

OREGON'S 2026 COMPREHENSIVE CLIMATE ACTION PLAN



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Executive Summary

Oregon's Comprehensive Climate Action Plan describes state economywide actions to achieve GHG emissions reduction goals. Oregon is an early adopter of state climate action, and the foundation of this plan is existing state policies and programs that are key to addressing emissions and achieving state goals. Many of these policies are ambitious and the state must continuously assess barriers and act to address them so that they can be fully implemented. At the same time, Oregon needs to be looking forward by preparing to implement additional actions to address the gap to achieving the 80 percent below baseline levels by 2050 goal. This plan includes existing actions to meet the goals, challenges the state may face in implementation, and options to mitigate and address these by bolstering existing policies and establishing additional measures to address the 2050 emissions reduction gap. The CCAP is not Oregon's first report addressing GHG reductions, but it is the most comprehensive as it includes analyses of energy needs, carbon sinks, and consumption-based actions.

This report provides modeled information to inform current and future planning efforts to reduce emissions across all sectors while maintaining a robust economy and a high quality of life for everyone in the state. The CCAP was developed through a collaborative effort by the Oregon Department of Environmental Quality, the Oregon Department of Energy, and the Governor's Office. The development of this report included significant inter- and intra-governmental collaboration with Tribes, state agencies, and local governments. It is based on hundreds of outreach hours with businesses, nonprofits and community-based organizations, and community members at large. This CCAP was also supported through expertise at the U.S. EPA, national networks, and leading modeling entities.

The CCAP is informed by three separate GHG emission inventories: a Sector-Based Inventory, Consumption-Based Emissions Inventory, and Land-Based Net Carbon Inventory. These inventories build the foundation for emission projection models for existing policies and efforts, while also identifying what gaps exist to meet Oregon's goals. Through extensive collaboration and review of modeling outputs and reports, measures to address those gaps are highlighted in this report and include authority, potential funding mechanism, and reduction potential. Examples of potential gap measure opportunities include, among many others: reducing vehicles miles traveled, cleaner and more efficient residential and commercial space and water heating, expanded industrial electrification, building with low-carbon materials in government buildings, and reducing food waste.

Understanding the effects of current, new and expanded GHG mitigation programs is crucial in decision making and charting a path towards meeting Oregon's climate ambitions. The benefits analysis of actions in the CCAP examine reductions of co-pollutants and associated health benefits, including those communities on the front line of climate issues. Conservatively, cumulative economic value of public health benefits through 2050 is approximately \$2 billion. Additional analysis was done to better understand costs associated with climate change for energy consumers and ways to reduce those costs for households.

Ensuring that there is workforce available to support measures proposed, as well as expanding existing jobs in the state, is essential to moving climate measures forward. The three occupations identified in this report with the greatest new demand are electricians, construction laborers, and HVAC and refrigeration mechanics and installers. The jobs study also examined existing programs for job training and skill building, and where more support is needed.

Creating plans to guide the state allows Oregon to be responsive to needs and funding opportunities. These plans also assist in balancing needs for infrastructure investment with resiliency measures. For example, climate and energy planning will help in balancing the need for electricity distribution upgrades

to meet demand growth, while investing in resilience and other infrastructure hardening measures. Planning across the whole system creates efficient processes to address a vast range of outcomes, from reducing wildfire potential to creating jobs and improving the health of those who live, work, and play in Oregon.

Oregon will continue working to update and develop strategies for reducing GHG emissions. The bodies of work that supported the development of this CCAP will continue to be updated and assessed to guide future choices and actions.

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Acronyms and Abbreviations

Acronym or Abbreviation	Definitions
ACC II	Advanced Clean Cars II
ACT	Advanced Clean Trucks
BAP	Business as planned
BAU	Business as usual
BCD	Oregon Building Codes Division
BPA	Bonneville Power Administration
BPS	Building Performance Standard
CBEI	Consumption Based Emissions Inventory
CCAP	Comprehensive Climate Action Plan
CERTA	Climate Equity and Resilience Through Action
CETI	Clean Energy Transition Institute
CFEC	Climate Friendly and Equitable Communities
CFP	Clean Fuels Program
COU	Consumer-Owned Utility
CPRG	Climate Pollution Reduction Grants
DCBS	Oregon Department of Consumer and Business Services
DLCD	Oregon Department of Land Conservation Development
DOT	Department of Transportation
EIA SEDS	Energy Information Administration State Energy Data System
EPA	Environmental Protection Agency
ETO	Energy Trust of Oregon
EQC	Environmental Quality Commission
FRA	Federal Railroad Administration
GET	1.5% for Green Energy Technology in public buildings
GHG	Greenhouse Gas
GHGMI	Greenhouse Gas Management Institute
GO	Governor’s Office
GWP	Global Warming Potential

HEAR	Home Electrification and Appliance Rebates
HES	Home Energy Score
HVAC	Heating, Ventilation, and Air Conditioning
IOU	Investor-Owned Utility
IPCC	Intergovernmental Panel on Climate Change
LIDAC	Low-Income and Disadvantaged Communities
LCI	Land-based Net Carbon Inventory
MHD	Medium- and Heavy-Duty
MSA	Metropolitan Statistical Area
MMT CO ₂ e	Million Metric Tons of Carbon Dioxide Equivalent
NLCD	National Land Cover Dataset
NGHGI	National Greenhouse Gas Inventory
NO _x	Nitrogen Oxides
OCAC	Oregon Climate Action Commission (previously Oregon Global Warming Commission)
ODEQ	Oregon Department of Environmental Quality
ODOE	Oregon Department of Energy
ODOT	Oregon Department of Transportation
OHCS	Oregon Housing and Community Services
OPUC	Oregon Public Utility Commission
ORS	Oregon Revised Statute
OSes	Oregon State Energy Strategy
OSSRP	Oregon Solar + Storage Rebate Program
PCAP	Priority Climate Action Plan
PM _{2.5}	Particulate Matter 2.5 micrometers in diameter or smaller
PPC	Public Purpose Charge
SAF	Sustainable Aviation Fuel
SEED	State Energy Efficient Design program
SBI	Sector Based Emissions Inventory
SUV	Sport Utility Vehicle

TIGHGER	Transformational Integrated Greenhouse Gas Emissions Reduction Project Report
VMT	Vehicle Miles Traveled
VOCs	Volatile Organic Compounds
ZEV	Zero-emission Vehicle

Introduction

Climate change is already harming Oregon’s natural resources. Impacts can be seen in communities throughout the state, particularly in communities that are the least resourced to adapt or relocate. These communities are often the most affected by wildfires, floods, drought, and extreme heat, that are degrading the health and livelihoods of Oregonians. Oregon requires immediate and sustained investments to reduce greenhouse gas emissions and address the adverse effects of climate change.

Oregon has made great strides in achieving GHG emission reductions, but gaps in regulation, policies, programs, and funding persist. The Climate Pollution Reduction Grant is a transformational opportunity to determine pathways to clean technologies, investments in critical infrastructure, and new policies and programs to reduce emissions while improving the quality of life for those who live, work, and play in Oregon.

Oregon’s Comprehensive Climate Action Plan builds on the state’s Priority Climate Action Plan and expands economywide to include additional studies and updated reports to support Oregon in achieving its GHG emissions reduction goals. This report was developed by Oregon’s departments of Environmental Quality and Energy. DEQ provided grant information, data for the sector and consumption-based inventories, and measure expertise. ODOE provided the carbon sequestration inventory, the Business as Usual and Planned models, as well as the gap measure data. DEQ provided qualitative information for the gap measures in the Waste and Sustainable Materials and Food and Agriculture sectors. Community Benefits and workforce sections were developed by ODOE as part of the state’s recently released Oregon Energy Strategy.

Climate Pollution Reduction Grant Overview

The Climate Pollution Reduction Grant program provides grants to states, local governments, Tribes, and territories to develop and implement ambitious plans for reducing greenhouse gas emissions and other harmful air pollution. The U.S. Environmental Protection Agency is authorized to implement this work under Section 60114 of the Inflation Reduction Act.

Through the grant program, EPA seeks to achieve three broad objectives:

1. Tackle damaging climate pollution while lowering energy costs for families.
2. Create well-paying, quality jobs economywide
3. Deliver cleaner air by reducing harmful air pollution in places where people live, work, play, and go to school.

