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September 24, 2021

***VIA ELECTRONIC FILING***

Public Utility Commission of Oregon
Attention: Filing Center
201 High Street SE, Suite 100
Salem, Oregon 97301-3398

**RE: UM 2178, Natural Gas Fact-Finding Per Executive Order 20-04**
**NW Natural's Comments**

At the conclusion of the September 14 workshop in the above-captioned docket, Public Utility Commission of Oregon ("Commission") Staff asked stakeholders to respond to several questions regarding the Climate Protection Program (CPP) modeling performed by the natural gas utilities.[1] Northwest Natural Gas Company, dba NW Natural ("NW Natural" or "Company"), appreciates the opportunity to respond to these questions and to provide its initial thoughts on how these modeling results can be incorporated into subsequent discussions regarding appropriate alternative scenarios and regulatory tools.

1. **What are your initial thoughts on the modeling results?**

Our initial modeling results are a significant step in showing how NW Natural can comply with the CPP. While the costs of CPP compliance are significant, the overall impact to annual customer bills over the thirty-year horizon is relatively low. This is a promising finding and shows that NW Natural can decarbonize its system at a reasonable cost.

As we stated during our presentation, the CPP rules are not finalized, and we could not perform modeling with the same level of detail as an IRP. We were unable, for instance, to use our full optimization or risk-modeling software and tools, and the time to complete the modeling was very short compared to an IRP, which usually involves a full year of planning and stakeholder workshops open to the public, followed by Commission public process. That said, NW Natural believes that the modeling served Commission Staff's intended purpose, where "there was less concern[] about the

[1] See UM 2178, NW Natural's Natural Gas Fact-Finding Workshop #3: Modeling Presentation at 52, available at https://edocs.puc.state.or.us/efdocs/HAC/um2178hac10454.pdf.

accuracy of the cost estimates from these Compliance Models" and more importance given to "identifying the direction and magnitude of any potential costs."[2]

**2. How do these results inform your thoughts about the upcoming webinars on regulatory tools?**

NW Natural recommends that the Commission explore the following regulatory tools:

**Decarbonization Study:** To fully understand what regulatory tools may be needed, there should be an in-depth decarbonization study that examines the overall energy system (both electric and gas).[3] Although this sort of study is very time and resource intensive, it provides an opportunity to understand and analyze the different paths to decarbonization and is necessary before a full assessment can be done on the appropriate regulatory tools. In response to Question #4 below, NW Natural provides some thoughts on how such a study in Oregon could be conducted.

**Joint System Planning:** The Commission should also explore where it has opportunities for joint system planning between electric utilities and natural gas utilities. While we recognize that this request is a shift in the Commission's historical practice, it may unlock new and innovative decarbonization pathways in Oregon by harnessing the benefits of our two interdependent energy grids. For example, joint system planning for hydrogen could utilize excess renewables on the electric system and fully developed underground storage on the gas system, to create long-term seasonal renewable storage for both the gas and electric systems. This type of breakthrough is within reach in our region.

Additionally, hybrid heating, which NW Natural modeled in our CPP compliance, helps address resource adequacy issues on the regional power grid by having natural gas utilities meet space heating demand at peak periods while electricity provides space heating during off-peak hours. NW Natural recommends further study of the benefits of hybrid heating systems, with a focused examination of the value of the capacity that the gas system to provides to the electric system during peaking conditions.

**Low-Income Rate Mitigation:** With the recent passage of HB 2475, there is an opportunity to mitigate the energy burden of the CPP on low-income residential customers. While our initial modeling does not show extreme residential bill increases

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[2] See UM 2178, Staff NGFF CPP Compliance Modeling Proposal, available at: https://edocs.puc.state.or.us/efdocs/HAH/um2178hah165249.pdf.

