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Oregon

January 8, 2019

MEMORANDUM

TO: **Council Members**

FROM: **Gillian Charles**

SUBJECT: **Update on annual historic carbon emissions**

BACKGROUND:

Presenter: Gillian Charles

Summary: Staff will present the latest annual regional and national carbon dioxide emissions from the generation of electricity.

Regional emissions in 2017 from the electricity sector decreased *slightly* from the previous year but are still on an overall downward trajectory from the peak in 2008. Emissions in the northwest tend to bounce around each year due to the hydroelectric system in the Northwest. In good hydro years (average, or above average output), emissions are lower as less natural gas and coal are dispatched. In poor hydro years, emissions tend to be higher as thermal resources are dispatched at a greater frequency and duration to meet demand. Overall, emissions are trending down, due to increased energy efficiency and renewable resources, and changes in thermal dispatch with the increased use of natural gas displacing coal resources (natural gas is less carbon intensive, releasing roughly half the emissions of coal). With over 3,000 MW of coal unit retirements currently planned for the region, emissions will continue to decline over the next several decades – however the extent of the decline from these retirements will largely depend on what replacement resources are developed.

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At the national level, emissions have steadily been declining since 2007 – with some year-to-year variability. While 2017 emissions followed this trend, early indications for 2018 (for which final data has not yet been released) signal an increase in emissions due to increased heating and cooling needs as a result of a warmer-than-usual summer and a colder-than-usual winter. The Energy Information Administration (EIA) forecasts emissions will once again decline in 2019.

Workplan: Implement Seventh Power Plan and related Council priorities; Prepare for Eighth Plan

