Carbon-Free Electricity Policies
Impacts & Perspectives

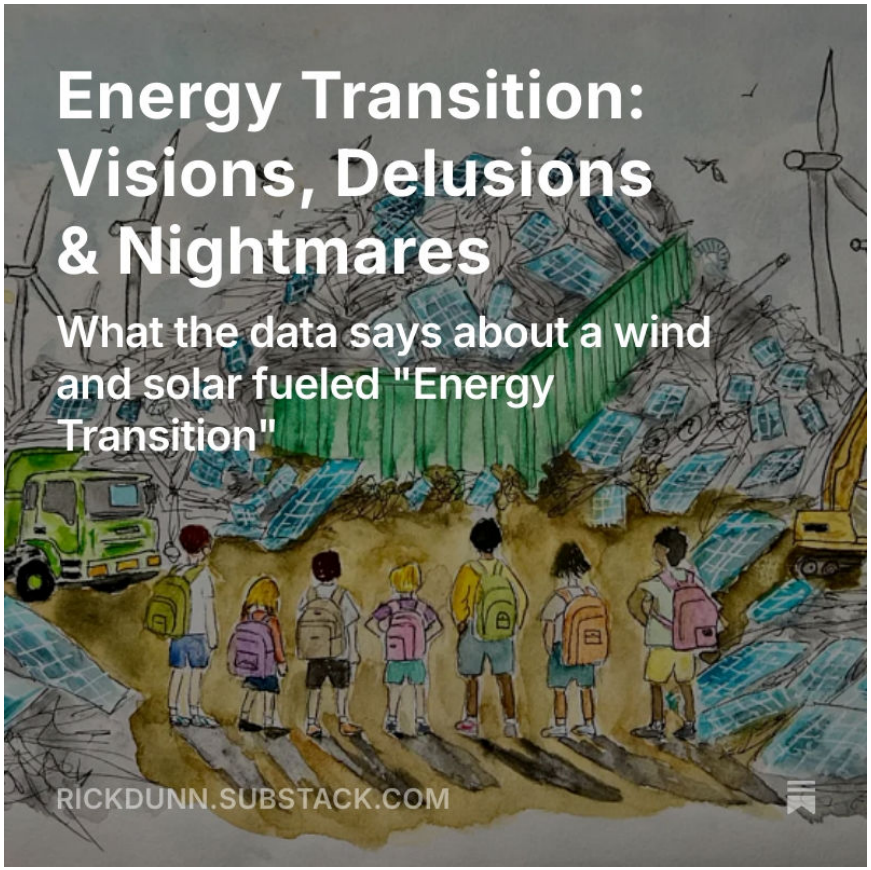
AMERICAN SOCIETY OF SAFETY PROFESSIONALS

BENTON P·U·D
Your Trusted Energy Partner

Rick Dunn, General Manager/CEO

April 10, 2025

I Just Couldn't Take it Anymore!



Rick Dunn, P.E. - Pro Nuclear, Experience & Common Sense
By Rick Dunn

More than 'bumper sticker' clean energy policy information. Politicians are designing the power grid and we're heading for a cliff.

https://rickdunn.substack.com/

- ✓ ***Began Publishing November 2023***
- ✓ ***Optional & Free to Subscribe***
- ✓ ***Artistic Collaboration: Marjean Allen-Dunn***

Agenda

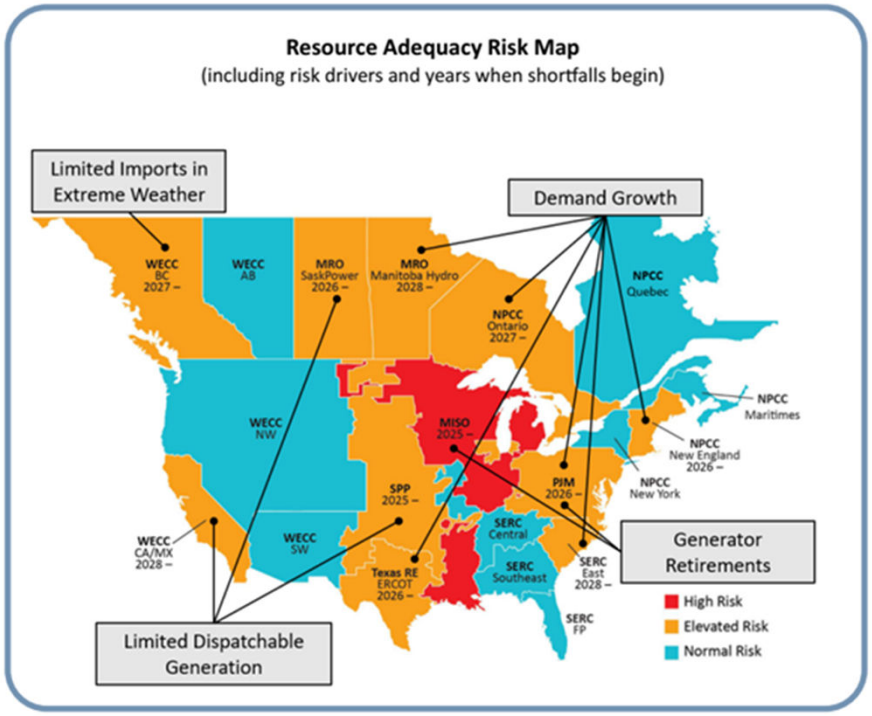
1. **Northwest Close to Blackouts** – How did we get here?
2. **WA & OR Clean Energy Policies** – Global & U.S. Perspectives
3. **WA Energy Strategy** – We're Coming for Your Wind MT & WY!
4. **Where Do We Go from Here?** – Near and Long Term

Growing Blackout Risk: *Shutting Down Dependable Generation*

Half US at high risk of power shortfall in next decade, regulator says

By **Reuters**

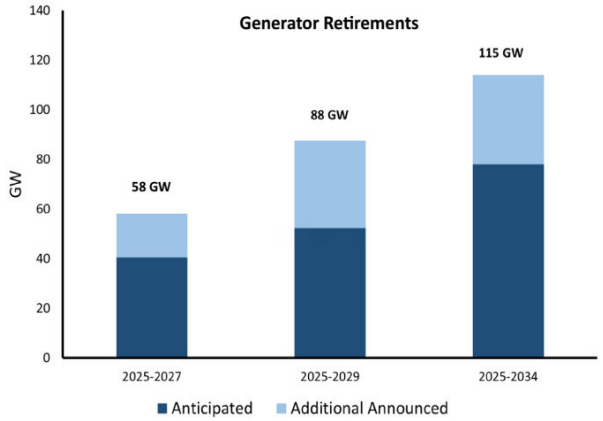
December 17, 2024 2:58 PM PST · Updated 16 days ago



Outsized Wind & Solar Federal Tax Subsidies

Declining Dispatchable Resources: Replacement resources projected over the next decade are more weather dependent and lack key reliability attributes.

Accelerating Retirements: Resource needs to meet escalating demand growth are threatened by the current pace of generator retirements.



What is ***Normal Risk*** ?

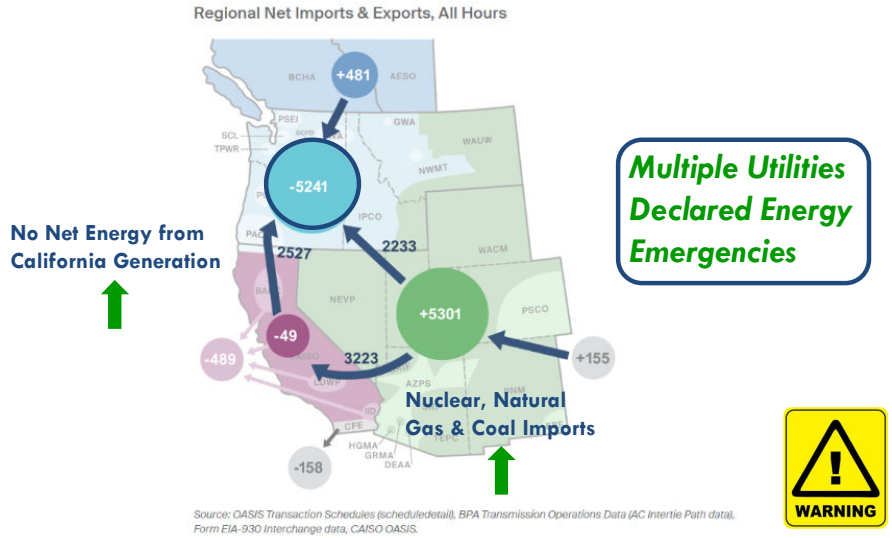
Northwest Close to Blackouts

TOP STORY

Winter Storm Pushed Northwest Close to Rolling Blackouts

Steve Ernst Mar 22, 2024

CLEARING UP
An Independent News Service from NewsData



Multiple Utilities Declared Energy Emergencies

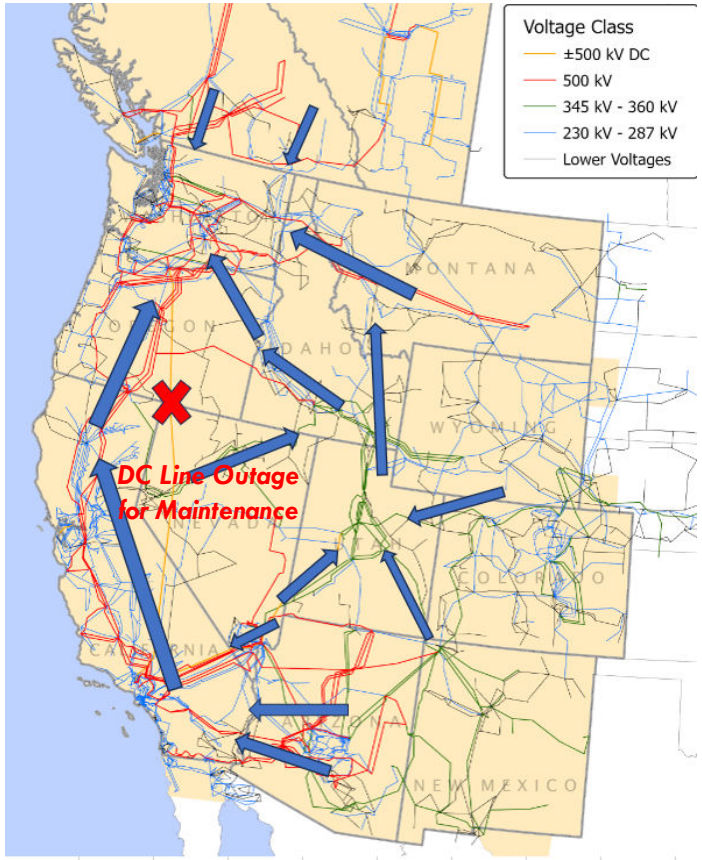
[January 12 – 16, 2024]

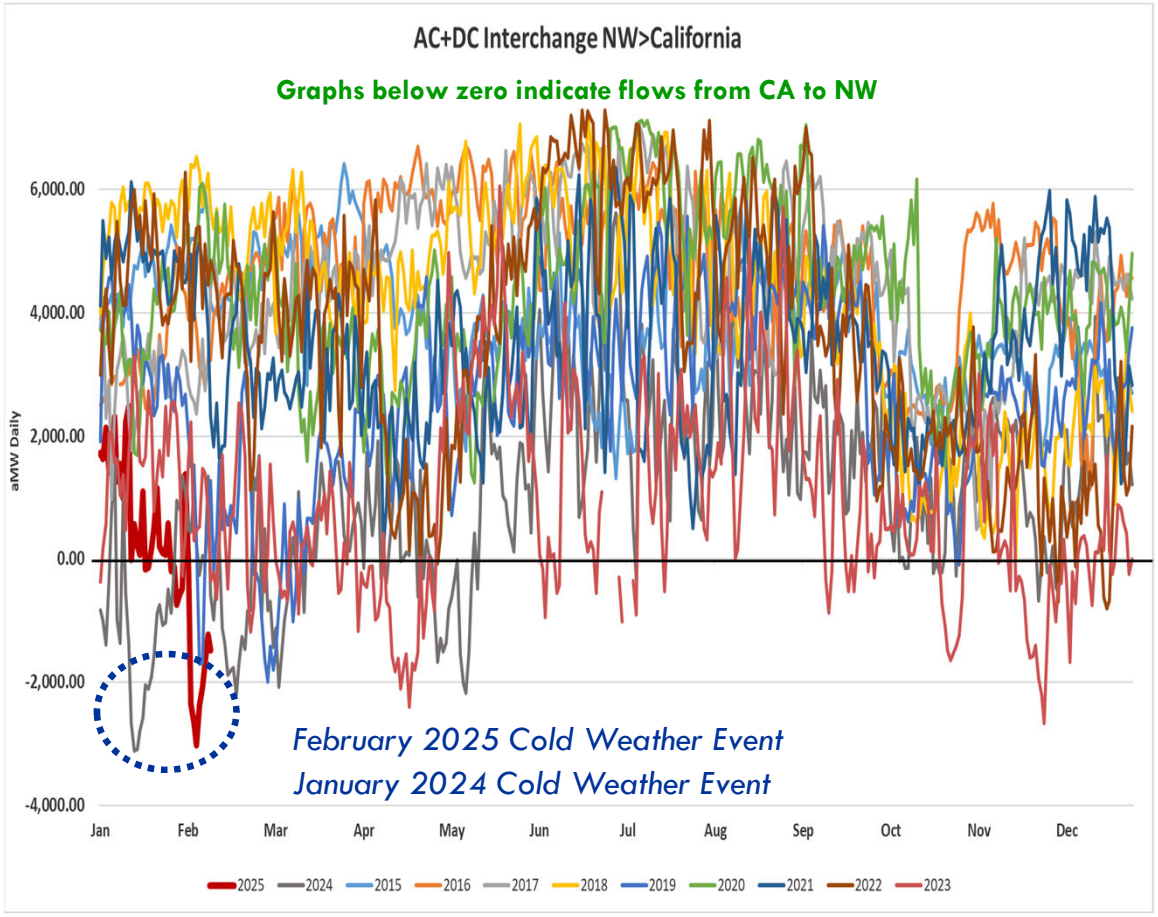
- Northwest **Imported Electricity** for all 120 Hours of Cold Snap
- Hydro **short on water,** natural gas **maxed out** & wind power collapsed to **zero**
- +2,000 MW of **coal retirements** so far
- Demand grew **2% to 6%** since December 2022 winter event

- Northwest electric **grid** & natural **gas** pipeline systems are at **immediate risk** with no margin for the unexpected

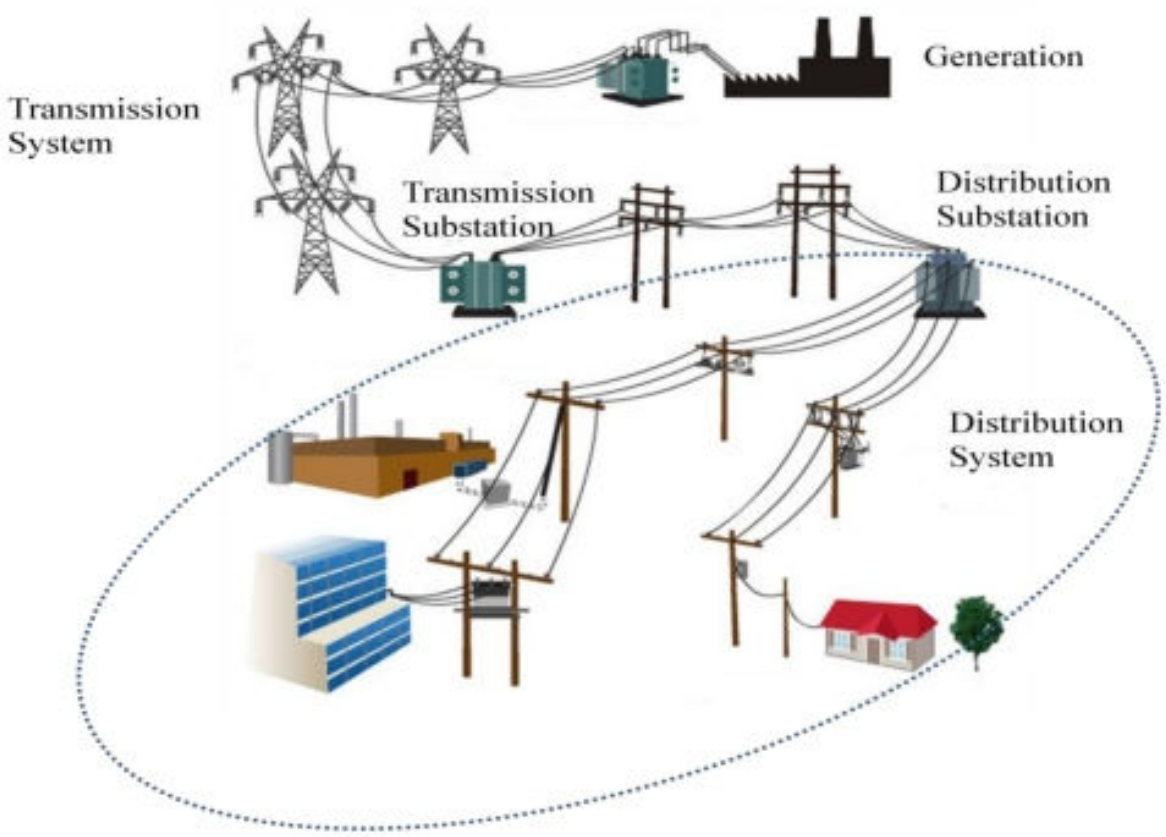
From Exporter to Importer: *We've Only Just Begun in WA & OR*

January 2024 Cold Weather Event





Power Grid Basics: *A Service Like No Other!*



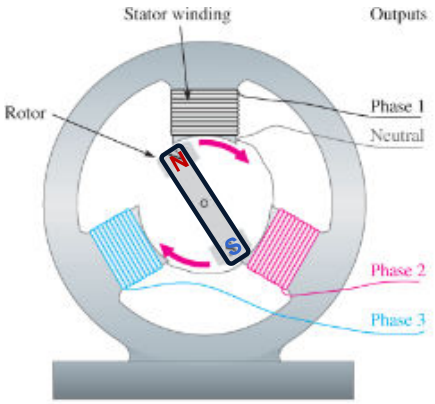
Electricity is simultaneously:

Produced

Delivered

Consumed

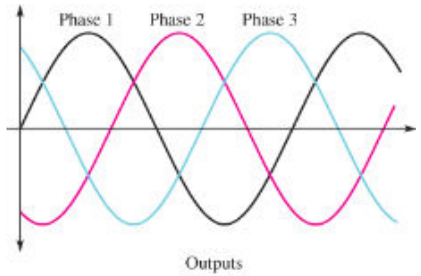
Alternating Current (AC) Electricity



(a) Three-phase rotating-field generator

Rotating Magnetic Field

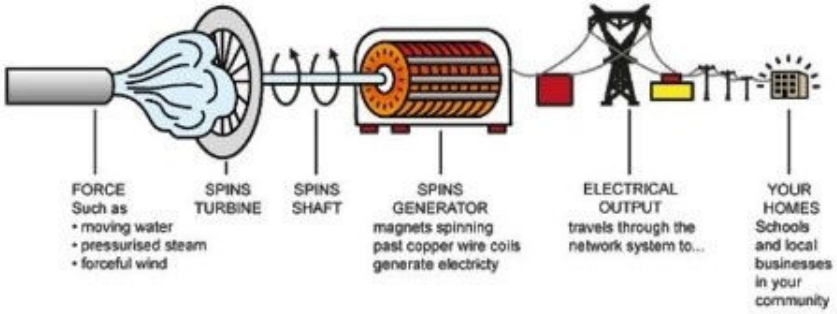
60 cycles per second sine waves



(b) Three-phase sine wave

Three-Phase Requires 3 Wires

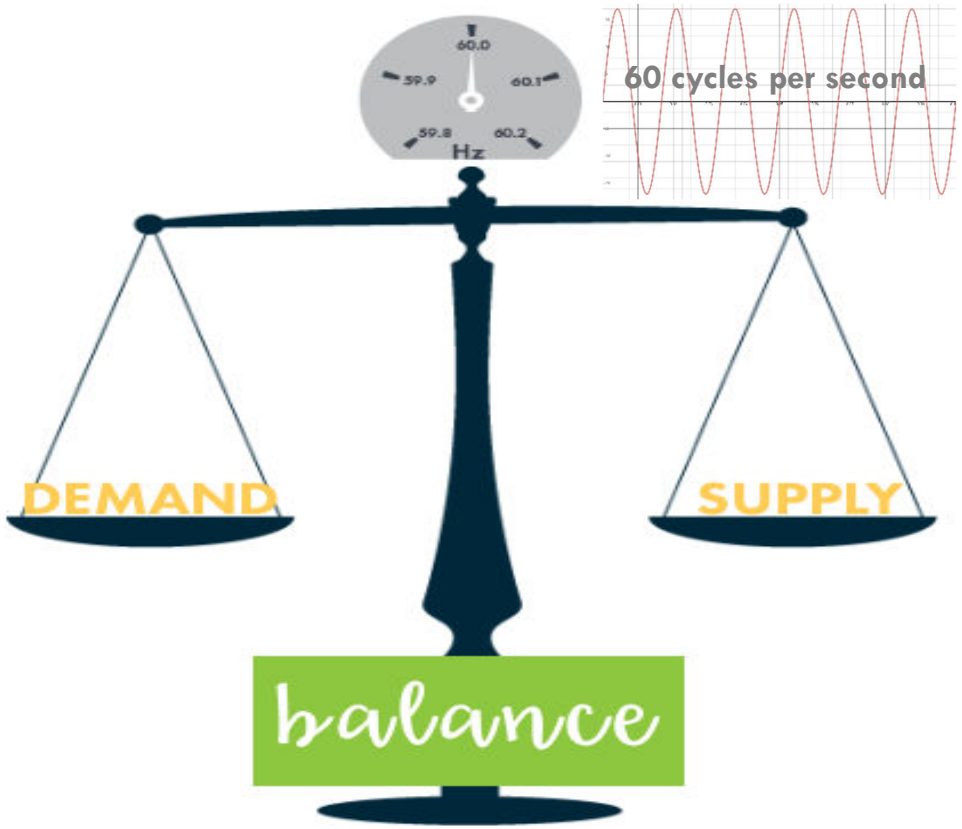
Speed of rotation ***precisely controlled***



- ✓ *All Generators must be* ***Synchronized***
- ✓ **Increasing** Demand Tends to **Decrease** Speed of Rotation
- ✓ **Decreasing** Demand tends to **Increase** Speed of Rotation

Demand/Supply Balancing: *Physics*

Electrical Demand and Supply Must Be Equal at All Times



- ✓ **'Cruise Control' set at 60**
  - ***No over supply***
  - ***No under supply***
- ✓ **The Laws of Power Grid Physics are Unforgiving**
- ✓ **Consequences of not maintaining supply & demand balance are blackouts**

Controllable Supply: *Blackout Insurance*

Effective Capacity = % of Installed Nameplate Generation that can be Counted on During Hours of Maximum Demand

PacNW Existing Resources
2018

Load + Resource Balance (Greater NW = WA, OR, ID, parts of UT, WY)

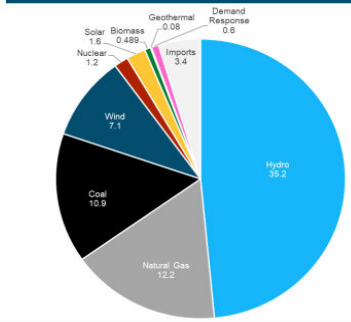
Load			Load GW
Peak Load			42.1
Firm Exports			1.1
PRM (12%)			5.2
Total Requirement			**48.4**
Resources	**Nameplate GW**	**Effective %**	**Effective GW**
Coal	10.9	100%	10.9
Gas	12.2	100%	12.2
Biomass & Geothermal	0.6	100%	0.6
Nuclear	1.2	100%	1.2
Demand Response	0.6	50%	0.3
Hydro	35.2	53%	18.7
Wind	7.1	7%	0.5
Solar	1.6	12%	0.2
Storage	0	—	0
Total Internal Generation	**69.1**		**44.7**
Firm Imports	3.4	74%	2.5
Total Supply	**72.5**		**47.2**
Surplus/Deficit			
Capacity Surplus/Deficit			**-1.2**

Controllable High Effective Capacity

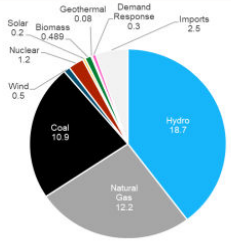
Uncontrollable Low Effective Capacity

Source: E3 Resource Adequacy in the Pacific Northwest, 2019
Note: other top-down analyses (e.g. NWPCC) suggest need starting in the 2020-2021 timeframe.

