



The Impact of Changing Conditions & Environmental Regulations on the US & Pacific NW Electricity Markets

By:

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President & CEO, NAES Corporation

Who is NAES?



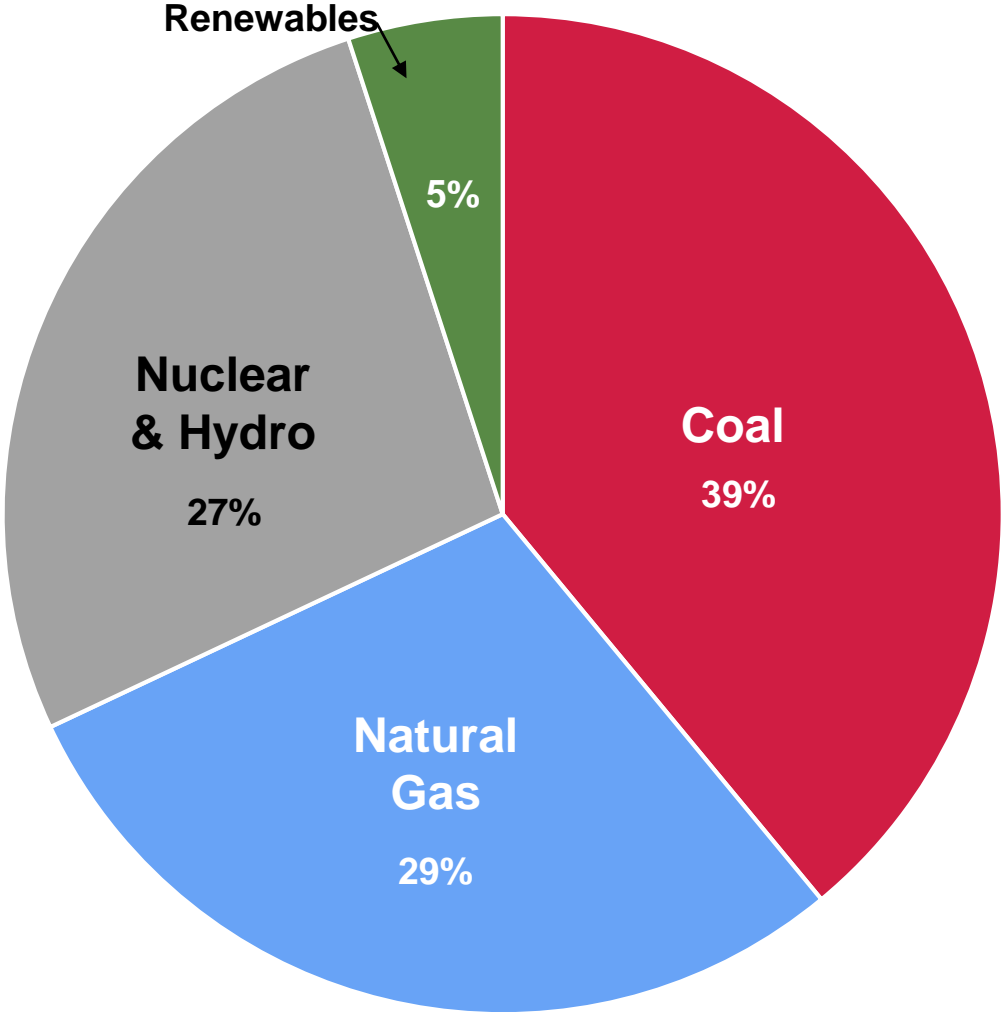
- **Business Lines**
 - **Power Plant Operations**
 - Operator of 135 Power Plants totaling over 35,000 MW in North America & a few overseas
 - **Maintenance & Construction**
 - Serves Power, Oil & Gas, Petrochem & Industrial sectors
 - Double Breasted
 - Acquired Greenberry Industrial - January 2015
 - **Engineering & Technical Services**
 - Environmental
 - Plant procedures, troubleshooting & betterment
 - Grid security
 - Consulting services
- Over 3,000 employees
- Headquarters in Issaquah, WA. Regional offices throughout US.
- Wholly owned subsidiary of Itochu, a \$55 billion Japanese trading company
- Safety is our top priority

THE CHANGING DYNAMICS OF POWER



- **Low natural gas prices**
- **Environmental compliance costs, particularly on aging coal plants**
- **Renewables becoming a significant part on generation mix**
- **Aging nuclear power plants with very expensive replacement new build costs**

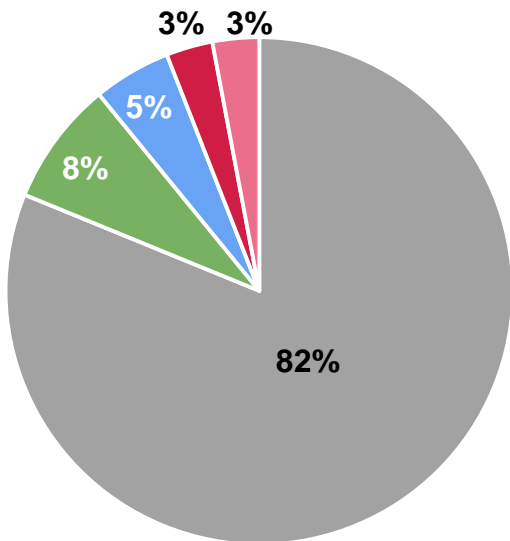
POWER GENERATION BY FUEL – US (2012)



