Macroeconomic Impact Analysis

Oregon Department of Environmental Quality's Proposed Climate Protection Program Regulation

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The energy costs and macroeconomic analysis presented in this report was prepared by Energy Strategies LLC, and RECON Insights Group LLC and Stillwater Associates LLC (Consultants) at the request of members of a coalition of Oregon businesses and energy consumer advocates. This report is an independent analysis of the energy costs and macroeconomic effects of an emissions cap regulation similar in design to the proposed Climate Protection Program rule.

RECON Insights Group LLC is responsible for the computable general equilibrium (CGE) modeling for this report. Recon can be reached at recon.insight@gmail.com for any questions or comments regarding details of the CGE modeling or results.

This report was prepared at the request of:

Alliance of Western Energy Consumers,
Associated General Contractors Oregon – Columbia Chapter,
Associated Oregon Loggers,
Food Northwest,
Northwest Pulp & Paper Association,
Oregon Business & Industry,
Oregon Forest & Industries Council,
Oregon Manufacturers and Commerce,
Oregon Trucking Association,
Pacific Propane Gas Association, and WSPA.

Disclaimer

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SUMMARY OF CONCLUSIONS

The economic analyses conducted for this report provide macroeconomic information that ODEQ's *Fiscal and Economic Impact Statement* implied wasn't available to estimate the potential economic effects of an emissions cap regulation on regulated entities, consumers and Oregon's economy. The analyses include an estimate and forecast of the potential impact an emissions cap regulation would have on the delivered costs of energy, and a more granular set of macroeconomic data that enables a more complete understanding of the potential economic impacts of the CPP rule on Oregon's economy.

Impacts on Energy Cost

This analysis concludes that covered industries' compliance with the CPP could add additional costs to the average delivered costs of transportation fuels and natural gas. This is due to the higher costs of renewable fuels and covered entities purchase of Community Climate Investments (CCIs) compliance instruments.

- Adoption of the CPP could add $0.10 to $0.36 per gallon to the cost of motor gasoline, between 2025 and 2050. This represents an increase of between 2.7% and 7.3% per gallon compared to the forecasted reference case price of motor gasoline.
- The compliance cost impacts on diesel fuel are similar. Compliance with the CPP could add an additional $0.09 to a gallon of diesel fuel in 2025 and increase to $0.39 per gallon by 2035 and remain near that level through 2050.
- A CPP policy is expected to have the largest impact on the average price of natural gas. By 2050 we estimate the average price could increase to $23.76/MMBtu, which would be $12.26/MMBtu higher than the 2022 reference case price for natural gas.
- The policy could be expected to have a relatively minor impact on retail electricity rates in the early years of the program, but prices in 2050 are projected to be 14.5% higher than they would be if the CPP rule was not in effect.

Macroeconomic Impacts

Comparison of Recon's CGE model's macroeconomic results and those of ICF's IMPLAN model indicate there is a significant difference in the results reported by the two modeling approaches.

- IMPLAN results generally showed a net positive increase in economic activity in 2050 while the CGE model was predicting the CPP would result in a decrease in jobs, gross state product and income of the Oregon economy of between 3.9 and 4.7 percent.
- Economy-wide, Recon reported job losses of 121,570 in 2050 while ICF was showing a net increase of 19,700.
- ICF's IMPLAN model's estimates of the effects of the CPP on income indicate a net positive increase of $1.1 billion while the CGE model estimates a net loss of approximately $6.4 billion.

- IMPLAN results estimate an increase of $1.7 billion in gross state product in the Oregon economy by 2050 with the CPP regulation in place while the CGE results indicate the CPP would have the opposite effect and lead to a $9.8 billion decrease in Oregon's gross state product.

Industry Impacts

Recon used the CGE model to estimate the macroeconomic impacts on 23 industry sectors in the Oregon economy in order to identify which sectors were expected to be vulnerable to the economic effects of the CPP. ICF only reported job impacts on four industry sectors.

CGE modeling confirmed that the industry sectors that will be most impacted by the CPP will be those directly covered by the rule, i.e., wholesale petroleum suppliers and the natural gas utilities.

- Sales of the wholesale petroleum supply industry are projected to decline by $1.4 billion by 2050, a decrease of 88% compared to what sales were projected to be in the absence of the CPP.
- The natural gas utility sector in Oregon is projected to experience a 57% decrease in sales and lose 755 jobs by 2050.
- By 2050 Chemical Manufacturing, Food Processing/Manufacturing, Wood Products Manufacturing, and Pulp and Paper Manufacturing are all projected to see a net economic loss of sales, gross state product, income and jobs of between 13% to 24% due to the CPP.
- These four industries will also experience the most significant declines in import-export volumes by 2050.
    - Food Manufacturing is the industry hardest hit with a total decline in its import-exports of $2.1 billion followed by Chemical Manufacturing with a decrease of $1.6 billion.
    - Overall, the Oregon economy will experience a net decrease of $9.3 billion in trade volume as a result of the CPP rule.

Household and Regional Impacts

- The CPP will result in a reduction of Oregon households' purchasing power of over $4.5 billion; the result of higher prices in energy and goods and services. Middle-income ($30,000-$100,000) and upper-middle-income ($100,000-$150,000) households will experience the biggest loss of purchasing power due to the CPP.
- The CPP's impact on jobs will be felt throughout the entire state of Oregon.
- As a percent of current employment, job losses in Oregon's rural economies will be significantly higher than the more populous and more urban areas of the state.
- Job losses are projected to be relatively modest through 2035, but then increase significantly by 2050.

INTRODUCTION

On August 5, 2021, the ODEQ issued a Notice of Proposed Rulemaking to establish a new program to set limits on greenhouse gas emissions from large stationary sources, transportation fuels, natural gas and other liquid and gaseous fuels.[1]

The proposed rule creates the Climate Protection Program (CPP) that establishes limits (or a cap) on the emissions of greenhouse gases (GHG) that must be collectively met by covered fuel suppliers and stationary sources. The cap for the first year of the CPP has been set at 28.2 million metric tons[2] and is based on the average GHG emissions of covered sources for the period 2017-2019. The cap declines annually and is set to reach 16.9 metric tons of carbon dioxide equivalent ($MTCO_2e$) by 2035 and 6.0 $MTCO_2e$ by 2050.

In the first compliance period, the CPP is expected to apply to GHG emissions from the combustion of fossil fuels supplied by Oregon's three natural gas local distribution companies (LDCs) [3], and nine wholesale suppliers of motor gasoline, diesel fuel, propane and kerosene. The program will also cover GHG emissions from industrial stationary sources whose industrial processes and natural gas combustion emissions exceed 25,000 $MTCO_2e$. However, emissions from these sources are not subject to the CPP cap. Instead, these firms will be subject to a best available emissions reduction (BAER) standard in which ODEQ will determine and require implementation of the best emissions reduction strategies for the covered firm to reduce their GHG emissions.

The ODEQ estimates that as many as 60 firms may eventually be covered under the CPP rule by the end of the fourth compliance period, based on 2018-2019 GHG Reporting Program data.[4]

Background

The issuance of the Notice of Proposed Rulemaking for the CPP is the culmination of an 18-month process that began March 10, 2020, when Governor Kate Brown signed Executive Order 20-04 (EO-20-04). The order contained a directive for ODEQ to exercise its legal authority to cap GHG emissions from transportation fuels, natural gas, other liquid and gaseous fuels, and large stationary sources. Per Section 3, *General Directives*

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[1] State of Oregon Department of Environmental Quality, Notice of Proposed Rulemaking, Greenhouse Gas Emissions Program 2021 Rulemaking, Climate Protection Program, August 5 2021.
https://www.oregon.gov/deq/Regulations/rulemaking/RuleDocuments/GHGCR2021Notice.pdf

[2] Oregon Department of Environmental Quality, Overview of Proposed Program, September 2, 2021, p. 2.

[3] Oregon's natural gas Local Distribution Companies (LDCs) include Avista, Cascade and Northwest Natural.

[4] State of Oregon Department of Environmental Quality, Notice of Proposed Rulemaking, Climate Protection Program, Statement of Fiscal and Economic Impact, August 5 2021. p. 26

to State Agencies, Item A, the emissions cap was to be set to help achieve the science-based GHG reduction goals established in the order.[5]

In response to EO 20-04, the ODEQ engaged stakeholders and the public in a process to develop a cap-and-reduce program with the stated purpose of achieving three goals: to achieve significant GHG reductions, to promote benefits and alleviate burdens for environmental justice and impacted communities, and contain costs to households and businesses.[6]

As part of the formal rulemaking process ODEQ contracted with ICF to use a variety of modeling tools to inform the development of the program. ICF used the 2019 Oregon state-level Impacts Analysis for Planning (IMPLAN) model to estimate macroeconomic economic effects on regulated entities, consumers and Oregon's economy.

ICF modeled a reference case to project future emissions and economic conditions under the current legislative and regulatory environment and then modeled four different policy scenarios[7] to assess the potential effects of each scenario's emissions cap design on emissions, social equity and macroeconomic costs.[8] The modeled policy and regulatory scenarios did not represent the final version of the proposed rule, however, Policy Scenario 4 was the last scenario developed by ODEQ and most closely resembles the published version of the proposed CPP rule.

In general, ICF found that the macroeconomic results for all four policy scenarios showed small macroeconomic losses in the early years of the proposed rule that turned into small net positive gains in employment, income and gross state product by 2035. These gains continued to increase through to 2050.

Of the four scenarios modeled, the emissions cap design scenario most similar to the proposed rule, Policy Scenario 4, resulted in the highest net gains in employment, income and gross state product. At the industry level, ICF reported that IMPLAN results indicated under Policy Scenario 4 that the Oregon economy would see jobs gains in

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[5] Office of the Governor of the State of Oregon (2020). "Executive Order No. 20-04", p.5. https://www.oregon.gov/gov/Documents/executive_orders/eo_20-04.pdf

[6] Oregon Department of Environmental Quality, (2021), Oregon Climate Protection Program, Proposed Updates to Draft Rules, July 1, 2021. https://www.oregon.gov/deq/Regulations/rulemaking/RuleDocuments/GHGCR2021ac7RuleUpdates.pdf

[7] Oregon Department of Environmental Quality, Climate Protection Program, Rulemaking Advisory Committee Meeting #6, June 17, 2021, Slide 33. https://www.oregon.gov/deq/Regulations/rulemaking/RuleDocuments/ghgcr2021m6pres.pdf

[8] Oregon Department of Environmental Quality, Climate Protection Program, Modeling Study on Program Options to Reduce Greenhouse Gas Emissions, *Frequently Asked Questions*. May 18, 2021, p. 2

the construction and manufacturing sectors while job losses were projected for the Trade and Transportation economic sectors.[9]

In many respects the economic results generated by ICF's macroeconomic modeling fell far short of the information ODEQ told stakeholders it would provide and that was recognized as needed to identify the economic effects of the program on regulated entities, consumers and the Oregon economy, and inform the design of an emissions cap rule.