There are three deliverables for this grant: 1) a priority climate action plan submitted in March 2024, 2) a comprehensive climate action plan, and 3) a status report due in May 31, 2027. This report is the second deliverable due to the EPA in accordance with Oregon’s award agreement.

Priority Climate Action Plan

Oregon’s Priority Climate Action Plan was submitted to the EPA on February 29, 2024. Based on that plan, Oregon was awarded funds to implement the Climate Equity and Resilience Through Action grant.

The three main areas identified in Oregon’s PCAP were: 1) transportation, 2) residential and commercial buildings, and 3) waste and materials management. These categories contribute the most GHG emissions in Oregon and were identified in prior climate planning efforts as key areas for future reduction efforts.

The PCAP laid out the critical measures that will leverage federal investments to accelerate Oregon emissions reductions efforts for a vibrant environment, for the health of our communities, and for a

sustainable future. Oregon's CCAP builds upon those same concepts applied economywide and impacting all sectors.

Comprehensive Climate Action Plan

Oregon's Comprehensive Climate Action Plan includes measures for the state to achieve its near- and long-term climate goals while also supporting a prosperous economy and improving Oregonians' overall quality of life. It is built on data and analysis from numerous bodies of work and agency efforts to better inform Oregon about GHG sources, mitigation options, and sequestration opportunities. This plan identifies economywide strategies and measures to achieve Oregon's climate goals. It considers effects of these measures on human health, workforce needs, local communities, and economic development. The foundation of the report is Oregon's multiple GHG emission inventories and modeling results used to inform the Oregon Energy Strategy. These bodies of work that support the CCAP for climate planning and prioritization and will continue to be updated and assessed to guide future choices and actions.

The Comprehensive Climate Action Plan includes these required elements:

- GHG Inventory
- GHG Emissions Projections
- GHG Reduction Targets
- Quantified Reduction Measures
- Benefits Analysis
- Review of Authority to Implement
- Intersection with Other Funding
- Workforce Planning Analysis
- Next Steps, Future Budget, and Staffing Needs

This report walks through the various data sets, models, and reports developed to support the required elements for the CCAP.

Oregon will continue to build on the goals of the CCAP, using new data and analysis to provide additional insight into the efficacy of actions, identify new opportunities to address emissions and overcome barriers. At the time of publication, Oregon is already assessing the effects of GHG reduction from additional actions, developing natural carbon solutions policy recommendations, and assessing additional energy sector workforce needs. The results of these and future state efforts will help build on the foundational information produced in this plan.

Approach for Developing the Comprehensive Climate Action Plan

The plan provides a comprehensive list of measures to achieve our goals, but it also includes additional potential actions that can be taken that address emissions beyond Oregon's sector-based emissions targets. The measures in the CCAP were determined by assessing current emissions, forecasting Oregon's population and economic growth over the planning horizon, and comparing emissions forecasts that are expected to occur without policy actions to reductions expected from implementing existing and new policies and programs.

The CCAP was developed through a collaborative effort by the Oregon Department of Environmental Quality, the Oregon Department of Energy, and the Governor's Office. It is informed by existing efforts that identify major sources of climate pollution in Oregon and modeling exercises to inform the Oregon Comprehensive Climate Action Plan – EPA Grant #02J38701

emissions reductions expected from different policy actions. Broad groups of stakeholders informed the design of the modeling inputs and assumptions which were integral to developing options beyond existing policies and programs.

Existing Policy Guidance and Analysis

In 2023, the Oregon Global Warming Commission (renamed the Oregon Climate Action Commission as of 2024) published the [Roadmap to 2030](#) and the [Transformational Integrated Greenhouse Gas Emissions Reduction \(TIGHGER\) Project Report](#), which presented recommendations for state climate action moving forward. These recommendations were informed by a GHG emissions reduction forecast developed by Sustainability Solutions Group (SSG), ODOE, and the Oregon Climate Action Commission. The forecast assessed how close existing policies and programs would get the state to meeting its goals.

The Roadmap to 2030 recommended six overarching strategies for maintaining and increasing Oregon's climate action ambition:

1. Support robust and continuous implementation and funding of existing climate programs and regulations.
2. Adopt updated state GHG goals consistent with the best available science.
3. Advance a set of additional climate actions that can help Oregon meet an accelerated GHG emission reduction goal of 45 percent below 1990 levels by 2030 (TIGHGER Project).
4. Support further study and analysis to continue to guide effective climate action over time.
5. Strengthen governance and accountability for Oregon climate action.
6. Position Oregon to take full advantage of federal investments in climate action.

The approaches for developing the TIGHGER analysis and recommendations are aligned with guidance from EPA. Other existing efforts that guided CCAP development include the [Climate Friendly and Equitable Communities program](#), [Statewide Transportation Strategy \(STS\) - a 2050 vision for reducing greenhouse gas emissions](#), local jurisdiction climate action planning, the [Resilient Efficient Buildings Taskforce](#), the [Climate Change Vulnerability Assessment](#), a [report to the legislature on opportunities to reduce consumption-based emissions](#), and plans and procurement strategies for energy sector climate emission reductions and community benefits captured in Oregon utilities' integrated resource and clean energy plans.

New Policy Guidance and Analysis

Since the TIGHGER analysis was conducted and the OCAC recommendations released, progress has been made in reducing GHG emissions and the policy landscape has evolved. The development of the CCAP presented an opportunity to update the TIGHGER analysis by assessing and updating existing and new policies and programs. The CCAP also supported a separate modeling exercise led by ODOE to assess the least-cost options in the energy sectors to meet Oregon's goals. The modeling provided additional information on energy policies and programs that could be used to meet emissions reduction goals. Together, these analyses informed the CCAP measures presented later in this report. ODOE also led the development of a new land-based carbon sequestration inventory that assessed net carbon emissions of Oregon's natural and working lands that will serve to inform future policy development on ways the state can leverage these lands to further reduce emissions. The following sections will describe these projects, their design elements, how they were informed by stakeholders, and how they contribute to this CCAP.

Inventories

Three different carbon accounting data sets inform the CCAP: a Sector-Based Emissions Inventory, Consumption-Based Emissions Inventory, and a Land-Based Net Carbon Inventory. Increasing atmospheric concentration of GHG emissions caused by human activities is the biggest driver of global climate change.¹ The IPCC indicates that system-wide transformation is necessary to minimize the impacts of climate change, and this will require participation from all actors regardless of their contribution to global GHG emissions.² To understand Oregon's contribution to climate change we must understand the contributions by Oregon and Oregonians to global emissions of GHGs. To better understand the extent to which Oregon contributes to climate change, we account for the emissions physically occurring within the state and the emissions occurring globally as a result of what we consume.

Oregonians generate emissions directly from activities such as cooking dinner, driving cars, and heating homes. We also indirectly create GHG emissions in other areas of the world when we purchase electricity, goods, or food manufactured in other states or countries. Land use decisions such as forestry and farm practices can also lead to carbon being stored in soils and trees, and stored carbon being removed and put into the atmosphere.

In acknowledgment of these different ways we contribute to global emissions, DEQ has historically estimated statewide GHG emissions in two ways:

1. Sector-Based Inventory (SBI): Emissions produced in Oregon from its transportation, residential, commercial, industrial, and agriculture sectors, including electricity produced elsewhere but used in the state.
2. Consumption-Based Emissions Inventory (CBEI): Emissions produced around the world due to Oregon's consumption of energy, goods, and services.

These two inventories characterize and quantify the anthropogenic (human-caused) GHG emissions resulting from activities occurring in Oregon and actions taken by Oregonians that contribute to global climate change.

The SBI is the longest-standing method for tracking Oregon's emissions and is similar to the methods used by many other states and countries. The CBEI is a less common method but is increasingly used by state and local governments to better understand additional ways that residents, businesses, and governments contribute to climate change. Both inventories allow us to understand how we contribute to emissions and how this is changing over time.

In addition to these inventories, Oregon recently developed its first Land-Based Net Carbon Inventory to estimate carbon emissions, removals, and stocks from all of Oregon's lands from 1990 to 2024. The LCI establishes a baseline for carbon emissions and removals from the land, providing science-based data to inform additional policies Oregon could leverage to further reduce in-state emissions.