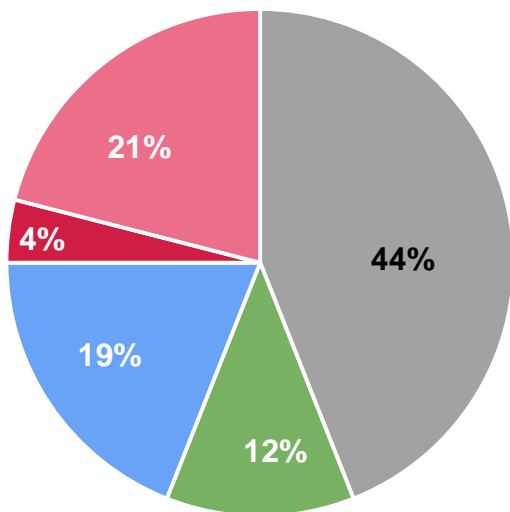
POWER CONSUMPTION BY FUEL PACIFIC NW STATES (2012)



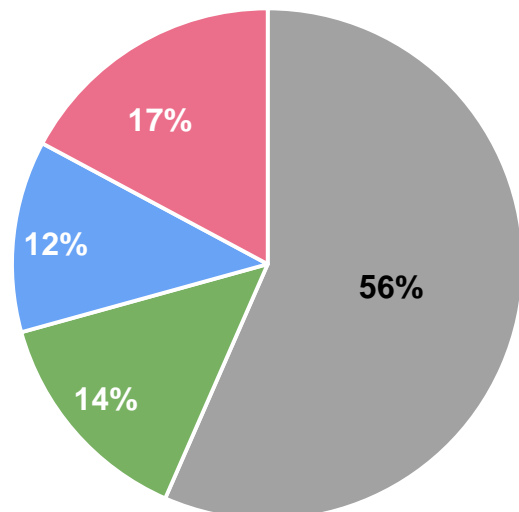
WA



OR



ID

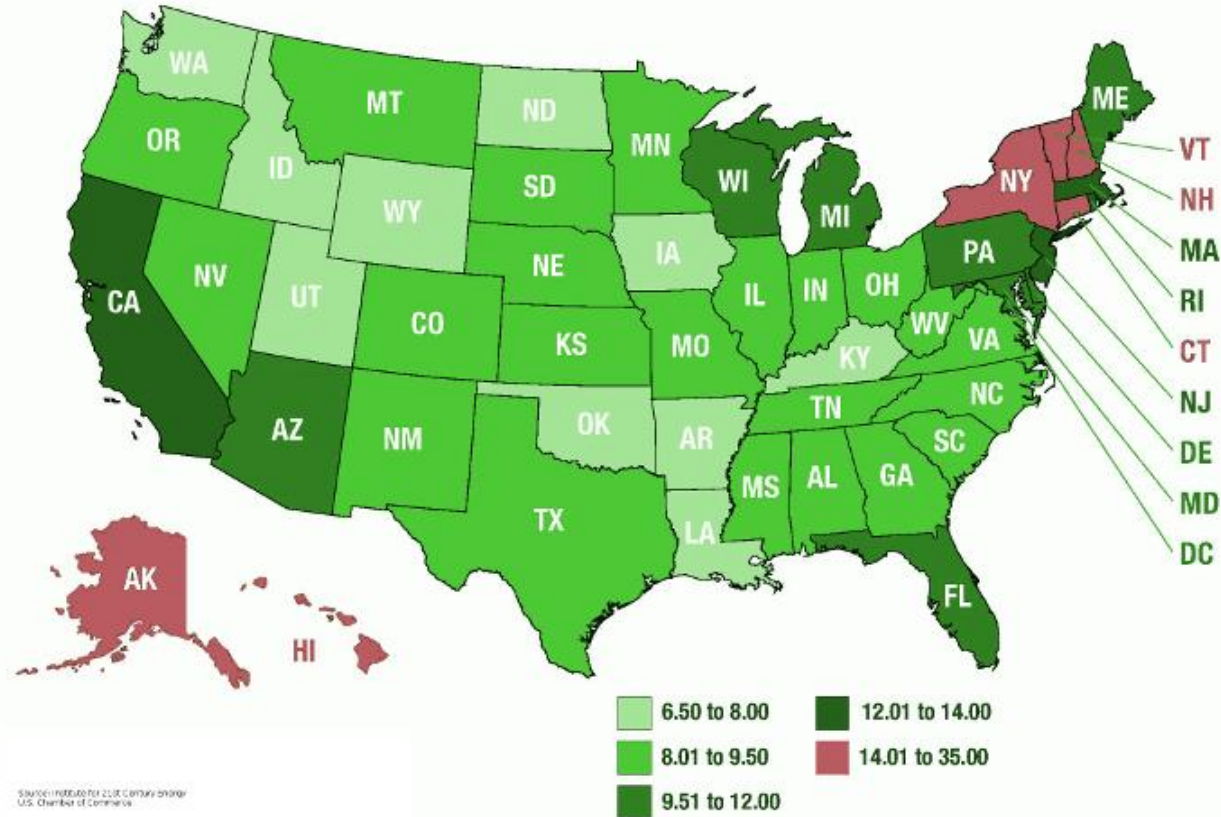


