Data centers and resource adequacy in the Pacific Northwest

Presentation to the Oregon Data Center Advisory Committee

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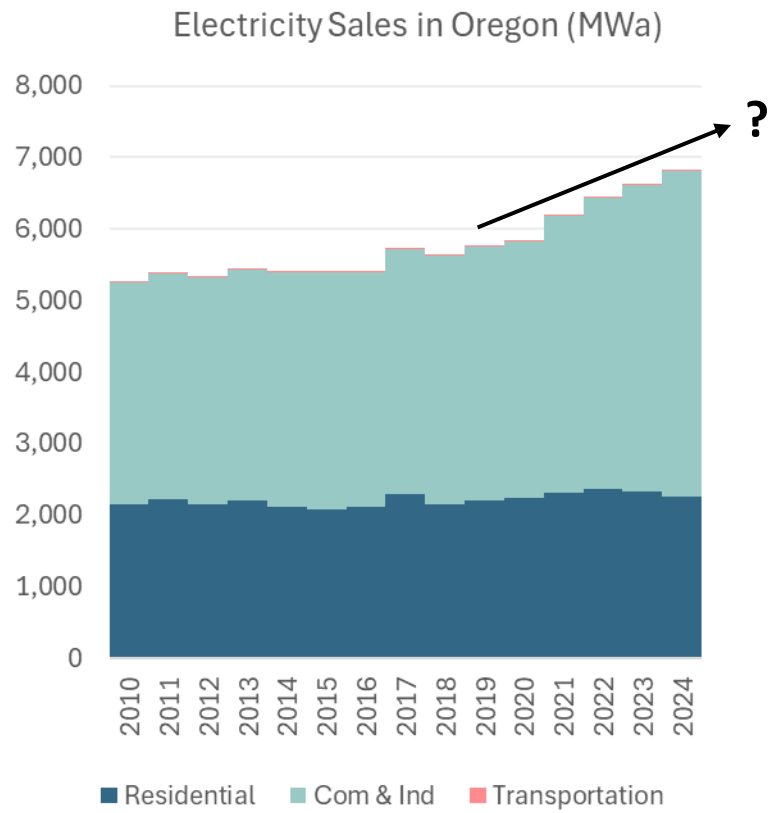
SYLVAN ENERGY ANALYTICS

What is resource adequacy and why does it belong in this conversation

- In electricity planning, a system is resource adequate when there is enough available generation to meet electricity demand across a very wide range of circumstances (weather, hydro conditions, generator outages, etc.)
- Resource adequacy is crucial for maintaining reliable electricity service
- For many years, the Pacific Northwest as a region has been resource adequate and the demand for electricity has been relatively flat due in part to energy efficiency
- The development of data centers (among other factors) has led to material demand growth in recent years and recent projections suggest this demand growth may accelerate
- This poses the crucial question: **Will the region still be resource adequate if recent data center growth projections materialize?**