For example, while acknowledging that compliance costs incurred by petroleum and natural gas suppliers could be passed on to consumers "through the retail price of fuels…"[10] ICF and ODEQ did not quantify or report how an emissions cap regulation could impact the delivered costs of energy to Oregon consumers and businesses.[11]

Early on in the rulemaking ODEQ advised stakeholders that the IMPLAN analysis would provide macroeconomic results at the 4-digit North American Industry Classification System (NAICS)[12] industry levels[13]. However, when ICF's modeling was completed, the macroeconomic results were aggregated and presented to stakeholders at the state-wide level. This level of detail lacked the necessary granularity to understand what industry sectors, employment categories and geographic regions within the state would be impacted by the regulation. This level of analysis is particularly critical in identifying those firms and industry groups that are energy intensive and trade exposed and assess the potential of the regulation to result in economic and environmental leakage.[14]

ICF's use of IMPLAN also meant that its macroeconomic analysis could not account for the price effects of the CPP rule and how changes in the costs of natural gas, and transportation fuels, and electricity could ripple through the Oregon economy and impact production and prices of other goods and services.[15] As a result ICF's IMPLAN results underestimated the economic impacts of the CPP.

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[9] Ibid; 17

[10] State of Oregon Department of Environmental Quality, Notice of Proposed Rulemaking, Climate Protection Program, Statement of Fiscal and Economic Impact, August 5 2021. p. 30

[11] Oregon Department of Environmental Quality, Climate Protection Program, Modeling Study on Program Options to reduce Greenhouse Gas Emissions, *Frequently Asked Questions;* May 18, 2021, p. 3

[12] Industries are categorized and measured by the Census Bureau according to the North American Industry Classification System (NAICS) codes.

[13] Oregon Department of Environmental Quality, Climate Protection Program, Modeling Study on Program Options to reduce Greenhouse Gas Emissions, *Frequently Asked Questions;* February 4, 2021, p. 3

[14] Ibid; p.5

[15] See discussion in this report on the Shortcomings of the IMPLAN Model, p. 16

While IMPLAN generates macroeconomic results at the county level, ODEQ did not publicly provide any information on how employment or economic activity in different geographic regions in Oregon might be impacted by the CPP rule.

Finally, ODEQ assumed that electrification of the economy would make a significant contribution to the reduction of both natural gas utilities and petroleum fuel suppliers' capped GHG emissions. However, the macroeconomic modeling did not account for the additional capital investment in generation and transmission infrastructure or how those additional costs would impact the Oregon economy or retail electricity prices.[16]

PURPOSE AND SCOPE OF THIS ANALYSIS

Throughout the rule making process members of the Regulatory Advisory Committee (RAC) and industry stakeholders expressed concerns about the narrow scope of the macroeconomic modeling ODEQ assigned ICF, the limited reporting of results, and whether in fact the IMPLAN model's "directional" results were being used to inform decision-making around the development of the CPP and how best to contain costs to consumers, businesses and the Oregon economy.

To provide an alternative and more comprehensive economic assessment of the impacts of an emissions cap program, a coalition of Oregon businesses contracted with Energy Strategies, LLC, Recon Insights Group LLC ("Recon") and Stillwater Associates, LLC (Stillwater).[17] Energy Strategies, LLC and Stillwater worked together to estimate how the cost of complying with an emissions cap program, as proposed by ODEQ in Policy Scenario 4 (CPP-4), could impact the costs of delivered energy to Oregon energy consumers. Energy Strategies and Recon collaborated to conduct an independent macroeconomic analysis using a more robust CGE model of the Oregon economy to estimate the macroeconomic impacts of the CPP-4 policy on businesses, households and the Oregon economy.

The economic analysis contained in this report has one primary objective, i.e., to provide a macroeconomic analysis and economic information that stakeholders and ODEQ should have been provided access to in order to better understand the potential economic impacts of the rule on consumers,[18] industry, and the Oregon economy. This

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[16] Oregon Department of Environmental Quality and ICF, Modeling Study on Program Options to Reduce Greenhouse Emissions, Assumptions, Data Sources, and Methods, at Section 4.2.5, p. 12, August 2021

[17] See Acknowledgements section of this report for a listing of industry members making up the coalition.

[18] ODEQ stated that it "*…acknowledges the importance of the potential impacts to consumers, although these impacts are difficult to quantify and DEQ does not have additional information to estimate the potential impacts. See State* of Oregon Department of Environmental Quality, Notice of Proposed Rulemaking, Climate Protection Program, Statement of Fiscal and Economic Impact, August 5 2021. p. 31

analysis quantifies how costs incurred by covered entities to meet the emissions reductions required by an emissions cap rule could impact the costs of petroleum transportation fuels, natural gas and electricity to Oregon consumers. The analysis also employed a more appropriate and robust economic model to estimate the macroeconomic impacts of the rule on the Oregon economy. Doing so provides a comprehensive set of economic results and enables a more informed assessment and understanding of the potential effects of the regulation on the Oregon economy.

POTENTIAL IMPACTS OF THE CPP ON ENERGY COSTS

Transportation fuel suppliers and natural gas utilities have three primary options to reduce their GHG emissions when they exceed the CPP-4 emissions cap over a given compliance period:

- Reduce the amount of fossil-based fuel they distribute to end-users,
- Replace fossil-based petroleum and natural gas fuels with renewable-based fuels, and
- Purchase CCIs.

Each of these compliance options imposes a cost on the covered business.

ODEQ's *Statement of Fiscal and Economic Impact* recognizes that the cost to comply with the emissions cap program could lead to increases in energy costs that could be passed on to households and businesses through higher retail prices.[19] Even while acknowledging potential for the rule to increase energy costs, ODEQ did not ask ICF to provide an estimate of how the cost of measures undertaken to comply with the CPP could impact the delivered cost of energy.

ICF's modeling of CPP-4 included a reference case forecast of transportation fuels, natural gas and electricity costs. The reference case primarily relied on the U.S Department of Energy's State Energy Database (SEDS) and other public sources of energy prices to estimate a baseline price for Oregon and then created a forecast out to 2050 by escalating that price by the annual rates assumed in the Energy Information's Annual Energy Outlook's forecast of U.S. energy prices. ICF did not create a separate CPP-4 forecast to account for how natural gas utility and petroleum supplier's costs to comply with the program could be reflected in the future costs of delivered energy.

[19] State of Oregon Department of Environmental Quality, Notice of Proposed Rulemaking, Climate Protection Program, Statement of Fiscal and Economic Impact, August 5 2021. p. 30

Energy Strategies was asked by a coalition of Oregon businesses to quantify the energy price effects of the emissions cap program and forecast how Oregon energy costs could change from the implementation of an emissions cap program similar to the CPP Policy 4 Scenario modeled by ICF.

Energy Strategies' energy costs impact estimates relied on the energy and compliance costs assumptions contained in the Excel-based worksheets of ICF's Multi-sectoral model for the Reference and CPP-4 case. In our compliance cost estimates we also accounted for the price effects of other clean energy policies, regulations and technology measures that are not currently in-place but were relied on by ODEQ to achieve the emissions reductions targets of the CPP.

Transportation Fuels

Energy Strategies requested the assistance of Stillwater Associates ("Stillwater") to review the methodology ICF used to derive a reference case forecast of the costs of Oregon transportation fuels. Stillwater found that ICF's reference case used 2019 Oregon petroleum fuel prices reported in the U.S. Energy Information Administration's (EIA's) 2021 SEDS as their baseline. This baseline price was adjusted each year at the national average annual escalation rate assumed in EIA's 2021 Annual Energy Outlook. ICF's reference case forecast of petroleum fuel prices did not explicitly account for the compliance cost effects of Oregon's current 10% Clean Fuels Program (CFP) or an expansion of the CFP to 25% by 2035 that ODEQ assumed would be needed for petroleum suppliers to meet the CPP emissions cap.[20]

To provide a more accurate estimate of the costs of petroleum fuels in the ICF reference case, Stillwater adjusted ICF's petroleum fuel cost projections for transportation fuels to account for the CFP credit price of $125 per metric ton.

To create an estimate of compliance costs petroleum fuels suppliers would incur to achieve the CPP emissions targets, we assumed the CFP standard would be expanded from 10% to 25% by 2035. ICF's revised transportation fuels reference case price forecast between 2026 to 2050 was then adjusted to account for the additional 15% increase in the CFP standard and the accompanying $125 per metric ton credit price.[21]

Finally, Energy Strategies included ICF's worksheet assumptions about the number and costs of CCIs the petroleum fuel suppliers purchased to comply with the CPP. Based on

[20] Various email communications with James Mladenik, Senior Associate, Stillwater Associates LLC, August 24, 2021 to September 21, 2021

[21] Ibid

these calculations Energy Strategies and Stillwater Associates analyses conservatively estimate the combined cost impacts of the CFP and CPP emissions cap program could add $0.10 to $0.36 per gallon to the cost of motor gasoline, representing an increase ranging between 2.7% and 8.7%. These costs are presented in Table 1, below.

Table 1: CPP Compliance Cost Impacts on the Costs of Motor Gasoline

CPP Compliance Cost Impacts on the Costs of Motor Gasoline			
Year	**Reference Case Projection $/gallon**	**CPP Cost of Compliance $/gallon**	**Percent Change**
2025	$3.53	$0.10	2.7%
2030	$3.93	$0.22	5.6%
2035	$4.13	$0.36	8.7%
2040	$4.36	$0.36	8.2%
2045	$4.45	$0.35	8.0%
2050	$4.54	$0.33	7.3%

The potential CPP compliance cost impacts on diesel fuel are estimated to be similar and are presented in Table 2.

Table 2: CPP Compliance Cost Impacts on the Cost of Diesel Fuel

CPP Compliance Cost Impacts on the Cost of Diesel Fuel			
Year	**Reference Case Projection $/gallon**	**Cost of Compliance $/gallon**	**Compliance Costs As % of Reference Case**
2025	$3.52	$0.09	2.7%
2030	$3.82	$0.23	6.1%
2035	$3.96	$0.39	8.7%
2040	$4.10	$0.39	9.6%
2045	$4.45	$0.39	9.3%
2050	$4.54	$0.38	8.8%

Electricity

The electric utility sector is not covered under the CPP, but in order to achieve the aggressive GHG emissions reductions required by CPP-4, ODEQ assumed that significant electrification of the transportation, buildings and industrial sectors would occur in Oregon's economy. The practical effect of this assumption is to significantly reduce the amounts of petroleum-based transportation fuels and conventional natural gas consumed by the Oregon economy, which in turn contribute to the GHG emissions of the covered transportation fuel suppliers and natural gas utilities.

ICF's reference case forecast of electricity prices and IMPLAN modeling of the macroeconomic effects of CPP-4 did not account for the additional capital investments in generation and transmission needed to meet the additional electricity loads ICF assumed would occur with increased electrification of Oregon's economy. [22] These costs should be accounted for in modeling the economic impacts of the CPP-4 scenario.

Energy Strategies forecasted the electricity price impacts of CPP-4 based on the assumptions contained in the Reference Case and CPP-4 worksheets of ICF's Multi-sectoral model and other public sources. We estimated the incremental annual revenue requirement of the additional generation resources using the Western Electricity Coordinating Council's (WECC) Cost Calculator tool.[23] The incremental transmission revenue requirement was also estimated utilizing the Bonneville Power Administration's current rate for transmission service in 2022[24] as the proxy rate for transmission service and escalated the rate at 2% per year.

The revenue requirement for the reference case was then calculated by multiplying the reported electricity consumption by the reference case electricity prices forecast.[25] The estimated Oregon revenue requirement for additional generation and transmission associated with the CPP-4 over the forecast period is the combination of the reference case revenue requirement and the estimate of the incremental revenue requirement for CPP-4.

Energy Strategies forecast of average retail rates under the CPP-4 was then calculated by dividing the estimates of Oregon's total revenue requirements by ICF's electric consumption forecast reported in the Multi-sectoral model's worksheets.

