Northwest **Power** and **Conservation** Council



January 3, 2024

**MEMORANDUM**

**TO:** **Council Members**

**FROM:** **Annika Roberts**

**SUBJECT:** **Update on Carbon Emissions from the Power Sector**

## BACKGROUND:

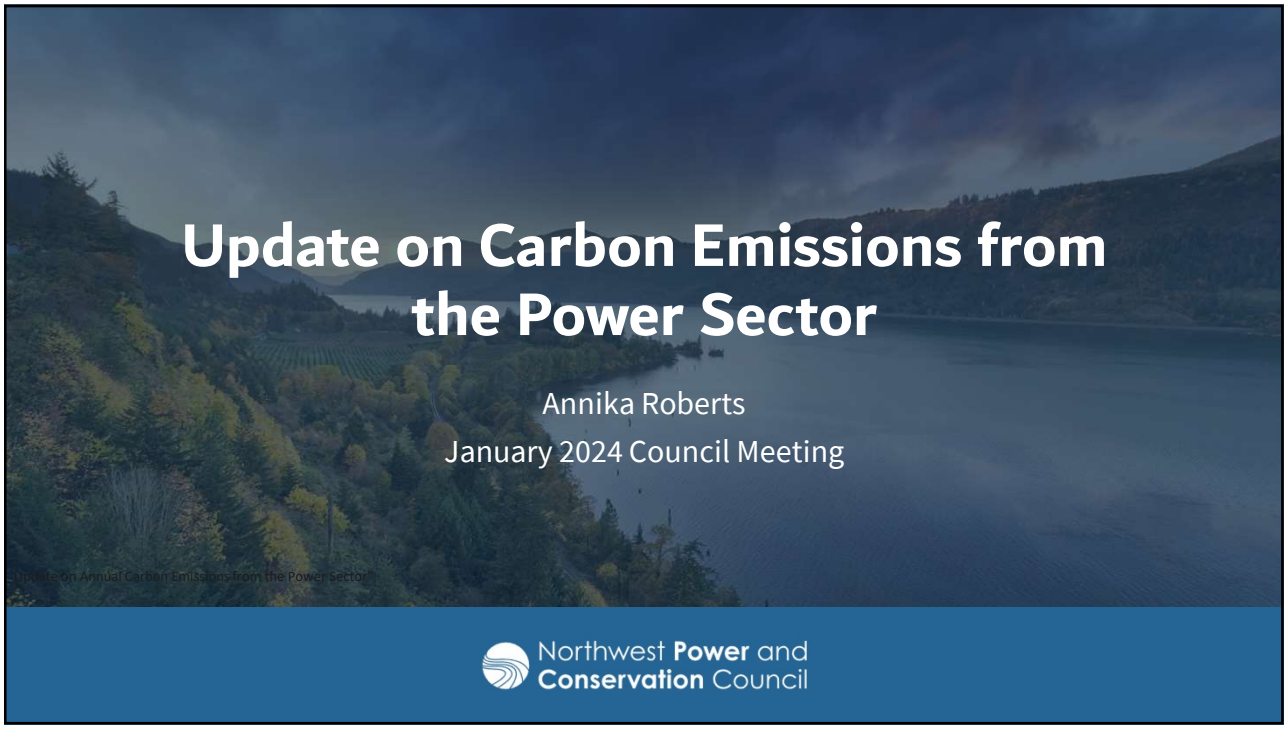
Presenter: Annika Roberts

Summary: Staff will present annual (2022) regional and national carbon dioxide emissions from electricity generation. The presentation will focus on the relationship between generation source and emissions in the pacific northwest, how regional emissions compare to the wider nation, and how current resource builds, policies etc. might impact future emissions.

Workplan: Staff track emissions data as it is made available by both the EIA and the EPA and present a comprehensive update biannually.