[3] The Washington Utilities and Transportation Commission is currently undertaking such a study that not only looks at how natural gas utilities can decarbonize, but also the impacts of increased electrification on the ability of electric utilities to deliver services to current natural gas customers reliably and affordably. This combined examination of the natural gas and electric systems will take is scheduled to be finished by June 1, 2023. See *Examination of Energy Decarbonization Impacts and Pathways for Electric and Gas Utilities to Meet State Goals,* U-210553, https://www.utc.wa.gov/casedocket/2021/21053.

over the next 30 years, low-income customer protections should nonetheless be pursued as part of the regulatory tools discussion.

**Rate Design:** Novel rate design issues will need to be addressed as gas utilities begin compliance with the CPP. NW Natural recommends some standardization in approach to how the costs of compliance are assigned to different customer classes.

**Innovation Fund:** There should be discussion of establishing an innovation fund to further accelerate decarbonization of our system. Fortis BC currently has such a fund that is pursuing carbon and methane capture, energy efficiency, and fuel cell technologies.[4] This type of fund would focus on initiatives that were ready for feasibility research rather than basic technology research and could help drive down the cost of decarbonization.

3. **What is one other alternative scenario you think would be important to model to inform the regulatory tools discussion?**

NW Natural believes that an alternative scenario that addresses how to mitigate the cost impacts of the CPP on low-income customers would inform the regulatory tools discussion. In addition, a federal tax credit for RNG and hydrogen should be modeled. This would help provide some balance to the alternative scenarios, which, to date, mostly appear to involve future scenarios that are worse than expected.

4. **If electrification is determined to be a scenario to be modeled, by either the utility or staff, what suggestions do you have for inputs and/or methodology?**

NW Natural notes that electrification scenarios have already been included as requested scenarios in its modeling. First, as previously directed by Commission Staff, NW Natural's included a "no growth" scenario, which is a *de facto* electrification scenario because any new customers would be relying on electricity for all of their energy needs. Additionally, NW Natural included hybrid heating in our base case, which relies on electric heat pumps with back-up natural gas space heating during the coldest times of the day, which is a standard install practice in the Pacific Northwest. To the extent that the Commission Staff intends to model additional electrification scenarios, NW Natural urges the Commission to undertake a comprehensive decarbonization study that includes the costs of new capacity resources and corresponding transmission and distribution infrastructure.

The study should be specifically tailored to the energy system in Oregon. A decarbonization strategy that may be appropriate in one region may be ill-suited when applied to another region. The Pacific Northwest, and Oregon in particular, is unique and the study should reflect the region's energy requirements. For example, the study should, at a minimum, account for differences in weather across the state, as well as

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[4] See https://www.fortisbc.com/about-us/climate-leadership/clean-growth-innovation-fund.

regional resource adequacy and reliability issues. Similarly, the study should accurately model the natural gas and electric systems and how various decarbonization scenarios will affect those systems using actual data whenever possible, not estimates or theoretical data. Having a deep understanding of all these issues is crucial in order to have a complete study that models the impact of different decarbonization pathways on the gas and electric systems.

With respect to technological issues, many decarbonization studies either have a limited understanding of accounting for heat pump efficiencies under extreme weather or assume very aggressive improvements in heat pump efficiency at cold temperatures (and some do not recognize the importance of the assumption at all). This is a critical piece of the study that should not be overlooked. Heat pump efficiency translates directly into the expected costs of electrification because it is the primary driver in the study's results for the expected peak load on the electric system under electrification. For example, some decarbonization studies completed for the Pacific Northwest assume i) all heat pumps that would be installed under electrification in the Pacific Northwest are 470% efficient, and ii) this efficiency rate is not dependent upon temperature (making the modeling simpler, but far less realistic). In combination with the assumption that supplemental heat source is not used (i.e. back-up resistance heating), the studies ultimately show there is very limited peak impact from electrifying space heating load. These assumptions create unrealistic results, understating winter peak energy requirements, and are a very large contributor to a common misconception that electrification of space heating is a cost-effective undertaking, because the real costs have been artificially depressed.