- Nuclear/Hydro
- Natural Gas
- Renewables
- Imported Coal
- In State Coal

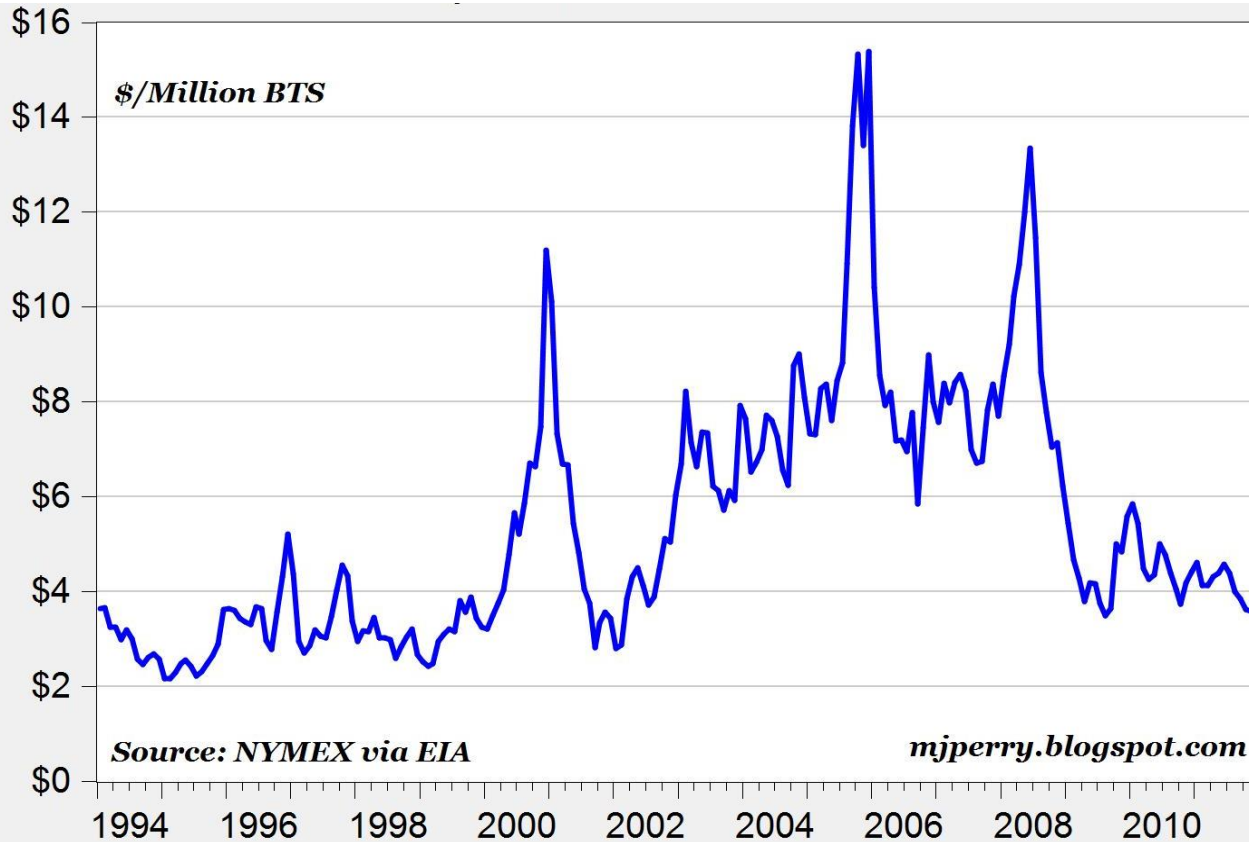
AVERAGE RETAIL ELECTRICITY PRICE BY STATE (CENTS/KWH)