More Info: Workbook feeding Charts in Presentation:
https://nwcouncil.box.com/v/PNWCO2Emissions-2022

Source Data:
https://www.eia.gov/todayinenergy/detail.php?id=61023
https://www.eia.gov/outlooks/steo/report/total.php

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## Outline

- **Annual Carbon Emissions in PNW**
  - Relationship between generation source & emission
- **Annual Carbon Emission in US**
  - Regional vs. National emissions
- **A forward look**
  - What will impact future emissions regionally and nationally



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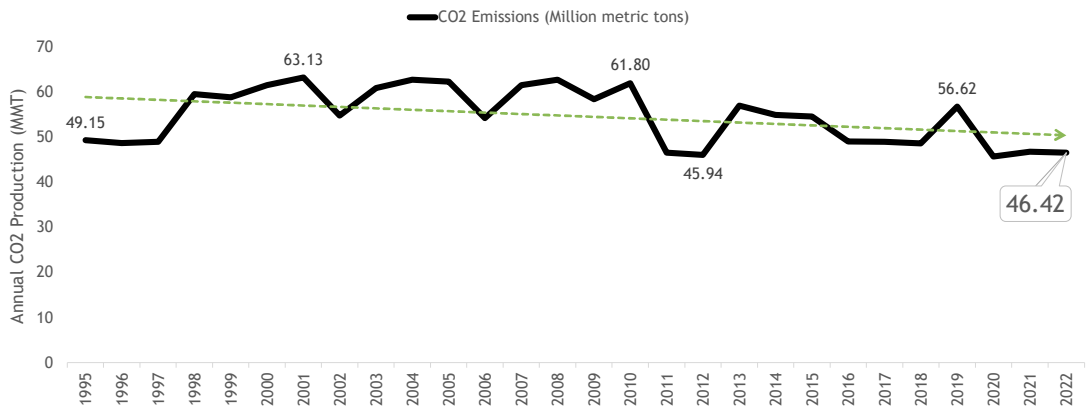
## Annual $CO_2$ emissions from electricity generation in the Region

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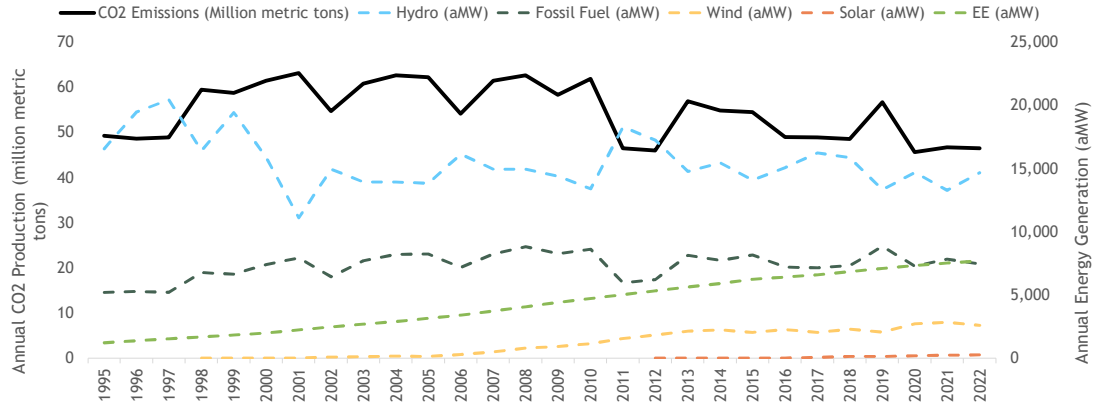
# Annual $CO_2$ emissions and generation source

Hydro production and emissions have a notably inverse relationship, while fossil fuels and $CO_2$ have a positive relationship