Even in more recent decarbonization work that is meant to address the deficiency in modeling related to heat pumps, it is typically assumed that "cold climate" heat pumps are the only type of heat pump installed, even though they are far more expensive than more standard heat pumps. The assumptions for "cold climate" heat pumps can also greatly understate the contributions to peak electric loads of heating with heat pumps as it is not uncommon that this work assumes the heap pumps are roughly 300% efficient at peak and that they do not require supplemental heat under peak conditions by using load profiles informed by building science simulations rather than actual usage during peak weather. These assumptions deviate from the specifications of the actual cold-climate heat pump (CCHP) specification from Northeast Energy Efficiency Partnerships (NEEP) where a heat pump can be classified in the CCHP directory if the unit is self-reported as being at least 175% efficient at 5°F. This specification applies only to the efficiency of the heat pump itself and not the combined efficiency of the entire HVAC system, which usually also relies upon supplemental heating under peak conditions.

This distinction – between total space heating loads and loads from the heat pump itself – is critical, and it requires a close examination of the heat pump sizing and back-up heating technology. It is not efficient, from a building science perspective, to install a heat pump that is sufficiently large to serve all the heating needs of a single-family home under peak conditions, and therefore, a supplemental heat source is almost always installed to reduce wear on the heat pump system. Heat pumps lose not only efficiency, but also heating capacity in colder temperatures. This is why *it is standard* for ducted heat pump installations to include a supplemental heat source in the Pacific Northwest, with the most common option being an electric furnace that is only 100% efficient. With a typical installation, the supplemental heat source becomes the only source used under peak conditions for comfort and to minimize wear and tear on the HVAC system. Installations without designed supplemental heat are possible in some applications, but current installation practices do not typically size the system in this way. Furthermore, for comfort of the occupant, it is not uncommon for residents to use supplemental heat sources (e.g., space heaters or natural gas fireplaces) not connected to the HVAC system that make large contributions to energy use in the home during peak times.

With this, it is likely that homes with heat pumps that are more efficient than code are still using much more electricity during peak times than most decarbonization studies suggest they do. While there have been numerous studies in the energy efficiency world analyzing electric heat pump loads over an entire heating season, there has not been a detailed study of actual usage data in Oregon or the Pacific Northwest on how much energy all-electric homes heated by heat pumps use during peak conditions. This study cannot be done properly using monthly billing data alone, but can be done in a straightforward manner with data currently available to utilities with smart meters and other high frequency meters.

The Commission Staff can develop a very informative data set from the utilities regulated by the Commission to study this issue by compiling usage information of homes that have received an incentive to install a high efficiency electric heat pump (by definition these systems are more efficient than code) over the last few years during peak times.

NW Natural proposes that Staff request data from the utilities it regulates to populate the following data for each building that has received a high efficiency heat pump incentive from the Energy Trust of Oregon:

- Square Footage
- Year Built
- Whether a heat pump incentive was received in 2013 or a more recent year
    - If a heat pump incentive was received, date of incentive
- Maximum hourly electric usage of the home for each year since 2013 for each year the system was installed
    - Hour of max usage
- Electric usage for the 7am hour for December 7$^{th}$ 2013, January 5$^{th}$ 2017, and January 14$^{th}$ 2020
- Electric usage for the 7am hour for July 15$^{th}$ of 2013, 2016, and 2019

- Gas usage in December 2013, January 2017, and January 2020 (if possible daily usage for 12/7/2013, 1/5/2017, and 1/14/2020)
- Gas usage in July 2013, 2016, and 2019 (if possible daily usage for July 15th of each year)
- Annual electric usage for each year starting in 2013
- Natural gas usage for each year starting in 2013

Analysis of this data would provide a real-world estimate of what it might mean if it were possible to employ the best available electric heat pumps at scale throughout Oregon. This work could then inform a broader study of the impacts of building electrification to Oregon utility customers, where the following assumptions should also be reviewed by stakeholders and be informed by the space heating discussion above:

