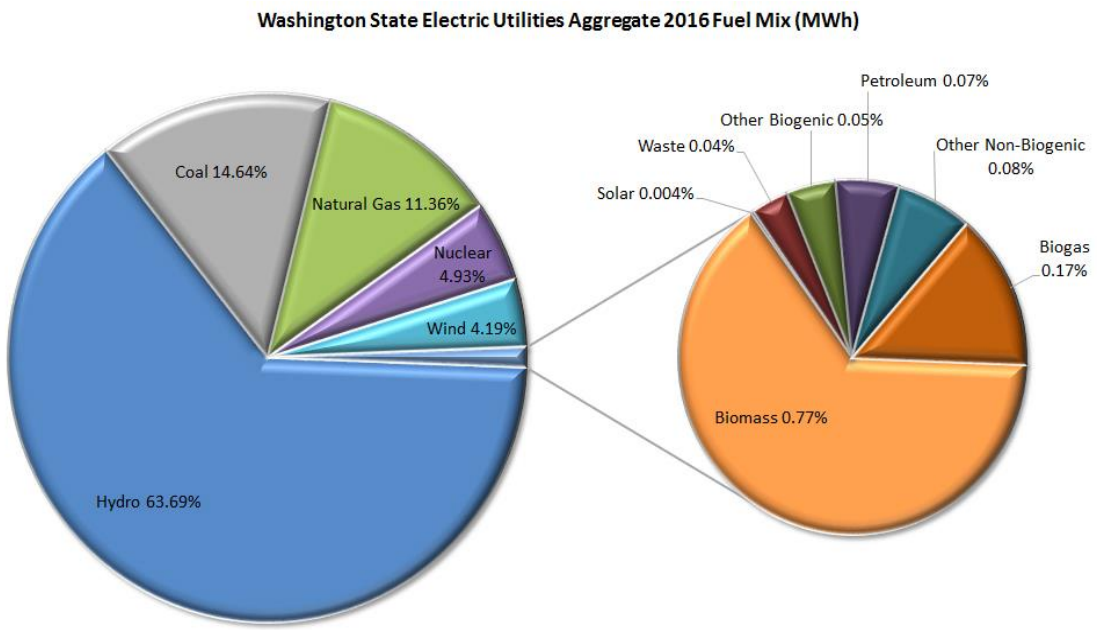
July 12, 2019

Doug Orth, Chairman
Washington State Building Code Council
P.O. Box 41449
Olympia, WA 98504
RE: Energy Code Proposals EP141 and EM050, Table of Carbon Emissions

The two code change proposals listed above include significant revision to the performance accounting done to assess the efficiency of buildings built in Washington. Specifically, they implement a carbon emissions accounting for the energy used by these buildings. While this should be a straightforward calculation, only the direct impact of fuel (gas, oil, coal, etc.) burned on site can be easily calculated. The impact of electric use on the building's carbon emissions depend on the particular mix of generation resources that are present in the electricity delivered. This varies by utility, time of year and resources available to each utility in the state. The WADOC under the direction of the legislature has produced an assessment of the carbon content of electricity supplied by all the utilities in the State. Figure 1 shows this distribution of generating resources and the overall carbon emissions rate of this system in this system in the most recent assessment (2016).

Figure 1:



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Carbon Emissions Rate= 0.46 #/kWh