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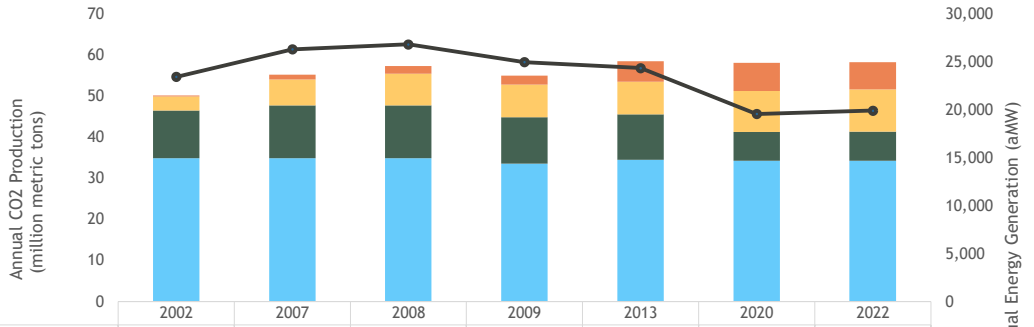
# Emissions across similar hydro years

*While total generation has remained fairly steady, the increase of renewables/natural gas has had a measurable impact on total emissions*




| | 2002 | 2007 | 2008 | 2009 | 2013 | 2020 | 2022 |
|---|---|---|---|---|---|---|---|
| Renewables(aMW) | 90 | 497 | 803 | 933 | 2,134 | 2,922 | 2,846 |
| Gas (aMW) | 1,470 | 2,729 | 3,306 | 3,405 | 3,401 | 4,279 | 4,412 |
| Coal (aMW) | 4,967 | 5,498 | 5,514 | 4,842 | 4,744 | 2,998 | 3,035 |
| Hydro (aMW) | 14,945 | 14,932 | 14,932 | 14,373 | 14,768 | 14,679 | 14,665 |
| Emissions (MMT) | 55 | 61 | 63 | 58 | 57 | 46 | 46 |



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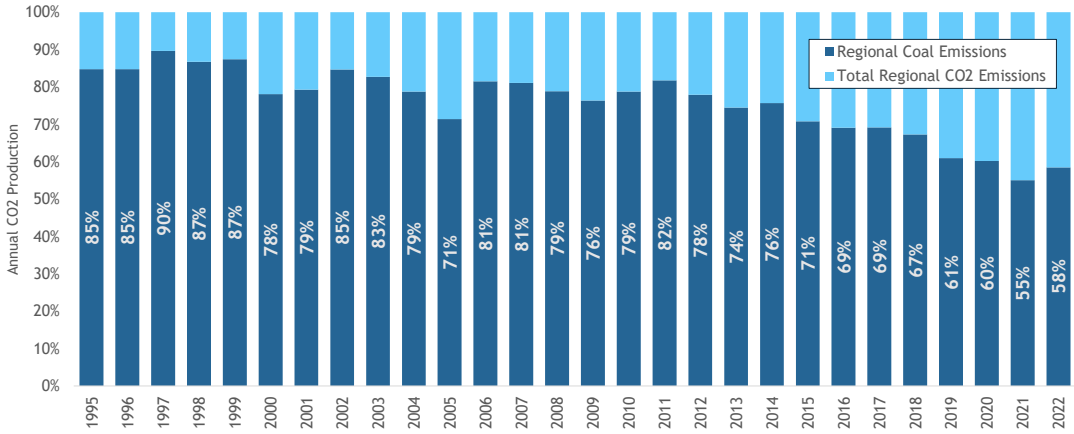
# % of regional $CO_2$ emissions from coal




Historically coal has accounted for the majority of the region's emissions though we can see that shifting over time, now only accounting for 58%



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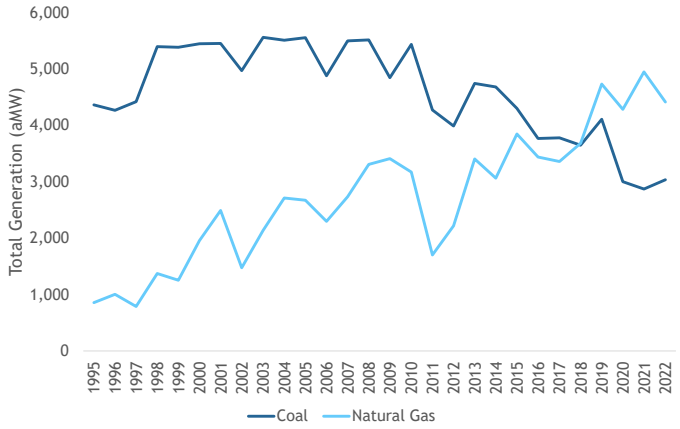
# The coal/natural gas trade-off