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[22] Oregon Department of Environmental Quality and ICF, Modeling Study on Program Options to Reduce Greenhouse Emissions, Assumptions, Data Sources, and Methods, at Section 4.2.5, p. 12, August 2021

[23] The WECC Cost Calculator was developed the by the consulting firm Energy + Environmental Economics.

[24] Bonneville Power Administration BP-22 Rate Proceeding, Appendix C: 2022 Transmission, Ancillary, and Control Area Service Rate Schedules and General Rate Schedule Provisions (FY 2022–2023).

[25] The projected electricity prices in the ICF reference case start with the average Oregon retail rate from the EIA's State Energy Data 2019 (SED 2019) and escalate the average retail rate based on forecasted national growth rate from the AEO 2021.

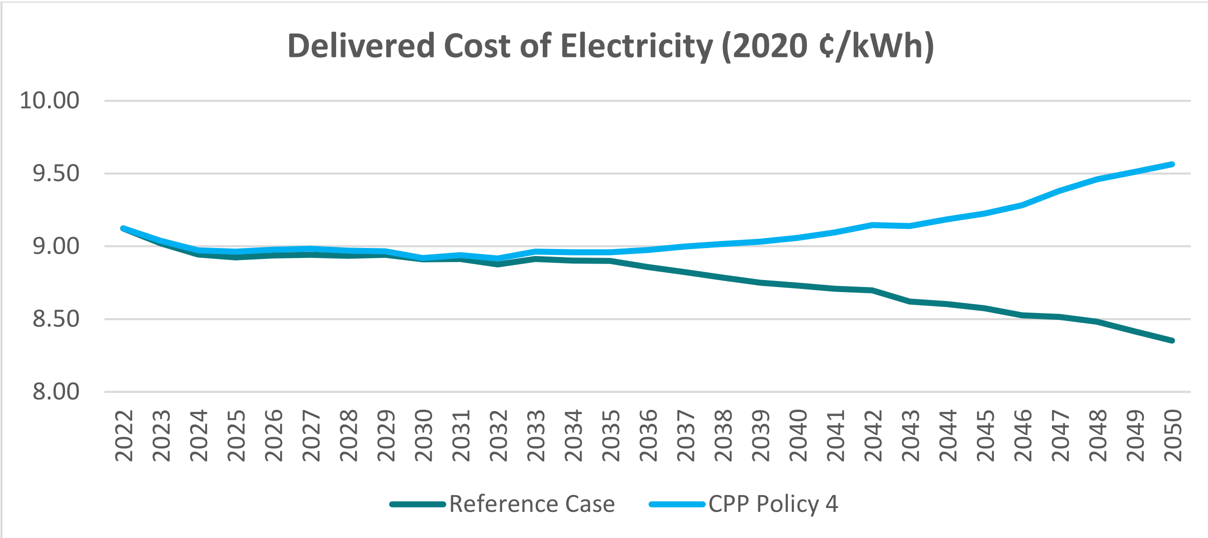
The electricity price impacts from the CPP-4 are illustrated in Table 3 below. Under the CPP Energy Strategies estimates the impact of the CCP on Oregon retail electricity prices would be relatively small in early years of the program, increasing by less than one-tenth of one percent through 2035. Costs impacts are more pronounced after 2040. By 2050 electricity prices are estimated to increase by more than 14%.

Table 3: CPP Compliance Cost Impacts on the Delivered Cost of Electricity

CPP Compliance Cost Impacts on the Delivered Cost of Electricity				
Year	**Reference Case Cents/kWh**	**Policy Scenario 4 Cents/kWh**	**Compliance Costs Adder Cents/kWh**	**Annual Percent Price Change**
2025	8.92	8.96	.04	.4%
2030	8.91	8.92	.01	.1%
2035	8.90	8.96	.06	.7%
2040	8.73	9.06	.33	3.7%
2045	8.57	9.23	.66	7.6%
2050	8.35	9.56	1.21	14.5%

This electricity price forecast reflects two primary and offsetting effects that impact the potential effect of CPP-4 on the costs of electricity. The increased electrification that is assumed by ICF will require more generation and transmission infrastructure. This would have the effect of increasing the overall cost of providing electric service in Oregon and put upward pressure on Oregon retail electric prices. However, the increased electric consumption under the CPP-4 would also provide a larger number of kWh over which to spread the costs of the incremental capital investments in generation and transmission infrastructure which would dampen the increase in average electricity rates.

Figure 1: Delivered Cost of Electricity



The declining electricity prices in ICF's Reference Case forecast reflect the EIA's Annual Energy Outlook 2021 (AEO 2021) for electric prices nationally and are not reflective of the future upward pressure expected on Oregon electricity rates. For example, House Bill 2021 requires Oregon's two largest investor-owned utilities, Portland General Electric and Pacific Power to reduce to zero the GHG emissions in the electricity they deliver to consumers by 2040. The new additional zero emissions resources that would be required to meet the requirements of HB 2021 will require additional investments by the Oregon utilities beyond what is reflected in the reference case or the CPP Policy Scenario 4 price forecasts.

Natural Gas

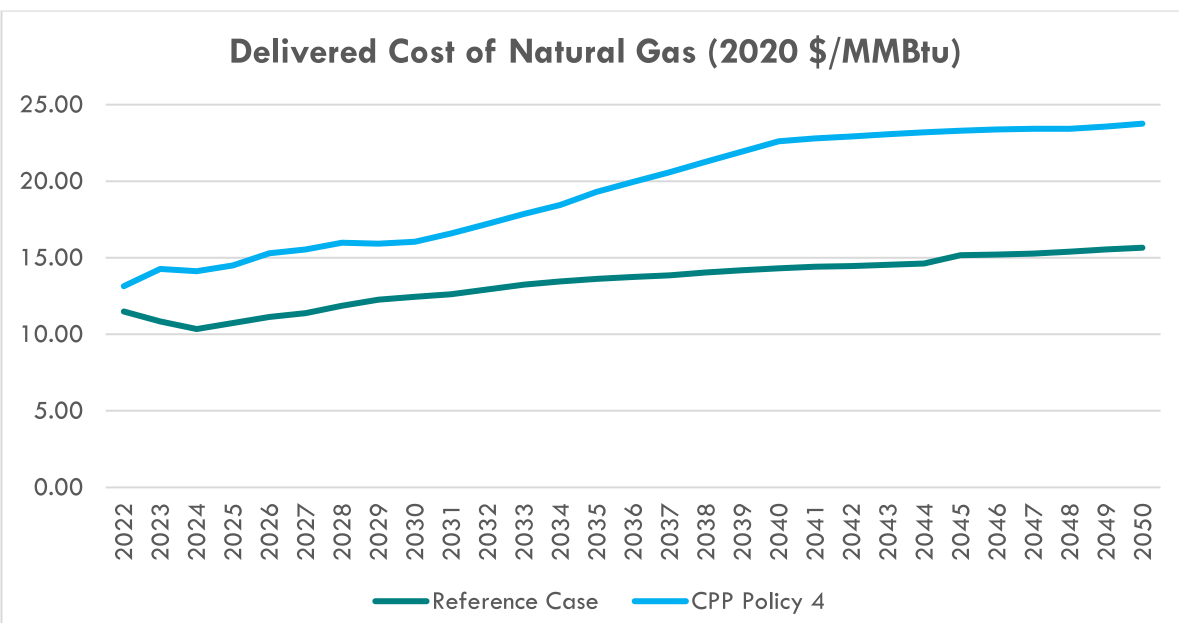
To estimate how compliance with the CPP rule would impact the delivered cost of natural gas in Oregon, Energy Strategies recreated a natural gas price forecast for both a reference case and the CPP-4policy case using natural gas annual cost and consumption data reported in the "Policy Scenario-4-Activity" and "Projected-Energy-Price" worksheets in ICF's Multi-sectoral spreadsheet model. Using ICF's cost and volumes data, we divided the reported annual total costs by the annual total volumes of fossil (FNG) and renewable natural gas (RNG) reported in the model's Reference and Policy Scenario-4 cases. This enabled us to calculate a weighted average $/MMBtu delivered cost of natural gas for 2022-2050 for both the Reference and CPP-4 case. The price forecast of the CPP-4 case was further adjusted to account for the added costs of natural gas utilities' purchase of CCIs ICF assumed in the model.

Natural gas was found to be the energy fuel most impacted by the CPP rule. Energy Strategies projections indicate that natural gas utility compliance with an emissions cap rule could increase the average price of a MMBtu of gas by more than 35% after the first compliance period and by over 50% in the years 2040 – 2050. These cost increases are driven by natural gas utilities' purchase of higher cost RNG and CCIs to comply with the CPP. Cost impacts on Oregon consumers will vary by customer category, but the largest impacts are expected to be incurred by Oregon's industrial and transport customers.

Table 4: CPP Compliance Costs Impacts on the Retail Costs of Natural Gas

CPP Compliance Costs Impacts on the Retail Costs of Natural Gas				
Year	**Reference Case $/MMBtu**	**Policy Scenario 4 Cost of Compliance $/MMBtu**	**Compliance Costs Adder $/MMBtu**	**Annual Percent Price Change**
2025	$10.73	$14.50	$3.77	35.1%
2030	$12.46	$16.05	$3.59	28.9%
2035	$13.61	$19.31	$5.70	41.8%
2040	$14.32	$22.61	$8.29	57.9%
2045	$15.17	$23.20	$8.12	53.5%
2050	$15.66	$23.76	$8.10	51.8%

Figure 2: Delivered Cost of Natural Gas (2020 $/MMBtu)



POTENTIAL MACROECONOMIC IMPACTS OF THE CPP

Shortcomings of the IMPLAN Model

ICF used the 2019 Oregon state-level IMPLAN model to estimate the macroeconomic impacts of four different CPP policy scenarios ODEQ considered during the rule making process. The benefit of using the IMPLAN is that it provides an accounting framework for understanding *the current* economic network of interactions between and amongst 546 industrial sectors of the economy.

Yet, IMPLAN has limitations. Economists often refer to input-output models generally, and IMPLAN in particular, as a recipe of the economy in which interactions between economic sectors are assumed to be *proportionally fixed* and remain static over time. This limits IMPLAN's ability to model price effects of a policy or a firm's ability to change their costs by changing their production practices.

The design of the CPP-4 is to create a regulatory "shock" that will affect the price and supply of fossil-based natural gas and petroleum transportation fuels. These changes cannot be accounted for in the fixed, static interactions between firms assumed in IMPLAN. IMPLAN is only able to model changes (shocks) in demand and cannot model supply shocks, that change regulatory costs, or prices that lead to substitution across business inputs, process changes, technological innovation, and business entry and exit from the economy. All of these changes must be accounted for to completely account for the economic effects of CPP-4 on the Oregon economy. These limitations of IMPLAN lead to its modeling results being incomplete and understating the macroeconomic effects of the CPP-4 policy scenario.

Given that the explicit intent of the CPP-4 is to fundamentally alter the recipe for both supply and demand, IMPLAN is not the best modeling tool to assess how firms and consumers are likely to respond to changes in costs, prices and resource scarcity and quantify the macroeconomic effects of the rule on Oregon's economy.

CGE Model

Because of the design of the proposed CPP, and the limitations of using IMPLAN to assess the macroeconomic effects of the rule on the Oregon economy, Recon collaborated with Energy Strategies to calibrate a CGE model to mimic the Oregon economy and evaluate the economic consequences of the CPP-4 policy scenario we assumed was a proxy for the proposed CPP rule.