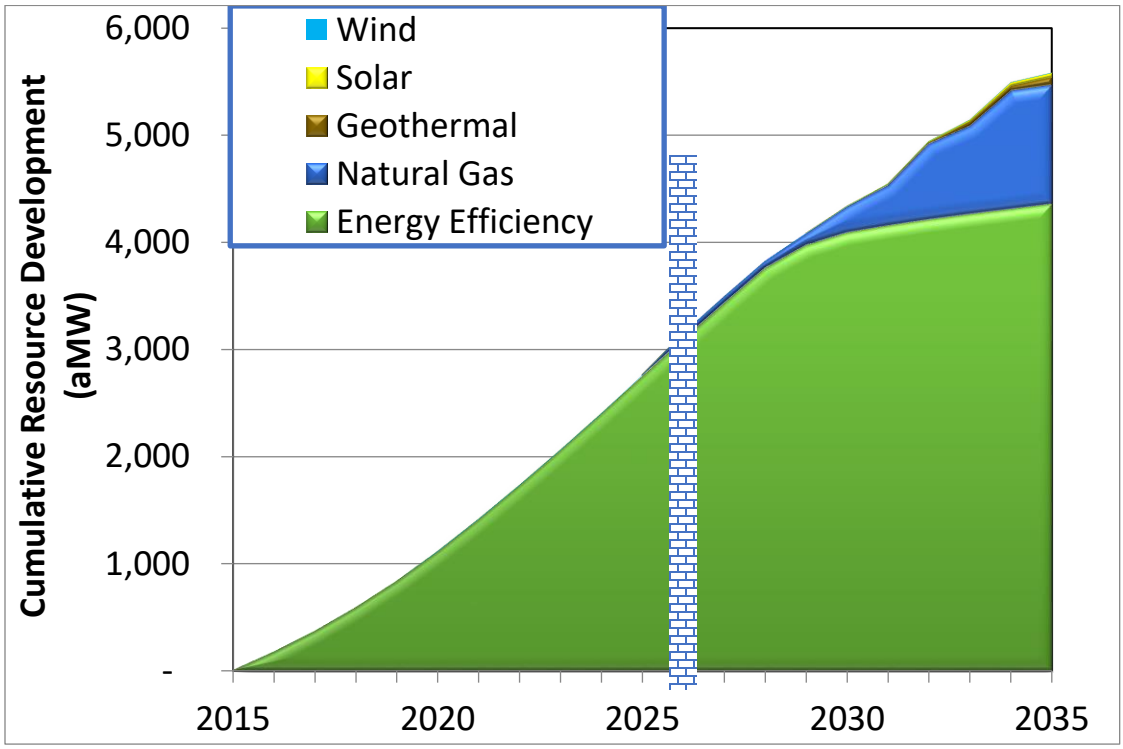
This represents among the lowest emissions rates of any electric grid in any state outside the Pacific Northwest in the country.

It has been the goal of the region for over 40 years to preserve this mix. In the PNW the resource of choice for almost 40 years has been to develop energy efficiency in the electric end uses throughout the

region efficiency has offset the need for new generating resources. Since 1982 the region has relied on the Northwest Power and Conservation Council (NPCC) to provide assessments of the available efficiency resource and the need for other generating recourses in the event that efficiency is not adequate. In that period the various conservation and efficiency programs have resulted regionally in about 5800 MWa of electric energy resource.

In 2016 the NPCC released its 7th Power Plan. This plan is produced every 5 years and is designed to provide updated assessments of the resource needs of the region's electric supply grid. Figure 2 shows the projected growth in the electric energy demand and the distribution of resources to meet that demand over the 20 year planning period.

Figure 2:



(source: NPPC, Seventh Power Plan, 2016)

The resource projections shown hear essentially provide a picture of a stable electric demand through 2026 with efficiency providing more than 95% of the new electric demand that results for population growth, increased economic activity, electrification of the transportation sector, etc.

Since this analysis was completed three years ago several important changes have been made that will impact this plan especially in the years after 2026:

- The most important of these changes is the advent of legislative initiatives that require *all* new power plants to have zero carbon emissions. The "Clean Power" bills were passed in both Washington and California. In effect the Clean Power act require that Washington State utilities develop power sources that are carbon neutral.

- A second important initiative is the "Carbon Neutral Cities Alliance." This includes an ever-growing number of cities throughout the state that are committed to developing carbon free electricity. While these cities have very few of the resources needed to meet this goal the Building codes provide resources that can help them meet their goals. Indeed the goals of this alliance are parallel to the legislative goals of the State of Washington: move toward substantial reductions in carbon emission in the next 30 years.

