

Pacific Northwest Energy

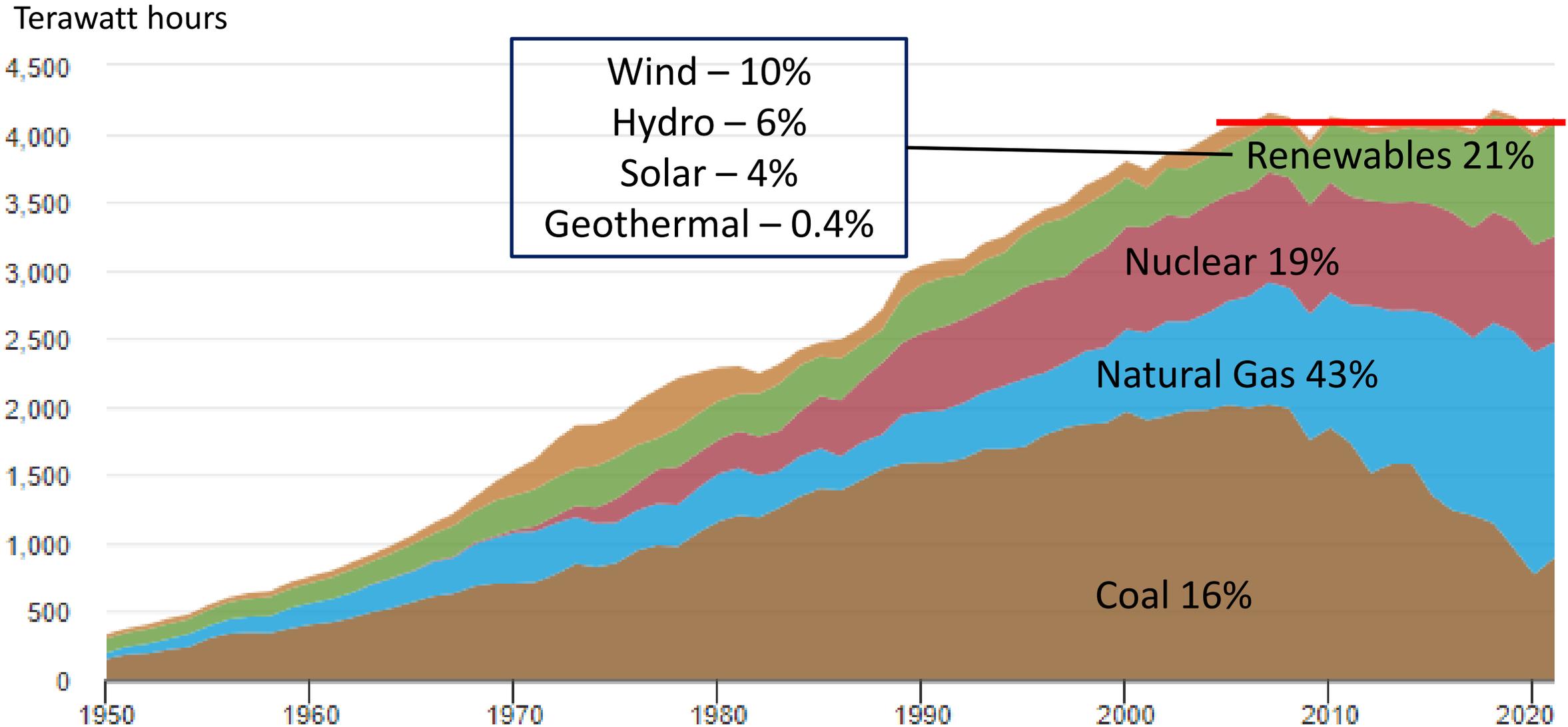
**Ensuring Reliable Affordable and Clean
Energy for Our Future**

**Whitman County Planning Commission
June 4, 2025**



**Bob Morris
Lance Energy Chair**

U.S. Electrical Energy Sources are Evolving

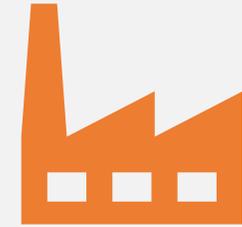
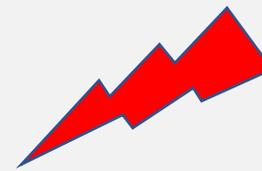
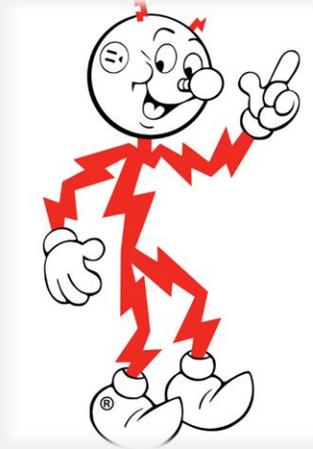
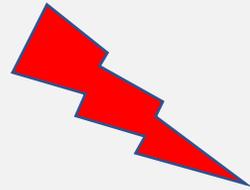


U.S. Energy Information Administration, [Electric Power Monthly](#), February 2024; preliminary data

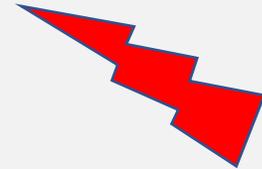
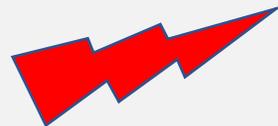
US Electricity Demand to Increase 15% by 2034*



Data Centers



Manufacturing



Heating



Transportation

Clean Energy Laws Drive High Electricity Use

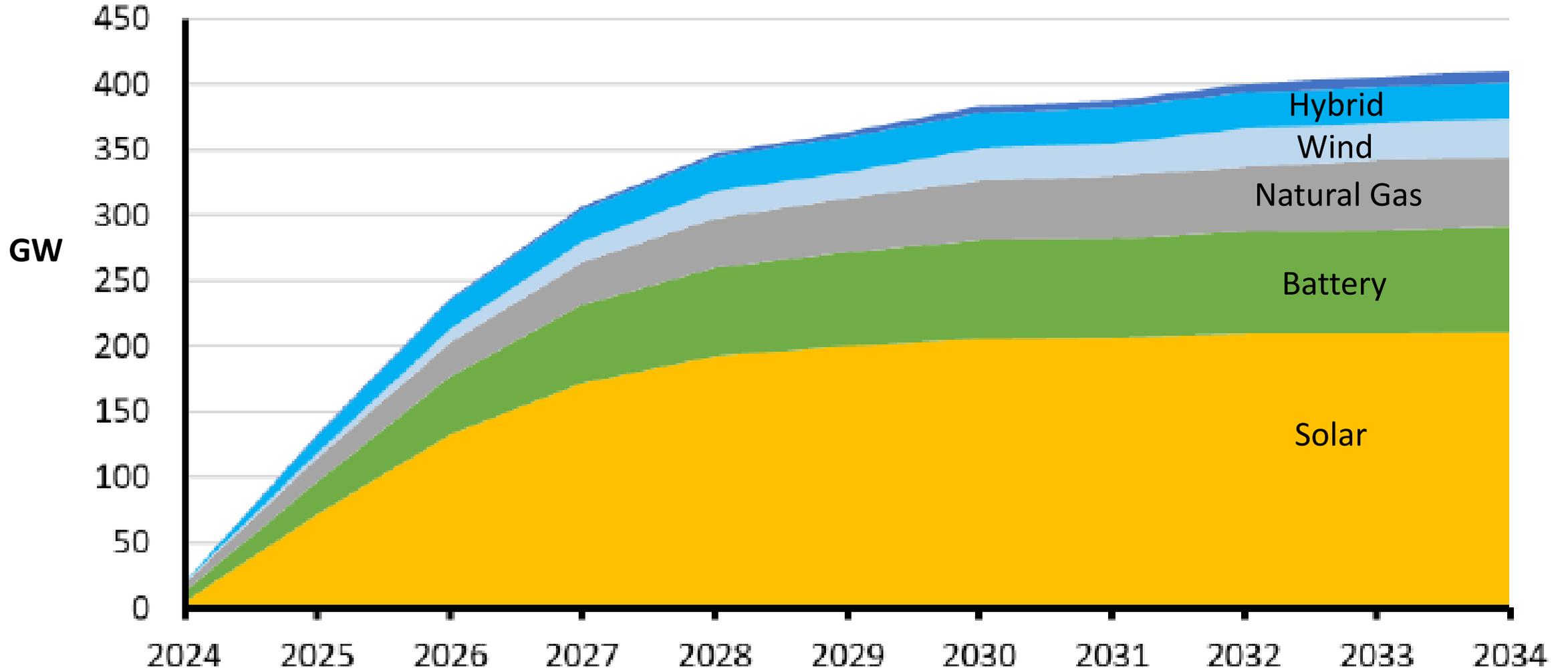
OR, WA Legislatures Mandate Carbon Free by 2045, 2050

Electricity Energy Consumption	(TWh)
Present	123
Electric Vehicles:	+38
Space Heating:	+16
Other:	+12
Total	189 (+50%)

Peak Load	(GW)
Present	33
EV	14
Space Heating	19
Total	66 (+100%)