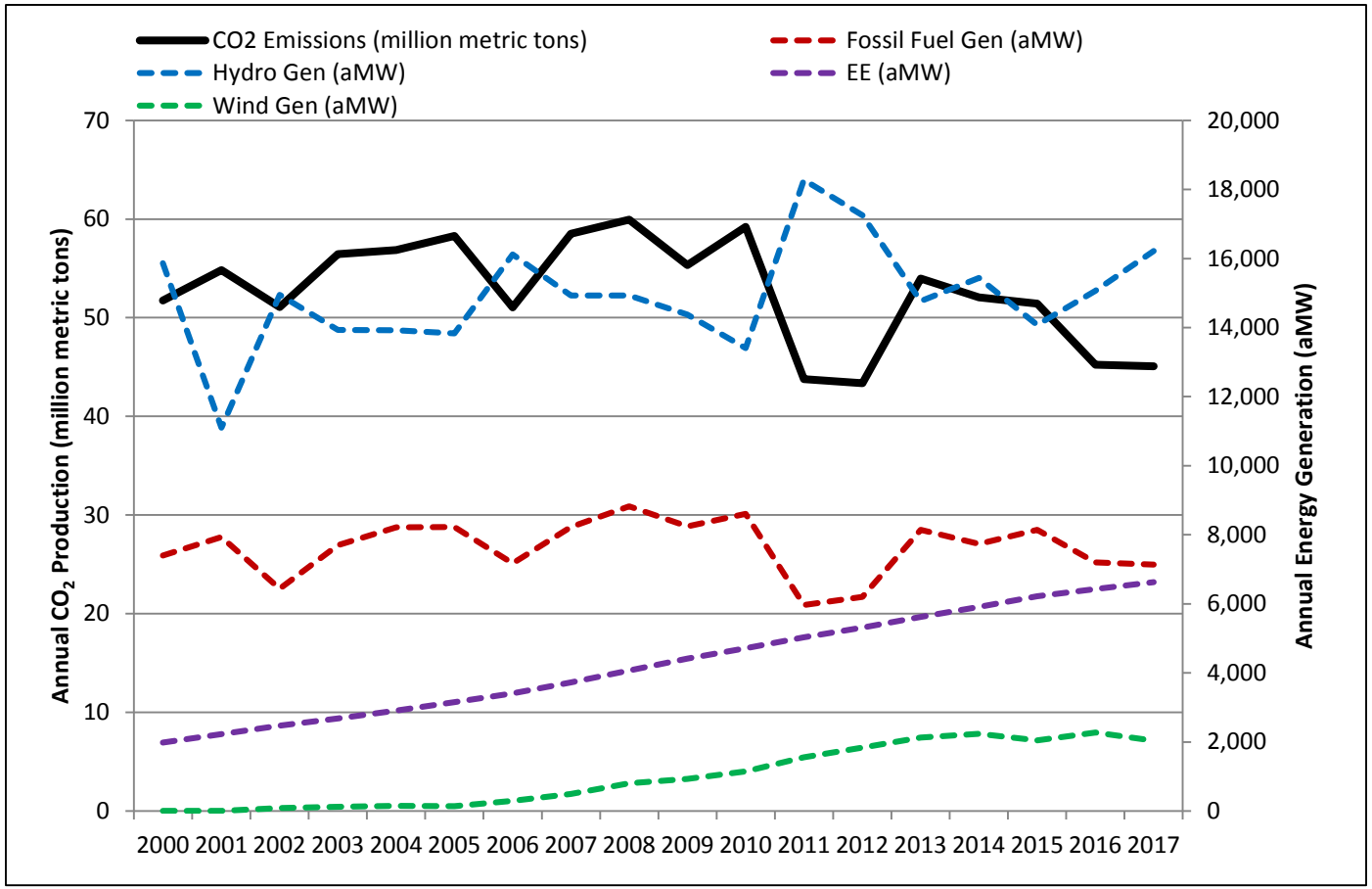
Update on Annual Carbon Emissions

Gillian Charles

Council Meeting

January 16, 2019

Annual carbon emissions from the generation of electricity in the NW



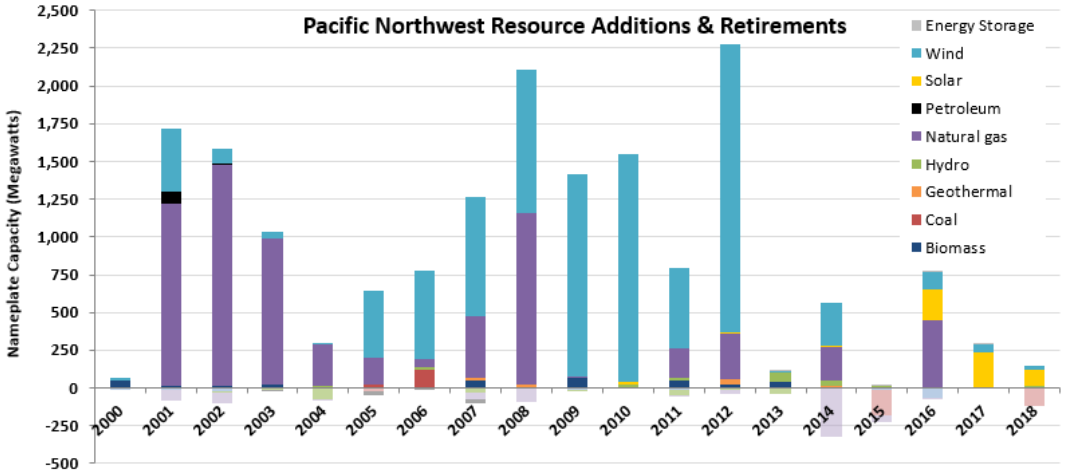
2017 emissions (~45 million metric tons) decreased *slightly* from 2016

Contributions to Declining Carbon Emissions

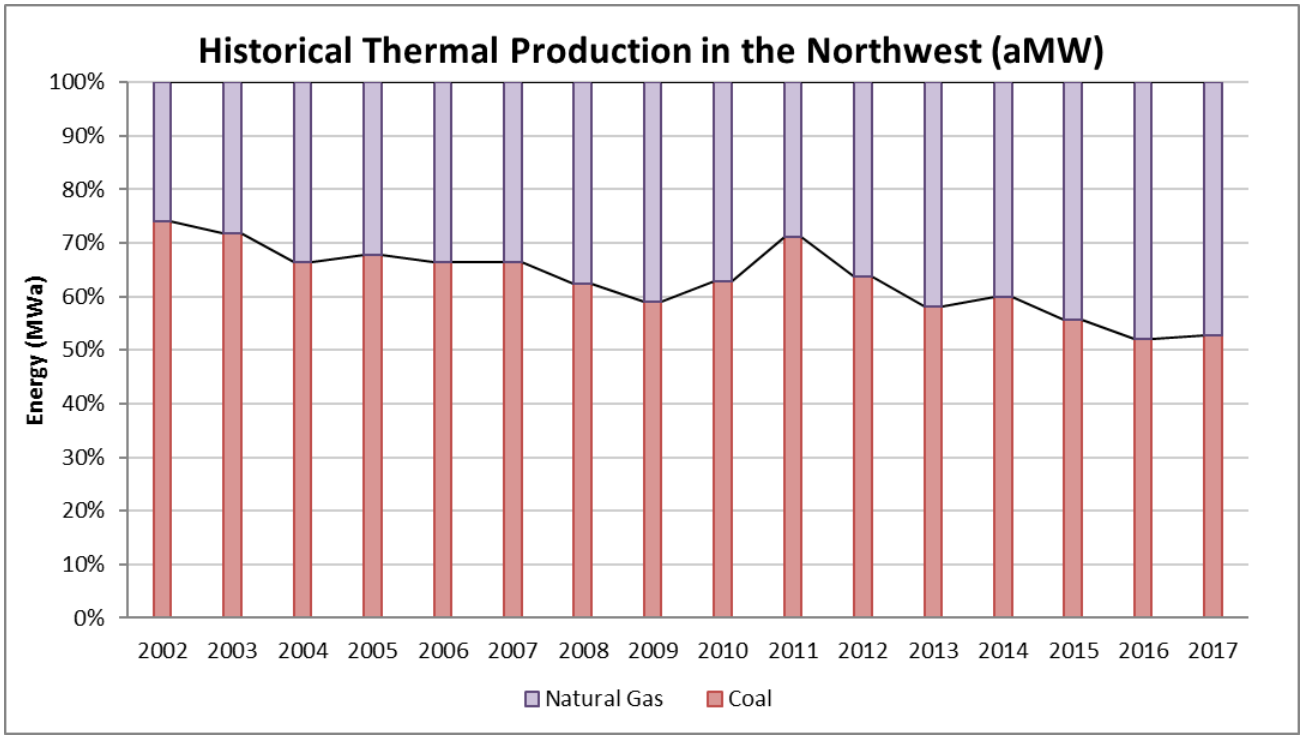
- Renewable Portfolio Standards enacted

Montana	**Washington**	**Oregon**
Enacted 2005	Enacted 2006	Enacted 2007; updated 2016
15% by 2015 	**15%** by 2020 	**50%** by 2040 

- Development of gas, renewable resources since 2000
- Planned coal unit retirements and changes in dispatch



