



TO: Tom Armstrong, City of Portland Bureau of Planning and Sustainability
FROM: Ted Light, Lighthouse Energy Consulting
SUBJECT: Electric Vehicle Demand & Fossil Fuel Storage
DATE: October 28, 2021

This memo documents research related to projected increases in demand for electricity associated with growth in battery-powered electric vehicles and proposed limits on new or expanded fossil fuel storage tanks within the City of Portland. A summary of key findings is provided, followed by sections that discuss the electrical system in Portland, projections of future EV demand, how those future demands will be met, and implications of storage tank restrictions in Portland.

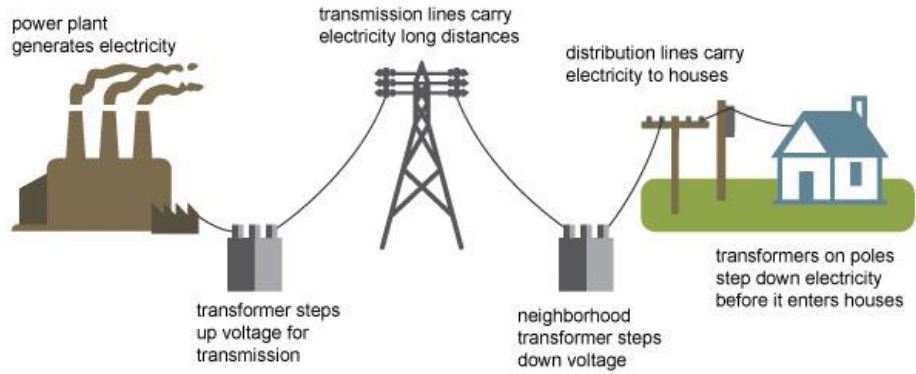
Summary

- Natural gas storage facilities in Portland do not serve, support, or impact power generation that serves Portland or the region.
- Natural gas is not needed to meet increased demand for electricity. Further, it is not allowed. The Oregon Legislature recently passed HB 2021 which prohibits new natural gas plants in Oregon and requires 100% clean, non-fossil electricity by 2040.
- The electric utilities that serve Portland—Portland General Electric (PGE) and Pacific Power are not planning to add new natural gas-powered generation capacity to meet future increased demand for electricity, including those caused by the increased use of EVs, in Oregon.
- Conclusion: Additional natural gas and fossil fuel storage capacity in Portland is not needed to serve future increases in demand for electricity, including new demands from EVs or other electrification efforts.

Overview of Portland's Electric System

The basic elements of the electric grid are shown in Figure 1 below. Electric generators supply energy, which is carried by transmission and distribution lines to end consumers. Typically, large utilities have multiple generators of various types which are often long distances from the utility's service territory and customers. Utilities may also contract with third parties to supply additional electricity generation when customer demand exceeds the capacity of utility-owned resources. These generators are operated in a coordinated fashion to ensure that the supply of electricity matches customer demand throughout each day.