Nameplate GW

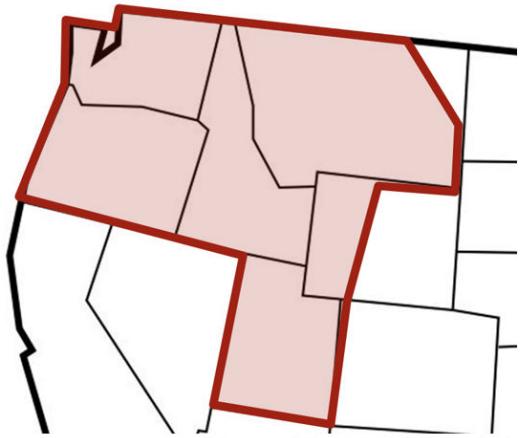


Effective GW



Fossil units are 1/3 of nameplate but 1/2 of effective GW

Energy+Environmental Economics 12



Balancing Authority Areas include: Avista, Bonneville Power Administration, Chelan County PUD, Douglas County PUD, Grant County PUD, Idaho Power, NorthWestern Energy, PacifiCorp (East & West), Portland General Electric, Puget Sound Energy, Seattle City Light, Tacoma Power, Western Area Power Administration

Coal & Natural Gas
✓ **50% of Effective Capacity**

Hydro
✓ **40% of Effective Capacity**

Coal = 16% of U.S. Electricity

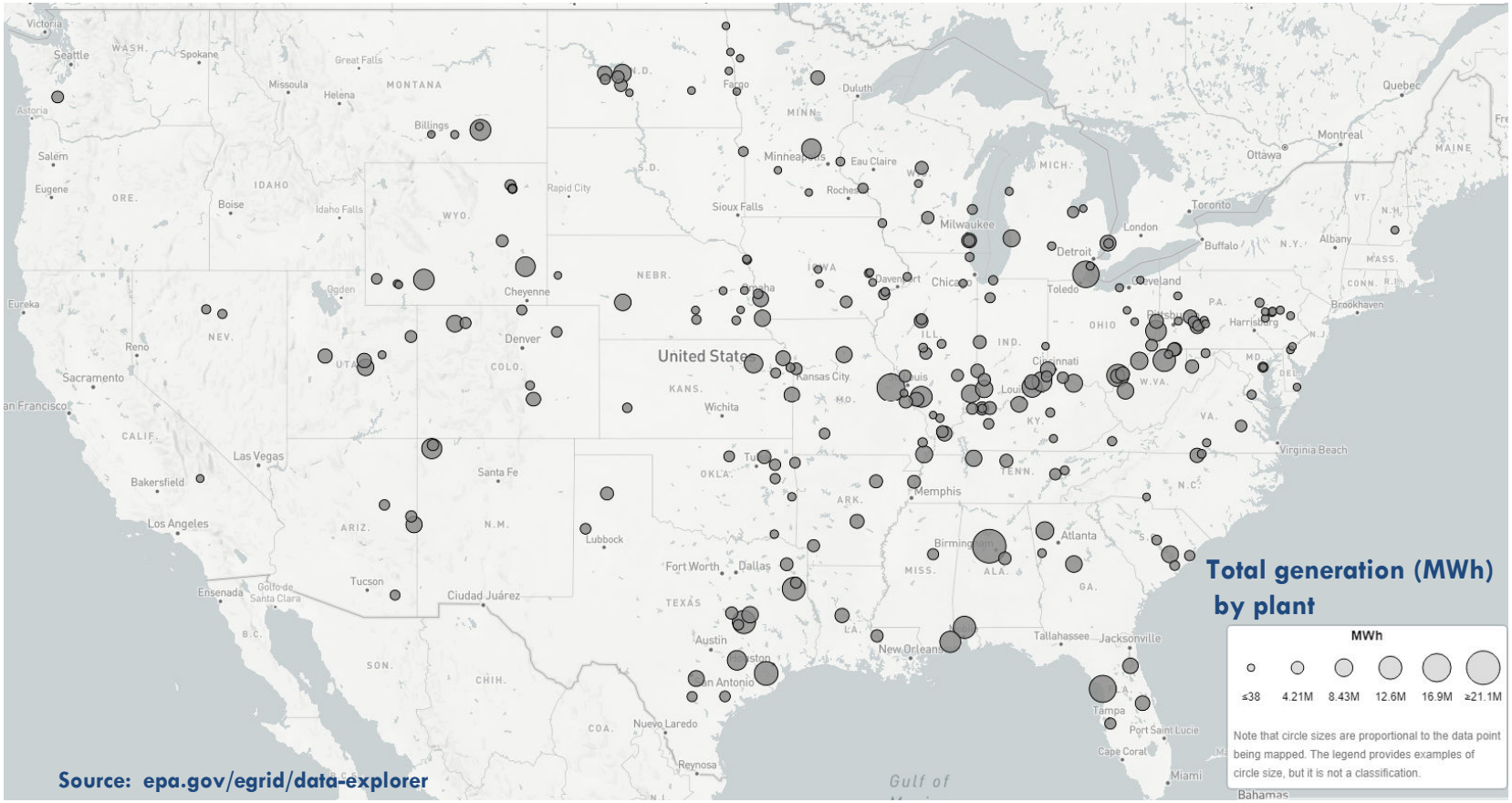
Electricity Provided

- ✓ **12% of PNW Region**
- ✓ **8.6% of Washington**

NW Coal Plant Closures

1) **Colstrip(1) 716 MW in 2019**
2) **Centralia(1) 730 MW in 2020**
3) **Boardman 600 MW in 2020**
4) **Centralia(2) 730 MW in 2025**

- ✓ **2,776 MW by 2025**

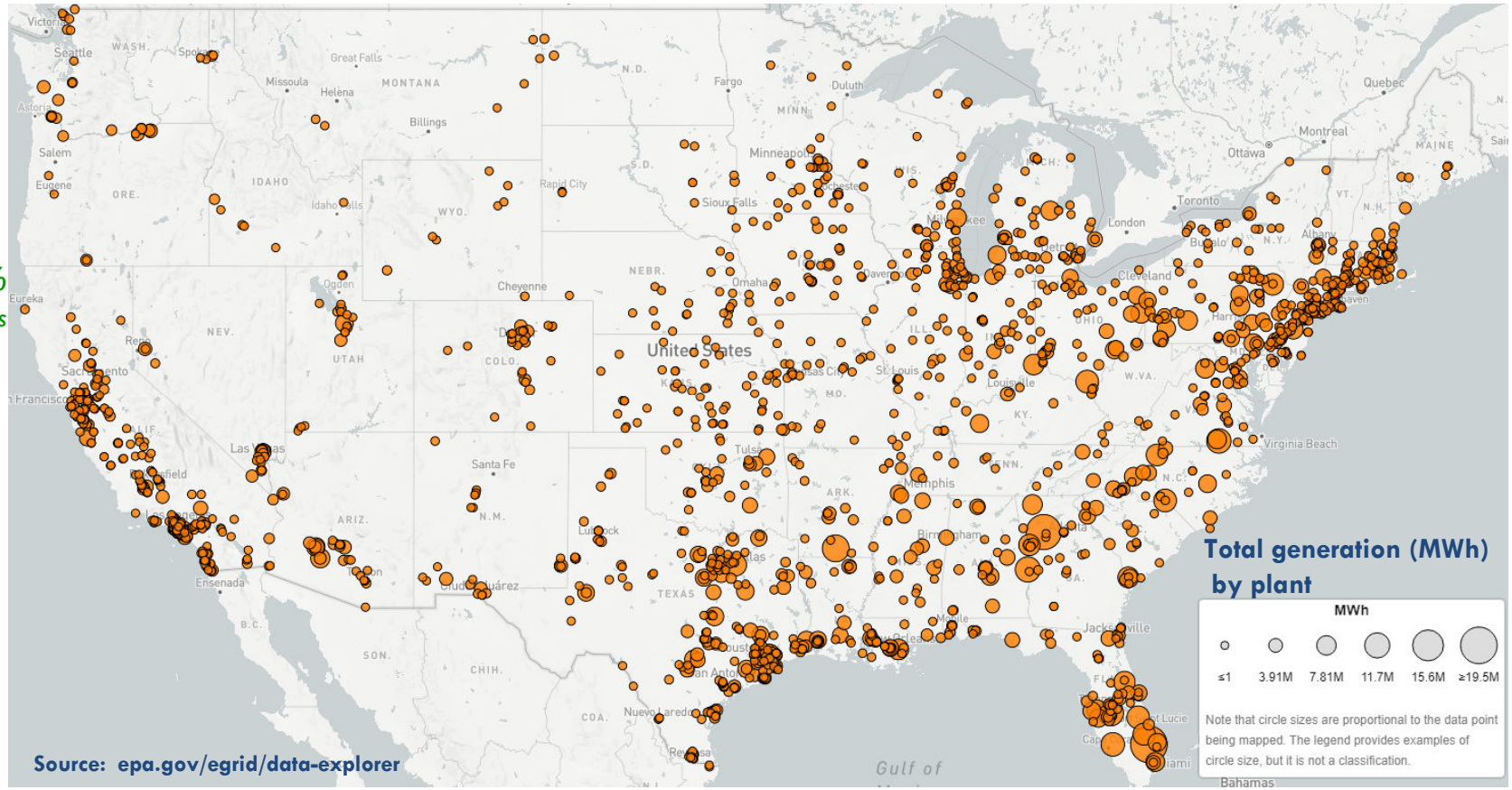


Natural Gas = 43% of U.S. Electricity

Electricity Provided

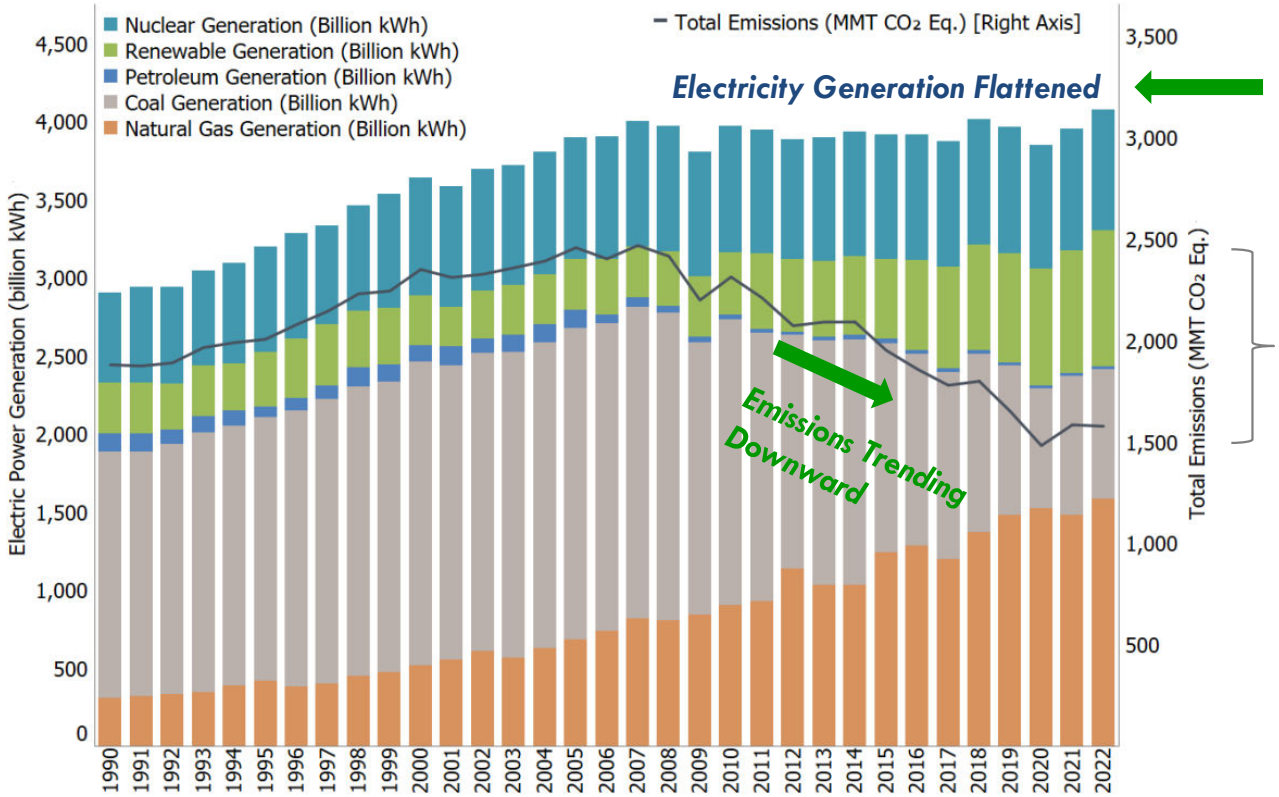
- ✓ **23% of PNW Region**
- ✓ **10.4% of Washington**

Plus, some share of 12.9% Unspecified Market Purchases



Coal-to-Natural-Gas: *U.S. Fuel Switching*

Figure 2-8: Electric Power Generation (Billion kWh) and Emissions (MMT CO_2 Eq.)



https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2022

Demand only up 2.8% in 2023 compared to 2007

36% CO_2 Reduction

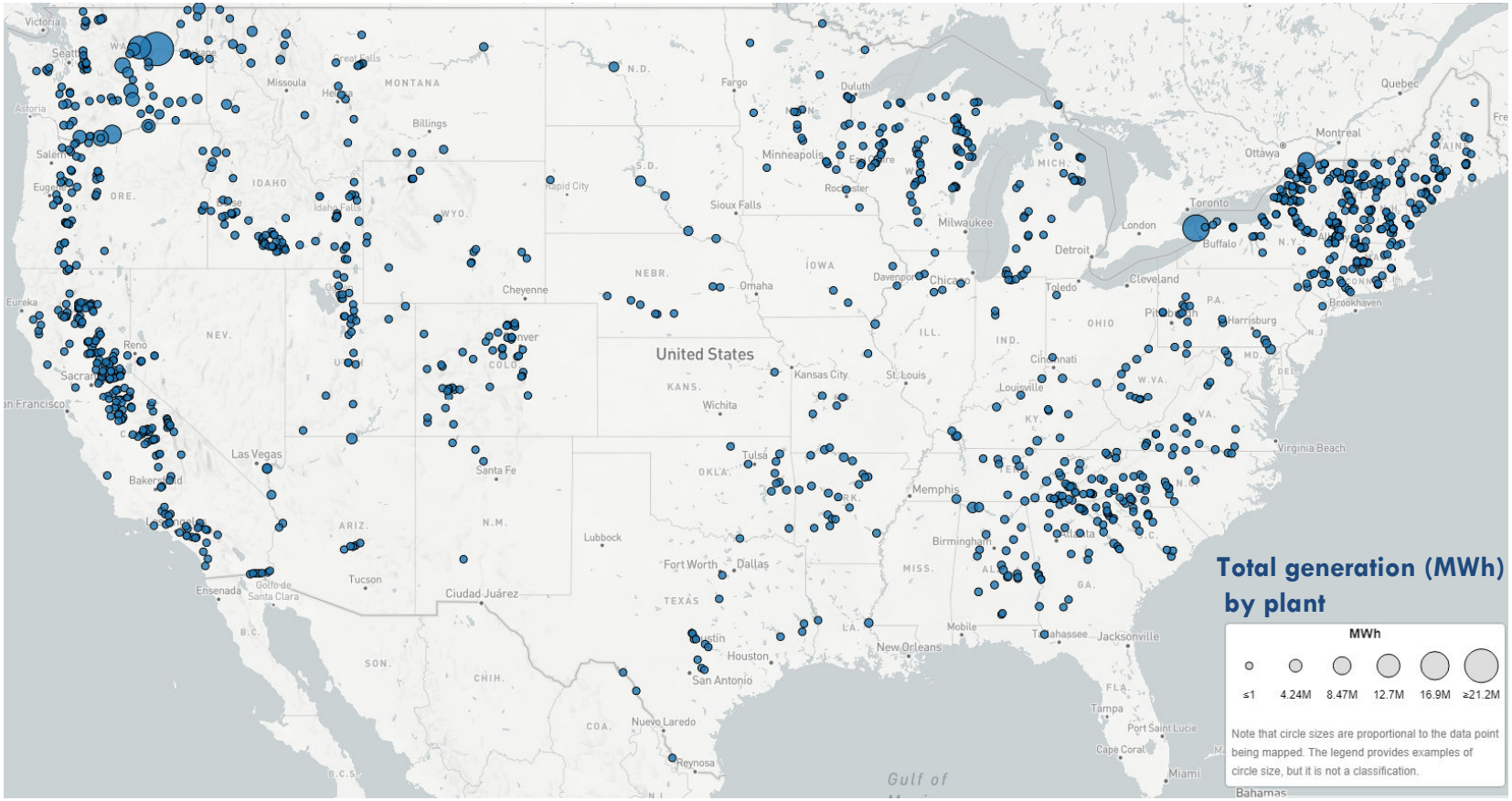
- ✓ *65% due to fuel switching*
- ✓ *30% due to wind & solar*

Hydropower = 5.7% of U.S. Electricity

Electricity Provided

- ✓ **50% of PNW Region**
- ✓ **60% of Washington**

Hydro-Based
100% CO_2-Free Electricity ***does not scale*** *to the rest of the U.S.*

