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September 10, 2019

MEMORANDUM

TO: Council Members

FROM: Gillian Charles

SUBJECT: Review of Existing System and WECC-Wide Coal Retirements

BACKGROUND:

Presenter: Gillian Charles

Summary: Understanding the existing regional power system, including new and retiring units, development trends, annual production and annual emissions, is an important starting point upon which to build and operate a future system. At the September Power Committee meeting, staff will provide a review of the existing system as it stands today.

In addition, staff will also share the results of its analysis on the future of the remaining operating coal fleet in the WECC. Over the next ten years, around 15 gigawatts of nameplate coal capacity are scheduled for retirement – about 45% of the total operating capacity today. The impact of these retirements will change the landscape of the western grid.

More Info: See the interactive map of coal units in the WECC - <https://www.nwcouncil.org/energy/energy-topics/power-supply/coalmap>

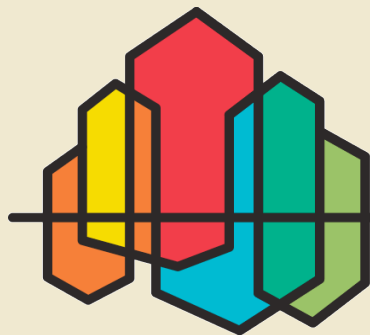
Read the blog post on WECC-wide coal retirements - <https://www.nwcouncil.org/news/coal-retirements>

Review of Existing System and WECC-Wide Coal Retirements

Power Committee

Gillian Charles

September 17, 2019

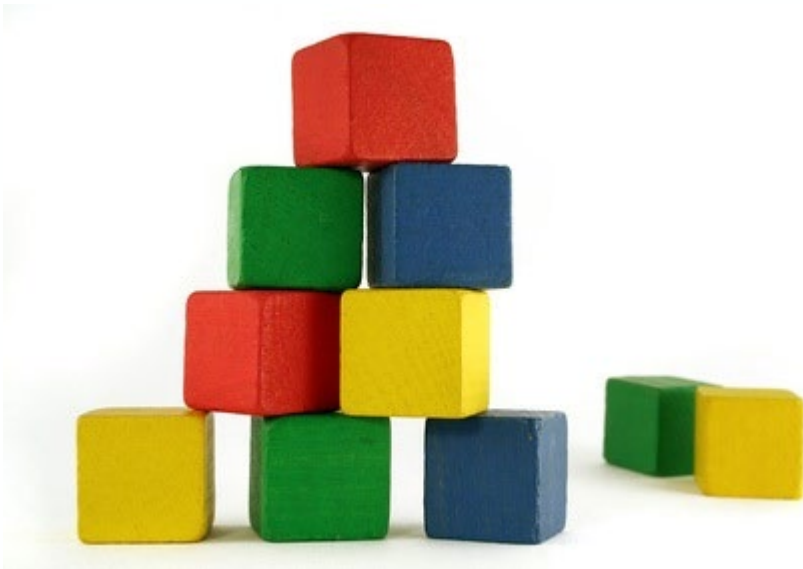


THE 2021
NORTHWEST
POWER PLAN

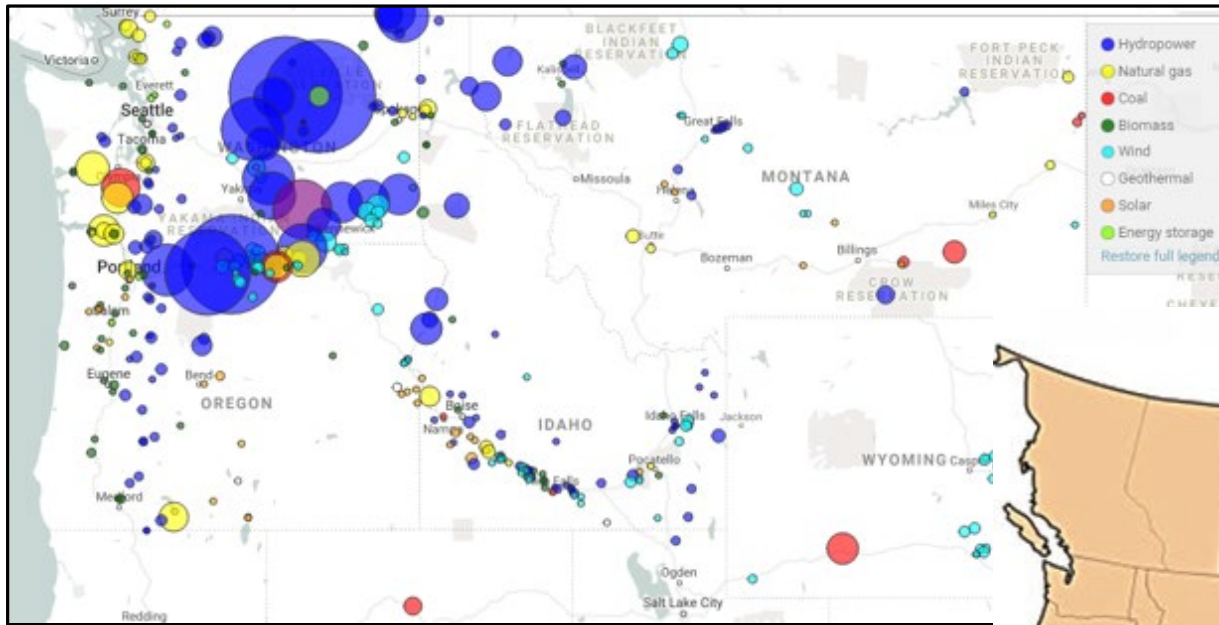
FOR A SECURE & AFFORDABLE
ENERGY FUTURE

Starting at the beginning...

The existing power system resources, including known future retirements, and the state policies that govern current resource operation and future resource development serve as the foundation and guideposts when determining the power plan's future resource strategy

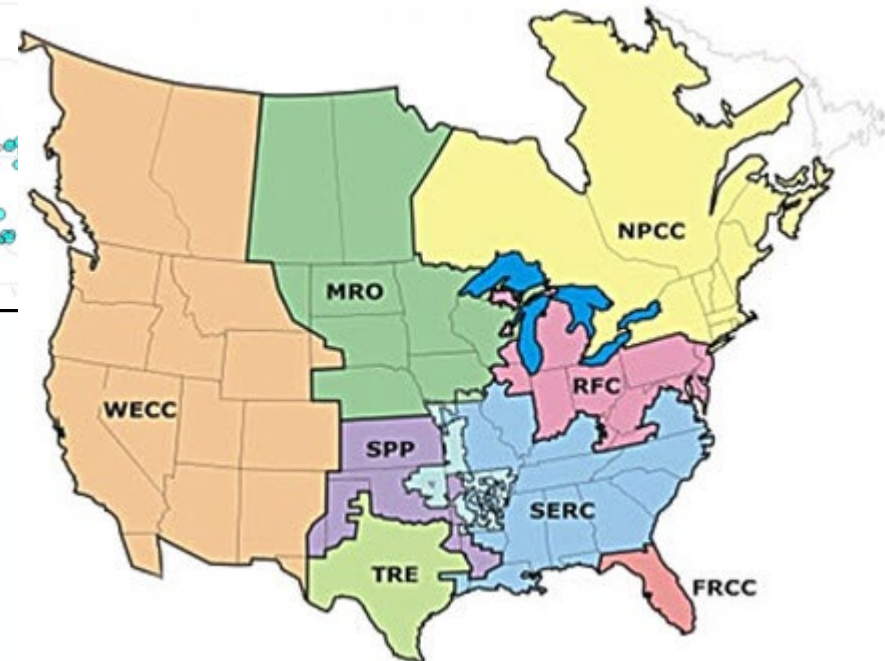


Quick note about the region and WECC



Power Plan is a plan
for the region...

