

Transmission & 100% Clean By 2040

Oregon Global Warming Commission

November 15, 2021

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&
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Topics

- 1) Grid Basics – Role of Transmission
- 2) Regional Transmission
 - Physical
 - Markets
- 3) 100% Clean Energy Targets & Scale of New Renewables
- 4) Renewables & Transmission
- 5) Transmission Planning for Renewables

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Electric Grid Basics

Generation

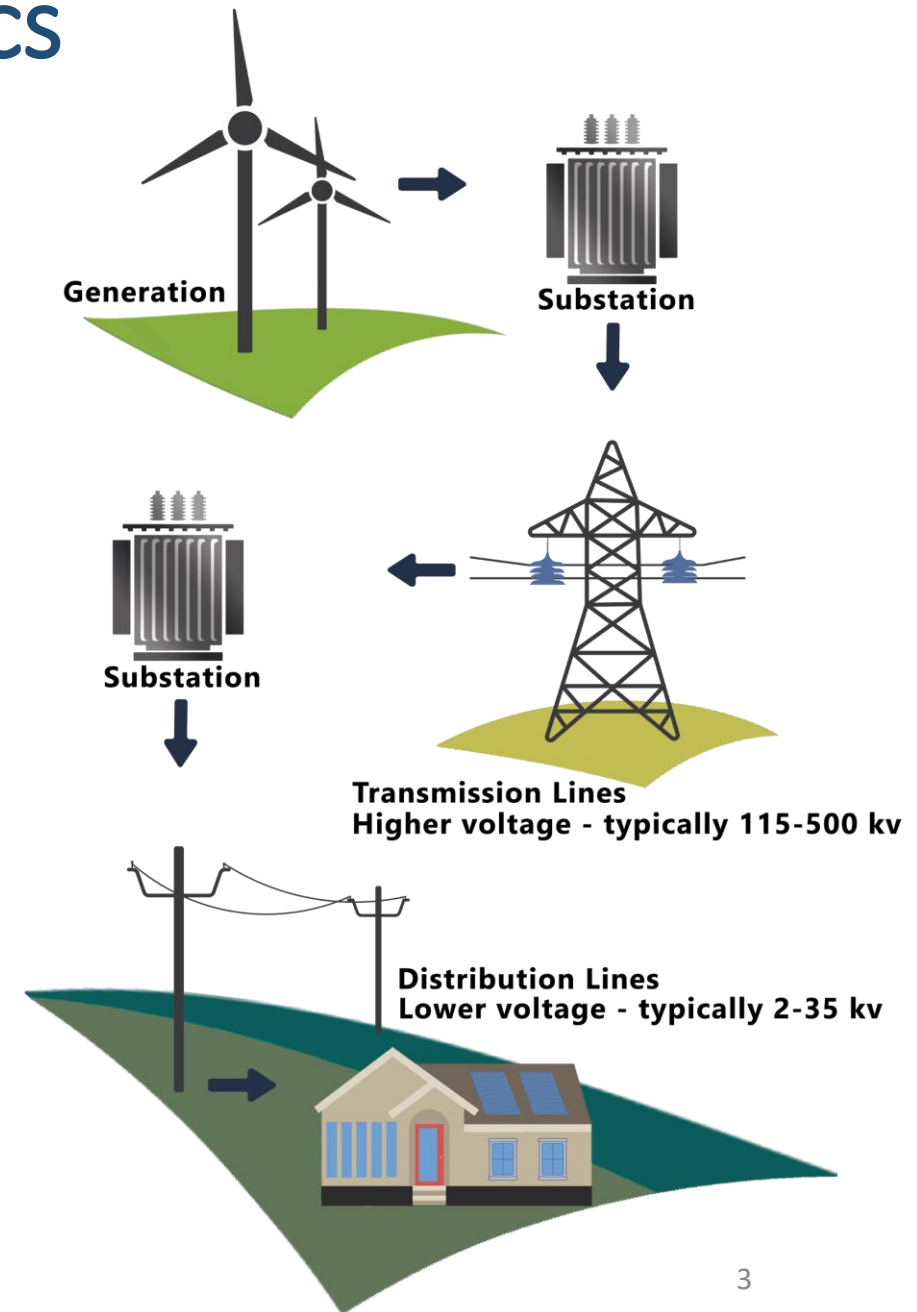
- Renewables - sunny/windy locations
- Hydro - river locations suitable for dams
- Gas/Coal/Nuclear - locations where fuel can be delivered

Delivery

- Large and small lines
- Transmission is larger (higher voltage)
- Distribution is smaller (lower voltage)

Transmission is Like the Interstate Highway

- Transmission Lines = Regional / Interstate Highways
- Distribution Lines = Local Highways / Sideroads



Electric Transmission's Origin

Connecting remote generation to load center

1889 - Willamette Falls to Chapman Square

- 13 miles
- DC then converted to AC in 1890

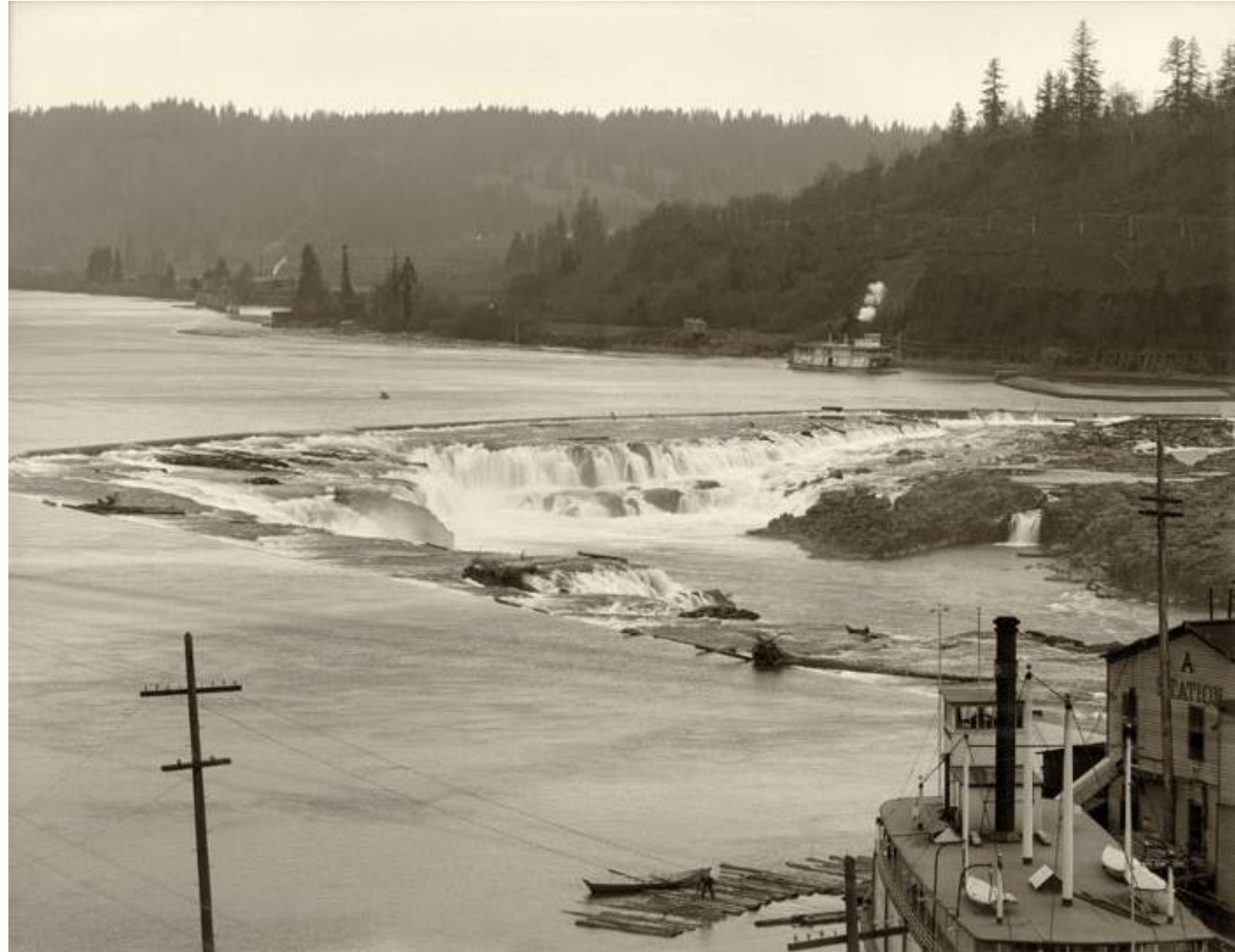
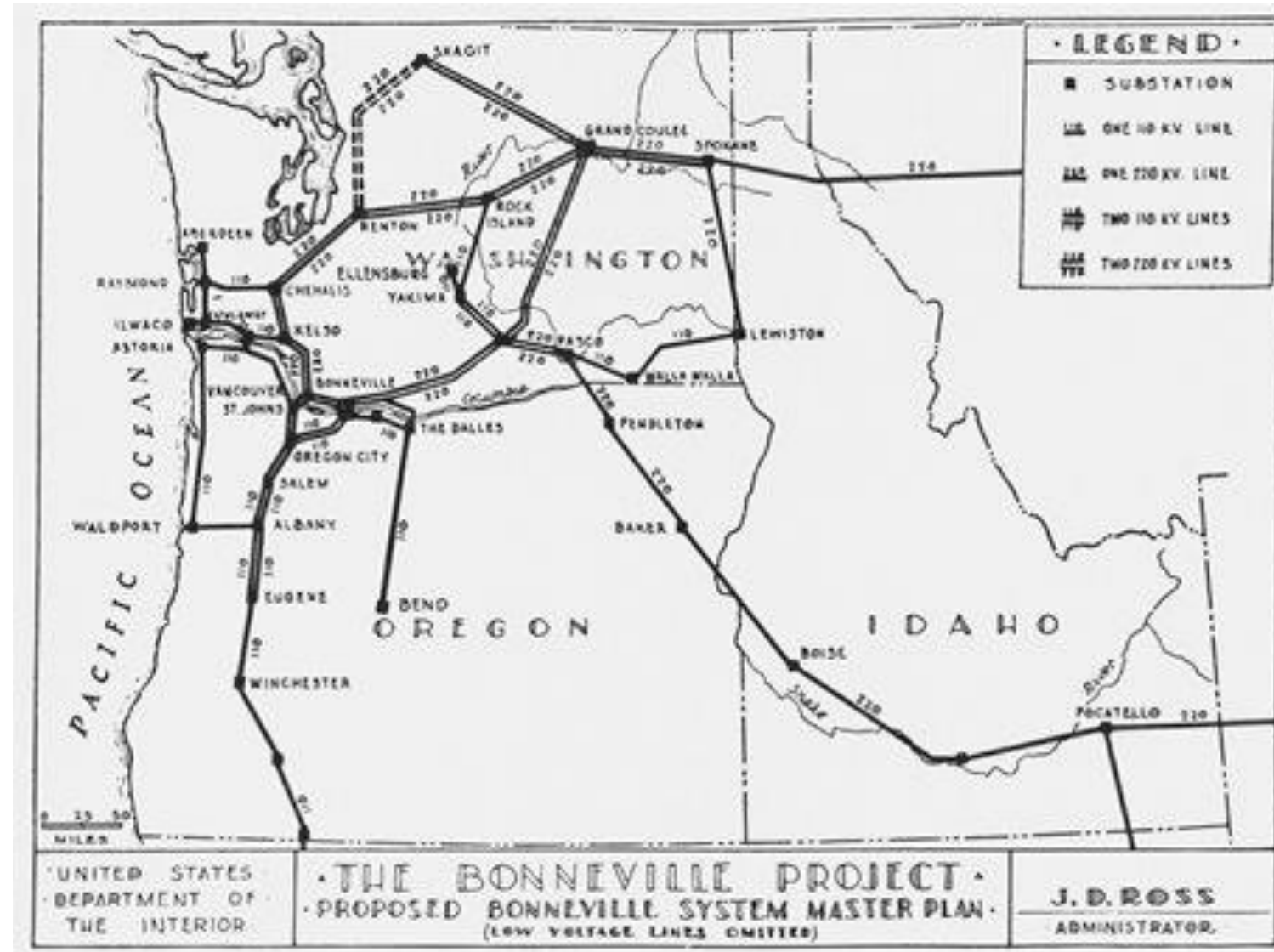


