2026 Integrated Resource Plan (IRP): External Advisory Panel Meeting #2

January 15, 2025

Seattle City Light

WE POWER SEATTLE

Building the 2026 IRP: Today's Agenda

- **SCL Presenters**
- 2026 IRP Report Overview
- 2026 IRP Load Forecast
- IRP Input Assumptions
  - Transmission
  - BPA Product Choice
  - Resource Options
  - Wholesale Prices
- Next steps

Today's SCL Sponsors and Contributors

Name	Title, Group	Role
Siobhan Doherty	Power Supply Officer	IRP Sponsor
Katie Ewing	Manager, Resource Planning & Analysis	IRP Contributor
Mike Hamilton	Strategic Advisor/Data Scientist, Finance	IRP/DSMPA Contributor
Ruizhe Wang	Sr. Economist/Data Scientist, Finance	IRP/DSMPA Contributor
Verene Martin	Data Scientist, Resource Planning & Analysis	IRP/DSMPA Contributor
Rebecca Klein	Data Scientist, Resource Planning & Analysis	IRP Contributor
Alan Bach	Sr. Power Analyst, Resource Planning & Analysis	IRP Contributor
Ana Mileva	Principal, Sylvan Energy Analytics	IRP Contributor
Elaine Hart	Principal, Sylvan Energy Analytics	IRP Contributor

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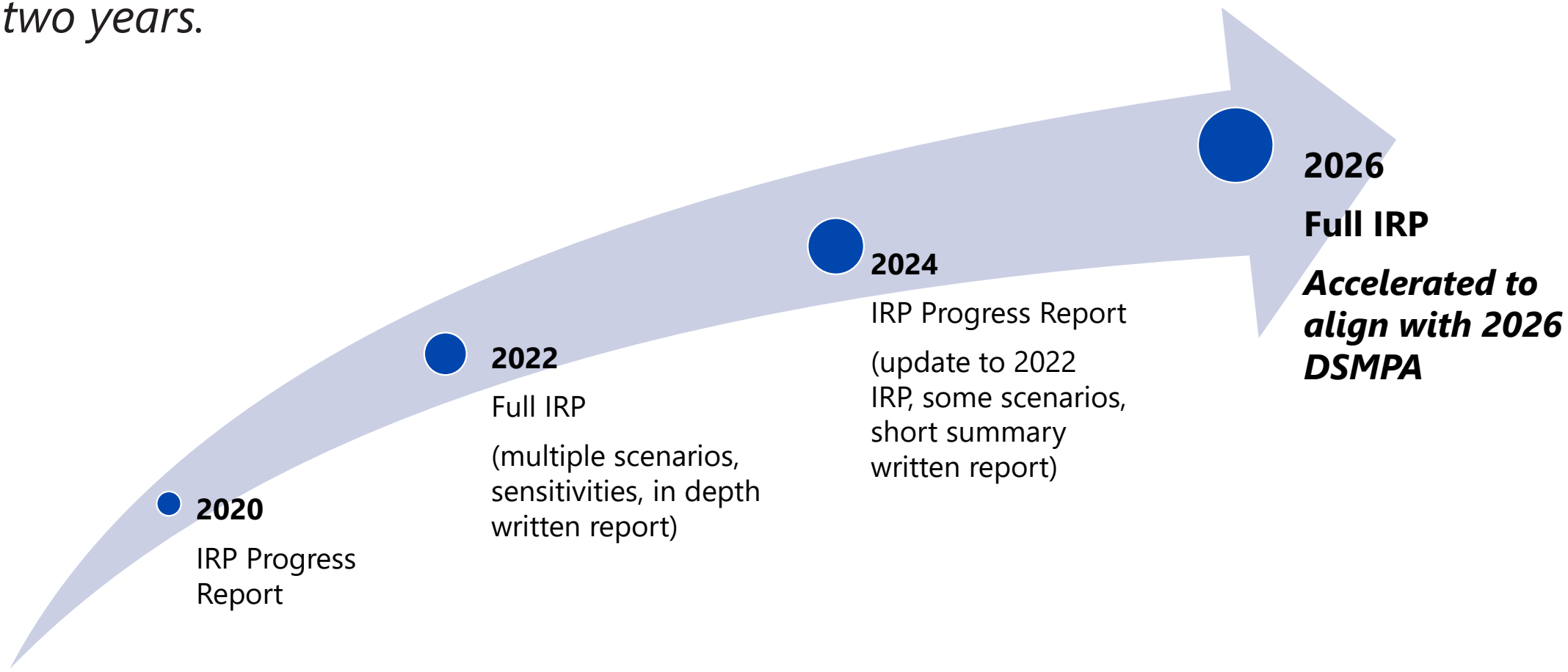
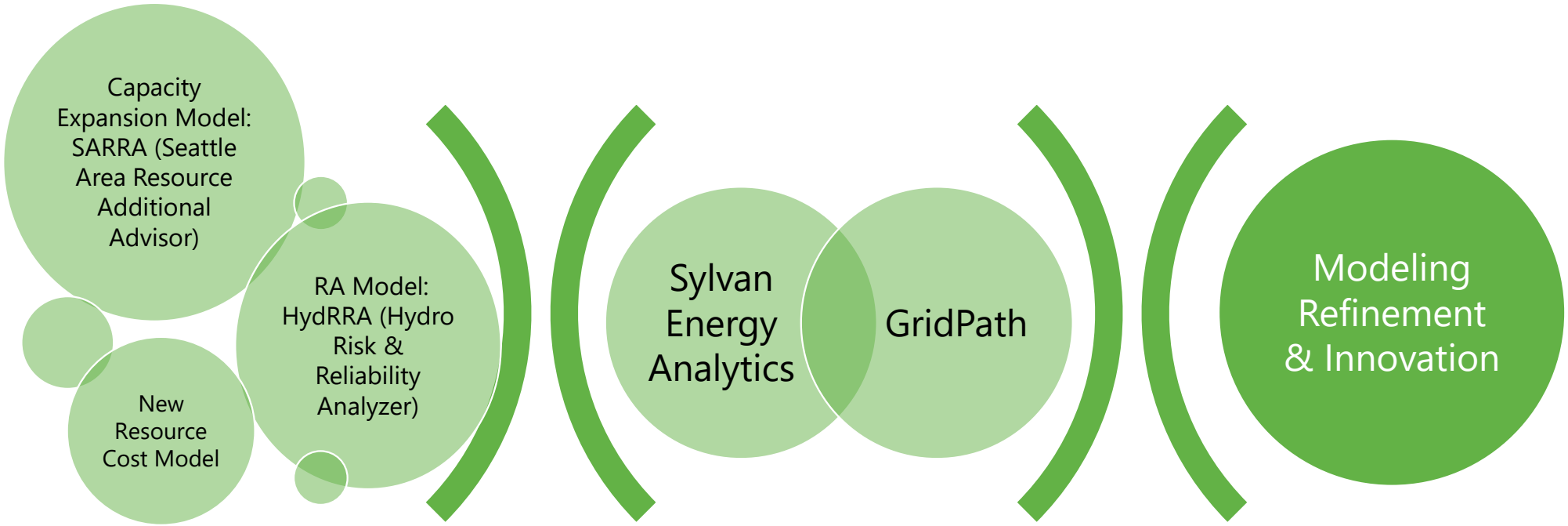
2026 IRP

- RCW 19.280.030 requires all state electric utilities to develop and update integrated resource plans (IRP) and make them available to the public *every two years*.