...however the Northwest is obviously directly affected by the resources and policies that exist in the surrounding states and markets



It is our intent to capture both - to the *extent possible*

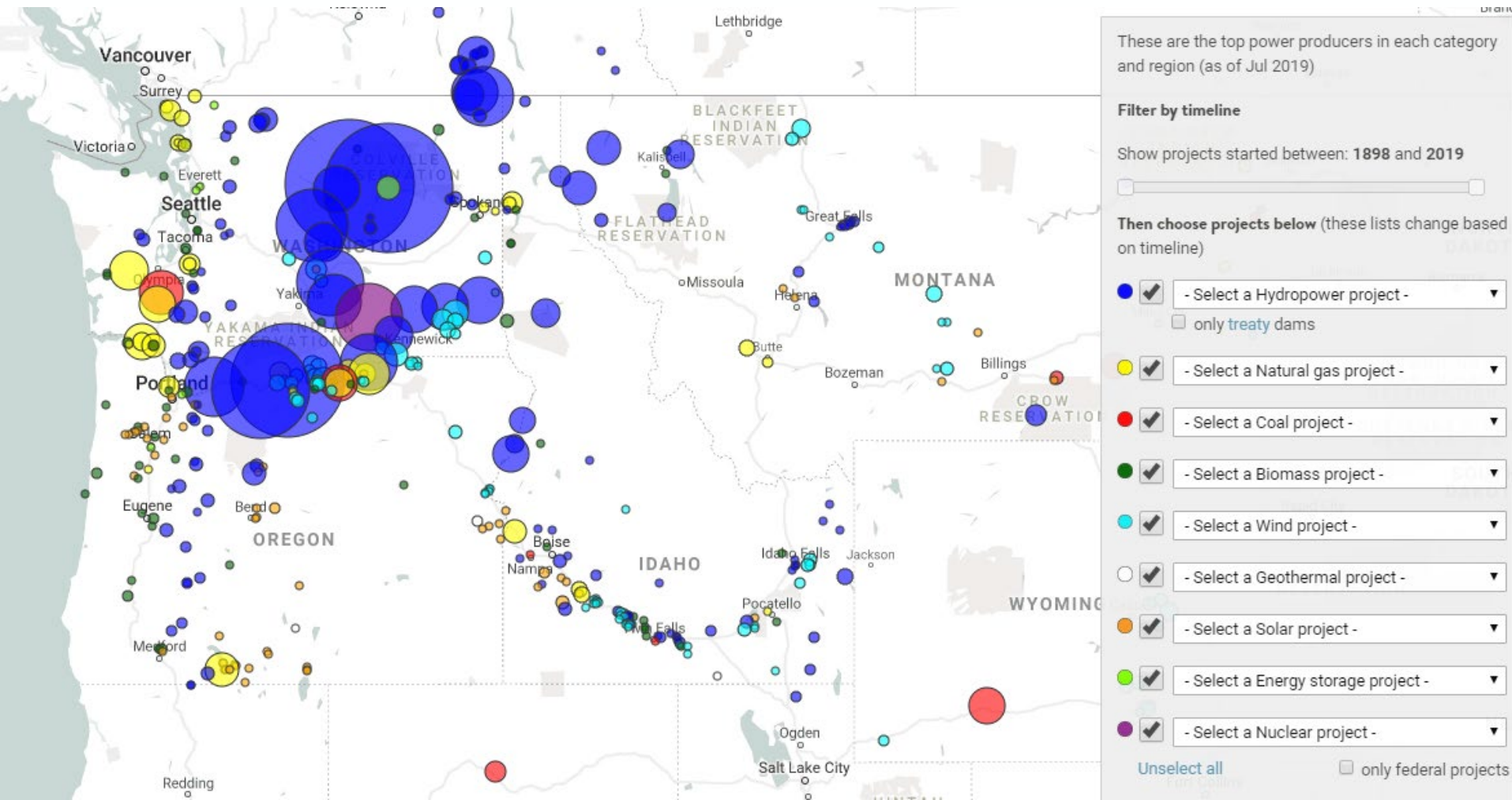


Existing System Resources – What is in, What is out?

- ✓ Existing resources **in operation** or **under construction** at the start of planning period
- ✓ Planned **retirements** of existing resources
- ✗ New resources that are **proposed** but not yet under construction... with exceptions!

Staff judgement may be necessary to make some resource determinations. For example, if a proposed resource is under power purchase agreement with high confidence of development, but not yet under construction at the start of the planning period.





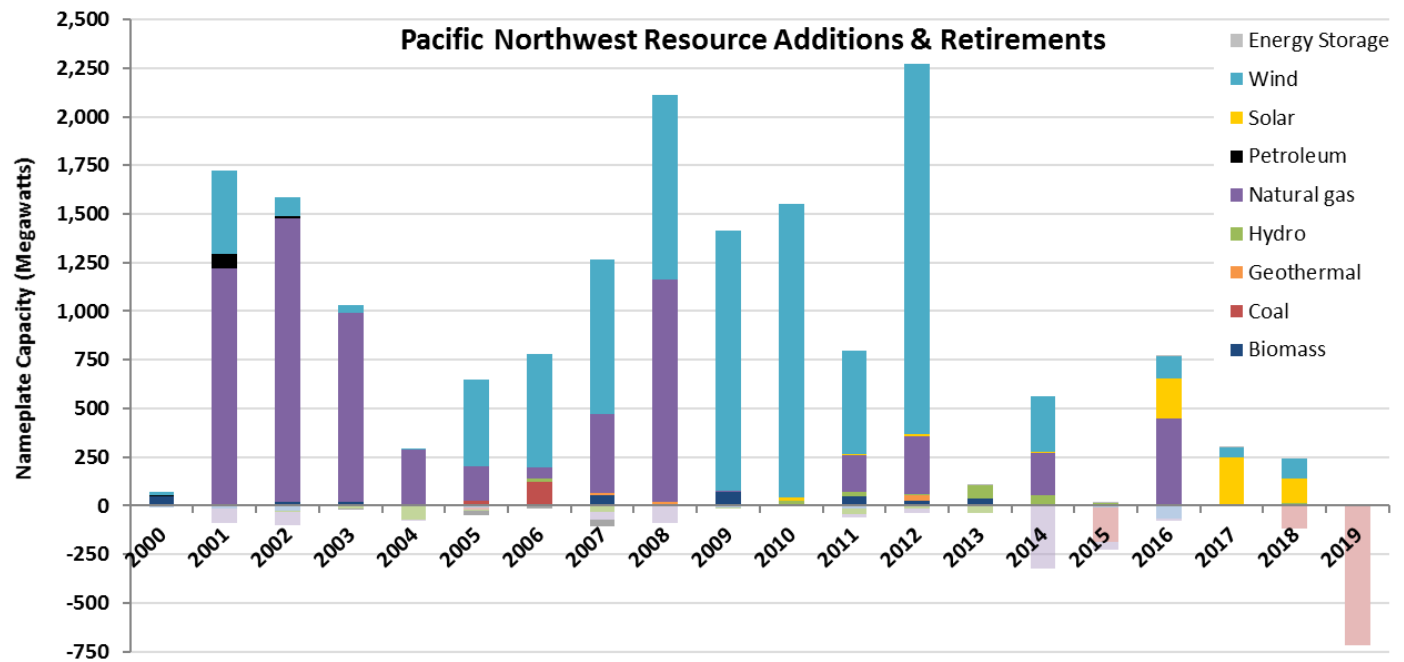
Council's Power Supply Map -

<https://www.nwcouncil.org/energy/energy-topics/power-supply/map-of-power-generation-in-the-northwest>



New gas and wind dominate recent additions

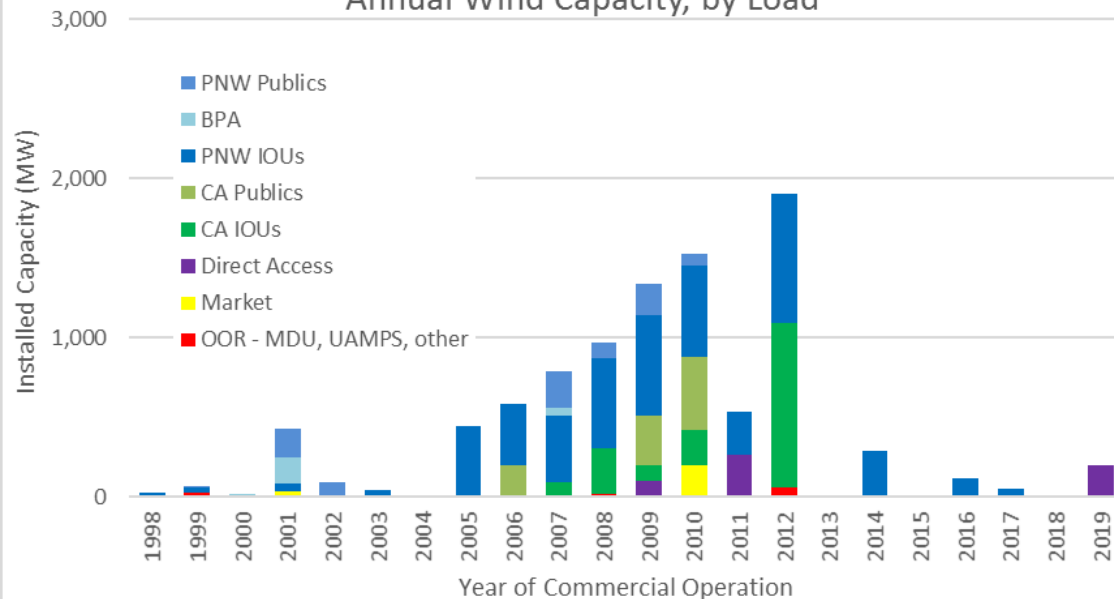
- West Coast Energy Crisis
- RPS enacted in 2005-2007
- Tax credits