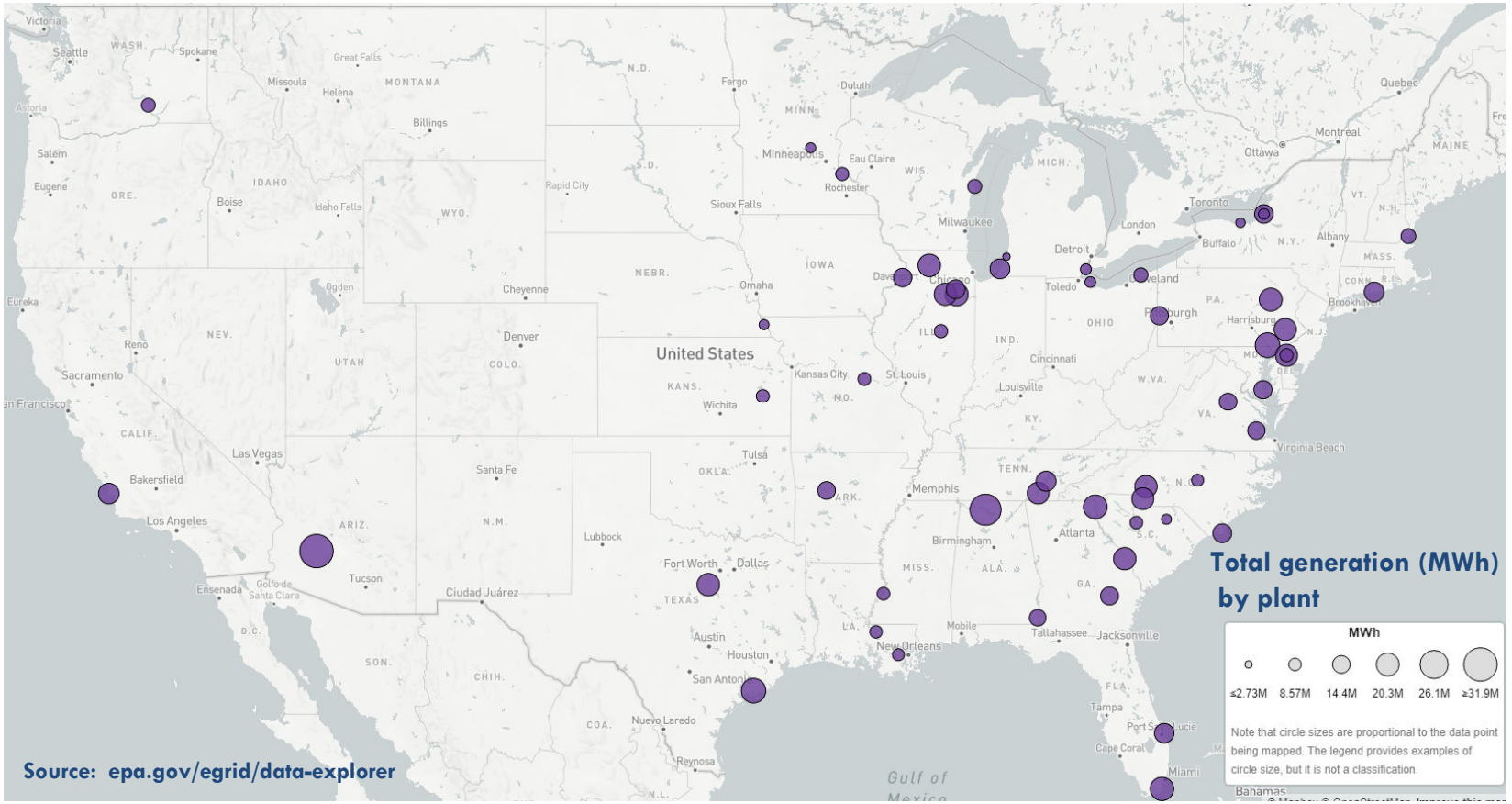


Source: epa.gov/egrid/data-explorer

Nuclear = 18.6% of U.S. Electricity

Electricity Provided

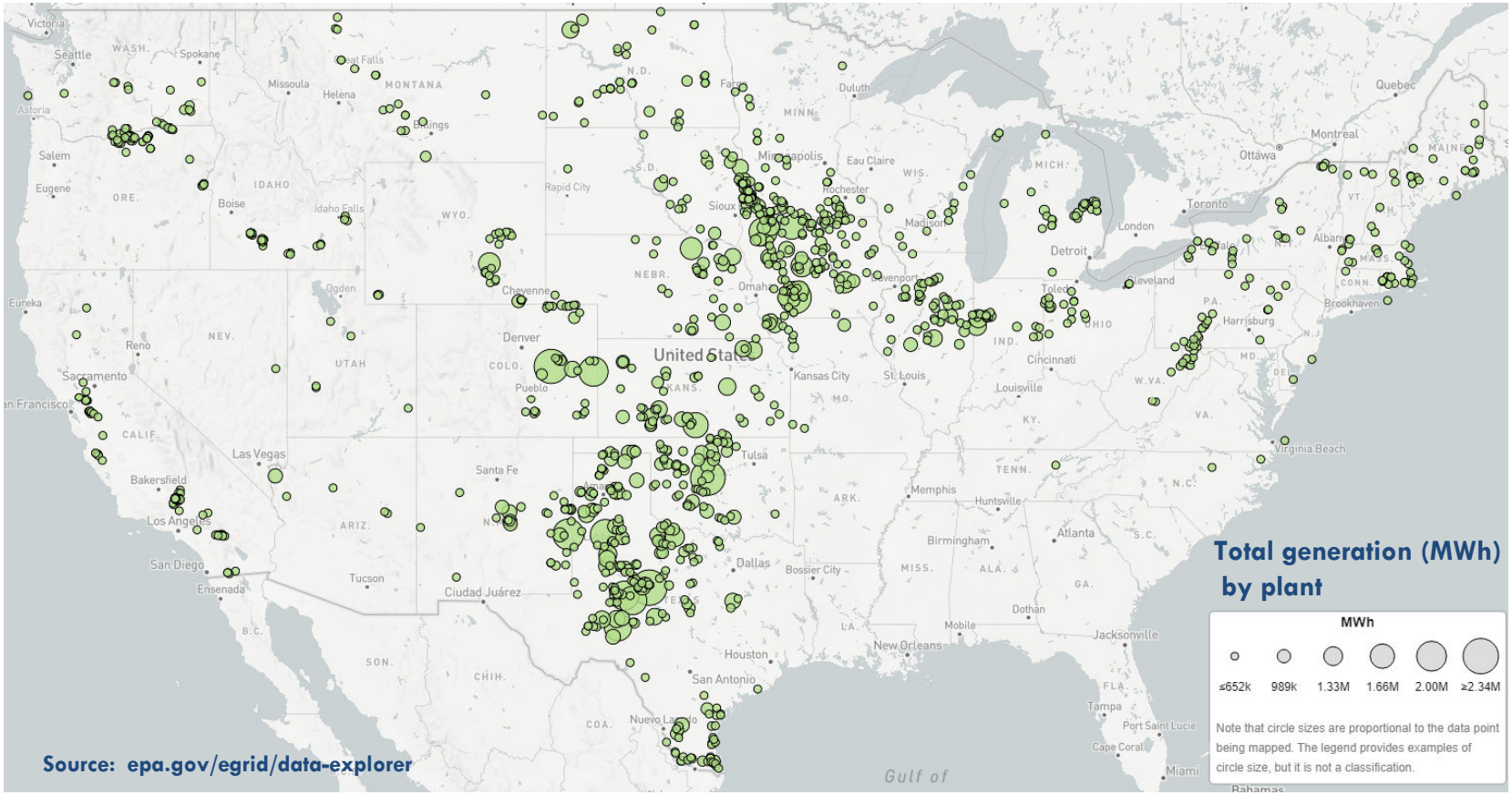
- ✓ **3% of PNW Region**
- ✓ **4.3% of Washington**



Wind = 10.2% of U.S. Electricity

Electricity Provided

- ✓ **10.5 of PNW Region**
- ✓ **8% of Washington**



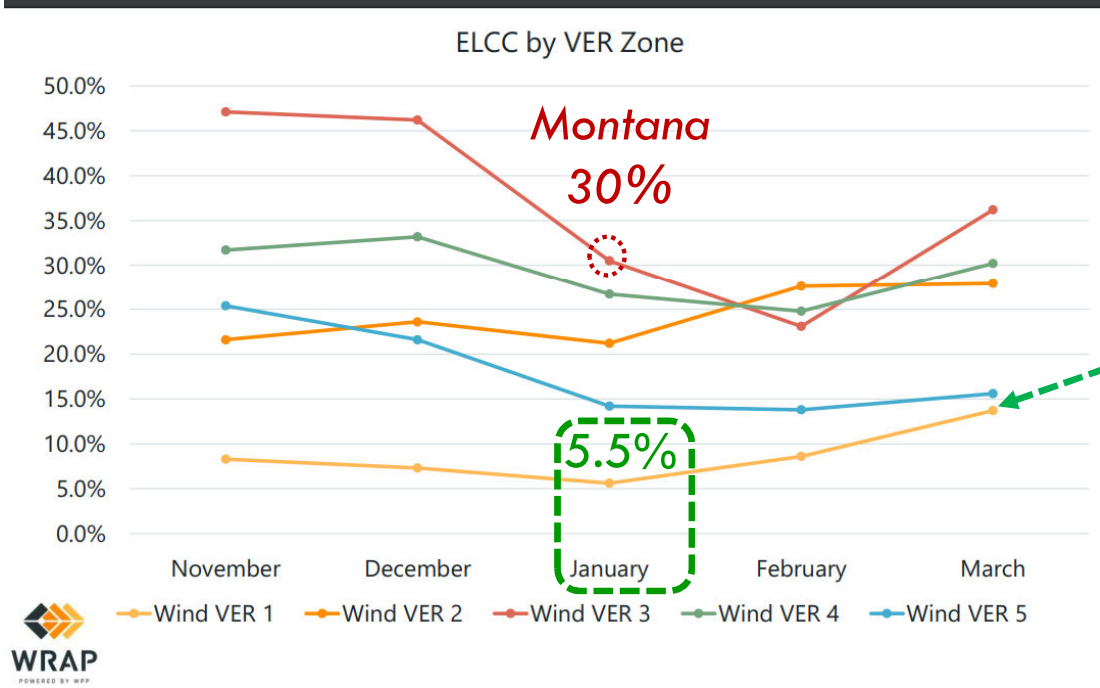
WA Wind Farms: *Lowest Winter Effective Capacity*

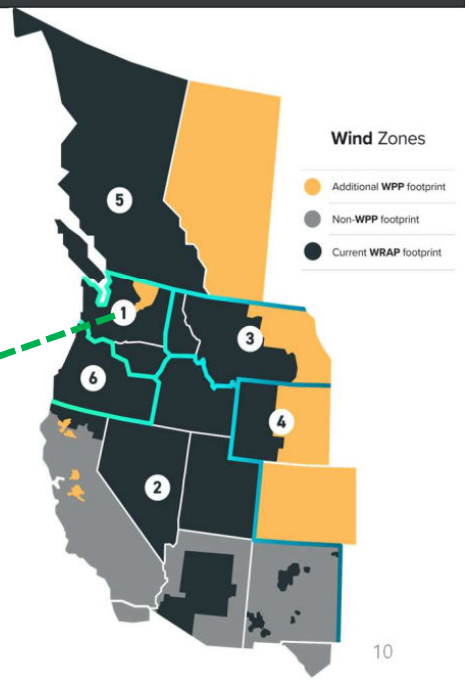
Overbuild Factor

+18,000 MW of Washington Wind

Replaces only 1,000 MW of January 100% Effective Capacity

WIND ELCC - WINTER





WRAP

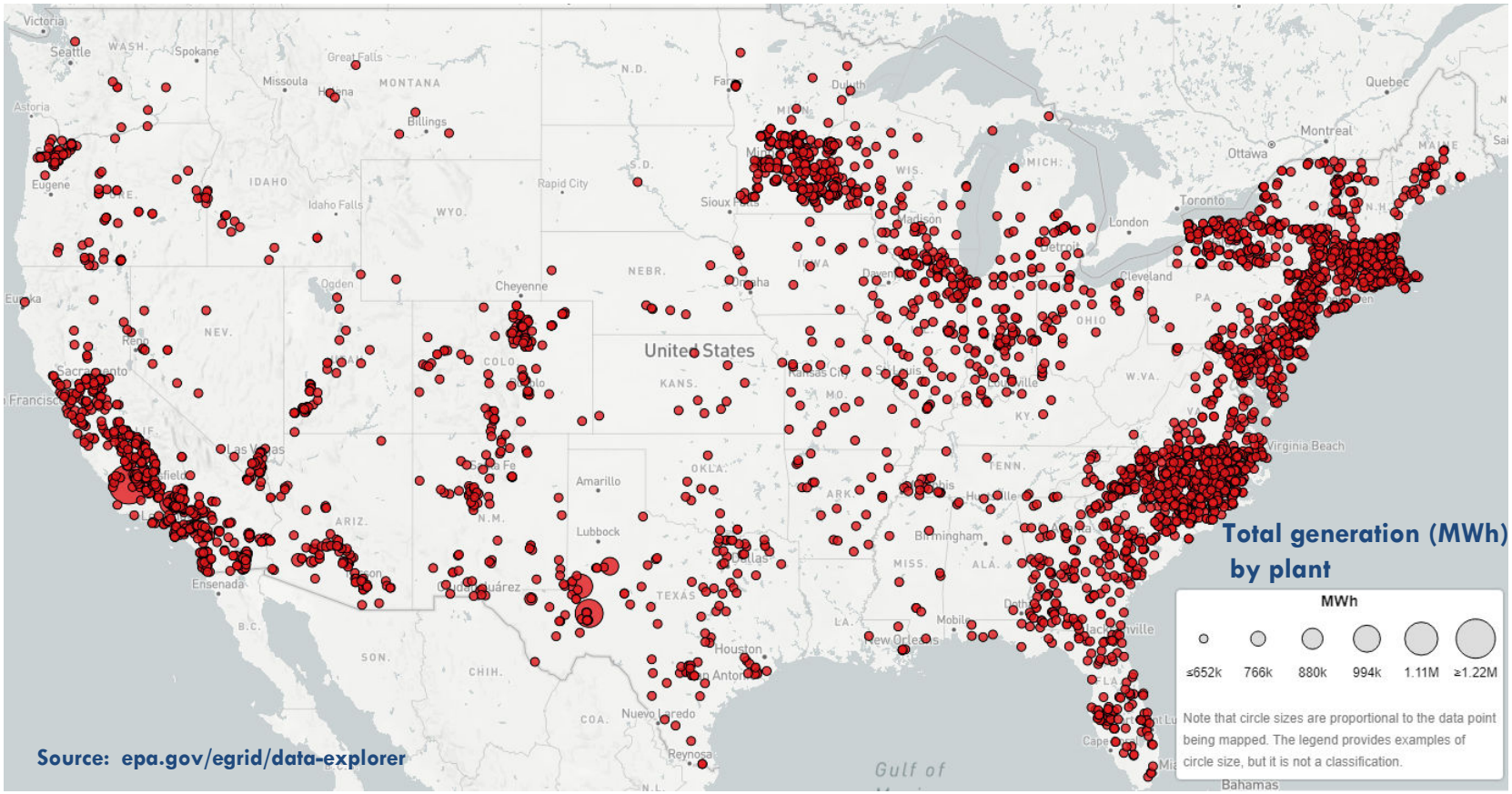
10

ELCC = Effective Load Carrying Capability (% of nameplate expected to show up during Capacity Critical Hours)

Solar = 3.9% of U.S. Electricity

Electricity Provided

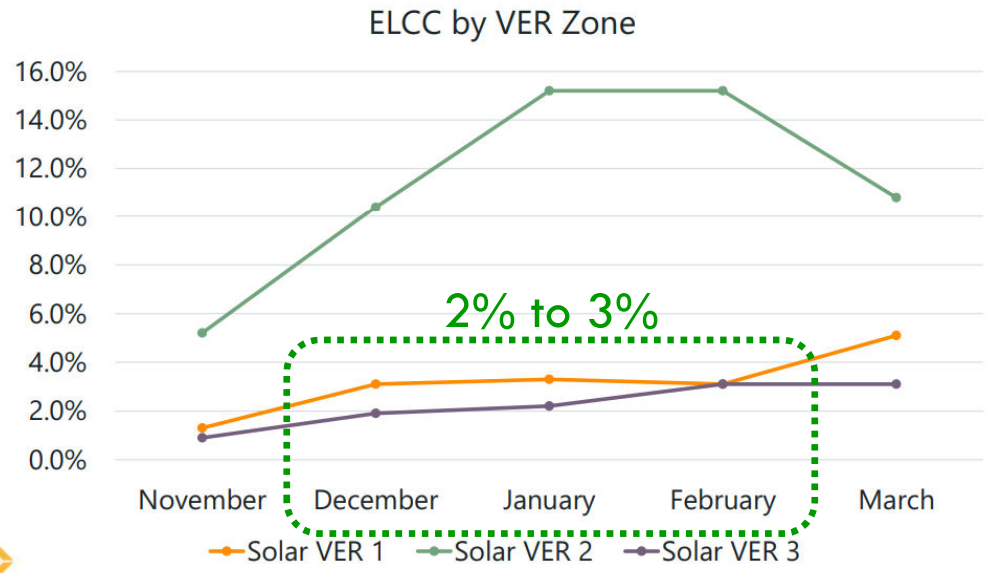
- ✓ **0.9% of PNW Region**
- ✓ **0.8% of Washington**

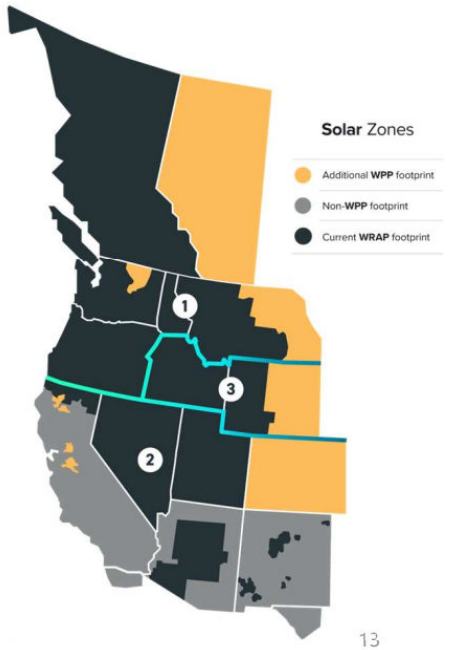


Northwest Solar Power: *Extremely Low Effective Capacity*

SOLAR ELCC - WINTER

Northwest Solar Extremely Low Effective Capacity in Winter →



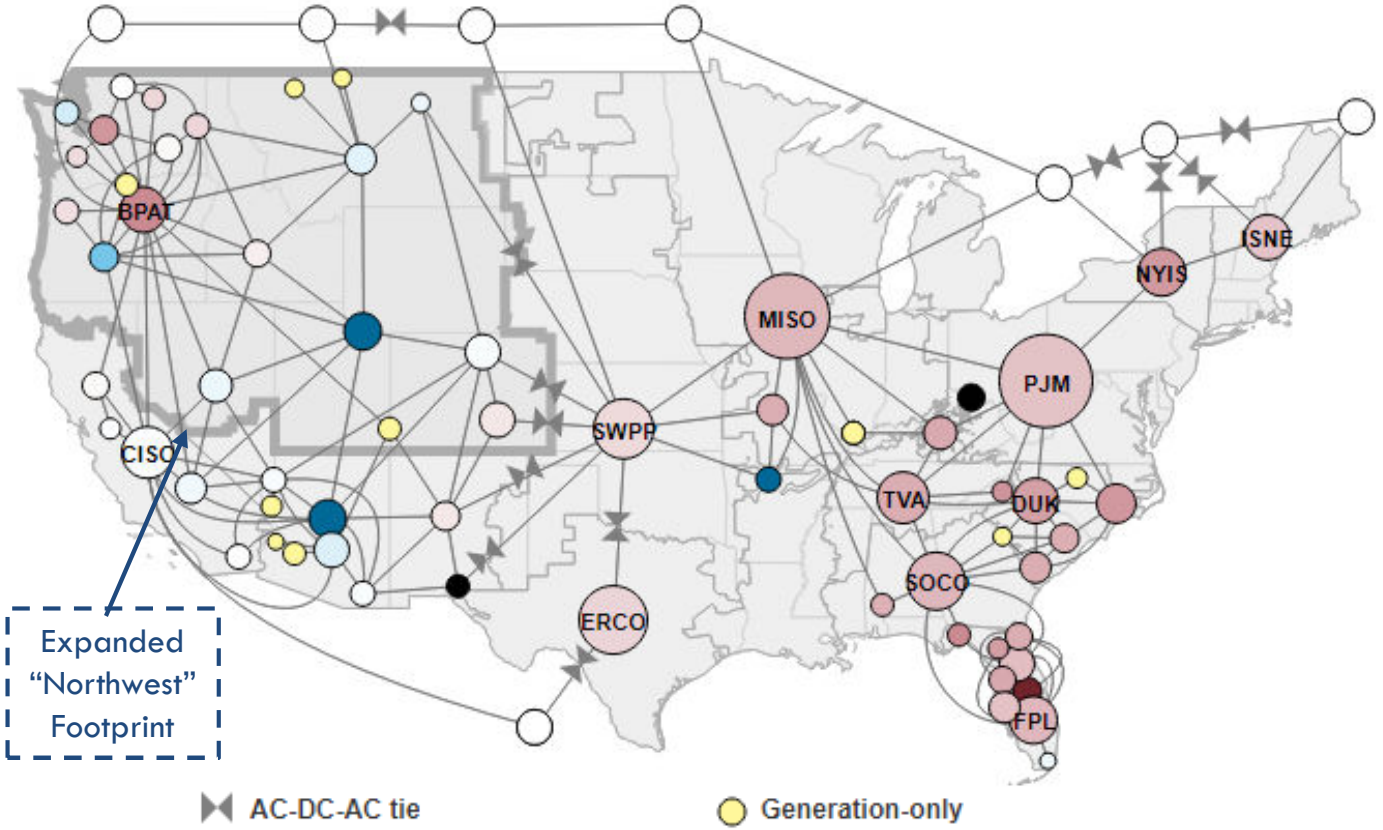


WRAP
POWERED BY WPP

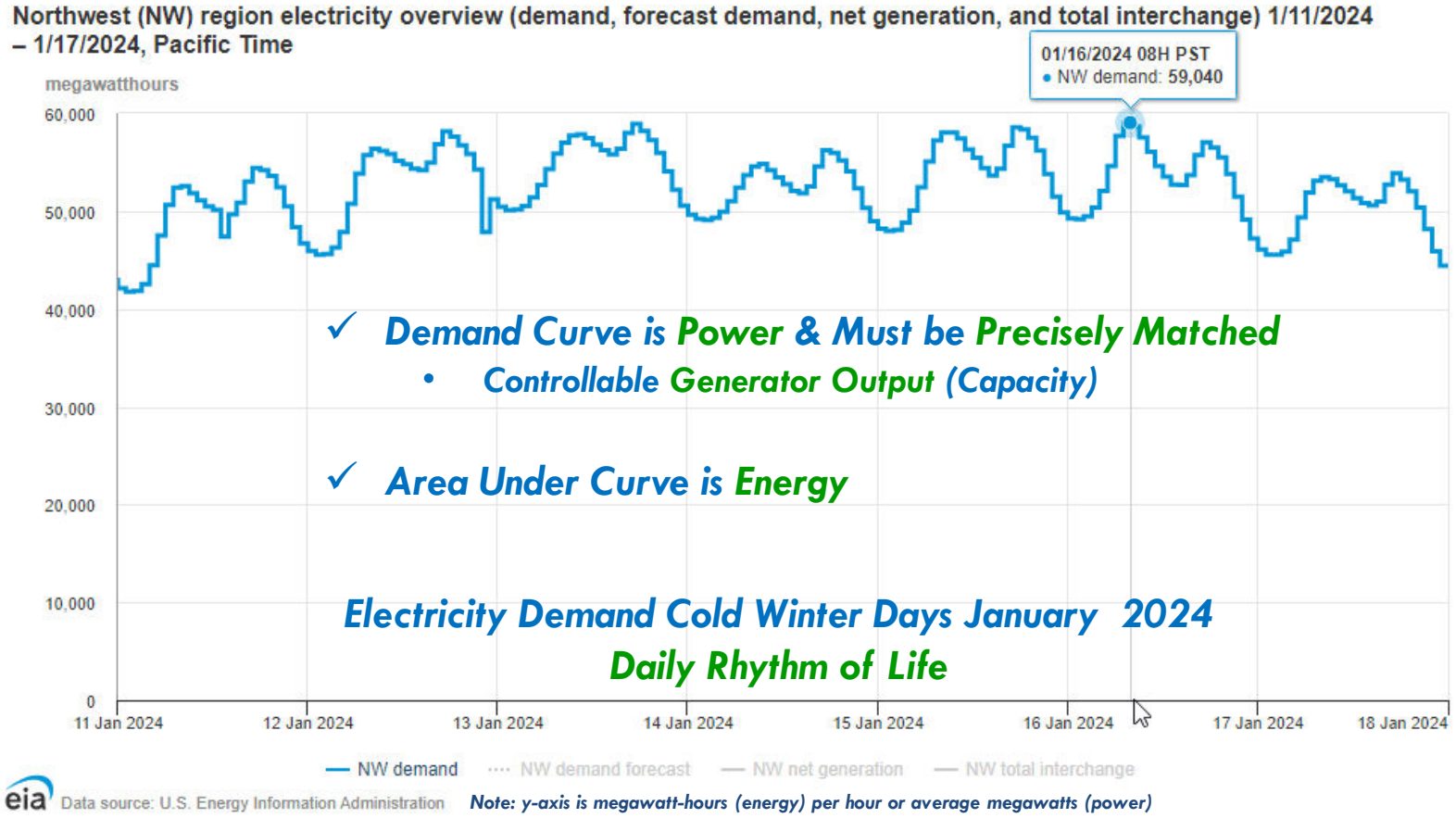
ELCC = Effective Load Carrying Capability