- Coal generation and regional CO2 emissions are very closely related
- With many coal plants retiring we are seeing an equivalent decrease in regional emissions
  - The total impact of these retirements on emissions will be determined by what replaces them
- The regions thermal fleet is shifting, with natural gas producing more power than coal for the first time in 2018
- This evolution will have interesting implications for future GHG emissions



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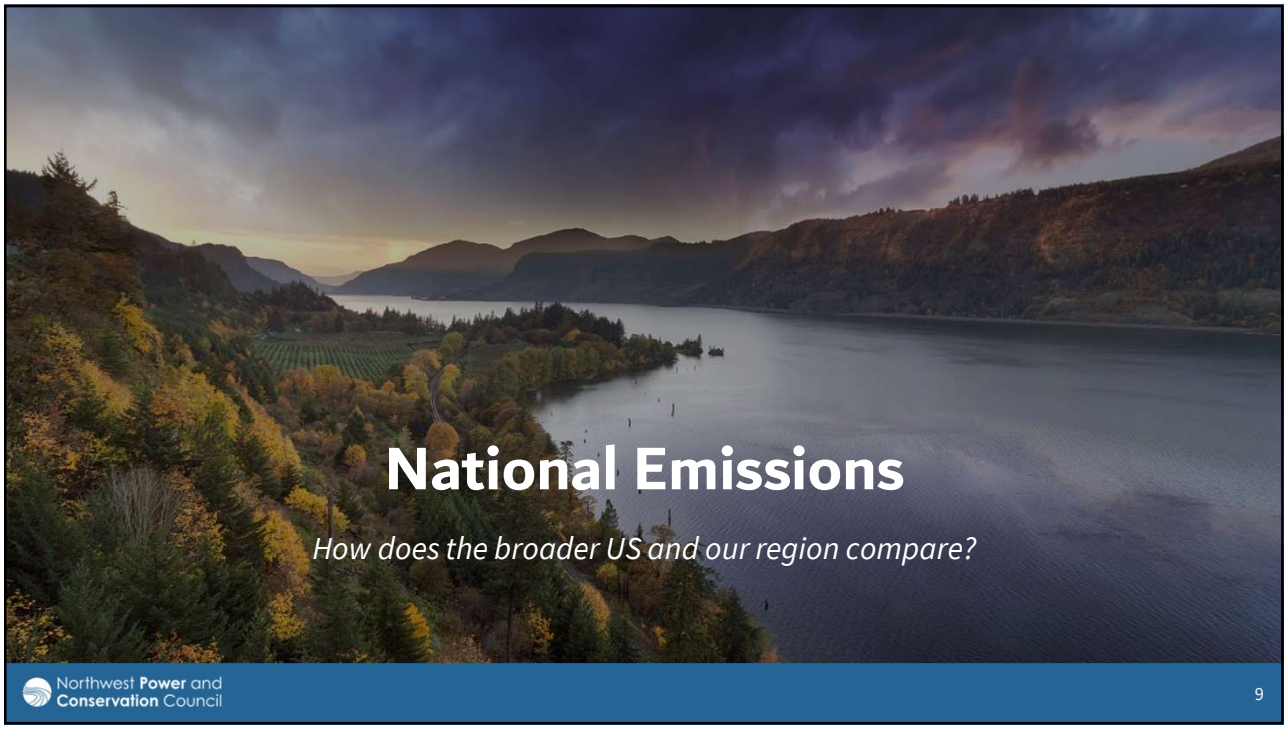


