ISSUE BRIEF

Pricing Carbon in Oregon:

POTENTIAL IMPACTS OF CAP AND INVEST ON FUEL AND ENERGY PRICES

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INTRODUCTION

For several legislative sessions, Oregon legislators have considered a cap and invest approach to carbon pricing. State-commissioned studies indicate this approach to be the most cost effective way to ensure state emissions reductions goals are met, while giving regulated industry some flexibility in deciding how to meet compliance obligations.[1,2]

The cap and invest program covers a broad scope of emission sources including energy production. This issue paper provides a brief overview of the potential effects of a cap and trade style systems on the price of fuel and electrical energy in Oregon. Please consult referenced sources for more in-depth analysis.

POTENTIAL IMPACTS OF CARBON PRICING ON FUELS IN OREGON

Potential changes in energy prices as a result of a price on carbon traditionally reflect the following factors: **(1)** direct increases in price based on the carbon content of fuel (compliance costs), **(2)** the portion of that increase passed through to consumers, and **(3)** the interactions of markets and possible substitutions of less carbon intensive energy sources.[3]

A carbon tax study conducted in 2014 by the Northwest Economic Research Center (NERC) at Portland State University (PSU) found a carbon price of $1 per $MTCO_2e$ to generally correspond to a $0.01 increase in the price of a gallon of gasoline. As electricity prices vary across Oregon, a carbon price of $10 per $MTCO_2e$ electricity price would be expected to increase prices by 1.5-5% with a price of $100 per $MTCO_2e$ potentially increasing prices by 17-51%.[4] This analysis is fairly straight-forward and *does not* reflect mechanisms included in the most recent versions of Oregon's Clean Energy Bill (cap and invest) designed to alleviate cost increases to both suppliers and consumers such as:

- Multi-year compliance periods.
- The use of a limited amount of offsets, which are lower cost than auctioned allowances.
- The ability to bank allowances, which can be purchased when prices are lower and used at a later date.
- Allowance trading.
- Free allowances provided to "emissions-intensive, trade exposed" entities that are subject to global competition and have limited price pass through (examples from other jurisdictions include food processors and pulp and paper mills, amongst others.)
- Consignment of allowances to utilities for rate-payer benefits.

i) Compliance Cost

Compliance cost can be calculated by multiplying the amount of carbon dioxide released when combusting a certain amount of a given fuel, by the set market price per metric ton of carbon dioxide equivalent ($MTCO_2e$). The amount of carbon dioxide released in the combustion of a given fuel depends on the amount of carbon in its chemical composition, and can be estimated by multiplying the energy

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[1] Oregon Department of Energy. 2012. 10-Year Energy Action Plan Modeling. The Center for Climate Strategies. Salem, OR.
[2] Oregon Department of Environmental Quality (2017). Considerations for Designing a Cap-and-Trade Program in Oregon. Feb 14, 2017.
[3] Sands, R., & Wescott, P. (2011, August). *Impact of Higher Energy Prices on Agriculture and Rural Economies* (Rep. No. 123). Retrieved https://www.ers.usda.gov/webdocs/publications/44894/6814_err123_1_.pdf?v=41432
[4] Liu, J.H., J. Renfro, Butenhoff, M. Paruszkiewicz, and Rice, A. (2014). Economic and Emissions Impacts of a Clean Air Tax or Fee in Oregon (SB306). https://www.pdx.edu/nerc/sites/www.pdx.edu.nerc/files/carbontax2014.pdf

associated with the fuel by an emission factor (expressed in metric tons of carbon dioxide per unit of energy). Emission factors are calculated by the U.S. Energy Information Administration of the Department of Energy. Table 1 presents the carbon dioxide emission factors associated with common fossil fuel types. Carbon pricing in general is meant to send a greater price signal on more carbon-intensive fuels in order to shift investments toward lower-carbon resources. These lower carbon alternatives include solar, wind, geothermal, wave energy, biogas/renewable natural gas (from waste water treatment plants, biodigesters, and landfill capture). Energy efficiency should also be considered a "no-carbon" resource.