New Approach

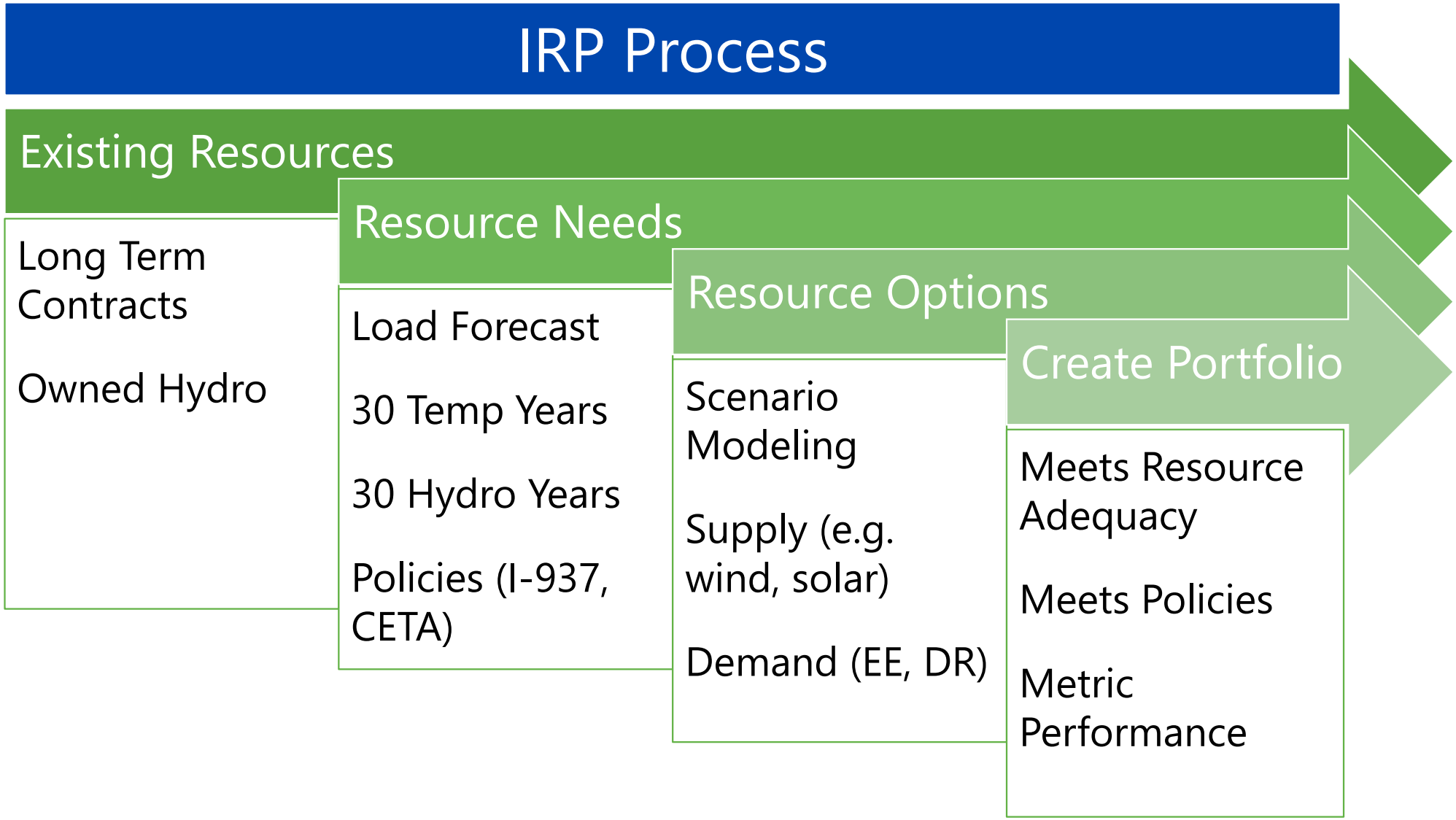


2024 Bespoke Models

2026 Open-Source Models

2028 Models

Elements of the 2026 IRP



Increased Coordination: DSMPA and IRP

1. Corporate Load Forecast for 2025-2045
2. 2026 Demand Side Management Resource Results
3. 2026 Integrated Resource Plan

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2026 IRP Load Forecast

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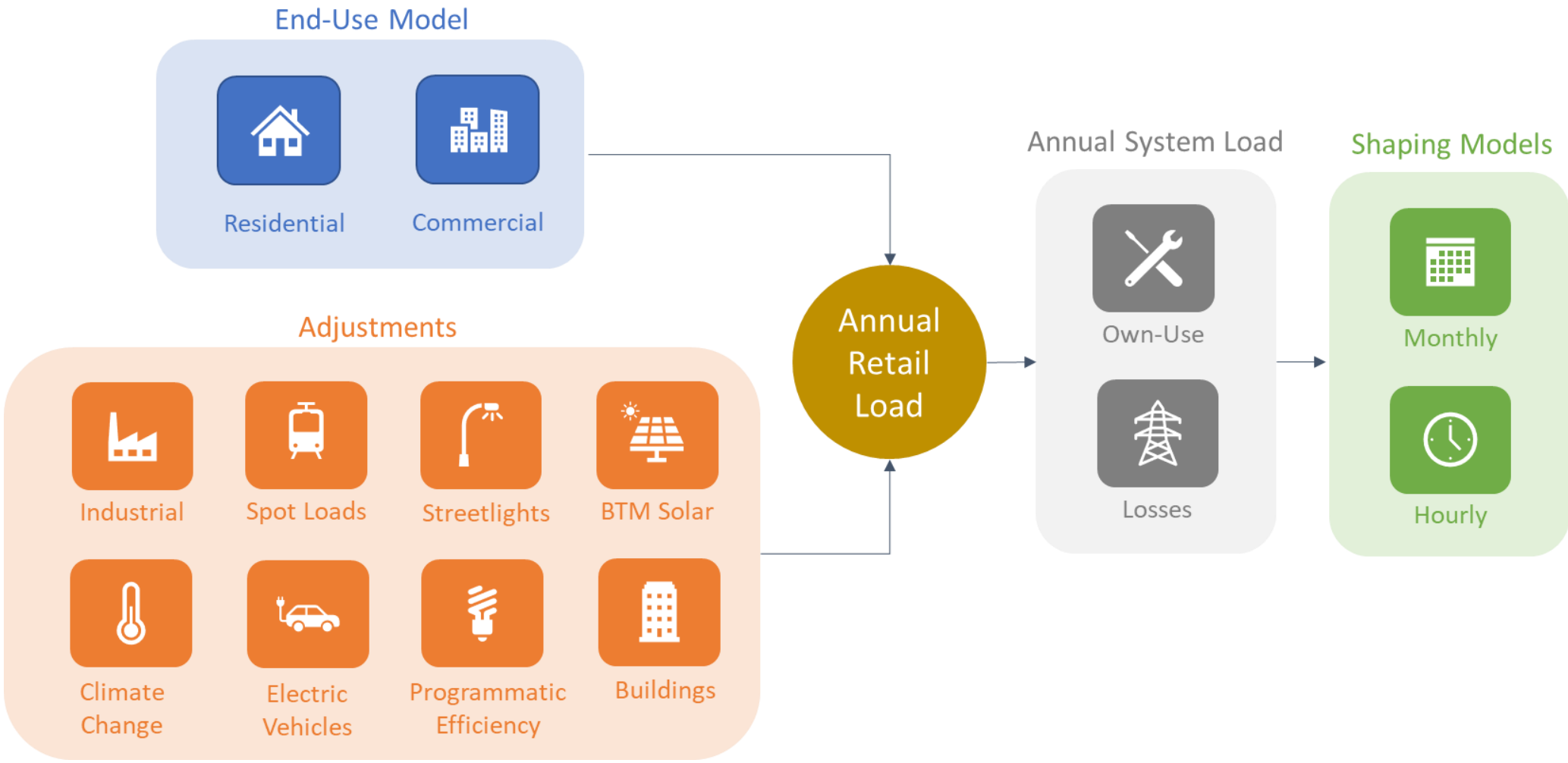
Context + Level-Setting

- Corporate load forecast is a long-term (20 year) forecast of expected loads.
  - Typically updated each year.

- For this update, we synced timing with other key planning functions so that this forecast will be used for all of them:
  - The 2026 Demand Side Management Potential Assessment (DSMPA)
  - The 2026 Integrated Resource Plan (IRP)

How Does the Forecast Model Work?



Key Points 1/2

- The 2026 IRP load forecast is similar to the last load forecast (discussed last February).
- Things that are mostly the same:
  - Overall trajectory
  - Future magnitude of growth from electrification (buildings and transportation)
- Things that are a little different:
  - Slightly more residential load, slightly less commercial load
  - Updated transportation (EPRI)
  - Some new “spot loads” incorporated/adjusted – primarily in later years

Key Points 2/2

- Average load and peak load are both projected to grow, with peak loads slightly outpacing average loads.
- Transportation electrification, and to a lesser degree building electrification, are driving this increase.
- Substantial uncertainty abounds.
  - We continue to carefully track policy and technological developments.

A note on climate change

- Similar but slightly updated assumptions for climate change as in previous forecast.

- Gradually warming temperatures produce…
  - Milder winters
  - Hotter summers, with higher cooling loads + penetrations
  - We incorporate linear temperature increases into the forecast.