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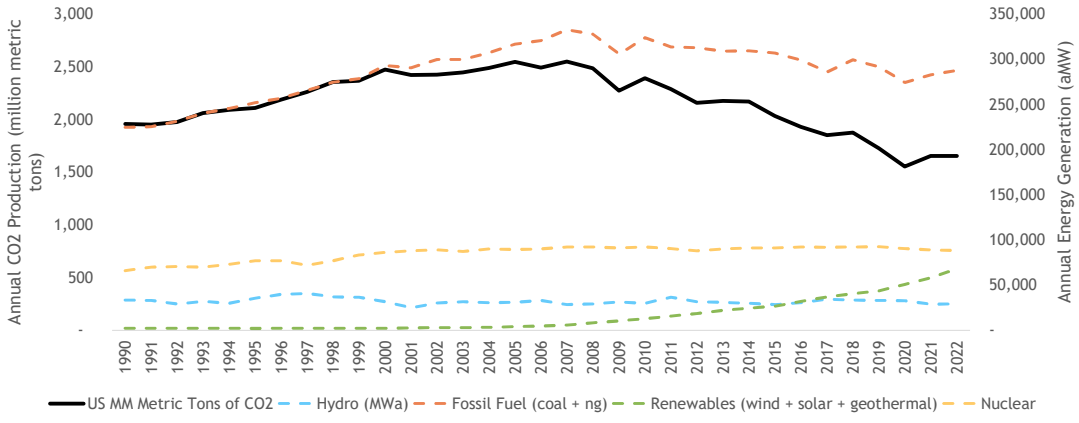
## Annual $CO_2$ emissions from electricity generation in the US

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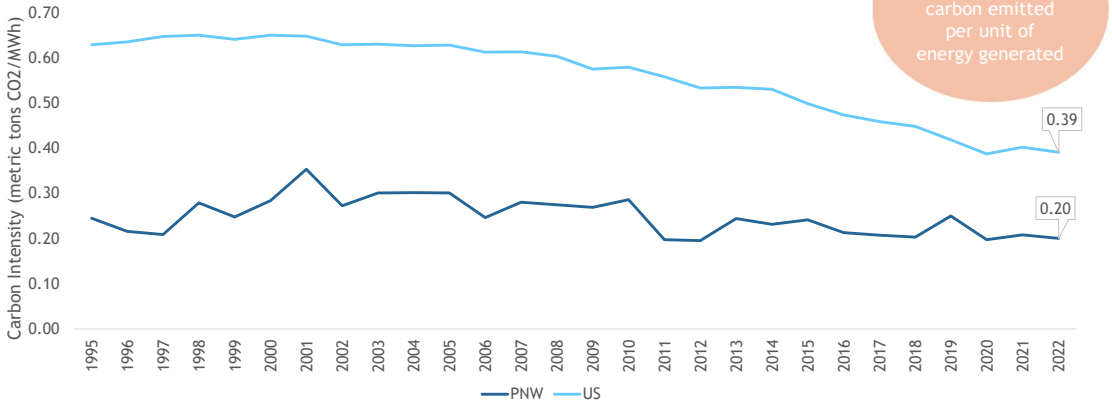
# $CO_2$ intensity

*The PNWs Carbon intensity has always been low, though variable, due to our reliance on the hydro system. While the carbon intensity of the US's electric mix has been steadily declining since the early 2000's*

Carbon intensity is the amount of carbon emitted per unit of energy generated



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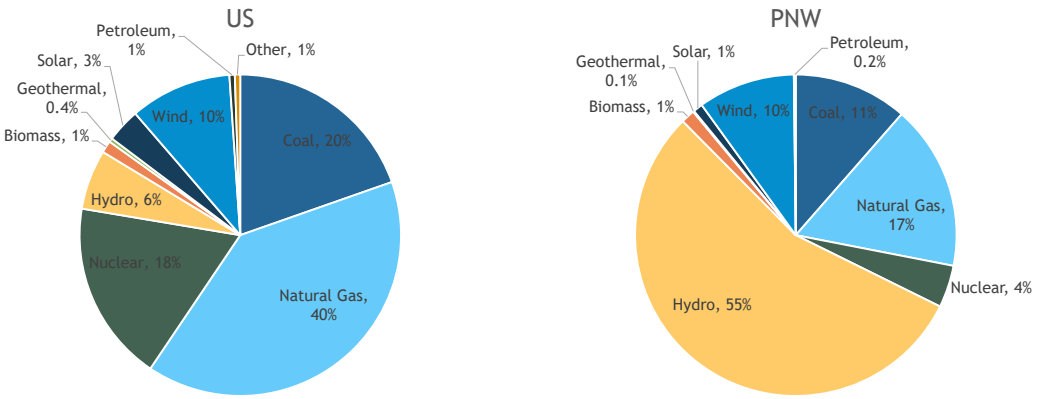
# US vs PNW generation (2022)