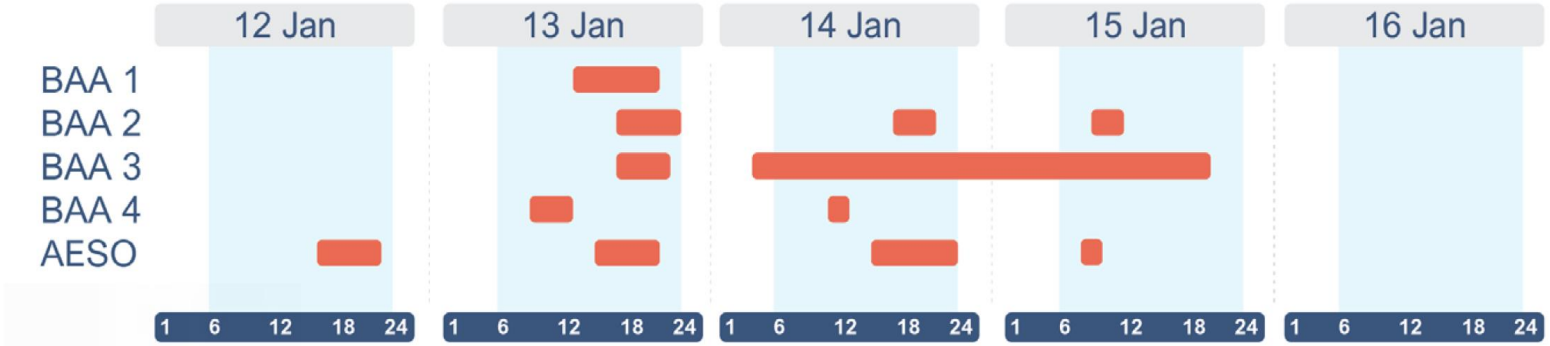


January 2024: a case study for winter RA challenges in the Northwest

Multiple compounding factors:

- Very low temperatures drove up heating demand (both electric and gas)
- Low water year reduced availability of hydro generation
- Gas supply was constrained, affecting the availability of some gas generators
- A transmission outage limited imports from California

Four Northwest Balancing Authority areas declared Energy Emergency Alerts (EEAs) between Jan 13 and Jan 15, although none shed load.



Source: RC West, AESO

Source: Powerex, "Analysis of the January 2024 Winter Weather Event," March 2024, https://powerex.com/sites/default/files/2024-03/Analysis%20of%20the%20January%202024%20Winter%20Weather%20Event.pdf.

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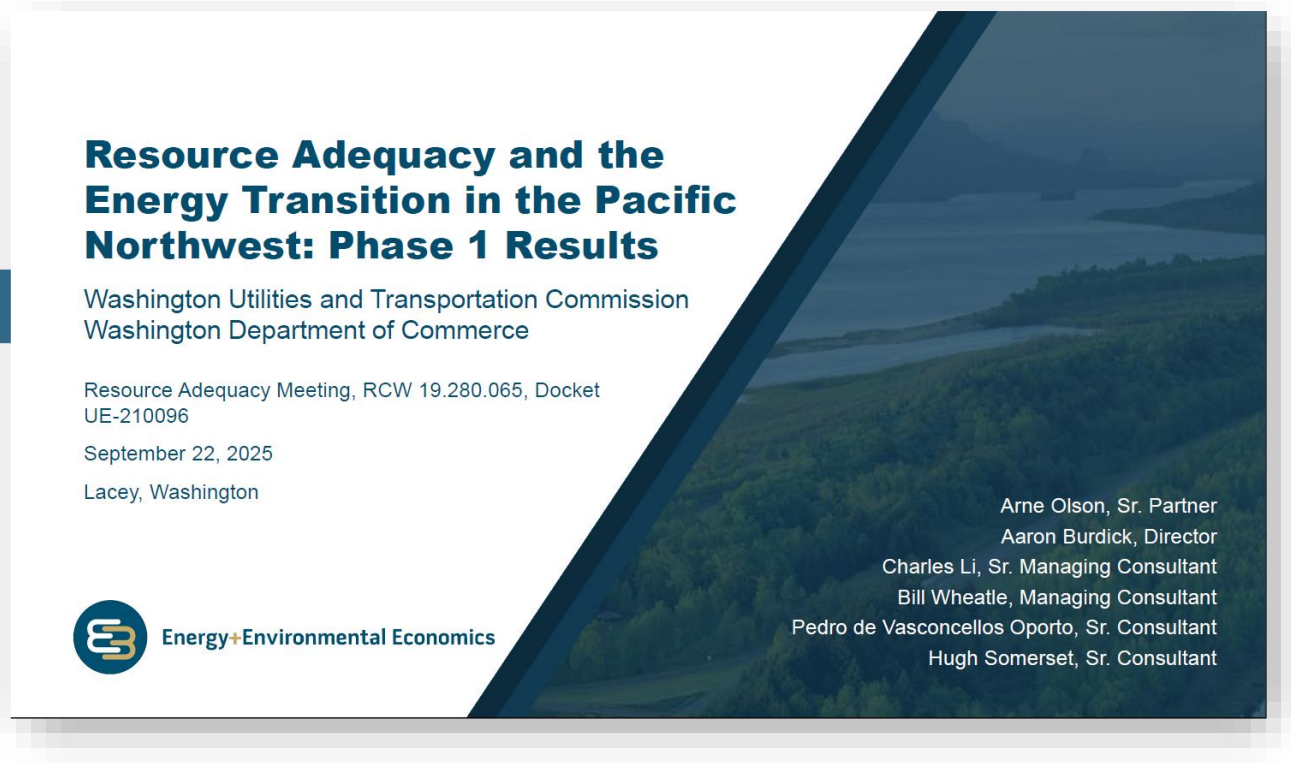

