SUSTAINABILITY SOLUTIONSGROUP

December 13, 2022

Response to NW Natural's letter of December 7, 2022

Dear Resilient Efficient Buildings Task Force Co-chairs Senator Lieber and Representative Marsh,

This letter provides clarifications on the modelling approach in response to the letter from NW Natural dated December 7, 2022.

The policies analysed by SSG were determined by the Task Force. In this context, our assignment for this project was not to make policy recommendations, but rather to provide an evidence-based analysis to support the deliberations of the Task Force. As analysts, we have no vested interest in a particular energy source or technology and, as a result, we are able to provide unbiased technical analysis that directly responds to the mandate of the Task Force and the parameters described by the Senate Bill 1518 (SB 1518), which created the Task Force.

Energy systems modelling is a complex field. There are only a few university research groups and firms in North America that have developed and currently operate models as detailed and comprehensive as the model that we used to support the Task Force, the Energy Systems Simulator (ESS). ESS was populated with data on the stocks of buildings and technologies years for Oregon, with resolution for each of the 37 counties. The energy use of buildings was calibrated against reported data for Oregon from U.S. Energy Information Administration's (EIA) State Energy Data System. The stocks of buildings and technologies evolve as population and employment is projected to grow, year over year out until 2050.

ESS exemplifies the relatively new class of systems dynamics models being used to help utilities and policymakers fill in the knowledge and insight gaps left by the fundamentally less sophisticated econometric models historically used by utilities to forecast future commodity demands. The complexity of this class of model means that it can be difficult for the layperson to understand; there are hundreds of different technologies represented, and the different policies impact different technologies. ESS is run by analysts with backgrounds in engineering, mathematics and energy systems and decades of experience.

Despite the complexity of the model, SSG is committed to transparency. For example, as indicated in the report, the ESS model itself can be downloaded from GitHub.[1] An interested person can therefore assess and test the logic of the model; although this comes with the caveat that it will take an investment of effort and time as the model is sophisticated.

Continuing in the vein of transparency, SSG has also offered to provide any specific data sets to members of the Task Force that are requested, either inputs or outputs from ESS, and this offer still stands. In addition to the Data, Methods and Assumptions Manual, which describes the modelling approach and data sources, a Financial Catalog (Appendix 7), describes the sources of financial assumptions, most of which come from industry standard sources, such as the EIA's Annual Energy

[1] The link for downloading the model is: whatIfTechnologies/ESS_public: Energy Systems Simulator model logic (github.com)

Outlook. The Financial Catalog was provided to the Task Force for feedback on any of the assumptions earlier in the process.

NW Natural is requesting that the emissions factor of the “natural gas system” decrease in the reference scenario, according to the requirements of the CPP. The emissions factor of natural gas itself cannot decline; in order to make the emissions from the gas system decline, we would therefore need to make a determination on the implementation pathway of CPP. As NW Natural indicates, the implementation of CPP has many compliance pathways, some of which are directly implicated in the policies evaluated by the Task Force and some of which are not.

For example, the Task Force evaluated policies on efficiency and heat pumps which could be part of a CPP implementation pathway, which, depending on the ambition of implementation, could include very little green hydrogen or RNG in residential and commercial buildings. Other CPP implementation pathways may involve more green hydrogen and RNG, but we were not asked by the Task Force to evaluate these pathways. To introduce more RNG, clean hydrogen or other zero emission fuels would have required us to presuppose specific implementation pathways for the CPP in a way that was not necessary for assuming a declining grid emission factor.

As an energy carrier, the assumed emission factor of electricity can be reduced but the end use commodity remains the same. In contrast, reducing the emission factor of “the natural gas system” involves reducing the amount of natural gas in that system in favour of zero emission RNG and hydrogen, which in turn requires specifying the mix and prices of those sources. An analysis of whether combustion-based building heating systems fueled by zero emission RNG and hydrogen and delivered via the “natural gas system” could offer a viable pathway to a zero emission building sector, and whether that would constitute the best use of such premium fuels would be a valuable analysis to undertake, but it was not the analysis we were asked to undertake.

Although beyond our current scope of work, should we be requested by the Task Force, we are certainly able to undertake such an analysis, assessing the trade-offs between efficiency, technologies and energy sources of different implementation pathways for CPP and their respective public benefits.

Recognising that CPP is a requirement, we did, however, illustrate the impacts of CPP on GHG emissions on the policy scorecards. This presentation allows Task Force members to assess the impact of each policy in the context of the GHG targets set by CPP.

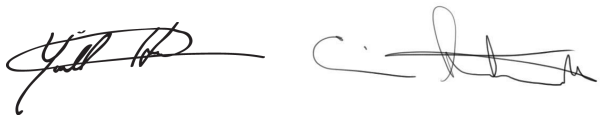
Note that two strategies of interest to NW Natural were evaluated by the Task Force; RNG was included as a strategy in the Building Performance Policy and hybrid heating systems were included in any policies that installed heat pumps.

On peak analysis, SSG did, in fact, evaluate the impact of shifting gas space heating loads to the electricity system using heat pumps, the results of which are detailed beginning on page 48 of the report. An important finding is that most of the policy combinations reduce peak demand, relative to the base year and relative to future demand in the reference scenario. HB 2021 does require new generating capacity, but the electricity transition was also not in the scope of this analysis. It is for this reason that there is no discussion on additional capacity as a result of the building policies evaluated.

It is also important to note that the electricity demand curves were generated with models that are calibrated to actual electricity demand for the Northwest (including Oregon), from the Northwest End Use Load Research Project, specifically the Home Energy Metering Study and the Commercial Energy Metering Study.[2] The collaborators on this project include Avista Utilities, Bonneville Power Administration, Building Technologies Office - U.S. Department of Energy, Clark County PUD, Energy Trust of Oregon, Eugene Water & Electric Board, National Renewable Energy Laboratory, Northwest Power & Conservation Council, PacifiCorp, Portland General Electric, Puget Sound Energy, Seattle City Light, Snohomish PUD and Tacoma Power.

Energy modelling is challenging work, and the future is uncertain, but models such as ESS are important tools to assess the implications of policy decisions.

Sincerely,



Yuill Herbert and Chris Strashok,
Principals, SSG

[2] US Department of Energy (2022). End-Use Load Profiles for the U.S. Building Stock; Methodology and Results of Model Calibration, Validation, and Uncertainty Quantification. Retrieved from: https://www.nrel.gov/docs/fy22osti/80889.pdf