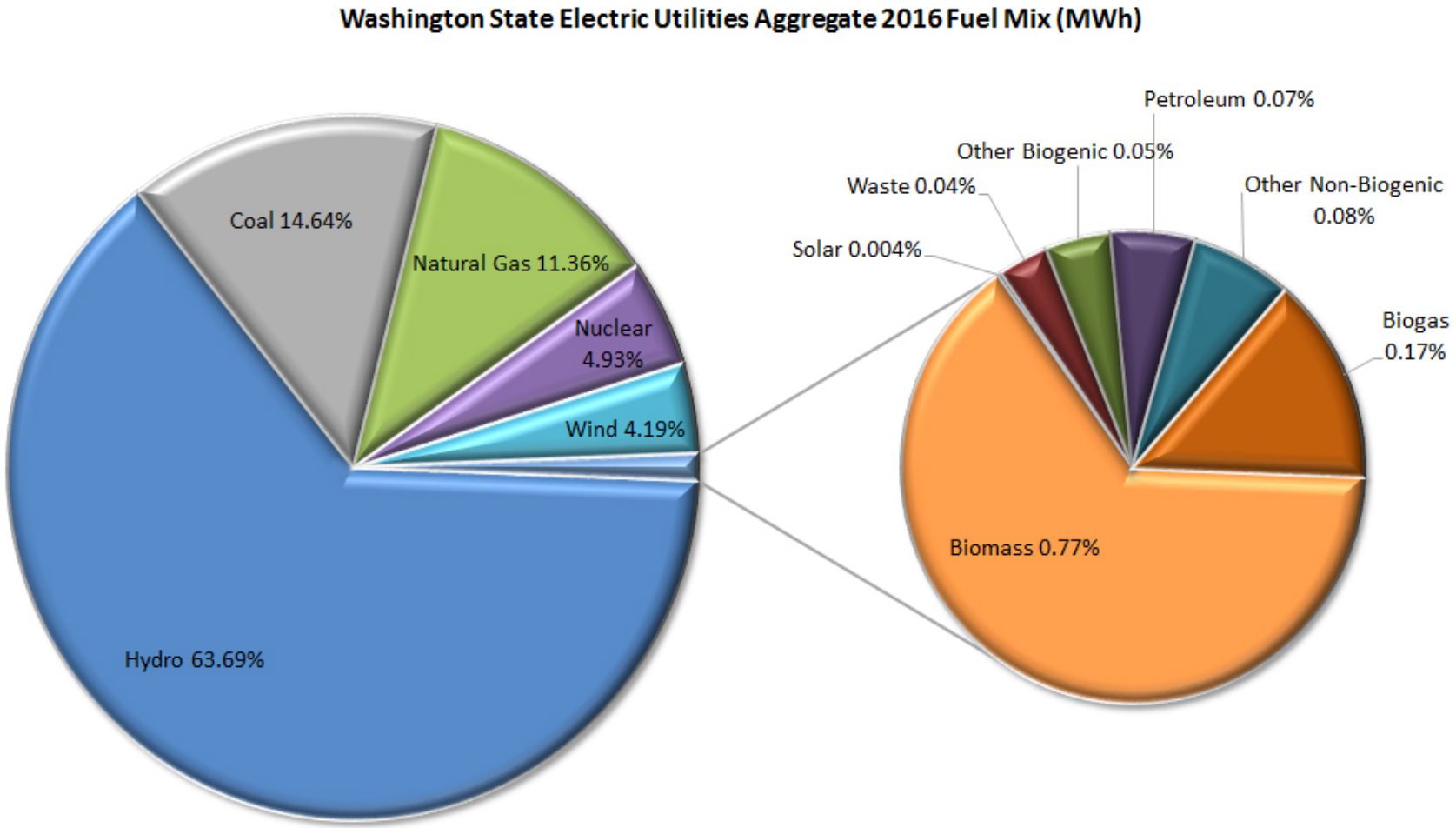
Carbon Accounting

The Residential Option Tables

Washington State electric system

- Mostly hydro
- About 15% Coal
  - About half of it scheduled for closure by 2030
  - Faster, if the Clean energy bill is implemented
- Expanding renewables, mostly wind
- Expanding gas generation mostly to replace coal closures.
  - Results in a 15% reduction in the overall carbon in the state’s electric system

Washington State Electric Generation (DOC)