The near term regional reliability challenge

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Greater Northwest

Total Resource Need and Effective Capacity Contribution from Planned Resources (MW)

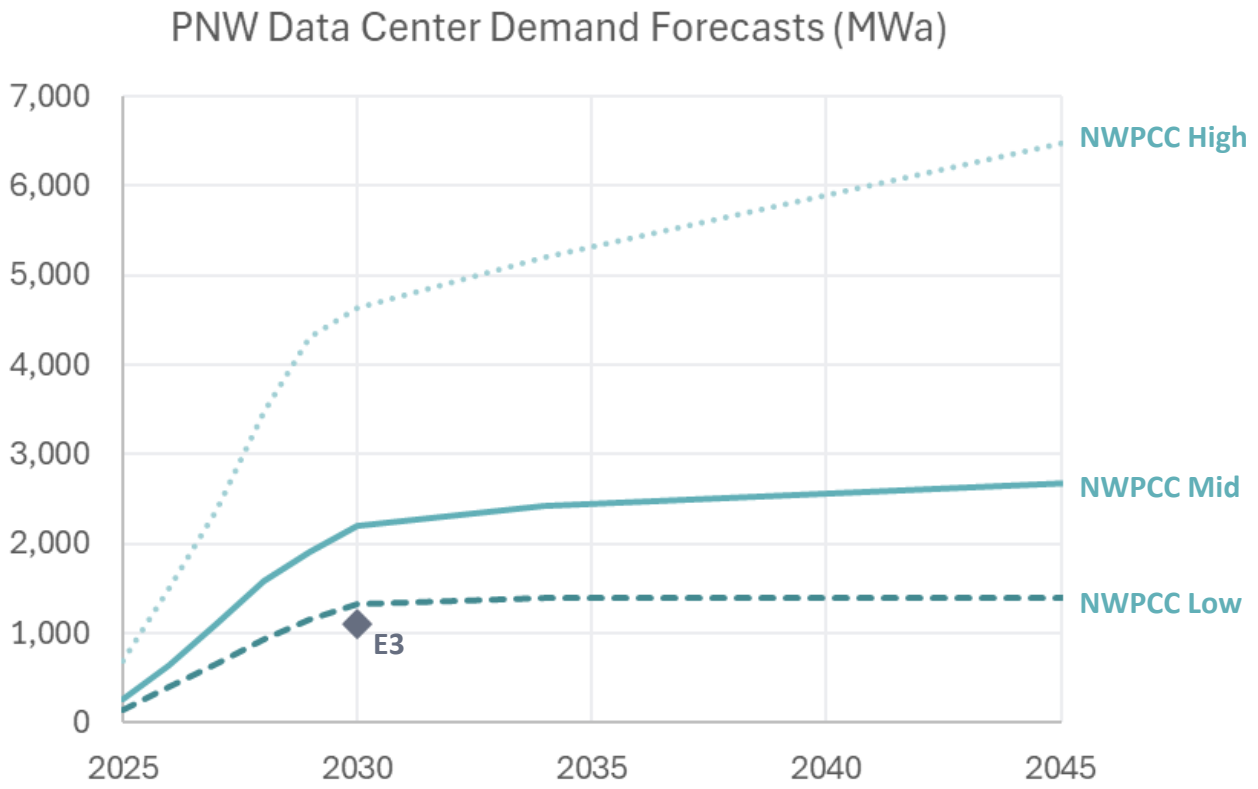
System Needs (MW)	2025	2026	2027	2028	2029	2030
Total Resource Need*	49,245	50,737	52,499	54,184	55,879	57,195
Existing Portfolio w/ Retirements	46,716	45,666	45,395	45,388	45,098	44,757
Firm Imports	3,750	3,750	3,750	3,750	3,750	3,750
Reliability Position Surplus (+) / Shortfall (-)	**+1,221**	**-1,321**	**-3,354**	**-5,046**	**-7,031**	**-8,689**
ELCC from "In-Development" Firm Resources	-	296	407	580	770	1,114
ELCC from "In-Development" Wind, Solar and Battery projects	-	645	1,015	1,316	1,508	1,934