The three inventories provide different, but sometimes overlapping, accounts of state GHG emissions contributions. While the SBI is the metric by which the state tracks progress on emissions reduction targets, all three serve to inform opportunities to reduce or avoid global emissions. Together these inventories offer a more comprehensive and complete view of Oregon's contribution to GHG emissions.

¹ Intergovernmental Panel on Climate Change. (2021). *Climate change 2021: The physical science basis. Summary for policymakers*. In V. Masson-Delmotte et al. (Eds.), Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. p 1535. <https://doi.org/10.1017/9781009157896>.

² Intergovernmental Panel on Climate Change. (2023). *A global assessment of actors and their roles in climate change adaptation*. Nature Climate Change, 13(11), pp 1250–1257. <https://doi.org/10.1017/9781009157926>.

Sector-Based Inventory

DEQ developed a statewide sector-based inventory of major sources of GHG emissions. This includes emissions produced in Oregon from transportation, residential, commercial, industrial, and agriculture sectors, including electricity produced elsewhere but used in state. The SBI was prepared using the following data resources:

- [EPA’s State Inventory Tool](#)
- Data reported to [Oregon’s Greenhouse Gas Reporting Program](#)
- Data reported to EPA’s Greenhouse Gas Reporting Program
- [Estimates of additional waste-sector emissions](#) from DEQ’s Materials Management Program

The Oregon 2023 SBI includes the following sectors and gases.

Sectors:

- Transportation
- Electricity consumption
- Residential and commercial
- Industry
- Agriculture

Greenhouse Gases (across all sectors):

- Carbon dioxide
- Methane
- Nitrous oxide
- Fluorinated gases (F-gases) including hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride

Table 1 includes Oregon GHG emissions in million metric tons of carbon dioxide equivalents by economic sector. Please see [Appendix A](#) for additional sector details and GHG emissions by source.

Table 1. Oregon Greenhouse Gas Emissions in MMTCO₂e by Economic Sector

Sector Totals	1990	2021	2023
Transportation	21	23	20
Electric Power Consumption	17	18	17
Residential and Commercial	6	9	9
Industry	7	7	7
Agriculture	6	5	5
Total Emissions (Sources)	56	62	59

Consumption-Based Inventory

Oregon’s consumption-based inventory estimates global lifecycle emissions associated with economic consumption of households and government entities, as well as business capital investments (including construction). Oregon was the first subnational government in North America to perform this type of analysis, publishing its first CBEI in 2011 for calendar year 2005. DEQ has subsequently updated the inventory for calendar years 2010, 2015, 2021 and 2023, along with a first-order estimate of consumption-based emissions for 1990. DEQ led the development of the CBEI through extensive

modeling and research and informed by public engagement that included consultation with the OCAC and several ad hoc groups formed to support DEQ’s research.

The most recent inventory work culminated in September 2024 with the publication of a [report](#) to the Legislature on opportunities to reduce consumption-based emissions, a [technical document](#) with detailed analysis informing that report, and an update to [Oregon’s consumption-based emissions inventory](#). Results of the 2024 CBEI analysis and research were used to help identify emissions reduction measures for inclusion in this CCAP.

The CBEI was prepared using a variety of data resources, including but not limited to:

- EPA’s national inventory
- Oregon’s SBI
- International emissions factors produced by the Center for International Climate Research.
- The IMPLAN economic modeling system
- Multiple other data points published by various federal government agencies, such as the U.S. Department of Energy, EPA, U.S. Bureau of Transportation Statistics, Federal Highway Administration, U.S. Maritime Administration, and Federal Aviation Administration

Oregon’s most recent CBEI estimates emissions by four broad meta-categories, 16 broad categories, 59 sub-categories, and 528 different commodity sectors. Emissions are estimated by lifecycle stage (at the category level), type of consumer (household, government, business capital), and location (Oregon, other U.S., other countries). Top-line emissions estimates at the category level are provided in Table 2 below for 2005, 2010, 2015, 2021, and 2023. Additional information on consumption-based emissions can be viewed in [Appendix B](#) and on DEQ’s [website](#).

Table 2. Category-level consumption-based GHG emissions in million metric tons of CO2e for Oregon, 2005 – 2023

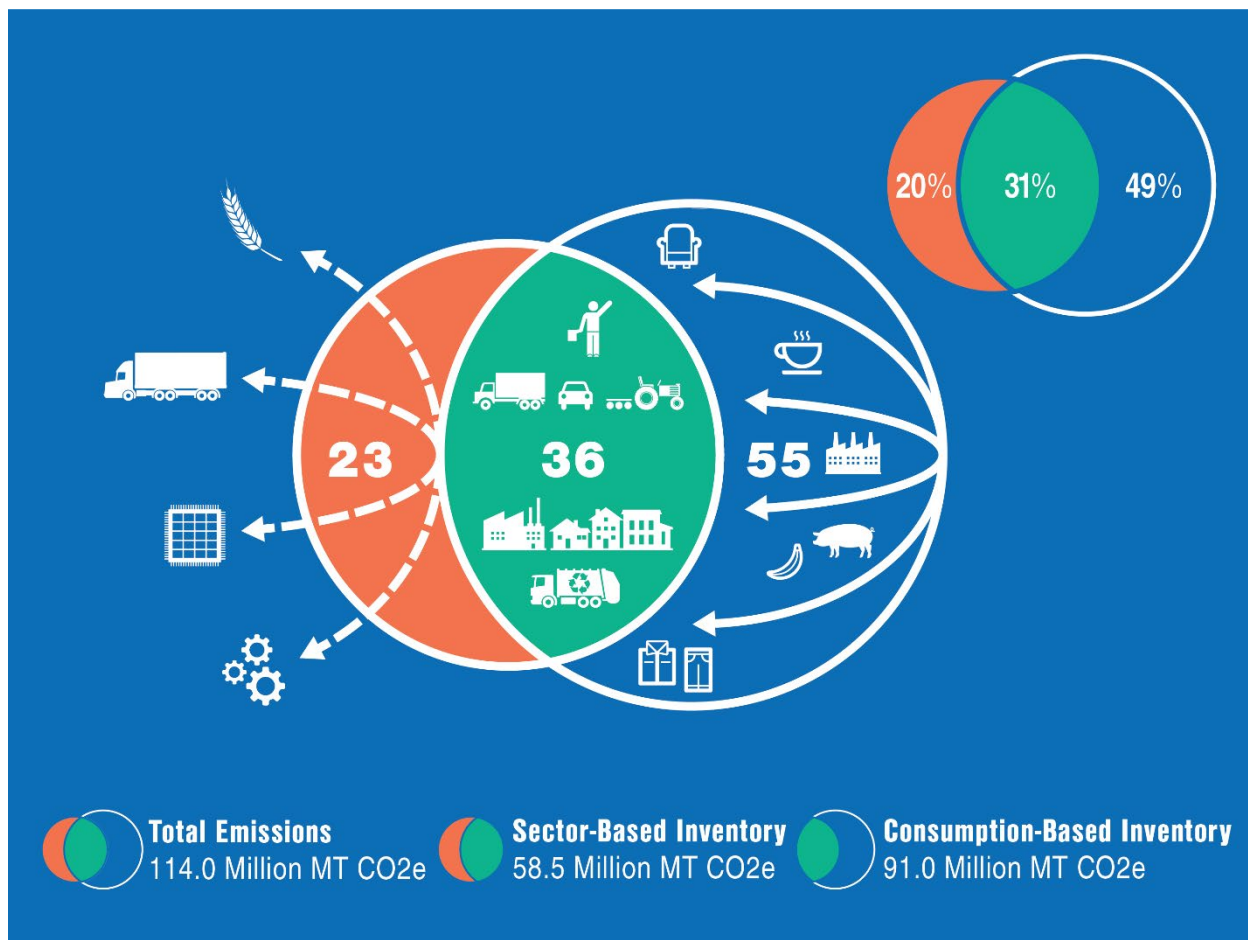
Categories	2005	2010	2015	2021	2023
Vehicles and parts	18.5	16.1	17.8	16.4	16.3
Food and beverages	9.7	11.3	11.8	14.6	13.9
Appliances	11.7	12.9	11.0	11.9	11.7
Services	5.6	7.0	10.4	9.7	8.9
Other manufactured goods	5.4	4.6	4.6	7.6	7.7
Construction	5.3	5.6	6.7	7.3	7.1
Transportation services	3.5	4.0	4.4	5.0	6.8
Healthcare	4.2	5.4	6.1	5.4	4.8
Electronics	3.7	2.9	3.4	4.1	3.4
Furnishings and supplies	3.4	3.1	3.1	3.2	2.9
Retailers	2.2	2.3	3.3	4.1	2.8
Wholesale	0.8	0.6	1.1	1.4	1.2
Lighting and fixtures	2.9	1.7	1.6	1.3	1.2
Water and wastewater	0.3	0.5	0.5	0.5	0.5
Clothing	1.9	1.5	1.1	1.0	0.4
Other	0.4	0.6	1.9	2.1	1.5
Total	79.6	80.2	88.7	95.6	91.0

Note: Totals may not add exactly due to rounding.