Changes in Thermal Dispatch

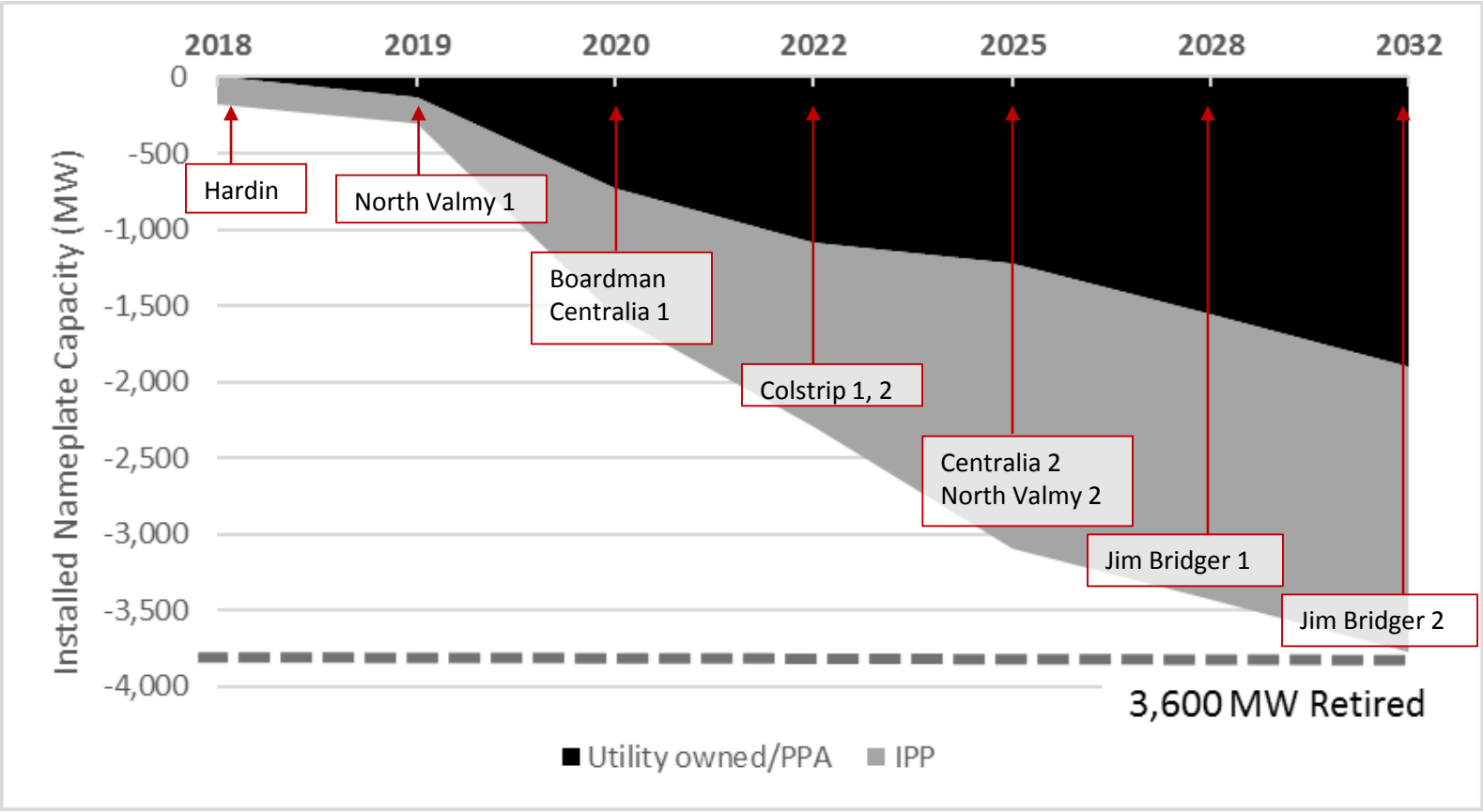


Fuel Type	CO_2 Emissions (lbs CO_2/MMBtu)
Coal	205 - 228
Petroleum/Oil	161
Natural Gas	117

Natural gas emits 40-50% less carbon than coal

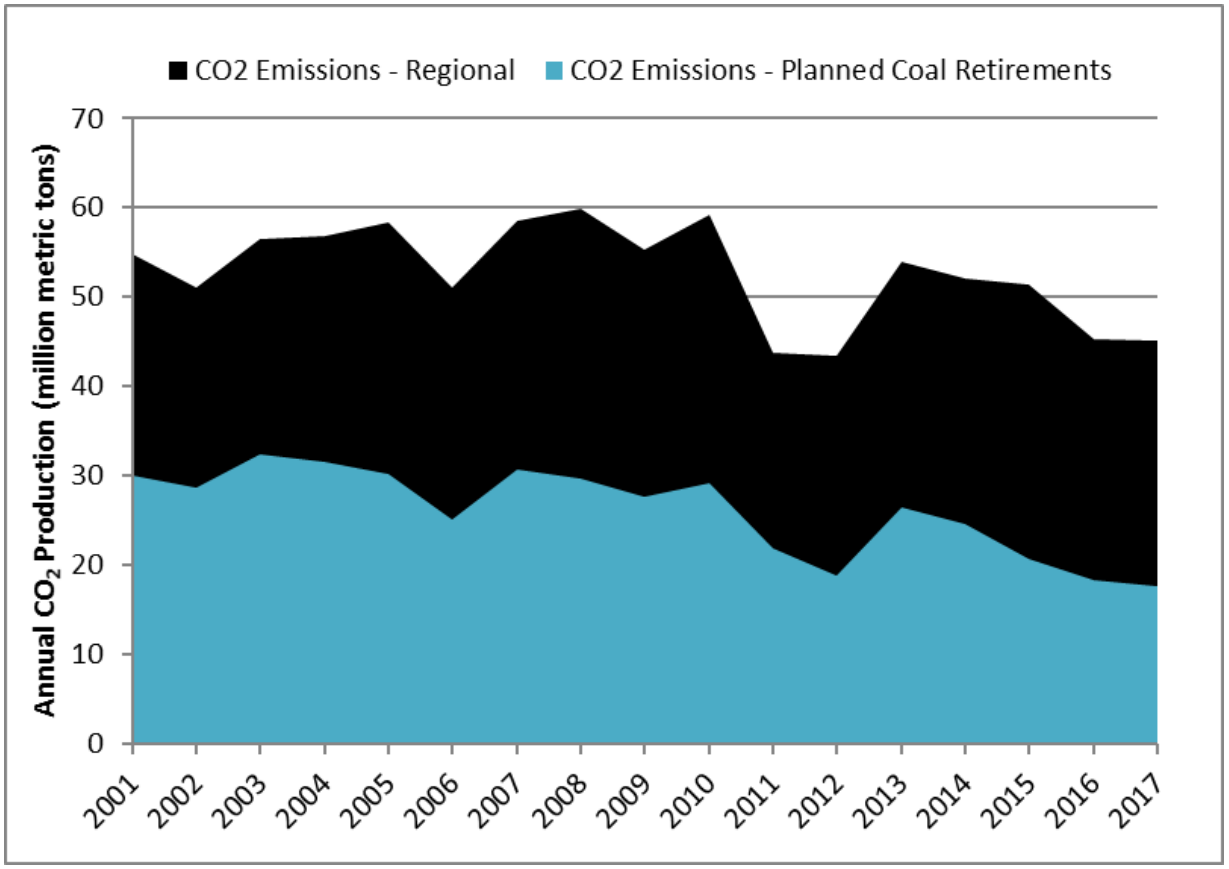
- On average, coal generation has been declining while natural gas generation has been increasing
- 2017 saw a very slight reverse of that trend; however 2017 was also a good hydro year which led to a slight decrease in overall fossil fuel generation