** Total Resource Need includes peak load + planning reserve margin as well as obligation to serve the Columbia River Treaty Regime*

E3 projected a capacity shortfall of 9 GW by 2030 in their recent resource adequacy study of the Pacific Northwest

Data centers drive uncertainty in resource adequacy evaluations

- The Northwest Power and Conservation Council (NWPCC) plans for a wide range of potential data center deployments in the region
- The E3 data center forecast for 2030 falls just below the “Low” scenario developed by the NWPCC
- Despite relatively low data center demands, E3’s load forecast appears to have higher electrification assumptions than utility forecasts



NWPCC data approximated based on Tech load forecasts provided at:
https://www.nwcouncil.org/news/2025/05/02/pacific-northwest-load-forecast-2025/

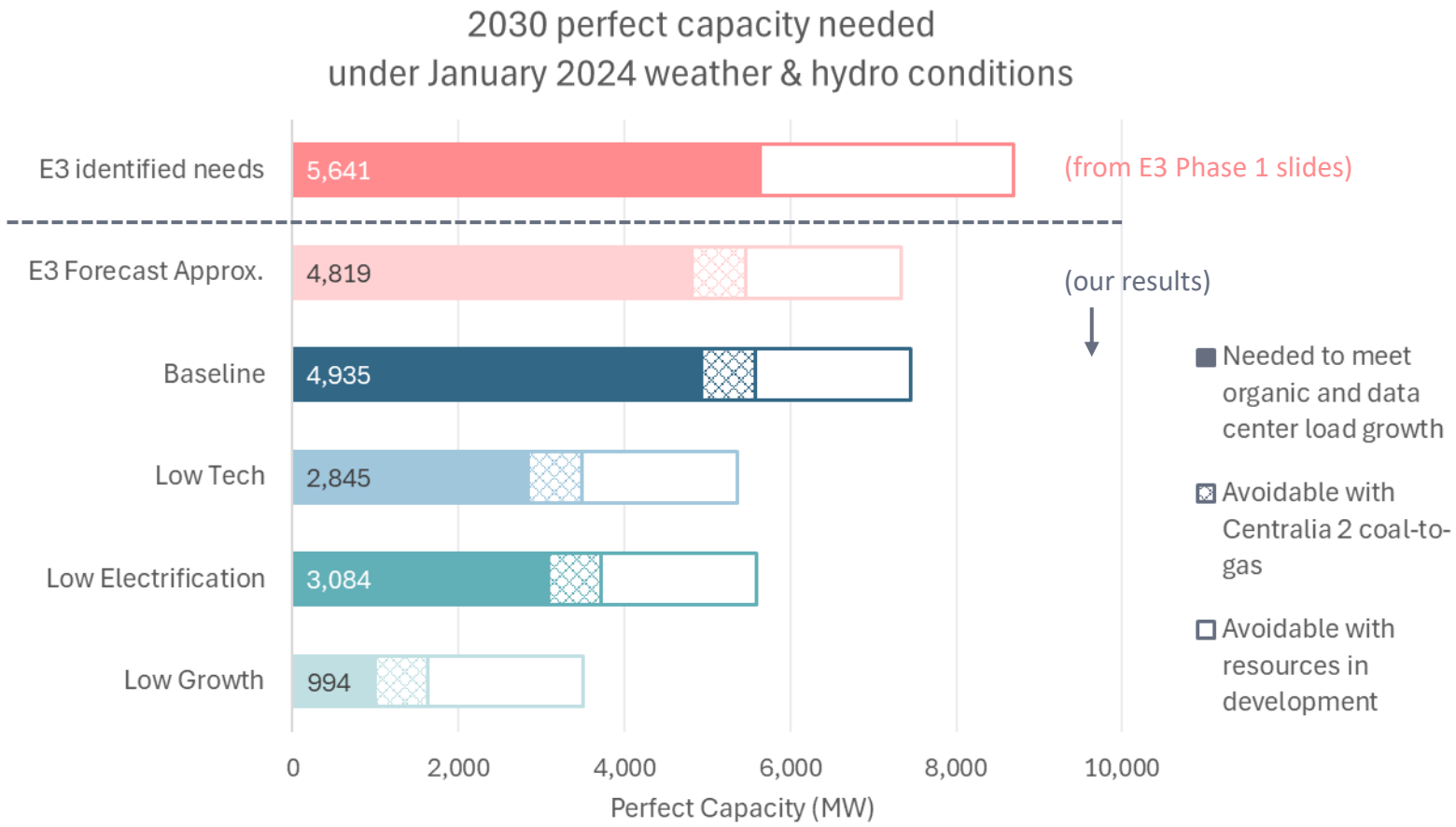
Testing January 2024 weather & hydro conditions under alternative load scenarios