Oregon’s sector- and consumption-based GHG inventories depict points of overlap as well as unique contributions and areas that need the most focused reductions:

- **Transportation** is the single-largest contributing sector under both inventories, producing 35 percent of state SBI emissions, and 25 percent of CBEI emissions (including “vehicles and parts” and “transportation services” categories).
- **Residential and commercial buildings** contribute 35 percent of the state SBI emissions. These are primarily associated with electricity and fuels used to heat, cool, and power buildings, but also include emissions from waste. There is considerable overlap in building emissions between the sector-based and consumption-based inventories, such as operating residential, commercial, and government buildings, including appliances and lighting. Emissions associated with construction itself – including both construction activities as well as “embodied carbon” in construction materials – contribute 8 percent of emissions in the CBEI.
- **Food and beverage** is the second-largest category in the CBEI, producing 15 percent of emissions. This overlaps with SBI emissions from in-state farms, ranching, and food manufacturing.

Figure 1. 2023 Oregon Sector-Based and Consumption-Based Inventories Overlap (DEQ)



In 2023, Oregon’s consumption-based GHG emissions were estimated to total 91.0 MMTCO₂e. This is compared against the state’s SBI, with an estimate of 58.5 MMTCO₂e.

The two inventories share approximately 36 MMTCO₂e in common. These shared emissions include direct emissions from vehicle and appliance use by households and governments, emissions at the point of electricity generation used by households and governments, and other emissions in the commercial

and industrial sectors that occur in-state and which were part of supply chains that satisfied Oregon consumption.

The crescent on the left side of Figure 1 represents emissions that are unique to Oregon’s SBI. In 2023, these emissions were estimated at 23 MMTCO₂e. These include emissions from in-state businesses producing goods and services consumed by, or as part of the supply chain of goods and services consumed by, households and governments not based in Oregon.

The crescent on the right side of Figure 1 represents emissions that are unique to Oregon’s CBEI. In 2023, these emissions were estimated at 55 MMTCO₂e. These include emissions in other states and nations associated with satisfying consumption by Oregon households, governments and businesses. For energy, these “imported” emissions are primarily upstream emissions associated with fuel extraction, and in the case of liquid fuels, “well to pump” emissions such as petroleum refining. Many of the emissions are associated with the consumption of imported materials. Significantly, these imported emissions (55.4 MMTCO₂e) are almost as large as Oregon’s entire sector-based inventory (58.5 MMTCO₂e). Oregon’s CBEI spotlights additional emissions, and opportunities to reduce emissions almost as large in quantity as those from the SBI that forms the basis for most climate-related policy in Oregon.

Land-Based Net Carbon Inventory

Oregon’s first [Land-Based Net Carbon Inventory](#) establishes a historical baseline for carbon in specific pools and rates of emission and sequestration in Oregon’s ecosystems. It provides the state, decision-makers, and the public a better understanding of the effects of changes on GHG emissions and removals from Oregon’s land over the last 35 years. The LCI was developed to be complementary to the state’s SBI and CBEI, without duplicating emissions. ODOE and DEQ continue to assess where overlap may occur and refine the LCI accordingly.

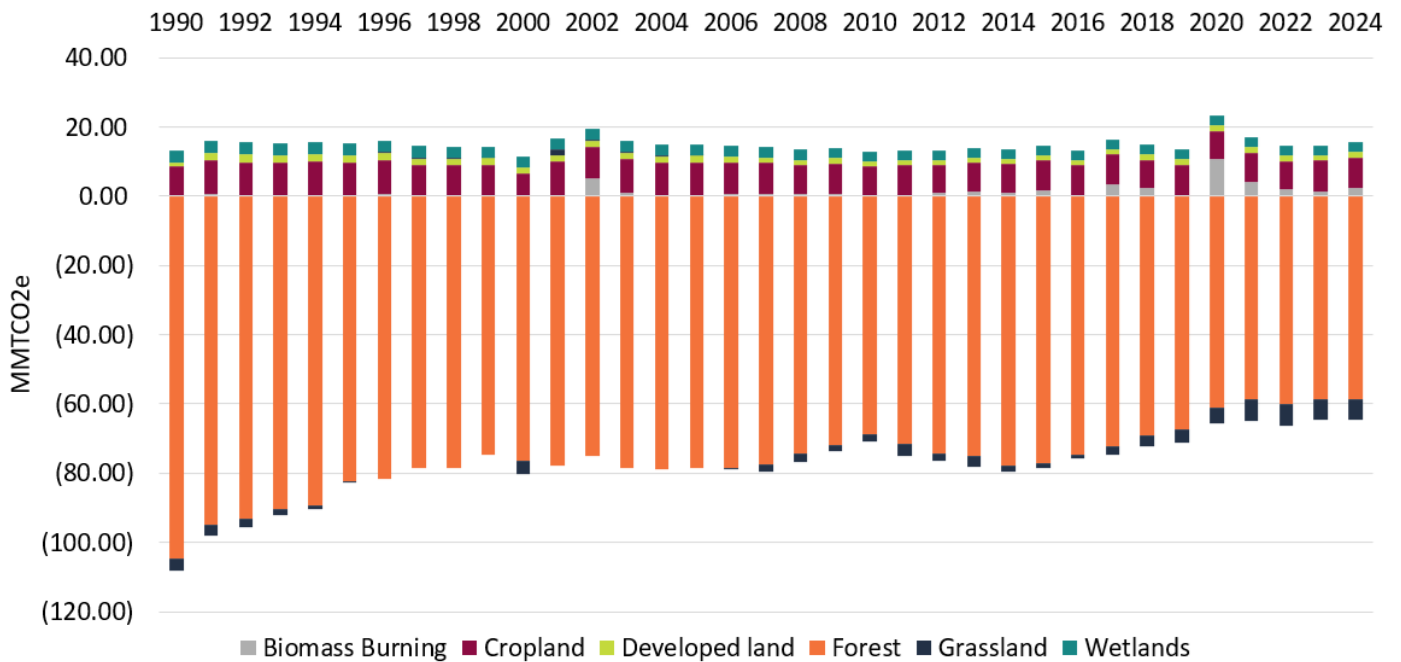
ODOE consulted with the OCAC, DEQ, and the departments of Land Conservation & Development, State Lands, Agriculture, Forestry, Fish & Wildlife, Parks & Recreation, and the Watershed Enhancement Board in developing the assumptions and inputs for the LCI. ODOE also engaged with and requested input on proposed inventory methodologies from regional soil and water conservation districts, federal agencies (EPA, NOAA, USDA), non-governmental organizations, academic researchers and university extension office employees at Oregon State University and the University of Washington, in addition to the public. Draft findings for the Inventory were presented to the public in a webinar on December 5, 2025 and made available online for public comment. Feedback received throughout the project was incorporated into the inventory development wherever possible.

ODOE’s Director and the OCAC Chair sent a formal letter in 2024 to the Chairs of the nine federally recognized Tribes in Oregon, extending an offer to advise ODOE in the development of the LCI through the OCAC. Tribes were not able to participate due to staffing limitations. The Coquille Tribe and Affiliated Tribes of Northwest Indians pointed ODOE staff to Tribal climate resilience documents and ODOE will continue to engage more in 2026.