Photo by Jesse A. Meiser - restored by Old Oregon Photos₄



BPA's 1938 Regional Plan

BPA planned to build out a transmission system for the Federal Columbia River Power System



PNW Regional Transmission

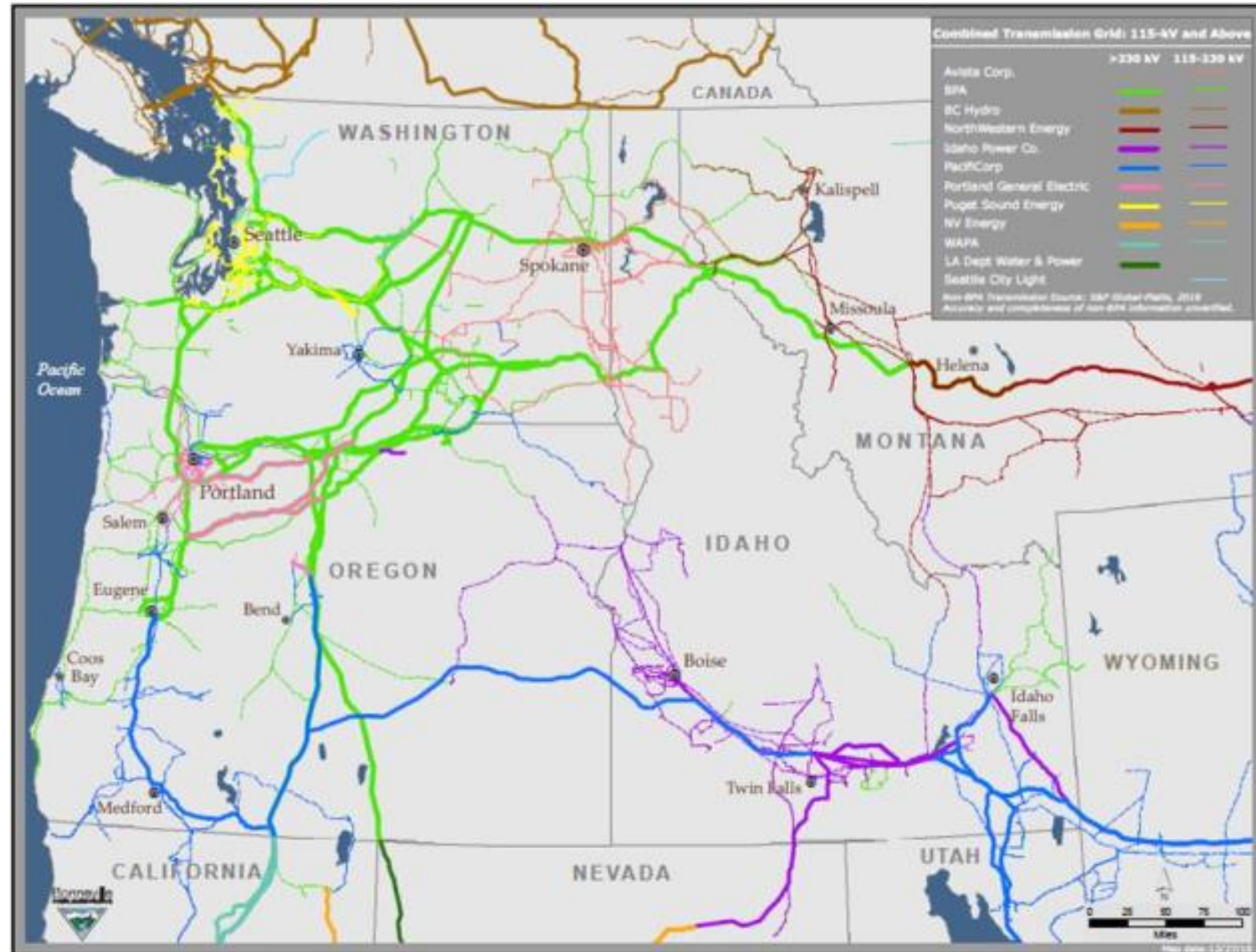
PNW

- BPA – Largest Owner

PNW & Intermountain West

- PacifiCorp – Large Owner
- Idaho Power – Large Owner

Others

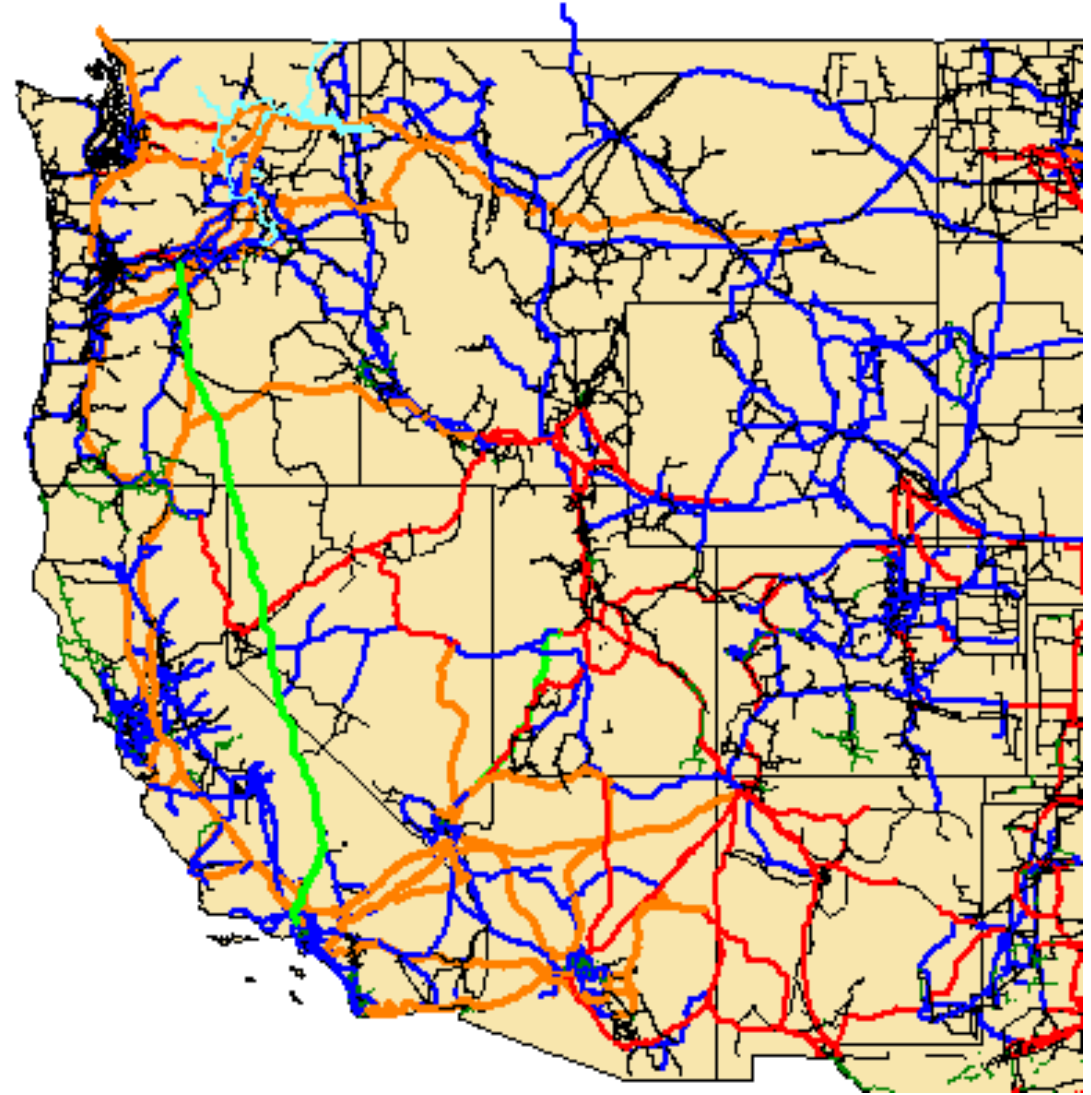


[Source](#)



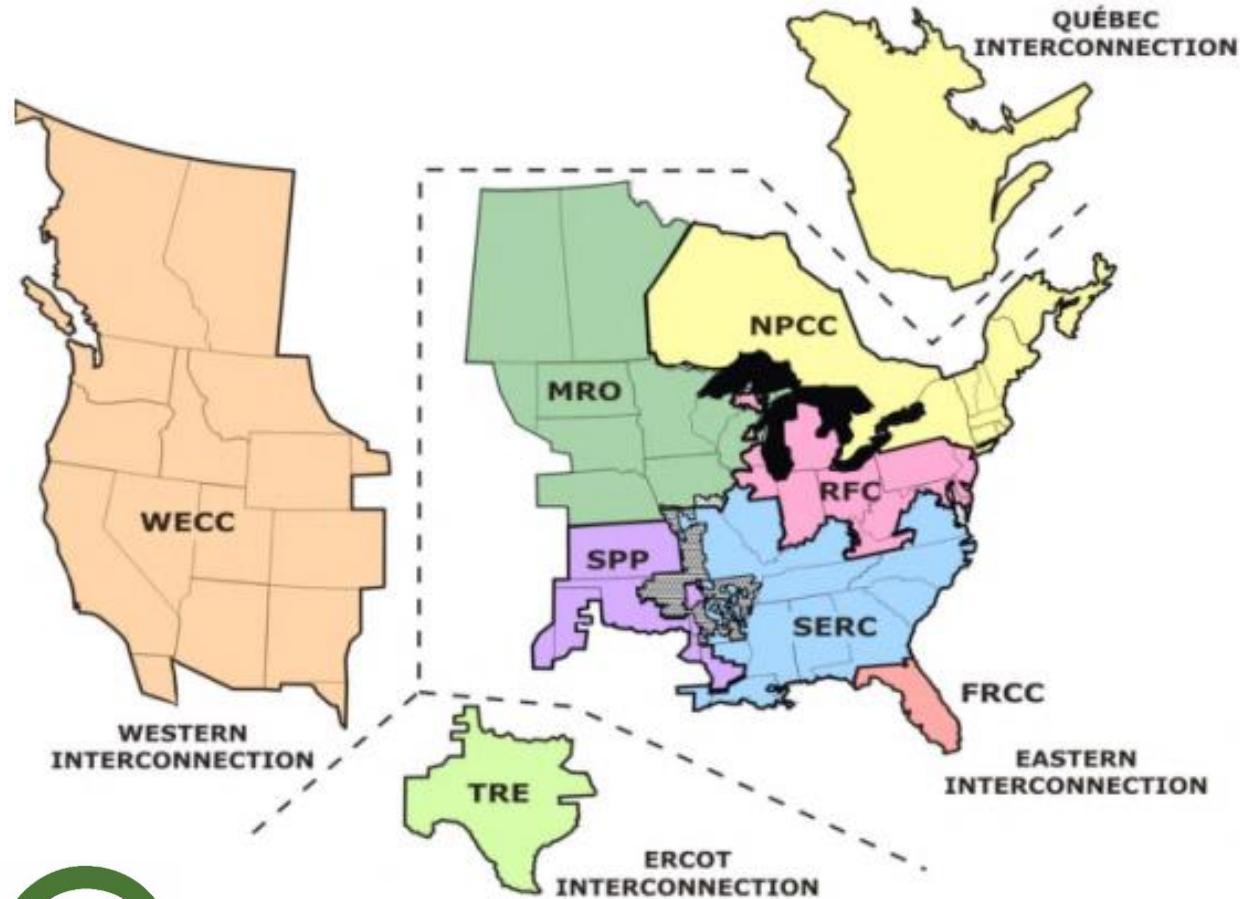
Western Interconnection

Operates in synchronism
where all load and resources
are continuously balanced

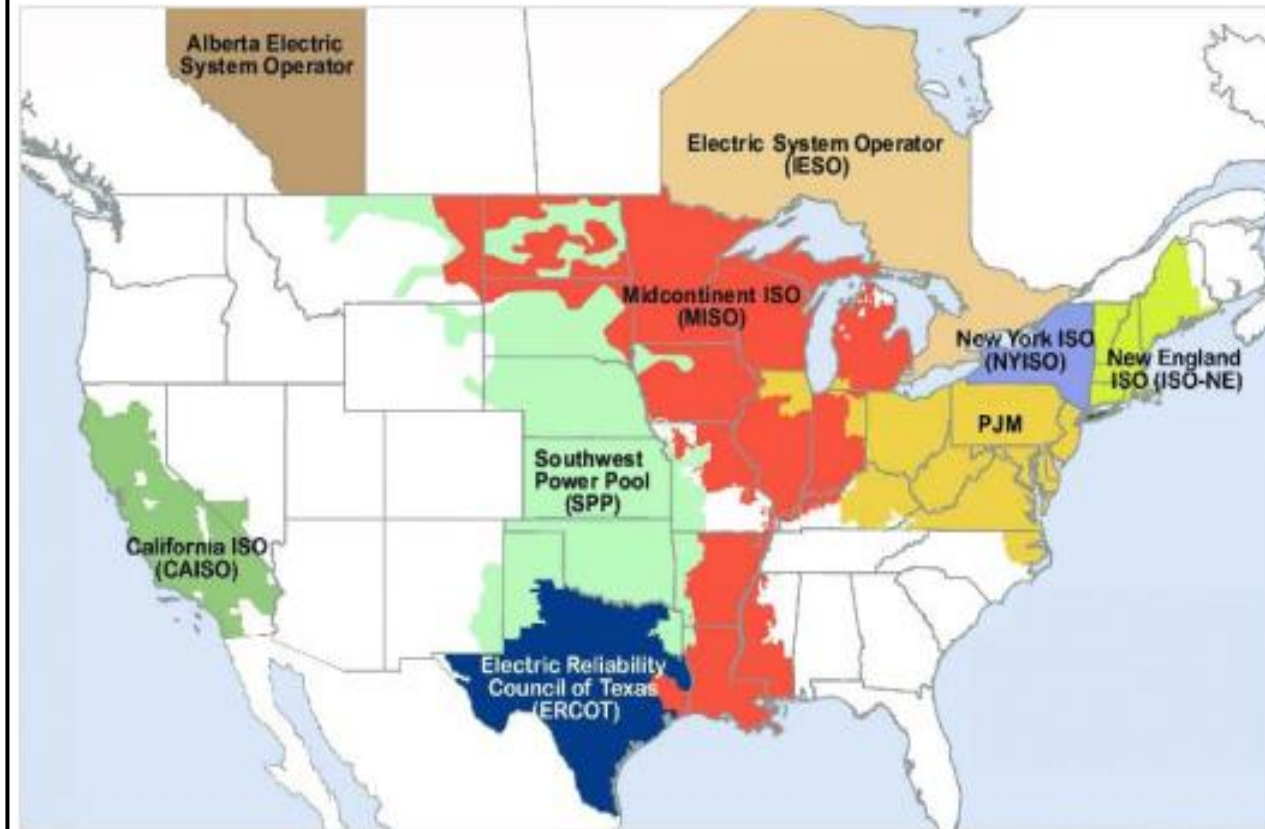


Regional Transmission - 2 Key Aspects

Physical Systems



Transmission Markets




Markets – Open Access to Transmission

FERC Deregulation in the 1990s

- All transmission owners required to provide “Open Access”
- *Strongly encouraged* formation of RTO/ISOs to help further open access

Open Access in the PNW

- Transmission Interconnection Queues
- Types of Transmission Service Requests
 - Network service
 - Point-to-Point service



Energy and Utility News
for the Pacific
Northwest and
Western Canada

NewsData LLC, Seattle & San Francisco: November 5, 2021 • No. 2029

The Week In Summary

[1] BPA Study Could Be ‘Early Warning’ of Trouble for Clean Energy Goals

The results of a 2021 BPA transmission study may foreshadow trouble in meeting the region’s clean energy goals. A batch of **transmission service requests from mostly renewable resources** is considered the first wave of projects needed for Washington and Oregon utilities to meet their 2030 clean energy goals. To meet the requests, BPA would need to invest \$845 million to upgrade its system. At [12], “we simply can’t make the 2030 goals without building more transmission capacity.”