Power Producers Planning for 30% New Resources

US Installed Capacity 1,200 GW



Electrical Energy Sources are Changing

Fossil Fuel, Nuclear



Wind, Solar



Dispatchable

High Inertia

Small Land Area

Existing Transmission Lines

Intermittent

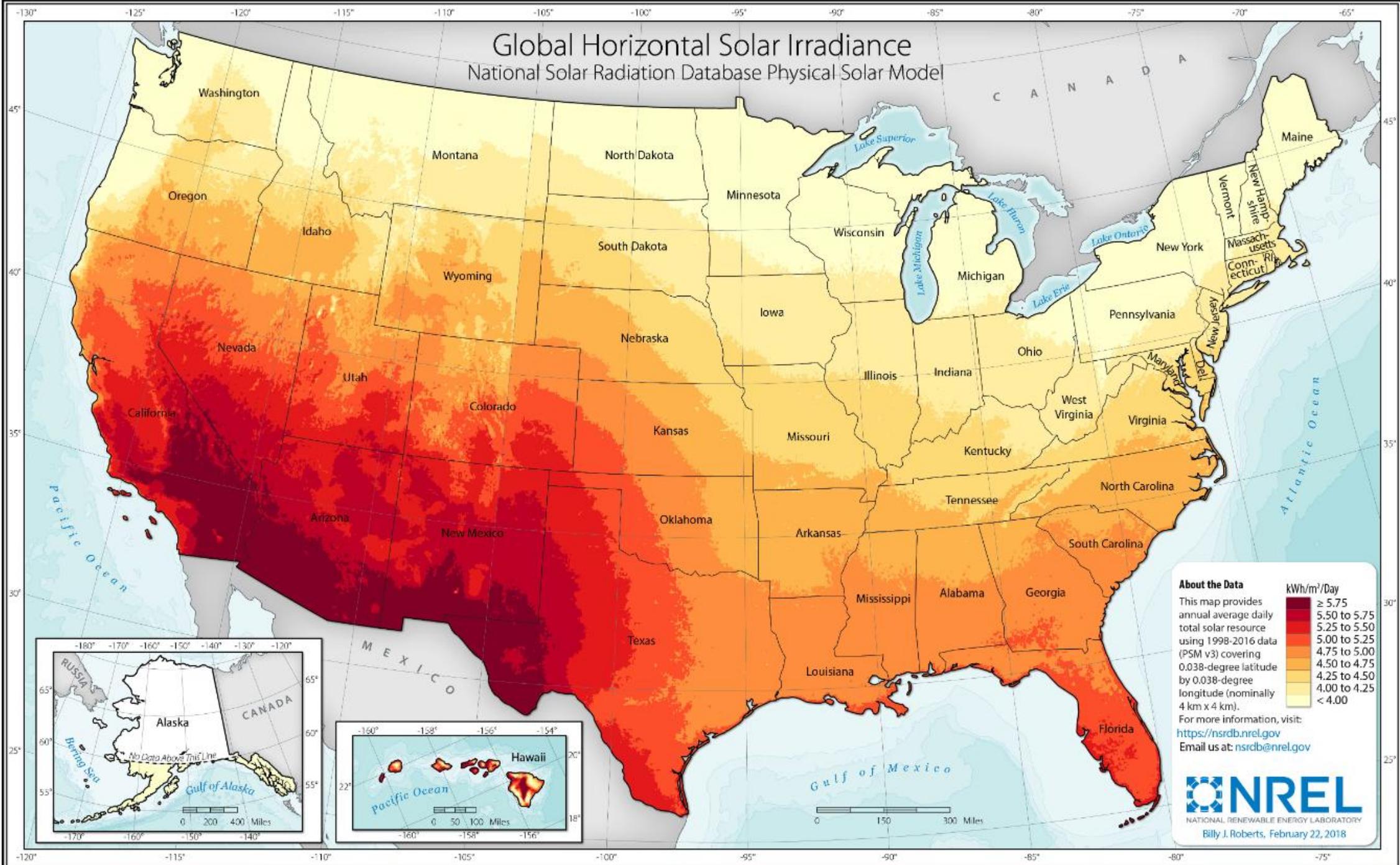
Low Inertia

Large Land Area

New Transmission Lines

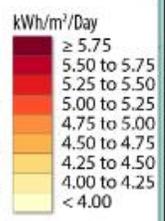
Global Horizontal Solar Irradiance

National Solar Radiation Database Physical Solar Model



About the Data

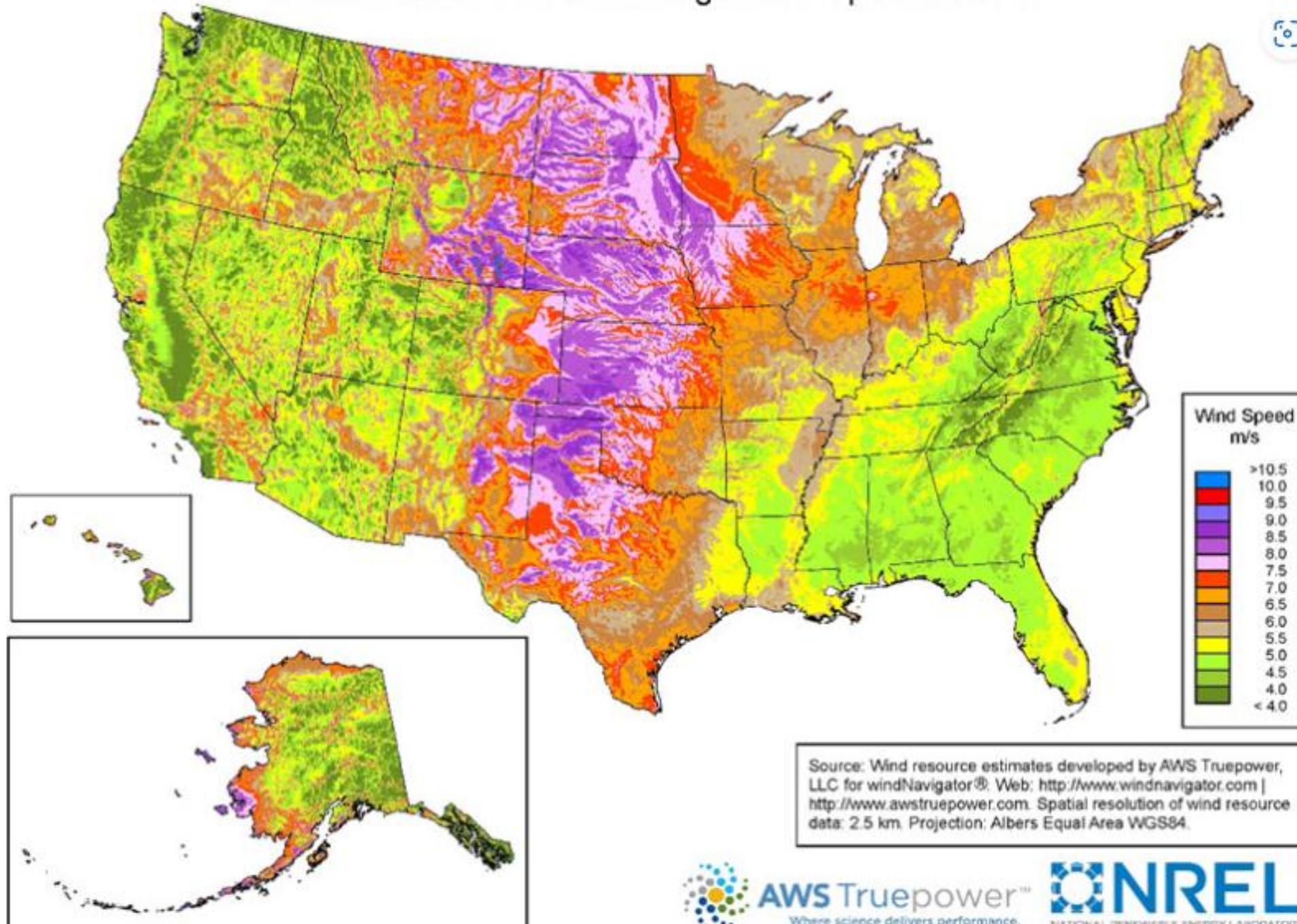
This map provides annual average daily total solar resource using 1998-2016 data (PSM v3) covering 0.038-degree latitude by 0.038-degree longitude (nominally 4 km x 4 km).