TABLE 1. Carbon Dioxide Emission Factors per Fuel Type. Source: U.S. Department of Energy

Fuel	Carbon Dioxide Emissions Factor (Kg CO_2/ M Btu) [5]
Natural Gas	53.07
Propane	63.07
Gasoline	71.30
Distillate Fuel	73.16
Coal	95.35

ii) Price pass through to consumers

Many distributional impact models used to determine the price of energy assume that 100% of compliance costs will be passed directly to consumers. This is often not the case, with some costs likely being passed back to production in the form of lower wages, returns on equity, and reduced surplus value after all extraction costs have been accounted for.[6] Pass through rates can vary by fuel source. A study conducted in 2008 found carbon pricing on coal almost fully passed forward to consumers, the rate for natural gas ranged from 14%- 200%, and crude oil from 2% to as high as 90%, depending on the year and tax scenario.[7] Empirical studies on electricity markets have shown pass through rates ranging from 80-100% in Spain and California. [8,9] Consignment of emission allowances to utilities is one mechanism intended to mitigate the impacts of price pass through to consumers.

iii) Market adjustment

Adjustments and interactions between markets and energy sources will also likely have an impact on energy prices for end users. Regulated entities, such as electricity providers, may substitute less carbon intensive fuel sources in response to rising prices. For example, Oregon currently derives 32% of its electricity from coal, with some utilities having near-zero carbon emissions, while others relying on more

[5] U.S. Department of Energy, Energy Information Administration, Independent Statistics and Analysis. (2016, February 6). Carbon Dioxide Emission Coefficients. Retrieved from https://www.eia.gov/environment/emissions/co2_vol_mass.php

[6] Metcalf, G., Mathur, A., & Hassett, K. (2010, June). Distributional Impacts in a Comprehensive Climate Policy Package. doi:10.3386/w16101

[7] Metcalf, G.E., Paltsev, S., Reilly, J. M., Jacoby, H. D., and Holak, J. (2008) Analysis of U.S. greenhouse gas tax proposals. MIT Joint Program on the Science and Policy of Global Change. Report no. 160. http://web.mit.edu/globalchange/www/MITJPSPGC_Rpt160.pdf

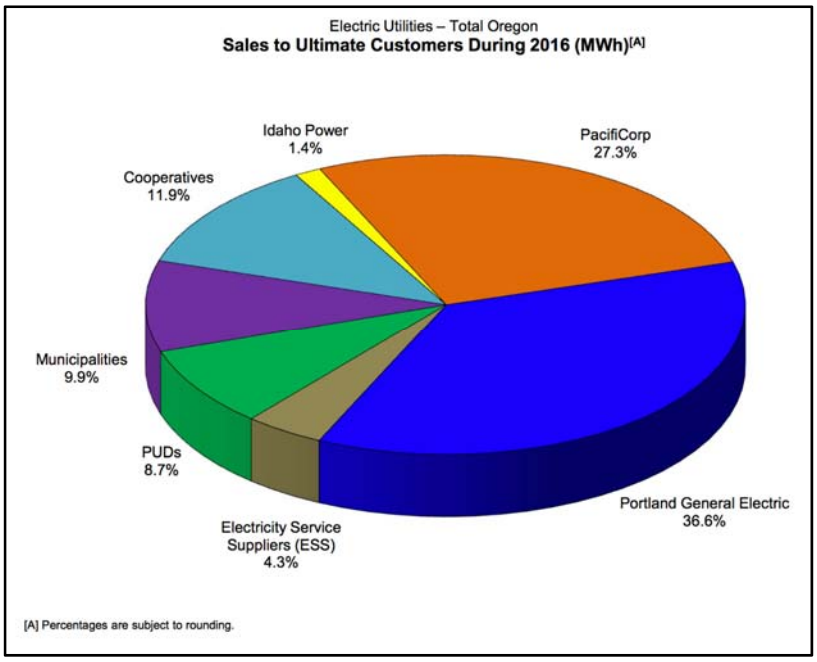
[8] Fabra, N., & Reguant, M. (2013). Pass-through of Emissions Costs in Electricity Markets. *American Economic Review, 104*(9), 2872-28799. doi:10.3386/w19613