We combined various organic growth and data center load scenarios to explore alternative load growth futures (ranging from 1.5% to 3.2% average annual growth through 2030)

Scenario	Organic Load Growth	Data Center Demand	Total annual average growth rate through 2030
E3 Forecast	High/E3 (~1.8%)	Low/E3 (1,700 MWa)	~2.8%
Baseline Scenario	Baseline (1.4%)	Baseline (3,700 MWa)	3.2%
Low Tech Scenario	Baseline (1.4%)	Low/E3 (1,700 MWa)	2.2%
Low Electrification Scenario	Low (0.9%)	Baseline (3,700 MWa)	2.6%
Low Growth Scenario	Low (0.9%)	Low/E3 (1,700 MWa)	1.5%
Historical growth in electricity sales (2019-2024, excluding 2020)			*1.3%*

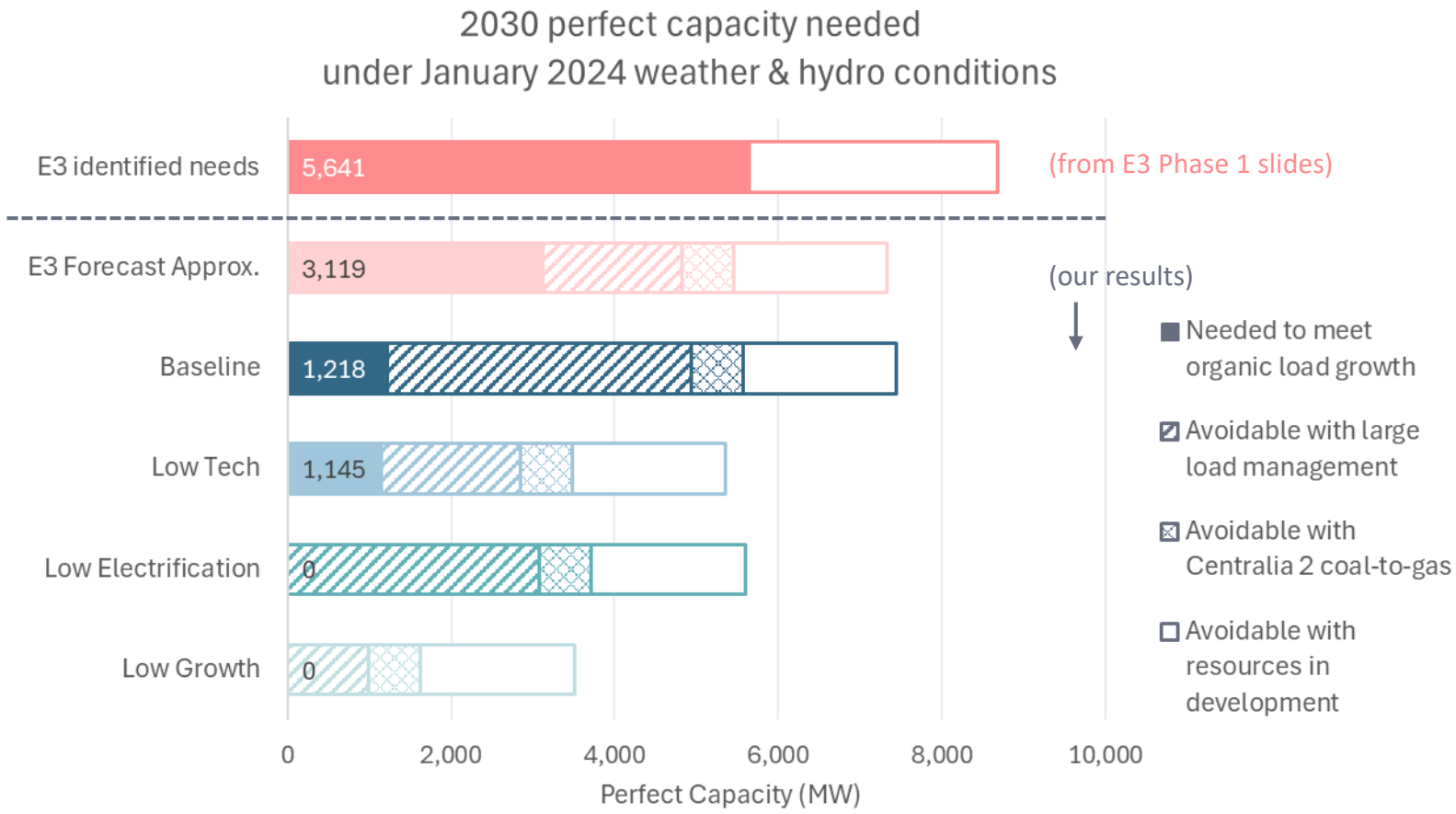
Testing January 2024 weather & hydro conditions under alternative load scenarios