ODOE contracted with the Greenhouse Gas Management Institute to produce the LCI. They used guidelines from the IPCC and EPA to produce estimates of carbon emissions and reductions for six land cover categories (Forest Land, Cropland, Grassland, Wetlands, Developed Land, Biomass Burning) with 49 subcategories. The inventory process included assessing more than 30 state-level datasets for quality and coverage over time and developing methods for producing estimates of emissions and removals for all categories and subcategories. Datasets used in the LCI included spatial (e.g., land cover), tabular (e.g., acres of crops planted per acre by county), or anecdotal (e.g., typical crop rotations by county). Methods were sometimes mixed, involving geospatial analysis and biogeochemical modeling, among others. For more information on the methods and data used in the LCI, see [Appendix C](#).

Results from the LCI indicate that Oregon’s lands act as a net carbon sink, sequestering substantially more carbon than emitted in a given year. In Oregon, most carbon emissions are sequestered and stored in forests, primarily from growth in forest biomass and in durable harvested wood products. However, the relative ability to store carbon in natural lands has decreased, particularly in forests. Figure 2 shows a drop in Oregon’s net carbon sequestration from 95 MMTCO₂e in 1990 to 49 MMTCO₂e in 2024. This reduction is largely a result of losses in total forest area coupled with lower production of harvested wood products; but also due to rising emissions from the conversion of drained organic soils³ for agriculture, other development, and increasing wildfires. Wildfires, particularly in forests, are a major growing emissions source.

Figure 2. GHG Emissions and Removals in Oregon from 1990-2024 by Land Category (MMTCO₂e)



Key Inventory Findings

Sector-based emissions in Oregon are trending downward, but not at the rate needed to meet Oregon’s goals. However, it is still early to tell the impact of the two big lever GHG emissions programs – House Bill 2021 clean electricity targets and the Climate Protection Program – since neither have yet to complete their first compliance period. Transportation contributed 35 percent of sector-based emissions in 2024, followed by the Electricity sector at 29 percent. Emissions in both sectors are declining, primarily due to increasing fuel efficiency standards for vehicles and state renewable and clean electricity policies. However, the use of passenger and freight vehicles is increasing, offsetting some of the progress in sector-based emissions. Reductions in the electricity sector are primarily driven by increases in the amount of solar and wind resources in Oregon’s electricity mix coupled with declining coal generated power. These gains are somewhat offset by natural gas-powered electricity, the use of which continues to increase.

Results from Oregon’s sector- and consumption-based GHG inventories indicate that Oregon’s contribution to global concentrations of GHGs fell slightly between 2021 and 2023, but sector-based

³ Drained organic soils are ancient peatlands that have been drained for human use.

emissions are still near, and consumption-based emissions are well above, historic levels. Combustion of fossil fuels is the key driver of emissions in both inventories, with the transportation sector in the SBI and the purchase and use of vehicles in the CBEI comprising the largest share respectively. This is because the materials are often created in countries where lower emissions energy sources and energy efficiency are not widely adopted.

Emissions in Oregon are generally trending downward, but more is needed for the state to achieve its goals. The inventories point to transportation and electricity as the largest sources of emissions, primarily from the combustion of fossil fuels either to generate power or move vehicles. By extension, there are additional global emissions stemming from the production of the vehicles and infrastructure used in these and other sectors. Production and consumption of goods such as building materials and agricultural products also contribute significantly to emissions. At the same time, wildfires are reducing the amount of carbon Oregon's forests can store. Policies that address emissions in power generation, transportation, and wildfire mitigation are essential for Oregon to be successful. Focusing on these sectors in the near-term plays a major role in helping Oregon decarbonize. However, transportation and electricity reductions alone cannot get Oregon to the 2050 goal. Actions across all sectors will be needed to meet that goal.

Modeling

ODOE led the development of two different economywide modeling scenarios to inform the development of the CCAP measures. One model specifically assessed future emissions for the state with and without existing policies and programs. The other model developed energy system supply scenarios that would enable Oregon to achieve its climate goals in order to assess how different energy policies affect the ability and cost to decarbonize. Together, these models provide insights into how far existing policies get us toward our goals and what are the least-cost energy options to address the remaining gap. Currently Oregon has ambitious policies in place, but reductions from these will only be realized *if relevant state and local programs are sufficiently staffed and the policies are fully implemented and resourced*. The information presented in the next sections will describe the two models, how they work, and how they inform the measures provided later in the report.

TIGHGER 2.0 Modeling (Transformational Integrated Greenhouse Gas Emissions Reduction)

The TIGHGER model shows that Oregon can meet the majority of its GHG emissions reduction goals, about 76 percent, if existing programs and policies are fully funded and implemented. Many of these reductions rely on policies addressing emissions in the transportation and electricity sectors, the two largest sources of emissions identified in the SBI.

The model forecasts future GHG emissions, taking into account population and economic growth. It quantifies the total emissions reductions needed to achieve Oregon's specific carbon-dioxide equivalent targets by modeling future emissions without the influence of government policies and comparing this to emissions with those policies and programs in place. This quantified total amount represents the total emissions that measures produced in this plan will need to cover.

State agencies responsible for the implementation and/or oversight of the state policies included in the modeling were primary contributors to the TIGHGER project. The modeler, SSG, collaborated with other

state agencies in the development of the first TIGHGER model published in 2023, using Oregon-specific data provided by agency programs reflecting Oregon-specific program goals and forecasted outcomes.⁴ These included ODOE and DEQ as well as the departments of Transportation, Land Conservation and Development, Housing & Community Services, Agriculture, and Forestry, as well as the Public Utility Commission, Building Codes Division, Health Authority, and the Oregon Water Enhancement Board. SSG and ODOE engaged with these same agencies to inform the TIGHGER 2.0 update.

ODOE also conducted stakeholder engagement and outreach on the modeling methodology for TIGHGER 2.0. From January through September 2025, ODOE staff and SSG held 30 meetings to discuss updates to the inputs and assumptions for the model. In addition to state agencies, meetings also included the Portland-area metropolitan planning organization and the Northwest Power and Conservation Council – an organization that develops a regional power plan informing grid decisions in Oregon. Participants helped provide information on any changes to policies or programs since the 2023 model, reviewed and modified proposed updates on inputs and assumptions, and agreed on the final inputs. ODOE consulted the Oregon Climate Action Commission on the modeling inputs, assumptions and draft forecast results developed with SSG and other agencies.

Final modeling results were presented to the OCAC and published on their webpage for public comment from October 10-31, 2025. ODOE reviewed and incorporated comments into the modeling assumptions and inputs, primarily to update data center load growth assumptions and some modifications relating to state clean electricity and clean fuels policies assumptions. SSG conducted the modeling and ODOE reviewed and updated the results. More information on assumptions and how programs and policies were categorized can be found in [Appendix D](#).

Business-as-Usual

The BAU scenario takes into account forecasts on population growth, economic development, and climate change (represented by projections of heating and cooling degree days), and data center load growth. These factors affect GHG emissions resulting from energy consumption across different sectors. It also assumes no policies and programs are influencing emissions, allowing the model to assess a baseline forecast that includes only non-policy/program-based influences. This information is then used to calculate a BAP scenario by incorporating existing policies and programs to see how they reduce the GHG emissions of the BAU.

The use of the term “Business-as-Usual” for this CCAP differs from the EPA definition, which includes emissions resulting from continued implementation of all existing policies and programs. The Business-as-Planned scenario as defined provides the information for the EPA’s BAU requirement. The use of these terms is the result of historical TIGHGER modeling terminology, and for consistency between this and other state reports, the terms are used throughout the report as defined here.