- Extreme events cause more uncertainty/volatility → wider distributions

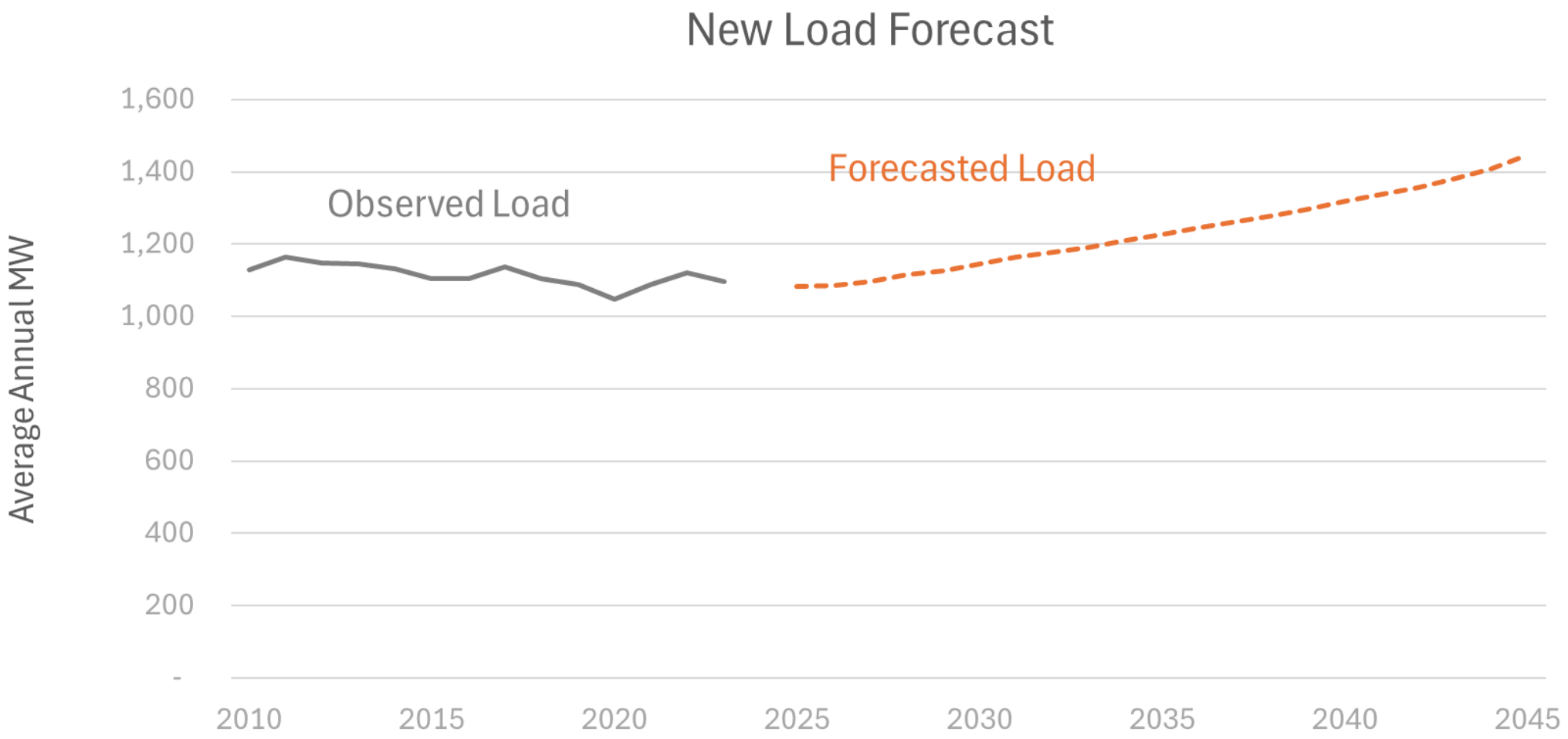
Physics Refresher + Definitions

- Megawatt (**MW**): A unit of power equal to 1 million Watts.

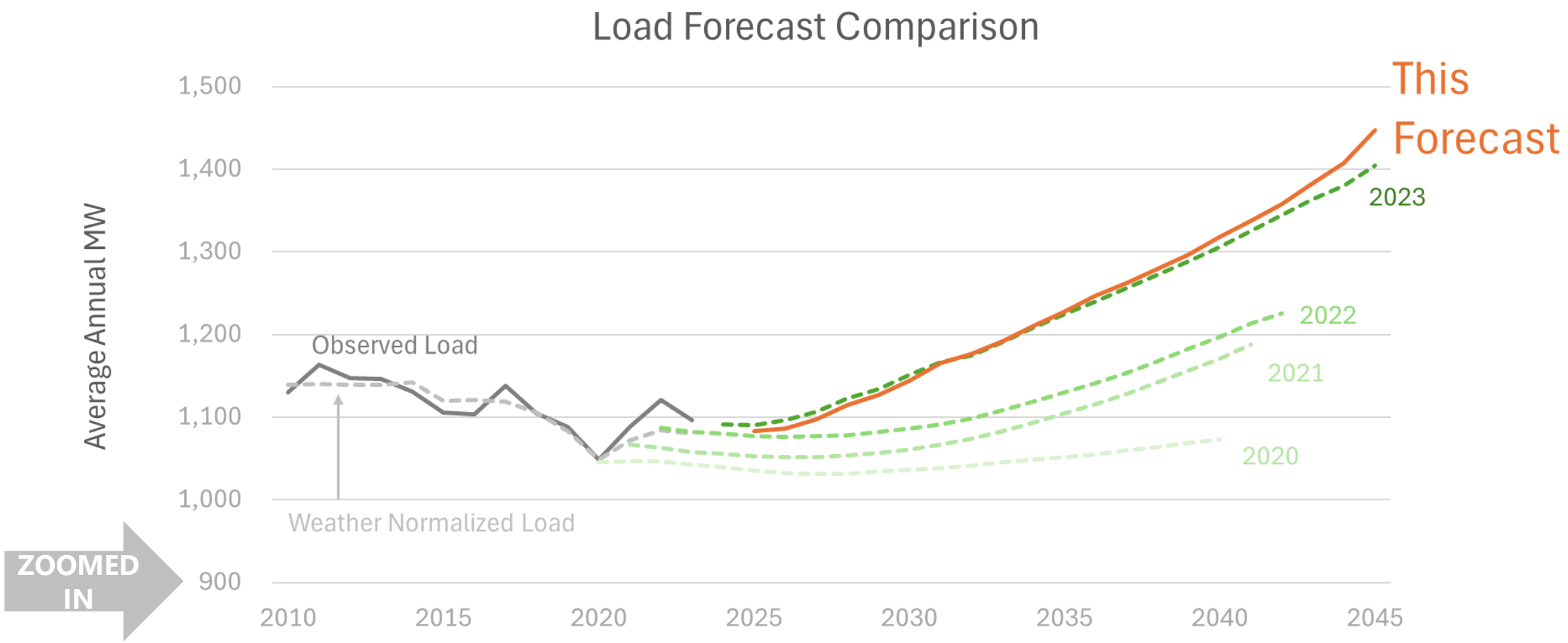
- Average MW (**aMW**): A measure of energy. It is simply the average MW value over *some period of time*.
  - Recall that energy = power * time
  - Example: 1 annual aMW = 8,760 MWh
  - Example: 1 monthly aMW in January = 744 MWh

- When we talk about MW, that refers to a peak value. When we talk about aMW, we are talking about energy (think MWh).