Planned Coal Unit Retirements
Cumulative; Prorated to Region's Share



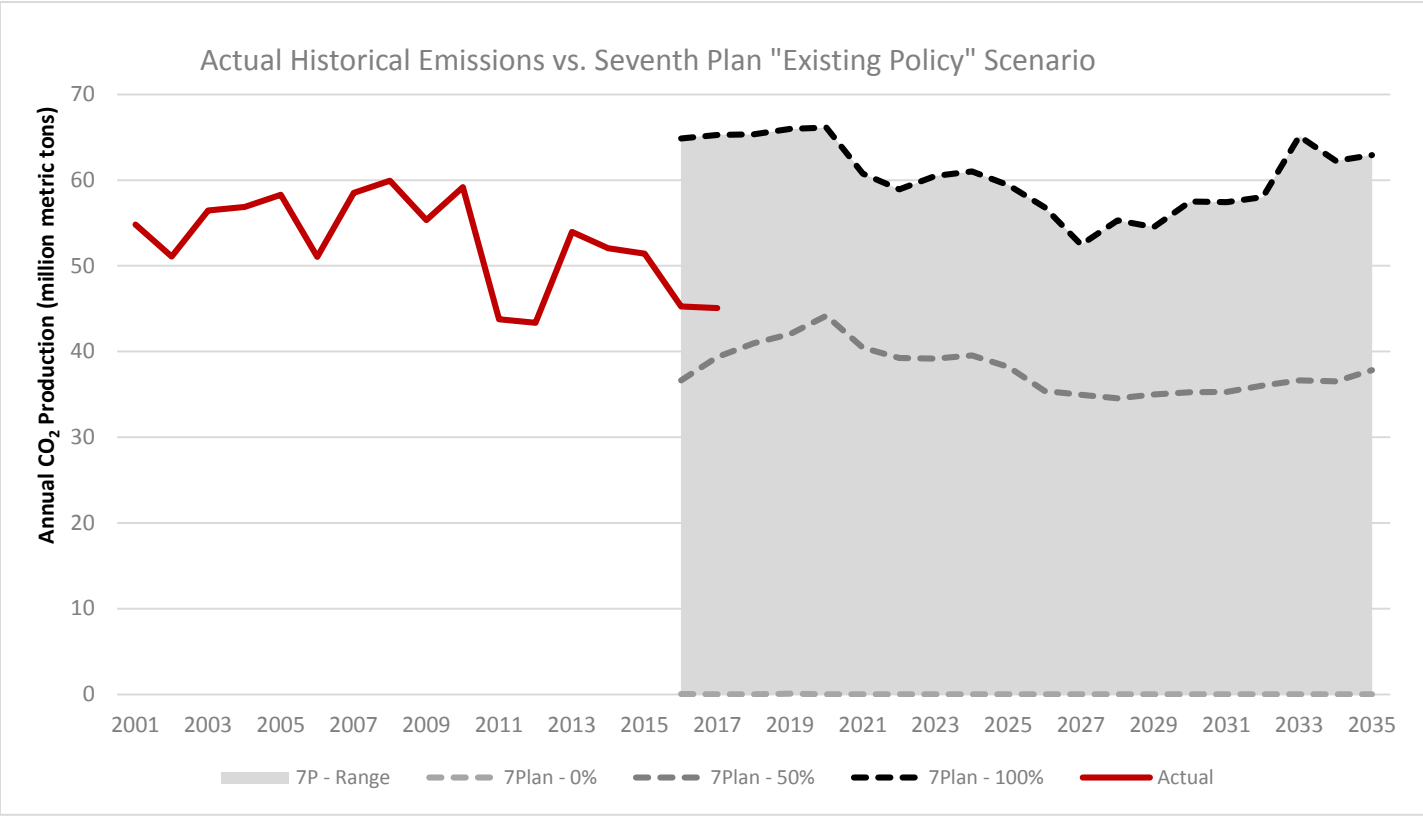
Planned retirements based on agreements, announcements, IRPs; subject to change

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



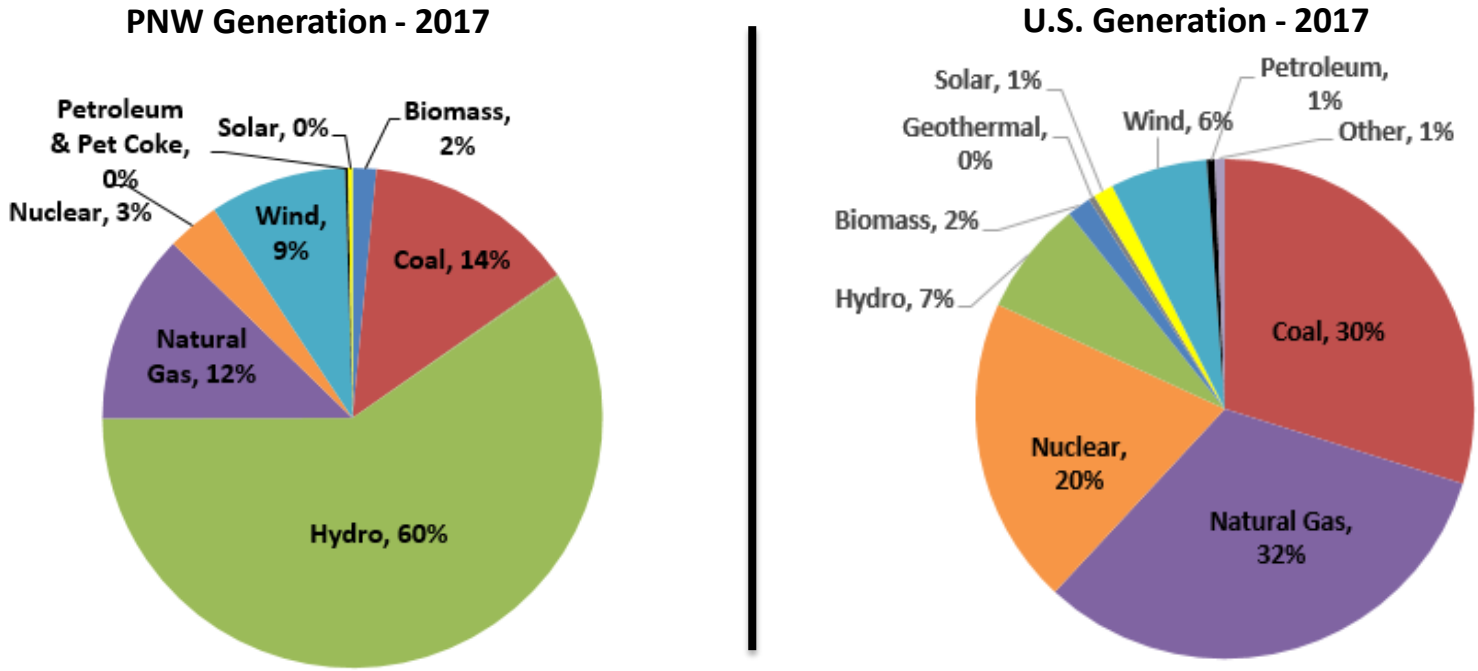
HOWEVER, actual future emissions depend on the **replacement resources**