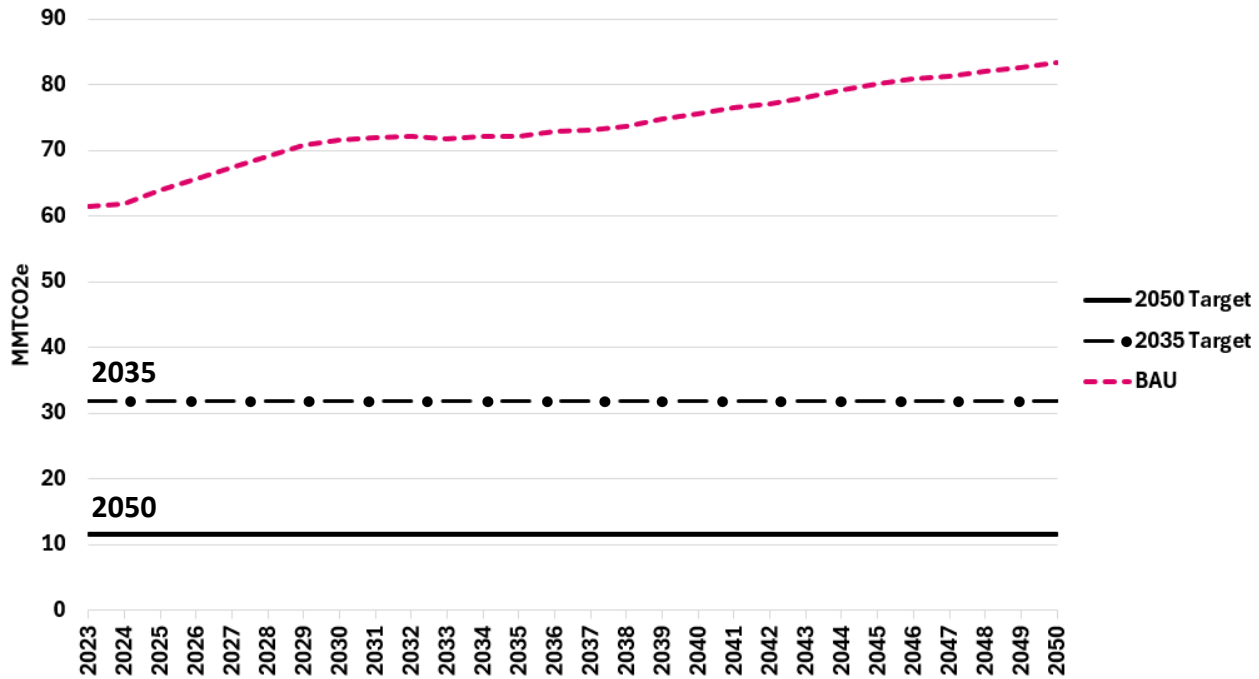
The BAU scenario assumes electrification of end uses, including vehicles and heat pumps, progresses through market forces alone. More of these technologies continue to rely on fossil fuels, which results in an overall increase in energy demand. Results for the BAU scenario are illustrated in Figure 3, which shows sector-based GHG emissions rising from 62 MMTCO_{2e} in 2023 to 83 MMTCO_{2e} in 2050, with the most significant sources of emissions from the electricity and transportation sectors, driven by data center development and population increases. Electricity load growth from data center development is the main driver for the increase and accounts for 27 percent of new energy demand. Increases in

⁴ Oregon Global Warming Commission. (2023 March). Transformational Integrated Greenhouse Gas Emissions Reduction Project Report. p 5.

<https://static1.squarespace.com/static/59c554e0f09ca40655ea6eb0/t/64275c449499a72eb55aa206/1680301133140/2023-TIGHGER-Project-Report.pdf#page=9>.

emissions from the transportation sector are due to multiple factors including; population and economic growth increasing the total amount people drive as well as federal actions designed to decrease fuel efficiency of vehicles on Oregon's roads.

Figure 3. Business-as-Usual Projected Sector-Based Emissions

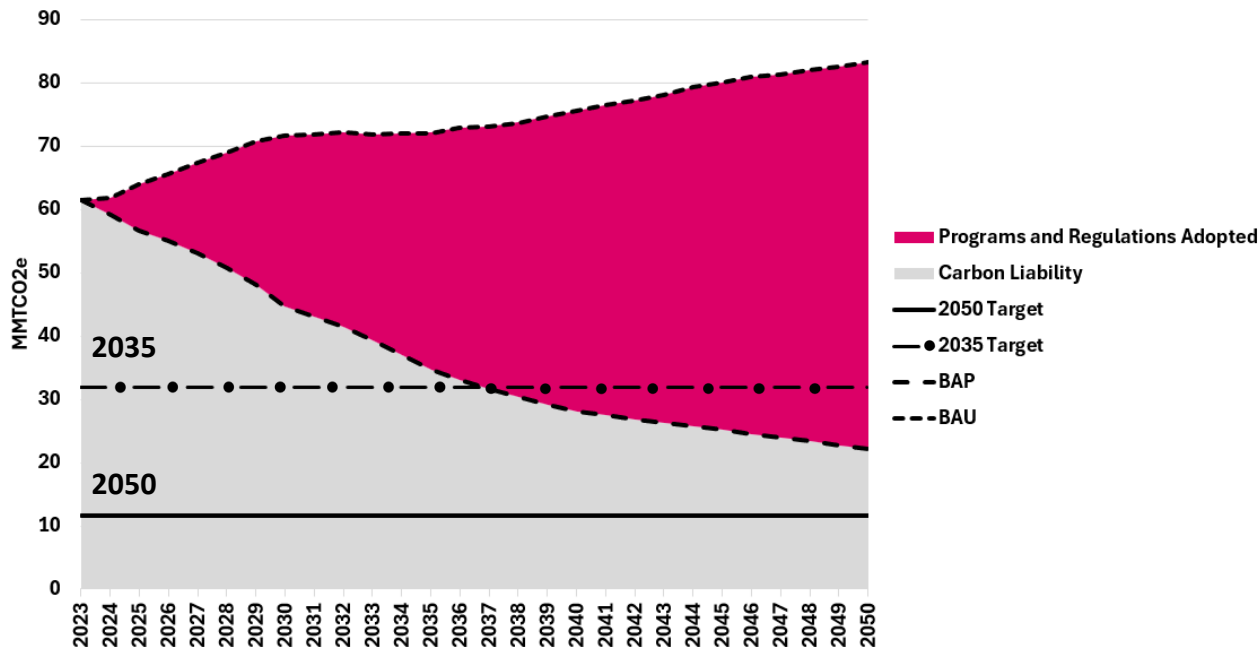


Consumption-based GHG emissions reductions included in the CCAP are calculated assuming future emission intensities are fixed. The BAU projection for these reductions includes future emissions related to projected population and income growth, and turnover of existing building stock. Sector-based and consumption-based emissions are reported separately.

Business-as-Planned

The BAP scenario incorporates federal and state regulations and programs that are currently in effect. These policies drive emissions reductions over the planning horizon. As shown in Figure 4, sector-based emissions in this scenario decline from 62 to 22 MMTCO₂e by 2050 but are still 10.6 MMTCO₂e higher than the 2050 goal.

Figure 4. Business-as-Planned Projected Sector-Based Emissions



Fully implementing existing GHG reduction policies and programs is foundational to Oregon’s success, as the BAP scenario yields about 76 percent of total emissions reductions needed to meet the 2050 goal. Over the planning horizon, data center and population growth still apply upward pressure on emissions, but the model shows state policies that encourage transportation electrification, clean electricity generation, and lower carbon fuels are strong enough to overcome this and drive emissions downward. About 95 percent of reductions in the BAP result from five major state policies: state clean electricity goals (HB 2021), DEQ’s Climate Protection Program, Advanced Clean Cars II, Clean Fuels Program, and Advanced Clean Trucks. Some GHG sources, such as fugitive emissions from natural gas distribution, landfill gas, and industrial and large commercial process emissions continue to grow in this scenario.

Recent Congressional actions purporting to disapprove of Section 177 waivers of the Clean Air Act have created uncertainty about the future of the ACCII, ACT, and Heavy-Duty Engine & Vehicle Omnibus rules, which represent 19.7 percent of planned emissions reductions by 2050 in the TIGHGER model. The validity of these actions is currently being litigated, but should the action stand, this plan would need to be updated and new pathways to achieve those emissions reductions identified.