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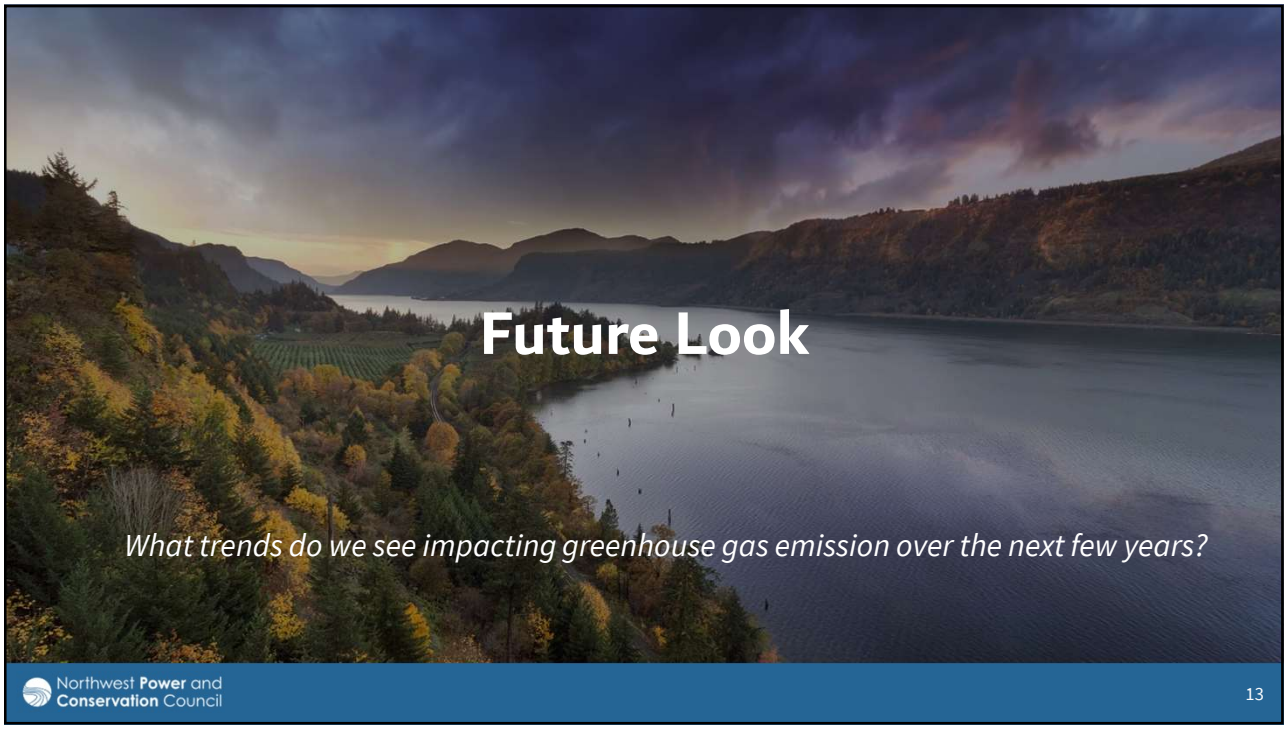


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## Factors impacting future emissions

- Increased utilization of thermal fleet (specifically Natural Gas), near term
  - Few new gas plants are likely to be built, but the flexibility/reserves they provide the system is becoming more important
- Coal retirements
  - Most of the regions coal plants are schedule for retirement by 2030—what replaces their capacity will have a large impact on future emissions
- Ambitious carbon goals set at the national, state, and utility level
  - The focus on not just carbon but all greenhouse gases
- Increased renewables
  - Non emitting resources on the rise due to low costs and legislative support



