MEMORANDUM

EUGENE WATER & ELECTRIC BOARD

Rely on us.

TO:	Matt Rodrigues, Public Works Director, City of Eugene; Sarah Medary, City Manager, City of Eugene
FROM:	Frank Lawson, CEO & General Manager
DATE:	July 8, 2022
SUBJECT:	Responses to City of Eugene Electrification Questions

Matt Rodrigues and Sarah Medary:

On behalf of Eugene Water & Electric Board (EWEB), please find responses to the questions posed by members of City Council and City Staff regarding the impacts of electrification on EWEB. We appreciate the outreach, and offer our ongoing assistance, as the City of Eugene evaluates potential policy that could impact EWEB. EWEB plans to have management and/or staff attend your upcoming work sessions later to this month if you should request additional assistance.

On June 3, 2022, EWEB received questions from the City of Eugene, as identified in the table below. In order to best respond to your questions EWEB has further defined, or refined the scope of, the questions and linked potential draft responses to a general-use document of frequently asked questions (FAQs) specific to the impacts of electrification.

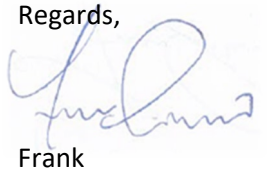
QUESTION (as received from City of Eugene)	**EWEB Scope of Response/ Refinement**	**Draft Response(s)**
Safety: A single energy type is a single point of failure vulnerability. How do we mitigate that?	What are the resiliency impacts of an electric-only energy system?	Please see response to FAQ #12.
What effect will drought and federal policy to preserve salmon runs have on one of the northwest's largest renewable energy sources which is hydroelectricity?	(1) What effect will climate change and drought have on the electric generation ratings for the regional hydropower system and EWEB's owned generation system? (2) What effect will federal policy and/or litigation have on the electric generation ratings for the Federal Columbia River Power System?	Please see response to FAQ #7 and #8.
What effect will this have on our overall energy portfolio as we start to put more demand on a reduced supply?	How will EWEB manage increasing loads while Northwest hydro (and other) supplies decline?	Please see response to FAQ #10.

60% of all electric on our national grid is produced by fossil fuels. What effect will the reduction of the west coast's hydro-electric generation capacity (described previously) have on this percentage?	What impact might a derating of the Federal hydropower system (NW Power Planning and Conservation Council boundaries) have on fossil fuel use and carbon emissions nationally?	Please see response to FAQ #11.
Concerned about electricity cost volatility. In the northwest we have benefited from reasonably priced electric due to hydro-electric generation but as that diminishes what is that going to do to our costs going forward. Wondering if there is a way to analyze the impact of the reduced hydro-electric capacity and how it will impact costs for electricity.	How will climate and regulatory restrictions on hydroelectric generation impact the reliability of the grid and pricing in the pacific northwest?	Please see response to FAQ #9.
What have we done in terms of looking at other alternative energy sources such as solar and wind, in order to have a mix of options to transition to?	No changes	Please see response to FAQ #13.
Industrial - Can we look at the industries where electric only IS feasible?	Which non-fossil technologies and fuels exist now or may soon for industrial processes?	Please see response to FAQ #14.
Does the infeasibility assessment take into account changing conditions such as temperature?	As the local climate changes, what will be the impact of changing temperatures on EWEB's electrical consumption (load)?	Please see response to FAQ #4.
The HB2021 that required electric utilities to be 100% clean by 2040 did not include EWEB. Can staff find out what EWEB's plan is?	Although Oregon's Clean Energy Standard, HB2021, does not apply to EWEB, what is EWEB's planned future electricity generation portfolio/mix?	Please see response to FAQ #3.
What is the projection for natural gas use in new buildings in the commercial and industrial sector? (Provide a forecast of how natural gas will be used and how much.)	No suggested changes.	Please see response to FAQ #18.
In the event of electrical system failure, is there a back-up energy source that is not based on fossil fuels?	In the event of electrical system failure, what back-up non-fossil energy sources exist and what are their feasibility?	Please see response to FAQ #15.
If there is, how do we get to a point where we can implement use?	What role can EWEB play in direct implementation of new fuel/technology adoption at owned facilities? What role can EWEB play in incentivizing new fuel/technology adoption at community facilities?	Please see response to FAQ #16 and 17.