Oregon Energy Strategy

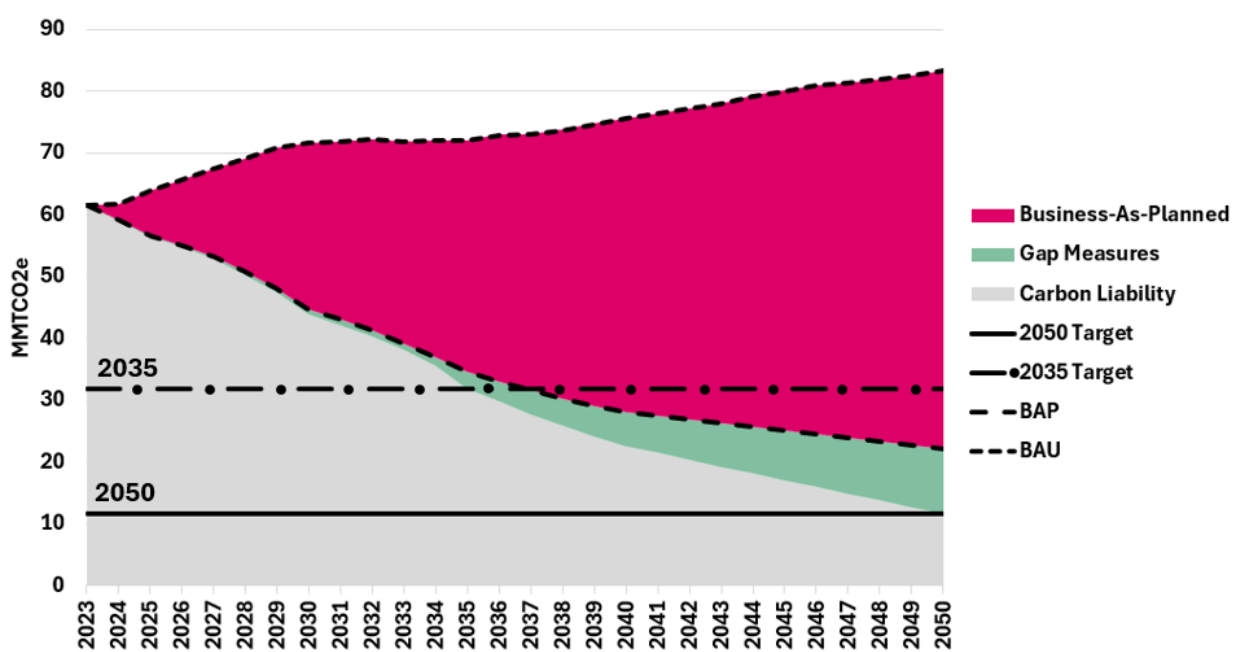
The Oregon Department of Energy collaborated with the Clean Energy Transition Institute and Evolved Energy Research to analyze energy-focused pathways that would achieve GHG emissions reduction goals as a tool to inform the development of the [Oregon Energy Strategy](#). These pathways were developed using two interconnected models, a bottom-up energy demand model and an economywide cost optimization supply model. The first model calculated future energy demand across 80 sub-sectors of the

economy. The second model used information on forecasted future costs for different types of energy resources to determine the least cost mix of supply-side investments and operational decisions necessary to reliably meet that demand. More information about the models can be found in CETI’s [technical approach document](#) and Evolved Energy Research’s [technical documentation](#). The information produced in this model directly informed many additional measures for the CCAP needed to address the gap in achieving Oregon’s GHG goals. Some additional measures were also drawn from modeling performed by DEQ and Stockholm Environment Institute assessing GHG reductions from consumption in Oregon.

The energy strategy modeling was used to inform the development of additional measures in the CCAP that address the 10.6 MMTCO₂e gap in emissions reductions identified in the TIGHGER BAP scenario. The model is not an emissions forecasting tool, but because it is designed to model future energy scenarios that will achieve a specific GHG target, it includes a calculation for energy-related emissions sources. Both the energy strategy and TIGHGER BAP model use the same assumptions for existing emissions and policies. This means that we can estimate associated emissions achieved beyond BAP using the energy strategy model. Because the model is designed to meet the 2050 goal, the sum of additional measures beyond BAP would fill the 10.6 MMTCO₂e gap. ODOE used the Reference Scenario as the basis for the CCAP gap measure assessments, because this was the least-cost scenario modeled. Evolved Energy Research calculated the percentage that each measure contributes to the total gap in the Reference Scenario, and SSG used these percentages to calculate specific GHG emission reductions for each gap measure.

Figure 5 illustrates the breakout emissions covered by BAP measures as the larger wedge on top (red), with the gap measures making up the remaining smaller wedge at the bottom (green). In the CCAP, measures are categorized as either BAP or Gap.

Figure 5. BAP and Gap Measures Share of Emissions Reductions



Gap measures were also informed by stakeholders through the energy strategy development process. The model included additional assumptions beyond BAP that were determined by consulting with eight [Technical Working Groups](#) of energy system, community, environmental, and land use experts. The groups included energy producers, developers, and suppliers, community experts, and state agency

policy and program staff. These groups helped derive specific adoption targets for gap measures, such as heat pump and electric vehicle adoption. Teams were convened from July through October 2024, providing the modeler with more Oregon-specific data resources and informing adjustments to modeling assumptions based on their areas of expertise. [Comments](#) received by ODOE during this phase were compiled along with responses from ODOE on how they were used to inform the modeling inputs and assumptions.

ODOE sought and incorporated input regarding the data and assumptions of the energy strategy from many different perspectives on policy priorities, challenges, and opportunities. This included formal government-to-government engagement with Tribes, and convening different groups to provide insight from many different backgrounds and interests. In addition to the Technical Working Groups, these included an Advisory Group to help guide ODOE in project development and decision-making, an Interagency Steering Group that ensured the strategy was consistent with existing state agency workstreams, and Policy Working Groups to help develop policy recommendations. ODOE also engaged with the public through listening sessions, webinars, a project webpage, and compilations of information for review. ODOE published comprehensive summaries of the input received during Phase 1 technical modeling and Phase 2 policy discussions and written comments of the strategy development, reflecting input on the technical modeling, policy discussions, and draft energy strategy report. Copies of public comments and recordings from public meetings are available on ODOE’s [website](#).

Table 3: Oregon Energy Strategy Engagement Opportunities

Tribal Engagement	Government-to-Government outreach and engagement with the nine federally recognized Tribes in Oregon to ensure Tribal perspectives informed the energy strategy.
Advisory Group	Group of experts that advised ODOE throughout the process and helped inform decisions. The group represented different perspectives and lived experiences across the state.
Focus Area Working Groups (Phase 1)	Eight Focus Area Working Groups informed early development of the strategy, particularly key assumptions and scenarios for the model.
Policy Working Groups (Phase 2)	Five Policy Working Groups included subject matter experts to dive into specific topics and identify gaps and needs to inform policy recommendations that built on previous analyses.
Interagency Steering Group	Representatives from the ODOE, DEQ, Land Conservation and Development, Transportation, and State Lands; Oregon Public Utility Commission; Business Oregon; the Governor’s office; and other agencies provided agency perspectives and guidance to develop a statewide energy strategy.
Public Listening and Information Sessions	Public forums held to provide updates on the process and gather broad views from across the state to inform the strategy.

At the outset of the project, ODOE reached out to the nine federally recognized Tribes in Oregon through formal government-to-government letters, staff-to-staff discussion, individual in-person or virtual meetings with Tribal leaders and staff, and presentations through the Legislative Commission on Indian Services and cluster groups. ODOE continues outreach and requests for consultation, where appropriate, and has heard important themes that include: advancing Tribal energy sovereignty and self-determination, ensuring equitable access to decision-making processes, ensuring energy affordability and energy access for Tribal members, securing stable and culturally responsive funding mechanisms,

including dedicated Tribal set-asides in state funding programs, and integrating Traditional Ecological Knowledge into energy and climate planning.

ODOE convened a 30-member [Advisory Group](#) to represent broad energy sector and community interests and provide insight, guidance, and advice on the most challenging issues and barriers to the actions identified through the working groups and the public. The group was developed by first identifying a list of perspectives needed to cover the many interests involved in and affected by energy policy development, followed by requests for letters of interest from 69 governments or organizations including Tribes, electric and natural gas utilities, and representatives for local governments and communities, port authorities, manufacturers and builders, fuel providers, and those with expertise in energy consumer protections, environmental interests, land use and air quality, manufacturers, energy development, and fuels. The Advisory Group consulted on the modeling inputs and assumptions, helped collect feedback on framing for supplemental analyses, and advised on policy priorities and the draft policy recommendations where there was the most misalignment among public partners.