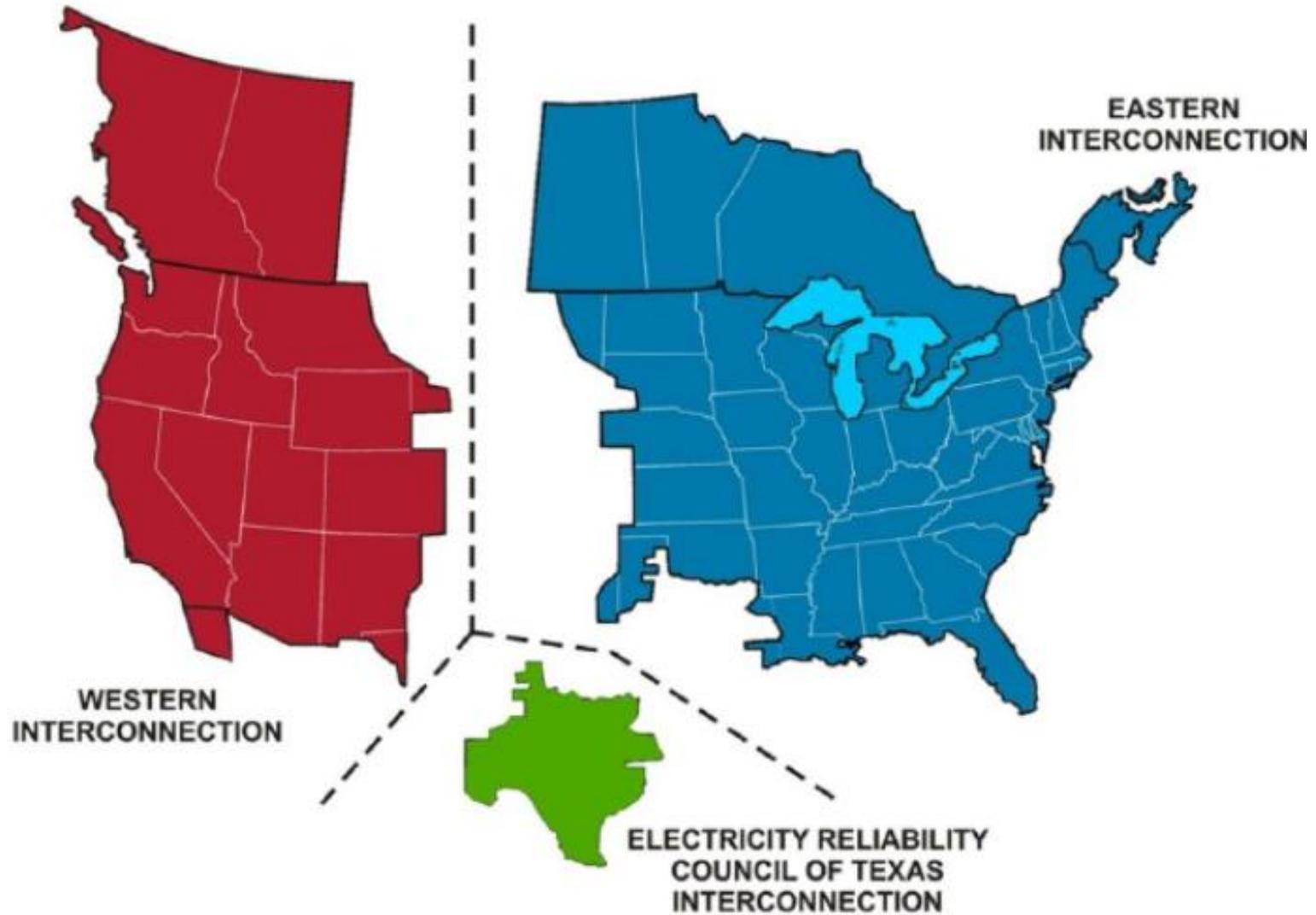
For more information, visit:
<https://nswrdb.nrel.gov>
Email us at nswrdb@nrel.gov