The CGE model formulation assumes that the Oregon economy operates as a perfectly competitive economic system. Another simplification of the model is that "shocks" to either prices and/or quantities result in consumers and firms instantaneously adjusting their behavior rather than making these economic adjustments slowly over time.

Use of the CGE model enables accounting for the interactions that take place within the Oregon economy between various producers of goods and services, and consumers. The model is particularly useful in estimating economic effects of how policy and technology can impact prices, employment, output and fiscal revenues. Explicit effects on energy prices and subsequent changes in output can be captured. Impacts on the Oregon economy's domestic and foreign trade can also be accounted for by using the CGE model.

In order to calculate the impacts of the CPP policy, parameters in the model were altered or "shocked." The policy parameters that were "shocked" included; capital investments made to increase electrification of the residential, commercial, industrial and transportation sectors; costs incurred by covered natural gas utilities and petroleum transportation fuel suppliers purchasing CCIs to comply with the CPP; and changes in volumes and prices of goods and services supplied by CPP-covered industries. Recon's CGE macroeconomic modeling did not account for capital investments made by those stationary emissions sources that could be subject to BAER compliance regulation. BAER compliance was not modeled for two reasons. First, at this stage it is unknown what firms will be covered by BAER. Second, the emissions reduction technologies or processes ODEQ could potentially require stationary sources to adopt and the costs of these measures were not known with a sufficient level of confidence to include in the CGE modeling analysis.

To ensure a consistent and comparable analysis with ICF's IMPLAN results, Recon modeled policy scenario CPP-4. This was the policy case most similar to the proposed CPP rule. The CGE model was also calibrated using production, employment, sales and other economic data from the 2019 Oregon state-level IMPLAN model, the same macroeconomic data set used by ICF. The modeling also relied extensively on energy cost, consumption, and compliance costs assumptions from ICF's Multi-sectoral spreadsheet model's excel worksheets that ODEQ provided to the RAC members.[26]

[26] A protected version of ICF's modeling worksheets were distributed to RAC members June 18, 2021.

Comparison of IMPLAN and CGE Modeling Results

Using IMPLAN, ICF found that of the four policy scenarios modeled, CPP-4 resulted in the highest net gains in employment, income and gross state product. This policy scenario, which was very similar in design to the proposed CPP rule, showed small macroeconomic losses in the early years due to the high upfront costs of investments in clean transportation, electrification and energy efficiency in the buildings sector. These loses were transformed into small positive net gains to employment, income and gross state product by 2035.[27] At the industry level, ICF reported that the IMPLAN results also indicated job gains in the construction and manufacturing sectors while job losses were seen in the Trade and Transportation sectors.[28]

The macroeconomic modeling results generated by Recon's CGE model indicated a CPP-type policy would have a negative effect on Oregon's economy and in this respect were opposite of the results generated by IMPLAN. Again, this is not surprising considering that the IMPLAN model was unable to account for price reactions, and that such reactions would have additional economic consequences and impacts on industry interactions within the model.

In the following tables the gains or losses relative to the reference case are reported, and the difference between the IMPLAN and CGE model is provided in the final row of each table. All results attributable to ICF's IMPLAN modeling in the following tables are from their modeling of policy scenario CPP-4 and are also found in their summary report entitled "Modeling Study on Program Options to Reduce Greenhouse Gas Emissions: Summary Report." Table 5 below shows the employment figures. Table 6 shows the gross state product results. Lastly, Table 7 shows the income/earnings results.

Table 5: Net Full-Time Equivalent Employment Changes by Year and Source

Employment Impacts	2025	2035	2050
ICF	-2400	700	19700
Recon Insight	-4,171	-26,074	-121,570
Difference	***-1,771***	***-26,774***	***-141,270***

Source: ODEQ and ICF Summary Report Table 5, Recon Insight Group LLC.

[27] *Modeling Study on Program Options to Reduce Greenhouse Gas Emissions, Summary Report*, August 2021, p. 17
[28] Ibid; 17

Table 6: Net Gross State Product Changes by Year and Source ($ million)

Gross State Product Impacts	2025	2035	2050
ICF	$120	$570	$1,720
Recon Insight	-$268	-$1,586	-$9,833
Difference	***-$388***	***-$2,156***	***-$11,553***

Source: ODEQ and ICF Summary Report Table 6, Recon Insight Group LLC.

Table 7: Net Income Changes by Year and Source ($ million)

Income Impacts	2025	2035	2050
ICF	-$20	$170	$1,100
Recon Insight	-$194	-$1,243	-$6,370
Difference	***-$174***	***-$1,413***	***-$7,470***

Source: ODEQ and ICF Summary Report Table 7, Recon Insight Group LLC.

In interpreting the results of both the CGE and IMPLAN macroeconomic modeling of the Oregon economy, it is important to note that any reductions in economic activity as a result of the CPP do not imply a net decline in macroeconomic economic activity. Rather, what the results indicate is that a CPP-type policy will slow the overall growth rate of the economy relative to how the economy would grow in the absence of the rule.

Statewide Impacts (by Industry and Year)

The emissions cap placed on the covered firms actually represents an additional cost to those firms, which has the effect of reducing their supply of goods and services. This one shock will lead to a cascading effect backwards through their supply network. This was captured by ICF's IMPLAN modeling results. However, it could also raise the prices for buyers of the covered firms' outputs, which will affect buyers that utilize the covered firms as part of their own supply chains. This was not accounted for in the IMPLAN model results.

Obviously not all industries will be affected by CPP by the same magnitude. When looking at the aggregated "utilities" industry (NAICS Code 22), it looks as though there is a positive change in gross state product in 2025.

Several other aggregated industries show growth early on, but that growth turns into decline for most industries by the year 2050 as the cap becomes more stringent. Table 8 shows the Statewide impacts by year and aggregated industry.

Table 8: Real Changes in Gross State Product due to CPP by Year and Aggregate Industry ($ million)

Industries	2023	2025	2028	2031	2035	2050
Agriculture	$6	$0	-$14	-$37	-$93	-$393
Forestry	$2	$1	-$2	-$6	-$14	-$70
Mining	$3	$2	$1	-$2	-$7	-$40
Utilities	$16	$103	$280	$553	$563	$587
Construction	$76	$57	$17	-$42	-$108	-$865
Manufacturing	$156	$170	$193	$226	$211	$38
Wholesale Trade	$7	-$5	-$36	-$87	-$257	-$1,932
Retail Trade	$1	-$1	-$8	-$19	-$65	-$541
Transportation & Warehousing	-$3	-$12	-$31	-$60	-$120	-$509
Miscellaneous	-$506	-$584	-$755	-$1,006	-$1,694	-$6,109
Total	**-$241**	**-$268**	**-$356**	**-$478**	**-$1,586**	**-$9,833**

However, if you separate out the utility sector into its various industry subsectors you see that the losses to the natural gas sector (NAICS 2212) are being hidden by gains in the electric sector (NAICS 2211). The story is much the same in manufacturing as well. In 2025 the effect of the CPP on manufacturing as a whole (NAICS 31-33) is a positive net change of roughly $170 million. Disaggregating the industries into their constituent parts we find that food manufacturing (NAICS 311), paper manufacturing (NAICS 322), chemical manufacturing (NAICS 325) all suffer losses. These losses become more pronounced and affect more industries as the emissions cap becomes more stringent in the later years. By 2050 within the aggregated manufacturing industry, only computer manufacturing (NAICS 334) shows growth in gross state product above the reference case. However, this manufacturing industry group could be subject to BAER and incur compliance costs that have not been accounted for in the CGE modeling. Every other Manufacturing industry sub-category shows a decline relative to their forecasted reference case performance in the absence of the CPP.

The following sections and tables identify the industries most affected by the CPP between the years of 2023 and 2050. Comprehensive data sets are available in Appendix 1.

Output (Sales)

Often referred to as total sales, output represents all economic transactions in an economy and may be thought of as the total of all cash register receipts. Much of the sales data captures "double counting" of transaction value. For example, timber sold to a mill, and boards sold to a distributor, then to a retailer and consumer, will capture the value of the original timber at every stage of the supply chain. This is the broadest measure of economic activity in the state. While some industries feel the negative effects of the policy immediately, predominantly in the manufacturing sectors, others see short-term growth but move into decline as the policy becomes more stringent, and the price effects become more pronounced. Building Construction output, for example, experiences an initial boost in output of $159 million in 2023, but that positive growth slows with each succeeding compliance period through 2028, becoming only $75 million at the end of the third compliance period. By 2050 building construction output has decreased because of the CPP policy and is $1.1 billion less in that year than it would have been without the policy. Table 9 shows a selection of key industries affected by the CPP over the time horizon of the policy.

Table 9: Real Changes in Output for selected industries and years ($ million)

NAICS	Industries	2023	2025	2028	2031	2035	2050
2211	Electric-Power	$57	$293	$771	$1,494	$1,698	$2,703
2212	Natural-Gas	-$7	-$12	-$20	-$28	-$94	-$826
236	Building-Construction	$159	$133	$75	-$12	-$93	-$1,111
237	Civil-Construction	-$23	-$29	-$42	-$60	-$96	-$416
311	Food-Manufacturing	-$20	-$48	-$113	-$213	-$449	-$1,963
321	Wood Products Manufacturing	$27	$12	$-22	$-73	$-192	$-954
322	Paper Manufacturing	-$3	-$17	-$43	-$75	-$139	-$459
325	Chemical-Manufacturing	-$18	-$39	-$78	-$124	-$229	-$1,113
4247	Petroleum-Wholesale-Trade	-$6	-$11	-$27	-$56	-$166	-$1,437
447	Gas-Station	-$1	-$2	-$4	-$9	-$24	-$207
48	Other-Transportation	-$11	-$24	-$53	-$94	-$167	-$589
484	Truck-Transportation	$4	$1	-$8	-$22	-$64	-$388

Gross State Product

Gross State Product is a measure of value produced at each step of the supply chain. It avoids the double counting of value that occurs in sales metrics. Gross state product should be understood as the true measure of an economy's health. Gross state product should be understood as the true measure of an economy's health. Gross state product is a subset of overall sales and is always smaller than the sales. The primary industries whose gross state product are predicted to be most impacted by the CPP in 2050 are Petroleum-Wholesale-Trade (-$1.2 billion), Building Construction Trade (-$622), and Food Manufacturing (-$363 million). Large differences between an industry's Sales and gross state product is an indication that the firm has a "deeper" local supply chain. Impacts on these firms will have broader economic impacts on other firms in the economy. Industries where the difference between gross state product and Sales is small, tend to spend the majority of their expenditures on labor incomes, capital assets, and taxes. Impacts on these firms will be reflected in larger jobs and fiscal impacts. Table 10 shows the change in gross state product for a selection of industries affected by the CPP over the time horizon of the policy.