1. **Space Heating Equipment Efficiencies and Costs**
    - Equipment options for the residential and commercial sectors
    - Efficiencies of equipment options (and how these efficiencies change with temperature and the equipment's size if the technology's efficiency is a function of temperature where a minimum of two separate efficiencies is required: annual average efficiency and winter peak hour efficiency at 12°F) for the climate in Portland, Newport, and Bend.
        i. Equipment efficiencies, both annual average and winter peak hour, should be based upon sizing recommendations from Air Conditioning Contractors of America (ACCA) *Manual S*
    - How efficiencies, both annual average efficiency and winter peak hour efficiency, are assumed to progress through time
    - Complete install costs – both new construction and retrofit – and how they are assumed to change through time inclusive of line itemed costs of equipment (including required accessory equipment such as line sets and refrigerant) and labor and conversion costs if current equipment type is being converted (with separate conversion costs for heat pumps in homes/businesses that currently have central air conditioning and homes/businesses that do not)
    - Assumed average efficiency of existing space heating equipment by fuel input
2. **Water Heating Equipment Efficiencies and Costs**
    - Equipment options for the residential and commercial sectors
    - Efficiencies of equipment options (and how these efficiencies change with temperature and the equipment's size if the technology's efficiency is a function of temperature where a minimum of two separate efficiencies is required: annual average efficiency and winter peak hour efficiency at 12°F) for the climate in Portland, Newport, and Bend.
    - How efficiencies, both annual average efficiency and peak hour efficiency, are assumed to progress through time
    - Install costs – both new construction and retrofit – and how they are

assumed to change through time inclusive of line itemed conversion costs of equipment based upon location of water heater in retrofit applications if current equipment type is being converted
- Assumed average efficiency of existing water heating equipment by fuel input

3. **Transportation Vehicle Efficiencies and Costs**
    - Vehicle options for passenger vehicles, medium-duty vehicles, and heavy-duty vehicles inclusive of compressed natural gas vehicles
    - Efficiencies of vehicle options
    - How efficiencies are assumed to progress through time
    - Capital costs and how they are assumed to change through time
4. **Energy Supply Options**
    - Assigned carbon intensity of all energy supply options
    - For electricity generation options: (1) install costs and how they change through time, (2) expected efficiencies, (3) annual capacity factor, (4) monthly capacity factors, (5) winter and summer peak hour firm capacity factors (peak capacity contribution), (6) O&M costs, (7) carbon intensity and (8) assumptions about siting
    - For biomass: (1) price and availability of different feedstock, (2) equipment install costs for renewable natural gas for pipeline injection and how they change through time, and (3) assumptions about siting
    - Energy Storage options: (1) install costs and how they change through time, (2) expected efficiency of storage process (out of and into useable form) as a function of time, and (3) capacity factor as a function of time energy is stored
        i. For power to gas: (1) install costs for electrolysis and how they change through time, (2) install costs for methanation and how they change through time, (3) costs of storing hydrogen or methane for later use, and (4) capacity factor
5. **Transmission and Distribution Costs**
    - For electricity transmission and distribution: cost per additional unit of peak hour load and how it changes with additional peak load
    - For natural gas transmission and distribution: cost per additional unit of peak load and how it changes with additional peak load
6. **Baseline Energy Load and Supply Profiles**
    - Daily and monthly load profiles by end use based upon temperature and calibrated against actual natural gas and electric intraday and seasonal loads in NW Natural's service territory
    - Current mix of generating resources that serve the electric load in NW Natural's service territory

7. **Energy Efficiency and Demand Response**
   - Technical and achievable energy efficiency potentials and the cost of measures to reduce energy use for the residential, commercial, industrial, and transportation sectors
8. **Fuel Prices**

NW Natural understands that a complete study that addresses all these issues will take considerable time and effort to complete, but it is necessary to fully understand the impacts of building electrification. A study that does not take these factors into account will likely have inaccurate results, and lead to regulatory tools that are ill-suited to the task of decarbonizing Oregon's energy supply while maintaining reliability and affordability.

We look forward to reviewing stakeholders' comments, and we will respond to those comments, as necessary.

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Sincerely,

*/s/ Zachary Kravitz*

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