What percentage of Oregon's electricity is generated by fossil fuels?	No suggested changes.	Please see response to FAQ #6.
Will this percentage change with the drought and federal policy effecting hydroelectric generation capacity?	See above as this is a duplicate of rows 6/7	Please see response to FAQ #7 and #8.
Given approximately 50% to 60% of the PNW region's peak heating load comes from natural gas, how could the idea of dual fuel heating systems, as suggested by Frank Lawson EWEB General Manager, be used to reduce GHG emissions as we transition to a fossil free future? What might be the benefits and cost from such an approach?	What are the benefits and costs of using dual-fuel technologies for space heating?	Please see response to FAQ #5.

Please review the responses and inquire further if you have follow-on or additional questions or requests for information. As the city and other community members raise questions, we will add to our FAQ responses.

Regards,



Frank

Attachment(s): *Frequently Asked Questions, Impacts of Electrification*

Frequently Asked Questions (FAQs)

Impacts of Electrification

Revised: September 1, 2022

1.0 Question: Do we have the grid that is needed to reliably support increasing electricity demand from electrification? Can the electric grid support increasing levels of electrification?

Response: A power system is defined as reliable when it has both sufficient generating capability and a robust transmission system. As a public utility, EWEB is obligated to serve the electricity needs of our customers, including the procurement of adequate generating resources, and the construction and operation of a local distribution system. EWEB presently relies on the Bonneville Power Administration (BPA) for most of its transmission.

EWEB can assure our customers that EWEB's portfolio of electricity generation, and local distribution system, will meet the future consumption needs of our customers. Using consumption forecasts that include electrification assumptions, EWEB is developing an Integrated Resource Plan (IRP) that will assist the utility in the planning and procurement of the electricity needed to meet expected future consumption in ways consistent with the values of our customer-owners (https://www.eweb.org/about-us/power-supply/integrated-resource-plan). EWEB is also using the forecasted information to plan, construct, and operate our local distribution network.

The situation is different for the Western Interconnection (11 Western U.S. states and two Canadian provinces), which is the grid that EWEB and BPA rely on for generation and transmission. **The West's overall ability to remain affordable and/or reliable in a decarbonized and electrified future is unclear.** Industry studies across the region highlight the challenges as to the region's ability to meet peak demands over the next decades. In 2019, near-term generating resource adequacy concerns triggered the development of a Western Resource Adequacy Program, in which EWEB is currently a participant. The 2021 Northwest Power Plan recommends that the region's transmission providers *"develop a comprehensive review of the existing state of the transmission system; and research potential short-term and long-term solutions to alleviate new resource development barriers."* In the recently published 2040 Clean Energy Sensitivities Study by the Western Electricity Coordinating Council, the organization that is responsible for compliance monitoring and enforcement and that oversees reliability planning and assessments, *"there is a need for other clean resource types with performance characteristic similar to that of gas-fired generation resources"*, a technology which has yet to be identified or developed. Additionally, *"increasing VRE (Variable Renewable Energy) resources may create transmission challenges"*.

As a local community-owned utility, EWEB is committed to evolving our system in ways consistent with our values of safety, reliability, affordability, environmental stewardship, and community. However, we also acknowledge our reliance on a Western grid that is facing challenges as regulations, resources, and consumer preferences change, and we will continue to monitor and engage in these issues.

2.0 Question: What will be the impact on EWEB of banning the use of natural gas in new construction?

Response: A ban of natural gas usage in new construction will impact EWEB's customer-owners and EWEB from a generation and distribution perspective.