NW Supply & Demand Balancing: *January 2024 Cold Snap*

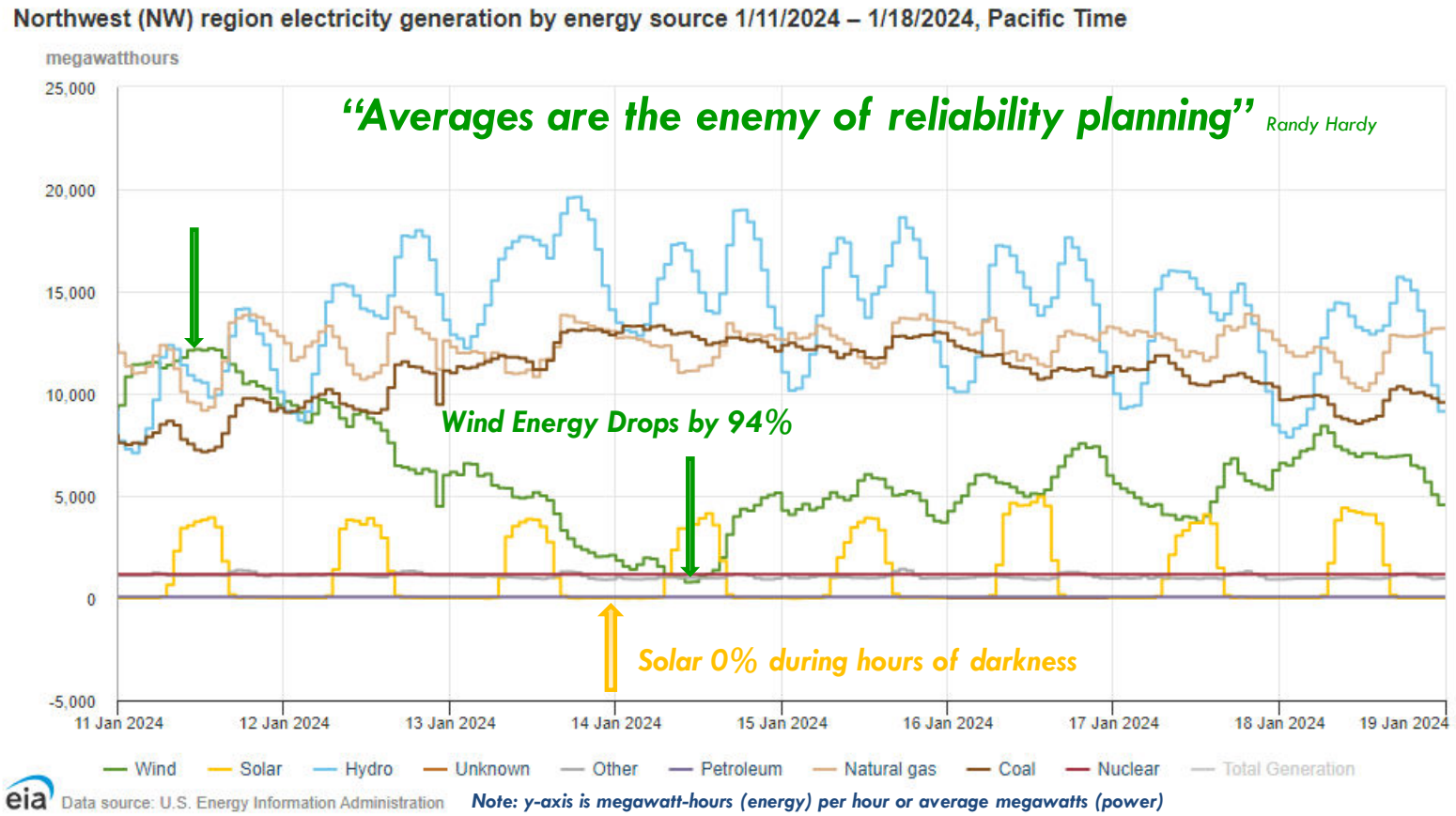
- ✓ **38 Balancing Area Authorities in Western Power Grid**
- ✓ **Maintain supply & demand balance including scheduled generation imports and exports**



NW Electricity Demand: *January 2024 Cold Snap*



NW Electricity Supply: *January 2024 Cold Snap*



- ***Energy Policies Driving Deeper Dependence on Drought Susceptible Hydropower***

- ***Increasingly Risky & Costly Probability Game***

NW Hydro: *Flexes Polar Vortex Muscle*

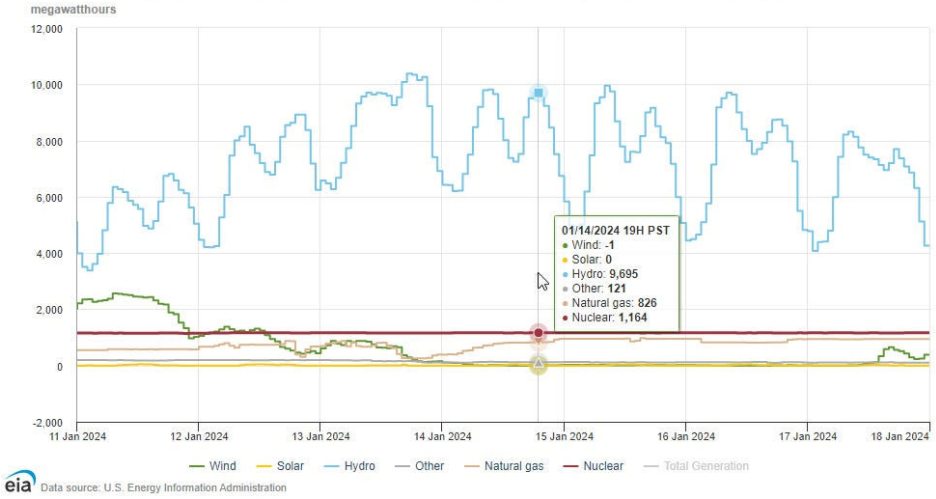
https://rickdunn.substack.com/p/northwest-hydro-flexes-its-polar

Northwest Hydro Flexes it's Polar-Vortex Muscle and 'Gone Went the Wind'

The question isn't, can you integrate tens-of-thousands of average megawatts of unreliable wind farms into the grid? The question is, should you?

RICK DUNN, P.E.
JAN 22, 2024

Bonneville Power Administration (BPAT) electricity generation by energy source 1/11/2024 – 1/17/2024, Pacific Time



WA & OR Wind Power at Zero or Less During Coldest Temperatures

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WA Energy Strategy: *Demonize* CO_2

ENVIRONMENT AMERICA

Washington state commits to 100% clean energy

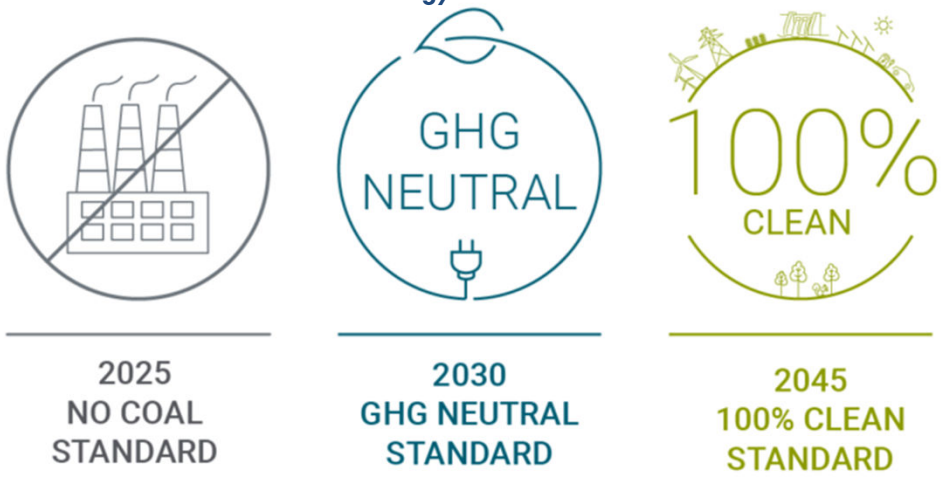
Washington is the latest state to go all-in on clean, carbon-free electricity.

Washington is the latest state to go all-in on clean, carbon-free electricity.

On May 7, Gov. Jay Inslee signed the 100% clean electricity bill into law,

- ✓ *70% CO_2-free Electricity Today*
  - *0.6% of U.S. Electricity Emissions*
- ✓ *Climate Catastrophizing Echo Chamber*
  - *Dogmatic Devotion to "Stop Using Fossil Fuels"*

Clean Energy Transformation Act



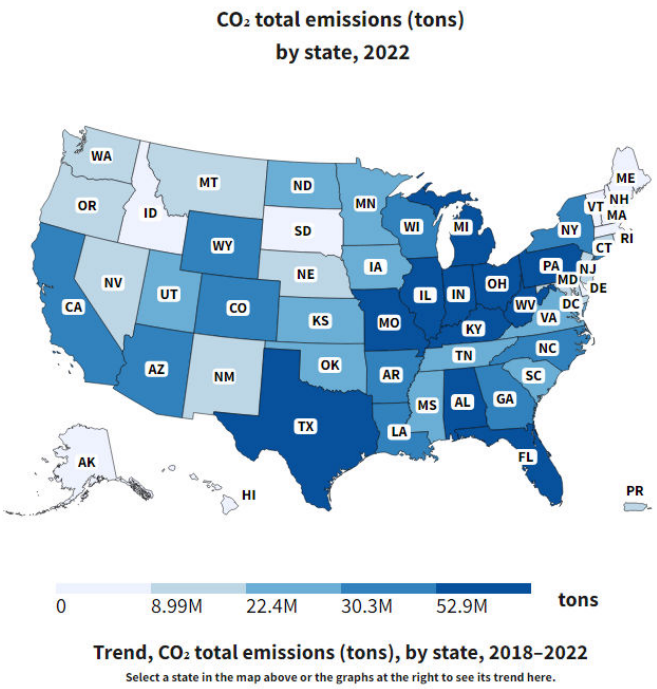
Oregon Clean Energy Bill

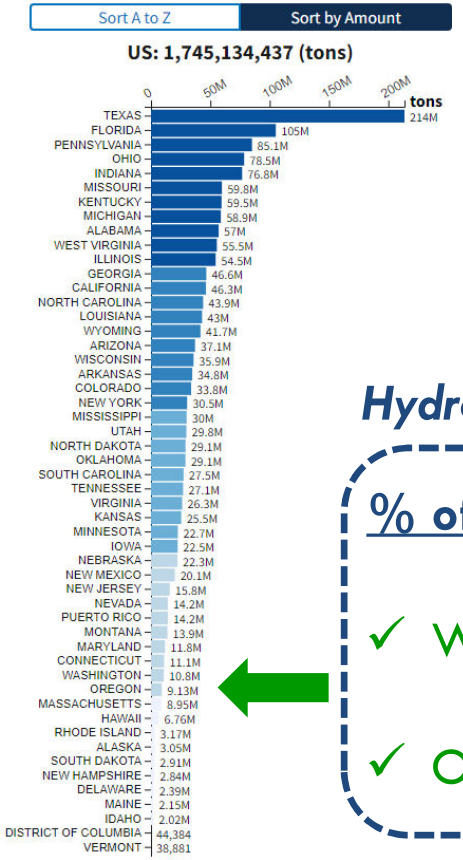
Governor Kate Brown Signs Clean Energy Bills, Sets Goal for 100% Clean Energy by 2040

July 27, 2021

- Directs two largest utilities to deliver 100% clean electricity to customers by 2040
- Stairstep from 80% clean electricity by 2030, to 90% percent by 2035 and 100% by 2040
- ***Prohibits*** new or expanded natural gas-fired power plants in the state *(also **illegal to build nuclear plants**)*
- Most ambitious timetable in the nation

Washington & Oregon: *What Dirty Energy Problem?*





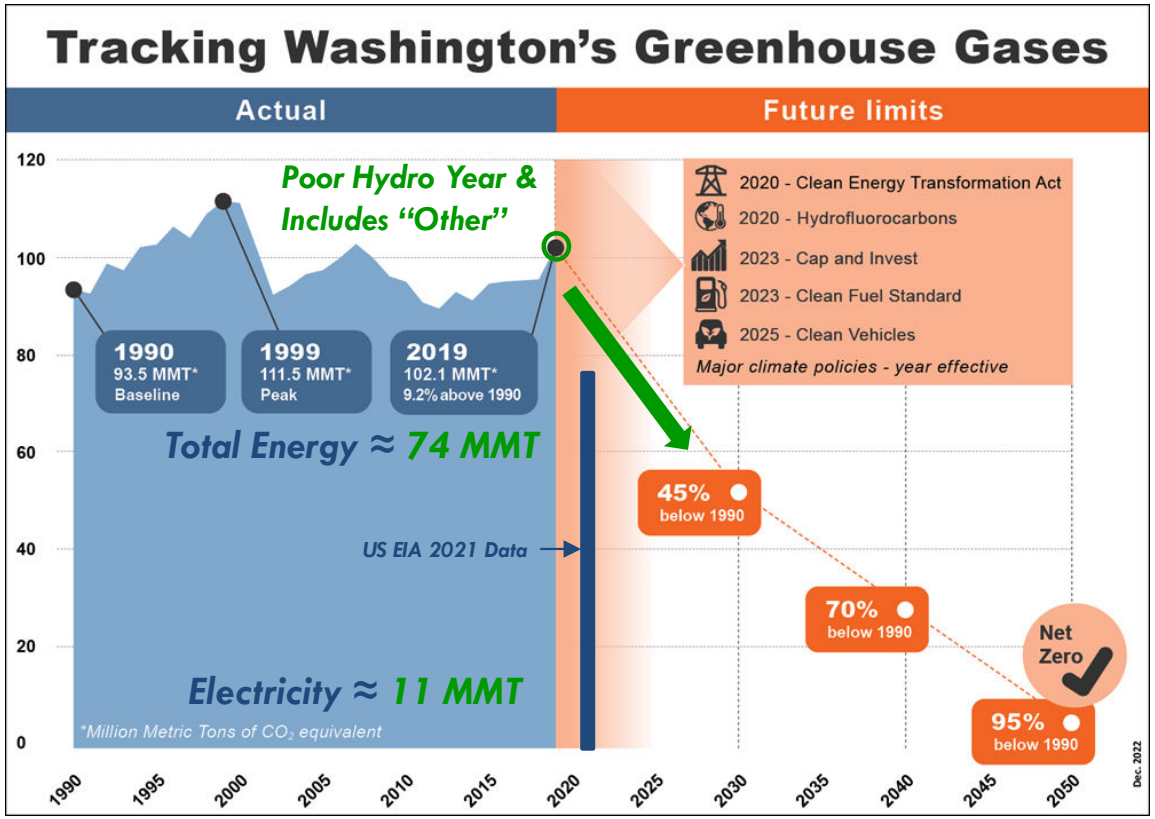
Source: https://www.epa.gov/egrid/data-explorer

Hydropower Like Nowhere Else

% of U.S. Total (1,745 MMT)

- ✓ WA = 10.8 MMT (0.62%)
- ✓ OR = 9.13 MMT (0.52%)

CO_2 Reductions: *Local versus Global*



https://ecology.wa.gov/air-climate/reducing-greenhouse-gas-emissions/tracking-greenhouse-gases/ghg-inventories

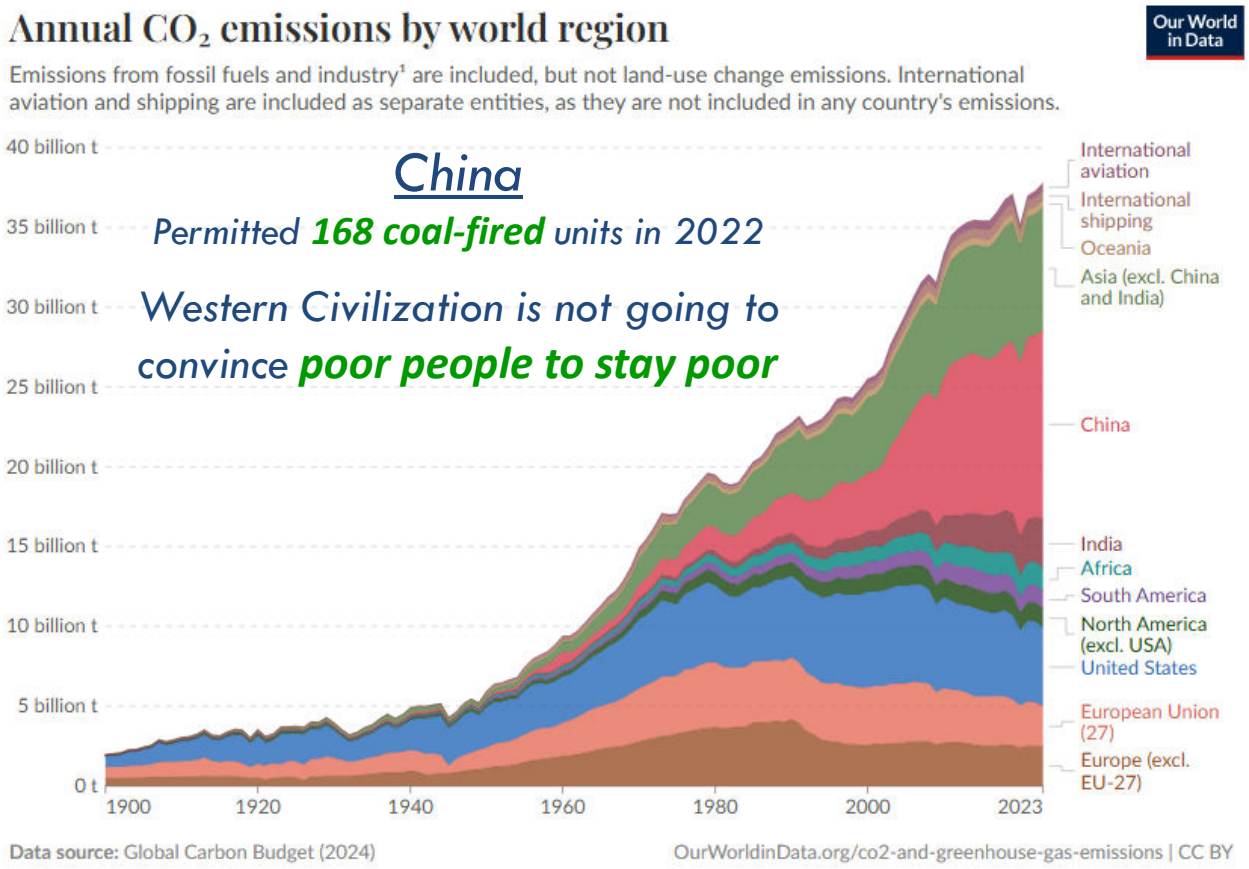
*"…cuts are necessary to **prevent** the **worst effects of climate change** on our state's coastlines, water supplies, forests, environment, and economy."*

What the rest of the world is doing matters & says something

- ***Extent & rate of CO_2 reductions***
  - ✓ *Virtue signaling vs. global impacts*

- ***Bending the Curve vs. Going Over a Cliff***
  - ✓ *Grid Reliability Risk*
  - ✓ *Increasing Energy Rates*
  - ✓ *Land-use Impacts*

"Energy Transition" *Reality Check 1 of 3*



China

*Permitted **168 coal-fired** units in 2022*

*Western Civilization is not going to convince **poor people to stay poor***

Source: https://ourworldindata.org/grapher/annual-co-emissions-by-region

Since 2007

- ✓ U.S. ***decreased*** by 1.22 billion t
- ✓ China ***increased*** by 4.92 billion t

