0.0%	3.2%	3.2%	1.5%	0.0%	0.0%	2.4%
20	2.1%	1.1%	0.0%	0.0%	0.0%	0.0%	2.3%	2.3%	0.2%	0.0%	0.0%	2.1%
21	1.8%	0.9%	0.0%	0.0%	0.0%	0.0%	0.9%	0.9%	0.0%	0.0%	0.0%	1.8%
22	0.9%	0.5%	0.0%	0.0%	0.0%	0.0%	0.3%	0.3%	0.0%	0.0%	0.0%	0.9%
23	0.5%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%
24	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%

Number of Regionally-Constrained Days by Month/Hour

2032

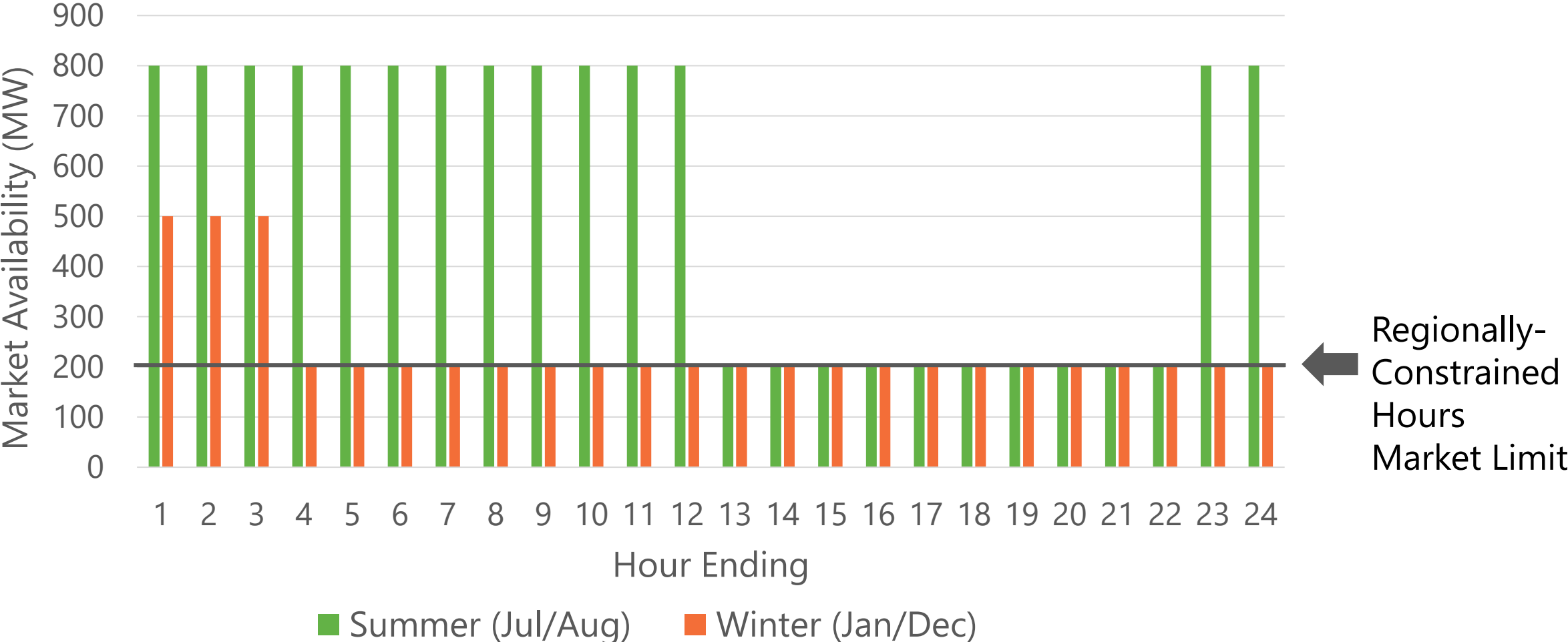
2047

Hour ending	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Hour ending	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0	1
5	1	0	0	0	0	0	0	0	0	0	0	1	5	3	1	0	0	0	0	0	0	0	0	0	3
6	2	1	0	0	0	0	0	0	0	0	0	2	6	6	3	0	0	0	0	0	0	0	0	0	6
7	4	2	0	0	0	0	0	0	0	0	0	4	7	14	7	0	0	0	0	0	0	0	0	0	14
8	4	2	0	0	0	0	0	0	0	0	0	4	8	16	8	0	0	0	0	0	0	0	0	0	16
9	4	2	0	0	0	0	0	0	0	0	0	4	9	14	7	0	0	0	0	0	0	0	0	0	14
10	2	1	0	0	0	0	0	0	0	0	0	2	10	7	4	0	0	0	0	0	0	0	0	0	7
11	2	1	0	0	0	0	0	0	0	0	0	2	11	7	3	0	0	0	0	0	0	0	0	0	7
12	1	0	0	0	0	0	0	0	0	0	0	1	12	3	2	0	0	0	0	0	0	0	0	0	3
13	0	0	0	0	0	0	0	0	0	0	0	0	13	2	1	0	0	0	0	0	0	0	0	0	2
14	0	0	0	0	0	0	0	1	0	0	0	0	14	1	1	0	0	0	0	1	1	1	0	0	1
15	1	0	0	0	0	0	1	1	1	0	0	1	15	3	1	0	0	0	0	4	4	3	0	0	3
16	2	1	0	0	0	0	2	2	2	0	0	2	16	6	3	0	0	0	0	7	7	6	0	0	6
17	4	2	0	0	0	0	3	3	2	0	0	4	17	14	7	0	0	0	0	10	10	8	0	0	14
18	6	3	0	0	0	0	4	4	3	0	0	6	18	22	11	0	0	0	0	13	13	11	0	0	22
19	4	2	0	0	0	0	5	5	2	0	0	4	19	15	7	0	0	0	0	20	20	9	0	0	15
20	4	2	0	0	0	0	4	4	0	0	0	4	20	13	7	0	0	0	0	14	14	1	0	0	13
21	3	2	0	0	0	0	2	2	0	0	0	3	21	11	6	0	0	0	0	6	6	0	0	0	11
22	2	1	0	0	0	0	1	1	0	0	0	2	22	6	3	0	0	0	0	2	2	0	0	0	6
23	1	0	0	0	0	0	0	0	0	0	0	1	23	3	1	0	0	0	0	0	0	0	0	0	3
24	0	0	0	0	0	0	0	0	0	0	0	0	24	1	0	0	0	0	0	0	0	0	0	0	1