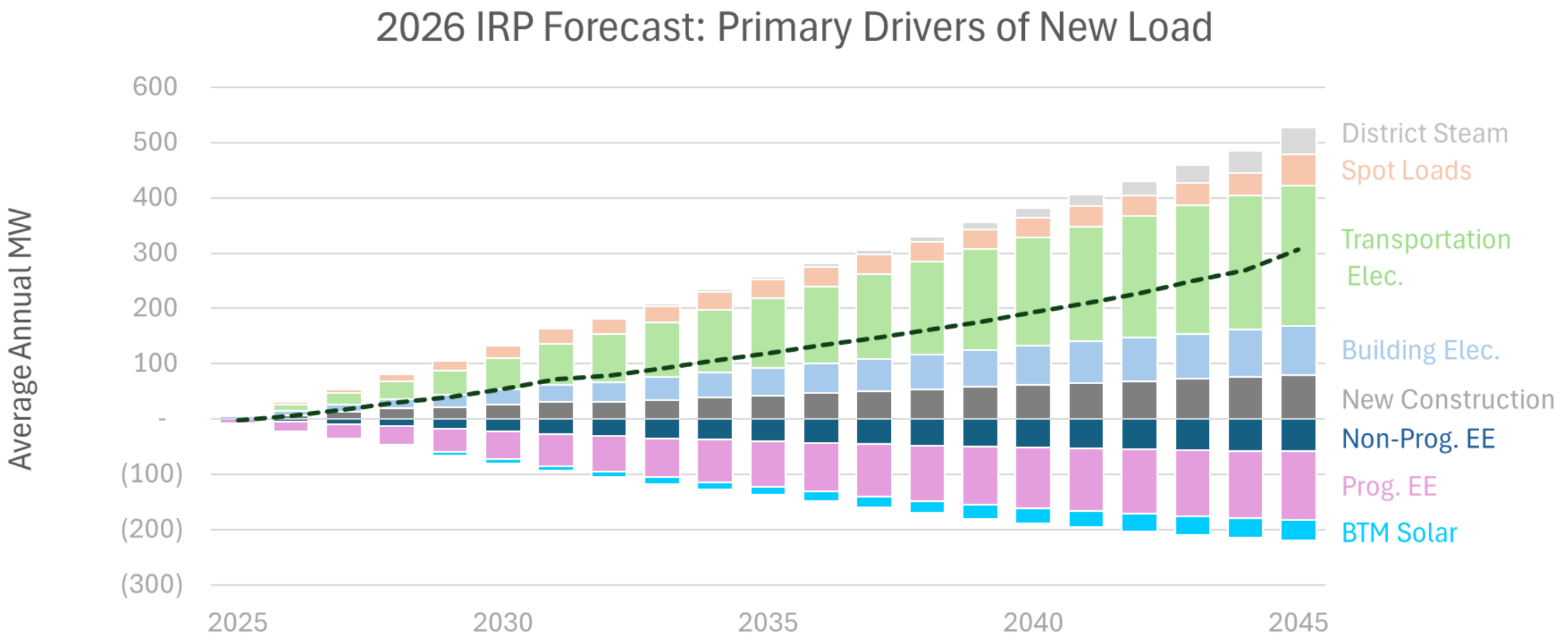
New Forecast in Context



Comparison to Previous Forecasts



Forecast Drivers



What's Driving Transportation Electrification?

- Zero-Emission Vehicle Standard (**ZEV Mandate**) requires higher % of new passenger EVs beginning in 2026, reaching 100% in 2035.
- The Advanced Clean Truck Rule (**ACT Rule**): Applies to MD/HD trucks.
- The Clean Fuel Standard (**CFS**) regulates carbon intensity of transportation fuels. Goal of 20% reduction from 2017 levels in carbon intensity by 2034.
- The Inflation Reduction Act and Investment, Infrastructure, and Jobs Act; (**IRA/IIJA**) provides consumer tax credits for EVs + incentives for infrastructure and manufacturing.
- Changing consumer preferences.

What's Driving Building Electrification?

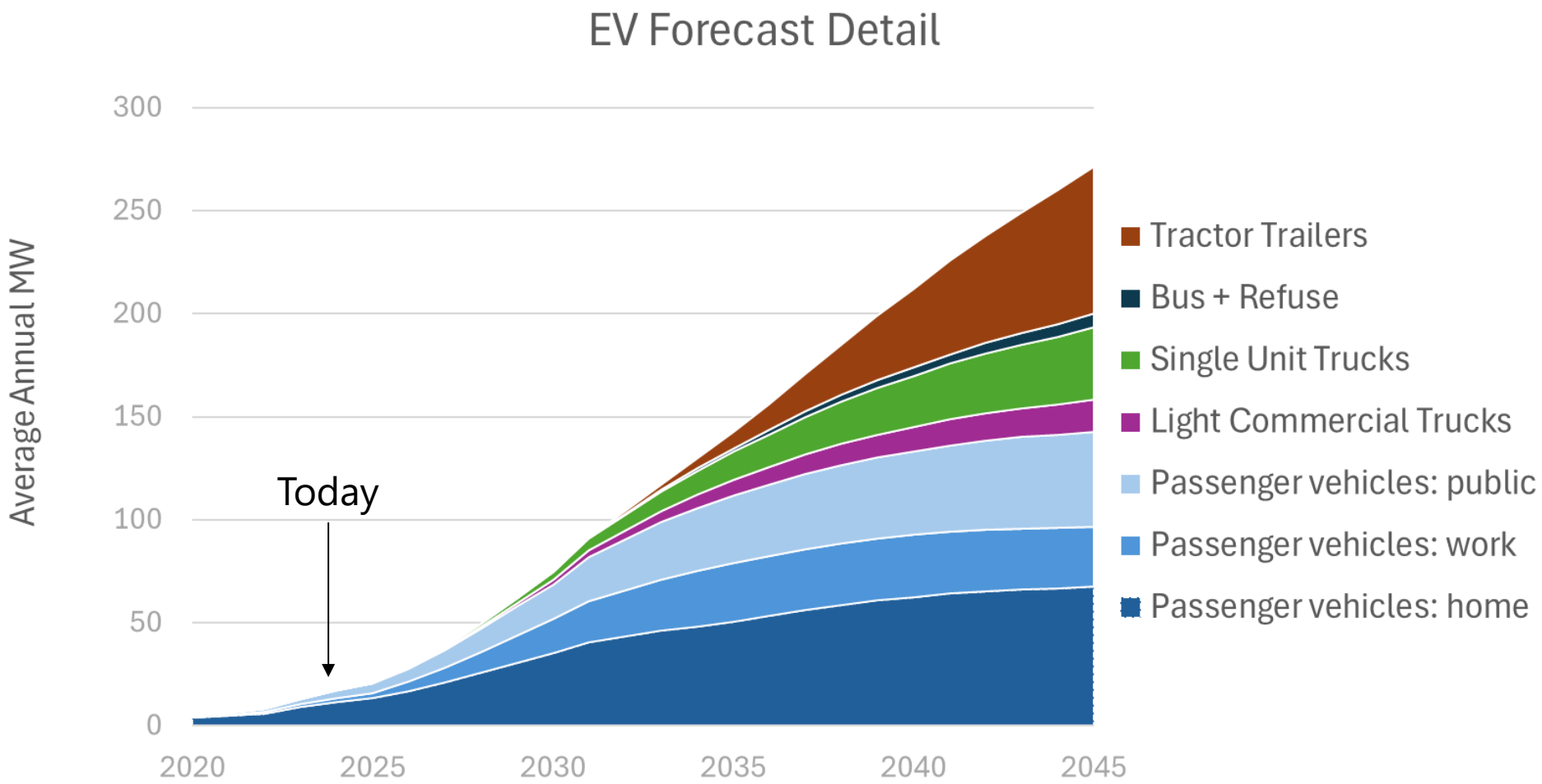
- **Technological improvements and declining costs for heat pump technologies,** coupled with **consumer demand for cooling**, is driving electrification in the residential sector.

- State and City building performance standards:
  - WA State Clean Building Performance Standard (**CBPS**)
  - City of Seattle Building Energy Performance Standard (**BEPS**)

- **The Climate Commitment Act (CCA)** requires largest customers (UW, Centrio) to decarbonize.