United States - Annual Average Wind Speed at 80 m



North American “Grid” is Three Networks





High Inertia Machines Stabilize the Grid

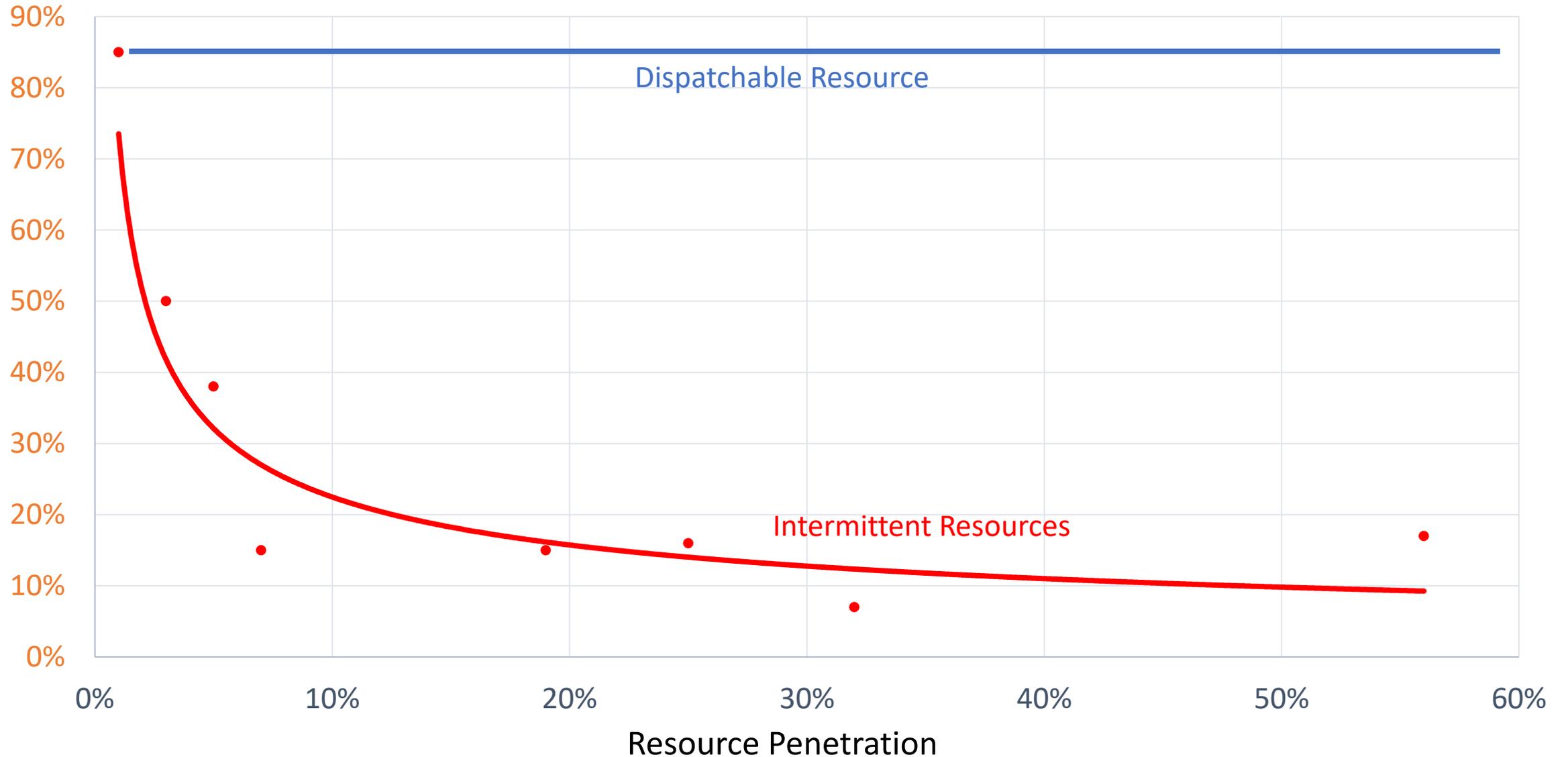
Hydro
Natural Gas
Nuclear
Coal

Provide Essential Reliability Services

- ✓ Voltage
- ✓ Frequency
- ✓ Ramping

Increasing Intermittent Resources Decreases Capability

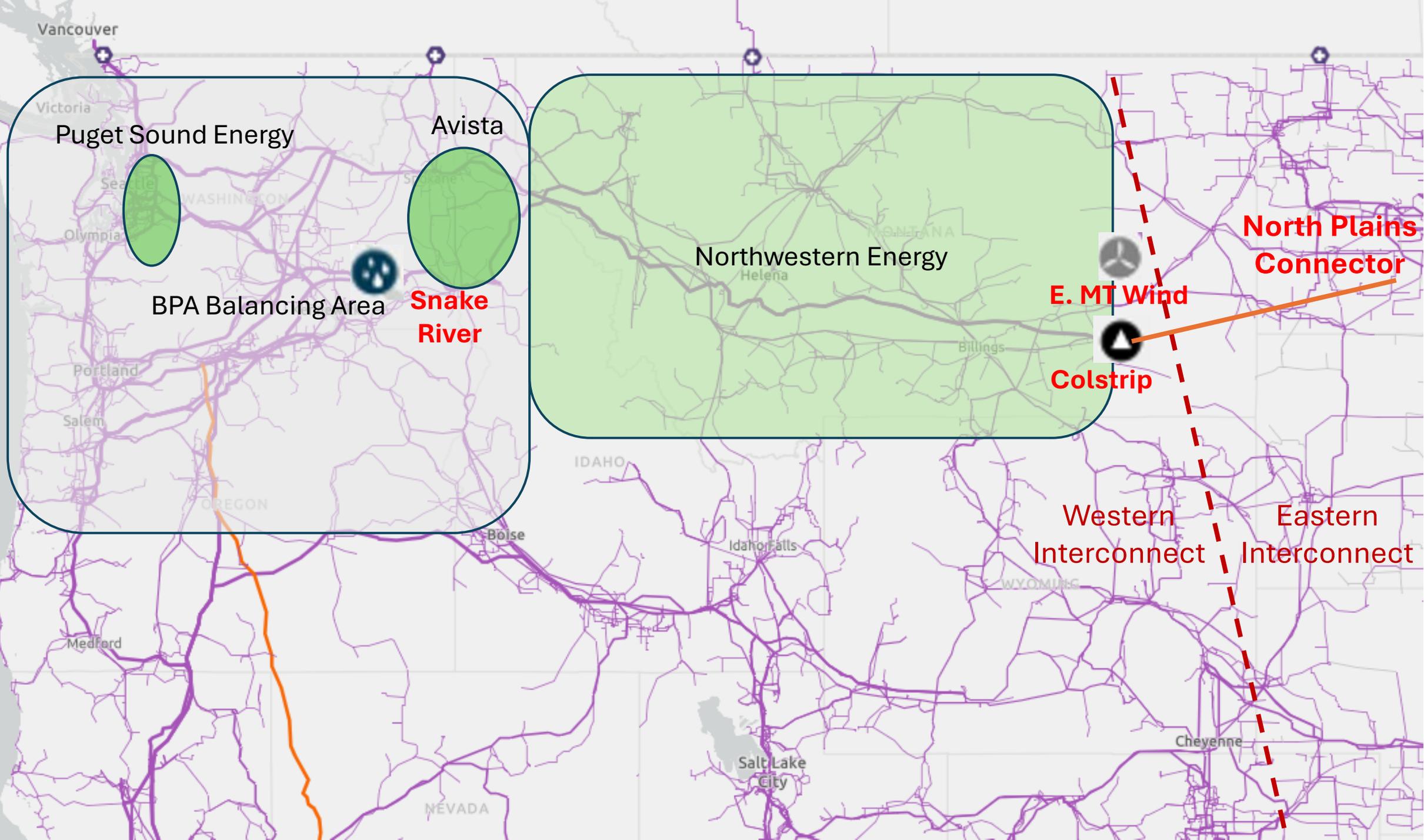
Effective Load Carrying Capability



“Firm Up” Intermittent Sources to Produce Reliable Energy



- Storage
- Interconnect over wide geographies