Total number of hours: 171

Total number of hours: 618

Market Availability on Most Constrained Days in 2047



Market Prices

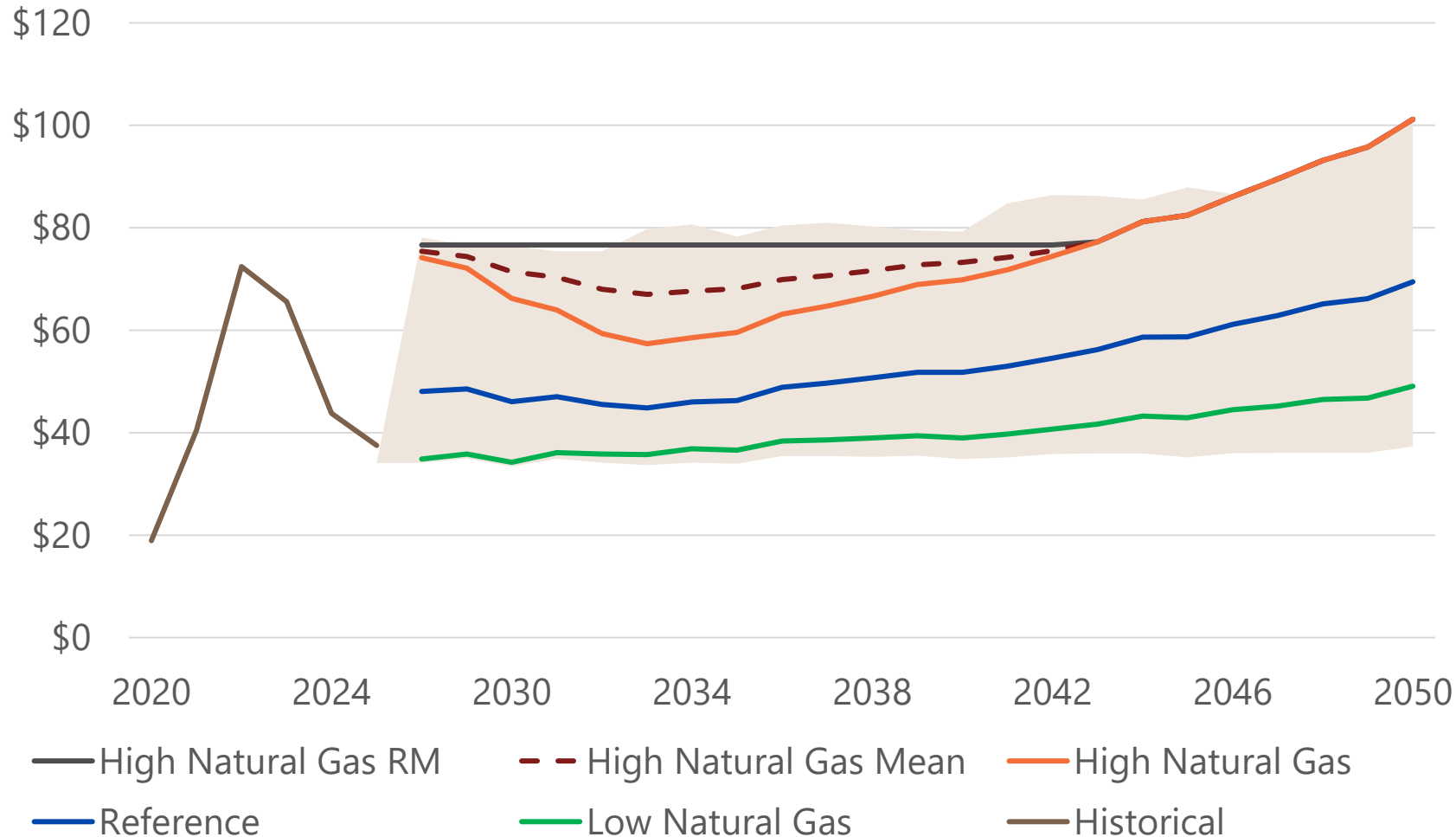


Goal

The model should include multiple price forecasts