2012 U.S. Average Electricity Retail Prices (cents per kilowatt hour)

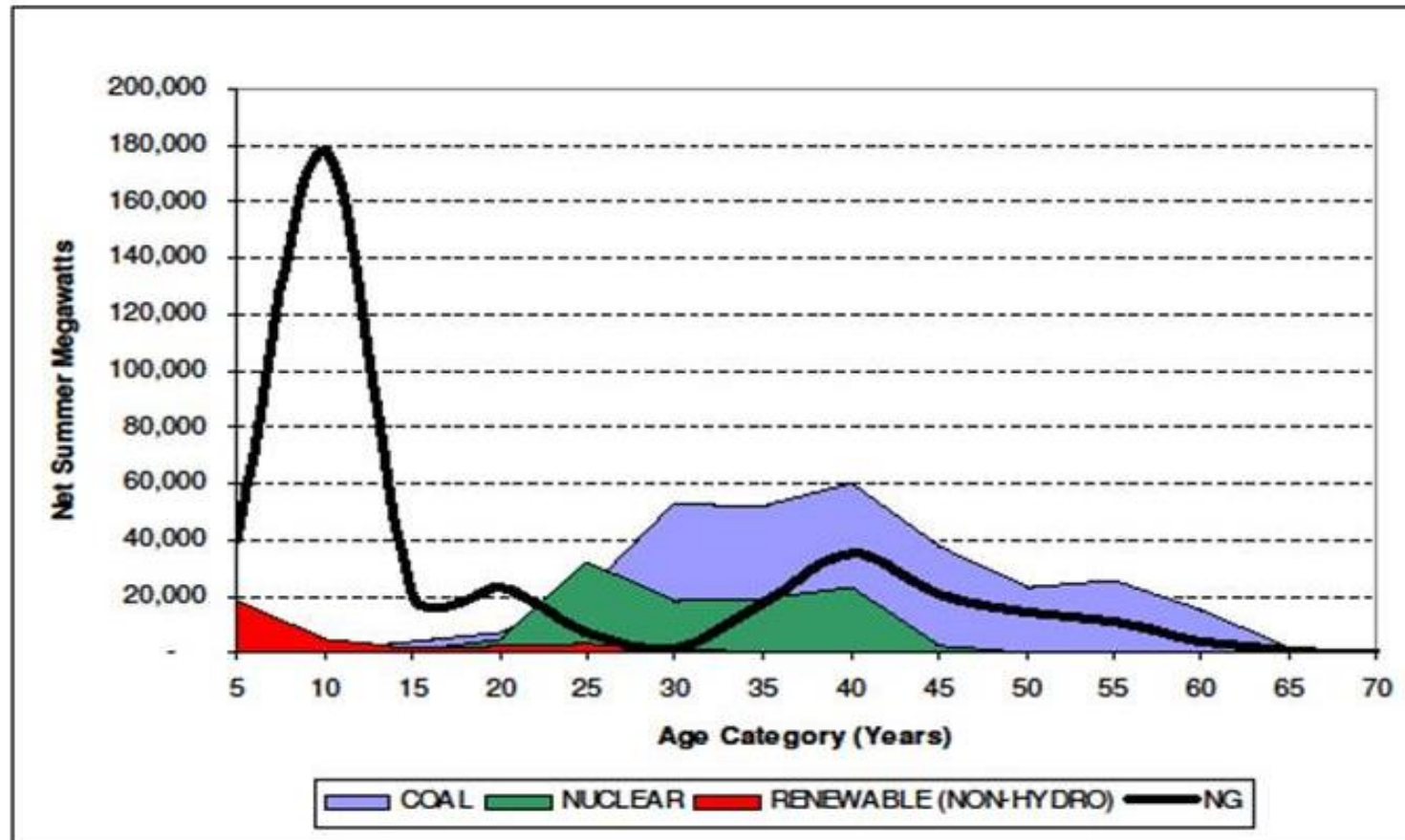


HISTORICAL NATURAL GAS PRICES (2012\$)



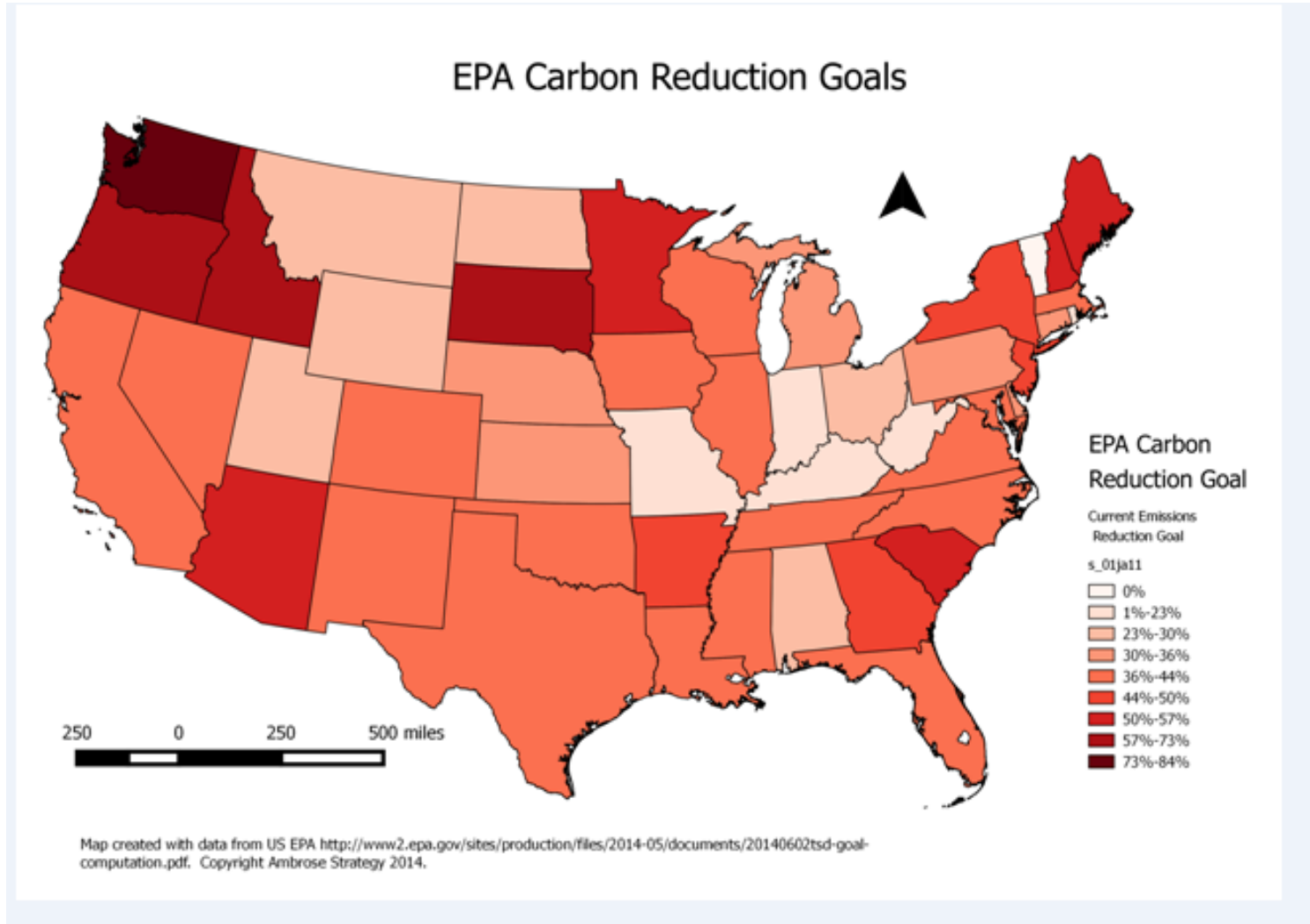
- Will Natural Gas stay low?
- Supply glut
- Increased demand from shift to Natural Gas in power generation
- Impact of LNG exports