- Standby combustion generators



Puget Sound Energy

Avista

Northwestern Energy

BPA Balancing Area

Snake River

North Plains Connector

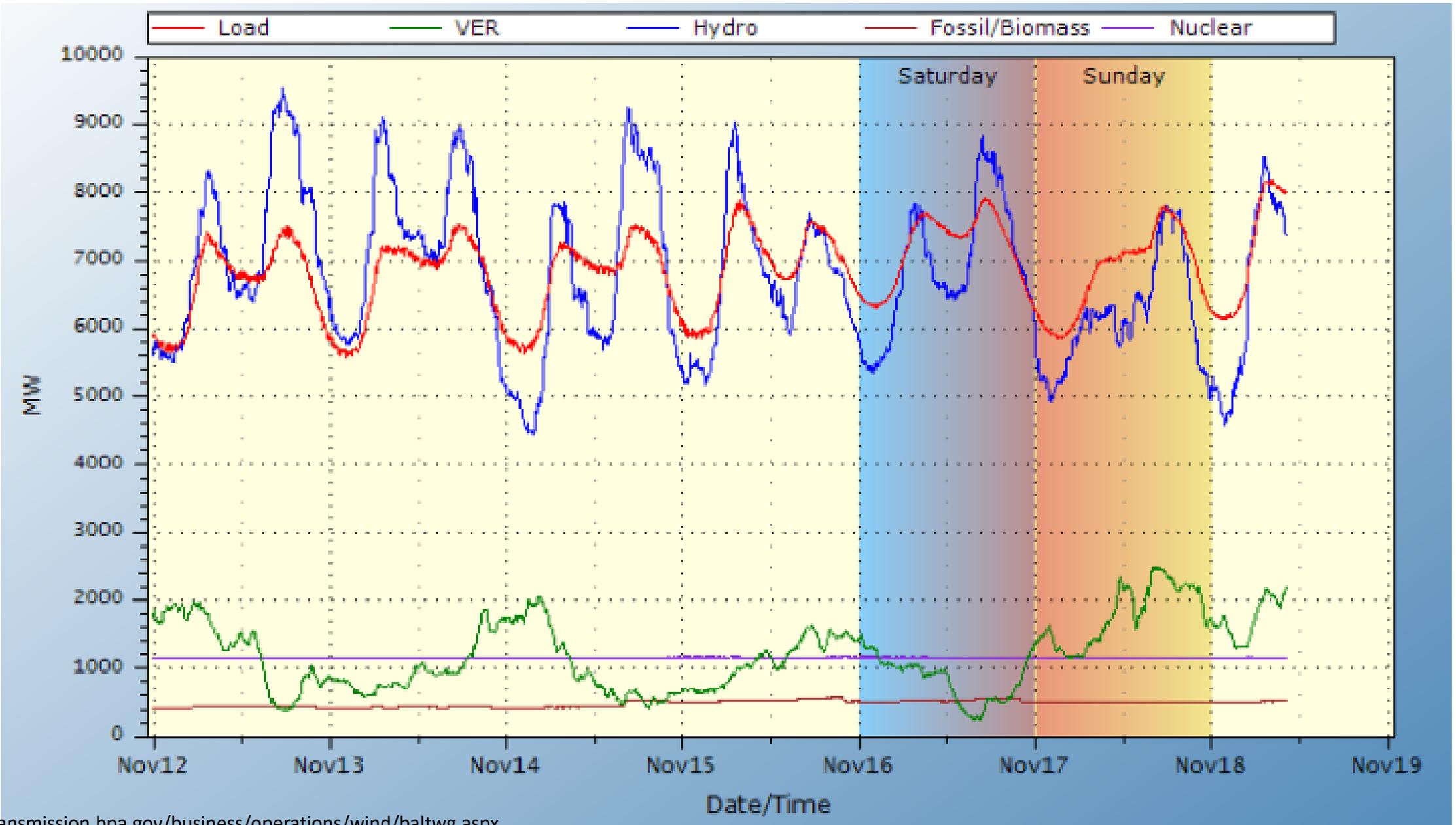
E. MT Wind

Colstrip

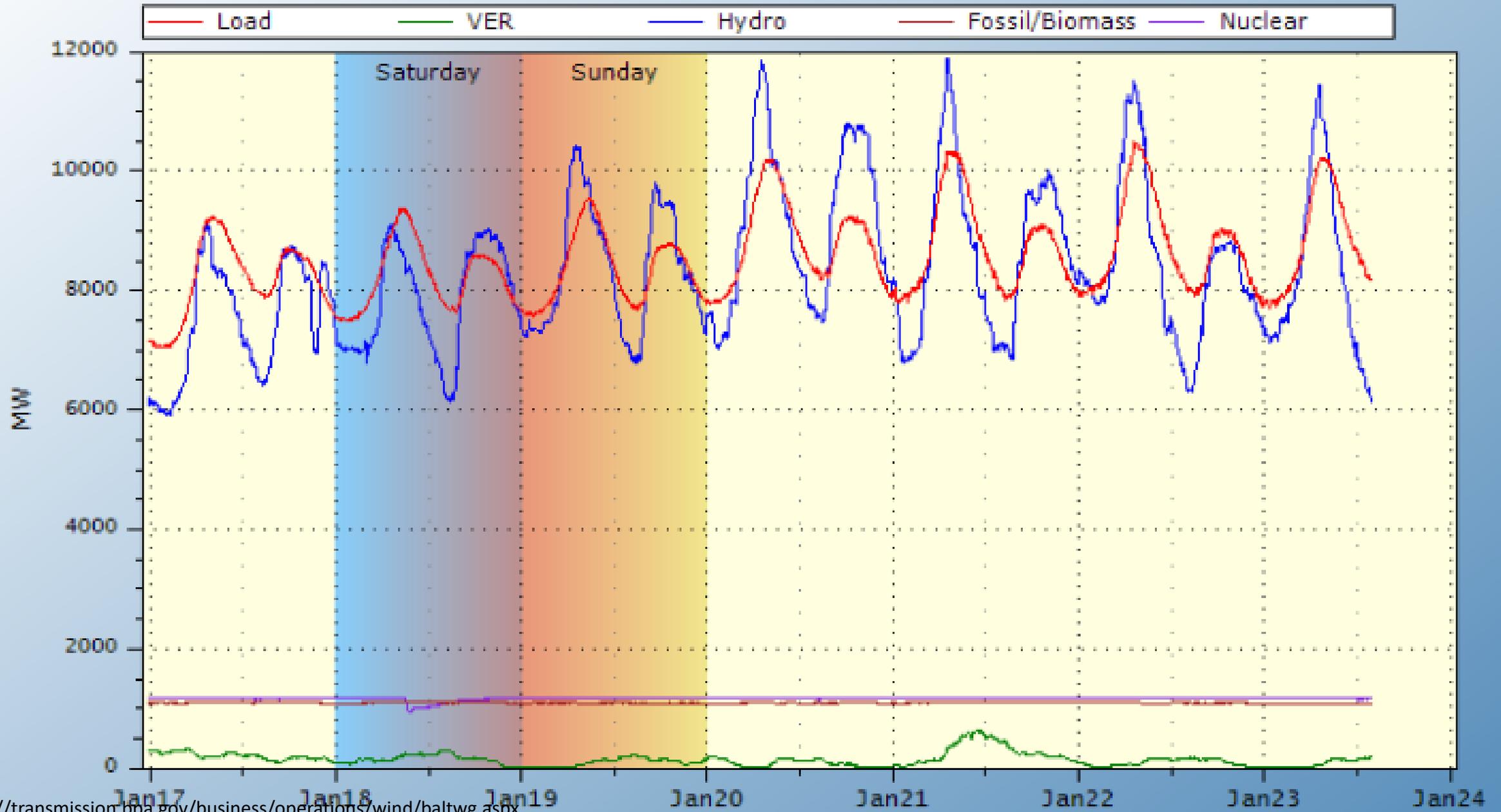
Western Interconnect

Eastern Interconnect

BPA Balances Load and Generation in WA, OR, ID

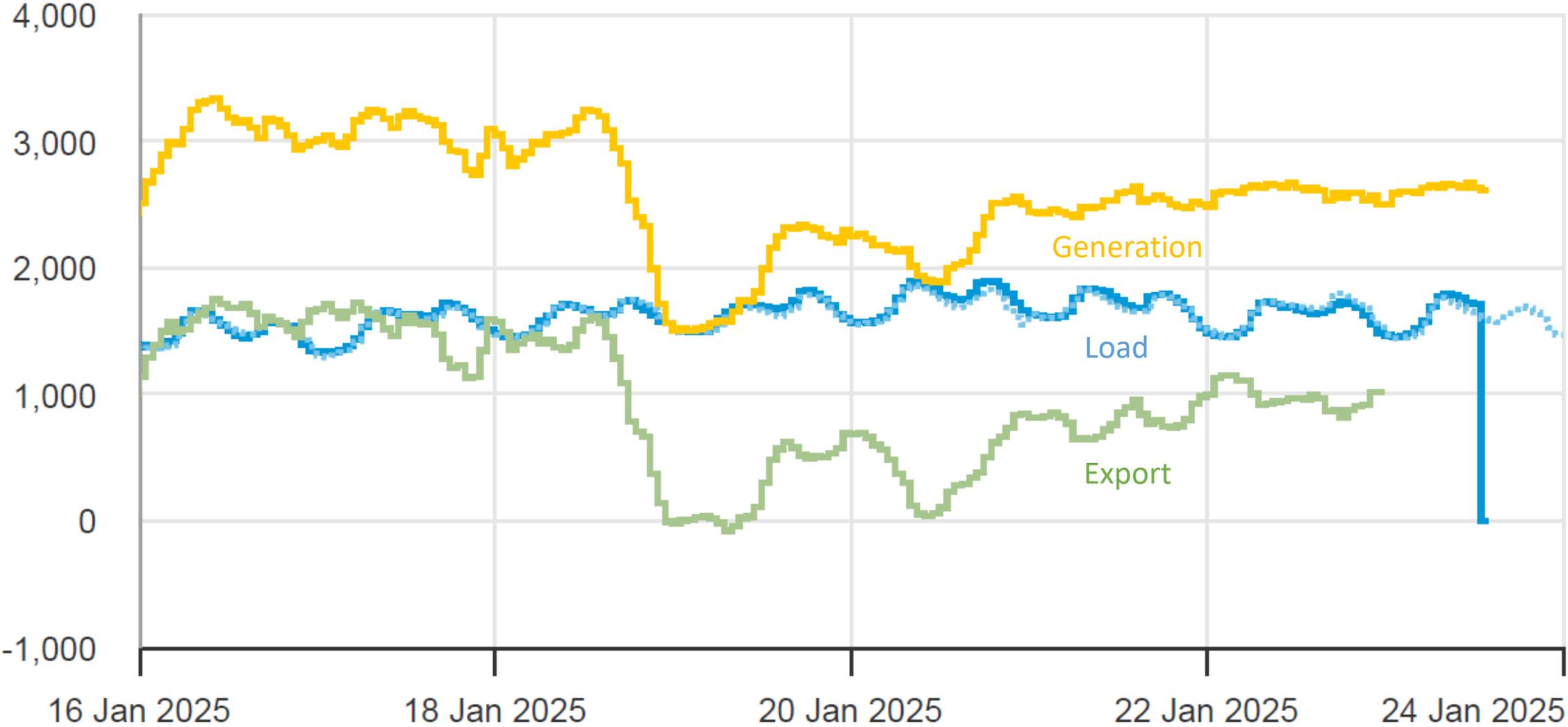


Hydro Generation Dominates the Pacific Northwest



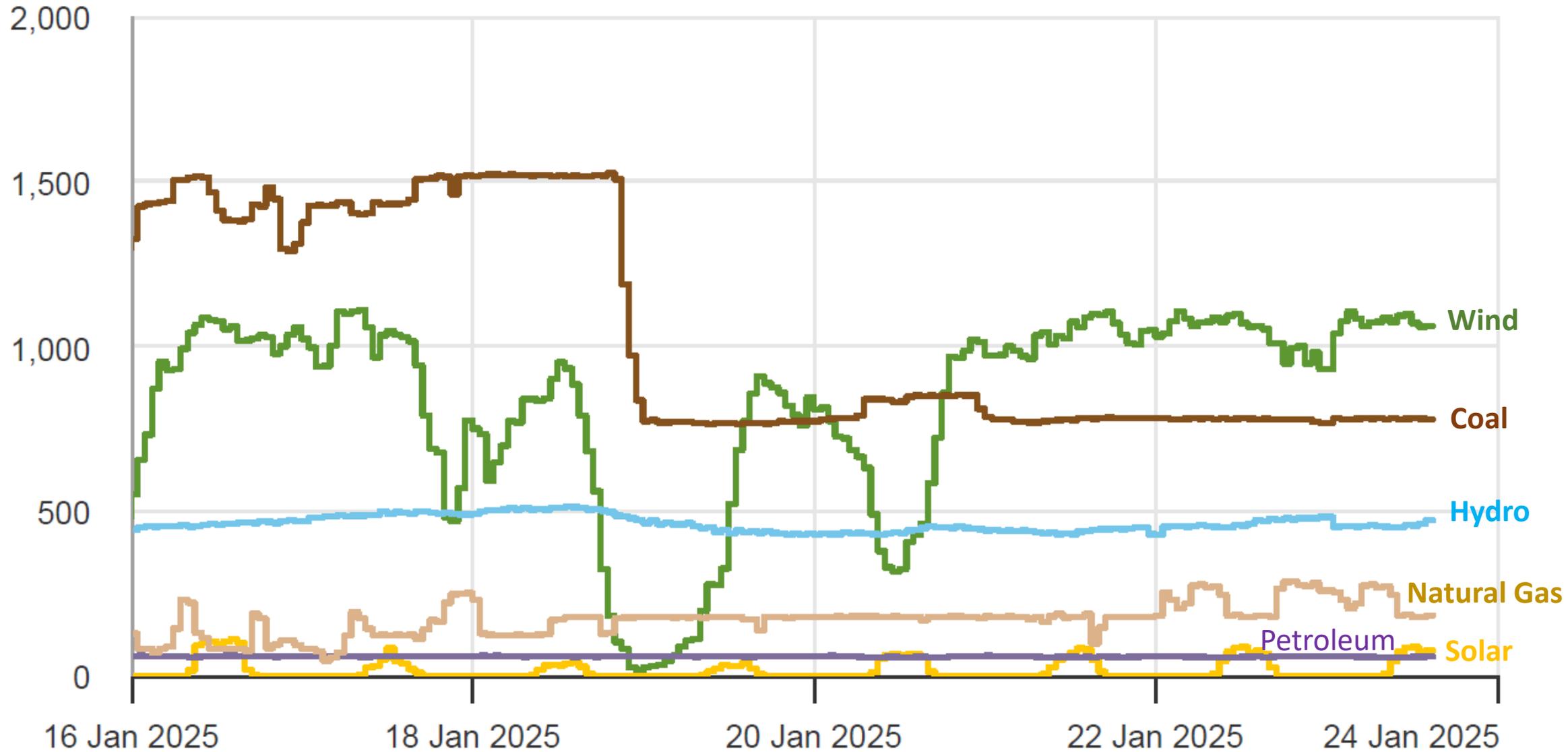
Montana Exports Half of its Energy