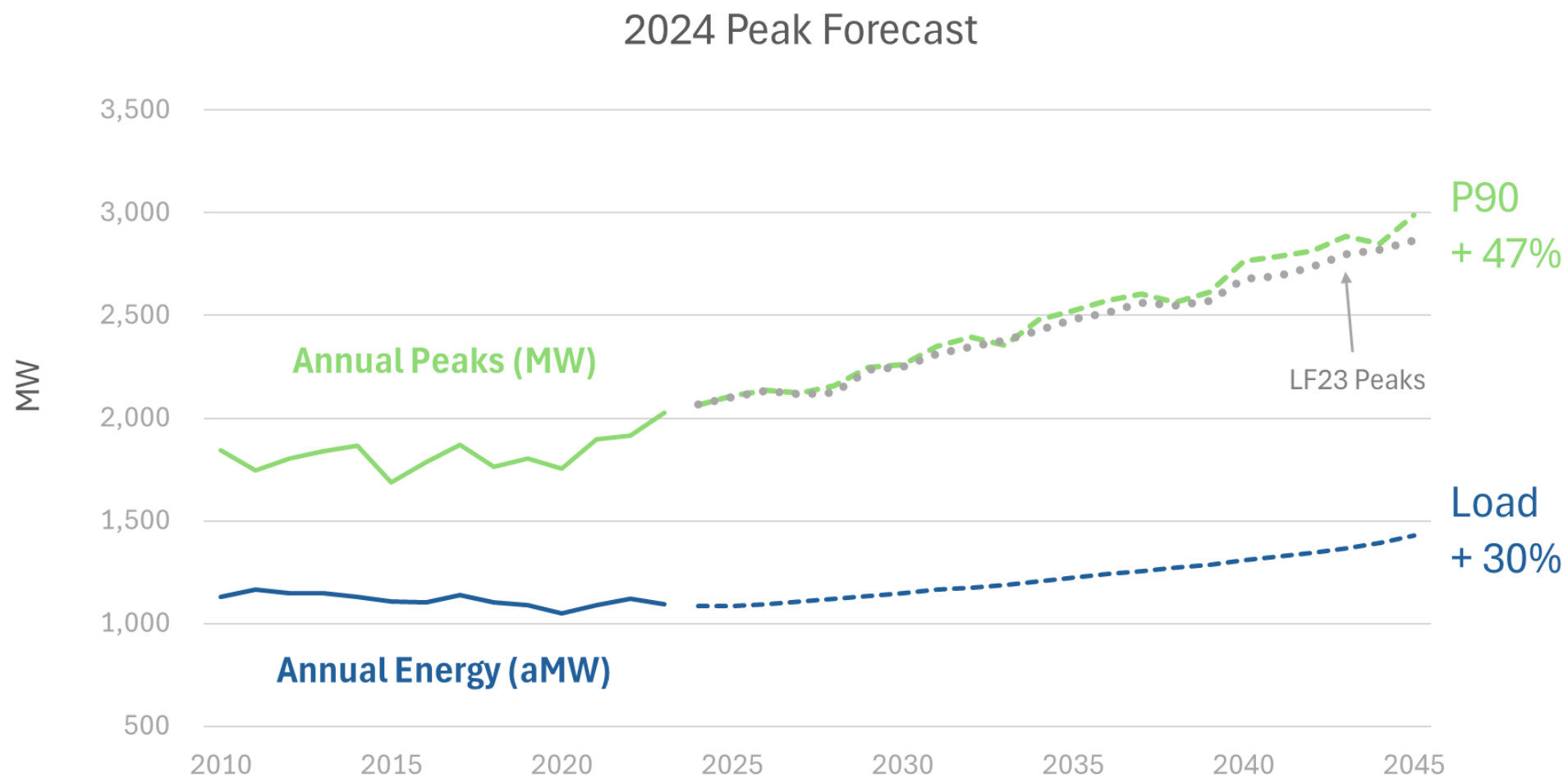
- Internal **organizational/corporate goals** have also contributed.

Electric Vehicle Forecast: Detailed Breakout

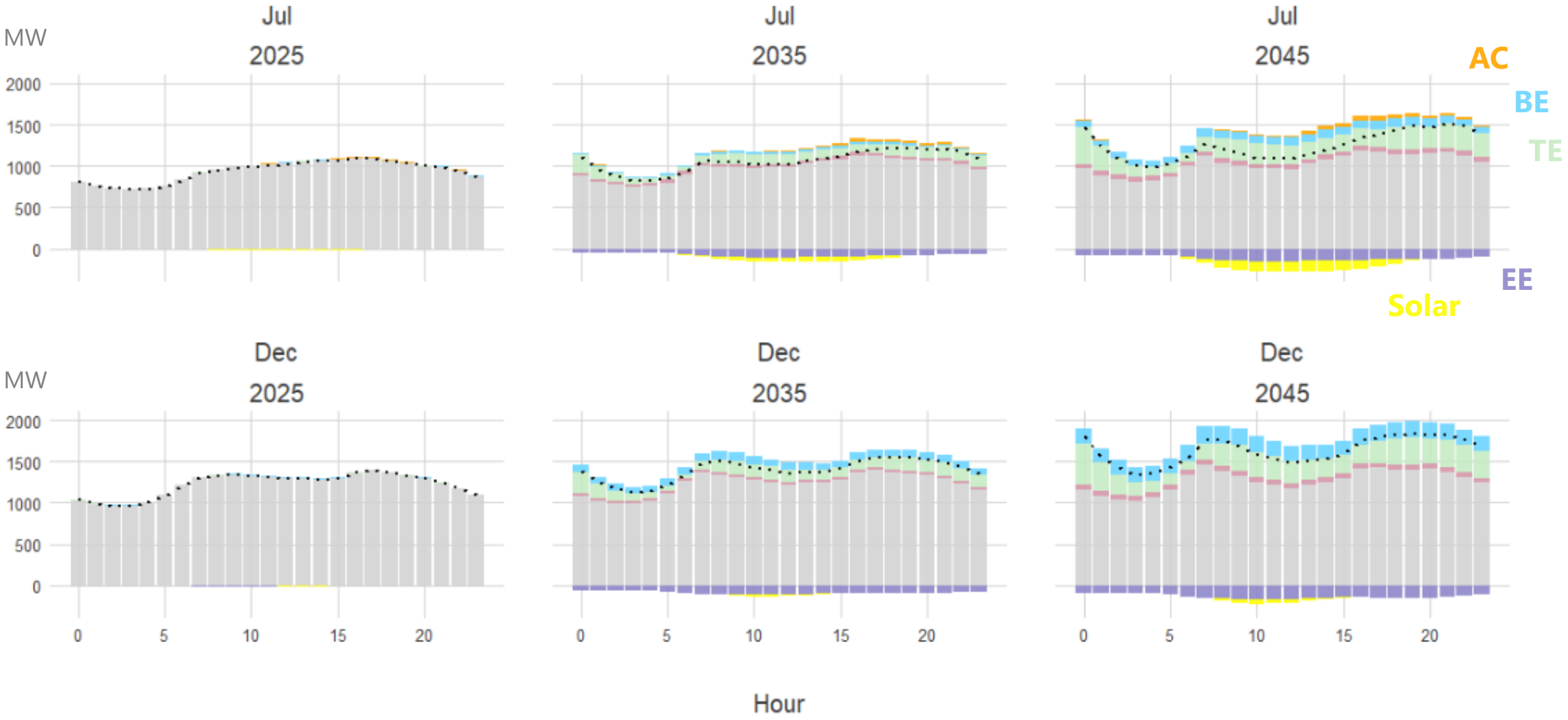


EV forecast data most up to date as of October 2024

Peak Forecast



Average Hourly Loadshapes: 2025, 2035, 2045



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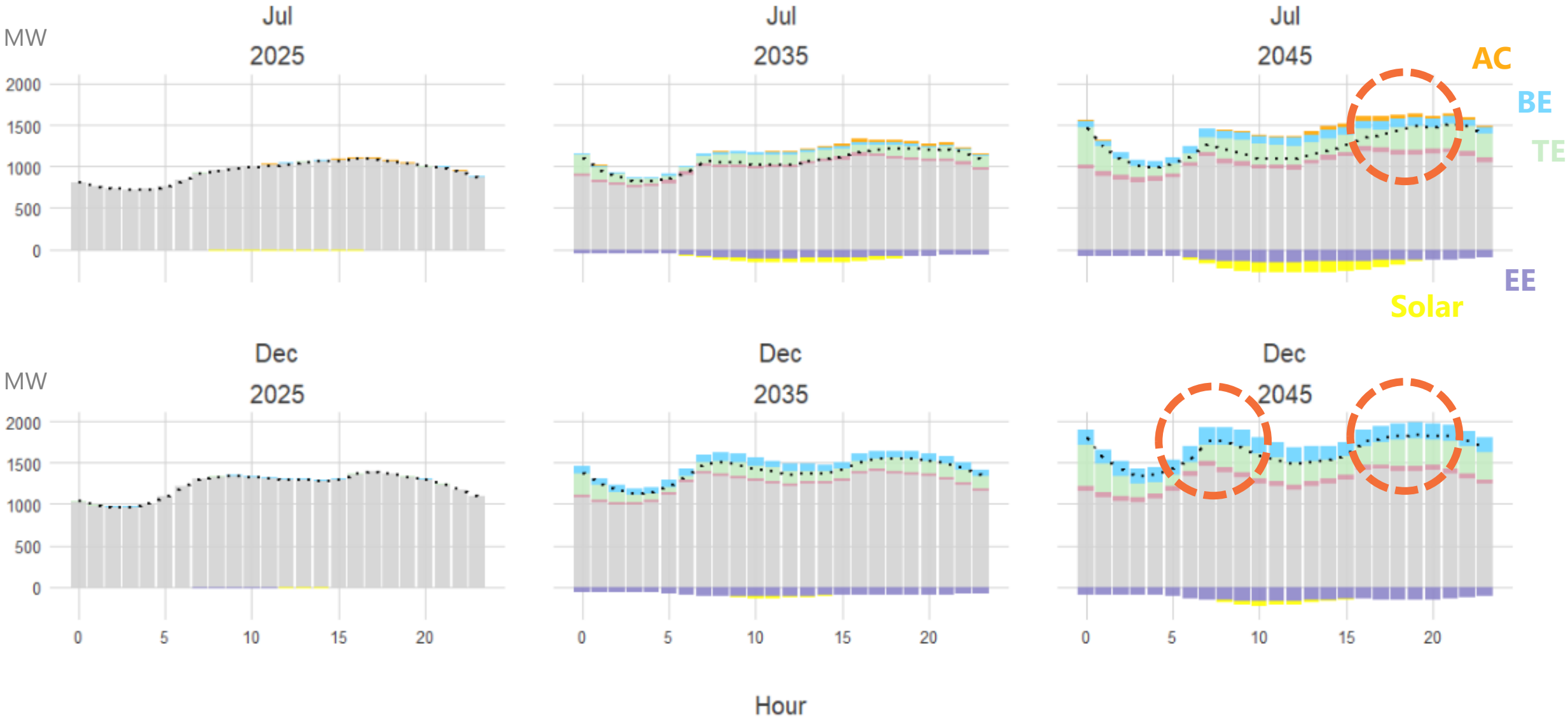