AGING COAL & NUCLEAR POWER PLANTS

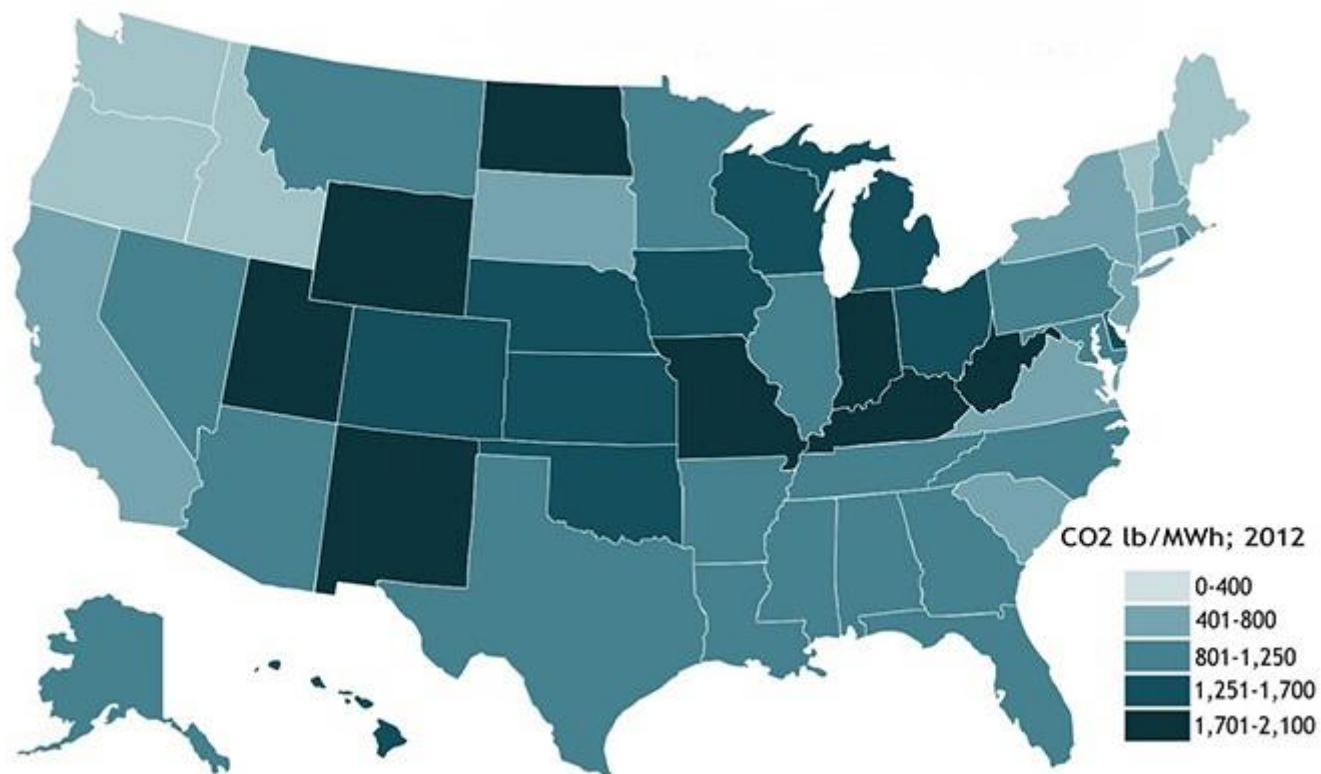


Source: EIA-860 database.