[9] Woo, C., Chen, Y., Olson, A., Moore, J., Schlag, N., Ong, A., & Ho, T. (2017). Electricity price behavior and carbon trading: New evidence from California. *Applied Energy, 204*, 531-543. doi:10.1016/j.apenergy.2017.07.070

than 60% coal.[10] The high compliance costs for coal usage, in combination with the state's mandated shift to renewables under the Clean Energy and Transition Act of 2016 (SB1547), makes a rapid shift to renewable energy sources likely. Under terms of the legislation, the amount of coal in Oregon's energy mix will be greatly reduced with the state's only coal power plant scheduled to go offline in 2020 and the vast majority of imported coal power out of rates no later than 2030.[11]

OREGON'S ENERGY MIX AND COMING CHANGES

From 2014 - 2016, hydroelectric power made up the largest portion of Oregon's electricity resource mix (40.47%), followed by coal (31.89%) and natural gas (16.58%).[12] The state's Renewable Portfolio Standard (RPS) requires that 50% of Oregon's electricity come from renewable resources by 2040. The Oregon Department of Energy tracks Oregon's RPS goals and certifies facilities that generate power from RPS-eligible renewable energy resources.



Source: 2016 Oregon Utility Statistics, Public Utilities Commission of Oregon. Chair Lisa Hardie, Commissioner Stephen Bloom, Commissioner Megan Decker. http://www.puc.state.or.us/Pages/Oregon_Utility_Statistics_Book.aspx

Oregon has three investor-owned electric utilities (IOU's): Portland General Electric, PacifiCorp, and Idaho Power which served 37%, 27%, and 1.4% of the total customer electricity demand in MWh respectively[13] (see figure in appendix). Together, these three IOU's provide service to approximately 65% of the customers in the state, followed by Cooperatives (12%) and municipalities (10%).[14]

As of 2016, Oregon had 37 consumer or publically-owned utilities (COU's) that serve approximately 30% of customer demands in the state in mostly rural areas (See Annex).[15] COU's source ~80% of their power from the federal Bonneville Power Administration (BPA) hydropower system and thus do not generally have a large enough carbon footprint to fall under the proposed emission cap. Only three COUs in Oregon are currently at or close to the regulatory threshold of 25,000 $MTCO_2e$.

IOUs have different resource mixes and their carbon intensity varies accordingly (see appendix). PacifiCorp's principal energy source is coal from out of state plants (~61% in 2015) with ~13% coming from renewable energy.[16] Portland General Electric's (PGE) electricity resource mix is comprised of: 16%

[10] Energy in Oregon. (n.d.). Retrieved April 26, 2018, from http://www.oregon.gov/energy/energy-oregon/pages/electricity-mix-in-oregon.aspx
[11] https://olis.leg.state.or.us/liz/2016R1/Downloads/MeasureDocument/SB1547/Enrolled
[12] http://www.oregon.gov/energy/energy-oregon/Pages/Electricity-Mix-in-Oregon.aspx
[13] http://www.oregon.gov/energy/energy-oregon/Pages/Find-Your-Utility.aspx
[14] 2016 Oregon Utility Statistics, Public Utilities Commission of Oregon. Chair Lisa Hardie, , Commissioner Stephen Bloom, Commissioner Megan Decker. http://www.puc.state.or.us/Pages/Oregon_Utility_Statistics_Book.aspx
[15] 2016 Oregon Utility Statistics, Public Utilities Commission of Oregon. Chair Lisa Hardie, , Commissioner Stephen Bloom, Commissioner Megan Decker. http://www.puc.state.or.us/Pages/Oregon_Utility_Statistics_Book.aspx
[16] http://www.pacificorp.com/content/dam/pacificorp/doc/CCCom_Update/2013/September_13/7374-29_PP_FactSheet_OR_F2v2.pdf