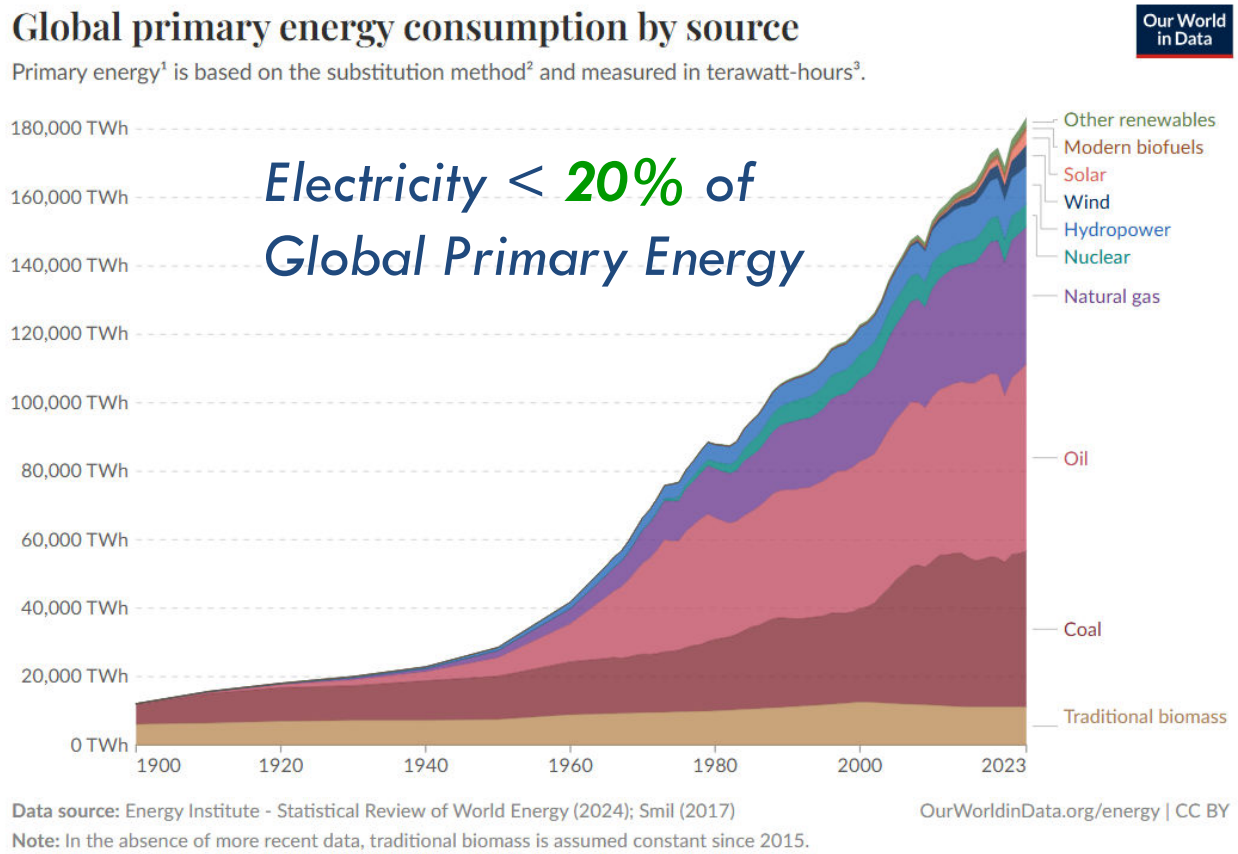
CO_2 from Energy Sector

*Washington = **0.074** billion t*

*United States = **4.91** billion t*

*China = **11.9** billion t*

"Energy Transition" *Reality Check 2 of 3*



*Electricity < **20%** of Global Primary Energy*

2.4% Wind & Solar

85% Fossil Fuels

92% CO_2 Emitting

Wood, Animal Dung, Charcoal, & Crop Residues

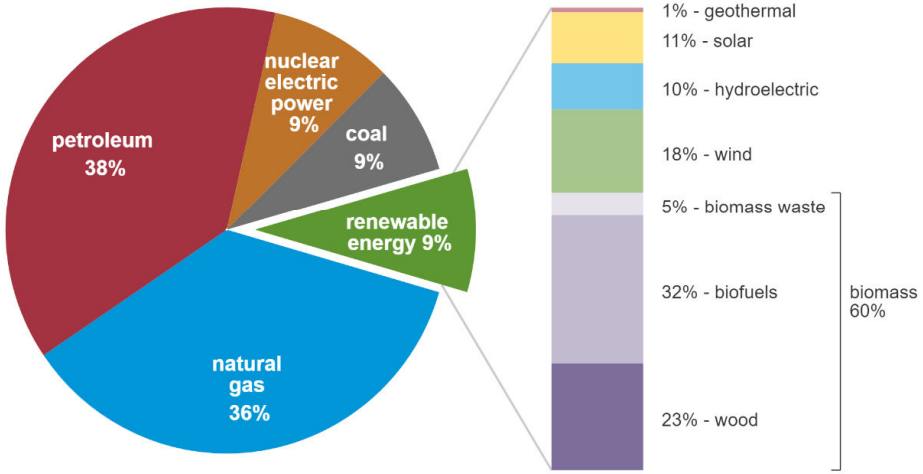
Source: https://ourworldindata.org/energy-production-consumption

"Energy Transition" *Reality Check 3 of 3*

U.S. primary energy consumption by energy source, 2023

total = 93.59 quadrillion British thermal units

total = 8.24 quadrillion British thermal units

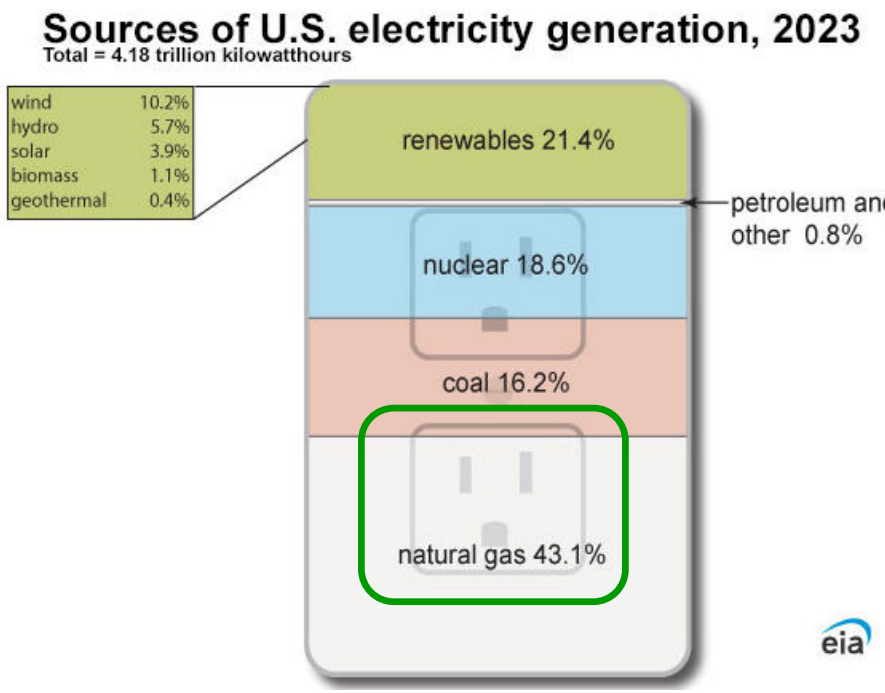


Data source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 1.3 and 10.1, April 2024, preliminary data
Note: Sum of components may not equal 100% because of independent rounding.

Wind was 18%x 9% =1.62% & Solar was 11%x9%=0.99% (Total = 2.6%)
Using non-preferred Fossil Fuel Equivalency Approach Wind & Solar Total = 5.8%

- Fossil Fuels = 83%
- Wind & Solar = 2.6% ⬅
  - Hydro = 0.9%
  - Total Renewables = 9%
- Nuclear = 9%
- *Electricity Represents 32% of total U.S. Energy*
  - Has been in the low 30% > 25 years
  - We are not "electrifying" America much

U.S. Electricity Generation



Source: https://www.eia.gov/energyexplained/electricity/

- Fossil Fuels = 60%
- Renewables = 21.4%
  - Wind & Solar = 14.1%
  - Hydro = 5.7%
- Nuclear = 18.6%
- *39% Non-CO_2 Emitting*

84% New Generation Under Development

Agenda

1. **Northwest Close to Blackouts** – How did we get here?
2. **WA & OR Clean Energy Policies** – Global & U.S. Perspectives
3. **WA Energy Strategy** – We're Coming for Your Wind MT & WY!
4. **Where Do We Go from Here?** – Near and Long Term

We're Coming for Your Wind MT & WY!

Add 10 x Columbia Generating Station Nuclear Plant

Decarbonizing the Electricity Sector

Sales in 2023 = 10,200 aMW

97% growth in electricity end use demand by **2050**

43% of electricity imported by 2050

36% from WY & MT wind

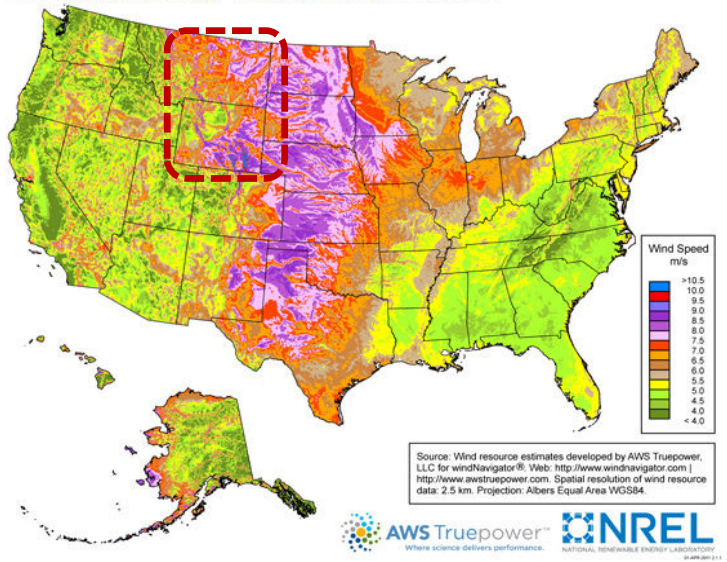
ELECTRICITY EMISSIONS INTENSITY

2020	2030	2050
85 grams/kWh	6.5 grams/kWh	0 grams/kWh

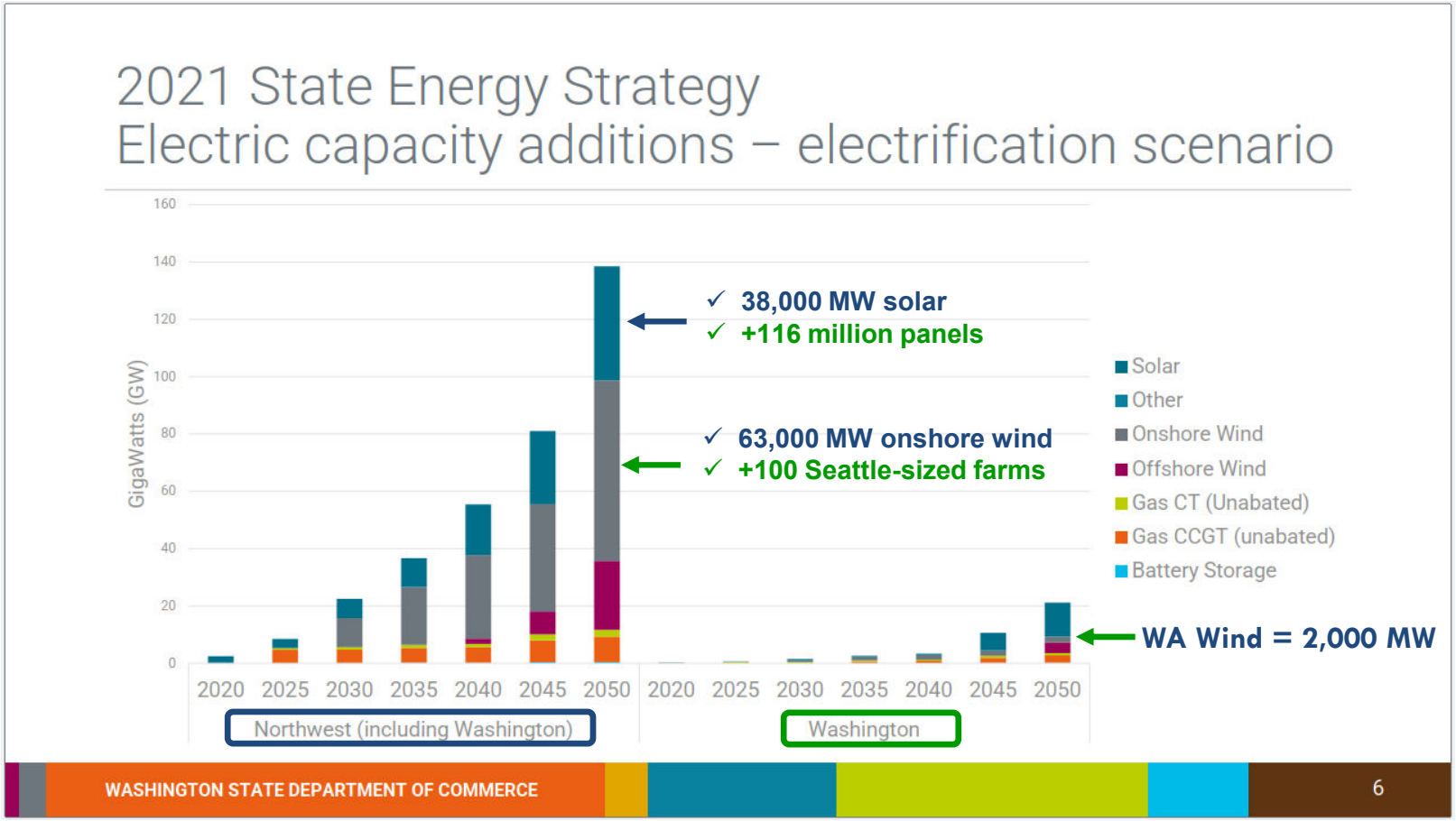
- Double end use electricity load by 2050
  - ✓ Electricity to displace fuels in transportation, industry, buildings
  - ✓ Hydrogen electrolysis and electric boilers as flexible demand resources
- Invest in new transmission capacity and renewable generation, coordinating with other states
- Develop distributed energy resources with smart grid capabilities to ensure reliability and flexibility
- Strengthen market mechanisms to ensure resource adequacy and efficient electricity markets.
  - ✓ Coordination with other states and federal government

- ✓ ***7,200 aMW = WY & MT Wind***
- ✓ *1,400 aMW = Other Imports*

U.S. annual average wind speed at 80 meters

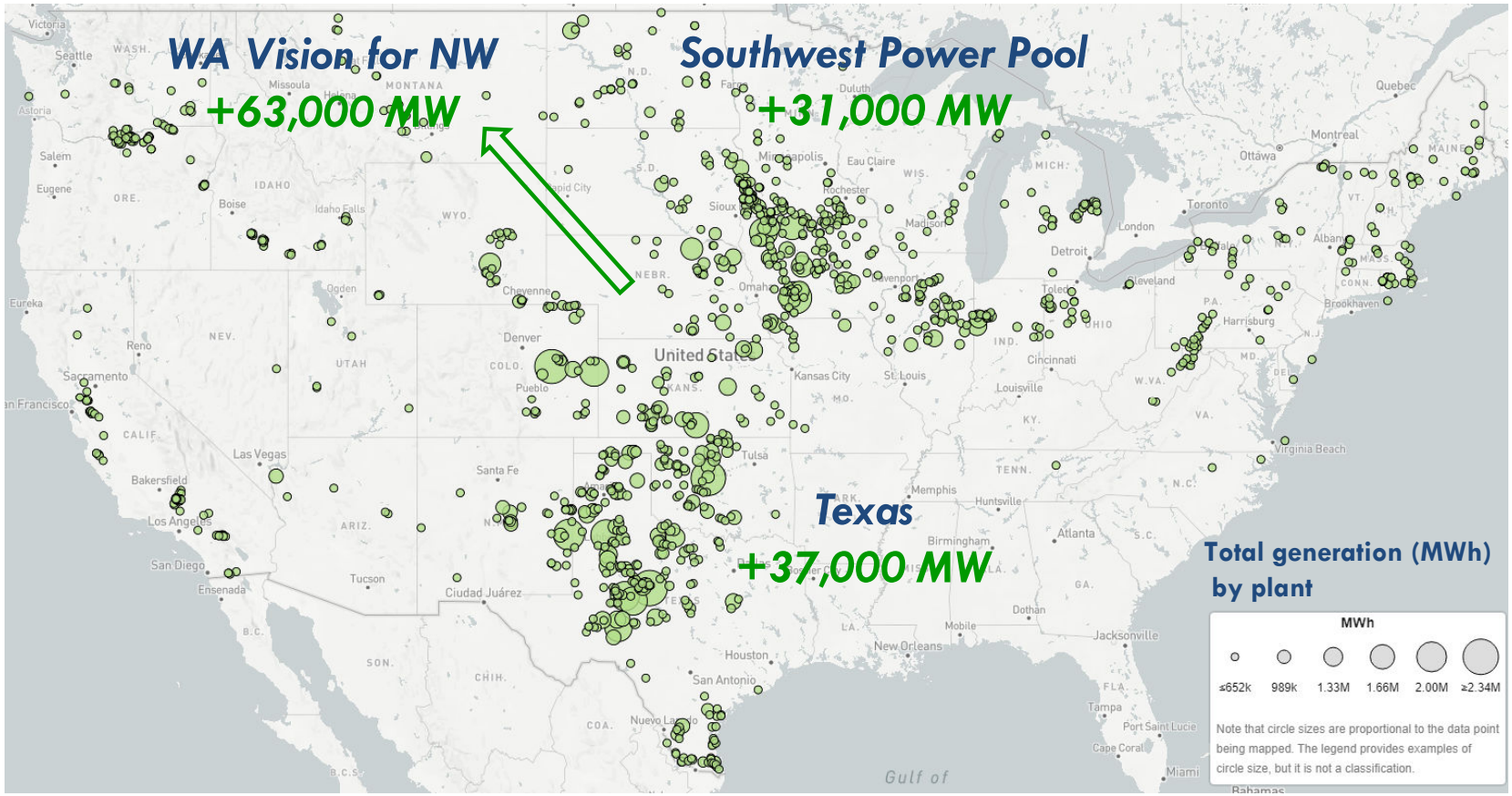


WA Energy Strategy: *Everywhere but Here*



Washington's Wind Farm *Vision for the Northwest*

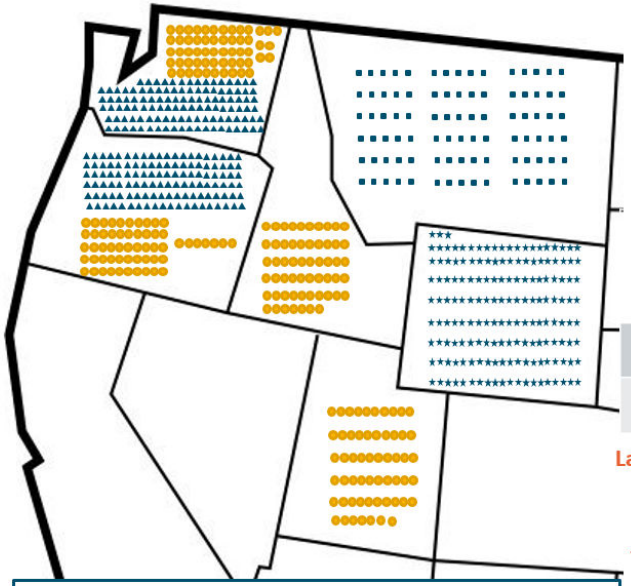
WA Policy Makers Assuming Unending Appetite for Industrial Wind Farms in Rural Areas East of Seattle & Olympia



Source: epa.gov/egrid/data-explorer

Wind & Solar: *Land Use Impacts*

Renewable Land Use
100% Reduction



Technology	Nameplate GW
Solar	46
NW Wind	47
MT Wind	18
WY Wind	33

	Solar Total Land Use (thousand acres)	Wind - Direct Land Use (thousand acres)	Wind - Total Land Use (thousand acres)
80% Clean	84	94	1,135 – 5,337
100% Red	361	241	2,913 – 13,701

Land use in 100% Reduction case ranges from

20 to 100x

the area of Portland and Seattle combined

Each point on the map indicates 200 MW.
Sites not to scale or indicative of site location.

Energy+Environmental Economics

Portland land area is 85k acres
Seattle land area is 56k acres
Oregon land area is 61,704k acres

56

Source: Public Generating Pool study by E3 Consulting submitted to WA State Legislature prior to passage of CETA

Transmission Lines Needed to Bring Wind and Solar Power to Population Centers

Assumes 100% of Existing Hydropower stays in Place

WA Energy Strategy: *Transmission Lines to the East*

- ✓ **High up front capital costs & long siting, permitting & construction *lead times***
  - 15 years or more not uncommon
- ✓ **Wildfire *legal and financial risks***
  - Risk mitigation includes *preemptive shutoffs* and blackouts

BRIEF

PG&E exits bankruptcy, but long-term wildfire risk could put it 'back in the soup'

PacifiCorp: Wildfire Insurance Costs Pose 'Material Threat' to Financial Stability

CLEARING UP • September 8, 2023

Boardman-to-Hemingway: *Tx Line Case Study*

Land crossed by the Agency Preferred Alternative

Land ownership and use (miles)			Total length (miles)	Miles within designated utility corridors	Miles co-located with existing transmission lines and pipelines
Federal	State	Private			
100	3	190	293	24	90

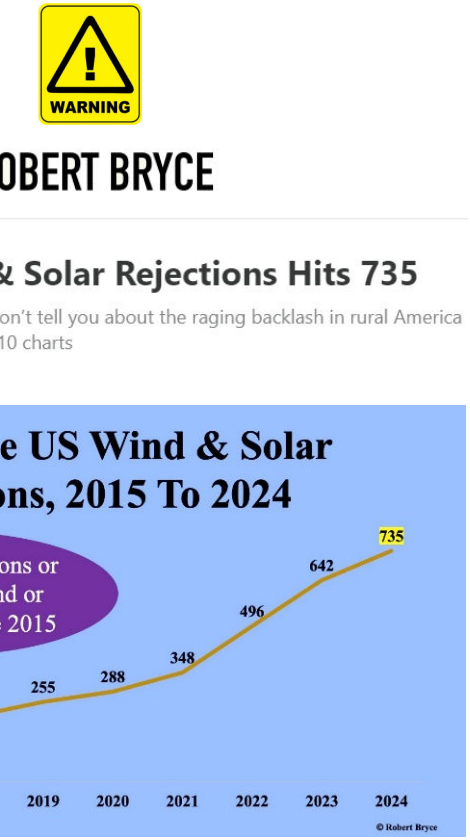
- 300 miles
- Need identified 2002
- 1,000 MW Capacity
- Project defined 2006
- Complete by 2027?