By combining the economic analysis contained in EWEB's Electrification Impact Analysis Study with the City of Eugene's 2021 permit data on natural gas infrastructure trends as presented to Council on April 13, 2022, **removing a natural gas heating option could cost the 3,000 residential-only (not including commercial) new construction customers expected over the next 15 years, who would have chosen gas, an additional $1.7 million (in 2021 dollars) to own and operate the equipment over its lifetime**, saving ~6,215 MTCO2e/year over the period at a cost of $18 per MTCO2e reduced.

EWEB estimates an annual electricity peak load increase of approximately 1% each year (22% compounded over two decades) if the use of natural gas is banned in new residential and small commercial construction. Increases in peak will result in higher electricity procurement costs and may result in distribution system enhancements, which is highly location dependent.

3.0 Question: Although Oregon's Clean Energy Standard, HB2021, does not apply to EWEB, what is EWEB's planned future electricity generation portfolio/mix?

Response: EWEB's Board amended the SD15 Climate Change Policy in 2021 to support a low-carbon electric power portfolio that maintains, on a planning basis, over 90% of annual energy from carbon-free resources and targets over ***"95% of annual energy from carbon-free resources by 2030 to the extent possible and practical without distinct adverse impacts to customer-owners"***. Both the legislated Oregon RPS requirements and EWEB's Climate Change policy will serve as requirements for planning EWEB's future electricity supply.

EWEB is subject to Oregon Renewable Portfolio Standard (RPS) requirements, but not HB2021. The Oregon RPS requires that an increasing percentage of EWEB's annual retail sales, excluding legacy hydro, must come from qualifying renewable resources. Currently, EWEB's annual RPS percentage target is 20% of qualifying electricity, increasing to 25% in 2025. EWEB's legacy hydro generation has historically provided sufficient exemption to reduce or eliminate EWEB's annual RPS obligation and EWEB maintains an adequate reserve of Renewable Energy Credits (RECs) that can be used to meet any remaining RPS obligations. Oregon RPS obligations are incorporated into EWEB's Integrated Resource Planning Process.

4.0 Question: As the local climate changes, what will be the impact of changing temperatures on EWEB's electrical consumption (load)?

Response: EWEB is currently a winter-peaking utility and summer peaks are approximately 80% of a typical winter peak. Climate forecasts have indicated that average heating loads (measured in heating degree days) may be declining over time and that cooling loads (measuring in cooling degree days) may increase over time (https://toolkit.climate.gov/#climateexplorer). For EWEB, summer peaks will also increase as more air conditioning is added to the area, eventually driving the utility to become "dual peaking" (winter and summer). According to research from the Bonneville Power Administration, the U.S. Army Corps of Engineers, Bureau of Reclamation, University of Washington, and Oregon State University completed regional climate change studies

under the review of the River Management Joint Operating Committee (RMJOC), **from the 2020s through 2040s, power demand could increase an average of 4.4% in July and August and decrease an average of 2.2% in December through February because of climate change-driven temperature increases.** Links to the RMJOC studies are contained in Question 7 below. Loads during high temperatures (summer) are generally considered more stressful on electrical systems.

5.0 Question: What are the benefits and costs of using dual-fuel technologies locally for space heating?

Response: The Energy Information Administration estimates 43% of energy use in all U.S. homes is for space heating, and another 8% is for air conditioning. Heat pumps, especially in areas with mild climates, are an efficient way to heat and cool buildings because the unit can pull heat out of the air to heat or cool spaces at an efficiency of over 200%, while the most efficient gas furnaces are around 95-98% efficient. Heat pumps work well down to temperatures of approximately 35-40 degrees Fahrenheit. When the outside temperatures dip below that point, there is less heat to pull from the air to maintain a heat pump's usually high efficiency levels. In these instances, standard heat pumps often switch to electric resistance heat and dual-fuel systems will switch to a natural gas furnace.