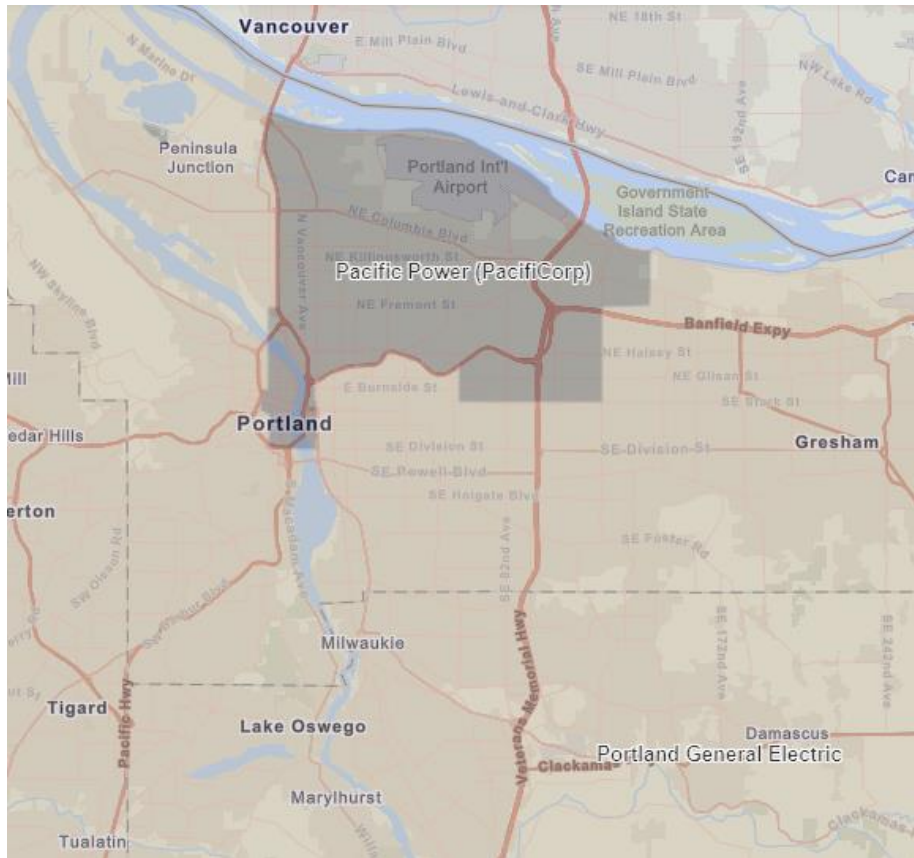
Figure 1: Elements of the Electric Grid



(US Energy Information Administration)

Portland is served by two utilities, PGE and Pacific Power. While PGE serves most of the city, Pacific Power serves portions of downtown as well as the area roughly bound by Interstates 5, 84, 205 and the Columbia River. Figure 2 shows the utility service territories in greater detail. Pacific Power serves the area shaded in dark gray while PGE (identified in the bottom-right) serves the remainder of the Portland metro area in Oregon.

Figure 2: Portland Utility Service Areas



(Oregon Department of Energy)

The Northwest Power and Conservation Council tracks the generation resources operating in the Northwest and provides the information on a mapping tool hosted on their website.¹ As shown in Figure 3 below, the only generators present in Portland include a 1.4 MW solar photovoltaic system at the Oregon Convention Center (small dark yellow dot) and a 1.7 MW biomass generator in North Portland owned by the City of Portland (small green dot). In Vancouver, the River Road natural gas generating plant, owned by Clark Public Utilities, is shown by the larger purple circle. This facility receives its natural gas supply through the interstate transmission pipelines and is not connected to the natural gas distribution system used by NW Natural to serve customers in Portland, including NW Natural’s Portland Liquefied Natural Gas (LNG) storage facility.

Figure 3: Power Generation in the Portland Area



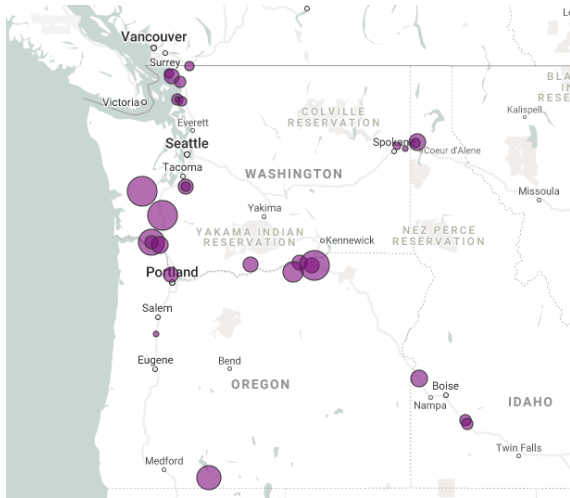
(Northwest Power and Conservation Council n.d.)