[Source](#)



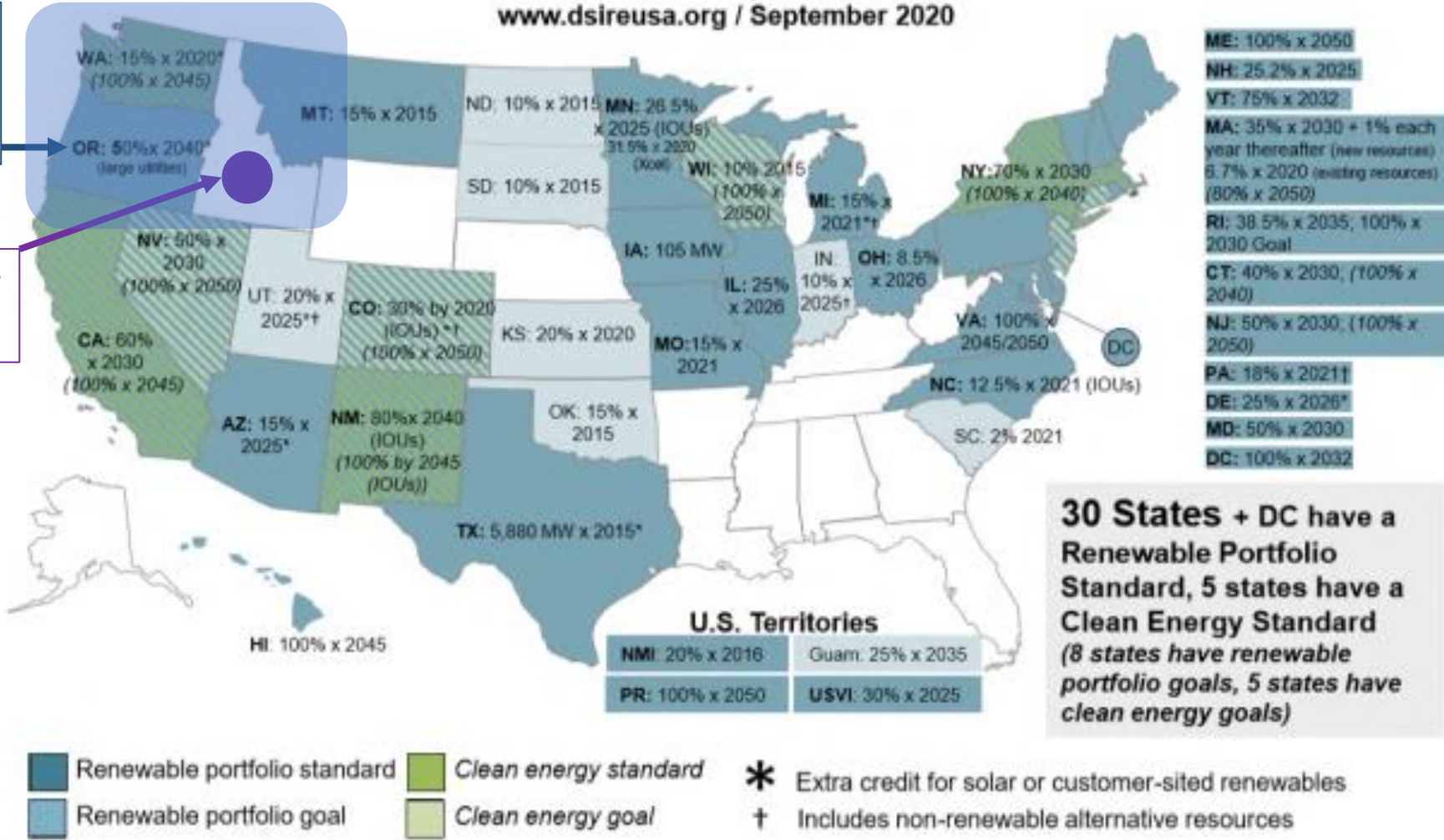
National & Regional Context

Figure 1: Renewable and Clean Energy Standards in the United States

www.dsireusa.org / September 2020

Oregon is now
100% Clean x 2040
HB 2021 (2021)

Idaho Power & Avista
100% Clean x 2045



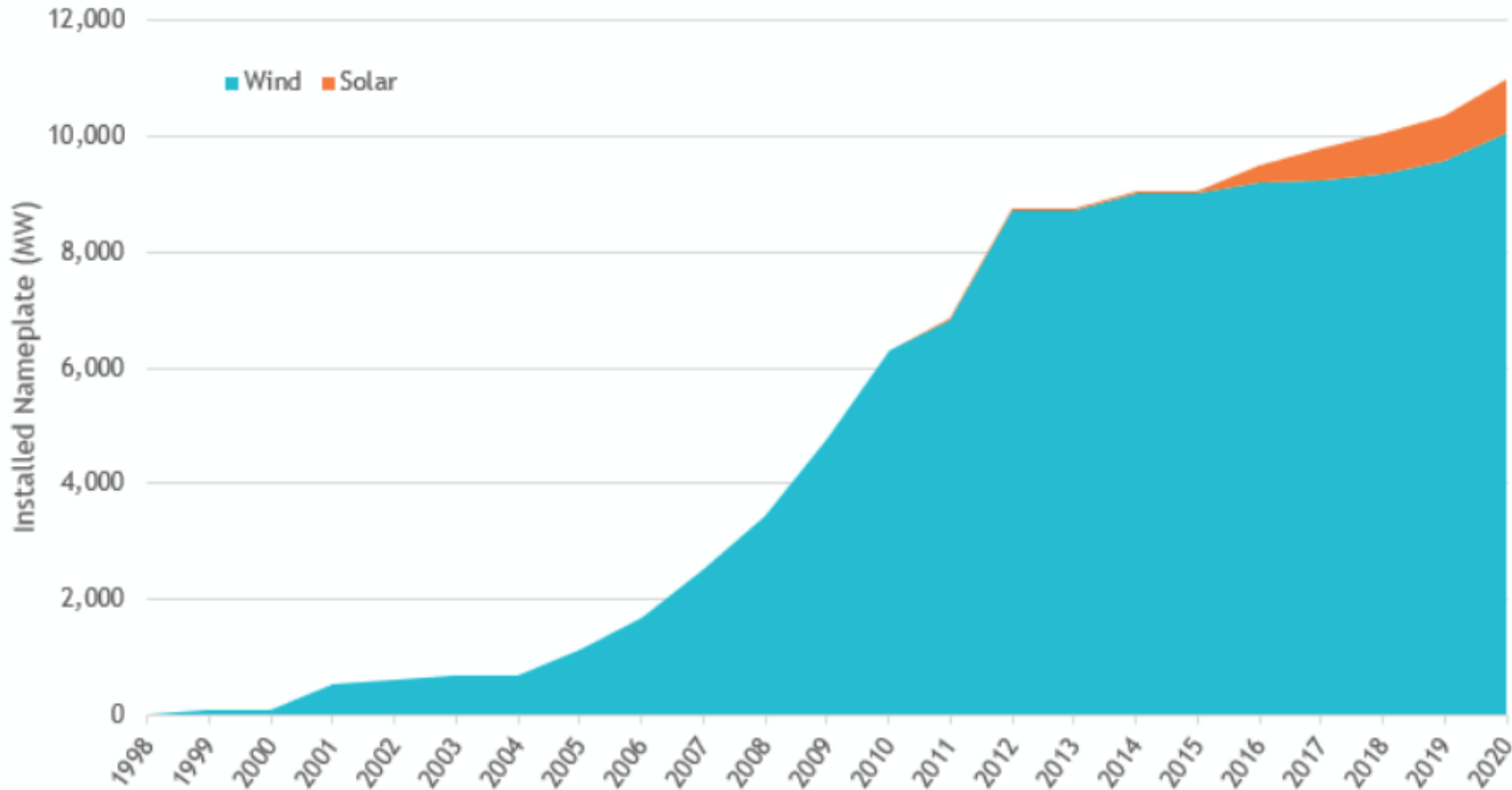
30 States + DC have a Renewable Portfolio Standard, 5 states have a Clean Energy Standard (8 states have renewable portfolio goals, 5 states have clean energy goals)



Oregon & Many States are Looking for Clean Energy!