In EWEB's territory, 3% of an average year is below 32 degrees, and 16% below 40 degrees. Using duel-fuel technology would require natural gas between 3-16% of the hours, depending on the settings, for space heating applications. As EWEB is a winter-peaking utility, cold snaps below 40 degrees often correspond with peaks in electricity consumption in our region resulting in more expensive and more carbon-intensive power. Dual fuel heat pumps present an opportunity to reduce carbon emissions while mitigating peak impacts for EWEB. EWEB's Electrification Phase 2 Study, shows that switching from natural gas furnaces to dual-fuel heat pumps could have similar lifetime GHG benefits to switching to an electric vehicle, or about 30-35 MTCO2e, without any detrimental impact on system or regional peak. However, electrification of 50% of the housing stock with standard performance heat pumps is likely to increase peak electricity demands by as much as 12%, which could increase EWEB's need to invest in more generation, transmission, and distribution infrastructure.

Based on EWEB's analysis of the economics of electrification, substantial single-family dwelling electrification (fuel switching) of space heating is unlikely given lack of financial benefits for customers. Today, there are higher upfront costs for the purchase and installation of heat atechnology, especially low-temperature heat pumps, compared to natural gas furnaces. This can act as a barrier to consumer adoption. Unless other variables (such as mandates or incentives) are removed, then wide-spread space heating electrification, other than dual-fuel technology, is not likely based solely on economics.

6.0 Question: What percentage of Oregon's electricity is generated by fossil fuels?

Response: The Oregon Department of Energy's 2020 Biennial Energy Report shows that **in 2019 a total of 45.86% of electricity consumed in Oregon was generated by fossil fuels**, 24.81% from coal-fired electricity and 21.05% from natural gas-fired electricity (other assorted fossil sources of electricity totaled less than 1 percent). Hydropower met 43.28 percent of Oregon's electric consumption for 2019.

7.0 Question: What effect will climate change and drought have on the electric generation ratings for the regional hydropower system and EWEB's owned generation system?

Response: In 2020, scientists from the Bonneville Power Administration, the U.S. Army Corps of Engineers, Bureau of Reclamation, University of Washington, and Oregon State University completed regional climate change studies under the review of the River Management Joint Operating Committee (RMJOC). This research is giving BPA a better understanding of the potential range of impacts that climate change may bring to the Columbia River Basin.

According to the studies, Northwest temperatures appear to be causing changes in streamflow runoff patterns, with higher winter flows, slightly earlier spring runoff and slightly lower summer flows since the 1980s. The studies forecast that regional warming will likely cause more precipitation to fall as rain in the winter rather than snow. Over time, these temperature changes will affect Columbia River Basin flood risk management, power generation, and fish protection efforts. Projections show that **between November and May, monthly generation could substantially increase while from June to October it could significantly decrease.**

The RMJOC Studies can be found here:

https://www.bpa.gov/-/media/Aep/power/hydropower-data-studies/rmjoc-ll-report-part-l.PDF

https://www.bpa.gov/-/media/Aep/power/hydropower-data-studies/rmjoc-ll-report-part-ll.PDF

For EWEB's local hydro generation along the McKenzie River, the RMJOC report estimated that fall and winter river flows are likely to increase. A slight decrease in spring flows is possible, with a longer period of low summer flows more likely than not. This change in flow patterns will likely affect how the U.S. Army Corps of Engineers operates their Blue River and Cougar Reservoirs on the McKenzie since river water temperatures are expected to increase during the critical migration periods for endangered Spring Chinook Salmon. The Corps has already changed operation of their reservoirs in ways that will reduce river water temperatures to protect fish by releasing more stored cold water during the warmest periods of the year. **EWEB staff expect the changes in flow patterns and Corps reservoir operation practices to reduce EWEB's McKenzie River power generation quantities by approximately 10 percent.**

8.0 Question: What effect will federal policy and/or litigation have on the electric generation ratings for the Federal Columbia River Power System?