Table 10: Real Changes in Gross State Product for Selected Industries and Years ($ million)

NAICS	Industries	2023	2025	2028	2031	2035	2050
2211	Electric-Power	$20	$100	$263	$509	$579	$921
2212	Natural-Gas	-$3	-$5	-$8	-$11	-$37	-$324
236	Building-Construction	$89	$74	$42	-$7	-$52	-$622
237	Civil-Construction	-$14	-$17	-$24	-$35	-$56	-$243
311	Food-Manufacturing	-$4	-$9	-$21	-$39	-$83	-$363
321	Wood Products Manufacturing	$9	$4	-$7	-$23	-$62	-$307
322	Paper Manufacturing	-$1	-$5	-$12	-$21	-$40	-$131
325	Chemical-Manufacturing	-$4	-$8	-$16	-$25	-$47	-$226
4247	Petroleum-Wholesale-Trade	-$5	-$10	-$23	-$48	-$142	-$1,235
447	Gas-Station	$0	-$1	-$2	-$5	-$13	-$110
48	Other-Transportation	-$6	-$12	-$27	-$48	-$86	-$301
484	Truck-Transportation	$2	$0	-$4	-$12	-$34	-$208

Income

Income is a subset of gross state product and represents the labor earnings and benefits paid to employees and owners. It does not include profits, depreciation, or returns on capital assets that owners may also receive. Income represents one of the narrowest measures of economic activity. Building construction sees the largest income losses by 2050 at $511 million below where they were expected to be in the absence of the CPP. Table 11 shows the income of a selection of key industries affected by the CPP over the time horizon of the policy.

Table 11: Real Changes in Income for Selected Industries and Years ($ million)

NAICS	Industries	2023	2025	2028	2031	2035	2050
2211	Electric-Power	$5	$26	$69	$133	$151	$240
2212	Natural-Gas	-$1	-$2	-$3	-$4	-$13	-$116
236	Building-Construction	$73	$61	$34	-$5	-$43	-$511
237	Civil-Construction	-$10	-$13	-$18	-$27	-$42	-$183
311	Food-Manufacturing	-$3	-$6	-$14	-$27	-$57	-$251
321	Wood Products Manufacturing	$5	$2	-$4	-$15	-$38	-$192
322	Paper Manufacturing	$0	-$2	-$6	-$10	-$19	-$63
325	Chemical-Manufacturing	-$2	-$4	-$8	-$13	-$23	-$112
4247	Petroleum-Wholesale-Trade	$0	-$1	-$2	-$3	-$10	-$89
447	Gas-Station	$0	-$1	-$2	-$4	-$11	-$93
48	Other-Transportation	-$3	-$7	-$15	-$27	-$47	-$167
484	Truck-Transportation	$2	$0	-$4	-$10	-$29	-$176

Employment

Table 12 shows the industries whose employment numbers are projected to be most impacted by the adoption of the CPP regulation. Again, the results of the CGE modeling reflect changes in employment compared to what the levels would have been in the absence of the CPP regulation being adopted. On the whole, employment levels are expected be higher in the Oregon economy in 2050. However, adoption of the CPP is projected to cause employment in the industries most impacted by the regulation to be 10% lower, on average, than what employment would have been had the regulation not been implemented.

Table 12: Changes in Full-Time Equivalent Employment for Selected Industries and Years

NAICS	Industries	2023	2025	2028	2031	2035	2050
2211	Electric-Power	29	147	387	750	852	1,356
2212	Natural-Gas	-6	-11	-18	-26	-86	-755
236	Building-Construction	1,055	880	494	-78	-618	-7,352
237	Civil-Construction	-145	-181	-260	-376	-599	-2,593
311	Food-Manufacturing	-51	-122	-285	-535	-1,129	-4,933
321	Wood Products Manufacturing	89	40	-72	-242	-637	-3,171
322	Paper Manufacturing	-5	-25	-63	-109	-202	-671
325	Chemical-Manufacturing	-22	-48	-96	-152	-281	-1,365
4247	Petroleum-Wholesale-Trade	-4	-8	-20	-42	-125	-1,083
447	Gas-Station	-7	-16	-40	-86	-230	-2,003
48	Other-Transportation	-67	-152	-329	-590	-1,044	-3,677
484	Truck-Transportation	24	3	-49	-132	-394	-2,383

Household Purchasing Power

The following table shows the loss in purchasing power to households as a result of the CPP. It reflects lost benefits to households resulting from higher prices for transacting in the new economy. This is referred to by economists as losses in consumer surplus. The data show that, while all income classes eventually suffer a loss relative to the reference economy, it is truly the middle-income ($30,000-$100,000) and upper-middle-income ($100,000-$150,000) categories that will be paying the costs of this policy. Upper-income households will be able to transfer some of their holdings to capital assets that will continue generating returns for them, but the middle-income households will likely be ones that become unemployed during the transition, which will have a greater effect on their income streams and ultimately their purchasing power. Table 13 shows the effects of the CPP by year for various household income brackets.

Table 13: Losses in Household Purchasing Power Due to the CPP by Year ($ million)

Income Bracket	2023	2025	2028	2031	2035	2050
Households <$15k	$0	$0	$0	$0	-$2	-$18
Households $15-$30k	-$3	-$3	-$4	-$4	-$18	-$121
Households $30-$70k	-$25	-$27	-$35	-$44	-$158	-$965
Households $70-$100k	-$24	-$26	-$33	-$43	-$150	-$898
Households $100-$150k	-$29	-$32	-$43	-$58	-$192	-$1,137
Households $150-$200k	-$15	-$17	-$23	-$31	-$98	-$567
Households >$200k	-$25	-$30	-$44	-$64	-$161	-$870
Total Change	-$121	-$136	-$182	-$245	-$781	-$4,577

Decline in Domestic and Foreign Trade

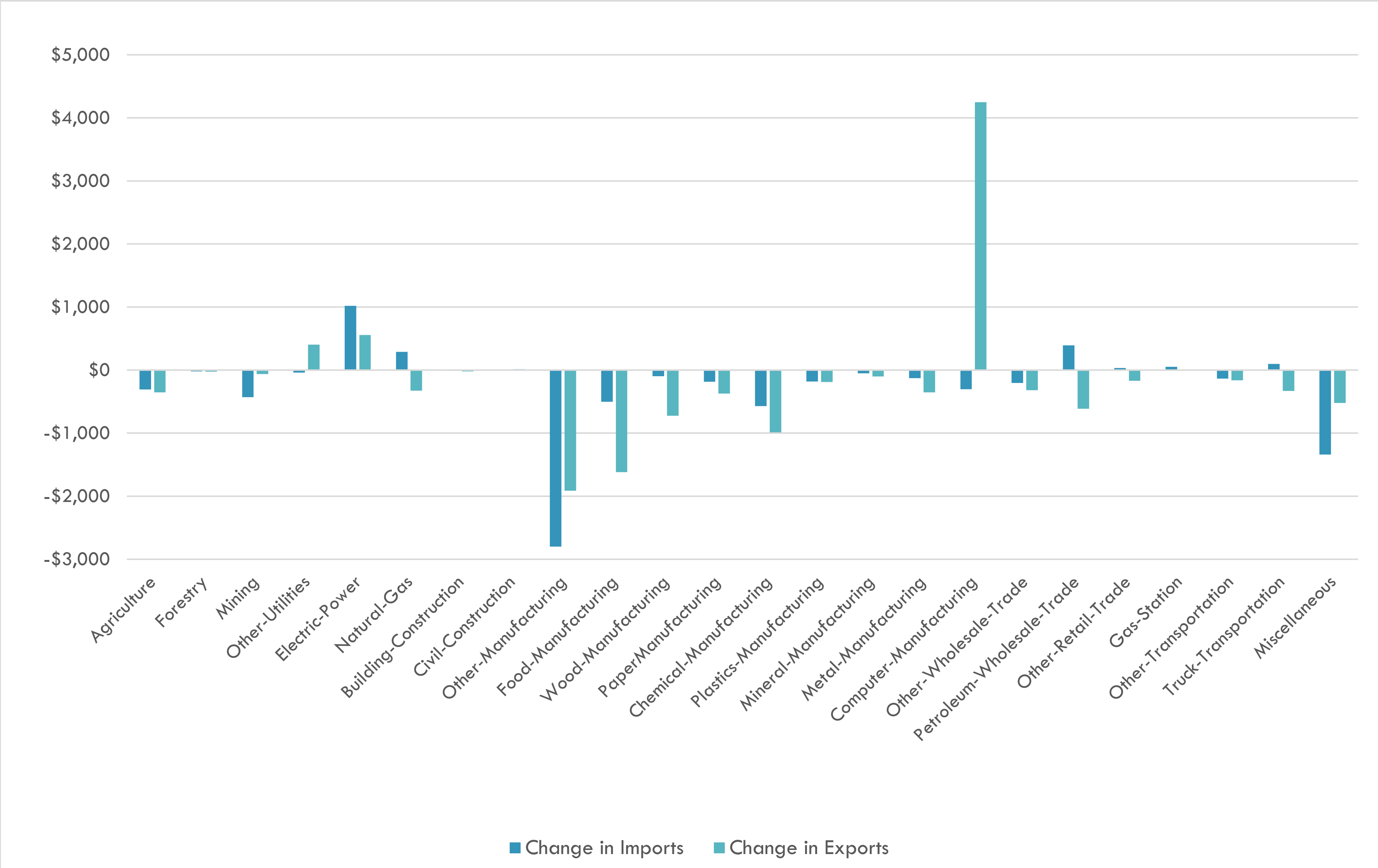
Trade, whether international or domestic (state-to-state), remains a key indicator of specialization and efficiency. The lack of international and domestic trade weakens a state's economy. This can contribute to reduced economic output and lower standards of living. Thus, when analyzing the CPP-4 regulation, it is important to ask how trade is affected.

ODEQ recognized the potential impact the CPP could have on regulated businesses and jobs and the potential for economic and emissions leakage. However, ODEQ did not attempt to model the net trade effects of the CPP, but instead just acknowledged the limitations of its macroeconomic analysis on this issue by stating that "DEQ does not have additional information to estimate the potential or economic impacts of leakage but recognizes the negative economic impacts on businesses and job loss that could occur…".[29] While Recon's CGE modeling analysis did not estimate the number of businesses that might leave the state, it did account for how import and export volumes of Oregon's business could be affected by the CPP. This is an important measure of the competitive disadvantage the CPP could place on trade exposed Oregon businesses who are at economic risk from the rule and might relocate manufacturing facilities in order to maintain market share.

The CPP-4, as modeled, has the effect of curtailing the competitive advantages of many Oregon businesses by 2050, resulting in overall declines in total trade volumes. Exports are expected to decline as a result of increased prices and reduced firm outputs. Imports decline because firms rely less on their out-of-state supply chain. Figure 3 shows the change in imports and exports by industry in 2050. While some industries are able to expand under the CPP, imports and exports on the whole are reduced, with the largest impacts falling on Agriculture, Forestry, and Manufacturing, particularly Food Processing and Manufacturing firms. Total trade volumes are $9.3 billion less under the CPP than they would be in its absence.