coal, 27% natural gas, and 25% from wind and solar,[17] however, PGE plans to end coal burning operations at its 585 MW Boardman coal plant in 2020 and consequently reduce its coal generating share[18]; iii) Idaho Power's energy mix in 2017 was sourced by approximately 50% hydropower.[19]

Due to the passage of the Clean Energy and Transition Act in 2016, Oregon's investor-owned utilities are undergoing some major changes. PacifiCorp and PGE have recently updated their Integrated Resource Plans and submitted them to the Public Utility Commission (PUC).[20] These include plans for major investments in wind energy prior to the scheduled expiration of federal tax credits in 2020. If these investments materialize, subsequent rate increases will depend on whether PUC officials deem these investments "used and useful." PGE has supported the cap and invest concept given that certain provisions, such as direct allocation of allowances to IOUs, are included.[21] PGE also provided rate increase estimates based on the provisions of the 2018 Bill and using the California Energy Commission's 2016 high and low GHG allowance price projections.[22]

Many of Oregon's rural communities are in consumer-owned utility service areas. Most COUs would not be impacted by cap and invest legislation as previously written. Umatilla Electric Coop[23], Clatskanie, and Eugene Water and Electric Board are currently the only COUs whose emissions are high enough to fall under the cap. Impacts to their ratepayers could be mitigated using auction proceeds to offset rate increases.

Other jurisdictions employing cap and trade style policies have consigned allowances to utilities as a way to guard rate payers, particularly low-income rate payers, from any rate increases resulting from a carbon price. Under this design utilities are still required to purchase allowances—thus putting a price on carbon upstream—but are consigned a certain amount of allowances for auction by the state. The language of the most recent 2018 bill specifies that proceeds from the sale of these allowances must be used for the "direct benefit of rate-payers" as determined by the Public Utilities Commission in the case of IOUs, and by the respective governing bodies in the case of COUs. The number of consigned allowances would likely diminish over time as utilities make mandated conversions to more renewable portfolios.

Without mitigation mechanisms, energy and fuel price increases resulting from carbon pricing could disproportionately affect rural, low income, and working lands based communities. [24] Developing carbon offset projects on working lands could work to mitigate potential fuel price increases for participating agricultural and forest operations by reducing fuel usage and providing additional revenue. Working lands operations of limited scale will likely require financial and technical assistance to overcome current barriers to offset project development. It may also help to direct a portion of auction proceeds toward energy efficiency, low-income weatherization, and other utility-system investments that reduce greenhouse gas emissions and lower customer costs.

At the community level, some of these impacts may be offset through investment of program revenues via the Climate Investment, Transportation Decarbonization, and Just Transition funds. Advisory committees guiding these investments may want to focus on fuel-efficient vehicles (such as tractor or fishing vessel

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[17] Presentation to the House Energy and Environment Committee; Lisa Schwartz - Director of Oregon Department of Energy (ODOE) and Jason Eisdorfer - Utility Program Director of Oregon Public Utility Commission (OPUC); 2013.
[18] https://www.portlandgeneral.com/our-company/energy-strategy/resource-planning
[19] https://www.idahopower.com/energy/delivering-power/energy-sources/
[20] PGE IRP: https://www.portlandgeneral.com/our-company/energy-strategy/resource-planning/integrated-resource-planning
PacifiCorp IRP: http://pacificorp.com/irp
[21] PGE Clean Energy Policy: https://www.portlandgeneral.com/our-company/news-room/cap-and-trade-legislation
[22] PGE Cap and Trade Factsheet: https://www.portlandgeneral.com/-/media/public/our-company/news-room/documents/2018-pge-cap-and-trade.pdf?la=en
[23] https://www.umatillaelectric.com/wp-content/uploads/Annual-Report-Summary_2016-web.pdf
[24] Stavins, Robert N. (2008). *Addressing Climate Change with a Comprehensive US Cap-and-Trade System*. Article. Oxford Review of Economic Policy 24 (2): 298–321. doi:10.1093/oxrep/grn017.