- After accounting for resources already under construction or with regulatory approvals in place as of December 2024 according to EIA 860 (“in development”) and coal-to-gas conversion of Centralia 2, estimated remaining 2030 needs range from 1 GW to 5 GW of “perfect capacity” across load scenarios

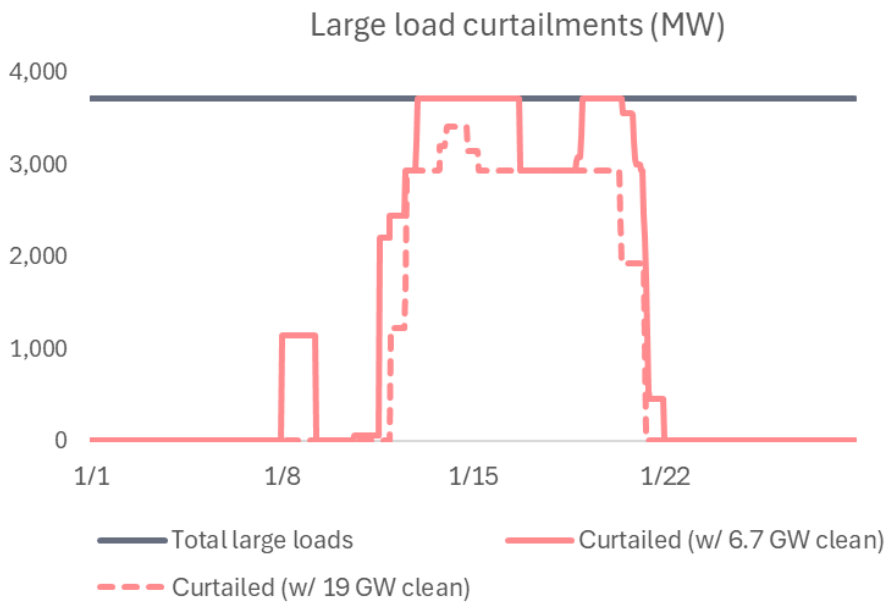


How much of the 2030 resource adequacy needs is driven by data centers?