megawatthours

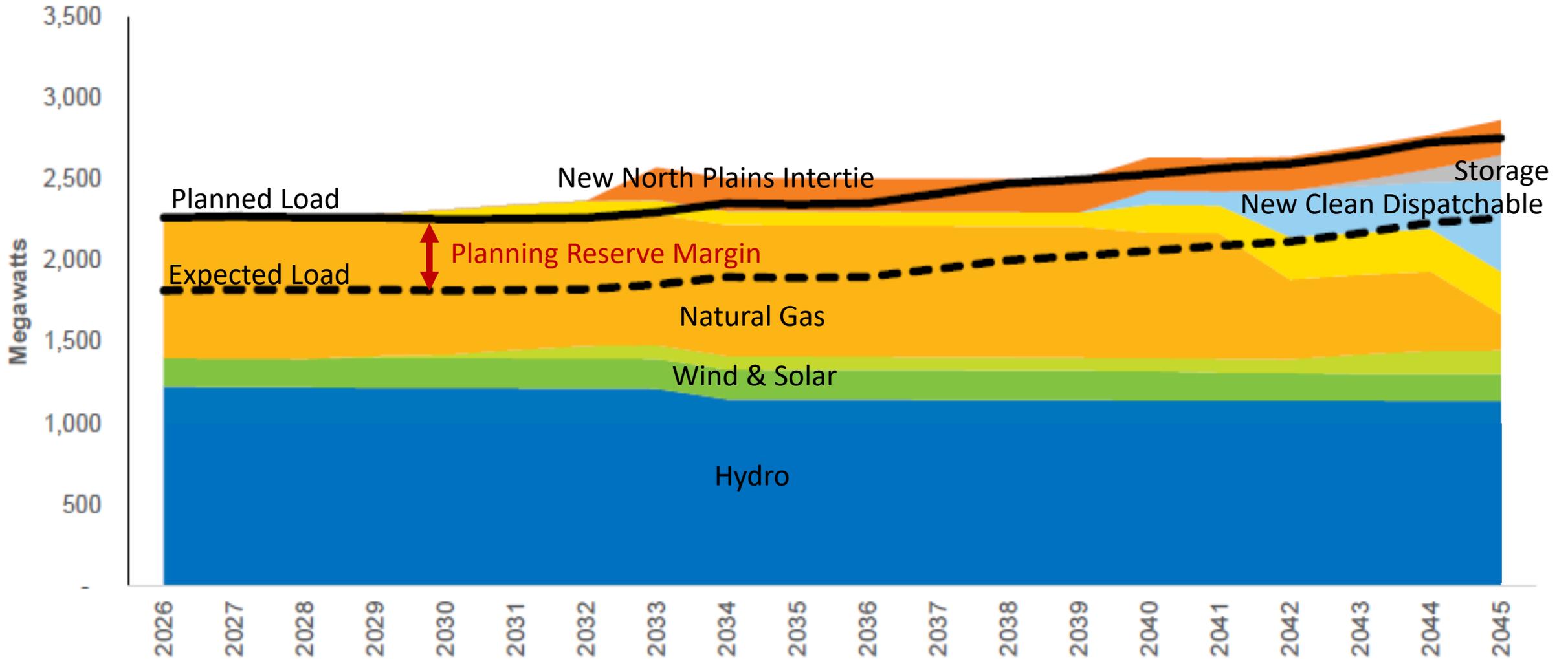


Coal and Wind Dominate Montana Generation

megawatthours



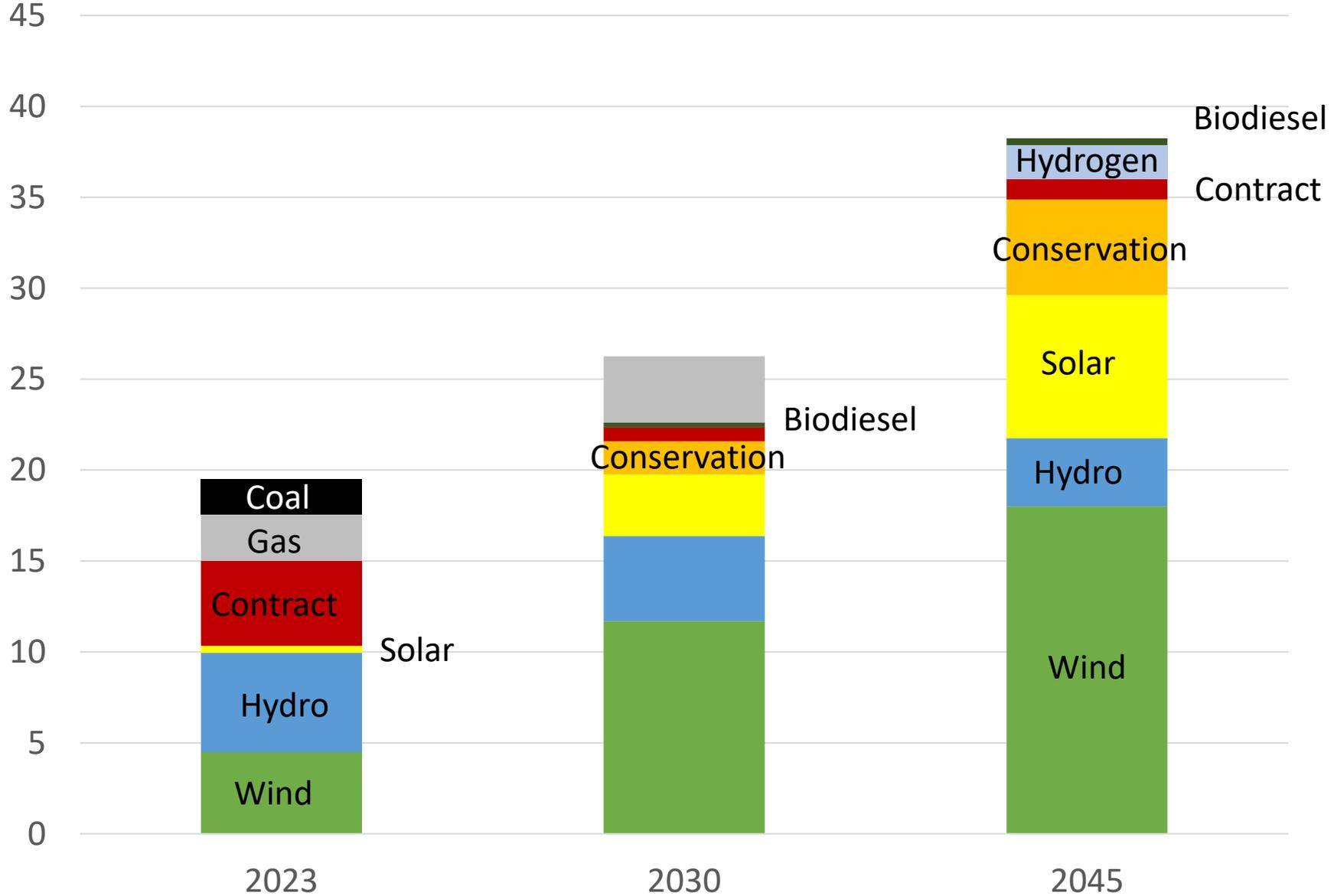
Avista Plans to Import from Eastern Power Grid



Puget Sound Energy Plans to Import Solar and Wind

WA Clean Energy Transformation Act – 0% Carbon by 2045

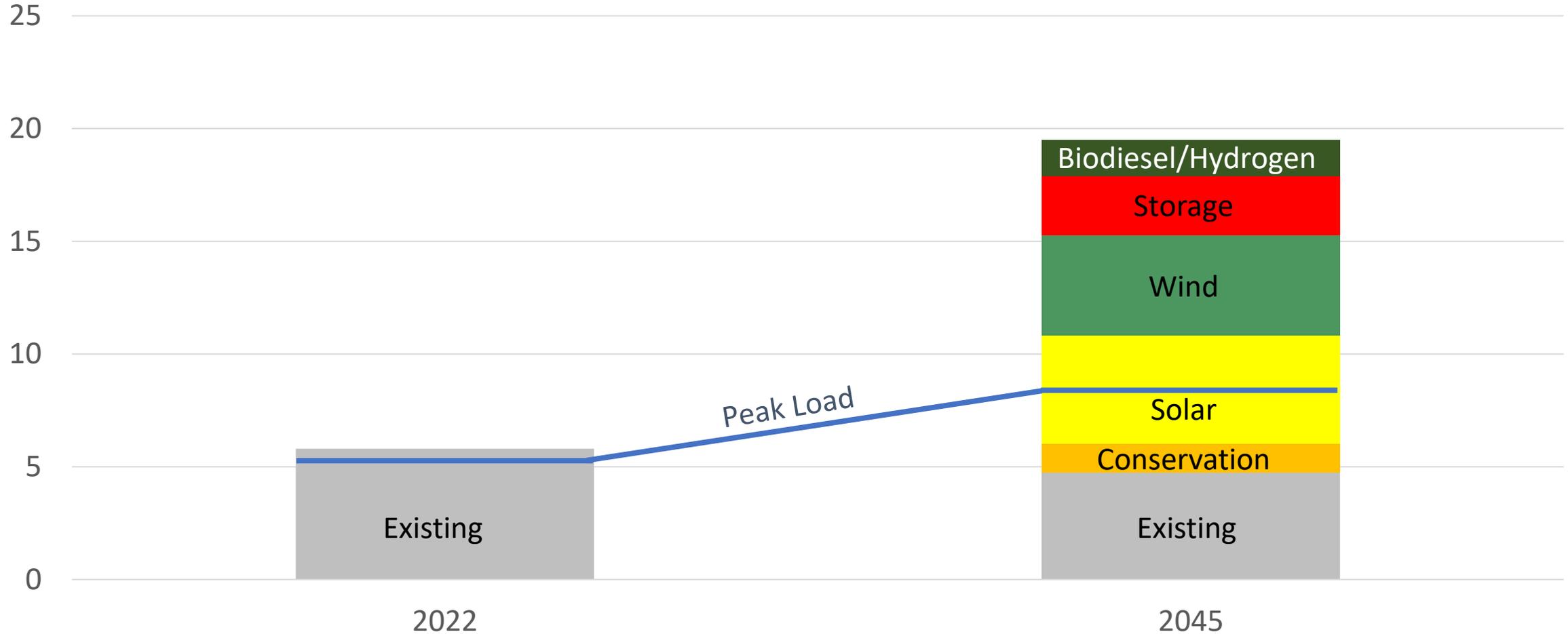
Terawatt Hours



Reliability with Intermittent Sources Requires Extra Capacity

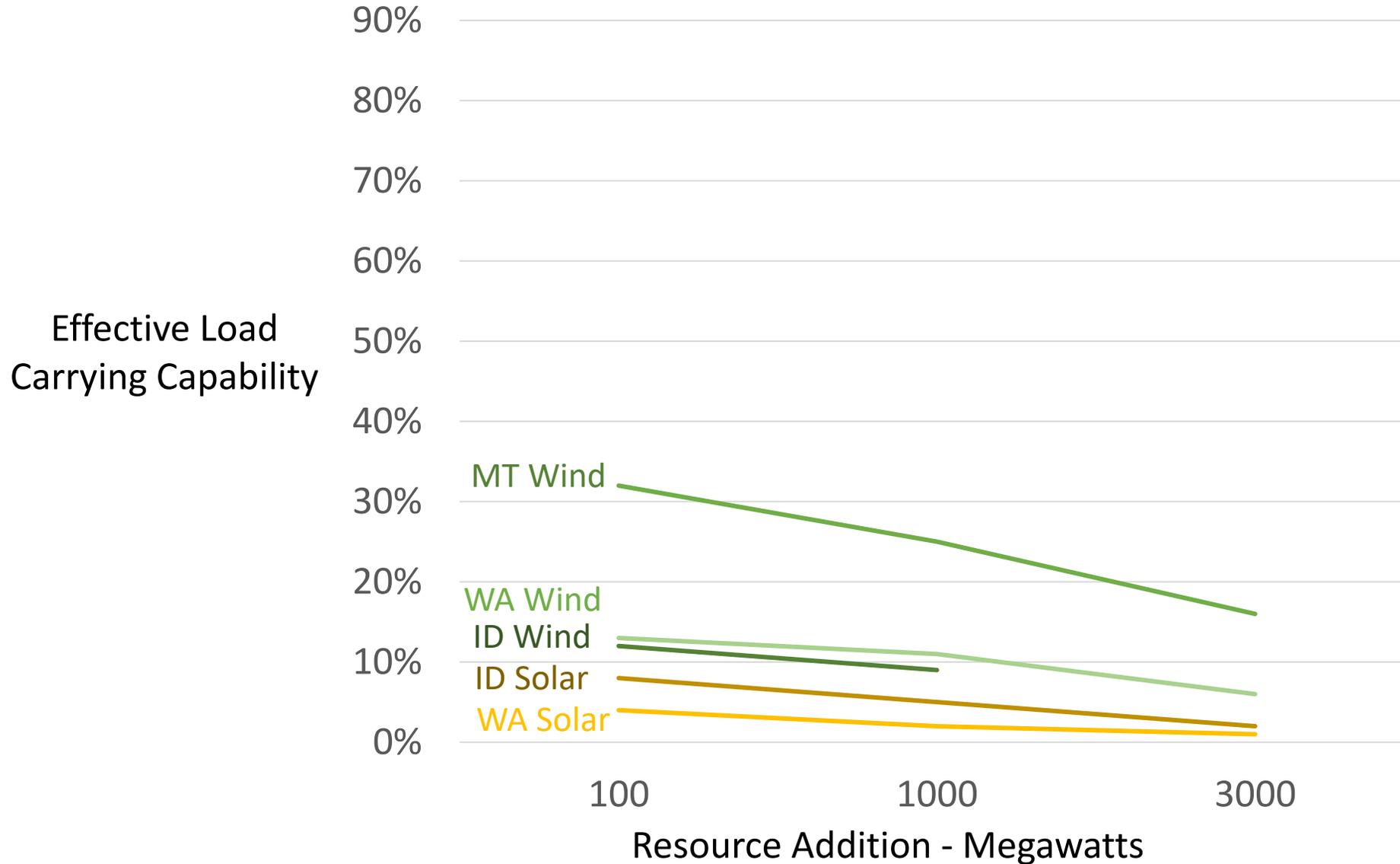
PSE Plan: 3X New Resources for 1.5X New Load