Emissions in the Seventh Plan



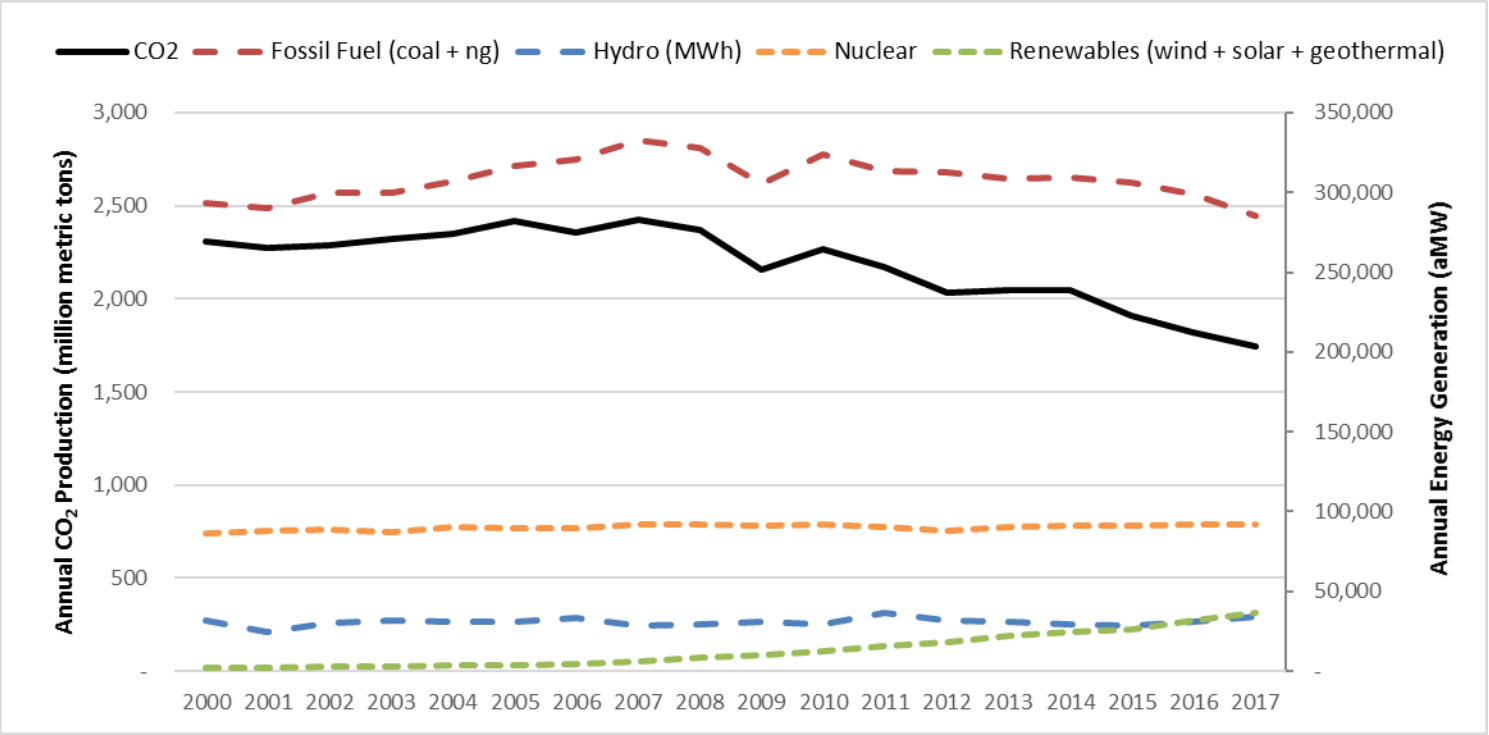
- 2017 actual emissions within the range of the Seventh Plan

2017 Electricity Generation Region vs. U.S.



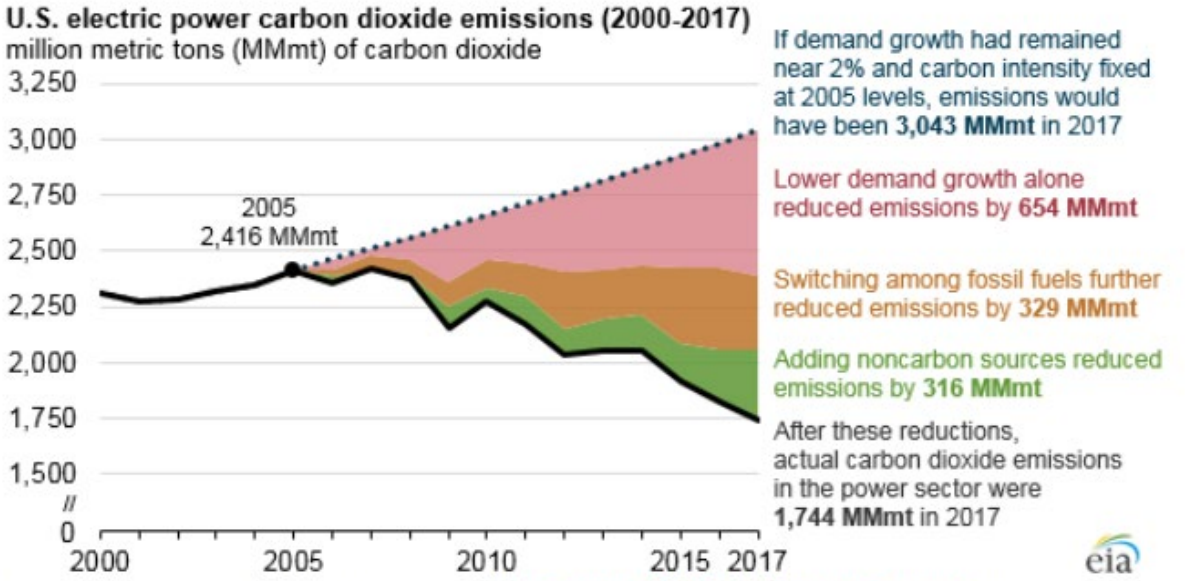
- Hydropower's role in the overall U.S. generation portfolio pales in comparison to its dominance in the pacific northwest region
- In 2016, natural gas overtook coal as the largest source of electricity generation on the national level