5-10 Minute Break

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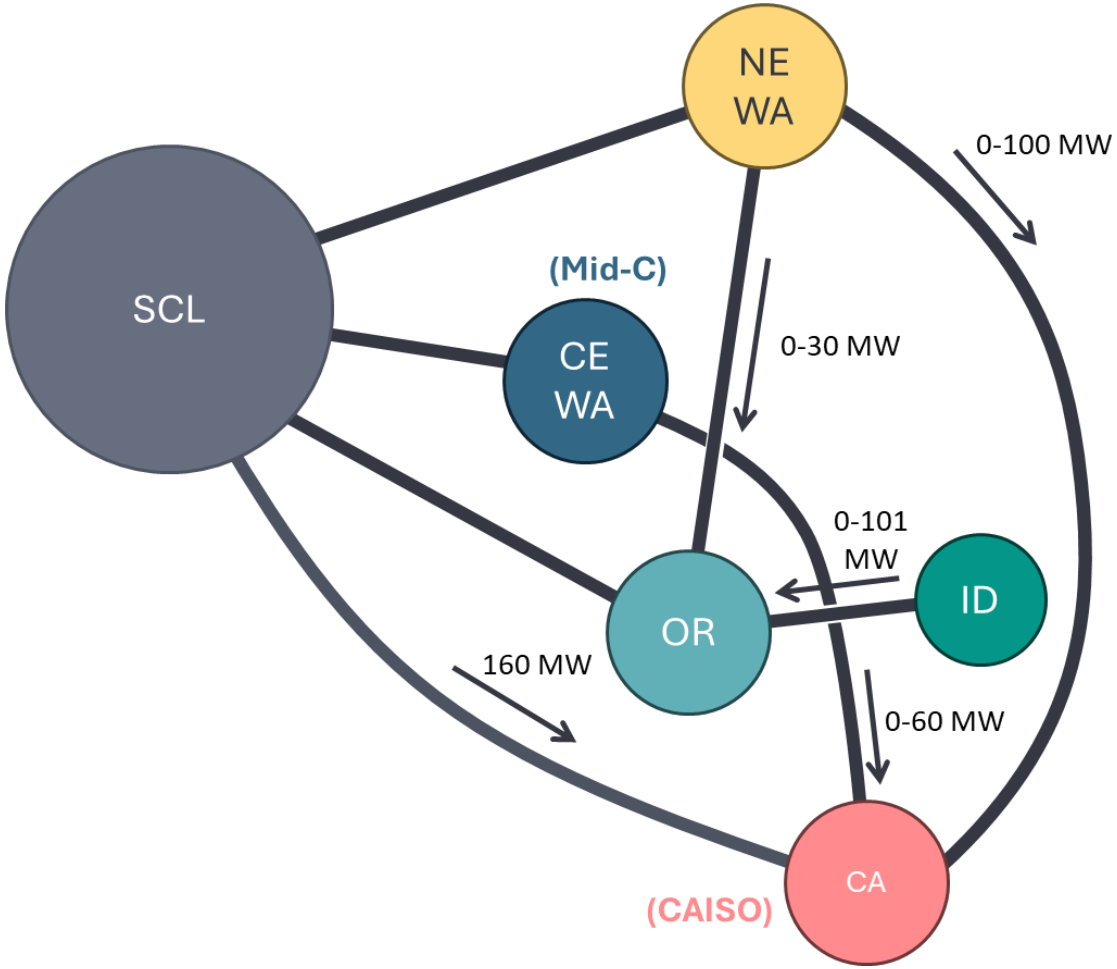
Transmission – Modeling

- **Why is this challenging?**
  - Traditionally, utilities have secured long-term firm (LTF) point-to-point (PTP) transmission rights for delivery of generation across BPA's system to their load
  - These rights effectively reserve portions of the transmission for all hours of the year, even if the resource does not generate in all hours of the year
  - The deployment of renewables in the region and the use of LTF PTP transmission rights to deliver these renewables has left the BPA system largely subscribed on a long-term basis
  - Granting additional LTF PTP rights to deliver into the Seattle area will require transmission upgrades, which may take years to complete
- **Goals for IRP:**
  - Approximate physical transmission constraints in the region, while recognizing the flexibility that SCL's existing transmission portfolio provides
  - Identify incremental transmission needs for meeting load while balancing cost and policy objectives

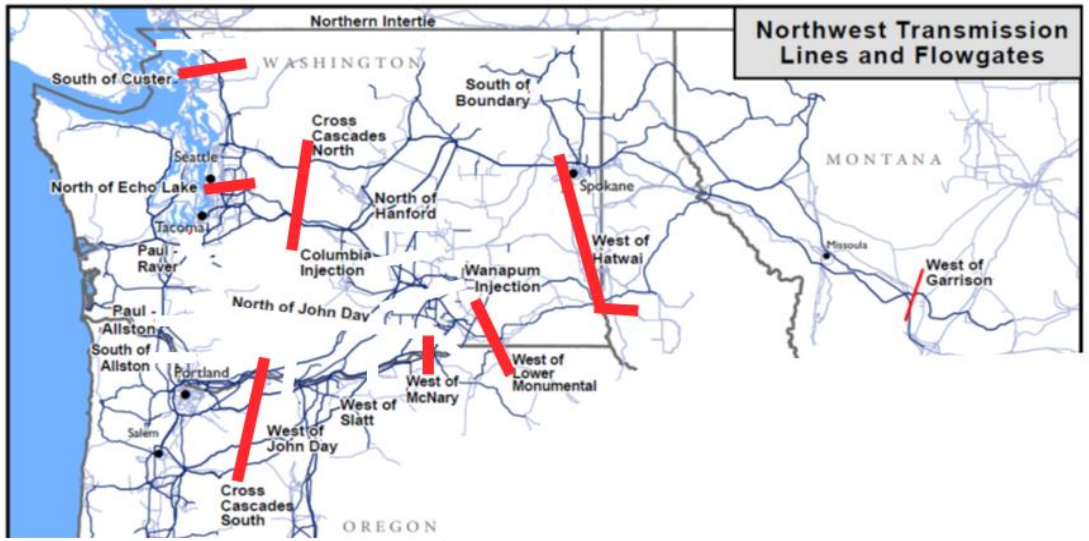
Transmission – Zonal Topology

- Zones were developed by clustering SCL's rights on the BPA system based on impacts to key flow gates
- ID and CA zones were added to reflect opportunities off BPA's system
- All flows between zones will be tracked in the model
- In addition, the model will constrain zonal flows in two ways:
  - Flows into SCL will be constrained based on their estimated impacts to physical flows across key flow gates
  - All other zonal flows are constrained by SCL's transmission rights