Sept 2019

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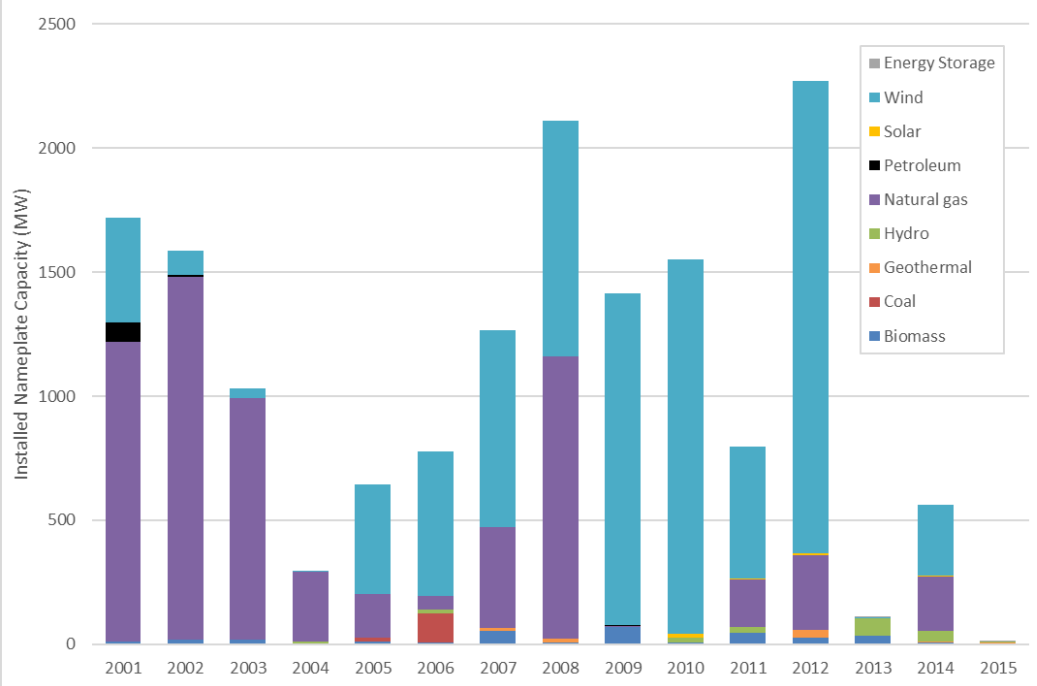
Annual Wind Capacity, by Load



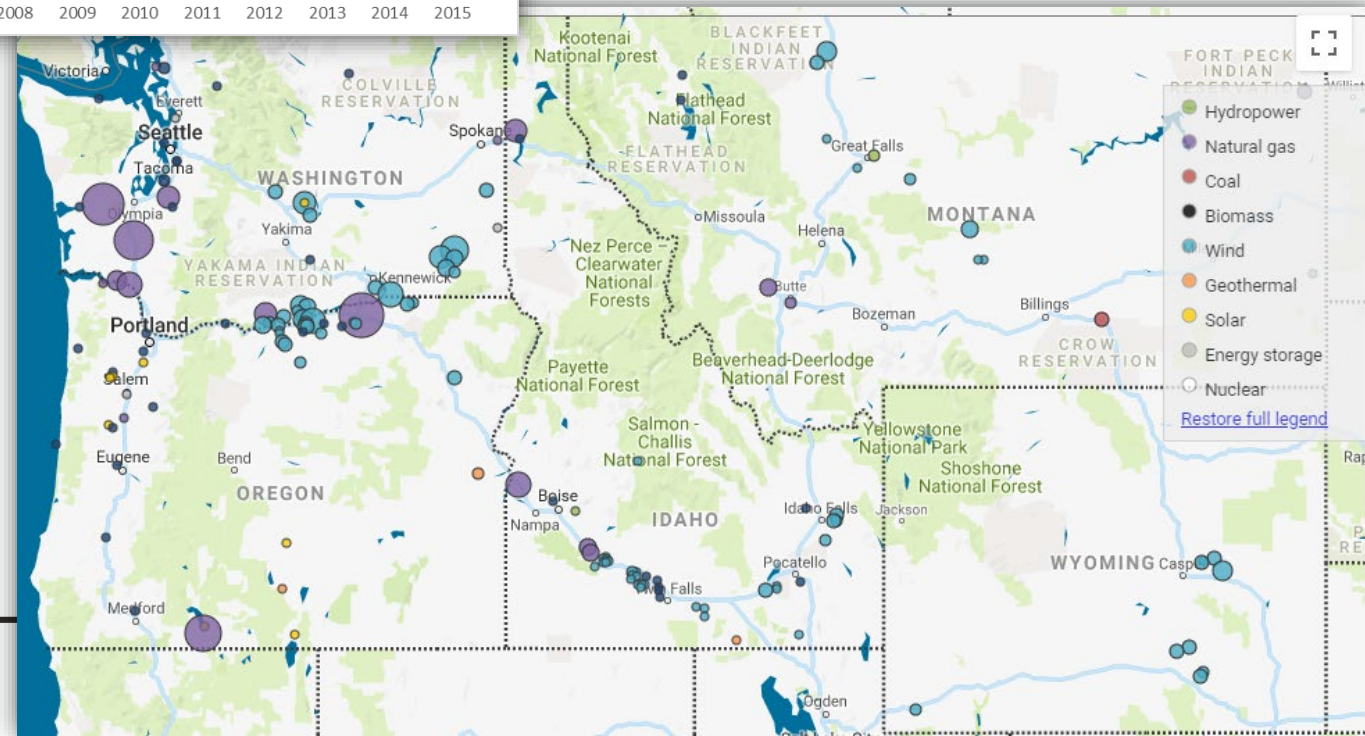
... Of course, not all wind developed in the PNW was built to serve PNW utilities

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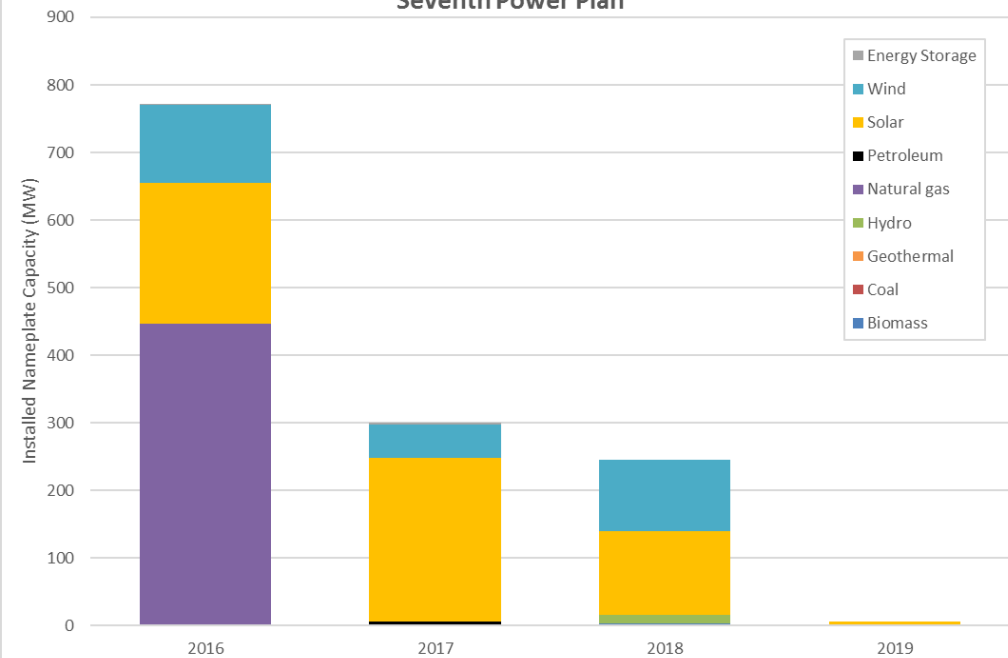
Pacific Northwest Resource Additions from 2001 - 2015



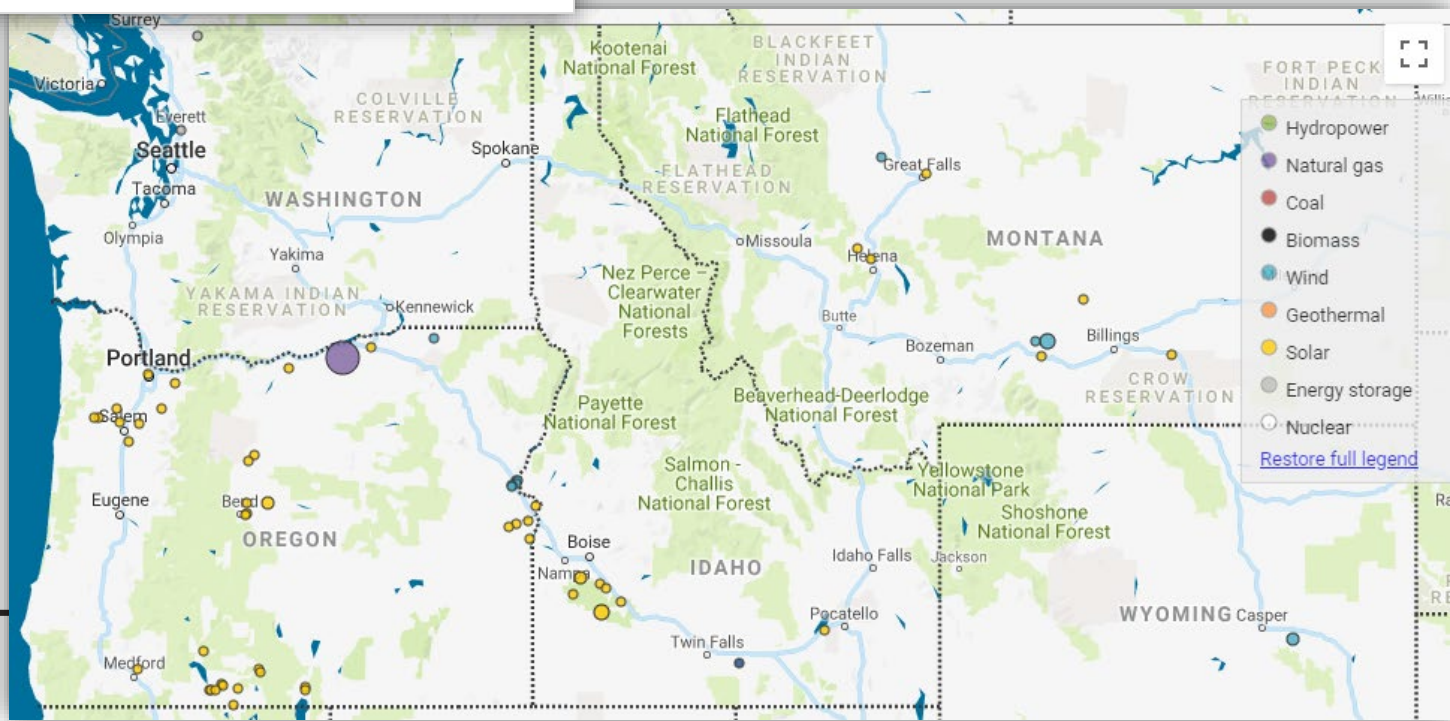
Resources that came online after the West Coast Energy Crisis, through the Sixth Power Plan (2001-2015)