Electricity supplied to Portland could come a mix of generation sources owned by PGE and PacifiCorp as well as power purchased by PGE and PacifiCorp from generators owned by other utilities or merchant power suppliers. Figure 4 shows a map of regional natural gas generators, shown in purple. The circle near Portland is the River Road generating plant, as described above.

These natural gas plants are located along and rely on the interstate natural gas pipelines within the region. These pipelines are shown in Figure 5. While these generators may occasionally rely upon regional storage such as NW Natural’s Mist storage facility or the Jackson Prairie storage facility for price arbitrage—buying and storing natural gas when it is less expensive in the summer and storing it for use in the winter—they do not rely upon storage facilities within Portland. NW Natural uses its Portland LNG storage facility explicitly for the purposes of meeting customer end use demands in the Portland area and not storing natural gas for natural gas generators, who do not purchase natural gas from NW Natural.

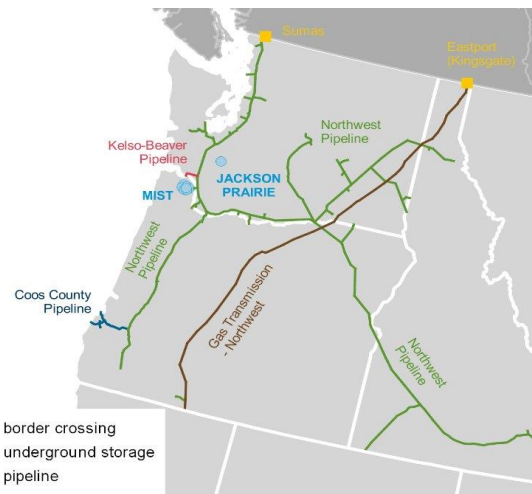
¹ <https://www.nwcouncil.org/energy/energy-topics/power-supply/map-of-power-generation-in-the-northwest>

Figure 4: Regional Natural Gas Generation



(Northwest Power and Conservation Council)

Figure 5: Natural Gas Interstate Pipelines in the Northwest



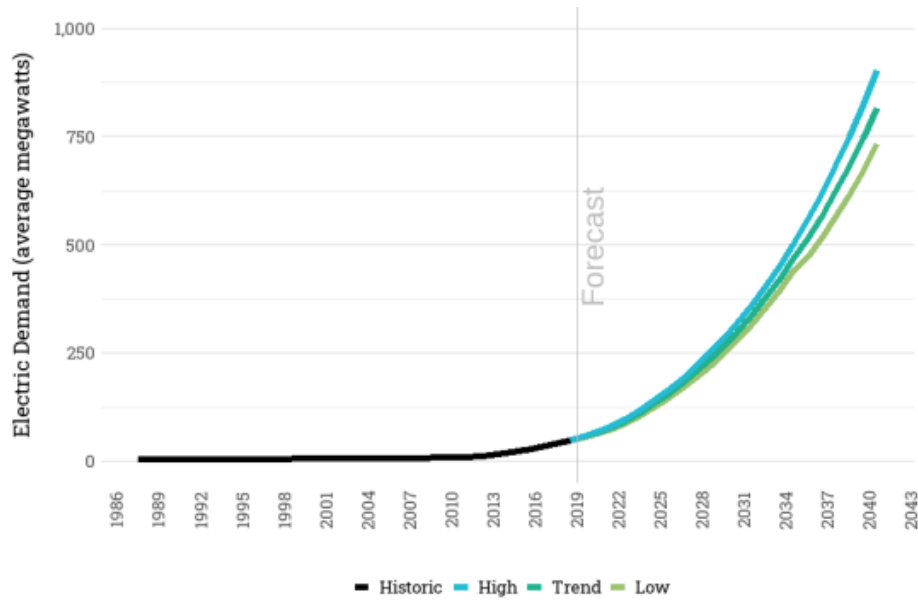
(US Energy Information Administration)

Future Electrification & Demand

The electrification of vehicles and end use equipment within buildings is a key strategy for reducing carbon emissions. Electrically powered equipment is already available for space and water heating, and options for electric vehicles are growing with consumer adoption. Switching this end use equipment to available electrically powered alternatives and powering that equipment with renewable electricity provides a resource for carbon reductions that is a core component of many carbon reduction strategies.