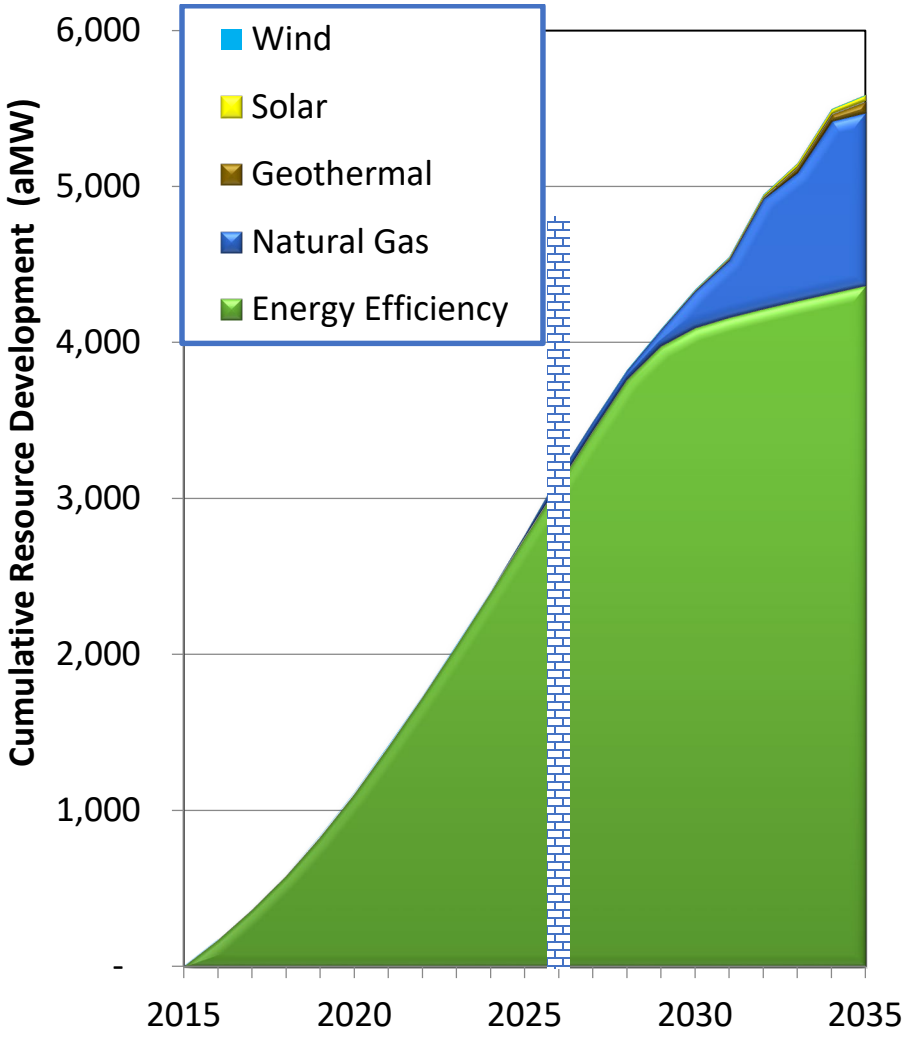


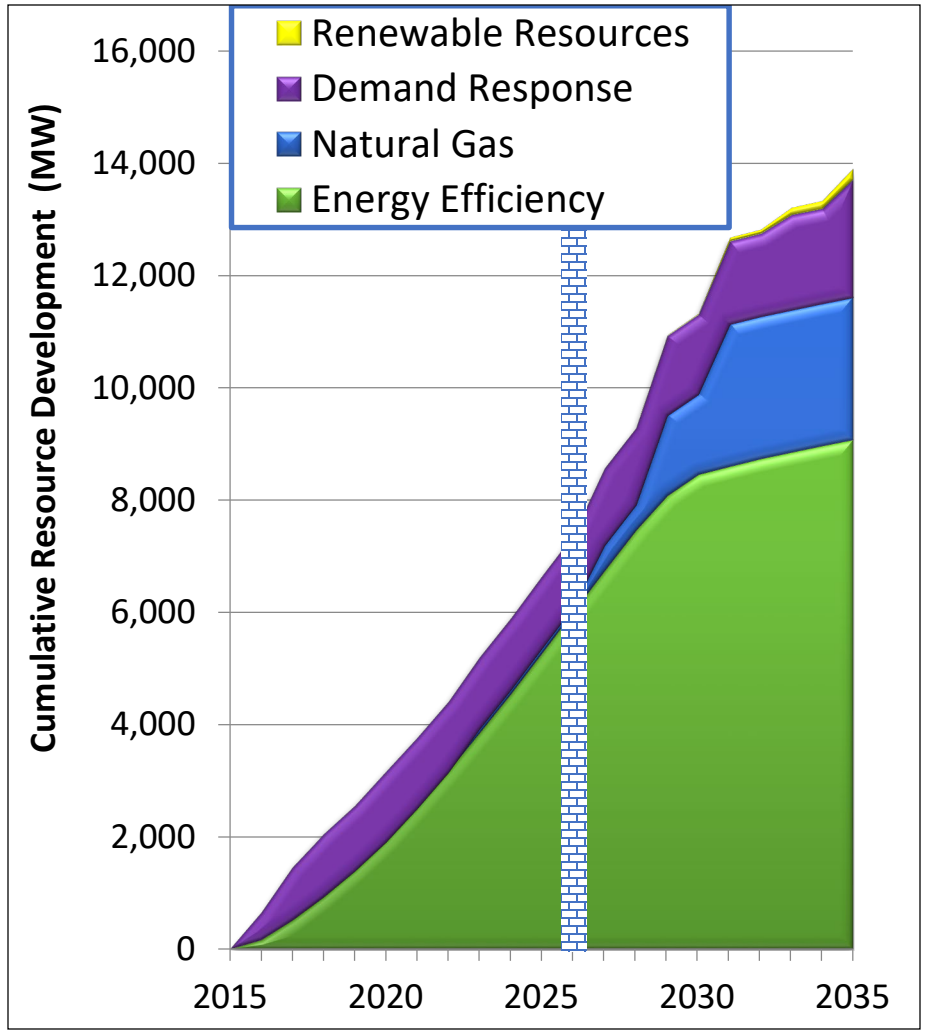
= 0.46 lb. CO_2e/kWh (Average 2002-2016)

Future growth in electric demand

- Most load growth would be offset by conservation and efficiency programs
  - 85% to 95% of load growth by 2026
- Additional resources added using gas
- Some wind and other renewables as a result of the Portfolio requirements

Seventh Power Plan Least Cost Resource Strategies for Meeting Forecast Energy and Capacity Needs





Proposed Carbon emission rates (commercial)

Type	CO2e (lb/unit)	Unit
Electricity	0.7	kWh
Natural Gas	11.7	Therm
Oil	19.2	Gallon
Propane	10.5	Gallon
Other	195	mmBtu
On-site renewable energy	0	

Carbon Emissions

Fuel Type	CO_2/mmBTU*	CO_2/kWh**
Diesel fuel and heating oil	161	0.55
Gasoline	157	0.54
Propane	139	0.47
Natural gas	115	0.39
Electricity (2026 Social cost of carbon, marginal)	205	0.70
Electricity (2026 Forecast, average)	161	0.55
Electricity (2016 Actual, WSDOC)	135	0.46
Site Renewable	0	0.00

Carbon Table in “Appendix G”

- Adjusts the energy use estimates
- Provides a carbon equalization for energy estimtes
- Table based on various compromises
  - Assumes 50% of load growth met by existing efficiency programs
  - Assumes marginal generation (gas turbines) emissions at .95 #/kWh
- Implies a penalty for Electric Resistance heating and DHW
- Implies a credit for most heat pumps and higher efficiency cooling