Response: Although it is difficult to speculate on the future of the Federal Columbia River Power System (FCRPS), past policy and litigation has continually resulted in restricted power operations along with reduced flexibility and capacity of the FCRPS. According to data disclosed in the 2020 Columbia River System Operations Environmental Impact Statement (CRSO EIS) from the Bonneville Power Administration, Army Corps of Engineers, and Bureau of Reclamation, **aggressive flow regimes now under litigation along with potential dam breaching scenarios could reduce system firm energy by as much as 870MW (11%), increase loss-of-load probability, and increase residential retails rates by up to 11%.** Future impact estimates will need to be based on specific proposed policy changes or litigation, but the Pacific Northwest utilities continue to highlight the importance of hydro power as a source of reliable, carbon-free power. Regional

utilities and advocacy groups consistently advocate for balanced approaches to hydropower regulation.

9.0 Question: How will climate and regulatory restrictions on hydroelectric generation impact the reliability of the grid and pricing in the Pacific Northwest?

Response: Specific to the federal system, BPA conducted analysis around several potential changes to dam operations or configurations in its 2020 Columbia River System Operations Environmental Impact Statement (CRSO EIS). BPA found that without acquiring replacement resources, removing the Lower Snake Dams or increasing spill over the dams would increase the probability of reliability events in the region. In a separate draft report commissioned by Washington Gov. Jay Inslee and Sen. Patty Murray, replacing services of the four lower Snake River dams will cost between $10.3 billion and $27.2 billion over the next 50 years.

Source: Columbia River System Operations Environmental Impact Statement Record of Decision (September 2020) (energy.gov)

10.0 Question: How will EWEB manage increasing loads while Northwest hydro (and other) energy supplies decline?

Response: Future energy demand and changes in electricity generating resources are part of EWEB's integrated resource planning (IRP) process, a data-driven process that can inform EWEB's long-term (5-20 years) electricity supply decisions. EWEB is currently preparing an Integrated Resource Plan (IRP), incorporating likely baseline conditions and forecasts, and will release a draft at the end of 2022, and finalize in 2023 following a public comment period. The IRP features a study that is designed to evaluate different electricity supply options under different possible futures.

11.0 Question: What impact might a derating of the Federal hydropower system have on fossil fuel use and carbon emissions nationally?

Response: EWEB is part of the Western Interconnection, not a national grid. Most studies show that meeting future demand will require significant commissioning of additional resources, including wind, solar, natural gas, nuclear, and storage technologies. Further constraints on the federal hydroelectric system will increase the requirement to develop additional intermittent renewable resources at significant cost. In the "Pacific Northwest Low Carbon Scenario Analysis", a study from December 2017 conducted by E3 on behalf of the Public Generating Pool, in order to achieve an 80% reduction in GHG emissions by 2050, assuming the same federal resource levels, the Pacific Northwest (OR, WA, ID, MT) needs to build and/or procure an additional 11,000 MW of wind/solar and 7,000 MW of natural gas generation for peaking capacity. The region's existing carbon-free resources include 31,000 MW of hydroelectric capacity and 1,200 MW of nuclear. If 3,400 MW of carbon-free resource (hydro or nuclear) is no longer available from the federal hydropower system, then an additional 5,500 MW of wind/solar and 2,000 MW of natural gas peaking generation will be needed to achieve the same carbon reduction goals, at an additional *annual* cost of $1.6 billion. Since the time that study was published time, the State of Oregon has passed legislation prohibiting new natural gas electricity production.

[Note: This response was edited on 9/1/2022 to provide the link to the referenced study and to update the correct units on the numbers cited from the research.]

12.0 Question: What are the resiliency impacts of an electric-only energy system?

Response: All energy systems, whether an electric only or a dual electric and natural gas system, have risk exposure and limitations. For example, both gas and electric transmission and distribution systems are vulnerable to seismic events. Electric systems with overhead lines have more risk exposure during storm conditions (wind, ice, snow), while some gas systems lack redundancy within the gas grid. As demonstrated during winter events, energy source flexibility and redundancy can improve resiliency and reduce the demand and criticality on a single-source system.