- Raises serious questions about WA doubling electricity capacity and counting on Montana & Wyoming Wind

Land-Use Conflicts: *Development Friction*

Source: https://www.americanexperiment.org/reports/not-in-our-backyard

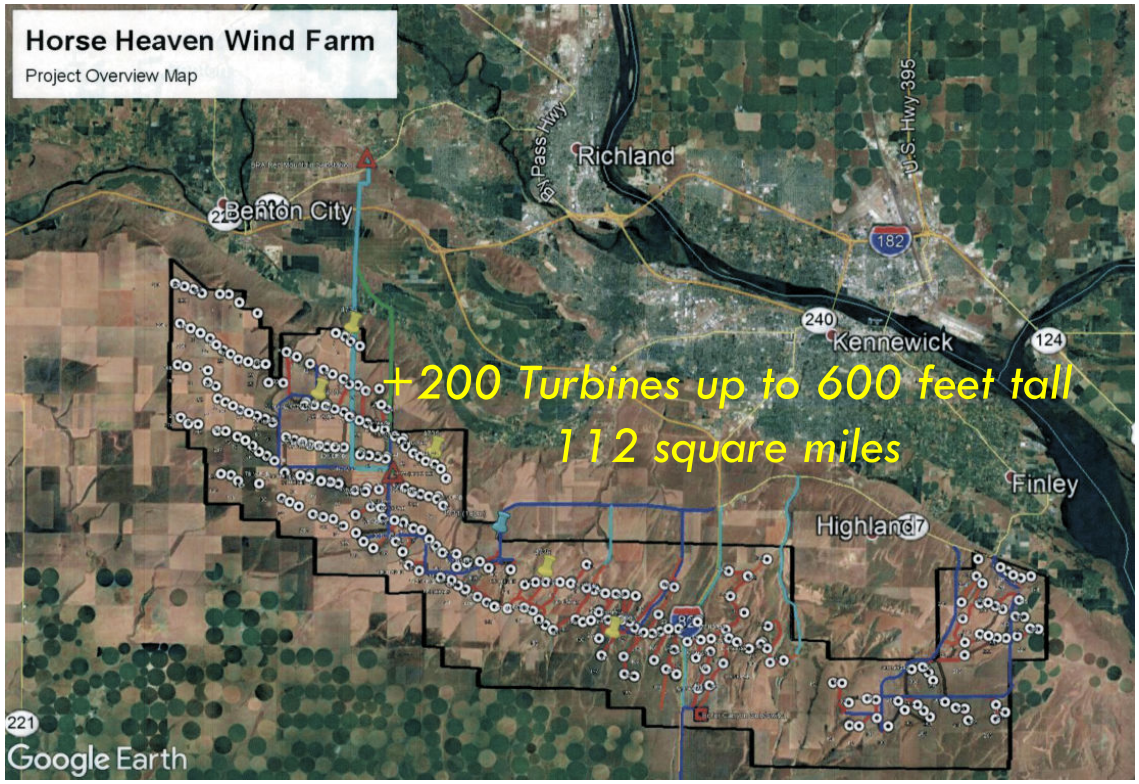
Land-use conflicts are a key issue today and those conflicts are already proving to be the limiting factor in the growth of renewables.



Tally Of US Wind & Solar Rejections Hits 735 - Robert Bryce (substack.com)

Not-In-My-Backyard: *NIMBY Case Study*

"communities and community members must have a seat at the table in designing programs and selecting projects." ***WA 2021 State Energy Strategy***



Benton County, Washington

- ✓ **Local Electricity > 95% CO_2 Free Today**
- ✓ **Developer bypassing "locals" using State EFSEC**

850 MW Nameplate
280 avg MW

47 MW
January
Effective Capacity Contribution

WARNING

Demonstrating the Landscape-Scale Impact of One Proposed Windfarm in a Rural County

Endangered Species: *Just Another NIMBY*

Washington Department of FISH & WILDLIFE

Ferruginous hawk *(Buteo regalis)*

Photo by Brett Billings - U.S. Fish and Wildlife Service

WARNING

A species native to the State of Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state.

Category:

Ecosystem

State status: Endangered

Vulnerability to climate change (More details)

Low	Low-Moderate	Moderate	Moderate-High	High

Washington Department of Fish & Wildlife has identified "***collision with wind turbines***" as one of several direct sources of mortality

Nowhere to Hide

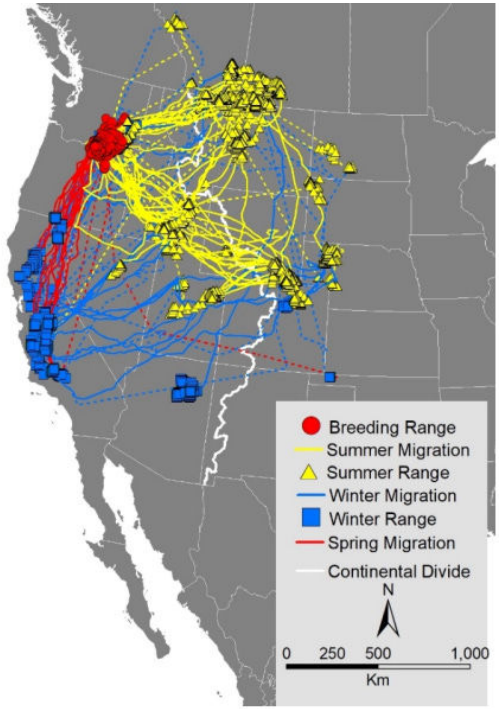


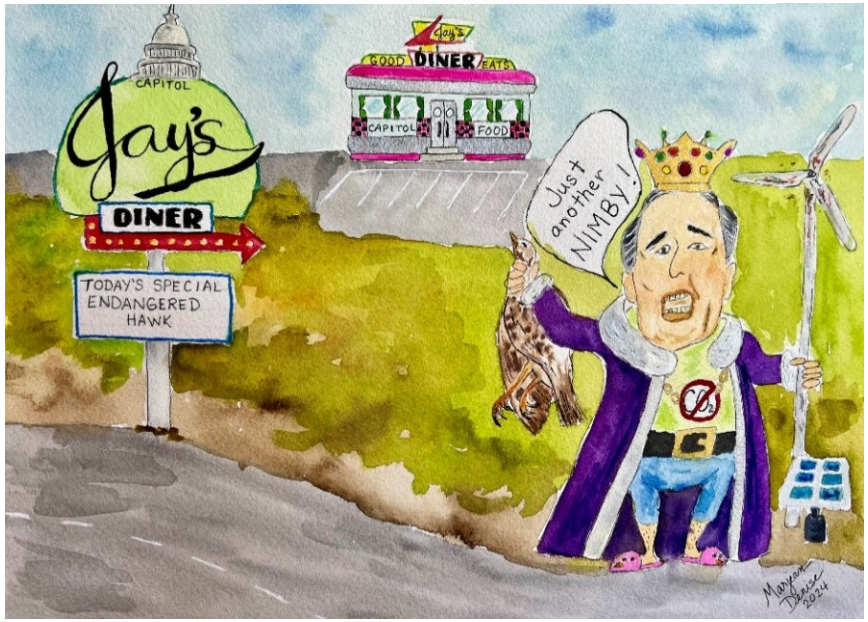
Figure 4. Year-round migration patterns of adult Ferruginous Hawks breeding in shrubsteppe west of the Continental Divide and tracked ≤6yr with satellite telemetry.

Inflaming the Rural/Urban Divide: *"Green Tyranny"*

Bold Action or Green Tyranny?

How Jay Inslee's Energy Policy Delusions and Hypocrisy are Inflaming the Urban-Rural Political Divide and Ignoring the Plight of an Endangered Species

RICK DUNN, P.E.
JUN 03, 2024



"You've got to break a few eggs to make an omelet".

Step 1

Replace Environmentalism with Climatism

Wrecking the Planet to "Save It"

Step 2

Regulatory Reforms

Preemption & Eminent Domain on Steroids

Step 3

Push the Grid to a Reliability Cliff

More wind & solar over a bigger area … and fast!

Step4

Propaganda

Our "bold actions" will change the future of the planet & there's no price too high for others to pay

https://rickdunn.substack.com/p/bold-action-or-green-tyranny

Agenda

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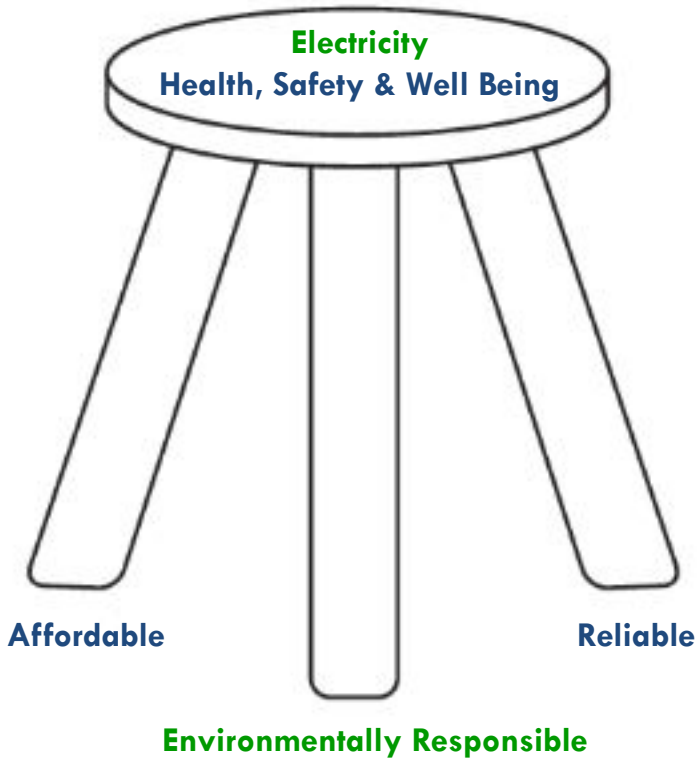
4. **Where Do We Go from Here? –** Near and Long Term

Balancing Act: *Increasingly Difficult*



- Hydropower Erosion
  - Increased **spill** & threats of **dam breaching**

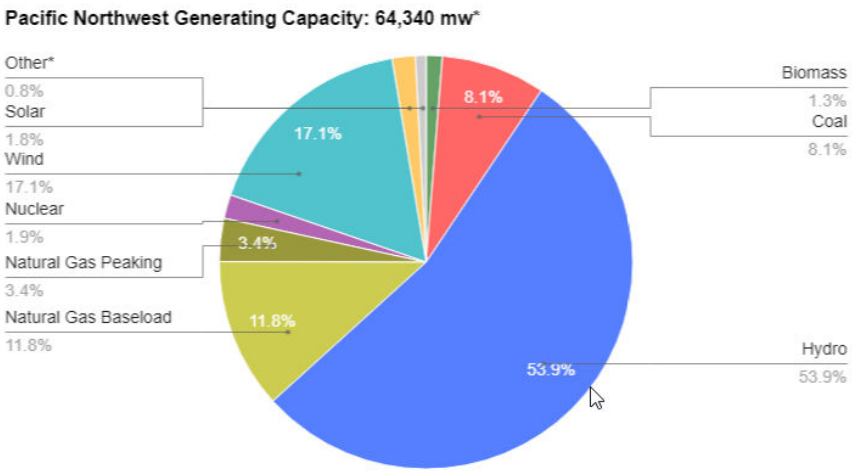
- Eliminating CO_2 valued above all factors
  - Coal-plant retirements & **no new natural gas** in WA & OR

- Wind & Solar: Weather Dependent & Energy Dilute
  - Located remotely from population centers & require vast swaths of land due to need for **extreme overbuild**

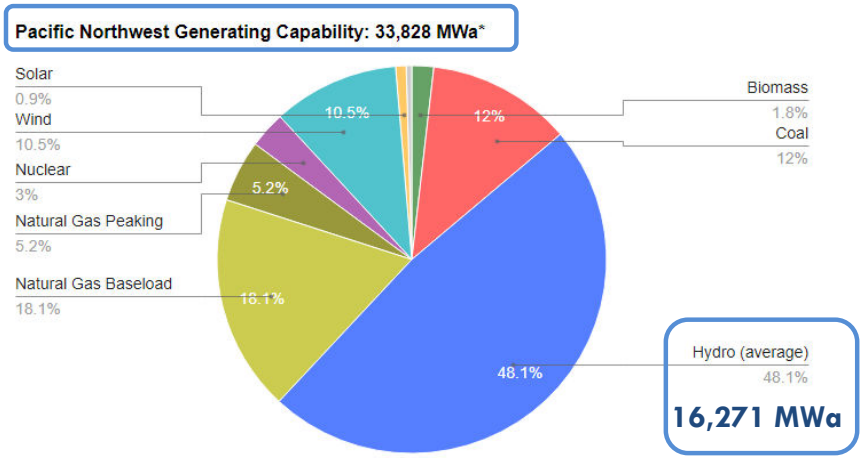
- Increasing **Costs** & Risk of **Blackouts**

Hydropower: *Foundation of Pacific Northwest Electricity Supply*

PNW Nameplate Capacity



PNW Annual Electricity Production



Capability is the maximum amount of energy the plants are capable of producing over the course of an average year. Download chart as PNG

* Other (yellow segment) includes geothermal, petroleum, and solar

Bonneville Power Administration

≈ 50% of hydro generation in average year

Source: https://www.nwcouncil.org/energy/energy-topics/power-supply

BPA Hydropower: *Foundation of Public Power Supply*

Bonneville POWER ADMINISTRATION

Federal Power Marketer

- **31 Federal Hydroelectric Dams**
- **Columbia Generating Station Nuclear Plant**

Statutory Rights

- ✓ ***Benton PUD***
- ✓ ***Benton REA***
- ✓ ***Franklin PUD***
- ✓ ***Richland***

Customers

Cooperatives	54
Municipalities	42
Public utility districts	28
Federal agencies	7
Investor-owned utilities	6
Direct-service industries	1
Port districts	1
Tribal utilities	3
Total	142

- Investor-Owned Utilities ***do not receive*** physical firm electricity
  - Receive ***financial payments*** on behalf of residential & farm customers (residential exchange program)

BPA Hydropower: *Firm Energy is Spoken For*

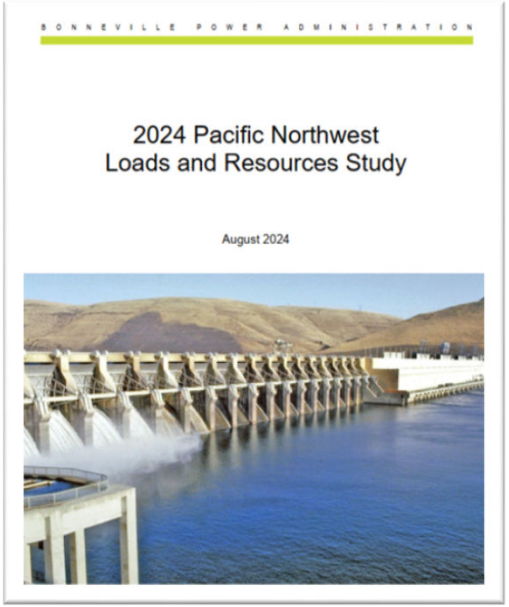
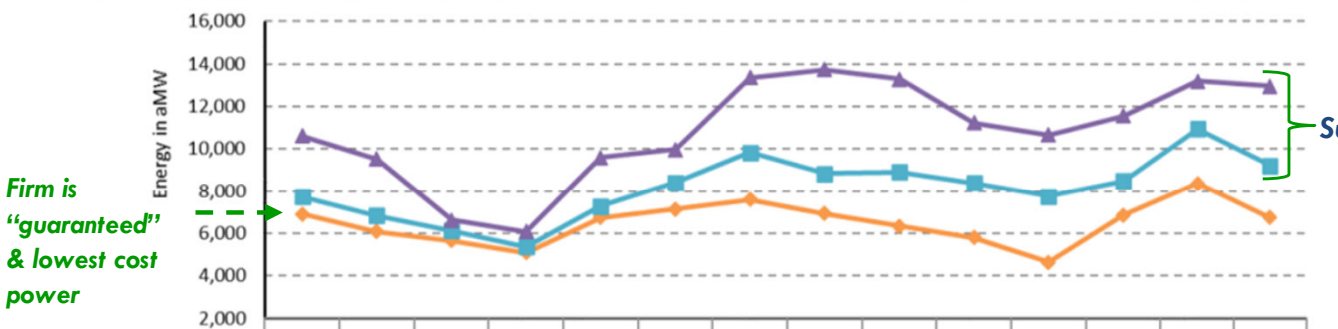


Table 2-9 Federal System Monthly Hydro Generation Variability by Streamflow Conditions – OY2025



	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Firm Water (P10)	6,905	6,077	5,649	5,072	6,731	7,148	7,586	6,928	6,333	5,800	4,635	6,856	8,360	6,732
Median Water (P50)	7,727	6,835	6,121	5,357	7,284	8,416	9,840	8,830	8,904	8,395	7,748	8,484	10,931	9,220
High Water (P90)	10,620	9,522	6,620	6,070	9,601	9,962	13,355	13,732	13,291	11,224	10,652	11,567	13,185	12,956

1. *Lowest-cost firm Tier-1 Federal Hydropower is spoken for: < $40 per MWh*
2. *Surplus meets demand above Tier-1 (new demand < 10 aMW): $67 to $70 per MWh (+75% higher than Tier-1)*
3. *Electricity Intensive Demand > 10 aMW (NLSL): $92 to $144 per MWh based on month (130 to 260% higher than Tier-1)*

Federal & State: *Threats to Hydro*

RICKDUNN.SUBSTACK.COM

Sawing Off the Branch We're Sitting On and Deepening our Dependence on Northwest Hydro for 'Blackout Insurance'

Washington and Oregon have Teamed with the Federal Government to Undermine the Very Hydropower on Which 100% Clean Electricity Mandates were Based

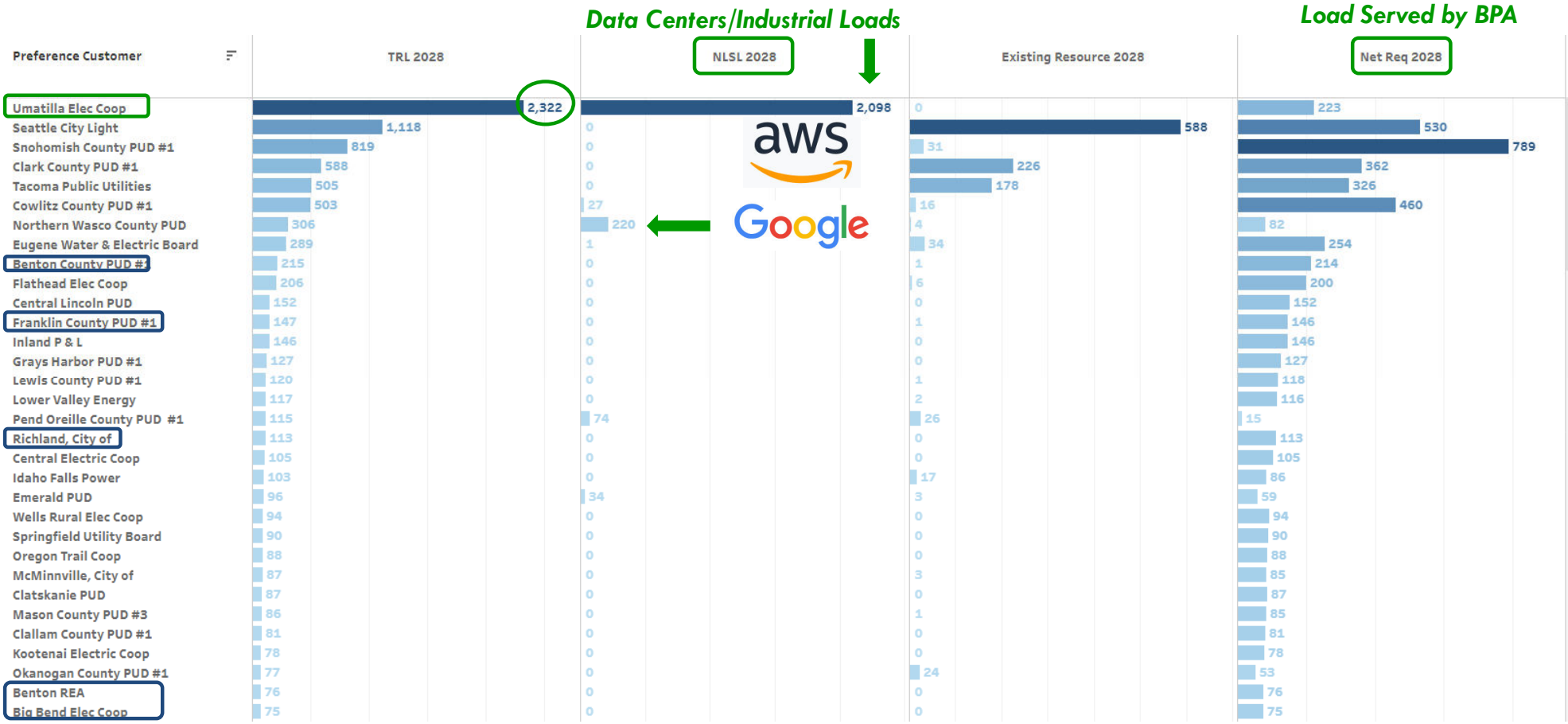
- ***Risky & Excessive Spillway Flows***
  - *125% Total Dissolved Gas*
- ***Water Temperature Regulation***
  - *Washington Stds. may be Impossible to Meet*
- ***U.S. Government Commitments***
  - *"12/14 Agreement" with "6 Sovereigns"*
  - *Washington, Oregon & 4 Tribes - NOT Montana*
  - *Failed to Engage Utility Sector*
- ***Lower Snake River Dam Breaching***
  - *"Centerpiece Action" for Salmon Recovery*

Tri-Cities Area: *Electricity Demand*

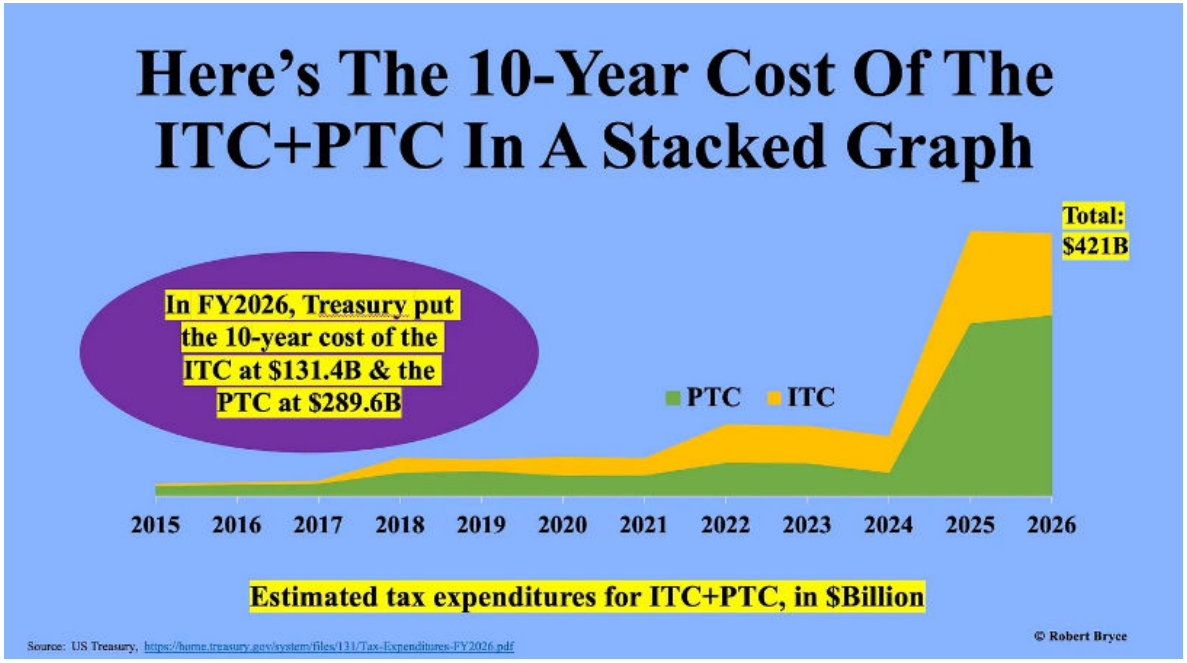
Utility	2028 Forecast MWa
Benton PUD	215
Franklin PUD	147
City of Richland	113
Benton REA	76
Big Bend Electric Coop	75
TOTAL	**626**