The electrification of end uses will result in an increase in demand for electricity, however. In particular, demand from electric vehicles has the potential to greatly increase demand for electricity. The Northwest Power and Conservation Council forecasted future regional demand for electricity from electric vehicles as part of their draft 2021 Power Plan (Figure 6).

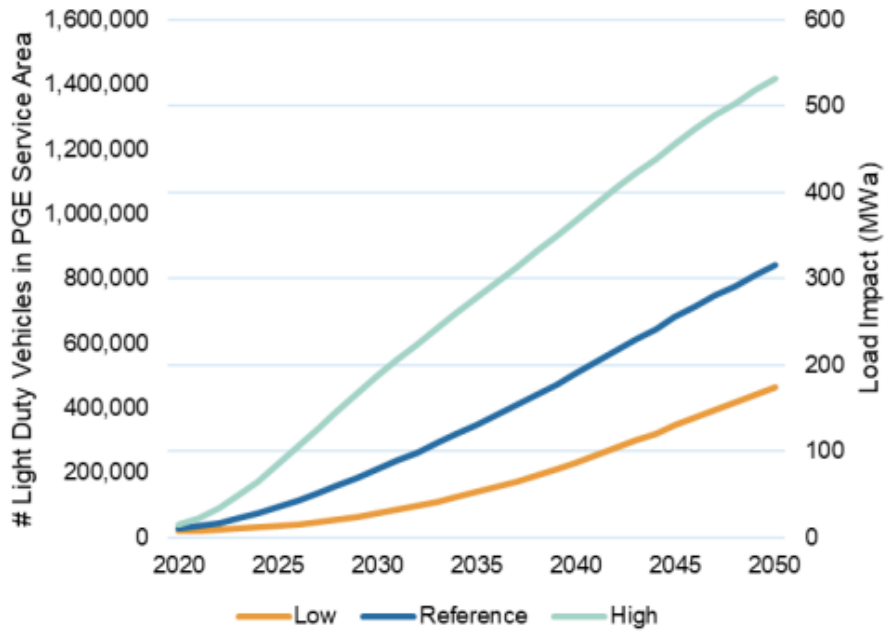
Figure 6: NW Power Council Regional Forecast of Demand for Electricity from EVs



(Northwest Power and Conservation Council 2021)

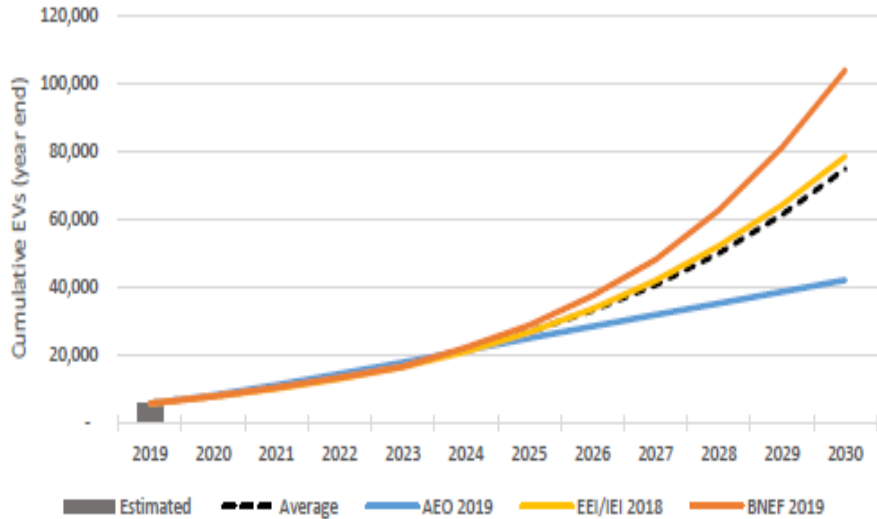
PGE and PacifiCorp also include forecasts of growth in electricity demand from electric vehicles as part of their integrated resource plans (IRP). Figures 7 and 8 show the forecasts of light duty EVs from PGE and Pacific Power, respectively. Because EVs are an emerging technology, utilities cannot forecast future demands based on an extrapolation of historical trends. PGE’s forecast was completed using a statistically driven propensity to adopt model using future technology costs and policy drivers while Pacific Power’s forecast is based on a combination of national forecasts and local adoption rates. This ensures that the utilities have an adequate power supply in a changing market landscape with increasing saturations of electric vehicles.