Transmission – Flow-Based Constraints

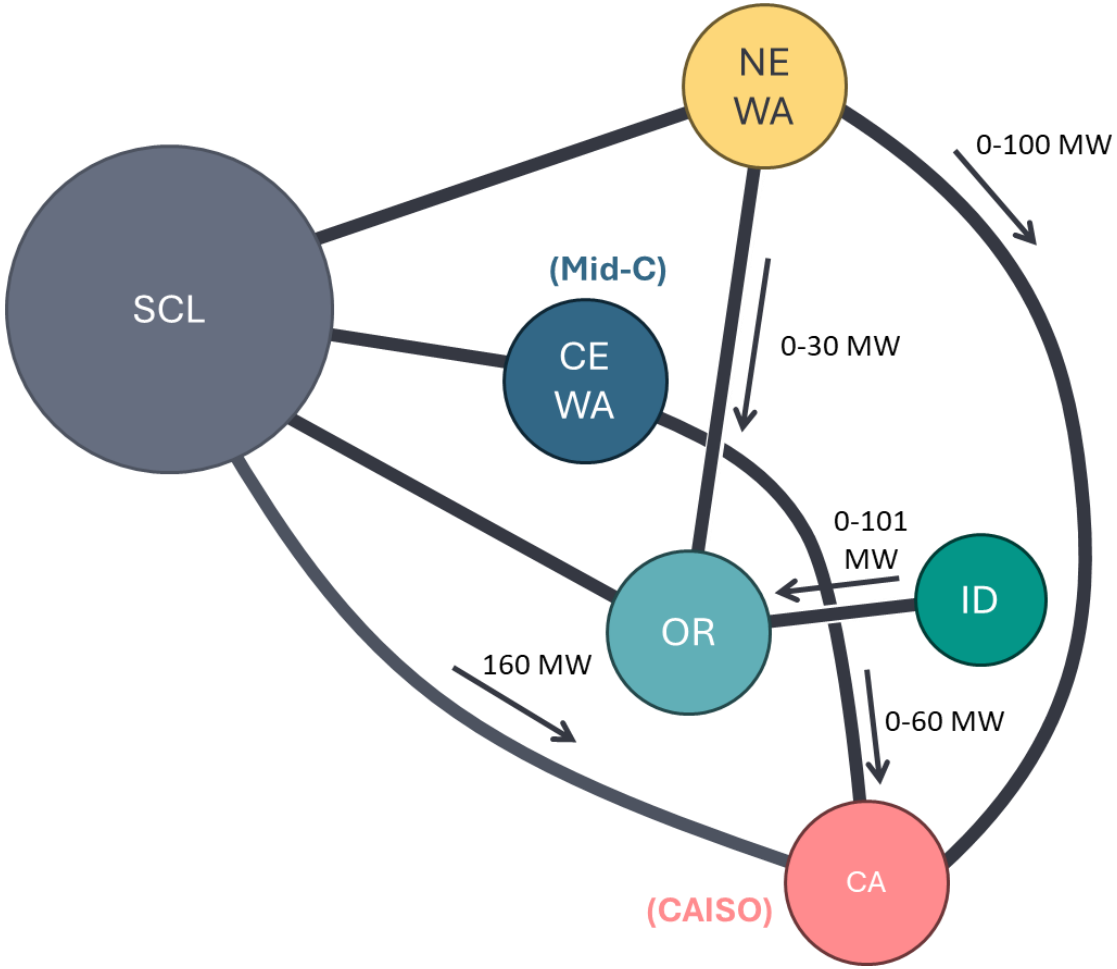
- The model will estimate flows across 7 BPA paths based on zonal flows and BPA Power Transfer Distribution Factors (PTDFs)
- Path flows will be constrained based on the amount of flow corresponding to SCL's transmission rights into BPAT.SCL



Zone From / Zone To	NE_WA SCL	CE_WA SCL	OR SCL	CA SCL	Max Flow (MW)
CROSS CASCADES N.	0.52	0.82	0.73	0.71	1,341
NORTH OF ECHO LAKE	0.15	0.34	0.36	0.36	561
SOUTH OF CUSTER	0.37	0.04	0.04	0.03	425
WEST OF HATWAI	0.57	0.07	0.08	0.04	673
WEST OF MCNARY	0.04	0.04	0.34	-0.12	151
WEST OF LOMO	0.14	0.10	0.01	-0.02	255
CROSS CASCADES S.	0.05	0.06	0.13	0.12	161

Transmission – Zonal Topology

- Beginning in 2030, the model will be able to select additional transmission. This information could be used to inform Transmission Service Requests.
- 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

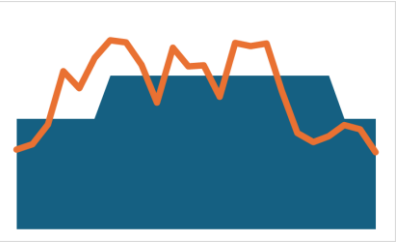


BPA Products Selection – Background

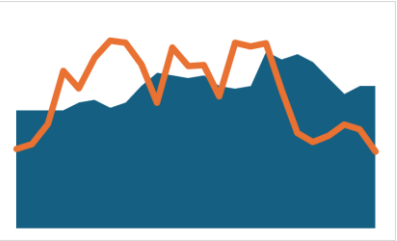
- ~40% of our energy comes from a contract with BPA
- Current contract expires in 2028
- Contract renewal from 2028-2044 allows us to choose a different BPA product

BPA Products Selection – The Products

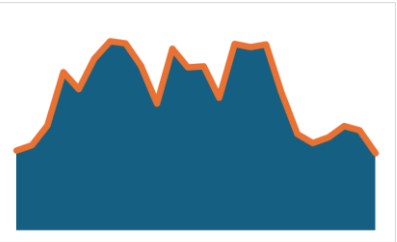
- **Block**
  - Receive a mostly flat “block” of power
  - This is our current product selection



- **Slice/Block**
  - Receive energy based on a “slice” of the BPA system
  - On average receive more energy, but variable on a monthly basis



- **Load Following**
  - BPA meets all of our load not met by our resources
  - BPA receives limited control on our resources
  - Priced at a premium



BPA Products Selection – IRP Model

1. Study BPA product qualities and costs
2. Input BPA product qualities and costs into IRP model as candidate resources
3. IRP model evaluates BPA products the same as other candidate resources, except only one BPA product can be chosen

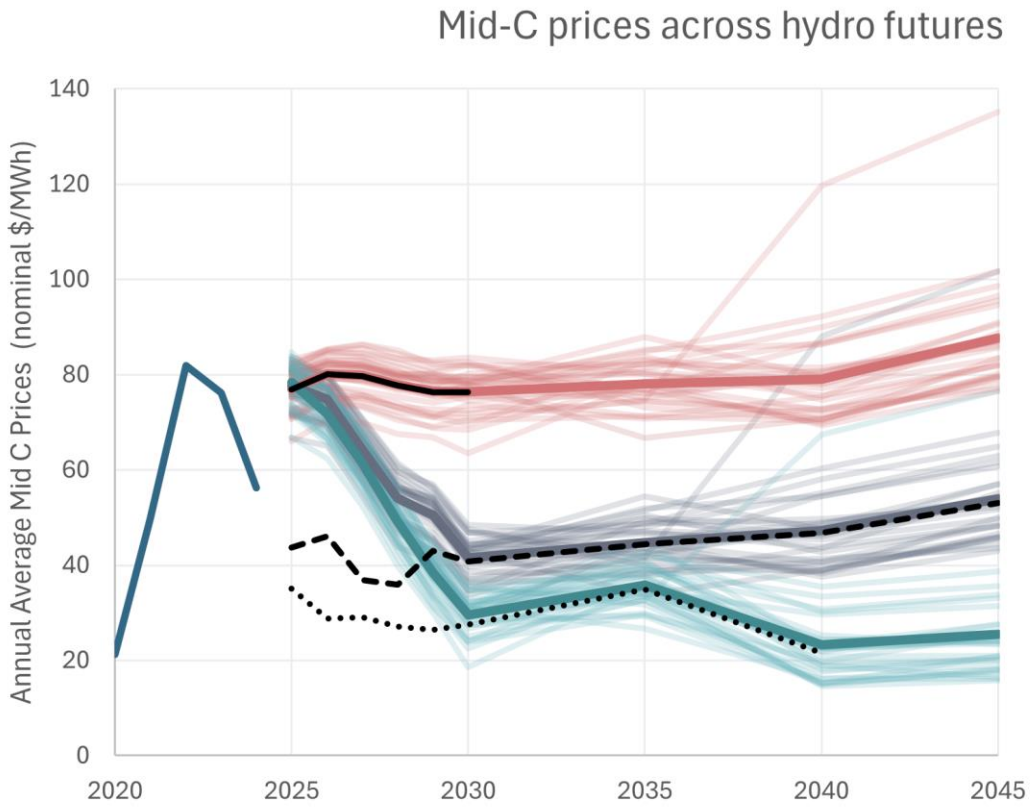
Candidate Resources – Existing Technologies