Scale of Existing PNW Renewables

Wind and Solar Development in the Region



Wind & Solar in the PNW Developed to date:

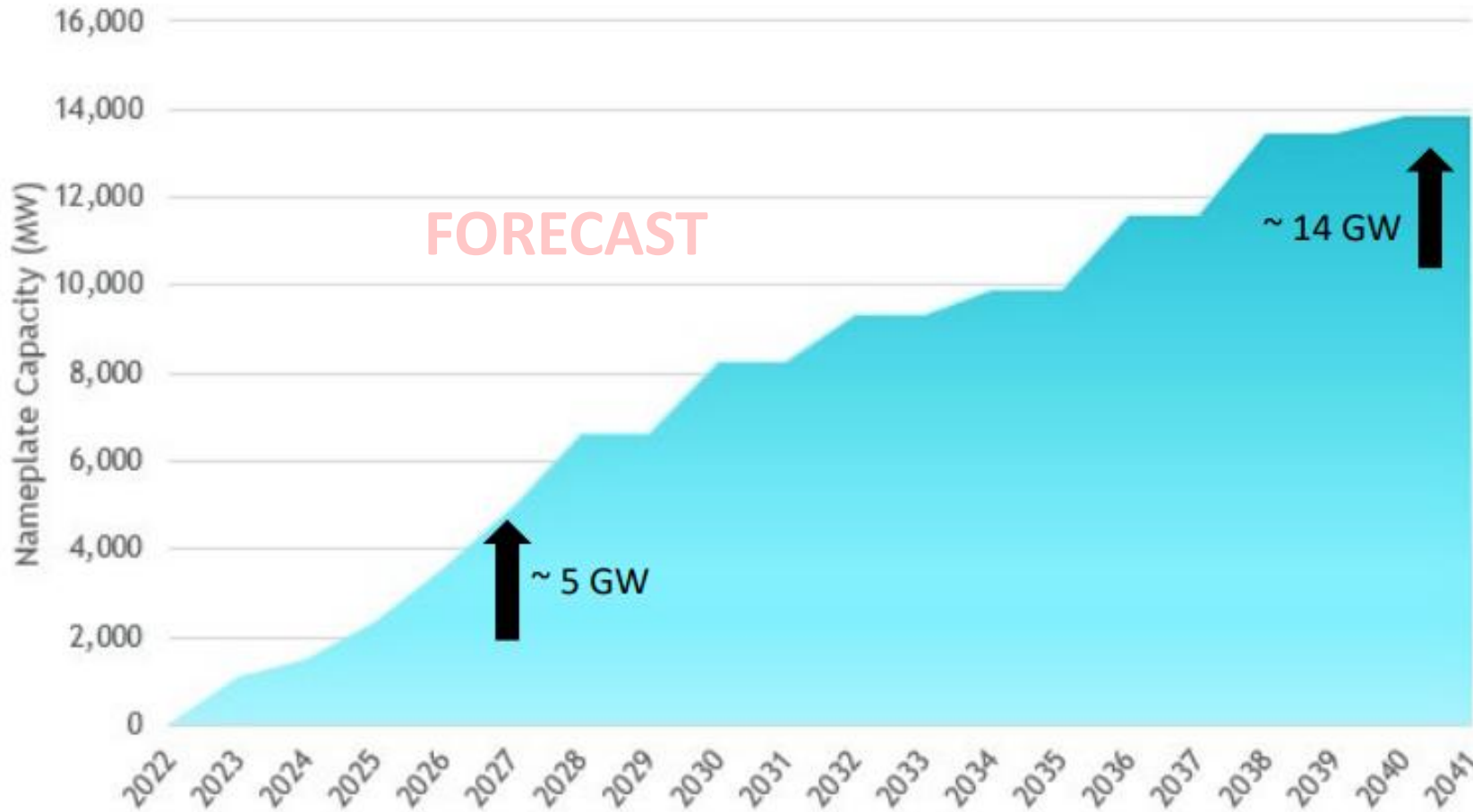
Approximately 10,000 MW
of wind, with solar increasing
in recent years.

[Source](#), Slide 3

How Much More?

Scale of Need for New PNW Renewables

Average Renewable Build in the Region - Baseline Conditions



Draft 2021 Power Plan: Baseline Conditions

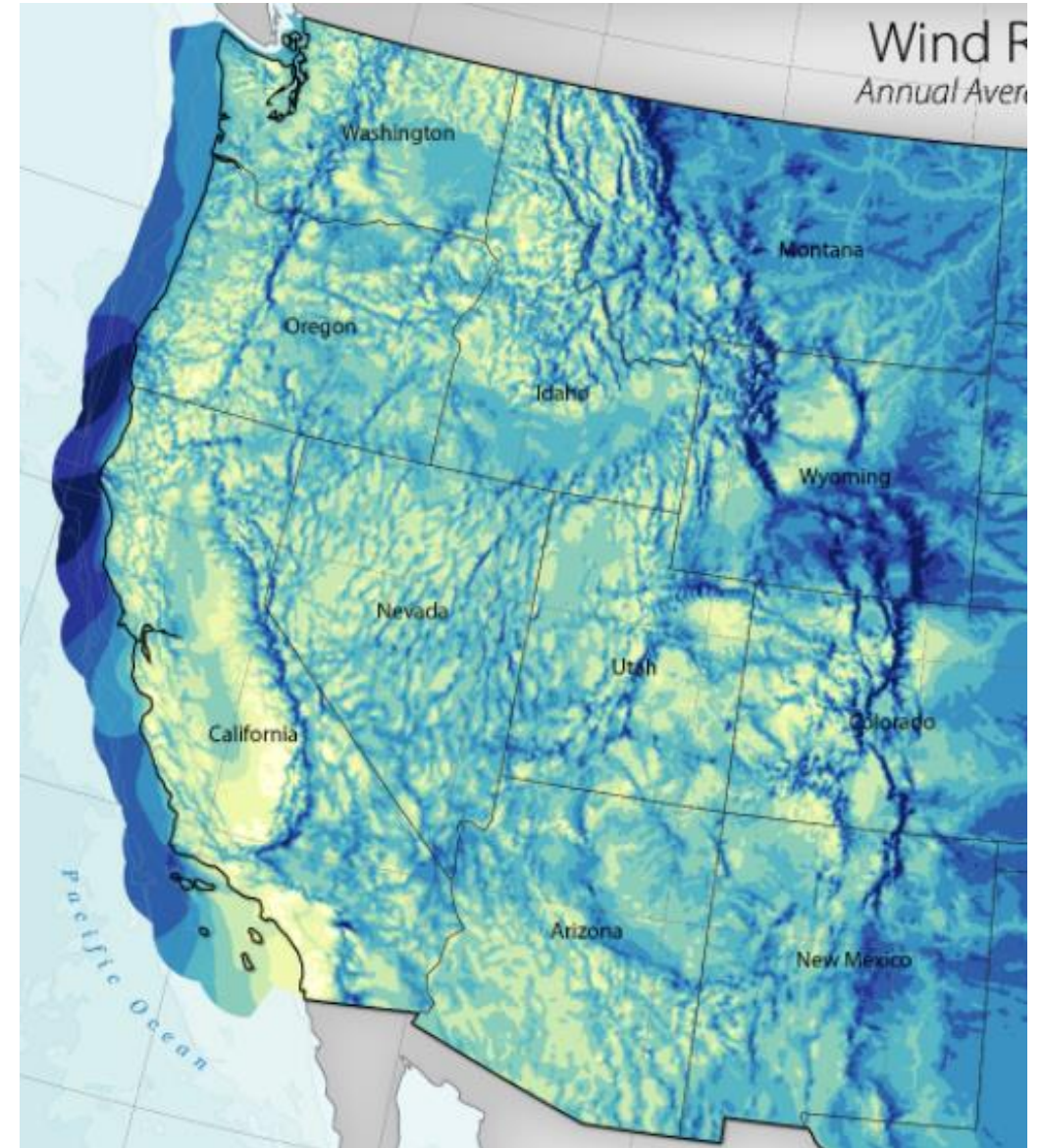
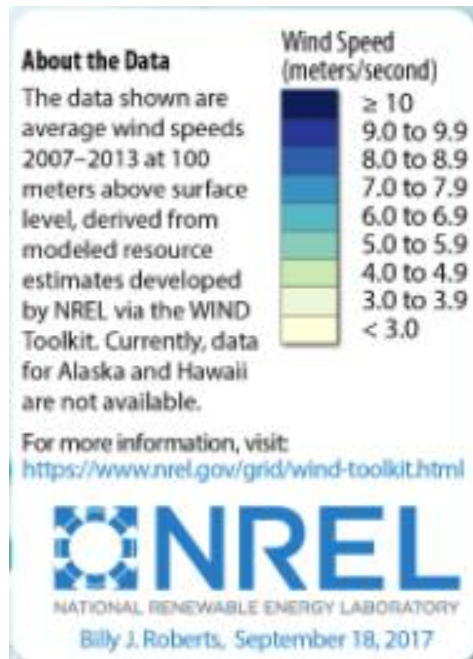
Average build of additional
new renewables in the
Pacific Northwest over the
next 20 years.

[Source](#), Slide 2

Lots More Needed! Can It All Get Built In Time? Where?