EPA CARBON REDUCTION TARGETS

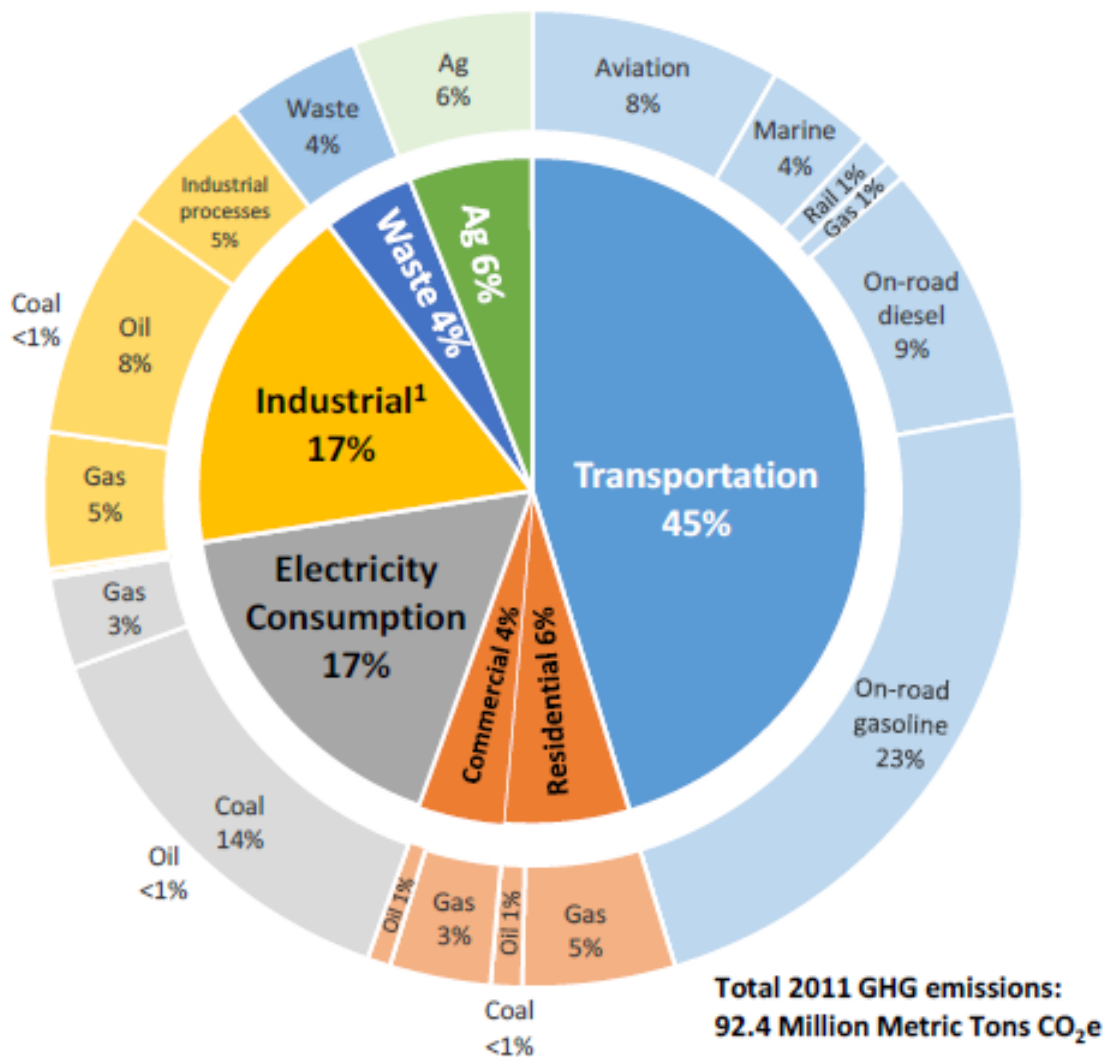


STATE-BY-STATE CO2 EMISSIONS RATE FOR POWER GENERATION



Learn more and download the report at www.ceres.org/airemissions

SOURCES OF WASHINGTON STATE GHG EMISSIONS



GOVERNOR INSLEE'S CLIMATE EXECUTIVE ORDER



Carbon Emissions Reduction Taskforce

Convene a taskforce to make recommendations for a carbon emissions reduction program for consideration during 2015 legislative session.



Energy Efficiency

Focus on saving costs and reducing emissions from buildings by improving their efficiency and taking advantage of clean power.

Governor Inslee's Climate Executive Order

"This is the right time to act. This is the right place. And we are the right people to make this happen."

- Gov. Inslee, April 29, 2014

Coal-Fired Electricity Transition

Work with private utilities and federal agencies to facilitate the transition from coal to cleaner electricity sources.



Clean Technology

Develop a new state program to support renewable energy and energy efficiency technology innovation in the public and private sectors.

Clean Transportation

Decide how to accelerate our use of clean cars and clean fuels, and reduce transportation emissions.



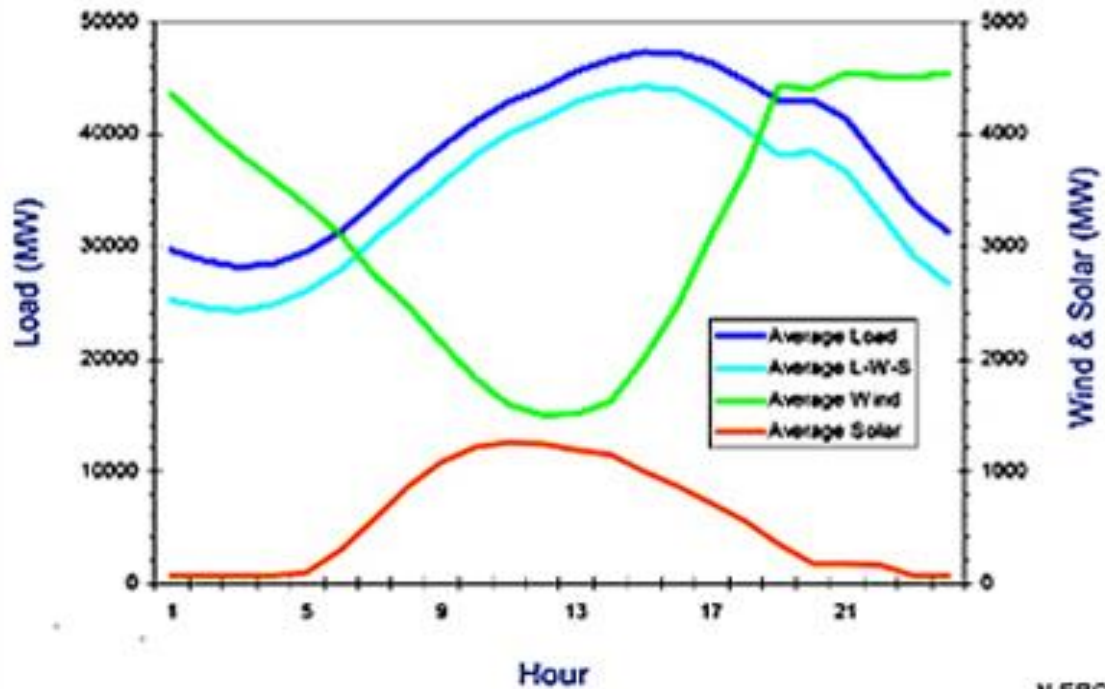
#ActOnClimate
bit.ly/ClimateWA

Lightbulb icon via Chris Brunskill, the Noun Project
Power Lines icon via Phil Laver, the Noun Project