Pacific Northwest Additions since the Adoption of the Seventh Power Plan



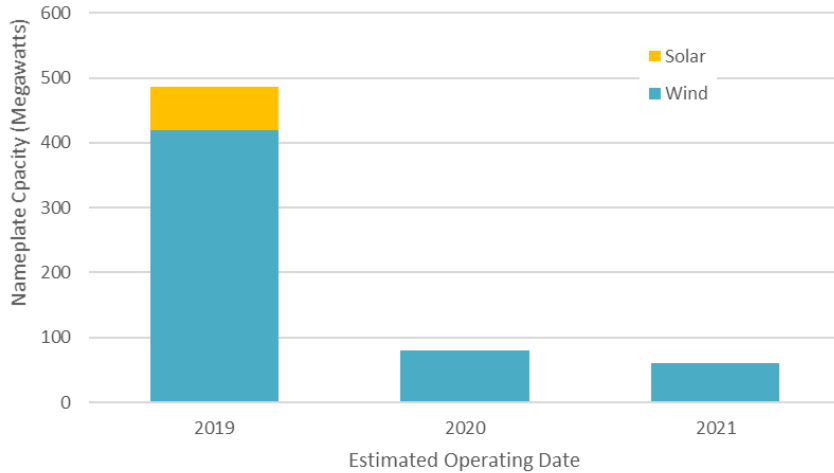
Resources that have come online since adoption of the Seventh Power Plan (2016-present)



What resources are under construction*?

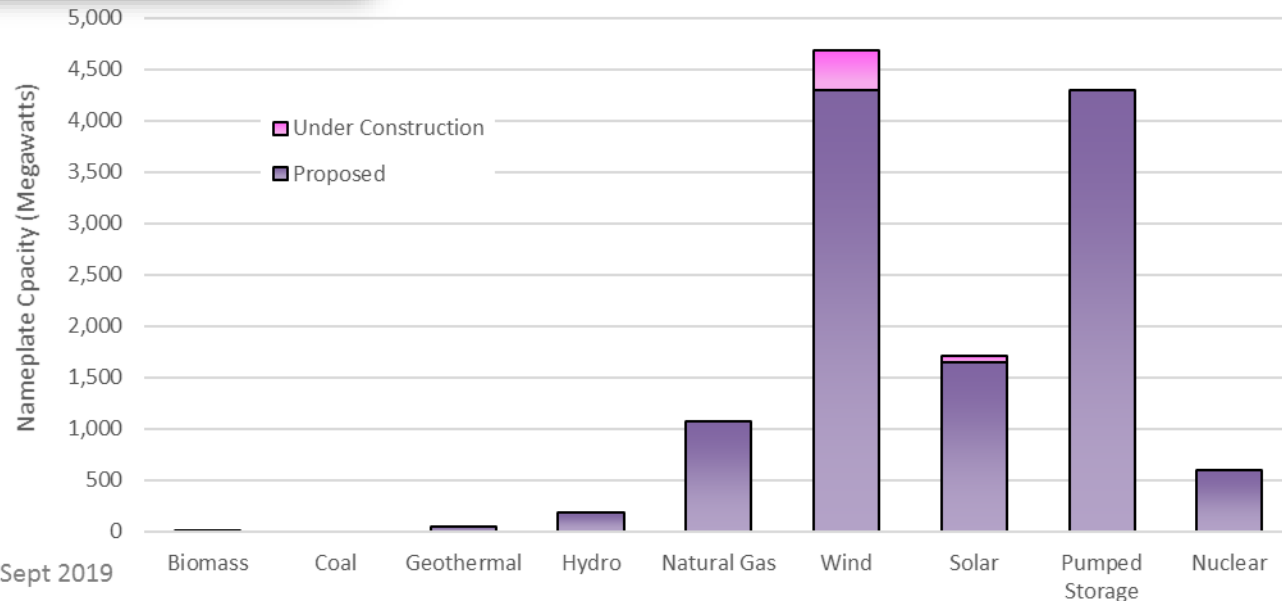
- Council tracks projects in various phases of development in the generating resources project database
 - *Proposed and under construction projects can be tricky to track, especially small PURPA projects

Generating projects under construction in PNW



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Not included: Upgrades to existing hydropower projects that result in improved efficiency and/or increased capacity