- Reduces the credit of high efficiency gas relative to electricity.

R406 option tables

- Prescriptive code option to allow performance trade-offs
  - Preset savings (site energy) set for individual measures
  - Allows trade-offs among efficiency options
- Carbon table changes to carbon emissions
  - Overall energy savings still the goals of RCW1927a
- Approach:
  - Fuel Normalization table to reflect the carbon impact of heat fuels
  - Points that normalize too standard efficiency gas furnace

Table R406.1 Fuel emissions adjustments

Option	Description	Credits (Single Family)	Credits (Group R-2, R-3, R-4)
a	For initial heating system using Gas furnace with minimum efficiency in accords with federal standards (AFUE 80)	0	N/A
b	For an initial heating system using a heat pump that meets federal standards	1.0	1.0
c	For an initial heating system based on electric resistance only (either forced air or Zonal)	-1.0	-.5
d	For an initial heating system based on electric resistance with a DHP per section R403.XX (either forced air or Zonal)	0	N/A

Other adjustments

- Required points not changed
- Most option points unchanged
  - Insulation and envelope option's (1)
  - Air tightness and ventilation (2)
  - Duct placement (4)
  - On site renewables, solar (6)
- Gas furnace and Gas DHW reduced by 0.5 points each (3a,5b,5c)
  - Will require at least an additional 0.5 points or electric DWH (5d,5e)
- Additional point for current all-electric Multi-family