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September 21, 2021

Amanda Maxwell, Executive Director and Secretary
Washington Utilities and Transportation Commission
621 Woodland Square Loop S.E.
Lacey, Washington 98503

Re: U-210553—NW Natural Response to Notice of Opportunity to File Written Comments

Dear Ms. Maxwell:

Northwest Natural Gas Company, dba NW Natural ("NW Natural" or "Company"), appreciates the opportunity to respond to the Washington Utilities and Transportation Commission's ("Commission") September 13, 2021 Notice of Opportunity to File Written Comments ("Notice") in docket U-210553. Generally, the Company believes that the Commission's draft Request for Proposals (RFP) is consistent with the requirements of section 143(4) of Senate Bill 5092, which set the parameters for this decarbonization study. NW Natural, however, recommends several additions to the RFP.

Perhaps most importantly, the consultant should have a proven track record of performing neutral, fact-driven analysis. It should not be an advocate for any one particular path of decarbonization. Different regions of the country have different needs. A decarbonization strategy that may be appropriate in one region may be ill-suited when applied to another region. The point of this study is to help determine the appropriate strategy for Washington with a focus on the impact to Washington's energy system from electrification of energy services in buildings currently served by natural gas utilities. This would be undermined by a consultant that believes it already knows the answers based on other states' experiences. Instead, the consultant should be able to demonstrate how it took regional differences into account in its prior decarbonization analyses, and how that was reflected in its recommendations.

In addition, the RFP should have a clear scope of work that is closely tied to the criteria listed in section 143(4)(b) of Senate Bill 5092. For each of the seven criteria, the RFP should require the consultant to identify how it will be assessed, the consultant's past experience with performing analysis based on that criteria, and any obstacles or barriers the consultant sees in performing the analysis and how the consultant plans to overcome that. For instance, in determining "[t]he ability of electric utilities to procure and deliver electric power to reliably meet that load," the consultant and the Commission will likely need the cooperation of publicly owned utilities that are not under the jurisdiction of the Commission. This should be addressed either in the RFP process or in the planning process for this study more generally.

The consultant should also have Pacific Northwest experience and with natural gas system planning. The Pacific Northwest, and Washington in particular, is unique and the consultant should have a clear understanding of that. For example, the consultant must, at a minimum, account for differences in weather between the west side and east side of the Cascades, as well as regional resource adequacy and reliability issues. Similarly, the consultant must be able to accurately model the natural gas system and how various decarbonization scenarios will affect that system 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 overall energy system (both gas and electric).

With respect to technological issues, most 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 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). Specifically, a well cited deep decarbonization study in the region assumes electric heat pumps are 470% efficient during peak winter conditions, and no supplemental heat source (i.e. back-up resistance heating) is needed to serve peak heating needs. In combination with the assumption that all resistance heating is eliminated, the studies then show there is very limited peak impact from electrifying space heating load. This assumption creates unrealistic results and is 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. The assumptions for "cold climate" heat pumps also greatly understate the contributions to peak electric loads of heating with heat pumps by assuming that the systems 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 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.

While there have been numerous studies analyzing electric heat pump loads over an entire heating season, there has not been a detailed field study in the region on how much electricity homes heated by heat pumps use during peak conditions in the Pacific Northwest.[1] The Commission's study can take this issue into account in a straightforward manner with data currently available to utilities with smart meters and other high frequency meters. Specifically, the consultant should request data from the electric usage of homes that have received an incentive to install a high efficiency heat pump (more efficient than code) over the last few years during peak times to examine their contribution to peak load. Combined electric and natural gas utilities have the data that will allow such an analysis.

As an initial consideration, NW Natural recommends that for each home in areas where the electric and natural gas utility are the same utility (making both electric and natural gas usage during peak events possible), the consultant populate the following:

- Premise/Customer Account #
- Square Footage
- Year Built
- Whether a heat pump incentive for a high efficiency heat pump was received in 2015 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 from 2015 through 2020
    - Hour of max usage and temperature during that hour
- Electric usage for home or building during the 7am hour for January 5th 2017 and January 14th 2020
- Electric usage for the home or building during the 7am hour for July 15th of 2015, 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 will provide an estimate of the impact on the electric grid of electrification of space heating with heat pumps supported by actual data rather than assumptions about efficiency or building science simulations and provide important evidence in the building electrification discussion in the Pacific Northwest.

Furthermore, the RFP should seek out a consultant that will deliver the following assumptions for review by stakeholders in this process before commencing with modeling work, where the efficiencies below for space heating should be informed by the field analysis requested above:

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[1] While not a field study, a more detailed building science approach was taken to consider heat pump performance under peak conditions in *Pacific Northwest Pathways to 2050: Achieving an 80% reduction in economy-wide greenhouse gases by 2050,* E3, 2018. See https://www.ethree.com/wp-content/uploads/2018/11/E3_Pacific_Northwest_Pathways_to_2050.pdf

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 Seattle, Spokane, and Portland, OR (as a proxy for Vancouver, WA)
        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 Seattle, Spokane, and Portland, OR
    - 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**

To the extent that the consultant cannot use actual field data (preferred), the consultant should either have building science experience or rely on subcontractors with that experience. As shown above, accurately determining the hourly load impacts of various types of space heating across building types (e.g., single family homes, multi-family buildings, and commercial buildings) is crucial in determining the impact of various decarbonization scenarios. This would include evaluating the different heat pump technologies and potential back-up sources of heating (electric resistance, renewable natural gas, etc.) when it is too cold to adequately heat a home with a heat pump.

Finally, NW Natural respectfully requests that the Commission allow for public participation in the selection process for this RFP. While the Company understands that the final decision on which consultant to select must rest with the Commission, making all non-confidential bid and proposal information available for stakeholders to review and providing an opportunity for comment would be helpful. It would assist in identifying potential issues with consultants' proposals that can be addressed relatively early in the process and not after a consultant has already been selected and started work. This would result in a smoother process overall, although we acknowledge that it would take some time to seek comments initially.

NW Natural appreciates the opportunity to provide these comments, and we look forward to the thoughtful, collaborative, and productive discussions in this proceeding.

Sincerely,

/s/ Zachary Kravitz

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