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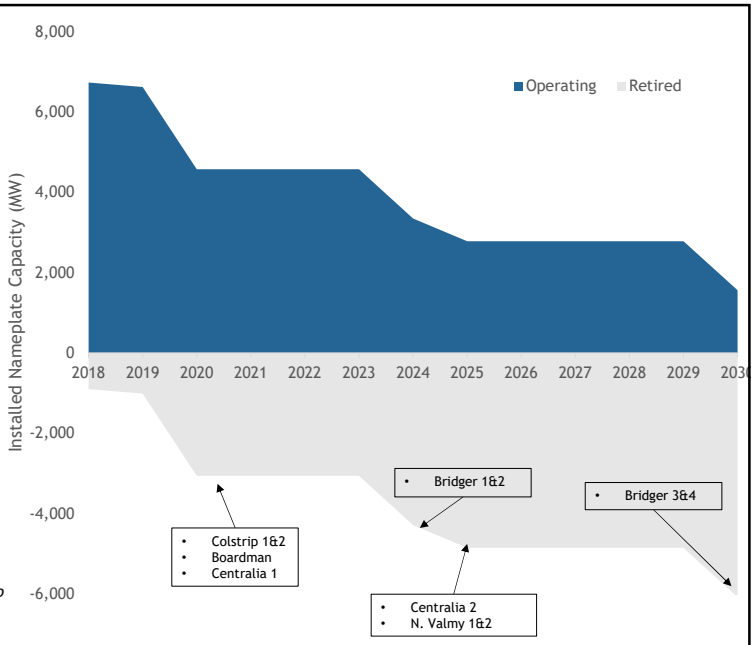
# Coal retirements

| Coal Unit | Nameplate Capacity (MW) | Planned Retirement |
|---|---|---|
| Colstrip 1 | 358 | 2020 |
| Colstrip 2 | 358 | 2020 |
| Boardman | 601 | 2020 |
| Centralia 1 | 730 | 2020 |
| Jim Bridger 1 | 608 | 2024* |
| Jim Bridger 2 | 617 | 2024* |
| Centralia 2 | 730 | 2025 |
| North Valmy 1 | 277 | 2025[x] |
| North Valmy 2 | 289 | 2025[x] |
| Colstrip 3 | 778 | - |
| Colstrip 4 | 778 | - |
| Jim Bridger 3 | 608 | 2030* |
| Jim Bridger 4 | 608 | 2030* |

*Planned conversion to natural gas announced in PacifiCorp's draft IRP
[x] Planned conversion to natural gas per NV Energy IRP amendment—*also plans to replace generation and help meet Nevada's RPS mandates of 50% by 2030 with a 400-MW solar/storage plant*



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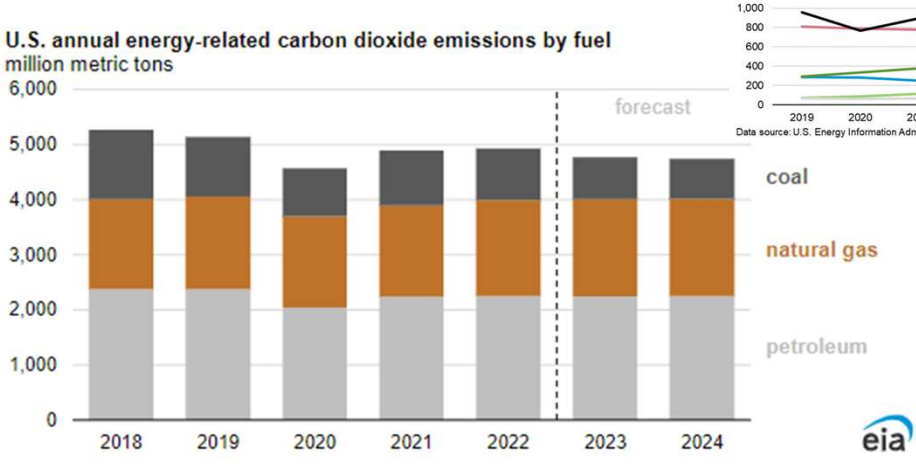
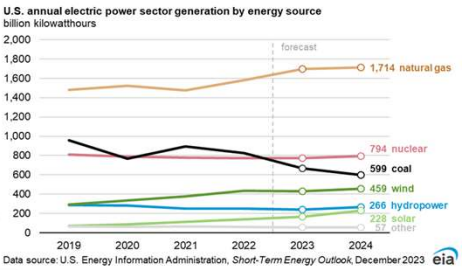
# National trends