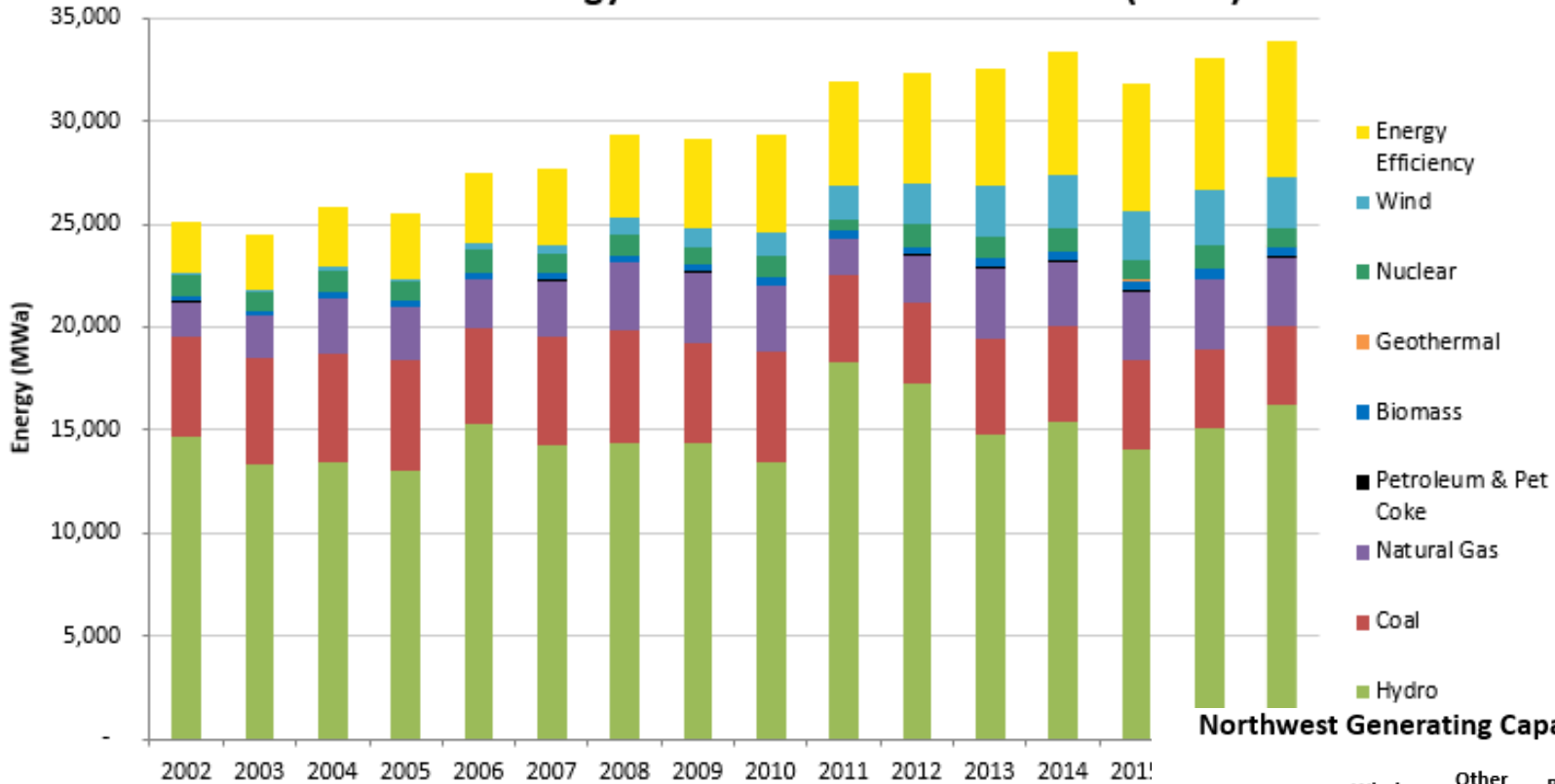


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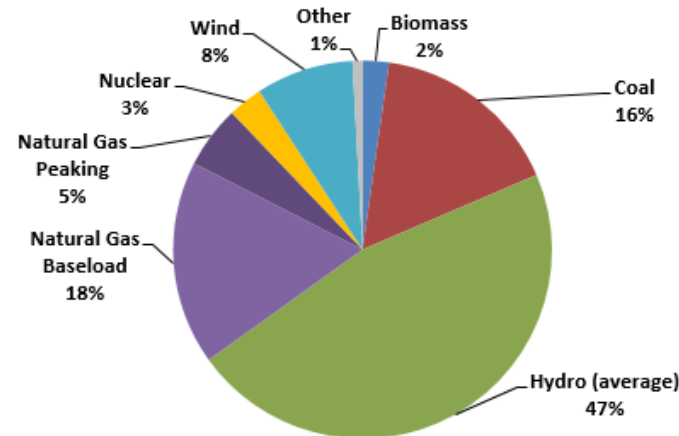


NW Generation: Last ~15 years

Historical Energy Production in the Northwest (aMW)



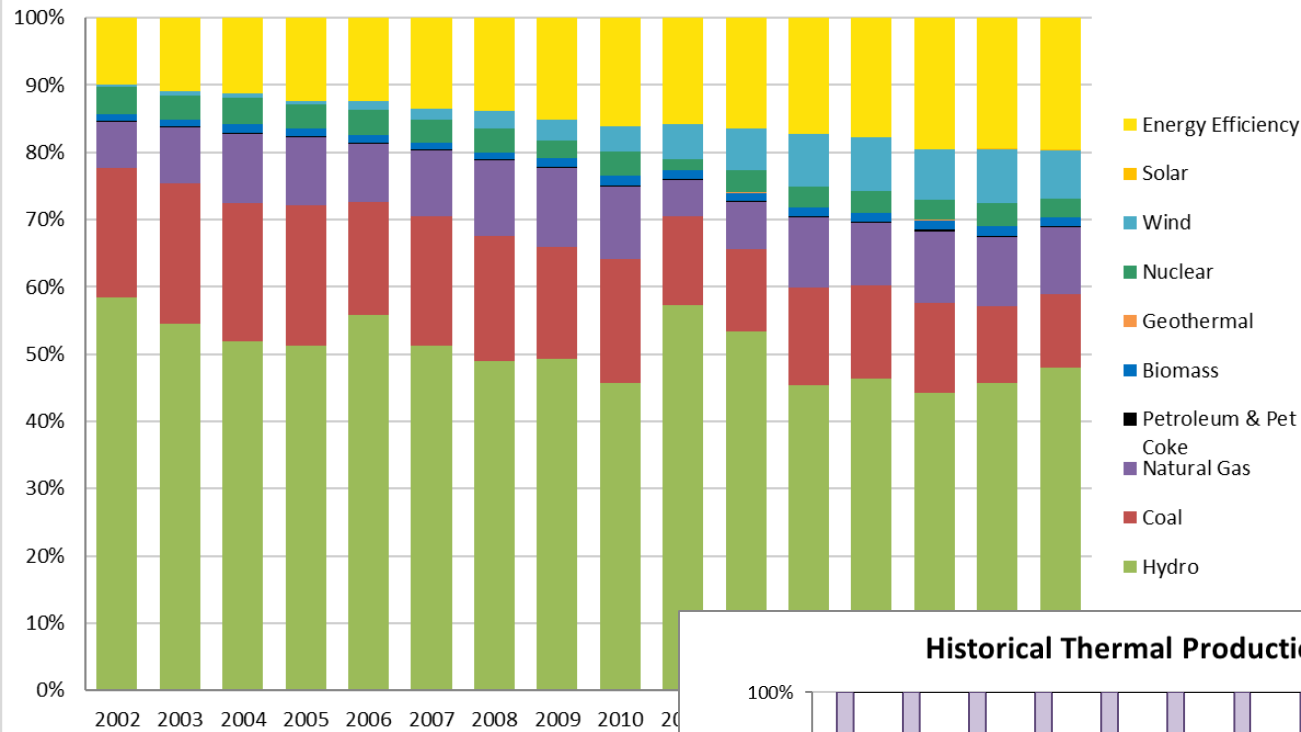
Northwest Generating Capability - 34,978 MWa



Data from EIA; Excludes small projects not reporting to EIA. WECC only (excludes E. Montana projects in MRO reliability area)

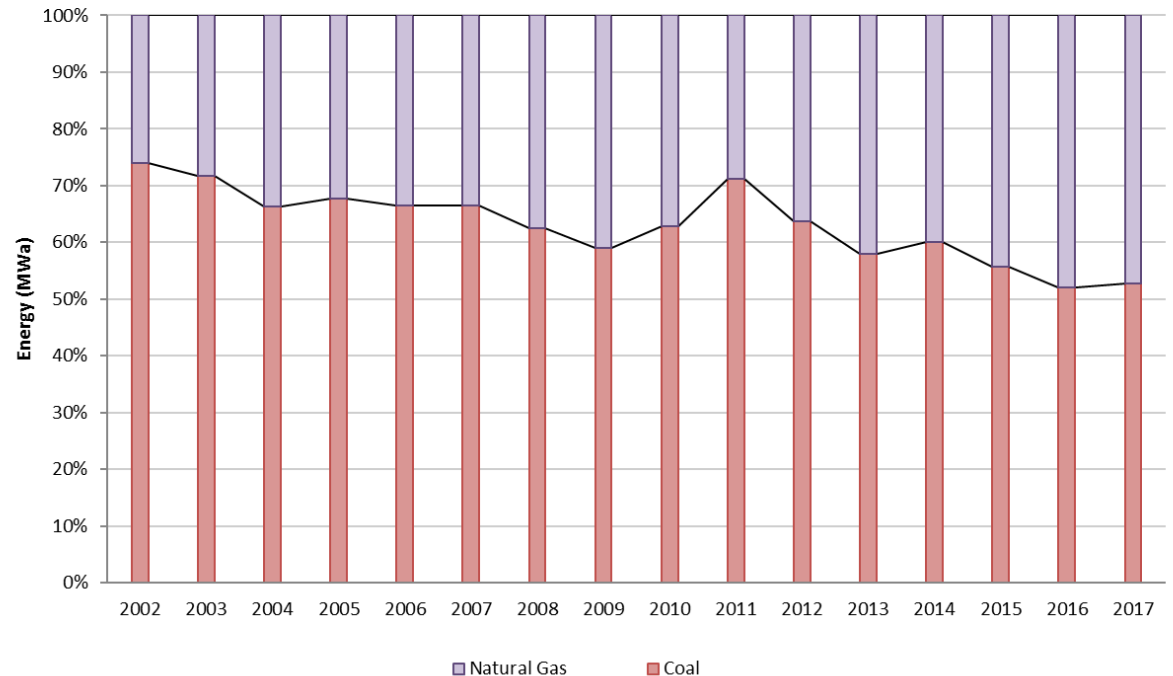


Historical Energy Production in the Northwest (%)



On average, coal generation has been declining while natural gas generation has been increasing