Annual carbon emissions from the generation of electricity: US



2017 emissions (~1,744 million metric tons) continue downward trend since 2010, and overall reductions since peak in 2007 (~2,425 mmt)

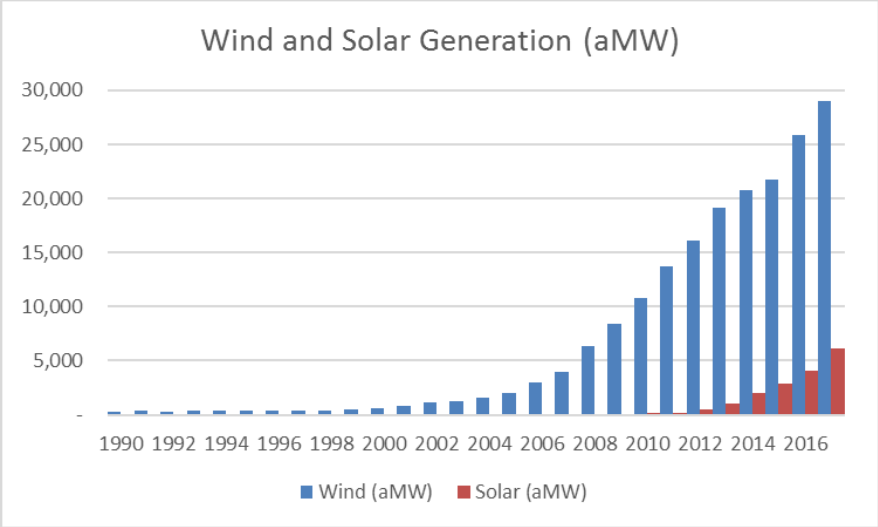
2005 emissions (~2,416 mmt) second highest emitting year, slightly below 2007

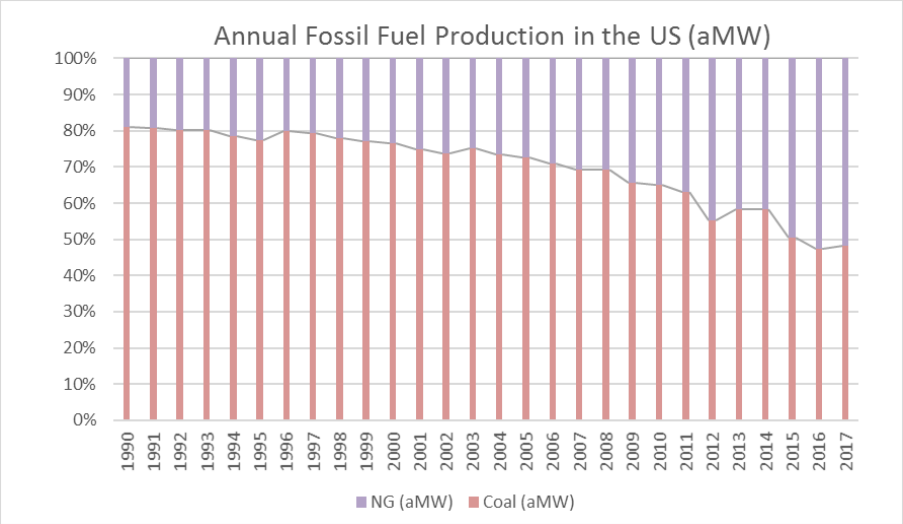


Source: U.S. Energy Information Administration, *U.S. Energy-Related Carbon Dioxide Emissions*, 2017

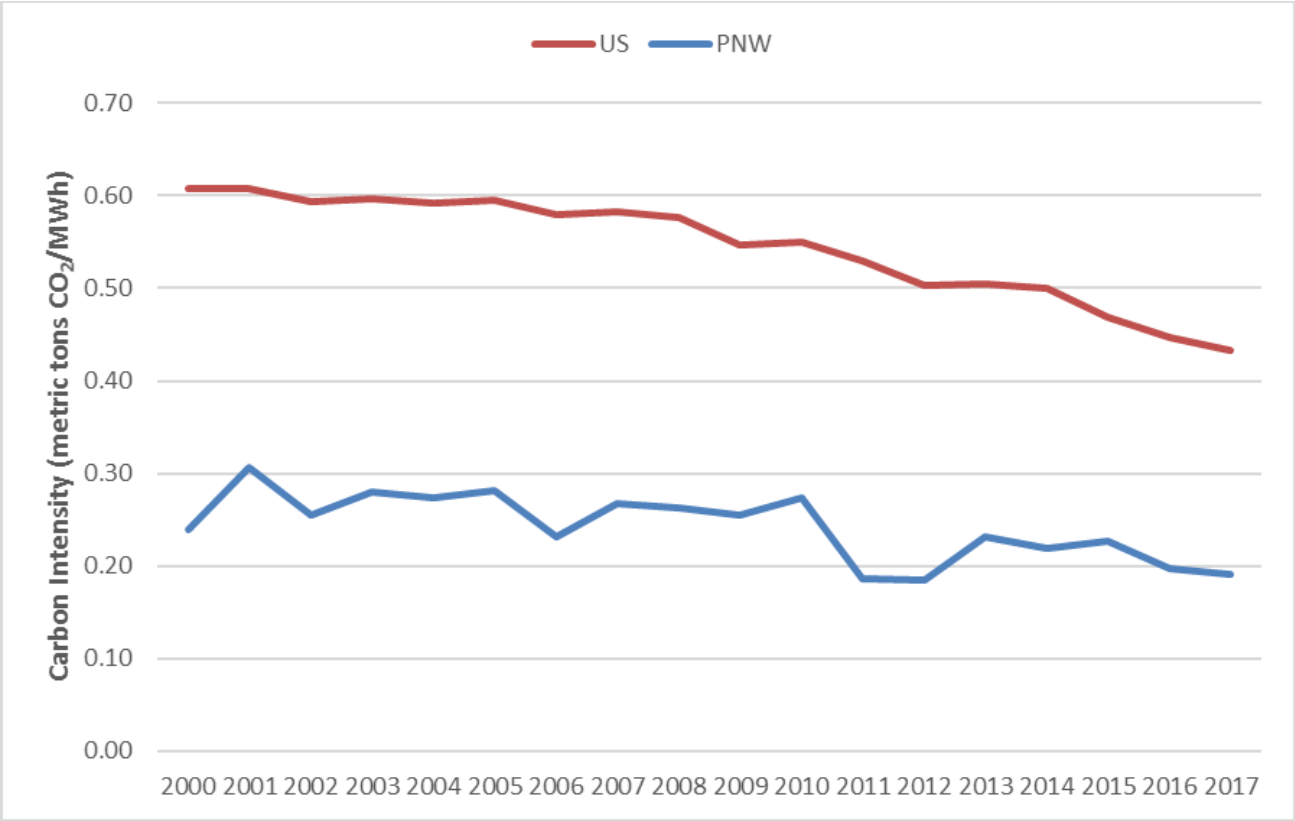
Contributions to US decline in emissions from electricity:

- Natural gas and coal dispatch changes
- Renewable, non-carbon emitting resources
- Low demand growth, energy efficiency



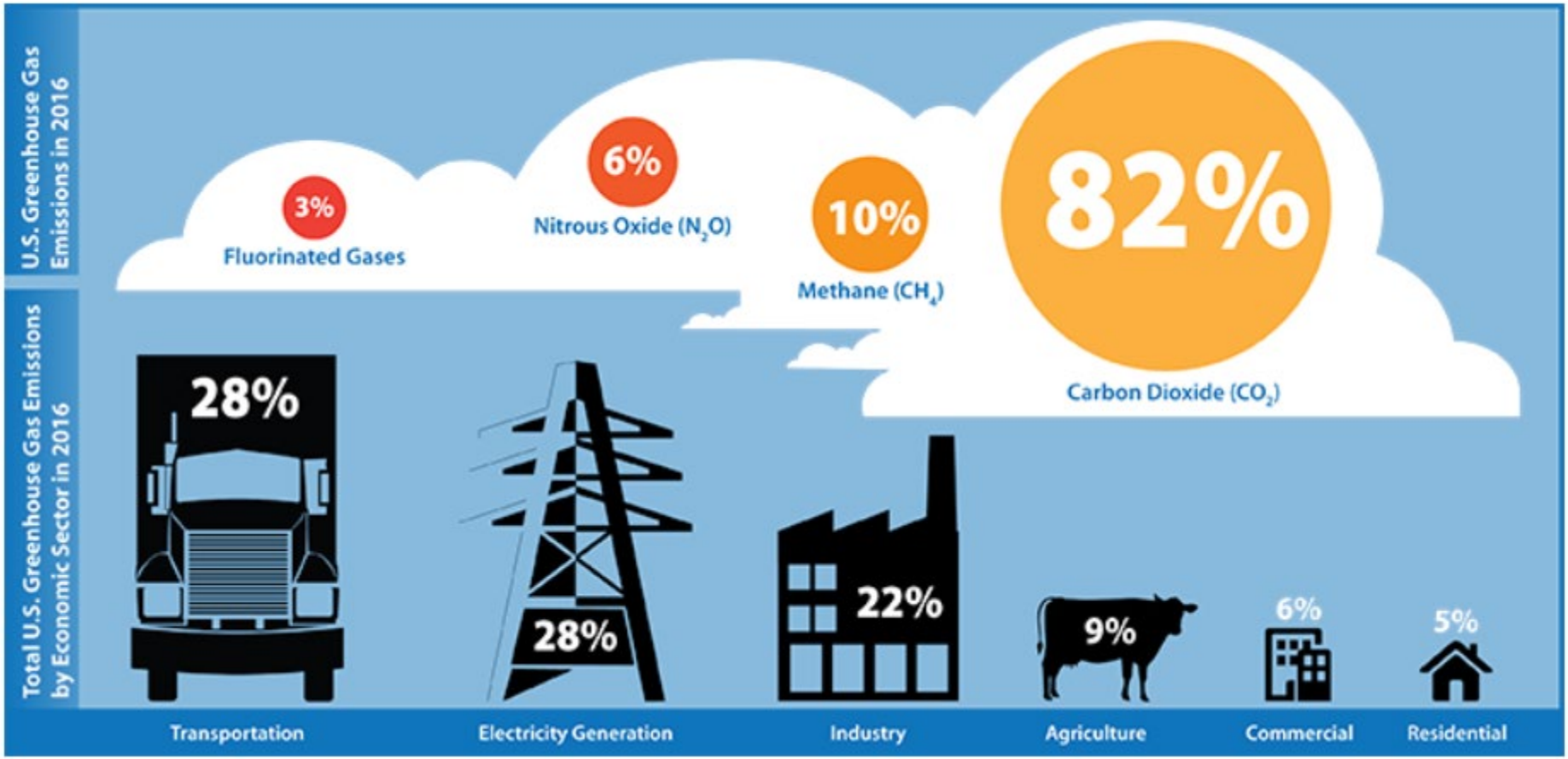


Carbon intensity: Region vs. US



Carbon intensity of electricity is the amount of carbon emitted per unit of energy generated; in this case million metric tons of CO_2 per megawatt hour