Like the region, the US is seeing decreasing coal generation and increased natural gas/renewables. The EIA forecasts this trend to hold over the next few years



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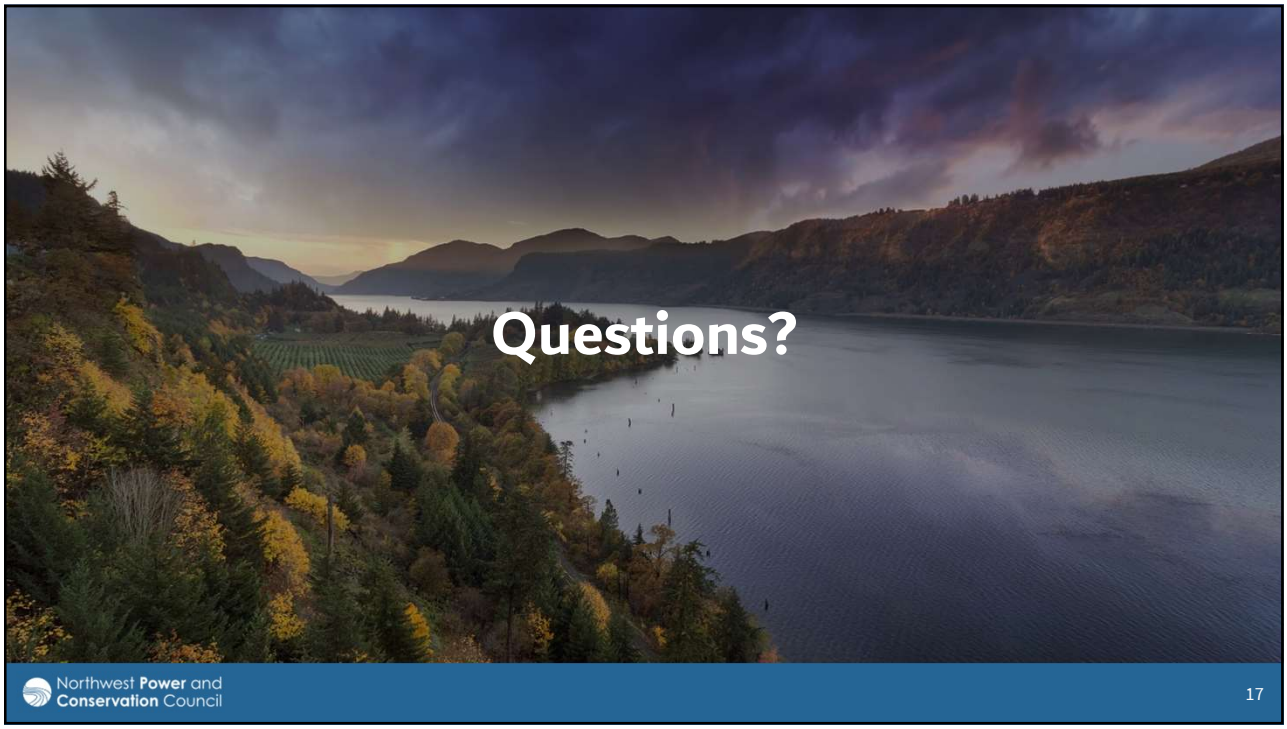


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