[29] *State* of Oregon Department of Environmental Quality, Notice of Proposed Rulemaking, Climate Protection Program, Statement of Fiscal and Economic Impact, August 5 2021. p. 18

Figure 3: Changes in Real Imports and Exports Values ($ millions) due to CPP in 2050



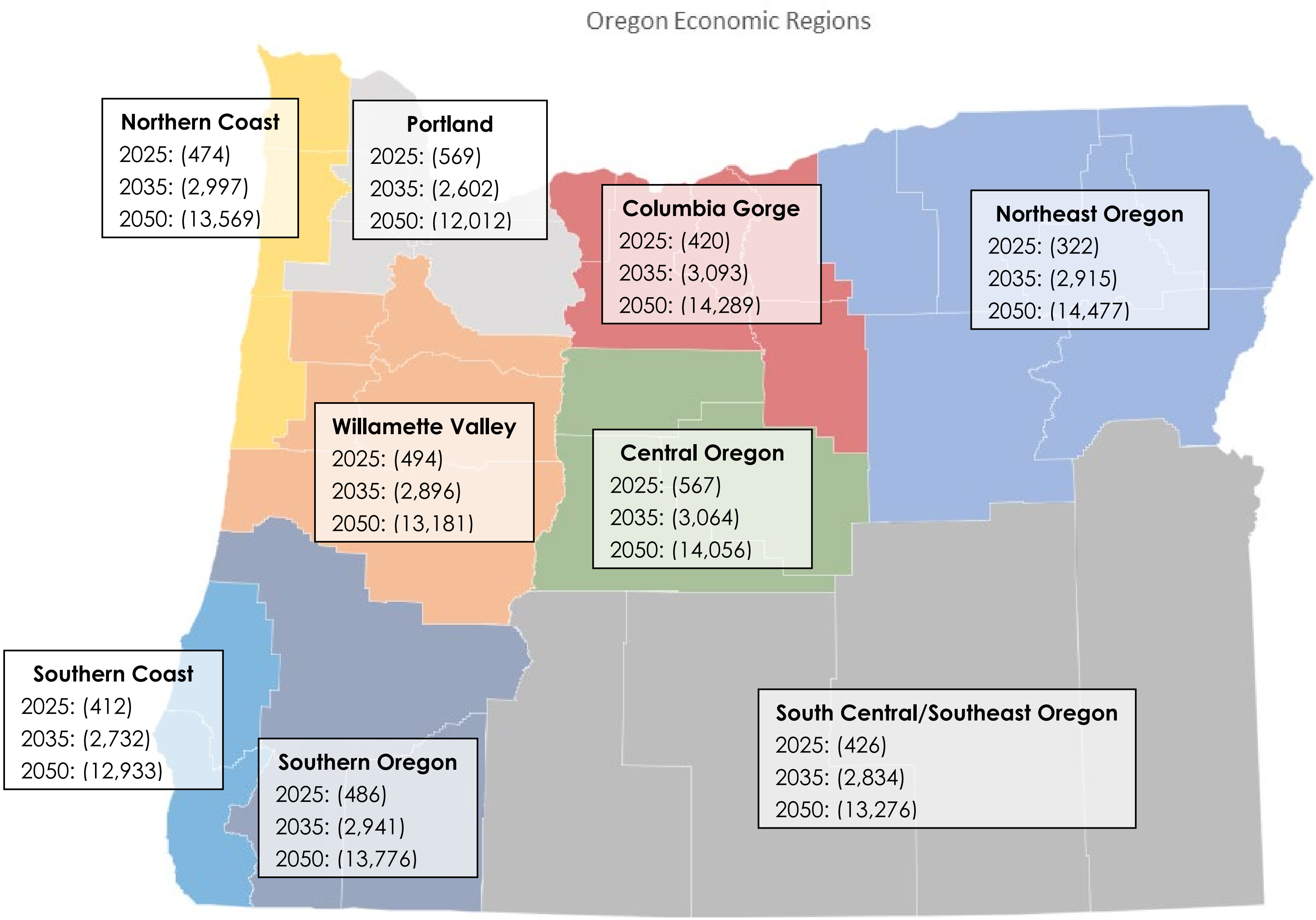
Regional Employment Impacts by Industry

Figure 4 provides a geographic representation of the CPP's impacts on FTE jobs in Oregon's economic regions for the years 2025, 2035 and 2050. More detailed information, including FTE impacts by industry type, are provided in Tables 18-20 in Appendix 3.

The CPP's impacts on jobs will be felt throughout the entire state of Oregon. Job losses in both urban and rural areas are modest through 2035, but the data implies that rural economies will feel the bulk of the CPP policy's full economic effects by 2050.

The total number of job losses reported in Figure 4 appear similar among regions. However, job losses in the more populous economic regions (Portland, Willamette Valley and So. Oregon) represent a significantly smaller fraction of total jobs compared to rural areas of the state. Accordingly, we expect that less populated, rural economies in Oregon are likely to see a larger percent of job losses, relative to total employment, under the CPP regulation.

Figure 4: Net FTE Employment Impacts of the CPP by Region in 2025, 2035 and 2025



CONCLUSIONS

The economic analysis conducted for this report had two objectives. First, in the absence of ODEQ and ICF providing an estimate of the potential impact of the CPP on the delivered costs of energy, this analysis provided a forecast of how the costs of the natural gas utilities and petroleum fuel suppliers' complying with the CPP could affect the delivered costs of transportation fuels and natural gas.

The second objective was to provide a more granular and meaningful economic analysis of the CPP and provide a set of the macroeconomic modeling results that ODEQ's modeling could not provide, but is necessary to enable a more complete understanding of the potential impacts of the CPP on Oregon's economy.

Energy Costs

Our analysis of the CPP-4 policy scenario indicates compliance with an emissions cap rule similar to the proposed CPP could add additional costs to the average delivered costs of transportation fuels and natural gas. Cost increases are the result of compliance cost incurred by wholesale petroleum suppliers and natural gas utilities complying with the CPP.

Energy Strategies estimated the adoption of the CPP could add $0.10 to $0.36 per gallon to the cost of motor gasoline, between 2025 and 2050. This represents an increase of between 2.7% and 7.3% per gallon compared to the forecasted reference case price. The compliance cost impacts of the CPP on diesel fuel are similar. Compliance with the CPP could add an additional $0.09 to a gallon of diesel fuel in 2025. Costs are projected to increase to $0.39 per gallon by 2035 and remain near that level through 2050.

The CPP is expected to have the largest impact on the average price of natural gas. This conclusion accounts for ICF's assumptions about the number of CCIs natural gas utilities will need to purchase and the increased volumes of more costly renewable natural gas that will be needed in order to comply with the rule. Energy Strategies estimates that the CPP could add an average of $6.02/MMBtu to the price of natural gas between 2022-2050. By 2035 the average cost of natural gas is estimated to be $19.31/MMBtu which is 42% higher than the price would be in the absence of the rule. By 2050 we estimate the average price could increase to $23.76/MMBtu, which would be $12.26/MMBtu higher than the 2022 price if the CPP is not adopted.

Even though the electric utility sector is not covered under the CPP, Energy Strategies estimated the impact of the CPP on average electricity prices because electrification is assumed by ODEQ to be an important measure to achieve the CPP GHG cap. Energy Strategies' estimate of retail electricity rates found the rule would have a relatively minor impact on rates in the early years of the program. Increases were estimated to be less than one-tenth of one percent through 2035. Price impacts became more pronounced after 2040 and by 2050 electricity prices are estimated to be 14.5% higher if ODEQ's assumptions on the penetration of electrification of the Oregon economy are realized.

State-wide Macroeconomic Impacts

Comparison of economy-wide macroeconomic results of the CGE model to those of IMPLAN indicate there is a significant difference in the results reported by the two modeling approaches.

ICF found that the macroeconomic effects of the CPP policy showed small state-wide macroeconomic losses in the early years for employment and income, but these losses were transformed into small net positive changes by 2050.[30] Recon's CGE macroeconomic modeling results were different in both the direction and amount of change. Economy-wide, Recon reported job losses of 121,570 in 2050 while ICF was showing a net increase of 19,700. ICF's IMPLAN estimates of income indicated a net positive increase of $1.1 billion while the CGE model projected a net loss of approximately $6.4 billion. Similarly, the IMPLAN results estimated an increase of $1.7 billion in gross state product in 2050 following adoption of the CPP while the CGE results indicated the CPP would have the oppositive effect and lead to a $9.8 billion decrease in Oregon's gross state product. In total, IMPLAN results generally showed a net positive increase in economic activity while the CGE model was predicting the CPP would decrease jobs, gross state product and income by between 3.9 and 4.7 percent relative to the entire Oregon economy.

The CPP's impacts on jobs will be felt throughout the entire state of Oregon. However, job losses in the more populous economic regions (Portland, Willamette Valley and So. Oregon) represent a significantly smaller fraction of total jobs compared rural areas of the state. Accordingly, we expect the less populated, rural economies in Oregon are likely to see a larger percent of job losses, relative to total employment, under the CPP regulation.

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[30] Oregon Department of Environmental Quality and ICF, *Modeling Study on Program Options to Reduce Greenhouse Gas Emissions- Summary Report*, August 2021, p. 17

Industry and Household Impacts

At the industry level, ICF's reporting on industry impacts was limited to four major industry sectors. ICF's summary report of modeling results concluded that the CPP-4 policy scenario modeled would result in net job increases in both the manufacturing, and construction sectors, while the Trade and Transportation sectors would experience job losses.[31] Unfortunately, this was the limit of ICF's report of industry level impacts.

In contrast, Recon used the CGE model to estimate the macroeconomic impacts on 23 industry sectors in the Oregon economy in order to identify which sectors were expected to be vulnerable to the economic effects of the CPP.

Predictably, the CGE modeling results confirmed that the industry sectors that will be most impacted by the CPP will be those directly covered by the rule, i.e., wholesale petroleum suppliers and the natural gas utilities. Between implementation of the CPP in 2022 and the year the Cap is expected to be reached, 2050, sales of the wholesale petroleum supply industry are projected to decline by $1.4 billion, a decrease of 88% compared to what sales were projected to be in the absence of the CPP. The industry is also expected to experience proportional decreases in jobs, gross state product and income. Similarly, the natural gas utility sector in Oregon is projected to experience a 57% decrease in sales and lose 755 jobs by 2050; due primarily to electrification of the buildings and residential sectors of the economy.

Other Oregon industries will also be impacted, but not to the same extent. In general, those industry's that are natural-gas-intensive in their manufacturing processes will experience the largest economic effects from adoption of the rule. Chemical Manufacturing (NAICS - 325), Food Processing/Manufacturing (NAICS - 311), Wood Products Manufacturing (NAICS – 321), and Pulp and Paper Manufacturing (NAICS – 322) are all projected to see a net economic loss of sales, gross state product, income and jobs of between 13 to 24 percent due to the CPP.

These four industries will also experience the most significant declines in import-export volumes by 2050 due to reductions in the purchase of inputs and production of products for sales to other states and overseas. Food Manufacturing is the industry hardest hit with a total decline in its import-exports of $2.1 billion followed by Chemical Manufacturing with a decrease of $1.6 billion. Overall, the Oregon economy will experience a net decrease of $9.3 billion of trade volume. The reduction in economic production and trade increases the potential for economic leakage.

[31] Ibid. p. 17

The CGE model also estimated that purchasing power of Oregon households will be reduced by over $4.5 billion; the result of higher prices in energy and goods and services. By 2050 all seven household income categories will see a loss of purchasing power but it is the middle-income ($30,000-$100,000) and upper-middle-income ($100,000-$150,000) categories that will experience the biggest loss of purchasing power due to the CPP.