IMPACT OF RENEWABLES



Variation in Solar and Wind Power in California



NERC April, 2009

- Variability creates grid stability challenges
- Price of renewable energy higher than existing generation

NUCLEAR POWER



- **103 Operating plants in US, average age – 33 years.**
- **Original design life 40 years. Programs underway to extend life to 60 years.**
- **Replacement cost - \$7000/kw or more than 6 times a baseload natural gas fired plant.**
- **Spent fuel disposal an unresolved issue**
- **Timeline to permit & build – 10 years**
- **Politically difficult**

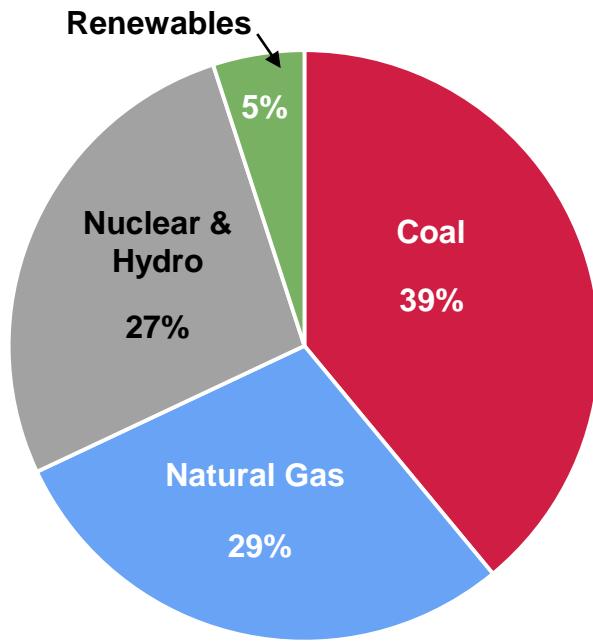


POWER MARKETS IN 2020

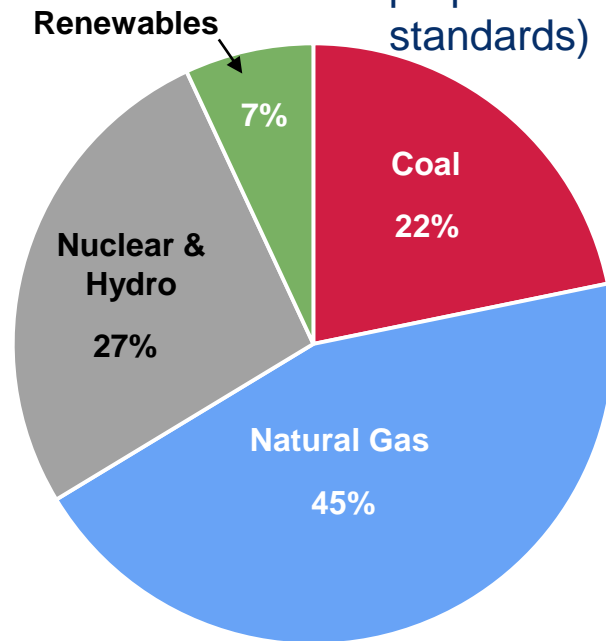
POWER GENERATION BY FUEL - US



2012



2020 (Based on EPA proposed carbon standards)