Peak Capacity
Gigawatts



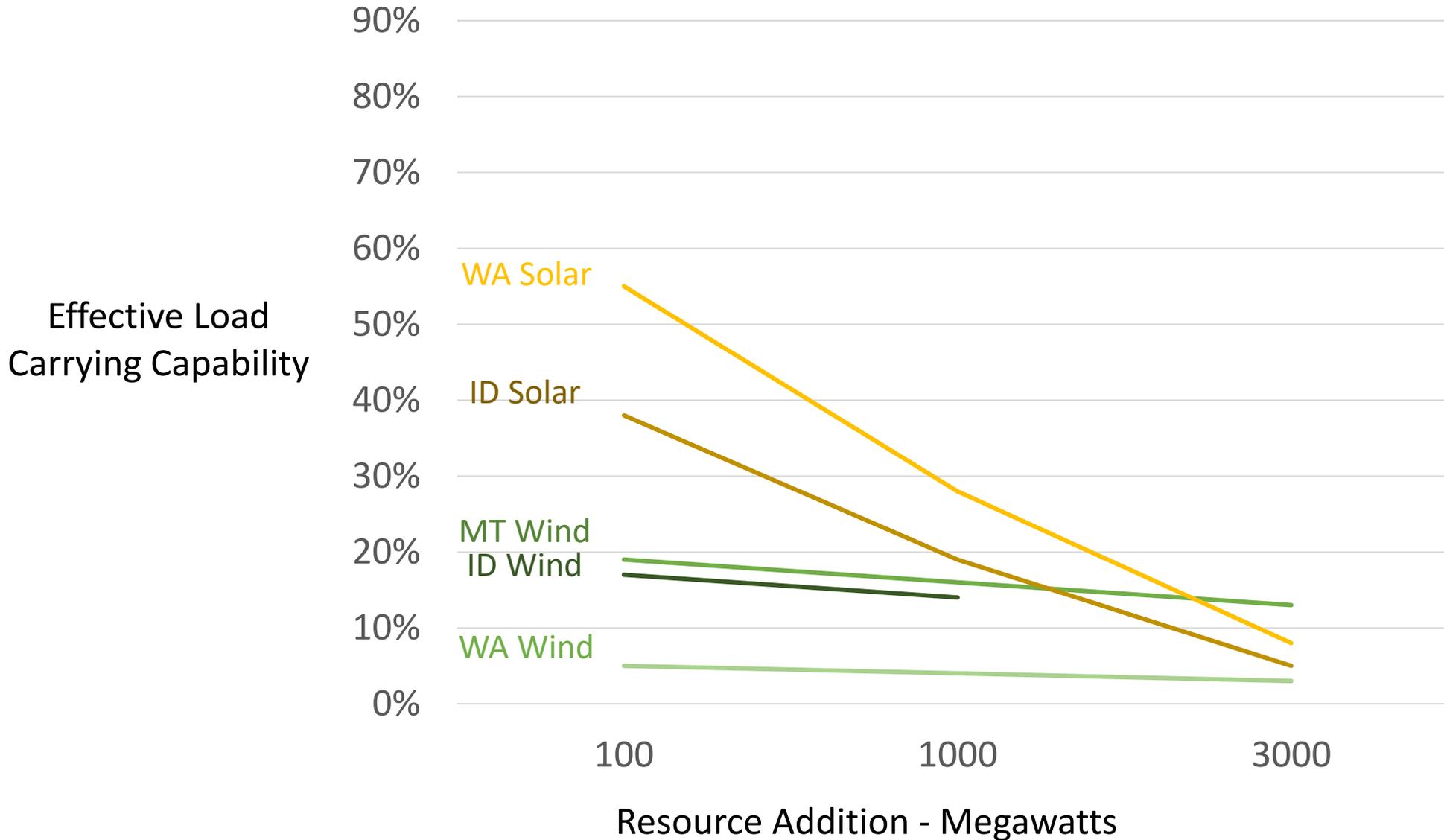
PSE Effective Load Carrying Capability Varies by Source

Winter Season

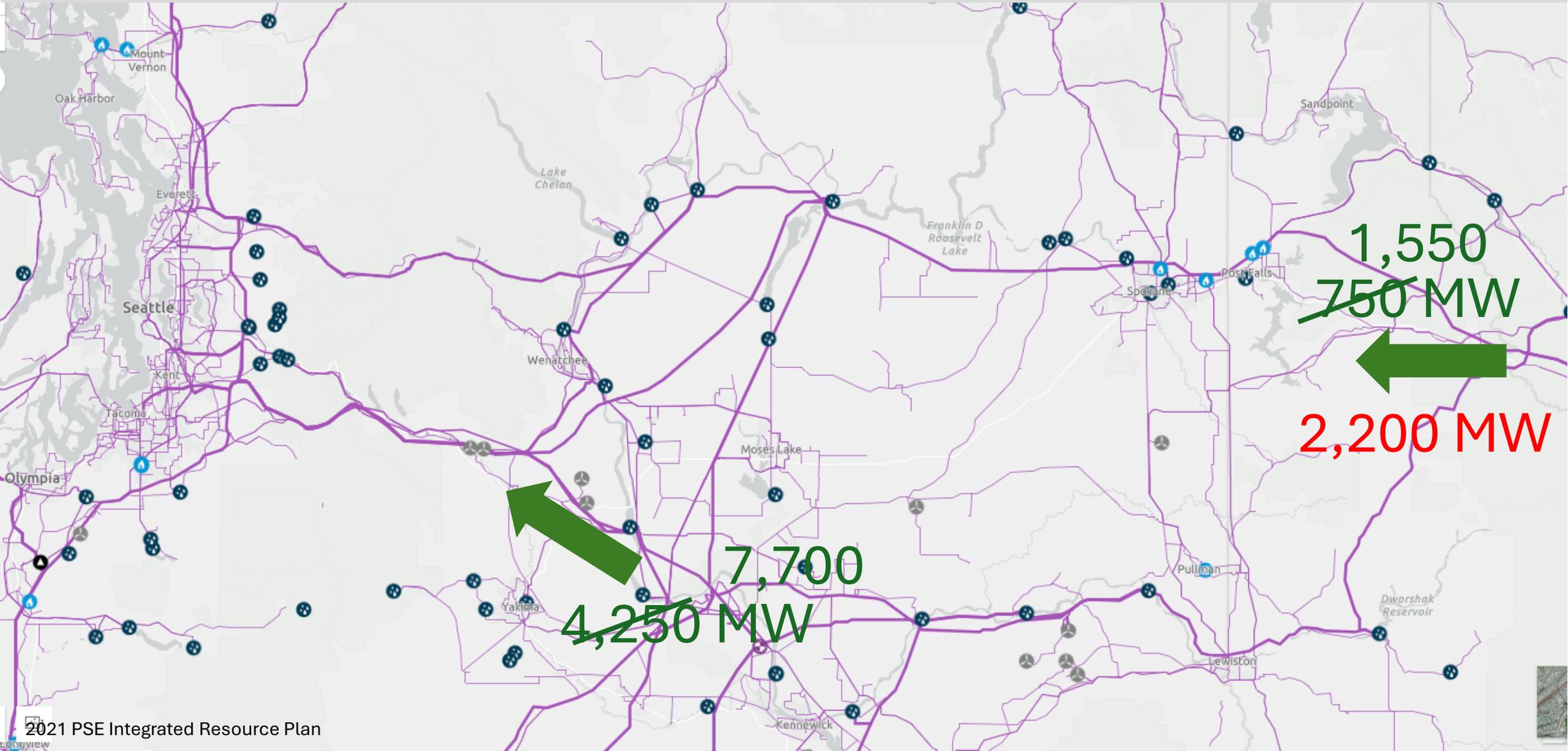


PSE Effective Load Carrying Capability Varies by Source

Summer Season



PSE: 85% More Transmission Capacity by 2033



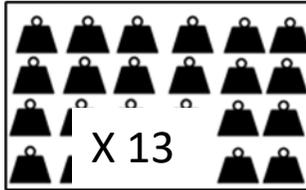
All Energy Sources Impact the Environment

Resources for 900 Average MW



Hydro

8,000,000¹



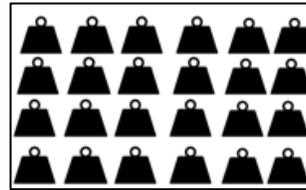
34,000

100



Wind

600,000²



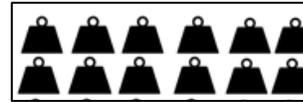
115,000

20



Solar

300,000²



31,000

20



Gas

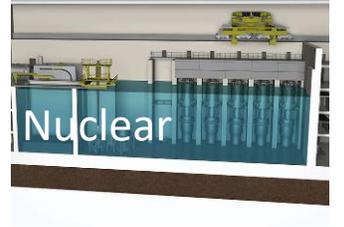
1500²



20



60



Nuclear

700²



10



80



Materials
(Tons)

Land Area
(Acres)

Useful Life
(Years)

1. Freeingenergy.com, US average kg/MW 2. Manufacturer's specifications

There is No Renewable Energy

Burying 100 Blades in Wyoming



1,700 blades for
Snake River
Wind Solution

What Will it Cost to Go Carbon Free?