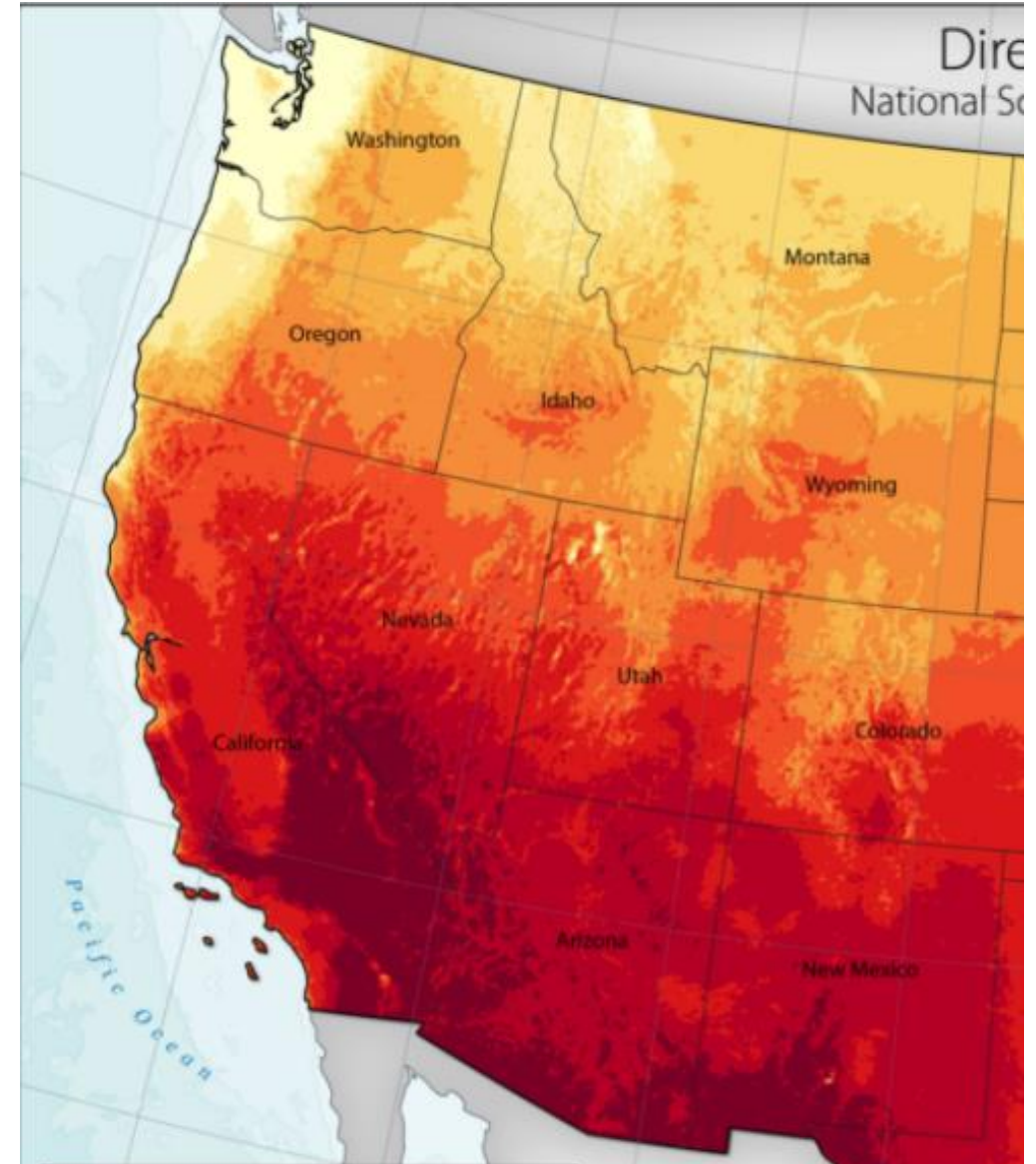
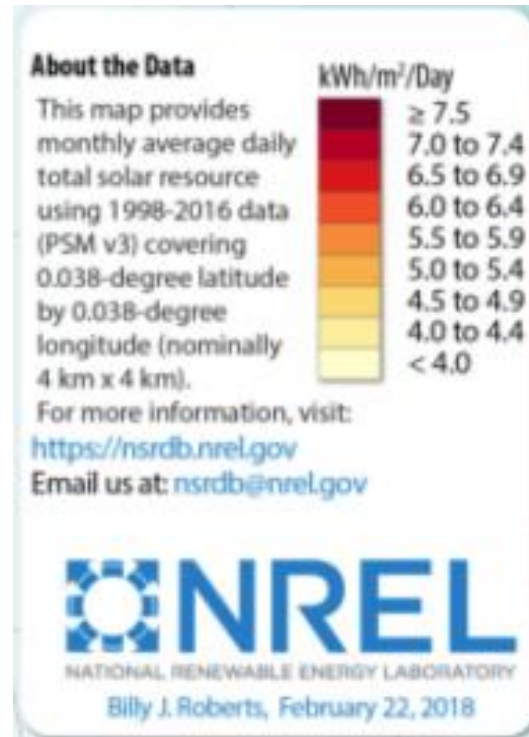
Western Interconnection Resource Areas

Annual average wind speed



Western Interconnection Resource Areas

Annual average solar output



Source: <https://www.nrel.gov/gis/solar-resource-maps.html>
Sengupta, M., Y. Xie, A. Lopez, A. Habte, G. Maclaurin, and J. Shelby.
2018. "The National Solar Radiation Data Base (NSRDB)." *Renewable and Sustainable Energy Reviews* 89 (June): 51-60.