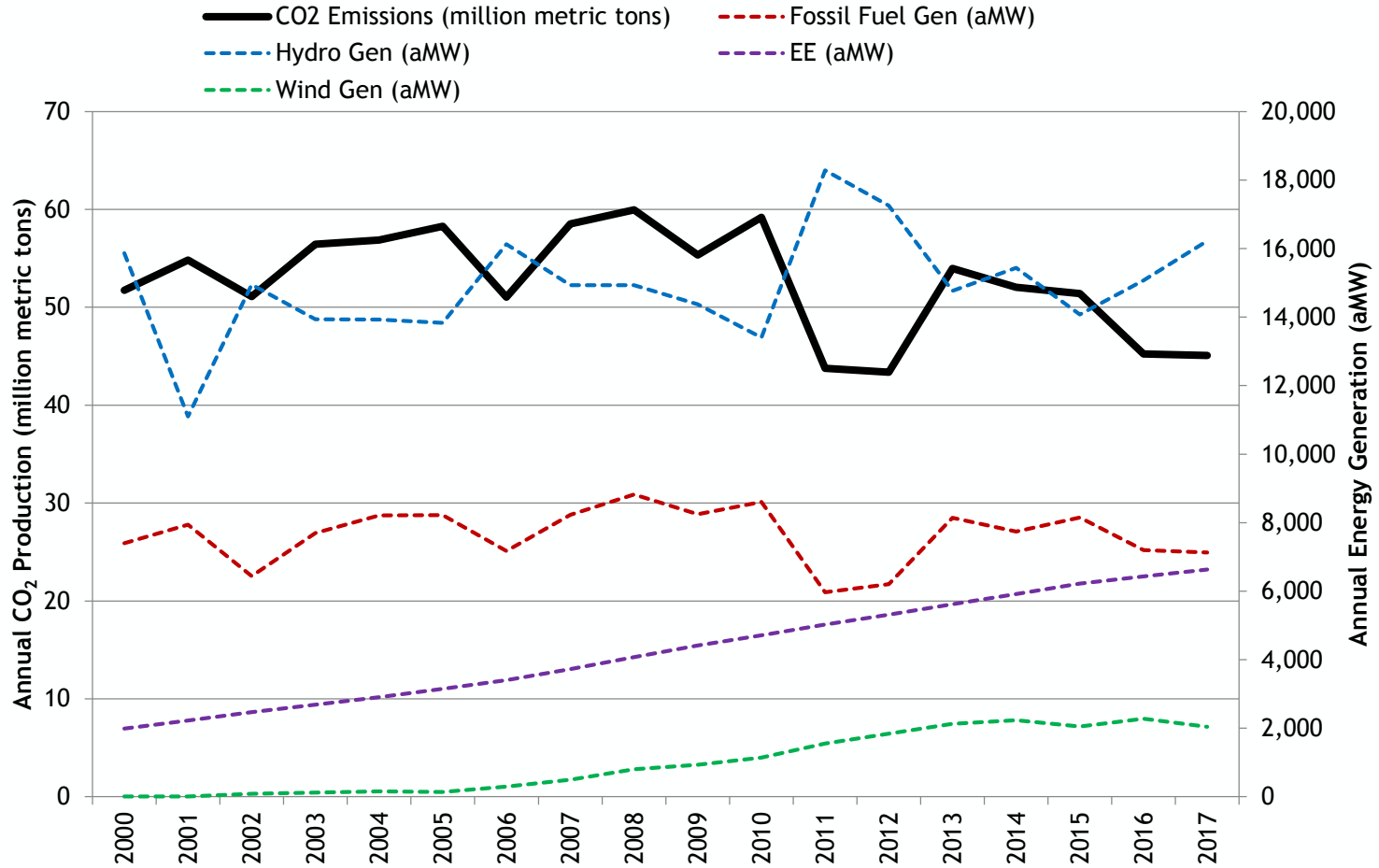
Historical Thermal Production in the Northwest (aMW)



Fuel Type	CO ₂ Emissions (lbs CO ₂ /MMBtu)
Coal	205 - 228
Petroleum/Oil	161
Natural Gas	117



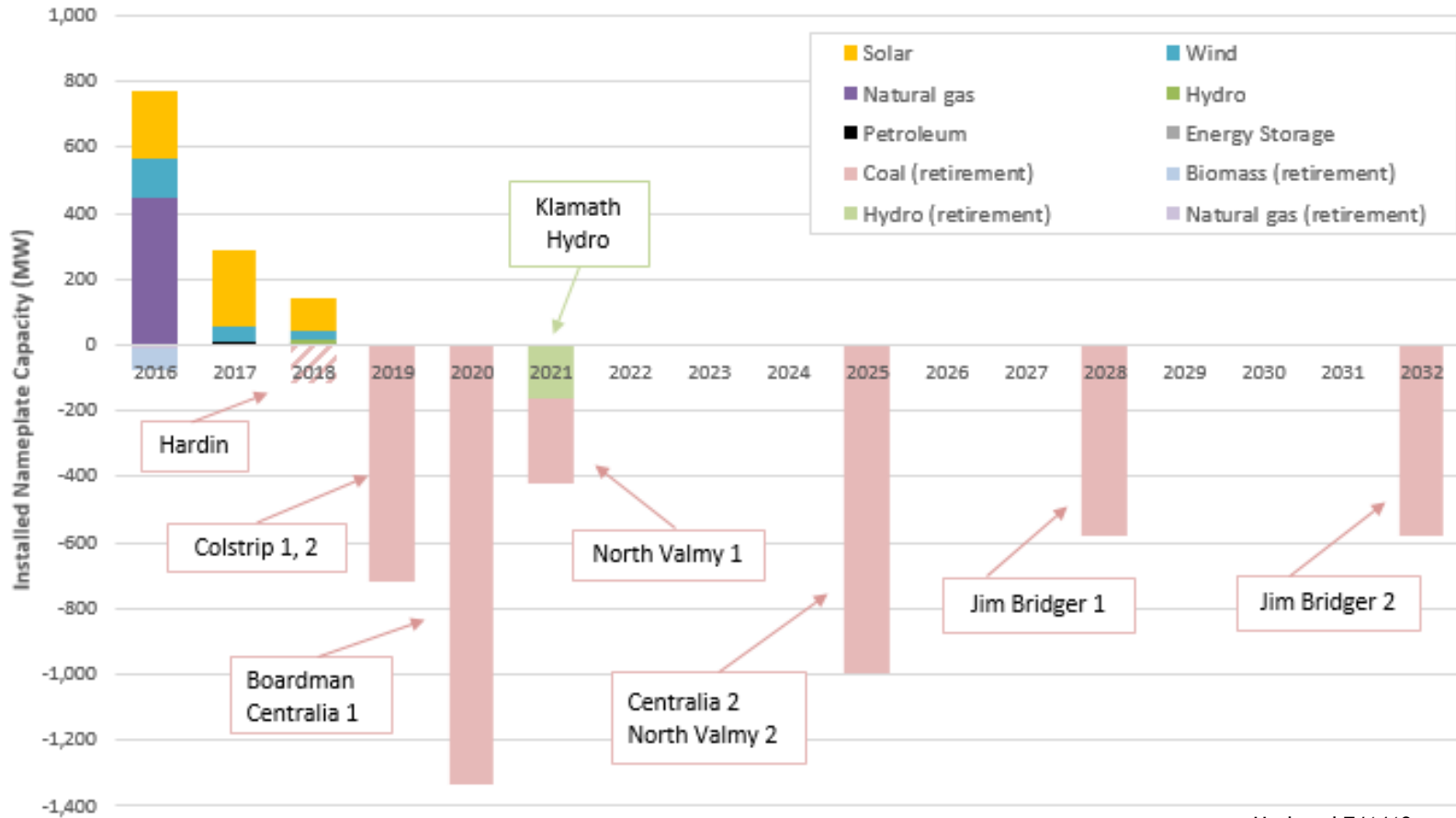
Annual carbon emissions from the generation of electricity in the NW



2017 emissions (~45 million metric tons) decreased *slightly* from 2016



Additions and Retirements since the Seventh Power Plan (incl. announced planned retirements)



Updated 7/1/19

Planned retirements based on agreements, announcements, IRPs; subject to change

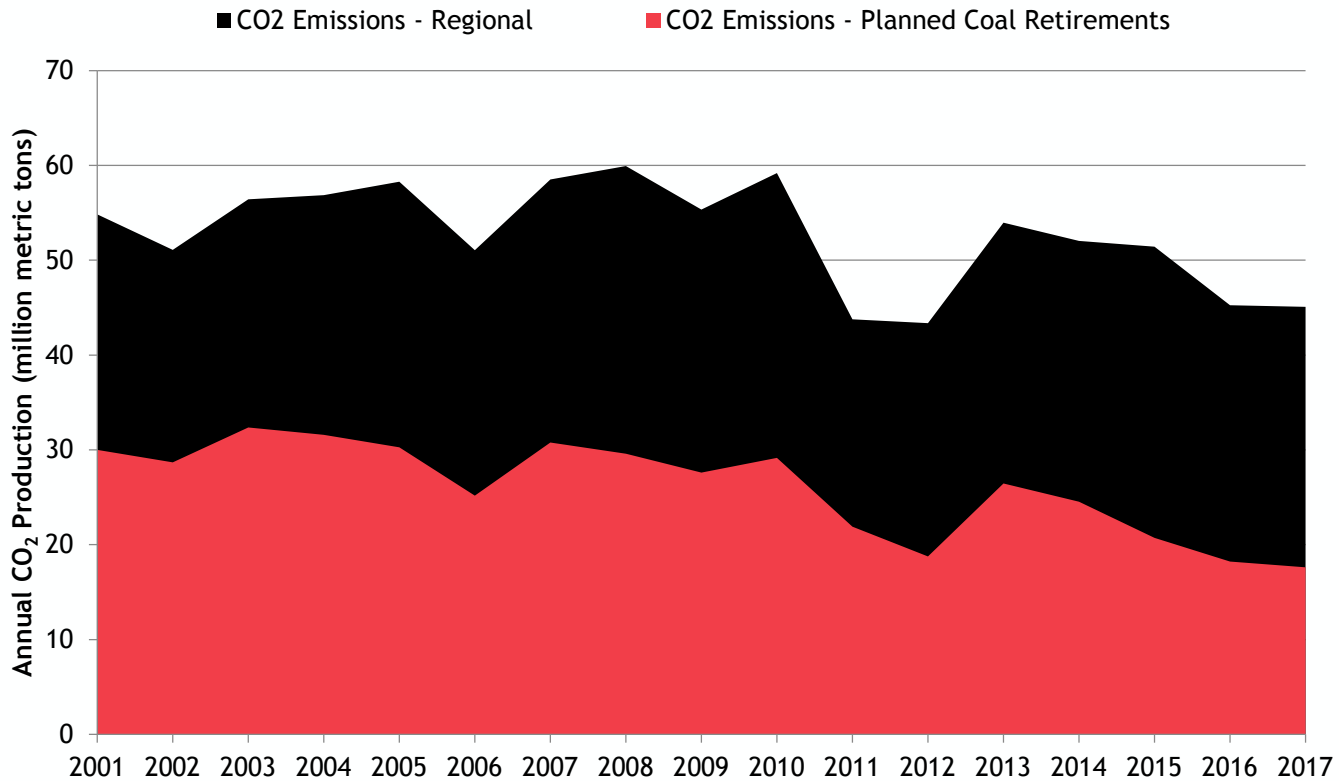
Idaho Power intends to end its participation in North Valmy 1 in 2019