OR, WA Legislatures Mandate Carbon Free by 2045, 2050

Generation Capacity – GW

Cost

Scenario	Hydro	Thermal	Nuclear	Wind	Solar	Storage	Total	Capital	\$/kWh
Present	30	9	1	7	1	0.4	49		\$0.11
Renewables Only	30	0	0	66	147	153	398	\$549B	\$0.28
Nuclear & Natural Gas	30	24	9	7	1	2.4	75	\$85B	\$0.13

Renewables Land Area - miles²

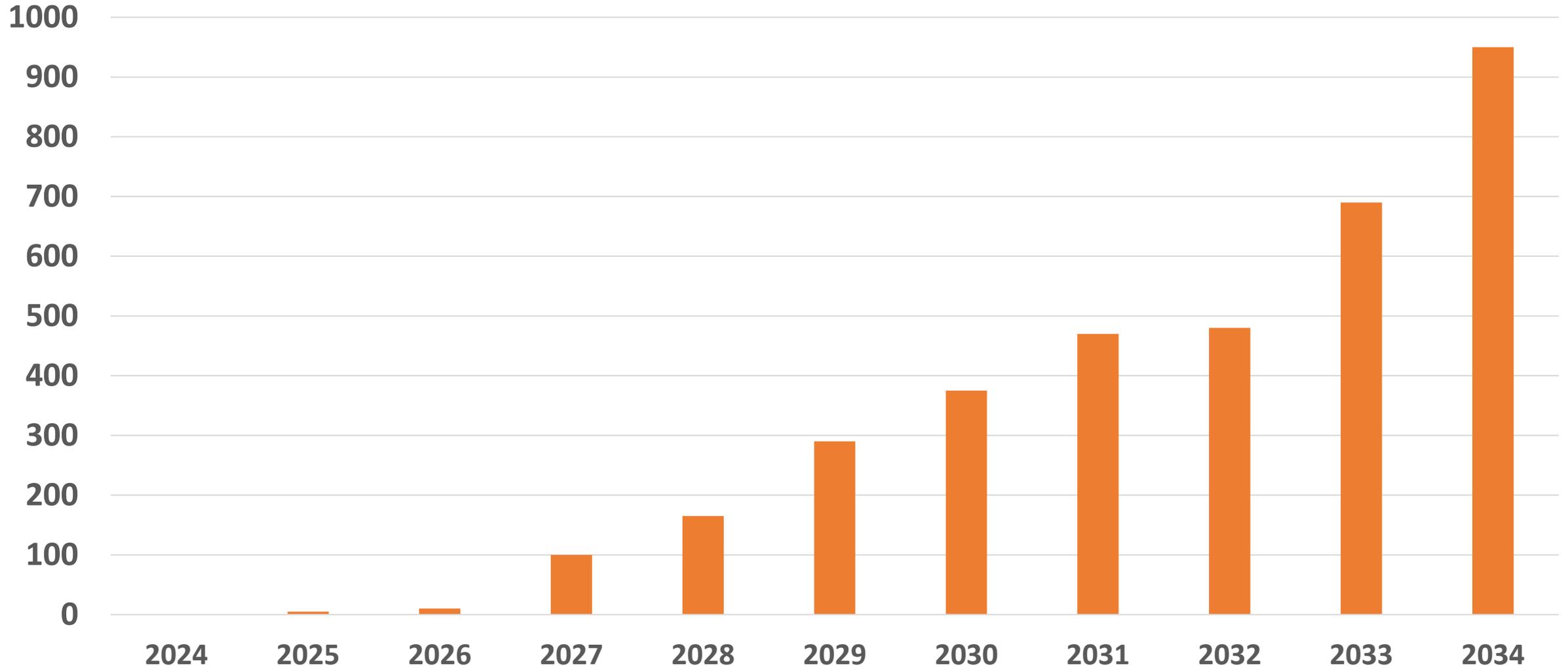
Wind 25,000

Solar 9,500

Developers Completed only Half of Planned Projects in 2023

WECC Forecasts Outages*

At-Risk Hours

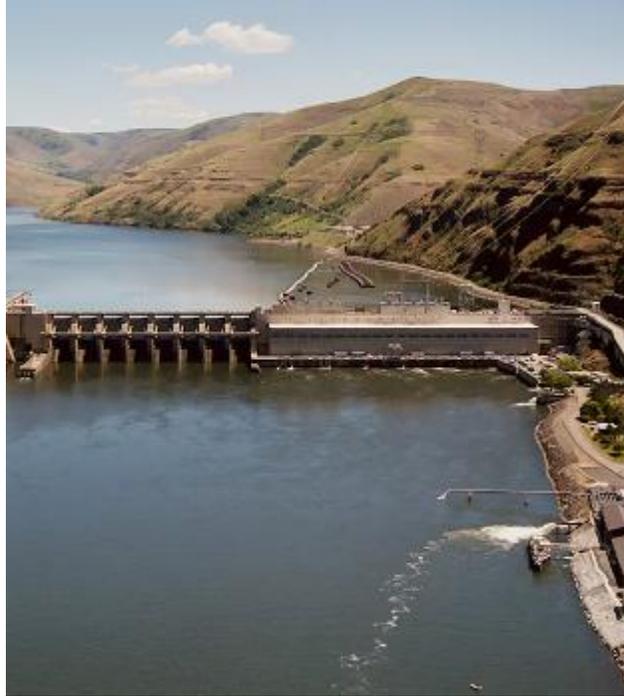


* Western Electric Coordinating Council: Western Assessment of Resource Adequacy 2024

NERC Forecasts Energy Deficiencies

Replacing Conventional Generation with Wind and Solar is Reducing Reserve Margins

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
MISO	17.7%	10.3%	10.3%	13.2%	8.6%	7.1%	10.6%	8.2%	7.5%	4.2%	-2.5%
MRO-Manitoba	12.5%	21.3%	18.4%	18.0%	15.0%	9.8%	0.5%	-0.6%	-1.7%	-2.9%	-4.2%
MRO-SaskPower	28.9%	27.8%	26.6%	31.1%	29.4%	7.0%	28.8%	28.0%	26.7%	26.8%	1.2%
MRO-SPP	28.3%	26.7%	26.0%	25.0%	20.8%	19.1%	26.7%	24.9%	23.5%	22.4%	8.1%
NPCC-Maritimes	18.9%	20.6%	25.5%	25.1%	18.6%	3.9%	23.4%	20.7%	19.1%	17.7%	-1.5%
NPCC-New England	20.4%	25.0%	25.0%	26.3%	24.9%	23.5%	22.0%	20.1%	19.7%	17.1%	14.6%
NPCC-New York	18.4%	17.1%	<p>Generation Capacity: +4.5%</p> <p>Demand: +15%</p> <p>Reserve Margin: 26% → 7%</p>						16.7%	14.9%	13.6%
NPCC-Ontario	22.5%	20.8%							-1.4%	-3.9%	-5.5%
NPCC-Quebec	12.5%	12.2%							3.5%	0.5%	-2.2%
PJM	29.8%	34.9%							20.1%	18.5%	10.3%
SERC-C	28.2%	18.9%							18.4%	21.1%	11.8%
SERC-E	30.4%	27.3%		6.3%	4.6%	-2.2%					
SERC-FP	27.0%	25.4%	26.0%	23.2%	22.1%	20.9%	18.4%	22.0%	20.4%	18.2%	16.0%
SERC-SE	44.9%	39.9%	35.9%	31.5%	24.5%	21.4%	27.7%	25.8%	24.7%	23.7%	13.0%
TRE-ERCOT	24.3%	30.2%	32.5%	29.7%	25.6%	25.4%	27.8%	28.0%	28.4%	28.9%	24.9%
WECC-AB	36.3%	35.8%	35.7%	38.5%	41.7%	41.9%	35.4%	41.2%	33.6%	27.8%	27.0%
WECC-BC	20.9%	25.2%	25.2%	15.8%	15.9%	22.3%	22.1%	21.6%	21.2%	13.4%	19.9%
WECC-CA/MX	38.6%	45.5%	45.2%	38.4%	43.1%	28.8%	29.6%	23.3%	25.0%	15.2%	11.1%
WECC-NW	34.5%	40.3%	38.9%	35.6%	30.7%	24.5%	18.3%	12.2%	10.2%	8.1%	5.9%
WECC-SW	28.6%	37.0%	35.6%	31.6%	24.2%	17.4%	11.3%	7.7%	0.2%	-4.7%	-9.6%



Balance Is Best

All energy sources are useful

All energy conversions have negative environmental impacts

Conventional sources stabilize our grid

Intermittent sources increase electric rates, land and material use

A balanced portfolio produces reliable, affordable, and clean energy