Western Interconnection Resource Areas

January



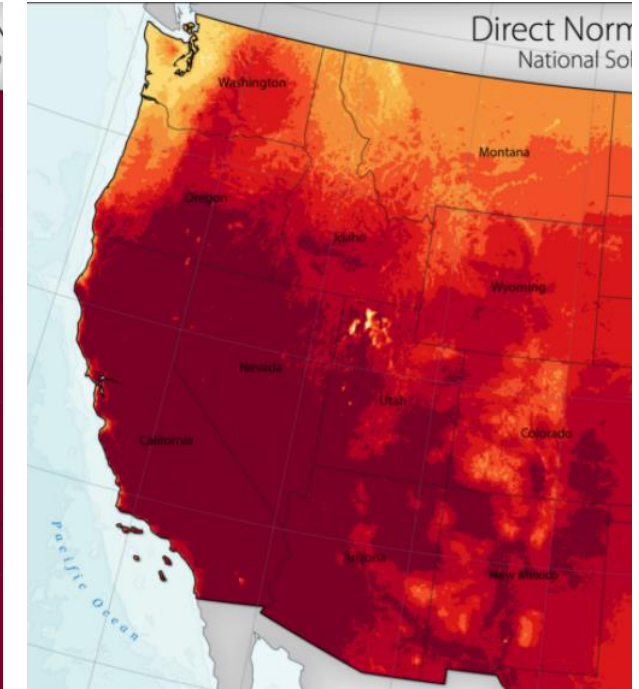
March



July



September

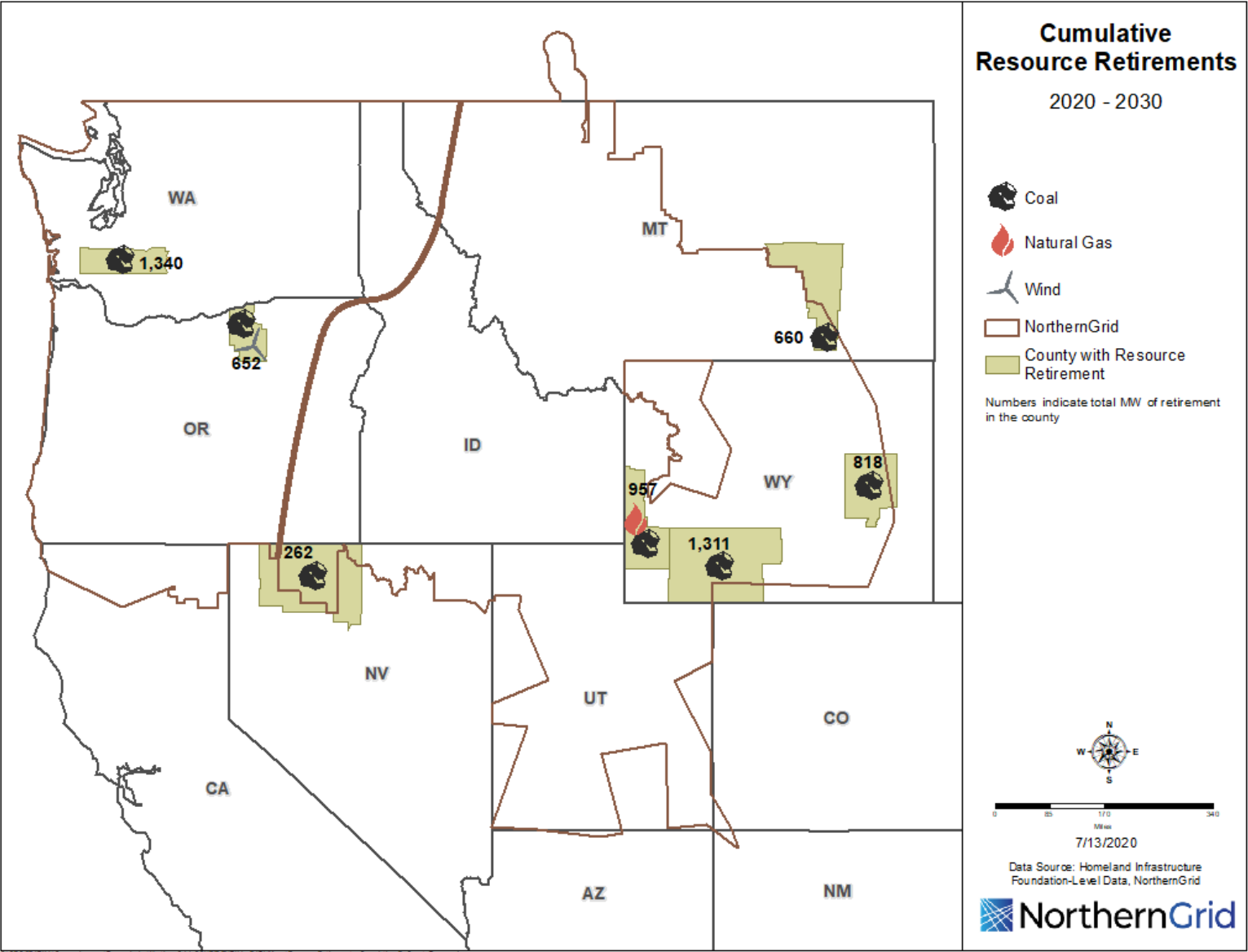


Source: <https://www.nrel.gov/gis/solar-resource-maps.html>
Sengupta, M., Y. Xie, A. Lopez, A. Habte, G. Maclaurin, and J. Shelby.
2018. "[The National Solar Radiation Data Base \(NSRDB\)](#)." *Renewable
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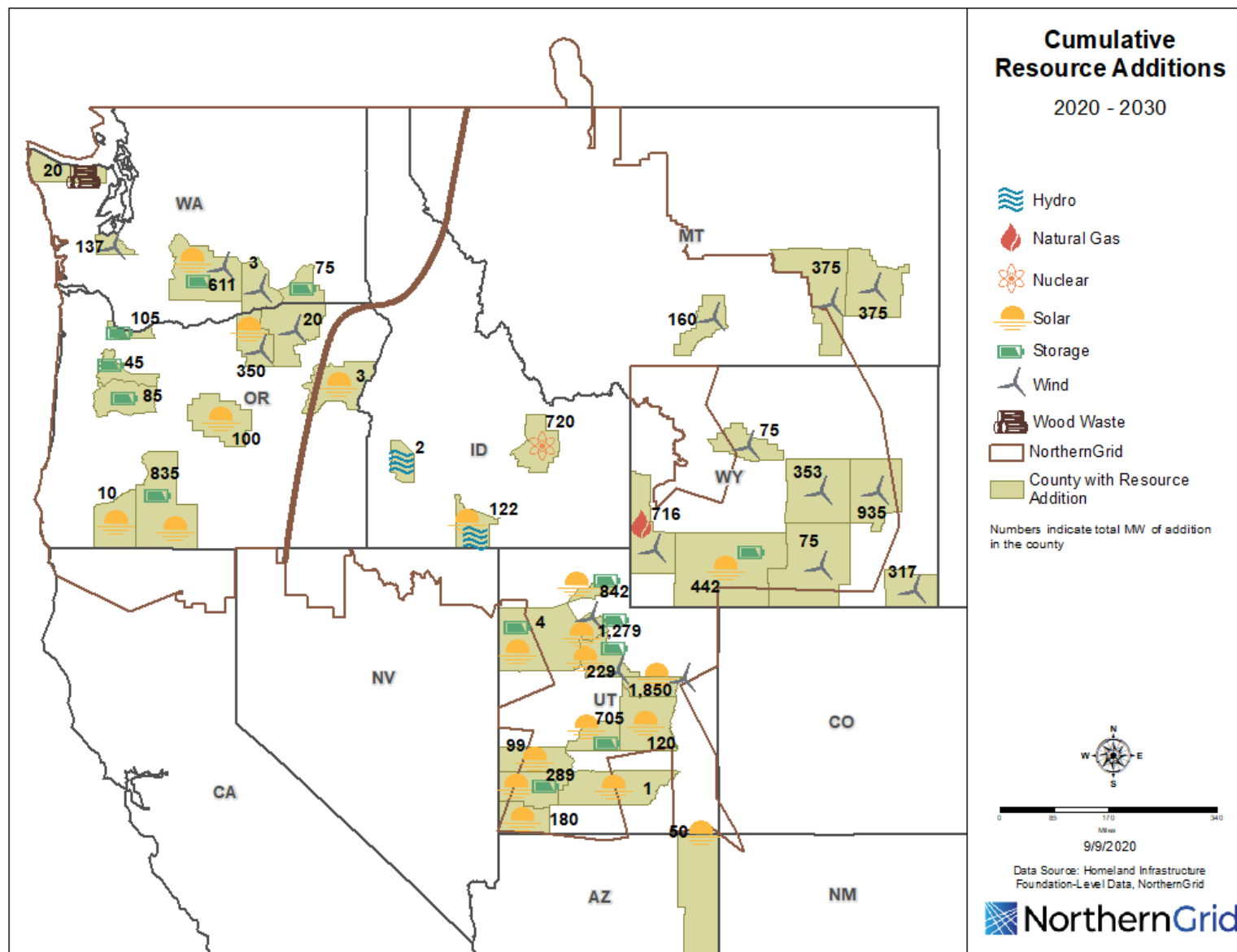
NorthernGrid Planned Resource Retirements

6,000 MW total



NorthernGrid Planned Resource Additions

13,390 MW total

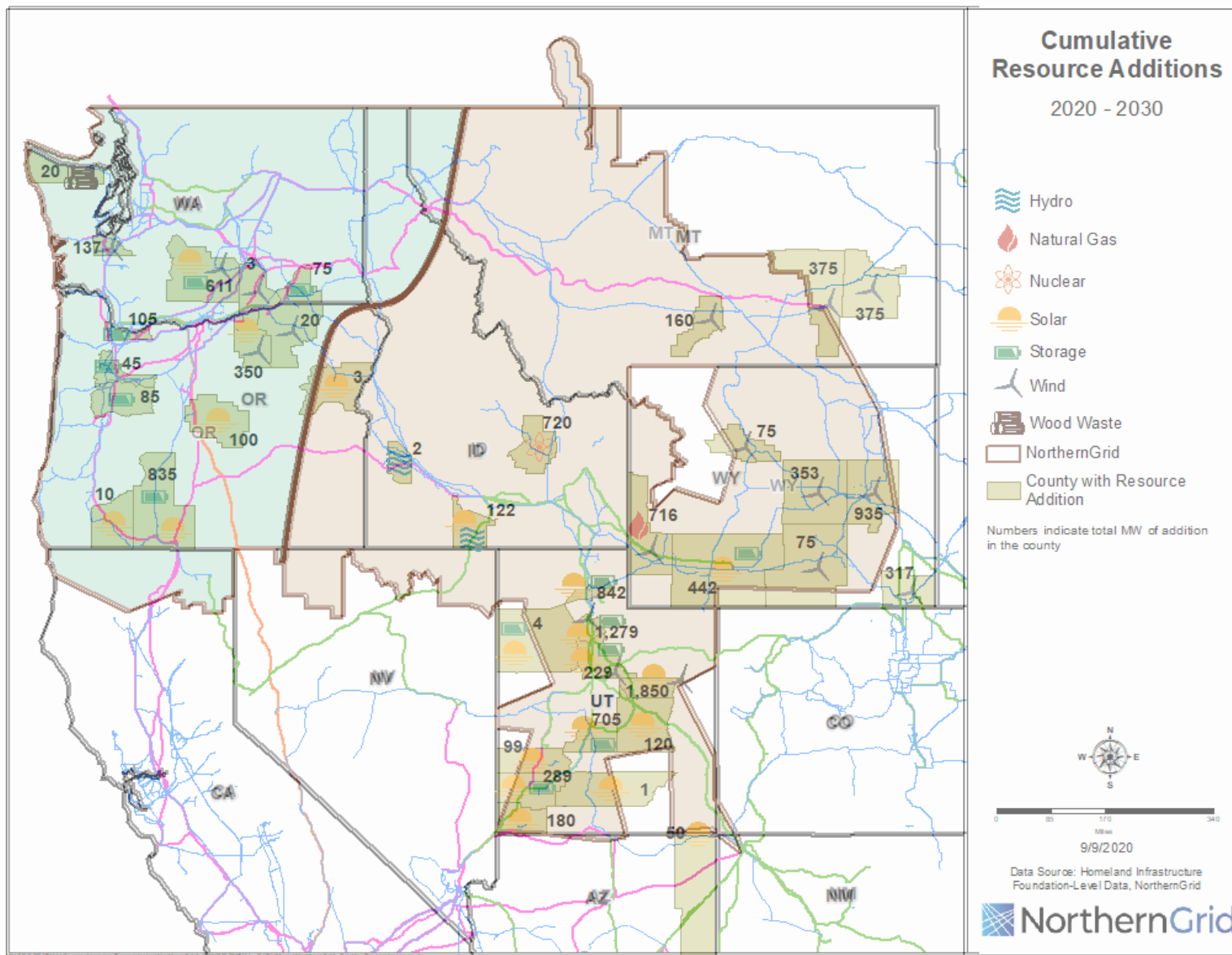


© 2020 SPAN LLC. All rights reserved. NorthernGrid. 2020. 9/9/2020. DATA: MapResourceAddition_Cumulative_ByCountyType.mxd