Given these trends we can expect a significant change in the assessment of the marginal resources across the region and throughout the West in future Power Plans. The NWGA insists that this will be led by a continued and increasing reliance on gas fired generating resources. This is the equivalent of asserting a failure of renewable energy and of energy efficiency over the next decade. This position pre-judges the feasibility of the clean power acts. The two largest states in the western grid are committed to carbon free electricity. It is reasonable at this stage to take them at their word.

The State building code can aid in these goals by embedding an assessment of the value of carbon the assessment of the design of commercial buildings. The table used in EO141 and EO50 is a compromise. It says that while we may not achieve a completely clean power future, we will be able to substantially offset the use of gas and other carbon sources. Table 1 shows the carbon emissions used in these code changes. They will provide designers with some insight into the carbon emissions of their design decisions.

Table 1: 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	117	0.40
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

*mmBTU delivered to the site
**kWh equivalent delivered to the site

This table was developed and the November meeting of the SBCC. It represents a reasonable compromised between a sole reliance on gas as the marginal generating resource and a significant probability that renewable and efficiency resources will meet the needs at the margin of the State and region in the next two decades . While it does not completely comport with the Clean Power act it does provide:

- Support for the use of high efficiency electric technologies where possible in the commercial building sectors. It also disadvantages the use of electric resistance heating in all applications.
- It provides for the efficient use of gas when high efficiency electric options are not available.
- It allows the designers to make design decisions based on a combination of equipment costs and carbon emissions.

- It allows the assessment of carbon in design decisions even though the social cost of carbon remains unquantified in the market.

I encourage the council to maintain the compromise from last fall and to include it in both the performance path revisions (EO141) and the proposed TSPR (EO050).