that capture a sufficient range of potential uncertainty.

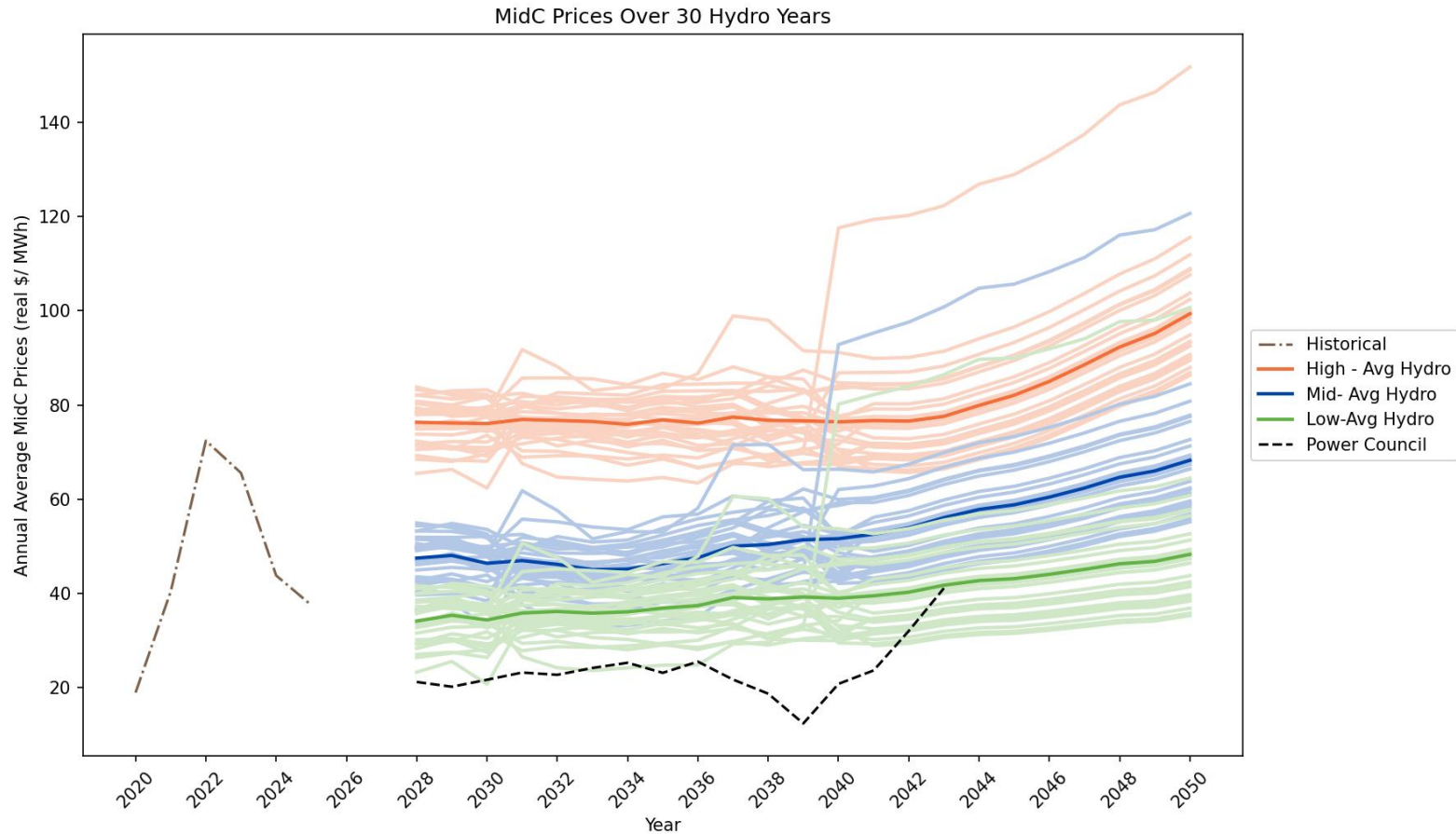
- Review proposal for price forecasts selected
- Request feedback on if these capture a broad enough range of uncertainty