Umatilla Electric = 2,322 MWa

BPA Firm Energy: *Where it Flows & Doesn't*



Interconnection Queue: *ITC & PTC Feeding Frenzy*



Source: https://robertbryce.substack.com/p/heres-the-real-hockey-stick

Robert Bryce

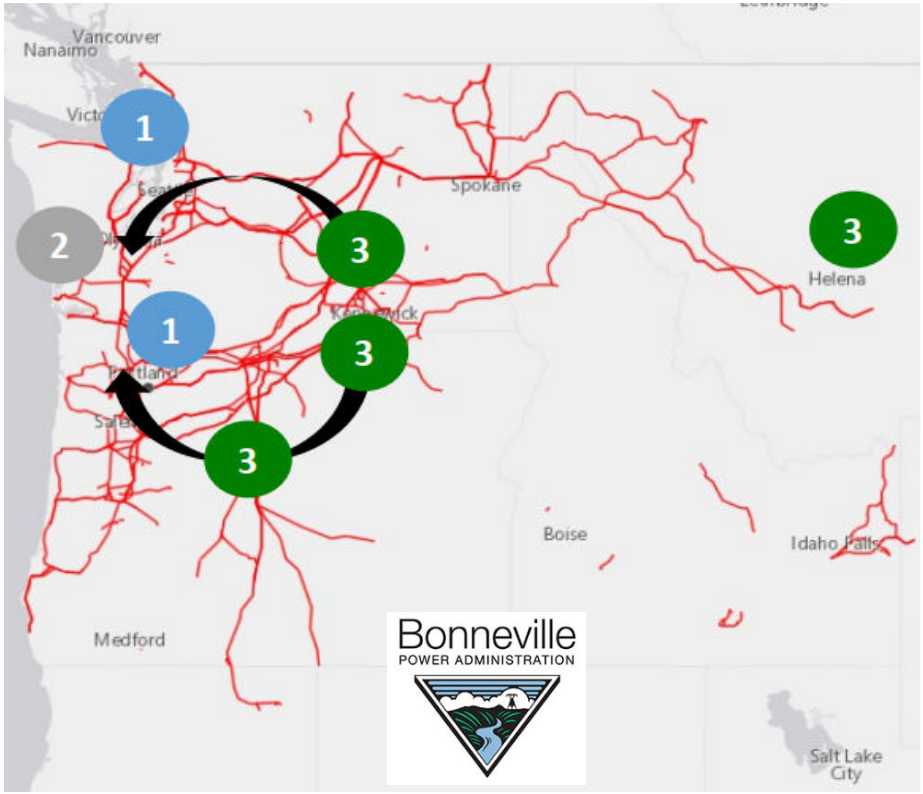
Energy, power, innovation, and politics.

*"… over the coming decade, thanks to the ITC+PTC, the alt-energy sector will get nearly **18 times more** in federal tax credits than the entire hydrocarbon sector*

*"…and **nine times** more than the nuclear sector."*

BPA Transmission Lines: *Critical to All NW Utilities*

BPA Owns & Operates 75% of NW Grid



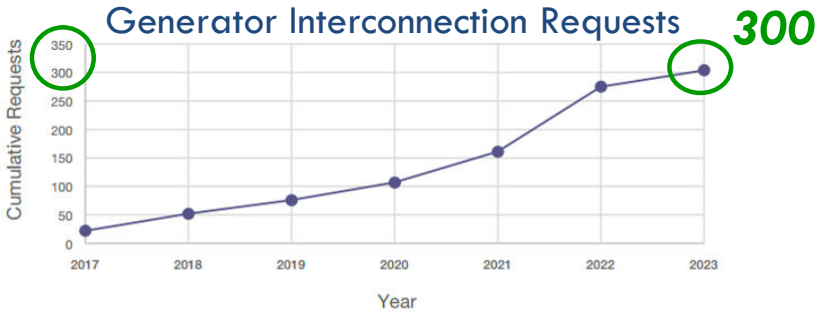
The following factors:

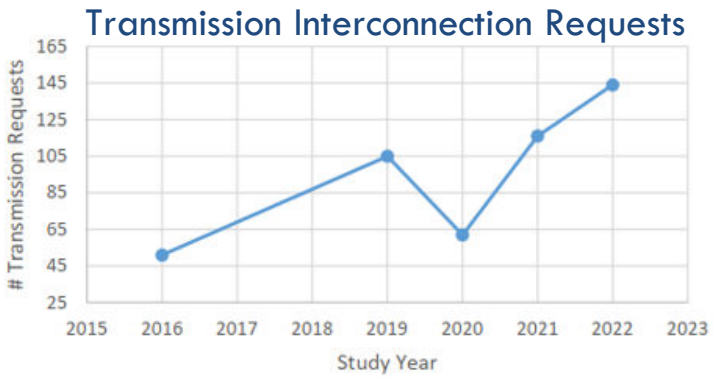
1. Load growth in Portland and Seattle – driven by high tech industry, transportation and building electrification
2. Reduced operation of 4.5 GW of carbon emitting generators on the west side along the I5 corridor
3. Replacement wind and solar resources are located east of the Cascades

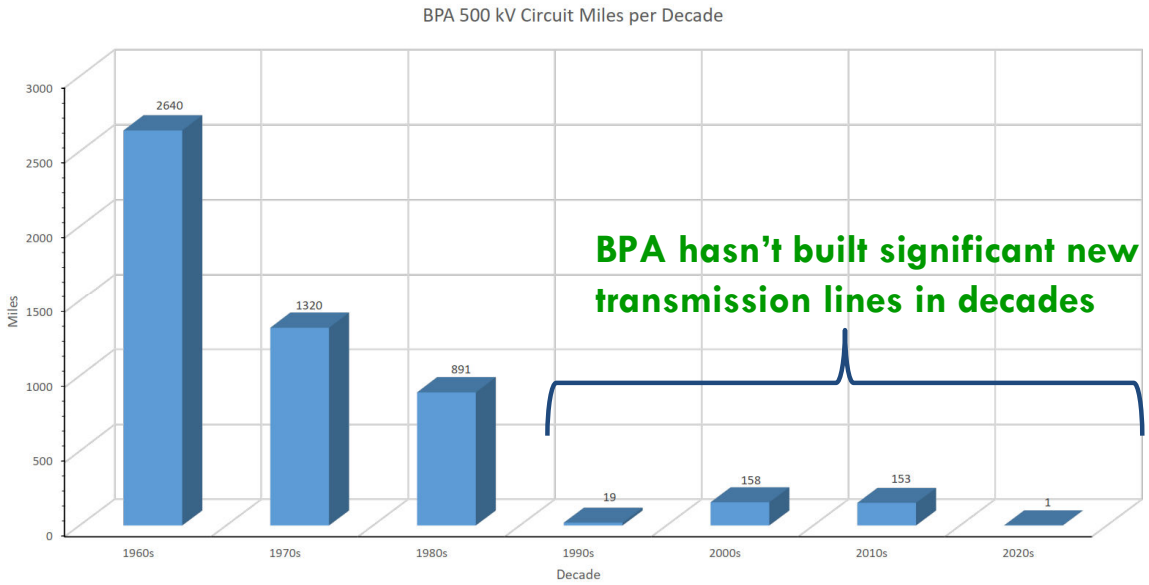
Will increase flows on cross-Cascades transmission paths and throughout the load centers

Source: BPA April 2023 Presentation "The Evolving Grid Update on the State of Transmission"

BPA Transmission: *Interconnection Frenzy*







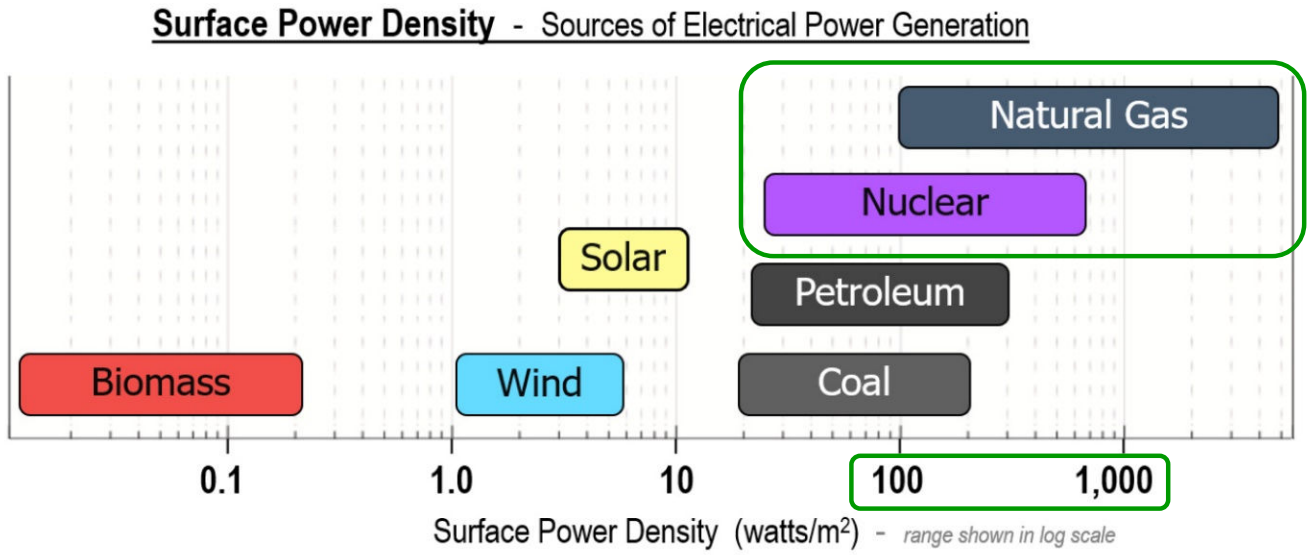
CLEARING UP
An Independent News Service from NewsData

TOP STORY

BPA Transmission Expansion Study Hits a 'Brick Wall'

Steve Ernst Mar 1, 2024

Rebalancing 3-Legged Stool: *Finding Common Ground*



(image source: Ecotech Advisors, Inc. Only renewable energy sources that are site agnostic are considered. Data source: "The spatial extent of renewable and non-renewable power generation: A review and meta-analysis of power densities and their application in the U.S." (John van Zalk & Paul Behrens, 2018))

What if we built:

- ✓ **As Little Transmission as Absolutely Necessary**
- ✓ **Reliable Generation Plants**
  - ***Energy-Dense with small-footprints***
  - ***Low or no-CO_2***
  - **Closer to where people live**

Best of the Above!

Big Tech Knows: *Reliable = Natural Gas + Nuclear*

Big Tech's "Dirty Little Secret"

Natural Gas Power + Renewable Energy Certificates

"Greenwashing"

https://rickdunn.substack.com/p/wind-and-solar-green-industry-fantasyland

Wind & Solar 'Green Industry' Fantasyland #1

How 'Big Tech's' 100% renewable deception, detached from reality politicians, and the legacy of Northwest hydropower are fueling false hopes of industrial development in Washington and Oregon.

RICK DUNN, P.E.
FEB 25, 2024

CNBC MARKETS BUSINESS INVESTING TECH POLITICS VIDEO INVESTING CLUB PRO LIVESTREAM

ENERGY

AI could drive a natural gas boom as power companies face surging electricity demand

PUBLISHED SUN, MAY 5 2024•6:53 AM EDT | UPDATED SUN, MAY 5 2024•12:00 PM EDT

Spencer Kimball
@SPENCEKIMBALL

SHARE

Driving Nuclear Renaissance

AWS acquires Talen's nuclear data center campus in Pennsylvania

Cloud company pays $650 million – plans 960MW campus

March 04, 2024 By: Dan Swinhoe Have your say

CNBC MARKETS BUSINESS INVESTING TECH POLITICS VIDEO INVESTING CLUB PRO LIVESTREAM

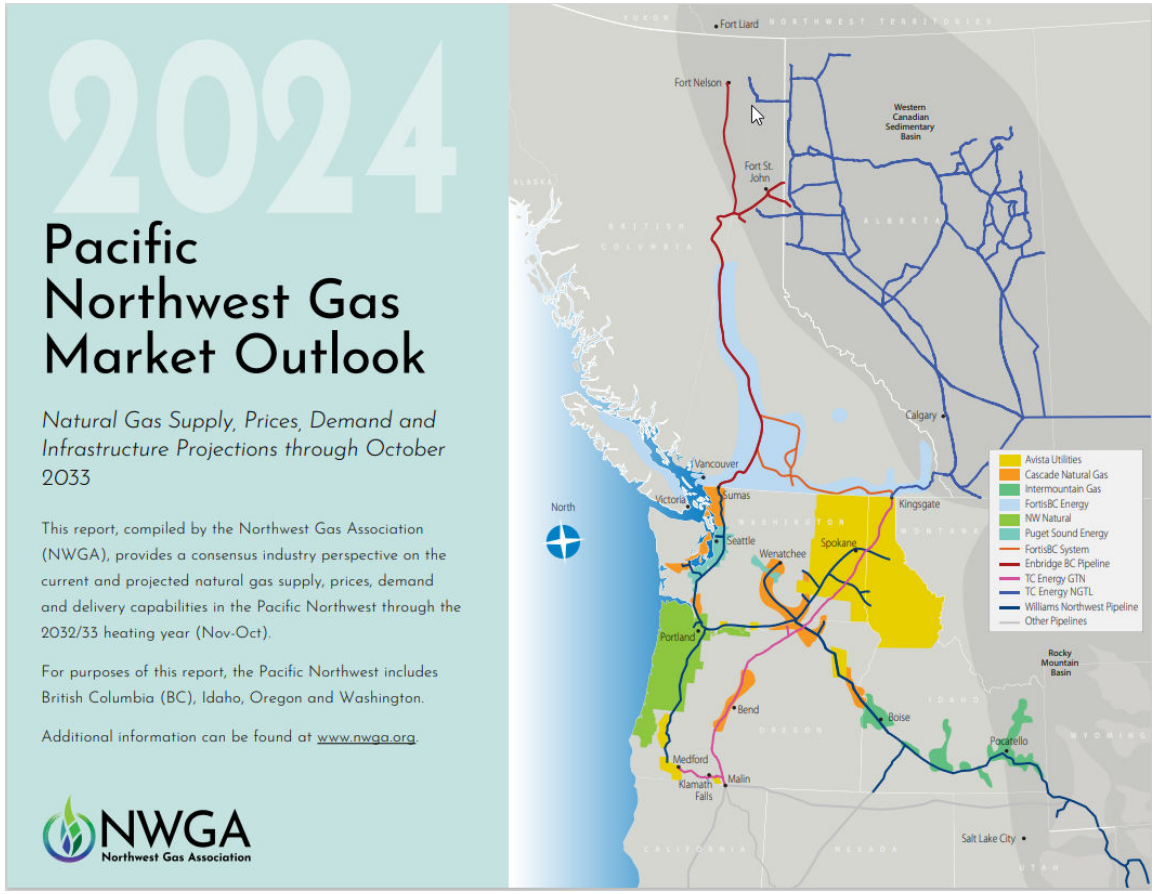
Constellation Energy to restart Three Mile Island nuclear plant, sell the power to Microsoft for AI

PUBLISHED FRI, SEP 20 2024•7:22 AM EDT | UPDATED 2 HOURS AGO

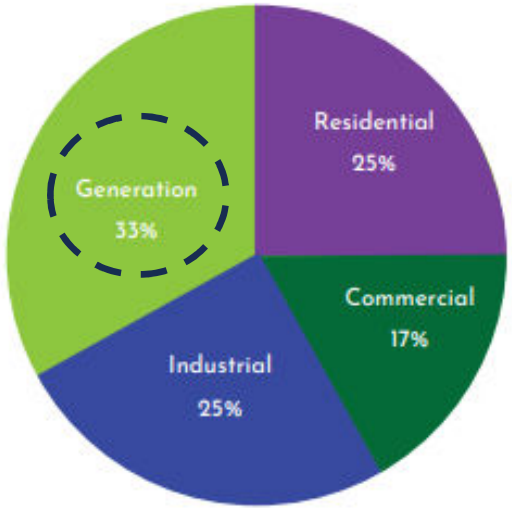
Spencer Kimball
@SPENCEKIMBALL

SHARE

Natural Gas: *Policies vs. Reality*



How Natural Gas is Used in the Pacific Northwest

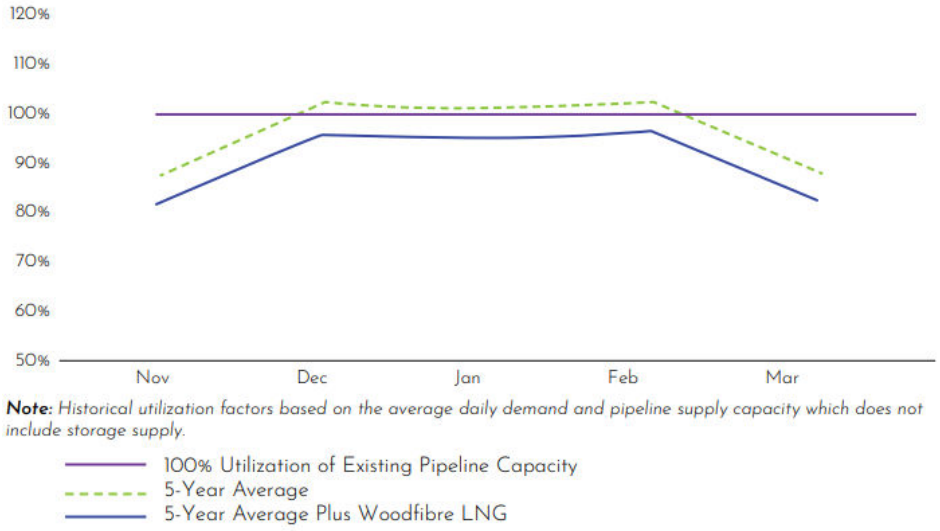


More than half of the total energy consumed in the region — either used directly for space and water heat or in industrial processes, or as gas-generated electricity. (Excludes transportation uses.)

Natural Gas: *We need you, but WA/OR policies hate you!*

*Pipeline Capacity **Maxed Out***

FIGURE 12. Regional Pipeline Capacity Utilization

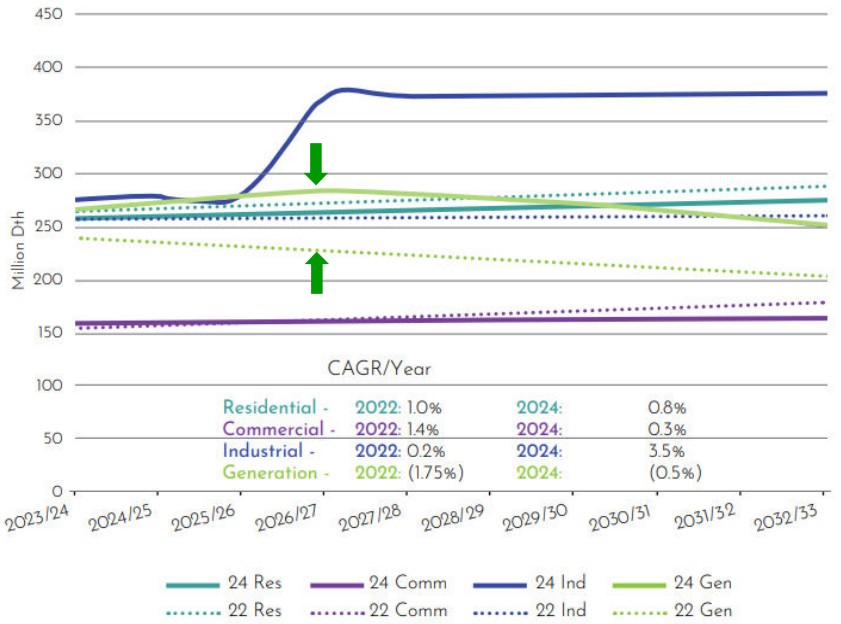


Note: *Historical utilization factors based on the average daily demand and pipeline supply capacity which does not include storage supply.*

"The region's existing storage assets would not be able to make up the 90-day capacity deficiency if the region experiences a cold winter."