While the gas sector already can remotely store energy or manage system capacity, the electricity sector is engaged in options to increase the resiliency of utility systems and the regional grid, including undergrounding lines, hardening equipment, adding energy storage, implementing microgrids, upgrading cybersecurity, improving remote black-start generation, and conducting more frequent proactive maintenance. Additionally new options are evolving to increase redundancy at the residential level beyond gas or diesel generators. These include alternative fuels back-up power generation products and the use of some electric vehicles capable of powering a residence for short durations.

13.0 Question: What have we done in terms of looking at other alternative energy sources such as solar and wind, in order to have a mix of options to transition to?

Response: EWEB's existing power supply information can be found on our website here: https://www.eweb.org/about-us/power-supply. Approximately 6% of our portfolio is from wind and 0.1% is from solar generation, and EWEB continues to offer customer incentives for rooftop solar. Like most utilities, wind and solar will be considered as resource options in EWEB's Integrated Resource Plan (IRP), which will be finalized in 2023.

14.0 Question: Which non-fossil technologies and fuels exist now or may soon for industrial processes?

Response: Several non-fossil fuel choices are evolving that can be evaluated for use in a variety of applications. Due to credits from the Oregon Clean Fuels Program and the Federal Renewable Fuels Standard, **most of these fuels are currently being used in transportation applications. These fuels include renewable diesel, biodiesel, renewable propane, renewable natural gas, and renewable hydrogen.** Additionally, formic acid, small modular nuclear reactors (SMRs), biowaste (e.g. wood waste) are continuing to evolve in larger (utility) scale applications. The business cases for adoption of these fuel options will depend on local economic circumstances. Industrial and large commercial fuel needs can be highly specific and local circumstances can have significant implications for the cost-benefit calculations for adoption.

15.0 Question: In the event of electrical system failure, what back-up non-fossil energy sources exist and what are their feasibility?

Response: For future technology options, please see Question 14 above. Presently, due to the high prevalence of existing back-up diesel generators, renewable diesel fuel is one of few viable non-fossil options for back-up energy systems. Access to the fuel can be difficult, especially if the

entity is not a significant diesel user for transportation applications. Other systems and fuels can work depending on local site needs and characteristics.

16.0 Question: What role can EWEB play in direct implementation of new fuel/technology adoption at owned facilities?

Response: EWEB is coordinating with NW Natural on the development of a green electrolytic hydrogen pilot production facility by providing them with water, electricity and space at standard market and retail rates. EWEB will be investigating operational, marketing, resiliency/emergency, and grid support opportunities associated with this alternative non-fossil fuel.

EWEB has taken a leadership role in the utilization of renewable diesel in its owned fleet vehicles. Additionally, EWEB has tracked costs and benefits of the fuel in its fleet to show how benefits in the way the fuel performs can offset the price premiums. EWEB has also been using higher blends of ethanol in its gasoline fleet, but flex-fuel vehicles are getting harder to source currently.

17.0 Question: What role can EWEB play in incentivizing new fuel/technology adoption at community facilities?

Response: EWEB's Field Services team offers direct customer advice, analyzing application-specific alternatives, on energy efficiency and electricity technology choices, including information about EWEB incentives. EWEB has also become a community expert on renewable diesel and offers a local contract to allow other local government entities to access R99 to ensure continued supply even as the market tightens.

18.0 Question: What is the projection for natural gas use in new buildings in the commercial and industrial sector? (Provide a forecast of how natural gas will be used and how much.)

Response: EWEB recognizes that NW Natural is the best source of natural gas forecasting information. EWEB's Electrification Analysis Study did include modeling of the economics of small office electrification within the commercial sector, which had similar space and water heating technologies as those found in residential buildings. The study showed little economic incentive for small commercial customers to choose electricity over natural gas in space and water heating applications. Larger commercial space and water heating needs were out of scope of EWEB's study, since space and water heating needs are often unique to business types and may have site-specific technologies that are difficult to analyze and generalize across a larger population of customers.