Figure 7: PGE EV Forecast



(Portland General Electric 2019)

Figure 8: Pacific Power EV Forecast



(Pacific Power 2020)

Meeting Demand

In their IRPs, PGE and Pacific Power have identified their preferred strategies for meeting any increases in demand, including new demands from electric vehicles. These IRPs are filed with the Oregon Public Utility Commission every two years after a public development process and significant review by stakeholders and the Commission. The IRPs document how the utility plans to reliably meet current and future energy

demands using a mixture of generation options that meets an optimal balance of cost and risk, subject to any policy requirements such as local climate policies.

In its 2019 IRP, PGE considered a variety of new resource supply options, in addition to its current resources, to meet future demands for electricity. These new resources include energy efficiency, demand response, wind, solar, biomass, geothermal, battery storage, pumped hydro storage, and natural gas resources. The preferred portfolio identified in PGE's 2019 IRP includes demand side resources like energy efficiency and demand response, renewable energy, and greenhouse-gas free capacity resources like battery energy storage and pumped hydro.

Similarly, Pacific Power's multi-state 2021 IRP identifies a preferred portfolio that includes new renewables, energy efficiency, demand response, energy storage, and advanced nuclear generation. While Pacific Power's preferred portfolio does also include converting some of its existing coal generators to natural gas plants used to meet peak demands, these facilities are located in Wyoming and Pacific Power will use them to serve its customers east of the Rocky Mountains in Idaho, Wyoming, and Utah.

In addition to building new generation, the demand for electric vehicles can be managed through various demand response programs which would control the timing of electric vehicle charging. By shifting charging to later evening hours when there is low demand for electricity, utilities can meet these demands with existing generating resources and avoid the construction of new ones. Both utilities considered demand response resources in their IRPs and programs to manage EV charging will likely become essential as the number of EVs increases.

While already accounted for in Pacific Power's 2021 IRP, in the future both utility IRPs will need to include consideration Oregon's HB 2021, which does not allow new natural gas plants to be built in Oregon and further requires PGE and Pacific Power to reduce emissions by 80% by 2030 and 100% by 2040.

Implications of Storage Tank Restrictions in Portland

There are no natural gas generation facilities in Portland and the utilities that serve Portland do not plan new natural gas generators in Portland or the region to serve increased demands, including those from EVs or other electrification efforts. Instead, PGE and Pacific Power plan to meet future demands with a mix of demand side resources like energy efficiency and demand response, renewable and non-emitting generation, and energy storage.

While PGE and Pacific Power may also rely upon market purchases of electricity generated by natural gas facilities owned by other utilities or third parties, there are no such facilities in Portland, and none would rely upon natural gas storage within Portland as they receive their gas supplies via the interstate network of natural gas pipelines. Oregon's recently passed HB 2021 prohibits the construction of new natural gas generators in Oregon, so no new facilities would be built that would rely upon storage in Portland.

Based on these findings, limitations on fossil fuel storage in Portland will have no impact on utilities ability to meet future demands for electricity, including demands from electric vehicles or the electrification of other end uses.