APPENDIX 1 – DETAILED DATA TABLES AND MODEL OUTPUTS[32]

Table 14: Real Changes in Sales due to the CPP for All Industries and Selected Years ($ million)

NAICS	Industries	2023	2025	2028	2031	2035	2050
11	Agriculture	$11	$0	-$27	-$68	-$172	-$729
113	Forestry	$4	$2	-$3	-$10	-$23	-$112
21	Mining	$15	$11	$3	-$8	-$32	-$183
22	Other-Utilities	-$1	$16	$53	$117	$44	-$21
2211	Electric-Power	$57	$293	$771	$1,494	$1,698	$2,703
2212	Natural-Gas	-$7	-$12	-$20	-$28	-$94	-$826
236	Building-Construction	$159	$133	$75	-$12	-$93	-$1,111
237	Civil-Construction	-$23	-$29	-$42	-$60	-$96	-$416
31-33	Other-Manufacturing	$334	$301	$221	$95	-$201	-$2,447
311	Food-Manufacturing	-$20	-$48	-$113	-$213	-$449	-$1,963
321	Wood-Manufacturing	$27	$12	-$22	-$73	-$192	-$954
322	Paper Manufacturing	-$3	-$17	-$43	-$75	-$139	-$459
325	Chemical-Manufacturing	-$18	-$39	-$78	-$124	-$229	-$1,113
326	Plastics-Manufacturing	$9	$6	$0	-$9	-$32	-$238
327	Mineral-Manufacturing	$7	$4	-$4	-$13	-$33	-$195
331	Metal-Manufacturing	$38	$31	$13	-$12	-$73	-$266
334	Computer-Manufacturing	$64	$154	$339	$607	$1,052	$3,947
42	Other-Wholesale-Trade	$23	$8	-$25	-$73	-$214	-$1,303
4247	Petroleum-Wholesale-Trade	-$6	-$11	-$27	-$56	-$166	-$1,437
44	Other-Retail-Trade	$3	-$1	-$10	-$25	-$95	-$779
447	Gas-Station	-$1	-$2	-$4	-$9	-$24	-$207
48	Other-Transportation	-$11	-$24	-$53	-$94	-$167	-$589
484	Truck-Transportation	$4	$1	-$8	-$22	-$64	-$388
51-90	Miscellaneous	-$815	-$939	-$1,216	-$1,619	-$2,728	-$9,835
	Total	***-$149***	***-$151***	***-$219***	***-$290***	***-$2,522***	***-$18,920***

[32] Results are mutually exclusive to avoid double counting. For example, NAICS 113 has been disaggregated from NAICS 11 to avoid double counting.

Table 15: Real Changes in Gross State Product due to the CPP for All Industries and Selected Years ($ million)

NAICS	Industries	2023	2025	2028	2031	2035	2050
11	Agriculture	$6	$0	-$14	-$37	-$93	-$393
113	Forestry	$2	$1	-$2	-$6	-$14	-$70
21	Mining	$3	$2	$1	-$2	-$7	-$40
22	Other-Utilities	$0	$7	$25	$55	$21	-$10
2211	Electric-Power	$20	$100	$263	$509	$579	$921
2212	Natural-Gas	-$3	-$5	-$8	-$11	-$37	-$324
236	Building-Construction	$89	$74	$42	-$7	-$52	-$622
237	Civil-Construction	-$14	-$17	-$24	-$35	-$56	-$243
31-33	Other-Manufacturing	$106	$95	$70	$30	-$64	-$773
311	Food-Manufacturing	-$4	-$9	-$21	-$39	-$83	-$363
321	Wood-Manufacturing	$9	$4	-$7	-$23	-$62	-$307
322	Paper Manufacturing	-$1	-$5	-$12	-$21	-$40	-$131
325	Chemical-Manufacturing	-$4	-$8	-$16	-$25	-$47	-$226
326	Plastics-Manufacturing	$2	$2	$0	-$3	-$9	-$66
327	Mineral-Manufacturing	$3	$1	-$1	-$5	-$13	-$74
331	Metal-Manufacturing	$12	$9	$4	-$4	-$23	-$82
334	Computer-Manufacturing	$33	$80	$177	$317	$549	$2,061
42	Other-Wholesale-Trade	$12	$4	-$13	-$39	-$114	-$697
4247	Petroleum-Wholesale-Trade	-$5	-$10	-$23	-$48	-$142	-$1,235
44	Other-Retail-Trade	$2	$0	-$6	-$14	-$53	-$431
447	Gas-Station	$0	-$1	-$2	-$5	-$13	-$110
48	Other-Transportation	-$6	-$12	-$27	-$48	-$86	-$301
484	Truck-Transportation	$2	$0	-$4	-$12	-$34	-$208
51-90	Miscellaneous	-$506	-$584	-$755	-$1,006	-$1,694	-$6,109
	Total	***-$241***	***-$268***	***-$356***	***-$478***	***-$1,586***	***-$9,833***

Table 16: Real Changes in Income due to the CPP for All Industries and Selected Years ($ million)

NAICS	Industries	2023	2025	2028	2031	2035	2050
11	Agriculture	$4	$0	-$9	-$23	-$57	-$242
113	Forestry	$2	$1	-$2	-$6	-$15	-$71
21	Mining	$2	$1	$0	-$1	-$4	-$21
22	Other-Utilities	$0	$4	$12	$27	$10	-$5
2211	Electric-Power	$5	$26	$69	$133	$151	$240
2212	Natural-Gas	-$1	-$2	-$3	-$4	-$13	-$116
236	Building-Construction	$73	$61	$34	-$5	-$43	-$511
237	Civil-Construction	-$10	-$13	-$18	-$27	-$42	-$183
31-33	Other-Manufacturing	$72	$65	$48	$20	-$43	-$527
311	Food-Manufacturing	-$3	-$6	-$14	-$27	-$57	-$251
321	Wood-Manufacturing	$5	$2	-$4	-$15	-$38	-$192
322	Paper Manufacturing	$0	-$2	-$6	-$10	-$19	-$63
325	Chemical-Manufacturing	-$2	-$4	-$8	-$13	-$23	-$112
326	Plastics-Manufacturing	$2	$1	$0	-$2	-$6	-$48
327	Mineral-Manufacturing	$2	$1	-$1	-$3	-$7	-$42
331	Metal-Manufacturing	$6	$5	$2	-$2	-$12	-$44
334	Computer-Manufacturing	$15	$35	$77	$139	$241	$902
42	Other-Wholesale-Trade	$7	$3	-$8	-$23	-$68	-$417
4247	Petroleum-Wholesale-Trade	$0	-$1	-$2	-$3	-$10	-$89
44	Other-Retail-Trade	$1	$0	-$4	-$11	-$40	-$329
447	Gas-Station	$0	-$1	-$2	-$4	-$11	-$93
48	Other-Transportation	-$3	-$7	-$15	-$27	-$47	-$167
484	Truck-Transportation	$2	$0	-$4	-$10	-$29	-$176
51-90	Miscellaneous	-$316	-$364	-$472	-$628	-$1,058	-$3,815
	Total	***-$138***	***-$194***	***-$329***	***-$524***	***-$1,243***	***-$6,370***

Table 17: Changes in Full-Time Employment due to the CPP for All Industries and Selected Years

NAICS	Industries	2023	2025	2028	2031	2035	2050
11	Agriculture	163	1	-385	-990	-2,489	-10,558
113	Forestry	33	16	-23	-81	-196	-948
21	Mining	57	43	12	-32	-121	-692
22	Other-Utilities	-1	26	86	190	72	-34
2211	Electric-Power	29	147	387	750	852	1,356
2212	Natural-Gas	-6	-11	-18	-26	-86	-755
236	Building-Construction	1,055	880	494	-78	-618	-7,352
237	Civil-Construction	-145	-181	-260	-376	-599	-2,593
31-33	Other-Manufacturing	1,026	924	679	292	-619	-7,518
311	Food-Manufacturing	-51	-122	-285	-535	-1,129	-4,933
321	Wood-Manufacturing	89	40	-72	-242	-637	-3,171
322	Paper Manufacturing	-5	-25	-63	-109	-202	-671
325	Chemical-Manufacturing	-22	-48	-96	-152	-281	-1,365
326	Plastics-Manufacturing	28	20	1	-30	-101	-756
327	Mineral-Manufacturing	25	13	-12	-46	-116	-683
331	Metal-Manufacturing	68	54	23	-21	-130	-468
334	Computer-Manufacturing	89	215	474	848	1,471	5,517
42	Other-Wholesale-Trade	82	30	-90	-264	-774	-4,714
4247	Petroleum-Wholesale-Trade	-4	-8	-20	-42	-125	-1,083
44	Other-Retail-Trade	37	-7	-122	-294	-1,118	-9,128
447	Gas-Station	-7	-16	-40	-86	-230	-2,003
48	Other-Transportation	-67	-152	-329	-590	-1,044	-3,677
484	Truck-Transportation	24	3	-49	-132	-394	-2,383
51-90	Miscellaneous	-5,216	-6,014	-7,786	-10,365	-17,461	-62,959
	Total	***-2,719***	***-4,171***	***-7,494***	***-12,409***	***-26,074***	***-121,570***

APPENDIX 2 – EMPLOYMENT IMPACTS OF CPP BY REGION AND INDUSTRY IN 2025, 2035 & 2050

Table 18: Net FTE Employment Impacts of the CPP by Region and Industry in 2025

NAICS	Industry	Central Oregon	Columbia George	Northeast Oregon	Northern Coast	Portland	South Central South Eastern	Southern Coast	Southern Oregon	Willamette Valley
11	Agriculture	0	0	0	0	0	0	0	0	0
113	Forestry	1	1	1	3	0	1	5	2	1
21	Mining	3	1	4	3	2	15	5	6	4
22	Other-Utilities	3	3	7	1	2	3	3	2	1
2211	Electric-Power	13	18	49	6	9	13	21	11	5
2212	Natural-Gas	-1	0	-1	-1	-2	-2	0	-2	-1
236	Building-Construction	147	73	88	108	91	70	114	94	95
237	Civil-Construction	-21	-24	-13	-22	-12	-8	-43	-18	-22
31-33	Other-Manufacturing	86	104	132	102	121	79	86	111	102
311	Food-Manufacturing	-4	-14	-33	-25	-7	-16	-7	-7	-10
321	Wood-Manufacturing	4	2	4	4	1	7	9	7	4
322	Paper Manufacturing	0	0	0	-20	-3	0	0	0	-2
325	Chemical-Manufacturing	-7	-7	-2	-1	-5	0	-2	-14	-9
326	Plastics-Manufacturing	4	0	3	0	5	0	1	2	4
327	Mineral-Manufacturing	1	6	1	1	1	1	1	1	1
331	Metal-Manufacturing	10	12	3	0	14	0	0	0	14
334	Computer-Manufacturing	13	16	1	0	128	1	9	18	28
42	Other-Wholesale-Trade	3	3	3	1	6	4	2	3	4
4247	Petroleum-Wholesale-Trade	0	-1	-2	0	-1	-2	-1	-1	-1
44	Other-Retail-Trade	-1	-1	-1	-1	-1	-1	-1	-1	-1
447	Gas-Station	-1	-2	-3	-2	-1	-3	-1	-2	-1
48	Other-Transportation	-13	-11	-30	-9	-22	-15	-17	-18	-17
484	Truck-Transportation	0	0	1	0	0	0	0	0	0
51-90	Miscellaneous	-807	-599	-536	-623	-898	-572	-597	-685	-694
	Total	**(567)**	**(420)**	**(322)**	**(474)**	**(569)**	**(426)**	**(412)**	**(486)**	**(494)**
	TOTAL Current Employment	**151,213**	**35,866**	**82,967**	**65,945**	**1,399,354**	**57,717**	**41,589**	**218,419**	**561,959**