Uncertainty remains over Jim Bridger 1,2 potential accelerated retirements

Hardin Generating Station was sold to an out-of-region cryptocurrency company; therefore no longer "counts" towards the region



Retiring coal plants account for about 50% of historical carbon emissions since 2000



HOWEVER, actual future emissions depend on the **replacement resources!**





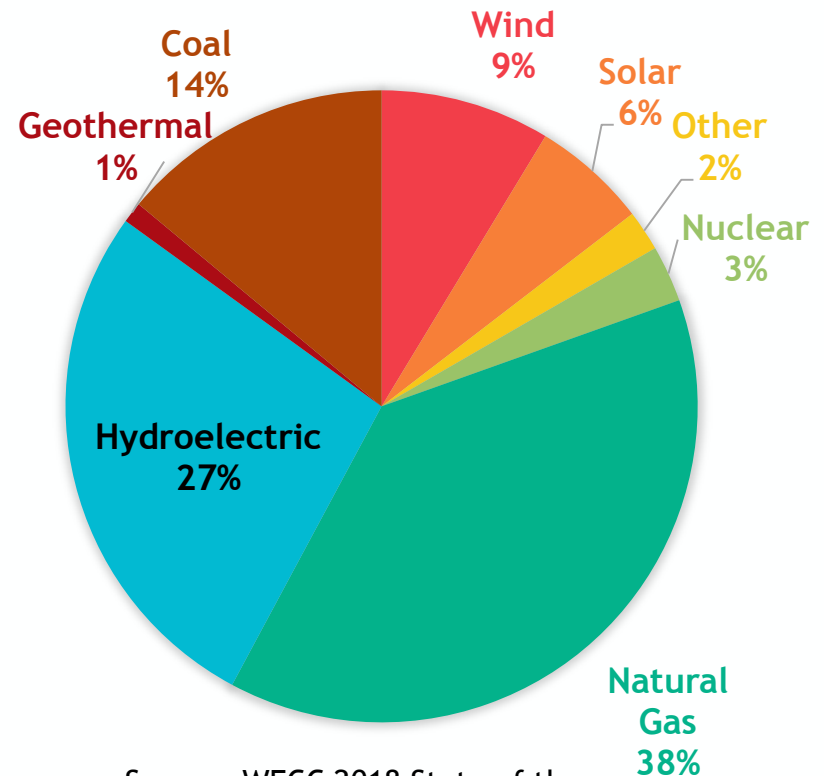
Coal Retirements in the WECC

Inventory of units currently in operation and assumed
future operations

What about Coal in the WECC?

- Council is tracking coal retirement developments in the region and WECC-wide
 - “Fluid” endeavor – new and updated information announced regularly by utilities and unit owners
- In 2017, coal was about 14% of nameplate capacity in the WECC
 - Share has decreased through the onset of wind, solar, and cheap natural gas
- 34 GW coal in operation in the WECC today (2019)

2017 CAPACITY BY FUEL TYPE
(266,000 MW)



Source: WECC 2018 State of the Interconnection Overview



Coal Unit Retirements in WECC – Analysis and Assumptions

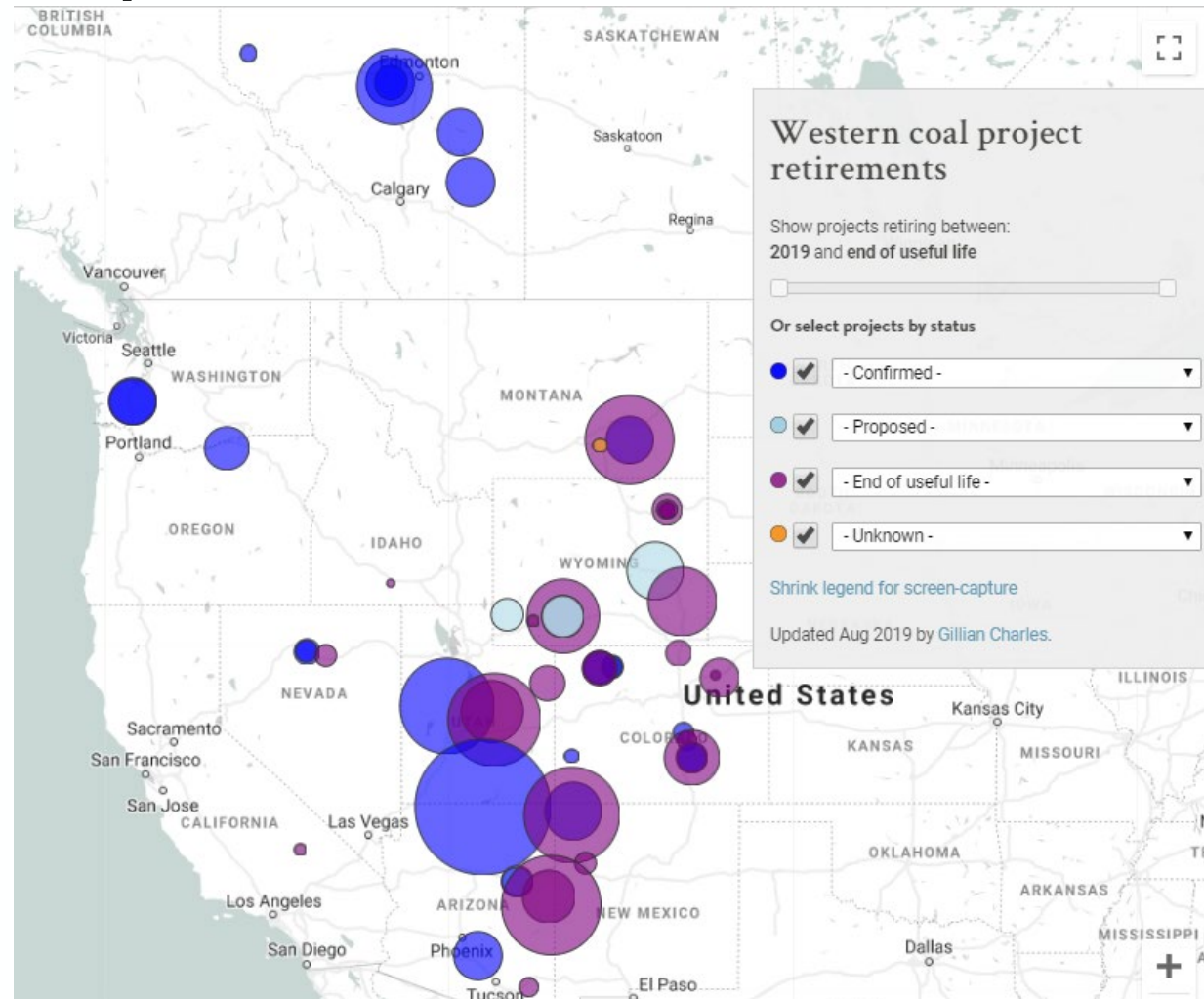
Assigned all WECC-wide coal units a retirement status:

- **Confirmed** – Unit retirement has been announced and confirmed; could still be accelerated due to environmental policies (for example, units in Alberta must be cease coal-firing *by* 2030, but many have plans to convert to natural gas in the early 2020's)
- **Proposed** – Unit retirement has been proposed by an owner; tentative retirement dates have been announced
- **End of useful life (EUL)** – No retirement plans have been announced; an owner has announced continual operations through investments and compliance with environmental regulations
 - An accelerated retirement is still possible, just not announced at this time
- **Unknown** – No information is available pertaining to the status and continued operation of the unit; EUL is assumed