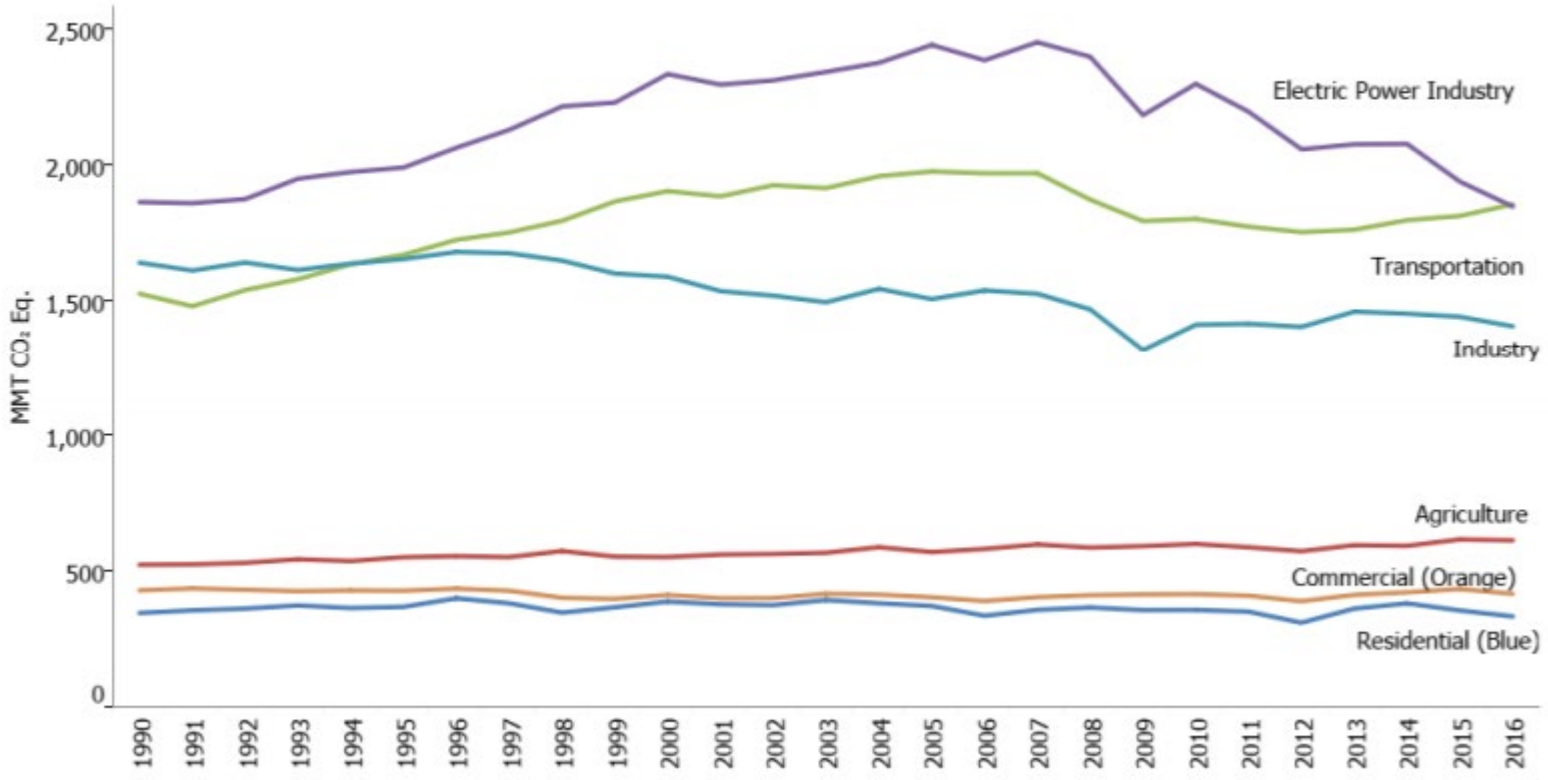
GHGs by Gas and Sector



Source: Environmental Protection Agency (EPA)

Decarbonizing an Economy:
Trends in emissions from all economic sectors

Figure 2-14: U.S. Greenhouse Gas Emissions Allocated to Economic Sectors (MMT CO_2 Eq.)

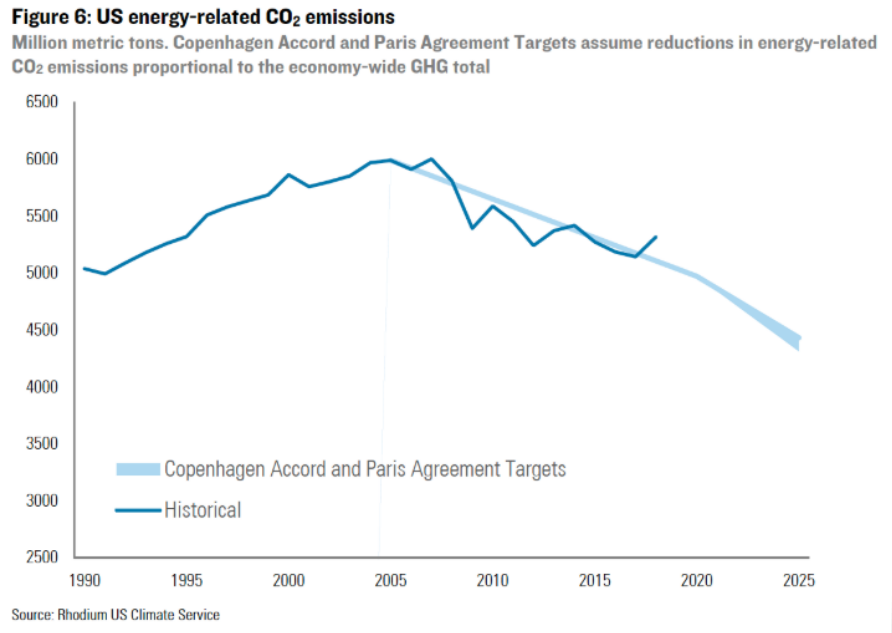


Source: Environmental Protection Agency (EPA) Inventory of US GHG Emissions and Sinks: 1990-2016

What about 2018?

- Early indications show a national rise in emissions from electricity and energy-related consumption (e.g. direct use of natural gas)
  - ⬆ Heating
  - ⬆ Cooling

  Weather-related
- Natural gas use and new capacity outweighed renewable resources for retiring coal replacement
- 2019 forecast to decline once again



2018 Emissions in the Region

Final data not available yet, however-

- Demand down 3% (Jan-Oct) in 2018 compared to 2017
- According to NOAA's water supply forecast, flow at The Dalles was above normal (although slightly lower than 2017)
- No new gas plants online in 2018
- New solar, wind, small hydro in service

2018 emissions will likely be similar to 2017 (and not see the increase like at the national level)

Stay tuned…

- Upcoming Council Meeting - Update on emissions-related administrative rulemakings and regulations