Table 19: Net FTE Employment Impacts of the CPP by Region and Industry in 2035

NAICS	Industry	Central Oregon	Columbia George	Northeast Oregon	Northern Coast	Portland	South Central South Eastern	Southern Coast	Southern Oregon	Willamette Valley
11	Agriculture	-73	-726	-492	-202	-64	-356	-227	-163	-188
113	Forestry	-9	-11	-17	-36	-3	-10	-67	-30	-15
21	Mining	-9	-2	-11	-7	-5	-43	-15	-18	-12
22	Other-Utilities	9	7	20	4	6	7	8	7	3
2211	Electric-Power	76	106	286	35	52	78	123	64	31
2212	Natural-Gas	-8	-2	-9	-7	-18	-16	0	-16	-10
236	Building-Construction	-103	-52	-62	-76	-64	-49	-80	-66	-67
237	Civil-Construction	-69	-81	-42	-71	-39	-26	-140	-58	-73
31-33	Other-Manufacturing	-57	-70	-88	-68	-81	-53	-58	-74	-68
311	Food-Manufacturing	-33	-134	-305	-229	-62	-144	-67	-62	-92
321	Wood-Manufacturing	-58	-25	-64	-57	-12	-110	-136	-117	-58
322	Paper Manufacturing	0	0	0	-162	-20	0	0	0	-20
325	Chemical-Manufacturing	-41	-42	-13	-6	-32	-2	-11	-81	-53
326	Plastics-Manufacturing	-22	-1	-14	0	-28	0	-4	-12	-19
327	Mineral-Manufacturing	-7	-54	-11	-7	-11	-6	-5	-9	-8
331	Metal-Manufacturing	-24	-30	-8	0	-33	0	0	0	-35
334	Computer-Manufacturing	87	112	5	3	879	5	62	125	192
42	Other-Wholesale-Trade	-90	-81	-85	-35	-155	-105	-47	-81	-96
4247	Petroleum-Wholesale-Trade	-7	-10	-23	-7	-8	-33	-17	-8	-12
44	Other-Retail-Trade	-130	-121	-104	-144	-97	-132	-131	-144	-115
447	Gas-Station	-21	-31	-44	-22	-10	-42	-16	-26	-16
48	Other-Transportation	-87	-77	-205	-65	-151	-107	-114	-122	-116
484	Truck-Transportation	-43	-31	-74	-28	-38	-29	-56	-60	-36
51-90	Miscellaneous	-2,345	-1,741	-1,558	-1,810	-2,609	-1,662	-1,733	-1,990	-2,016
	Total	**(3,064)**	**(3,093)**	**(2,915)**	**(2,997)**	**(2,602)**	**(2,834)**	**(2,732)**	**(2,941)**	**(2,896)**
	TOTAL Current Employment	**151,213**	**35,866**	**82,967**	**65,945**	**1,399,354**	**57,717**	**41,589**	**218,419**	**561,959**

Table 20: Net FTE Employment Impacts of the CPP by Region and Industry in 2050

NAICS	Industry	Central Oregon	Columbia George	Northeast Oregon	Northern Coast	Portland	South Central South Eastern	Southern Coast	Southern Oregon	Willamette Valley
11	Agriculture	-310	-3,079	-2,086	-855	-271	-1,511	-961	-691	-795
113	Forestry	-41	-52	-83	-175	-14	-48	-322	-143	-70
21	Mining	-49	-11	-60	-41	-28	-243	-87	-103	-69
22	Other-Utilities	-4	-3	-10	-2	-3	-4	-4	-3	-2
2211	Electric-Power	122	169	456	56	83	124	196	102	50
2212	Natural-Gas	-74	-14	-77	-62	-162	-141	-2	-137	-86
236	Building-Construction	-1,230	-613	-737	-900	-763	-581	-949	-788	-791
237	Civil-Construction	-301	-348	-180	-309	-169	-112	-608	-252	-314
31-33	Other-Manufacturing	-698	-848	-1,071	-832	-988	-642	-703	-903	-832
311	Food-Manufacturing	-145	-586	-1,333	-1,000	-273	-631	-291	-272	-402
321	Wood-Manufacturing	-291	-124	-317	-283	-57	-547	-680	-583	-289
322	Paper Manufacturing	-2	0	0	-537	-66	0	0	0	-65
325	Chemical-Manufacturing	-200	-205	-61	-27	-155	-11	-55	-393	-258
326	Plastics-Manufacturing	-168	-4	-107	0	-208	0	-31	-92	-145
327	Mineral-Manufacturing	-38	-319	-64	-38	-63	-34	-29	-51	-46
331	Metal-Manufacturing	-87	-108	-28	0	-120	0	0	0	-126
334	Computer-Manufacturing	327	420	19	10	3,297	20	233	469	722
42	Other-Wholesale-Trade	-547	-490	-519	-213	-942	-639	-286	-492	-584
4247	Petroleum-Wholesale-Trade	-58	-86	-199	-61	-71	-288	-149	-67	-104
44	Other-Retail-Trade	-1,060	-989	-848	-1,179	-788	-1,079	-1,070	-1,179	-937
447	Gas-Station	-186	-267	-388	-195	-85	-369	-143	-228	-141
48	Other-Transportation	-305	-270	-724	-228	-533	-376	-403	-429	-409
484	Truck-Transportation	-259	-185	-446	-171	-227	-172	-340	-365	-218
51-90	Miscellaneous	-8,454	-6,276	-5,616	-6,525	-9,406	-5,991	-6,248	-7,174	-7,268
	Total CPP Employment Impacts	**(14,056)**	**(14,289)**	**(14,477)**	**(13,569)**	**(12,012)**	**(13,276)**	**(12,933)**	**(13,776)**	**(13,181)**
	TOTAL Current Employment	**151,213**	**35,866**	**82,967**	**65,945**	**1,399,354**	**57,717**	**41,589**	**218,419**	**561,959**

APPENDIX 3 – PRICE EFFECTS ON ENERGY COMMODITIES

Table 21: Electricity Price

Electricity Price (2020 ¢/kWh)				
Year	Reference Case	CPP Cost Adder	CPP Policy Price	% Change
2022	9.12	0.00	9.12	0.0%
2023	9.02	0.02	9.04	0.2%
2024	8.94	0.03	8.97	0.3%
2025	8.92	0.04	8.96	0.4%
2026	8.94	0.04	8.98	0.4%
2027	8.94	0.04	8.98	0.5%
2028	8.93	0.04	8.97	0.4%
2029	8.94	0.02	8.97	0.3%
2030	8.91	0.01	8.92	0.1%
2031	8.91	0.03	8.94	0.3%
2032	8.88	0.04	8.92	0.5%
2033	8.91	0.05	8.96	0.6%
2034	8.90	0.06	8.96	0.6%
2035	8.90	0.06	8.96	0.7%
2036	8.86	0.12	8.98	1.3%
2037	8.82	0.18	9.00	2.0%
2038	8.78	0.23	9.02	2.6%
2039	8.75	0.28	9.03	3.2%
2040	8.73	0.33	9.06	3.7%
2041	8.71	0.39	9.09	4.4%
2042	8.70	0.45	9.15	5.1%
2043	8.62	0.52	9.14	6.0%
2044	8.60	0.58	9.19	6.8%
2045	8.57	0.65	9.23	7.6%
2046	8.53	0.76	9.28	8.9%
2047	8.51	0.87	9.38	10.2%
2048	8.48	0.98	9.46	11.5%
2049	8.42	1.10	9.51	13.0%
2050	8.35	1.21	9.56	14.5%

Table 22: Natural Gas

Natural Gas (2020 $/MMBtu)				
Year	**Reference Case**	**CPP Cost Adder**	**CPP Policy Price**	**% Change**
2022	11.50	1.65	13.14	14.3%
2023	10.85	3.43	14.28	31.6%
2024	10.34	3.78	14.12	36.5%
2025	10.73	3.77	14.50	35.1%
2026	11.14	4.15	15.30	37.3%
2027	11.39	4.15	15.55	36.5%
2028	11.87	4.11	15.98	34.6%
2029	12.27	3.66	15.93	29.8%
2030	12.46	3.59	16.05	28.9%
2031	12.61	3.97	16.58	31.5%
2032	12.92	4.30	17.22	33.2%
2033	13.24	4.63	17.87	35.0%
2034	13.44	5.01	18.45	37.3%
2035	13.61	5.70	19.31	41.8%
2036	13.75	6.19	19.94	45.1%
2037	13.85	6.74	20.59	48.6%
2038	14.05	7.22	21.27	51.4%
2039	14.18	7.76	21.94	54.7%
2040	14.32	8.29	22.61	57.9%
2041	14.41	8.38	22.79	58.2%
2042	14.45	8.48	22.93	58.7%
2043	14.54	8.53	23.07	58.7%
2044	14.63	8.56	23.19	58.5%
2045	15.17	8.12	23.30	53.5%
2046	15.20	8.19	23.39	53.8%
2047	15.27	8.15	23.42	53.4%
2048	15.40	8.02	23.42	52.1%
2049	15.55	8.02	23.57	51.6%
2050	15.66	8.10	23.76	51.8%

Table 23: Motor Gasoline and Diesel Fuel

Motor Gasoline (2020 $/gallon)					Diesel Fuel (2020 $/gallon)			
Year	**Reference Case**	**CPP Compliance Cost Adder**	**% Change**		**Year**	**Reference Case**	**CPP Compliance Cost Adder**	**% Change**
2022	3.31	0.00	0.0%		**2022**	3.05	0.00	0.0%
2023	3.42	0.02	0.6%		**2023**	3.31	0.02	0.7%
2024	3.45	0.04	1.1%		**2024**	3.43	0.04	1.2%
2025	3.53	0.09	2.7%		**2025**	3.52	0.09	2.7%
2026	3.56	0.12	3.4%		**2026**	3.56	0.12	3.4%
2027	3.60	0.14	4.0%		**2027**	3.61	0.15	4.1%
2028	3.69	0.17	4.6%		**2028**	3.68	0.18	4.8%
2029	3.75	0.19	5.1%		**2029**	3.72	0.20	5.4%
2030	3.93	0.22	5.6%		**2030**	3.82	0.23	6.1%
2031	3.94	0.24	6.1%		**2031**	3.86	0.26	6.6%
2032	4.02	0.27	6.7%		**2032**	3.90	0.29	7.4%
2033	4.05	0.30	7.4%		**2033**	3.92	0.32	8.3%
2034	4.10	0.33	8.0%		**2034**	3.94	0.36	9.1%
2035	4.13	0.36	8.7%		**2035**	3.96	0.39	9.9%
2036	4.19	0.36	8.6%		**2036**	3.97	0.39	9.9%
2037	4.23	0.36	8.5%		**2037**	4.01	0.39	9.8%
2038	4.28	0.36	8.4%		**2038**	4.04	0.39	9.7%
2039	4.29	0.36	8.3%		**2039**	4.04	0.39	9.7%
2040	4.36	0.36	8.2%		**2040**	4.10	0.39	9.6%
2041	4.40	0.36	8.1%		**2041**	4.13	0.39	9.5%
2042	4.43	0.36	8.1%		**2042**	4.15	0.39	9.4%
2043	4.46	0.36	8.0%		**2043**	4.19	0.39	9.3%
2044	4.47	0.36	8.0%		**2044**	4.19	0.39	9.3%
2045	4.45	0.36	8.0%		**2045**	4.19	0.39	9.3%
2046	4.50	0.26	5.7%		**2046**	4.24	0.30	7.1%
2047	4.52	0.30	6.5%		**2047**	4.26	0.34	7.9%
2048	4.54	0.34	7.6%		**2048**	4.26	0.38	9.0%
2049	4.53	0.35	7.6%		**2049**	4.28	0.39	9.1%
2050	4.54	0.33	7.3%		**2050**	4.27	0.38	8.8%