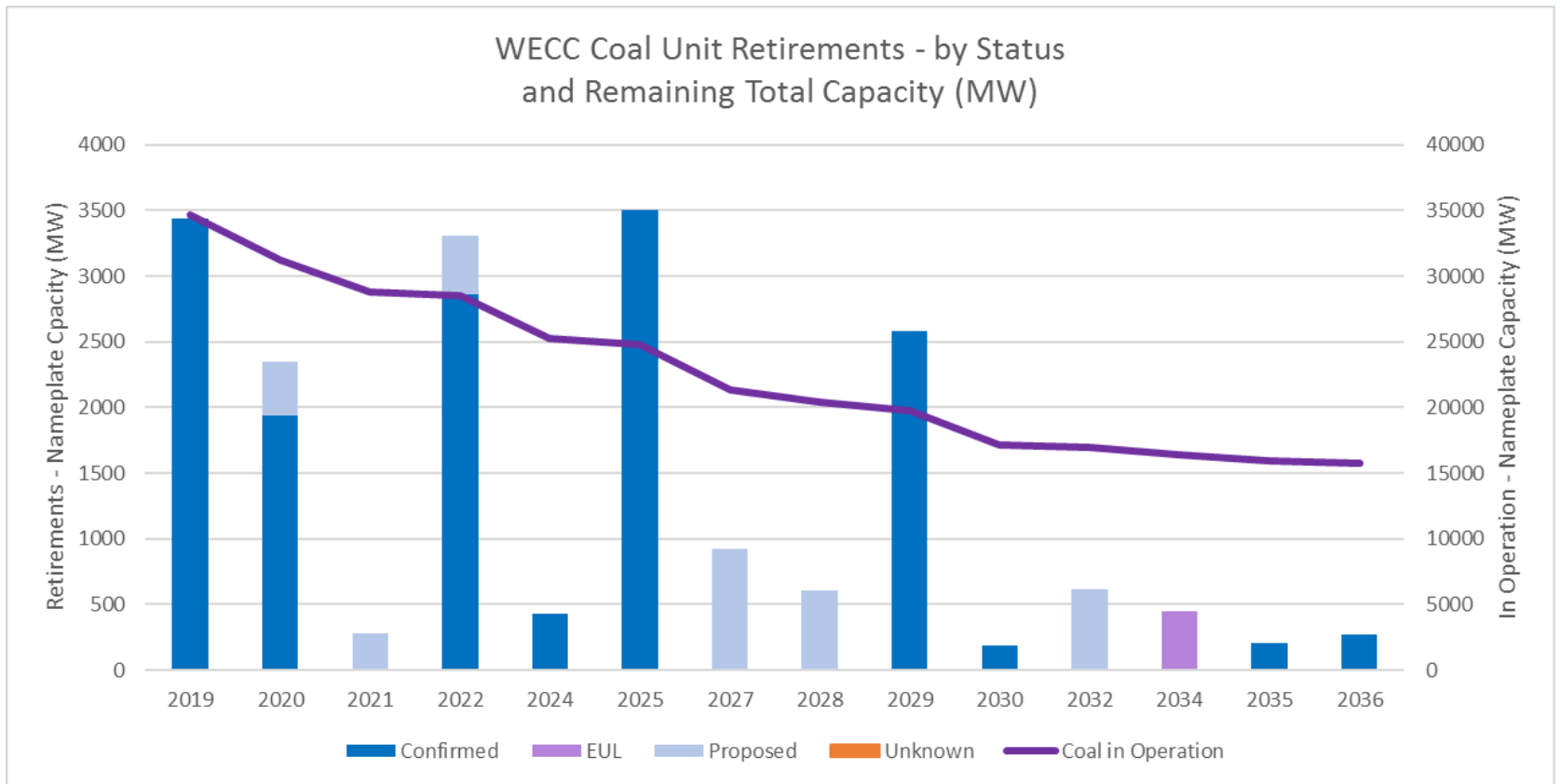
Coal Unit Retirements in WECC – Interactive map on Council’s website

- Visual representation of coal unit retirements
- Filter on status, retirement dates
- Markers based on nameplate capacity (MW)
- Ability to screen-capture and copy image
- Check out map [here!](#)
- Also, see [blog post](#)



(Big thanks to Eric Schrepel for his work on the map!)



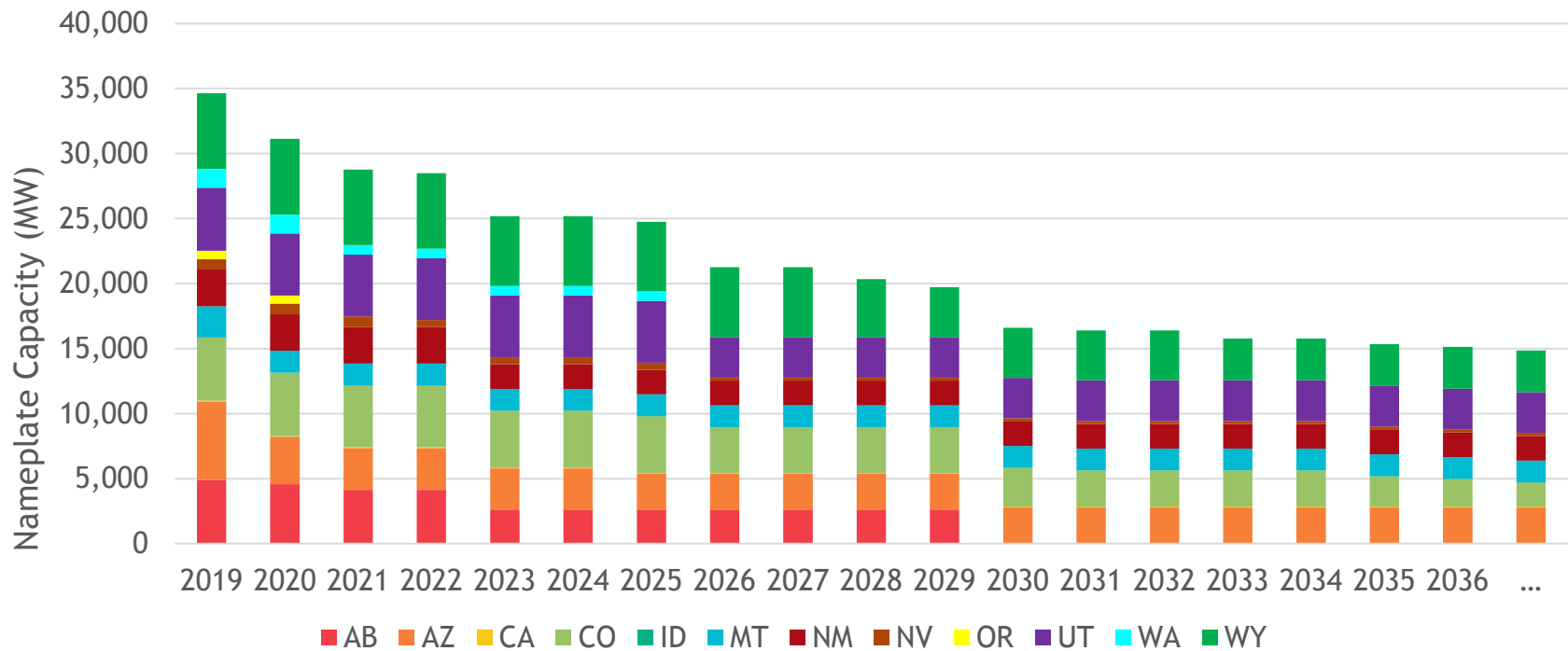


Note: Horizontal axis is discrete

- By 2030, the WECC region retires about **~15GW** nameplate coal (confirmed), just about 45% of the total operating capacity today
- Of that, about **~3GW** serves load in the PNW



WECC Coal Units in Operation, Decreasing over Next 20 Years

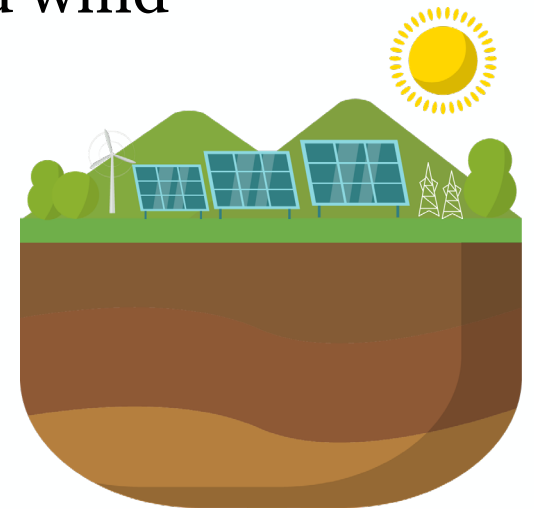


Overall, coal operating in the WECC falls from about ~34GW in 2019, to ~15GW in 2036



What about replacement resources?

- Varying strategies for replacing retiring resources; case-by-case, site-specific basis
 - Depends on state policies, utility goals, market demand
- New gas development
- New renewables, most notably solar and wind
 - Often combined with storage
- Coal-to-gas conversion of existing infrastructure
- Combination of all/any of the above!



Next Steps

- Staff to continue tracking and updating coal unit retirements
- Staff to continue tracking new projects within the region
- Final 2018 generation and emissions data released by EIA later this month
- Staff will provide a summary of the utility integrated resource plans (IRPs) – probably Q1 2020
- Presentation on clean, renewable, and carbon policies in the region and WECC-wide (next month?)



Extra Slides



Operating Coal Units in the PNW, by In-Service Date