Sincerely

David Baylon
Member,
Energy Code Technical Advisory Group

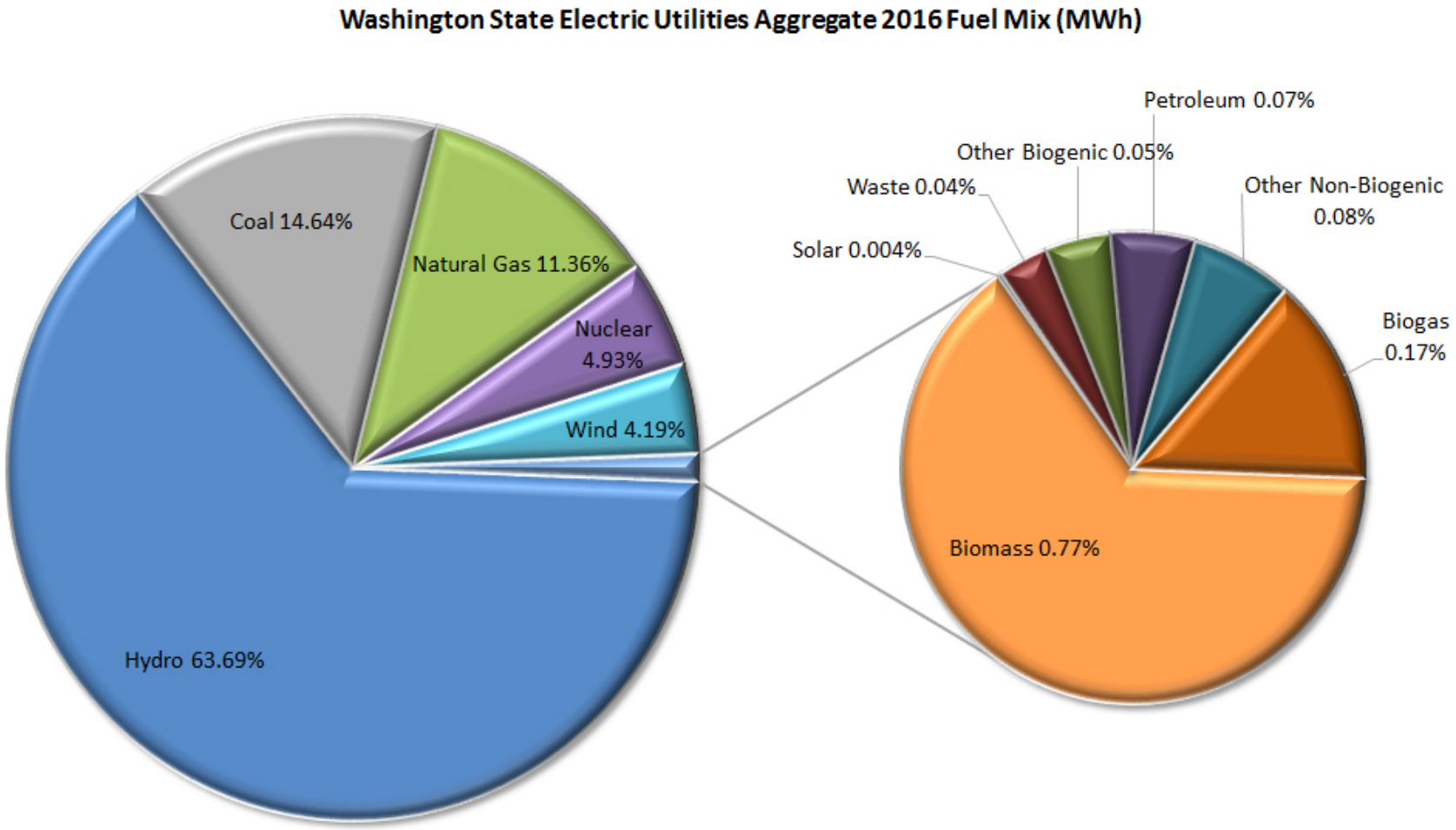
Carbon Accounting

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)



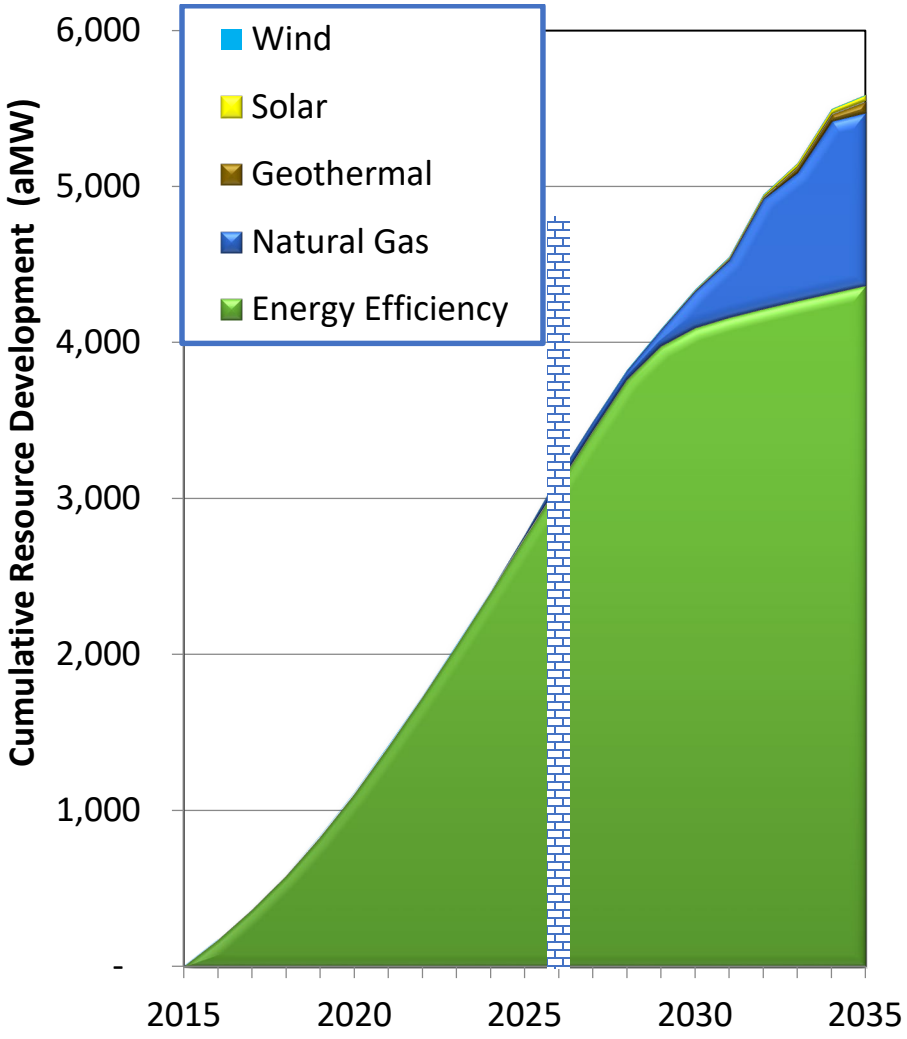
= 0.46 lb. CO_2e/kWh (Average 2002-2016)