Technology	Location(s)	Data Sources & Notes
Demand-Side Resources	Within Seattle's Balancing Area	Consulting with Cadmus to determine viable demand-side resource candidates • Demand response (DR) • Customer Solar Programs (BTM Solar) • Time of Use Programs (TOU) • Energy Efficiency (EE)
Onshore Wind	• Gorge (WA/OR border) • Idaho • Montana	• NREL-based wind shapes • RARE renewable dataset • RFP responses • NREL ATB
Solar PV	• Central WA • Gorge (WA/OR border) • Idaho	• NREL-based solar shapes • RFP responses • NREL ATB
Battery storage	On-system or co-located with renewables	• RFP responses, NREL ATB • Assume 85% RT efficiency • Assume 4-hr min

Candidate Resources – Emerging Technologies

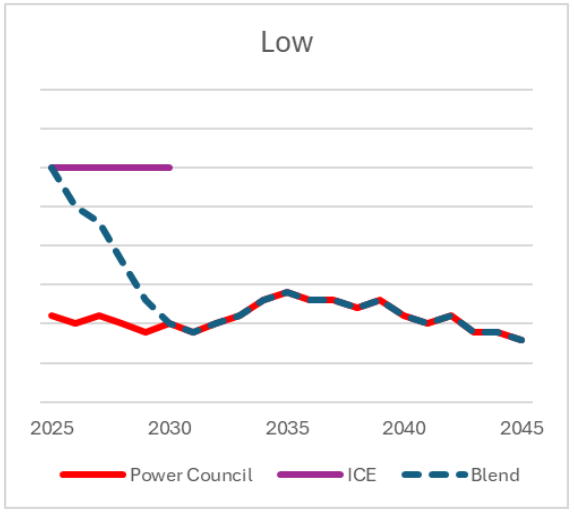
Emerging Technology Available 2035	**Data Sources & Modeling Notes**
Multiday Storage	100-hr iron air batteries from Form Energy
Offshore Wind	Oregon coast; data from PNNL
Enhanced Geothermal	Baseload resource with 80% capacity factor (per NREL ATB)
Small Modular Nuclear	1) baseload resource with 93% capacity factor (per NREL ATB) 2) flexible resource with 5.5 hours of storage (per TerraPower)
Hydrogen Peakers	Modeled as new frame combustible turbines (CTs) located on-system.

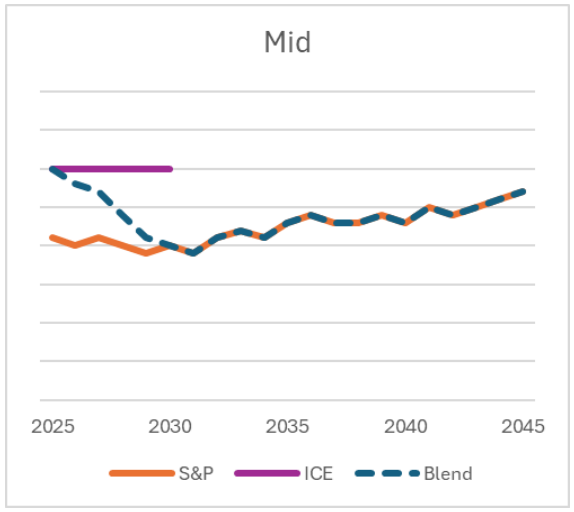
Wholesale Prices

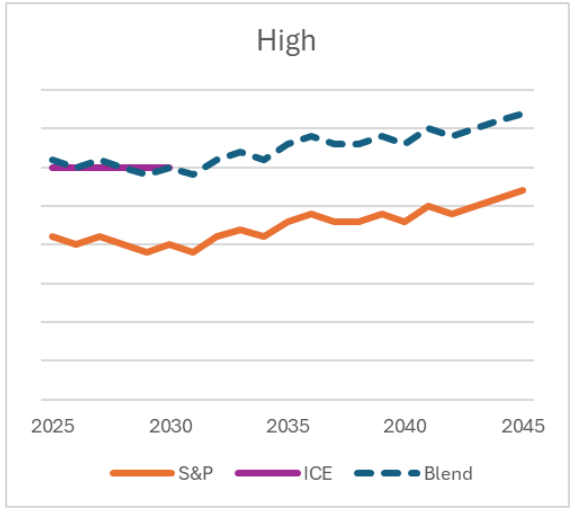


- 3 cases with 30 water years each
- Data Sources:
  - ICE MID-C Forward prices
  - S&P price forecasts
  - NWPCC's modeled regional market price scenarios
- Base Price: ICE blend
- Adder: water-year deviations in NWPCC regional price models

Wholesale Prices







- Low: Blend Power Council/ICE
- Mid: Blend S&P/ICE
- High: Extend ICE
- All:
  - Apply price adder from Power Council to get 30 hydro scenarios

*Not actual data

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Next Meeting

- March proposed agenda
  - Resource Adequacy and Existing Resources
  - DSMPA Initial Results
- 2025 meetings:
  - March
  - May

THANK YOU

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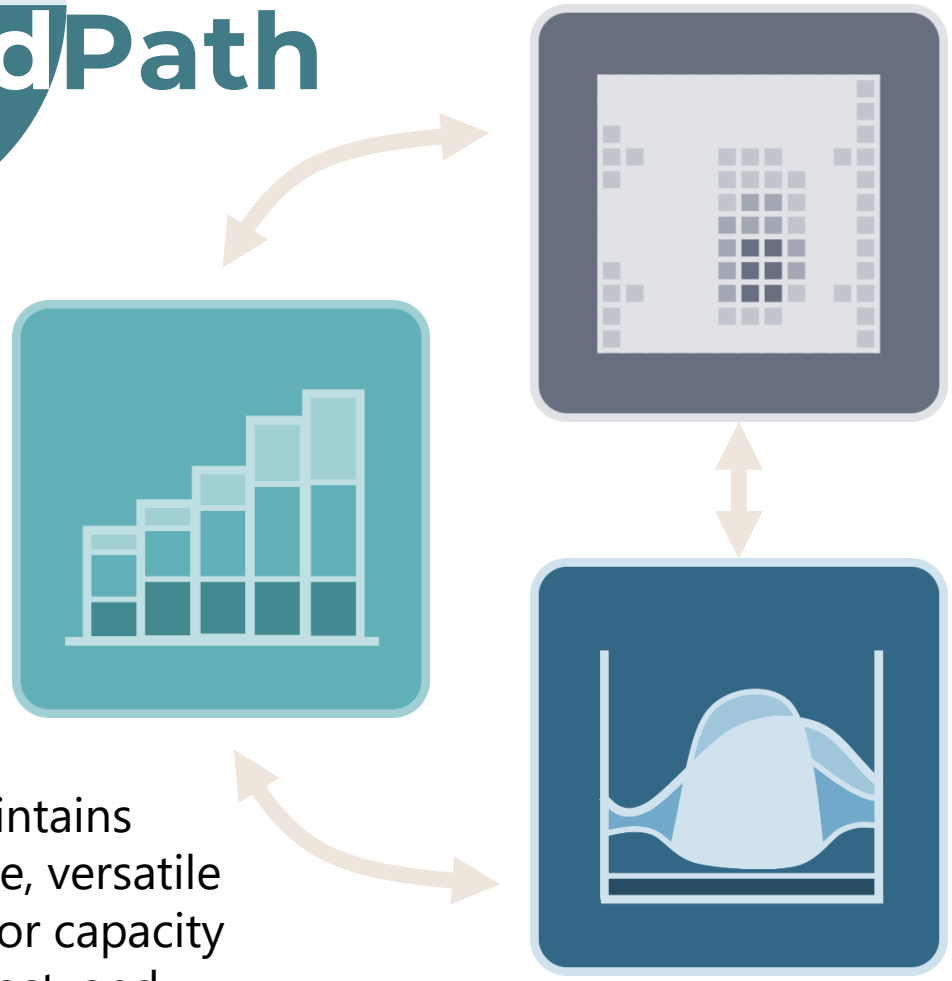
SYLVAN
ENERGY ANALYTICS

- **Sylvan Energy Analytics** provides consulting services and software solutions for clean energy planning
- Extensive experience in integrated resource planning, working across the utility industry, with specific expertise in the Pacific Northwest

GridPath



Sylvan develops and maintains GridPath, an open-source, versatile grid-analytics platform for capacity expansion, production cost, and resource adequacy analysis

Mission, Vision, and Values

Mission

Seattle City Light safely provides our customers with affordable, reliable, and environmentally responsible energy services.

Vision

Create a shared energy future by partnering with our customers to meet their energy needs in whatever way they choose.

Values

- **Customers First**
- **Environmental Stewardship**
- **Equitable Community Connections**
- **Operational and Financial Excellence**
- **Safe and Engaged Employees**