- If allowing emergency curtailment of data centers, remaining needs are between 0 and ~3 GW across the load scenarios



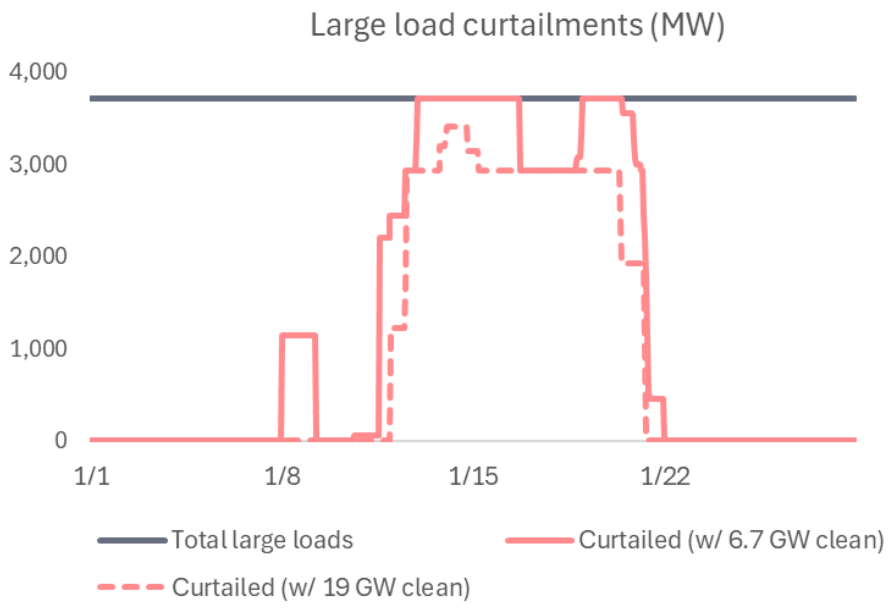
What might emergency curtailment look like during winter events?



Load scenario	Large load curtailments in 2030 under January 2024 weather & hydro conditions
Low Growth	0 hrs
Low Electrification	2.5 - 4.6 days
Low Tech	2.3 - 6.2 days
Baseline	7.0 - 9.3 days

Note: Clean resource additions range from the greater of the resources under development and the resources needed to meet organic load growth to all proposed clean resources as of December 2024 (19 GW)

What solutions are available for multiday winter events?



- Multiday shortages are very hard to solve with existing clean technologies
  - Building all proposed clean resources in the region barely makes a dent in the data center curtailment profile (see figure at left)
- Workload management (i.e., shifting computing to data centers in other regions when the PNW is constrained) could avoid the need for new infrastructure to solve this problem
- Alternative resource options (bulk system or self-generation) all face or pose challenges:
  - Backup diesel generation impacts local air quality (more info from DEQ: https://www.oregon.gov/deq/aq/aqPermits/Pages/Data-Center-Permit.aspx)
  - Natural gas plants can also face supply constraints during these events and cannot be permitted in Oregon if 25 MW or larger
  - Emerging clean technologies, such as enhanced geothermal and multiday storage are not yet commercially available and may be high cost when they are. Small modular nuclear faces similar challenges, plus Oregon's prohibition on new nuclear power plants

What is going on around the country to address these challenges?

Multiple states are working on variations of **Bring Your Own (New) Generation (BYOG/BYONG), Connect and Manage, and Non-Firm Interconnection** options to facilitate more rapid interconnection of large loads without eroding resource adequacy

- **Texas Senate Bill 6** gives ERCOT the authority to curtail large load customers (75+ MW) or deploy their onsite backup generation during firm load shed emergencies
- **PJM is developing a Connect and Manage framework** for large loads that would use voluntary acceptance of curtailment risk or **BYONG** to facilitate more rapid interconnection
- **US DOE issued an emergency order on May 18, 2026** allowing PJM to curtail data center customers due to high temperature conditions coupled with planned generator outages
- **BYOG deals in Minnesota, Nevada, and Washington** are also driving potential investment in emerging technologies (multiday storage, enhanced geothermal, and SMR, respectively)

Cape Lookout State Park, Oregon Coast (source: www.oregonlive.com)

Thank you!

For more information, contact:

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