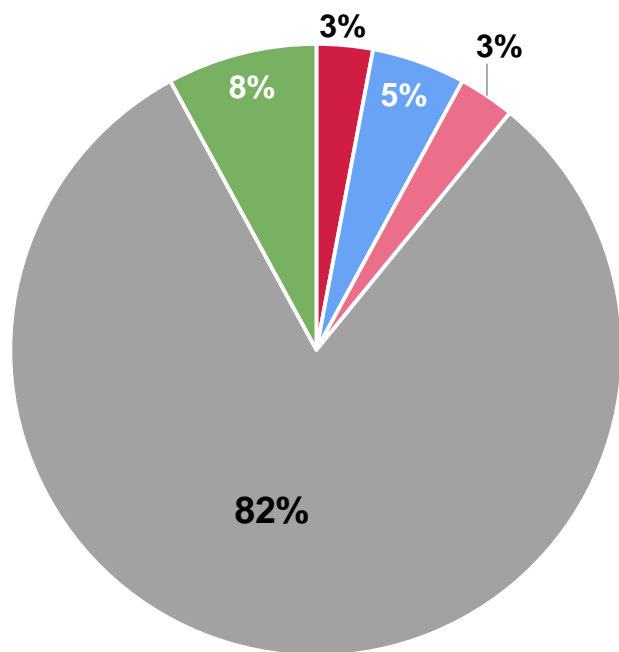


POWER GENERATION BY FUEL - WASHINGTON

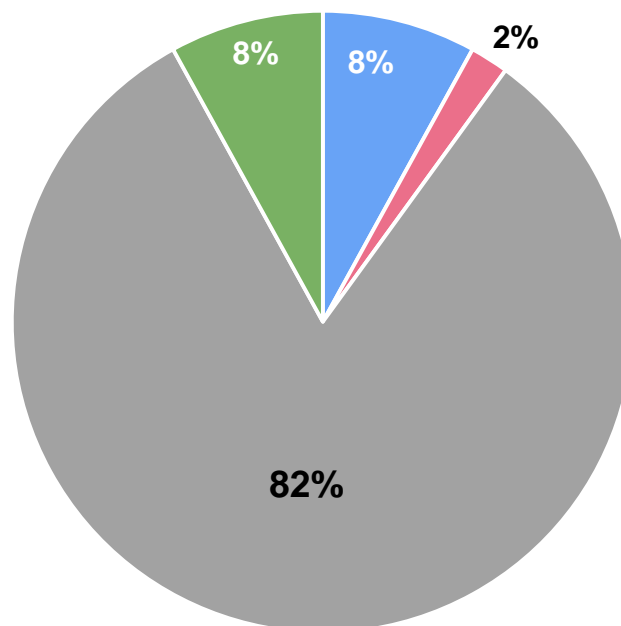


WA

2012



2020 (EPA Carbon Plan)



■ Nuclear/Hydro

■ Natural Gas

■ Renewables

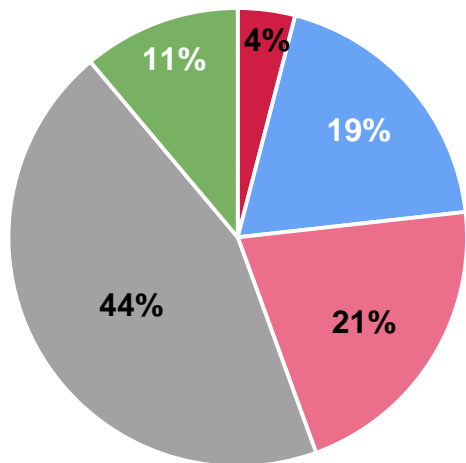
■ Imported Coal

■ In State Coal

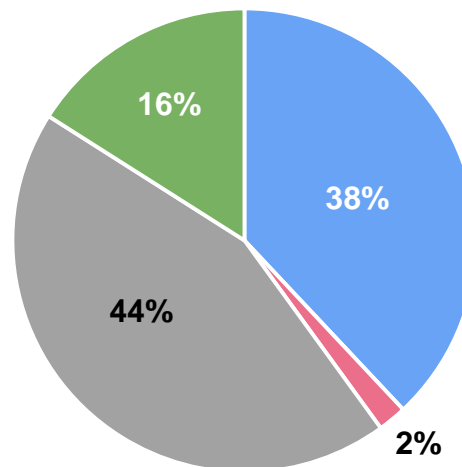
POWER GENERATION BY FUEL OREGON & IDAHO



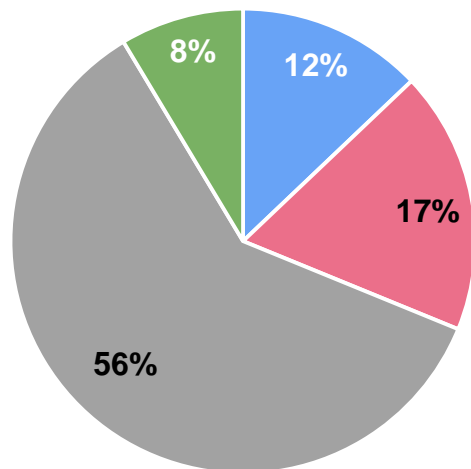
2012



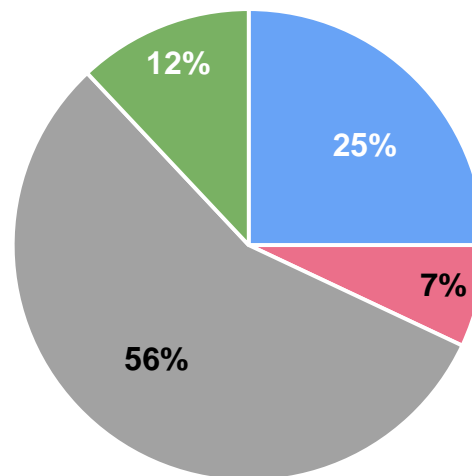
2020 (EPA Carbon Plan)



OR



ID



Nuclear/Hydro

Natural Gas

Renewables

Imported Coal

In State Coal

ESTIMATED COST IMPACTS OF ENVIRONMENTAL ISSUES ON COAL PLANTS, INCLUDING EPA CARBON PLAN



	% Increase in electricity cost by 2020 (real \$)	
	All Consumers	Industrial Consumers
US	25-30	30-35
WA	0-10	0-5
OR⁽¹⁾	50-55	70-75
ID	10-15	5-10

(1) Price increases dominated by significant shift from coal to gas as marginal cost, and assumption of natural gas prices increases

CONCLUSIONS



- Environmental compliance costs will increase coal fired power prices & accelerate coal plant retirements
- In the next few years natural gas will displace coal as #1 power generation fuel
 - Current economics good, but will it stay low?
 - CO2 emissions much lower than coal
 - Concern about future price volatility
- Renewable penetration will drive up costs & pose grid reliability challenges
- Replacement new nuclear power plants will be very few due to economic & political factors