upgrades), increases in public transit options, public rideshare programs and coupons (for paid ride-share programs), rebates for increased fuel related spending for agriculture and forest operations, and infrastructure projects that build resiliency, such as culvert replacements that prevent road washouts and maintain economic vitality in areas that depend on single roads. Advisory committees and other governance frameworks for carbon pricing can participate in collaborative, transparent, and objective analysis around how best to stabilize energy rates, i.e. consignment or direct allocation of allowances or other mechanisms.

AUTHOR INFORMATION

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Appendix

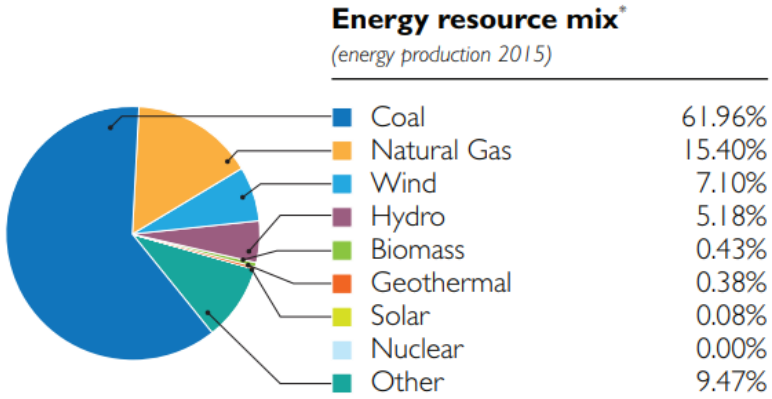

Figure 1: PacficCorp Energy Resource Mix 2015

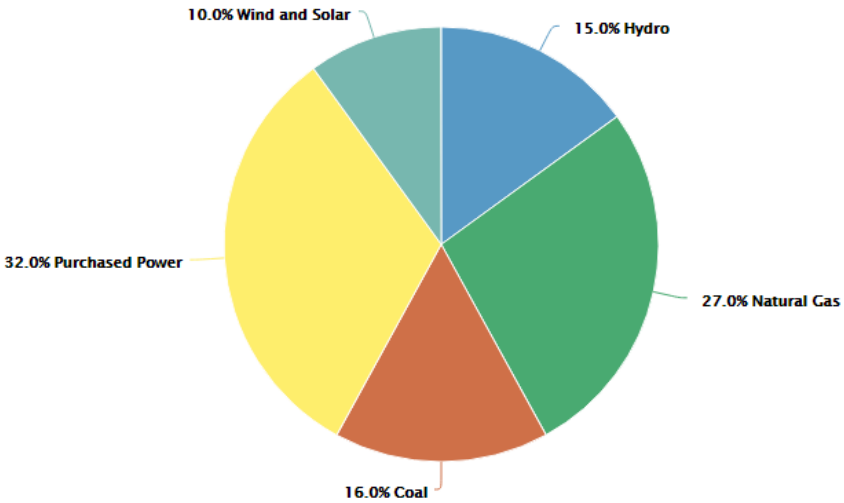