NorthernGrid Planned Resource Additions

Located near
existing transmission



Renewables & Transmission

Renewables → Location Matters

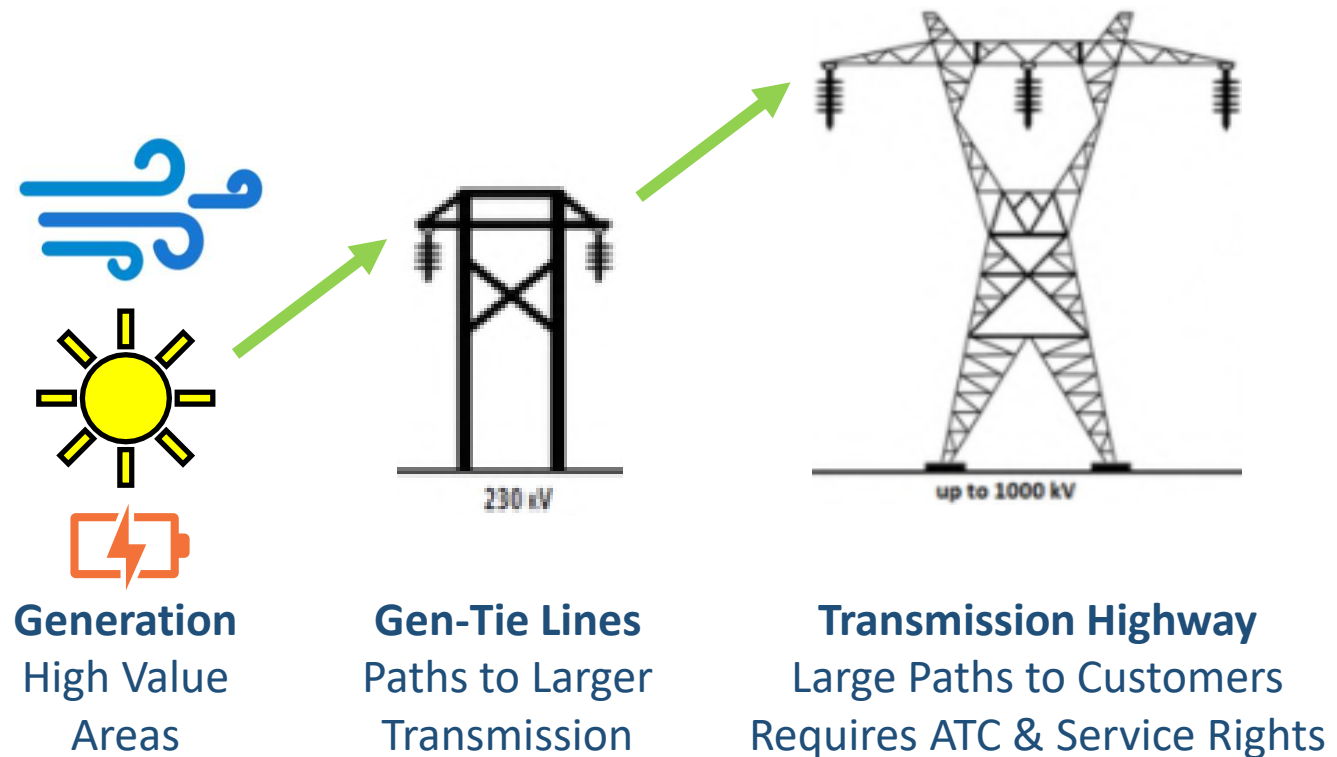
- Sunny/Windy Areas + Transmission

New Renewable Projects

- Available Transmission Capacity (ATC)
- Transmission Service Rights
- New Gen-Tie Lines
- Batteries Help Optimize

Two Ways to Increase ATC

- 1) Optimize Existing Lines
- 2) Build New Lines

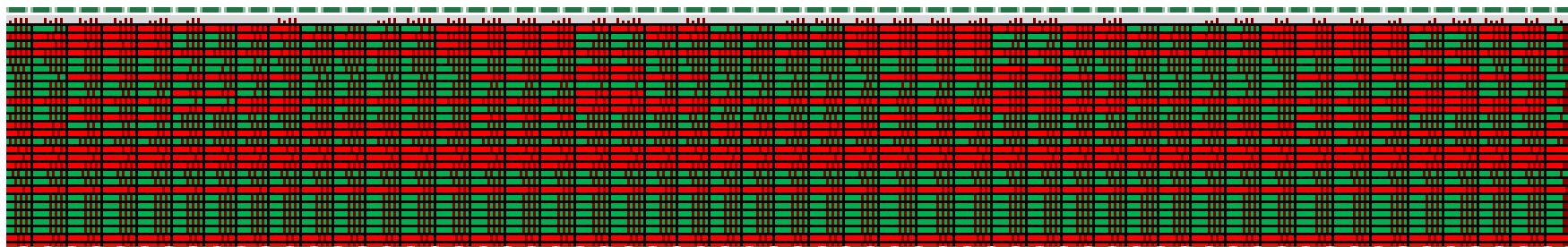


Transmission Capacity Example

BPA's 10-year Long-Term Firm Available Flowgate Capability Less Pending Requests

Green: available capacity

Red: pending requests exceed available flowgate capacity



Source:
<https://www.bpa.gov/transmission/Reports/TransmissionAvailability/Pages/default.aspx>



More Transmission → Optimizing Existing Lines

- Energy Efficiency & Distributed Energy Resources
- Upgrade Existing Paths
- Re-Use Transmission from Retired Generation
- Strategically Locate New Generation and/or Batteries
- Increased Regional Coordination

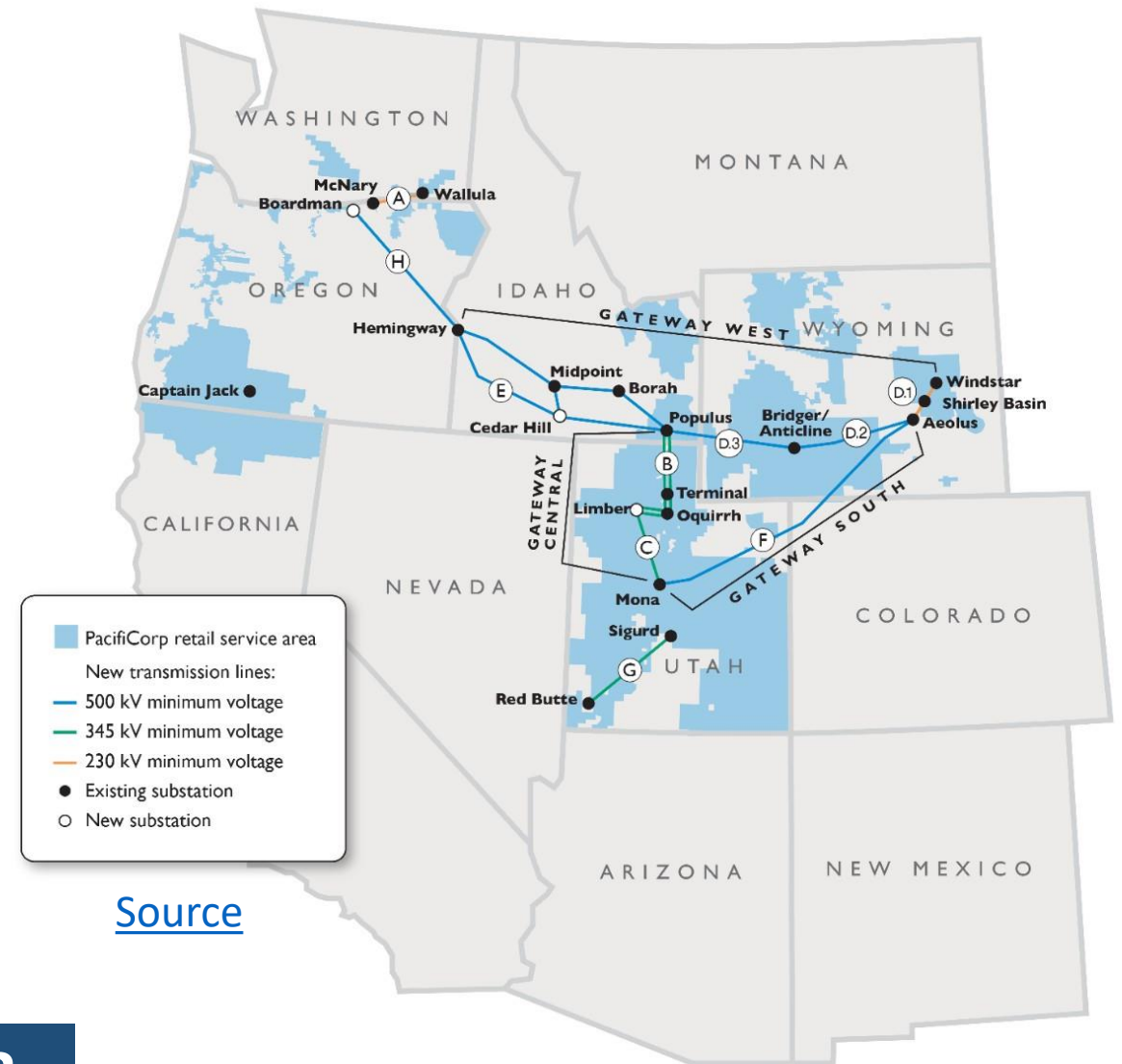


Is Optimizing Existing Enough?



More Transmission → Building New Lines

- New Renewables & Load Growth
- Costs
- Long-Lead Times (~10+ years)
- Environmental/Cultural Resources
- Natural Hazards (e.g. Wildfires)



[Source](#)

How Can We Optimize New?

This map is for general reference only and reflects current plans. It may not reflect the final routes, construction sequence or exact line configuration.



Key Takeaways

- New Renewables May Drive New Lines
- Building New Transmission Lines Can Be Difficult
- New Transmission Can Support New Generation
 - How much generation needed should drive regional conversations on how to optimize existing lines and how to optimize processes for building new lines



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<https://www.nwpp.org/>

<https://www.northerngrid.net/>

Q & A Discussion

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