Rebuttal of Northwest Natural (NWN) oral testimony
Philip H. Carver, Ph.D.
Representing 350 Salem OR
Before the House Climate, Energy and Environmental Committee
Referring to the hearing on HB 3152 on March 13, 2023

Greetings Chair Marsh, Co-Chairs, and Members of the Committee,

My name is Phillip Carver. I live in Salem and I represent 350 Salem OR.
I am the same Philip Carver who submitted testimony on Feb. 28 for the March 1 hearing on HB 3152 and March 12 for the March 13 hearing on HB 3152. This testimony is to rebut the misleading and inaccurate oral testimony of NWN.

NG efficiency: CCCT powered heat pump vs. condensing NG furnace
In oral testimony, NWN implied that directly burning natural gas (NG) in home equipment and appliances may currently be a more efficient use of natural gas than using electricity from a power plant burning natural gas. While that may be true for some appliances (e.g. gas dryers vs. resistance electric dryers), it is not true for space heat pumps.

As shown in the appendix, using the average efficiency of a gas power plant in 2013 and heat pump "efficiencies" (SEERs) of 300% to 400%, **space heat pump is 127% to 169% more efficient** use of NG than even a 100% efficient condensing furnace (which is unattainable).

CO2 emissions are much less for PGE heat pump than a condensing NG furnace
Portland General Electric's (PGE) 2020 electric mix has less carbon emissions per kWh than the average CCCT used in the analysis above. The average CCCT above would emit 0.85 lb. of CO2 per kWh. PGE's average emission rate in 2020 was 0.79. **Therefore on a carbon basis a condensing NG furnace would 148% to 197% more CO2 per unit of heat output than a PGE heat pump. (see Appendix below).**

For the future all the factors are stacked against the condensing furnace.

As PGE mix gets cleaner (HB 2021, 2021 session) and heat pump efficiency improves, and methane losses in the natural gas transmission and distribution are included in the analysis; this ratio will only get worse for the condensing furnace. There is virtually no opportunity for condensing efficiency to improve (assumption above is 95%). Residential NG heat pumps are not commercially available. Research NG heat pumps units have far lower efficiency than commercially available electric heat pumps.

Currently new solar photovoltaic (PV) power is cheaper than the operating costs of existing coal and CCCT NG power plants. In contrast, current renewable natural gas is far far more expensive than fossil NG. Future cost reductions are much more likely for solar PV power than for renewable NG.

APPENDIX

CO2 Emission of Heat Pump vs Gas Furnace

Natural Gas (NG) Efficiency: PGE Heat Pump vs. Condensing Furnace

ELECTRICITY - HEAT PUMP

Assume existing combined cycle combustion turbine (CCCT)
Power Plant Burning NG (NWPCC, 2013)[1]
Avg, NW CCCT efficiency: 7,243 Btu per kWh (20 power plants)
Electric Output: 3,412 Btu per kWh

Efficiency: 47.1%
Transmission Losses 10%
Delivered efficiency 42.3%

Heat Pump SEER ("efficiency') 300-400%

Net efficiency 1.27% to 1.69%

CONDENSING FURNACE

Gas Pipeline Transmission Losses 3%
Furnace Efficiency 95%
Net Efficiency 92%

But PGE is not 100% gas CCCT
With an average CCCT: 7,243 Btu per kWh x 117 lbs. CO2 per MMBtu = 0.85 lb per kWh

PGE actual 2020 = 0.79 lb per kWh[2] (93% of an average CCCT)

Current CO2 emissions comparison

A condensing furnace emits 148% to 197% more CO2 per unit heat output than a PGE heat pump.

[1] https://www.nwcouncil.org/sites/default/files/Final_CCCT-Presentation_101613.pdf

[2] https://www.oregon.gov/energy/energy-oregon/Pages/Electricity-Mix-in-Oregon.aspx