*Increased NG **electricity generation***

FIGURE 8. Expected Case Forecast by Economic Sector – 2022 to 2024 Comparison



✓ ***replace decommissioned coal plant power***
✓ ***balance intermittent renewable sources***

Land-Use vs. CO_2 Footprint: *Finding Common Ground*

An artist's rendering of NuScale Power's small modular nuclear reactor plant. Photo courtesy of NuScale

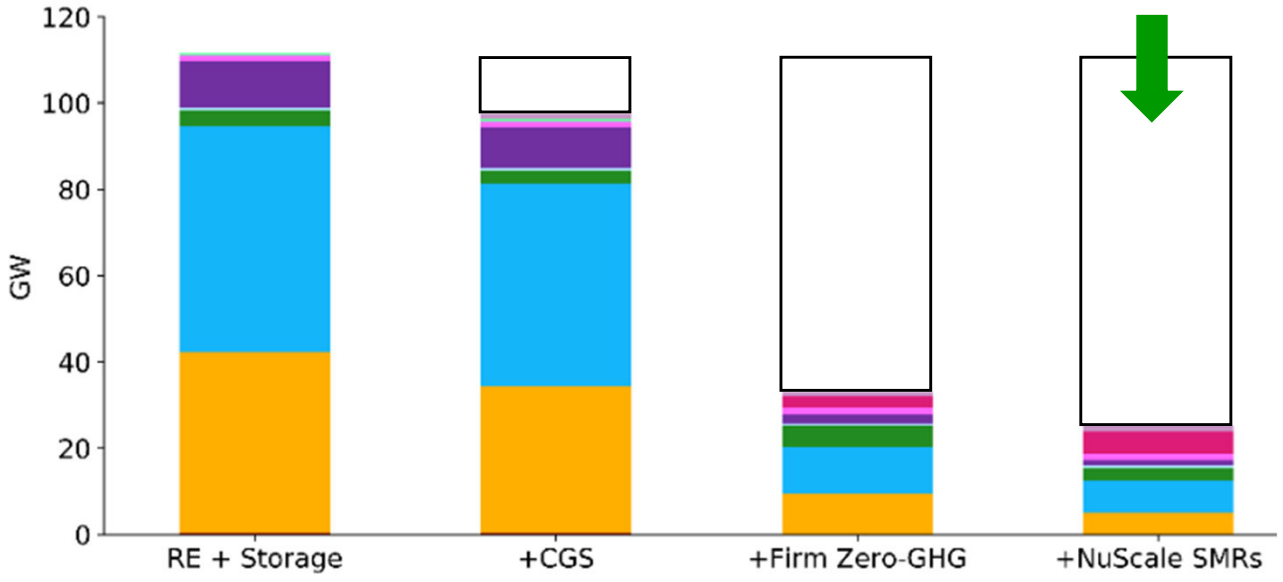
Energy contained in a ***gummy bear pellet*** *of uranium fuel*

= ***2,000 pounds*** *of coal*

Benefits of zero-emitting firm capacity at 100% GHG reductions

Avoids 80 to 150 Seattle-Sized Wind Farms & 112 M solar panels

100% GHG Reduction Portfolios



Adding	Avoids
+1.2 GW CGS	-9.5 GW Storage
+5.3 GW SMRs	-44.8 GW Wind
	-37 GW Solar
+6.5 GW Firm	-91 GW Non-firm

CGS + NuScale SMRs reduce system costs by almost $8B per year relative to RE + Storage

New Nuclear: *Gaining Momentum*

ARDP Grant New Recipient #1
Breaking Ground in 2026
"completed by end of decade"

Nuclear

X-Energy, Dow Unveil Texas Site for ARDP Nuclear Demonstration

X-energy and Dow will site a proposed four-unit 320-MWe Xe-100 advanced nuclear reactor facility at Union Carbide Corp. Seadrift Operations, a sprawling Dow chemical materials manufacturing site in Seadrift, Calhoun County, Texas.

ARDP Grant Recipient #2
Breaking Ground Now
2030 Operational Goal

Amazon Steps Up for *Site-1 SMR*

On-Line Goal = Early 2030s

energy amazon

ENERGY NORTHWEST

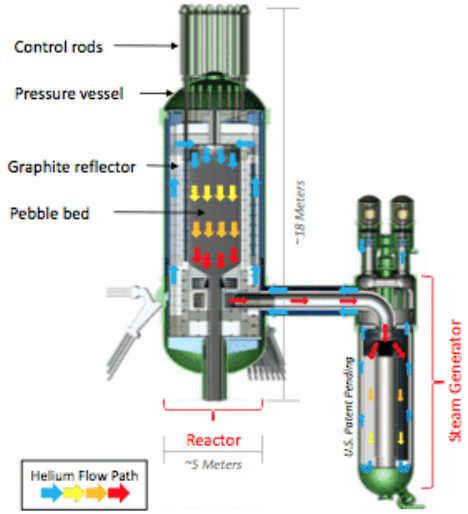
- ✓ Amazon providing development funding for ***4 modules***
- ✓ Energy Northwest has option to build additional ***8 modules***
  - Additional power available to ***Amazon and northwest utilities***

"Long Game" Solution: *Scalable, CO2-Free & Safe*

High Initial Cost, Supply-Chain Constrained & Operationally Unproven

Meltdown-Proof

The Xe-100 Reactor Cannot Melt Down

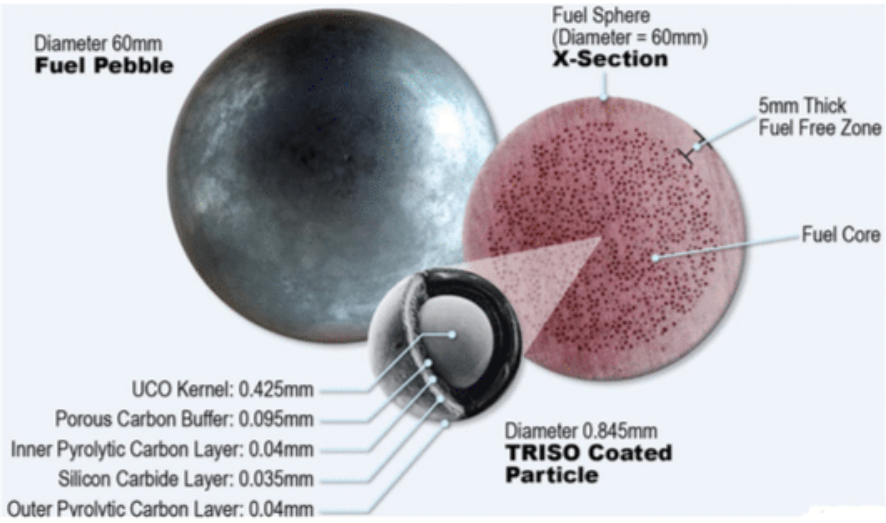


Xe-100 Reactor Benefits

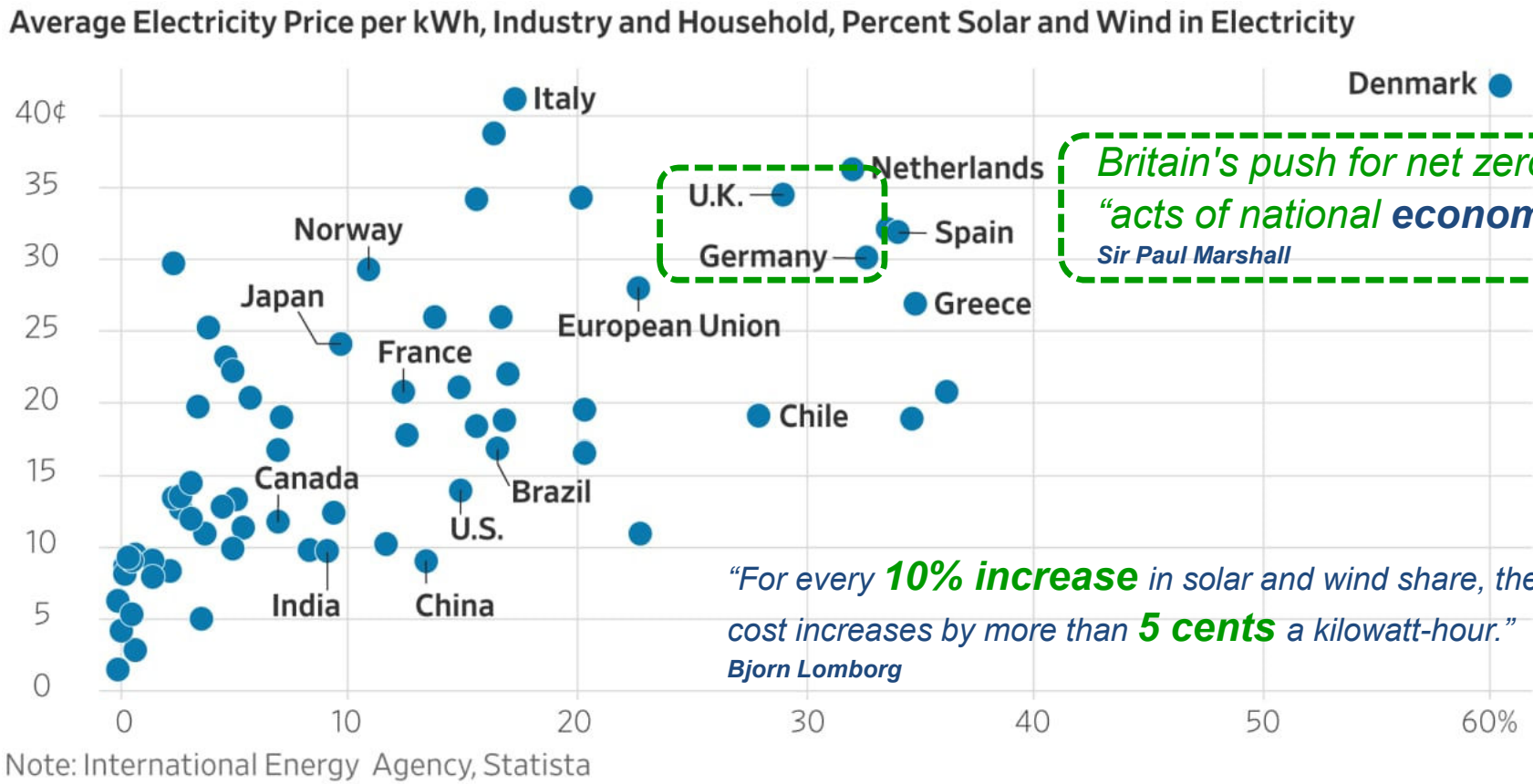
- Helium transports heat from the reactor to the steam generator; no cooling fluid required
- Reactor core design eliminates the possibility of meltdown
- On-line refueling allows for continuous operations
- Able to quickly respond to energy demands
- Used fuel is proliferation resistant

Walk-Away-Safe

Fuel is the Key to Unsurpassed Safety



Increased Costs: *"Cheap" Wind & Solar is a Lie*



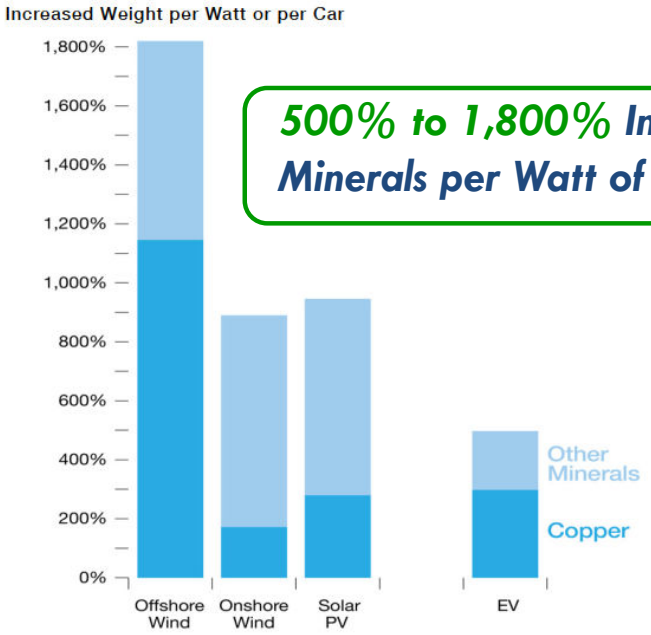
Britain's push for net zero are:
"acts of national ***economic suicide****."*
Sir Paul Marshall

"For every ***10% increase*** *in solar and wind share, the electricity cost increases by more than* ***5 cents*** *a kilowatt-hour."*
Bjorn Lomborg

Wind & Solar: *Land & Mineral Intensive*

6. ENERGY TRANSITION HARDWARE RADICALLY INCREASES THE DEMAND FOR MINERALS

Mineral Demands for Solar, Wind, and EV to Replace Hydrocarbon Machines

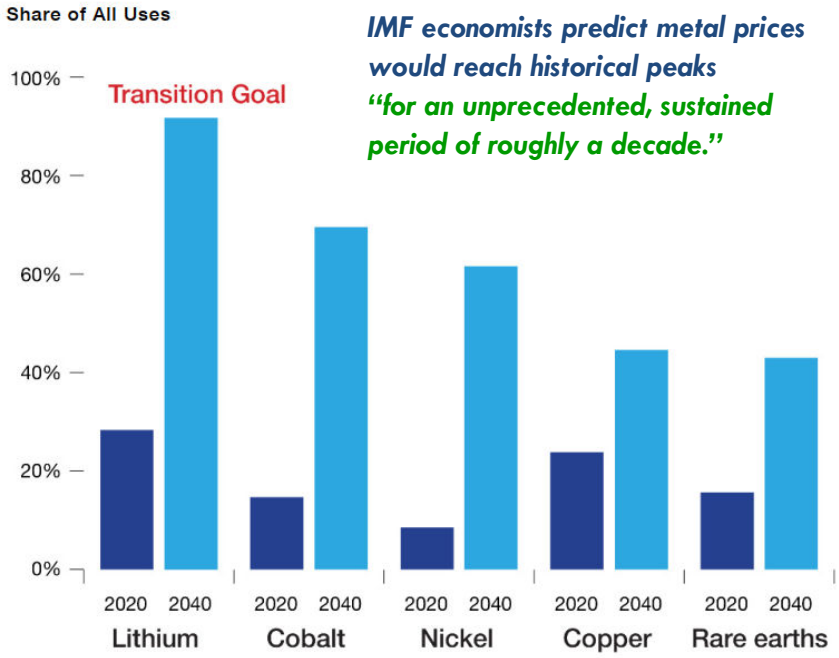


500% to 1,800% Increase in Minerals per Watt of Electricity

Source: "The Role of Critical Minerals in Clean Energy Transitions," World Energy Outlook Special Report, International Energy Agency (IEA), May 2021

7. ENERGY TRANSITION POLICIES ARE INFLATIONARY

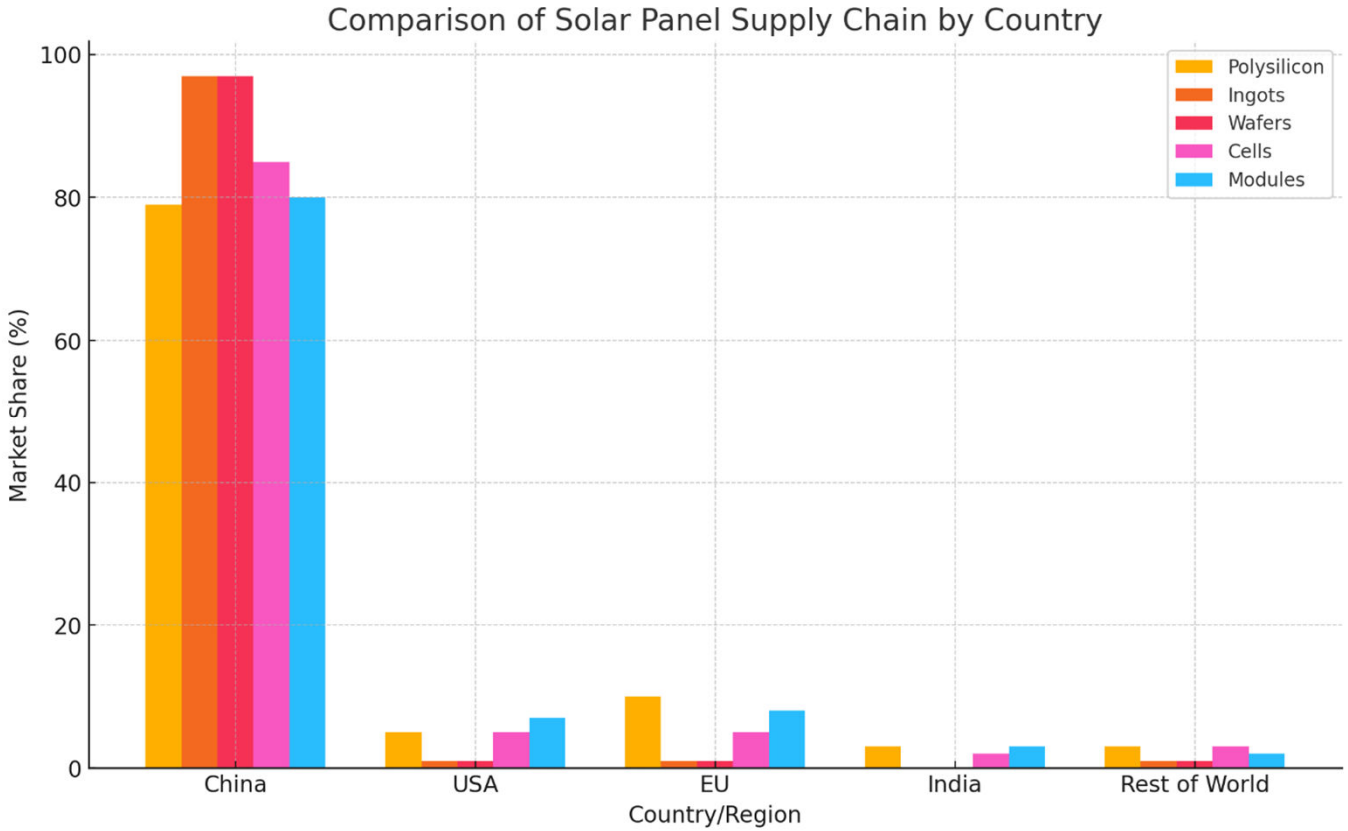
Energy Sector Share of Mineral Demands for All Purposes



IMF economists predict metal prices would reach historical peaks "for an unprecedented, sustained period of roughly a decade."

Source: IEA, "The Role of Critical Minerals in Clean Energy Transitions," 2021

Coal-Fired Manufacturing: *Deep Reliance on Chinese Solar*



Source: ChatGPT using International Energy Agency Data

*"A **majority** of all new generation capacity under development is for **solar** energy (**51%**), followed by wind (33%) and natural gas (7%)."*

APPA 2024 Update
https://www.publicpower.org/periodical/article/appa-report-says-nearly-468000-mw-new-generation-capacity-under-development

Unspoken Environmental Costs: *Cradle-to-Grave*

If You Want 'Renewable Energy,' Get Ready to Dig

Building one wind turbine requires 900 tons of steel, 2,500 tons of concrete and 45 tons of plastic.

By
Mark P. Mills
Aug. 5, 2019 6:45 pm ET

Wind turbines in Palm Sprines. Calif.. July 13. 2017. PHOTO: PAUL BUCK/EUROPEAN PRESSPHOTO AGENCY

ARGUMENT

The Limits of Clean Energy

If the world isn't careful, renewable energy could become as destructive as fossil fuels.

BY JASON HICKEL | SEPTEMBER 6, 2019, 8:51 AM

- ✓ All energy conversion technologies involve *Environmental Tradeoffs*
- ✓ Social *cost of carbon* should not be the only environmental metric

INVESTING

The battery decade: How energy storage could revolutionize industries in the next 10 years

PUBLISHED MON, DEC 30 2019·11:55 AM EST | UPDATED MON, DEC 30 2019·3:25 PM EST

WIRED on Energy

The spiralling environmental cost of our lithium battery addiction

As the world scrambles to replace fossil fuels with clean energy, the environmental impact of finding all the lithium required could become a major issue in its own right

Federal vs. State Policies: *Shifting Priorities*

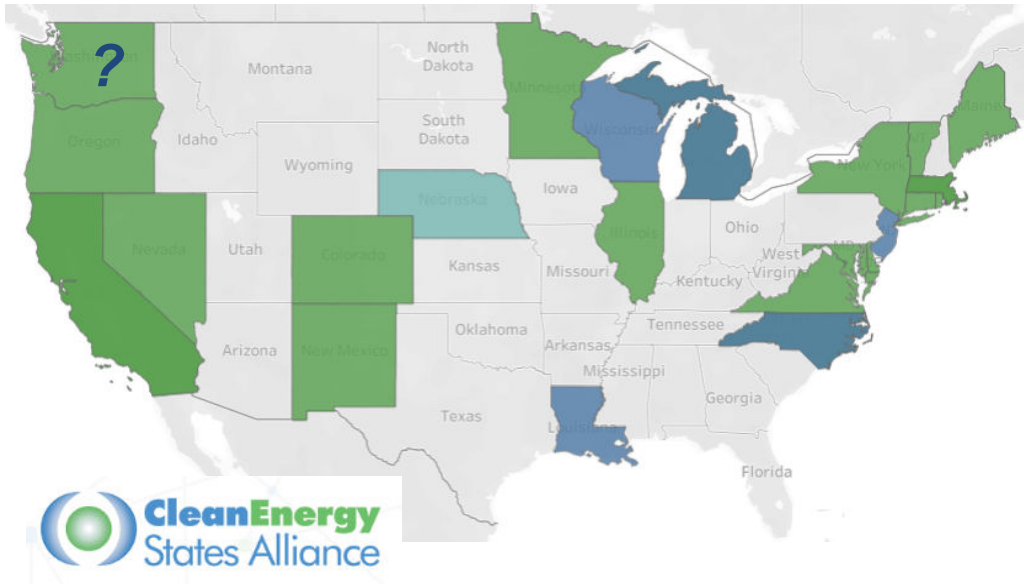
Charting a New Direction in U.S. Energy Policy or Irreconcilable Differences?

Secretary Wright Acts to "Unleash Golden Era of American Energy Dominance"

U.S. Secretary of Energy Chris Wright signed his first Secretarial Order today directing the Department of Energy to take immediate action to unleash American Energy in accordance with President Trump's executive orders.

- "Net-zero policies ***raise energy costs*** for American families and businesses, ***threaten the reliability*** of our energy system, and undermine our energy and national security."
- "They have also ***achieved precious little in reducing global greenhouse gas*** emissions."

100% Renewable/Carbon-Free



Conclusions: *Solutions*

"Climate & Energy Realism"

1) Keep Every Drop of Northwest Hydropower

- Optimize Investments in ***Fish & Wildlife*** Programs (Habitat, Hatcheries, Harvest & Hydro)

2) Eliminate Outsized Federal Tax Subsidies for Wind & Solar

- Stop the ***Bleeding*** - Premature Retirement of Dependable Coal & Natural Gas is a Reliability Crisis of our Own Making
- Allow Wind & Solar to ***Compete*** on a More Level Playing Field

3) Keep Natural Gas on the Table

- Continue to ***Bend the CO_2 Curve*** without Going Off a ***Reliability & Cost Cliff***
- Investments in Pipeline Capacity & Storage

4) Nuclear is the Long Game Solution

- Energy Security is National Security
- Forward Looking & ***Globally Impacting***

Natural-Gas-to-Nuclear: *N2N*

Source: ChatGPT DALL•E

*"How about an energy future of **abundance and human flourishing**, not one based on unprecedented land grabs, intermittency, variability, and scarcity."* Me

- ✓ ***Reliable*** *& Resilient*
- ✓ *Energy-Dense &* ***Small Footprint***
- ✓ *Built Close to Where* ***People Live***