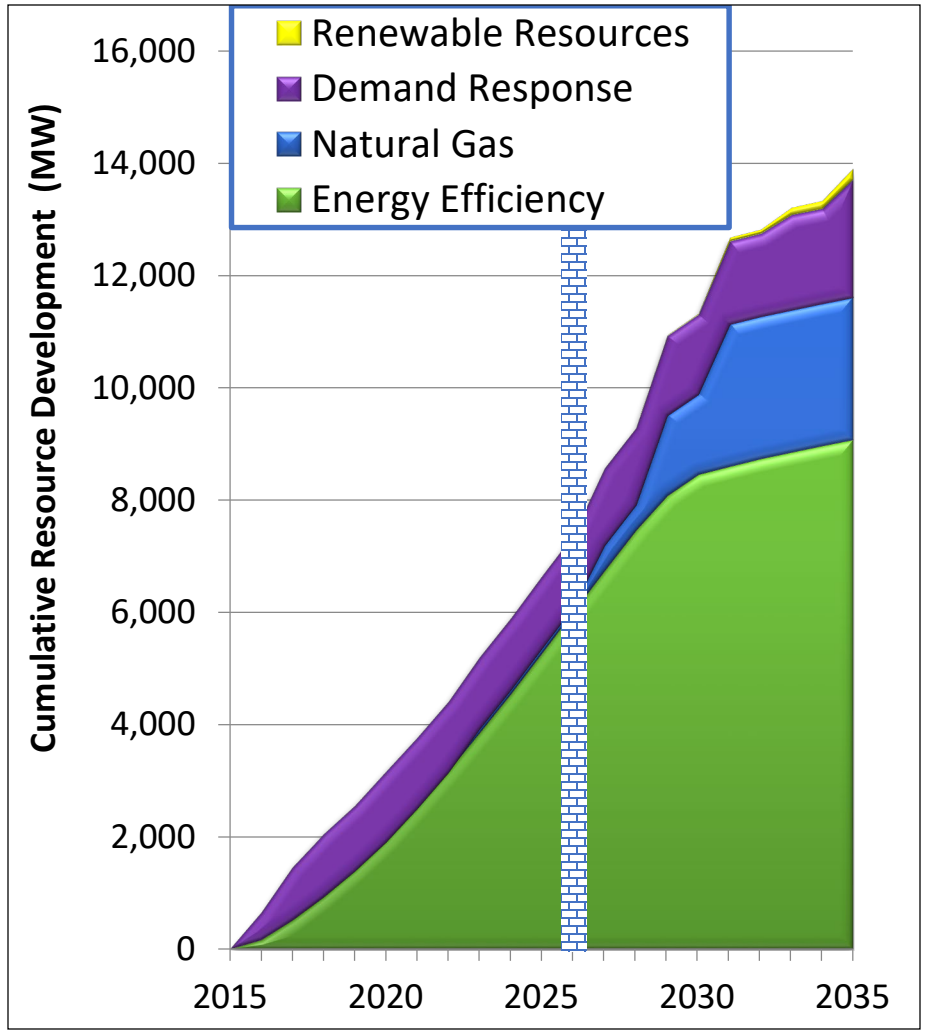
Future growth in electric demand

- 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	

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Electricity (2026 Social cost of carbon, marginal)	205	0.70
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Site Renewable	0	0.00

Carbon Table in “Appendix G”

- Adjusts the energy use estimates
- Provides a carbon equalization for energy estimates
- 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.