Wholesale Energy Market Prices: Annual Look



- **High Price Future:** High NG forecast
- **Mid Price Future:** Baseline forecast
- **Low Price Future:** Low NG forecast
- Apply an increase to High NG forecasts to have more conservative ceiling?

Wholesale Energy Market Prices



- 3 price futures with 30 water years each
- Base Price: High, Mid, Low Forecasts
- Adder: Water-year deviations from NWPCC price models

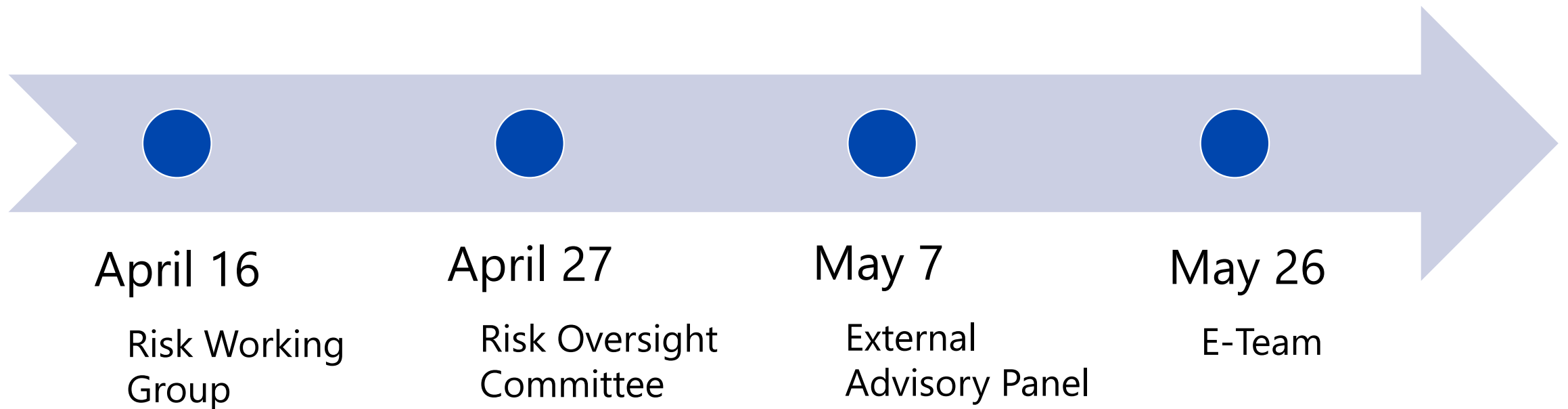
Next Steps



Next Steps for Inputs

1. Compile Recommendations
2. Follow Up as Needed
3. Finalize Inputs and Present to E Team

Timeline



Upcoming Advisory Panel Meetings

Estimated Timeframe	Potential Agendas
<i>April 2, 2026</i>	<i>Introductions & Timeline</i>
<i>May 7, 2026</i>	<i>IRP Input Preview</i>
July	Load Forecast Overview & IRP Modeling
September	IRP Resource Adequacy & Portfolio Proposal
November	IRP Portfolios & DSMPA Results

THANK YOU



Seattle City Light