Figure 2: PGE Energy Resource Mix 2015

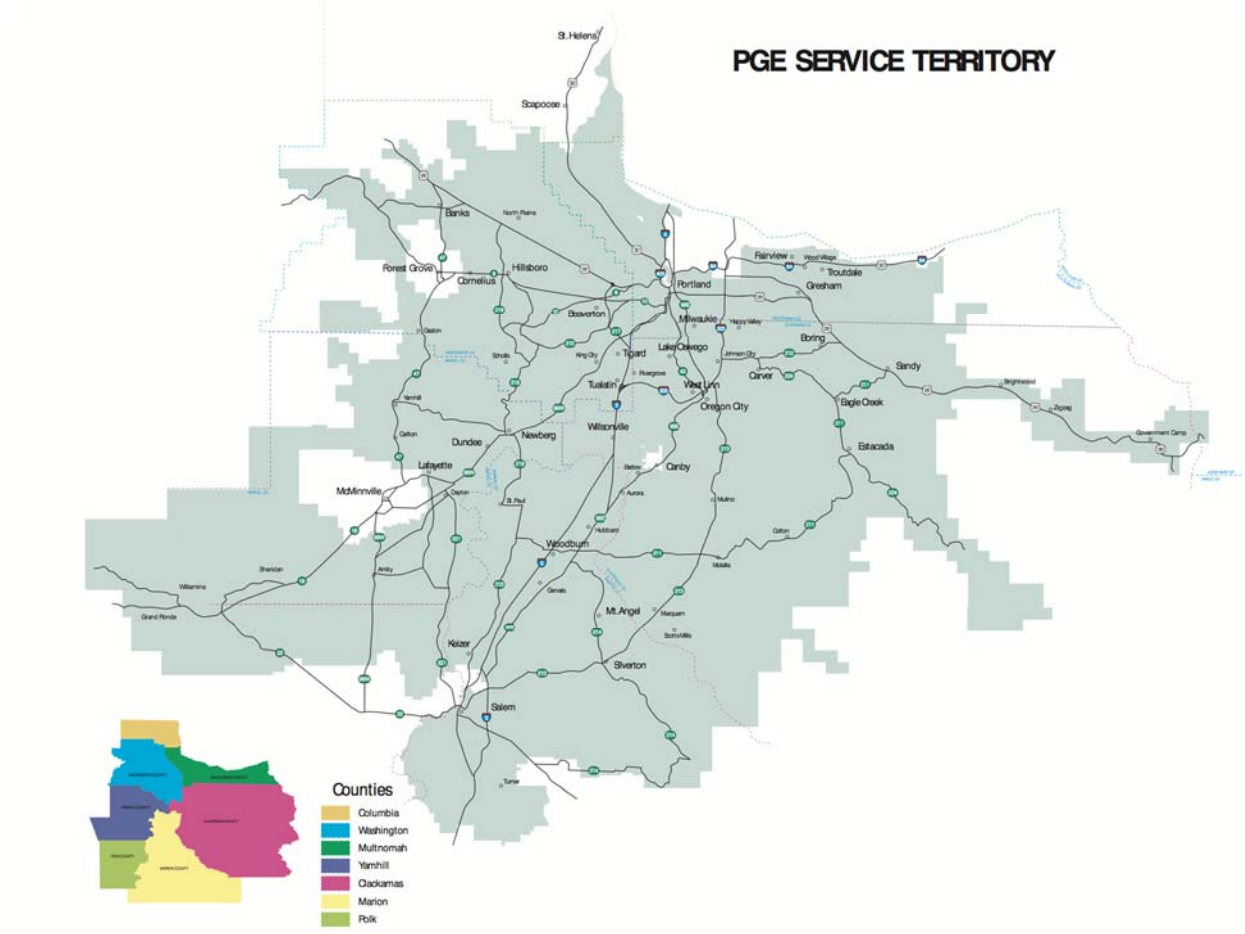

Figure 3: Territory served by Portland General Electric

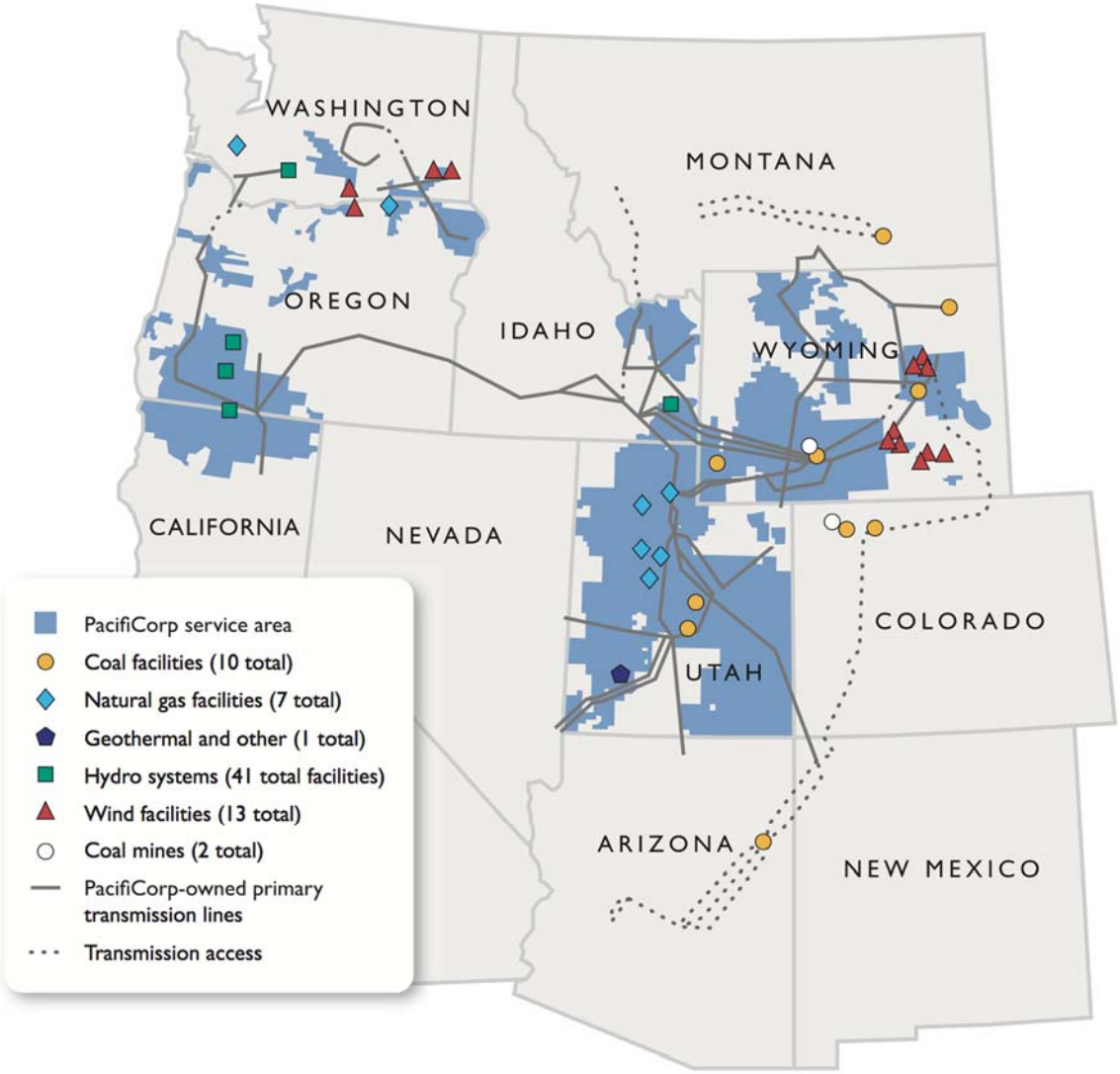

Figure 4: Territory served by PacificCorp

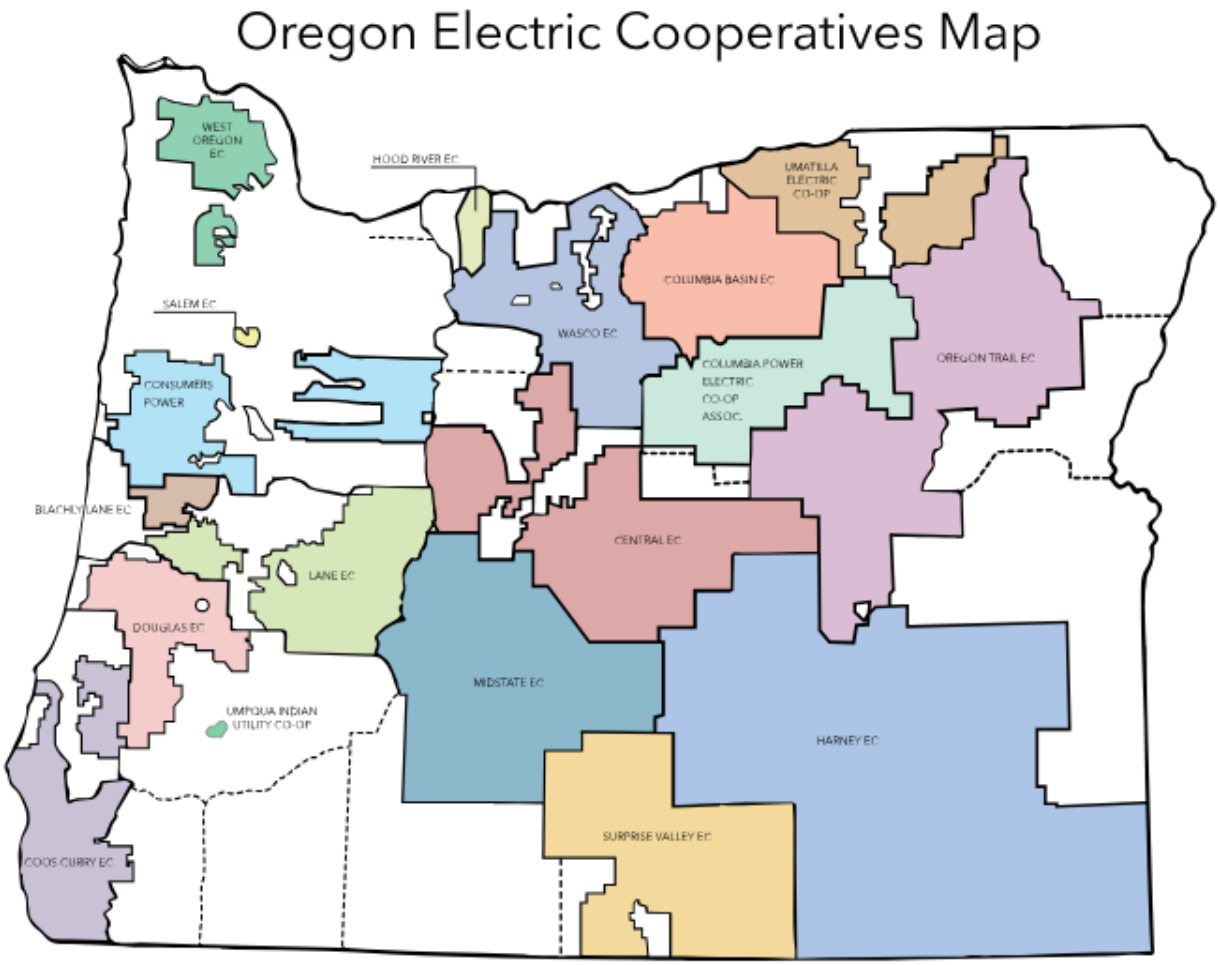

Figure 5: Oregon Energy Coop Map