ODOE, with Governor Tina Kotek's office, convened a six-member [Interagency Steering Group](#). The group included the ODOE, DEQ, Transportation, Land Conservation & Development, and State Lands, as well as the Public Utility Commission, and Business Oregon. They helped identify data resources for the modeling and ensure modeling assumptions were consistent with existing programs and policy goals. The group also assessed policy recommendations for alignment with existing work and agency missions, providing guidance on gaps in authorities, funding, and resources needed to implement the recommended actions.

The Oregon Energy Strategy was also informed by a robust public engagement process. This included four information sharing [public listening sessions and webinars](#) about technical modeling from May 2024 – December 2024 (Phase 1), followed by six additional [public engagements](#) to inform development of the policy recommendations from February 2025 – May 2025 (Phase 2), and a written comment period on the Draft Report from August 2025 – September 2025. ODOE maintained an online [portal](#) for public comments (over 700 pages) throughout the energy strategy development process and provided compilations of those comments for public review. These comments were used to inform modeling decisions and policy recommendations in the final report.

Final modeling results were shared on January 31, 2025 in an in-person public meeting that was also streamed online. All meeting and listening session recordings, notes, and materials were posted on ODOE's website for the public. A compilation of [public comments](#) was also posted after the formal modeling comment period.

Supplemental studies developed using the strategy modeling are used to inform the benefits and disbenefits of measures and community benefits described in this CCAP. ODOE and CETI developed these supplemental analyses using the modeling data to provide additional information for upcoming policy option discussions. These included a consumer energy costs analysis, an air quality assessment, a geospatial assessment of land use considerations, a jobs study, and a workforce needs study.

[Consumer energy costs](#) were informed by an Energy Wallet analysis that assessed changes in energy spending across five different sample Oregon households, and the effects of efficient electric technology and equipment investments on overall costs. Technical Working Group members with expertise in consumer energy costs, community needs, and barriers to adoption met with ODOE and CETI to define the sample households and assess results. Members included Tribes and Tribal interests, union representatives, consumer advocates, public health experts, rural community interests, agricultural energy representatives, and environmental interests. The [methodology](#) for developing the Energy Wallet is provided on ODOE's website.

The Air Quality analysis used EPA’s Co-Benefits Risk Assessment model to assess changes in health outcomes resulting from criteria air pollutant emissions reductions and the associated economic benefits that would occur through the strategy’s Reference Scenario. Co-pollutant data used for the COBRA analysis could not be broken out into individual Gap measures, air quality benefits are provided as a sum of the Reference Scenario. Full details of about the actions and policies included in the Reference Scenario are available in the [Key Data and Assumptions](#) document. Information on the air quality analysis [methodology](#) and [results](#) are found on ODOE’s website.

The land use geospatial maps were built using assumptions from The Nature Conservancy’s [Power of Place](#) study. The study included three levels of land use exclusions that could be used to inform modeling constraints on energy resource development options. This information was presented to the Land Use and Natural Resources Technical Working Group, which included representatives of the Departments of State Lands, Land Use & Conservation, Forestry, Agriculture, and Fish & Wildlife, as well as county commissioners, energy developers, utilities, and representatives with interests in agriculture, ranching, hunting, and fishing. The group recommended using the most comprehensive land use exclusion level, and land reserved for most agricultural and some ranching purposes were excluded for the development of electricity generation and transmission development in the model.

ODOE and CETI [presented](#) findings from the above complementary analyses on April 16, 2025 in a public webinar that Policy Working Group members were asked to attend. CETI also presented the findings to the Advisory Group.

CETI subcontracted with BW Research to produce a study looking at changes in employment needs associated with the Reference Scenario, differentiated between the eastern and western areas of the state and across primary energy sectors: transportation, electricity, direct use fuels, and commercial and residential buildings. The [study](#) was published in August 2025 so that it could inform comments on the draft strategy, and served to identify where job losses might occur and where the state might need to support training and education for new or expanding jobs’ needs. More [information](#) on methodology, including information on developing occupation-level job estimates, is provided in [Appendix E](#).

In Phase 2 of the energy strategy, ODOE convened six [Policy Working Groups](#) of experts in energy policy, including Tribes, local governments, ports, utilities, producers, developers, planners, builders, and those with insight on perspectives from energy consumers, environmental issues, land use interests, fuel providers, trucking and transport. Group membership was developed in consultation with the Interagency Steering Group and recommendations from the Advisory Group and Technical Working Group members. Groups reviewed the model findings, identified barriers to making progress on the least-cost actions identified, discussed and recommended actions to overcome those barriers, and provided guidance to ODOE on actions to include in the draft strategy. The teams met from February through May 2025, with [meeting recordings, notes, and materials](#) made available to the public on ODOE’s website. [Comments](#) received throughout this phase were compiled and made available to the public prior to the draft strategy publication for public comment.

ODOE published the [draft Oregon Energy Strategy](#) on August 14, 2025 and accepted written comments through September 22, 2025. The agency received 115 submissions, and [comments](#) were posted online along with a [compilation](#) of those comments organized to different sections of the report. ODOE reviewed the comments and used them to make changes to the final strategy, including supplementing the definitions and glossary, adding narrative discussion and additional detail, drafting a section on implementing the strategy to highlight actions that advance near-term priorities, and updated and reorganized several of the recommended legislative and policy actions. The [Oregon Energy Strategy](#) was published in November 2025. ODOE presented an overview of the strategy in a public [webinar](#) on December 17.

The robust engagement of partners and the public throughout both phases of the strategy's development significantly contributed to the shape and content of the energy strategy. Public engagement informed the design and focus of the technical analyses. Conversations with interested parties supported policy discussions, including evaluation of current progress, barriers, and options to advancing Oregon's energy policy objectives. Partner and public input considered the merits of proposed legislative and policy actions and contributed to the recommendations and organization of the report.

ODOE heard interest throughout the strategy's development for partner perspectives to be considered critically and that dissenting voices be visible in the report. ODOE incorporated information about barriers and challenges to the section on Pathways and Policies. The written comment summary is a compilation of Phase 2 discussions with Policy Working Groups, the Advisory Group, and the public and written comments. This approach highlighted where and how the energy strategy reflected partner input and where partners and members of the public expressed dissenting opinions.

Greenhouse Gas Emissions Reduction Goals

Oregon's climate targets, or GHG reduction goals, come from a 2020 [Executive Order 20-04](#) under Governor Brown, directing state agencies to take action to reduce and regulate GHG emissions toward meeting reduction goals:

- Achieve greenhouse gas levels that are **45 percent below 1990 levels by 2035**.
- Achieve greenhouse gas levels that are at least **80 percent below 1990 levels by 2050**.

These build on statutory goals established in 2007, when the Oregon Legislature first established climate change goals for the state through House Bill 3543.

While the statutory goals apply to emissions that originate inside Oregon, the Climate Action Commission has historically interpreted them to apply to the emissions within Oregon's sector-based GHG inventory. Oregon's GHG goals are linked to sector-based GHG emissions and tracked using the state's SBI. It is with that precedent that Oregon continues with this CCAP; discussions of goals and graphical representation of emissions forecasts are presented through the lens of the sector-based inventory, while tabular results show impacts of measures on both sector-based and consumption-based emissions.

In 2021, the Legislature passed HB 2021 which requires the state's investor-owned utilities (57.2 percent of sales in 2024) to reduce their GHG emissions compared to a baseline level⁵ on the following schedule:

- 80 percent below by 2030
- 90 percent below by 2040
- 100 percent below by 2050

Oregon does not have GHG emissions reduction goals for individual sectors, but DEQ's Climate Protection Program places a mandatory, declining cap on GHG emissions from multiple sectors in Oregon. The declining cap applies to emissions from the use of fossil fuels, including gasoline, diesel, natural gas and propane, in transportation, residential, commercial, and industrial settings. This also includes GHG emissions from certain industrial processes but does not include emissions from the electricity sector. This CCAP does not include sector-specific targets for reductions.

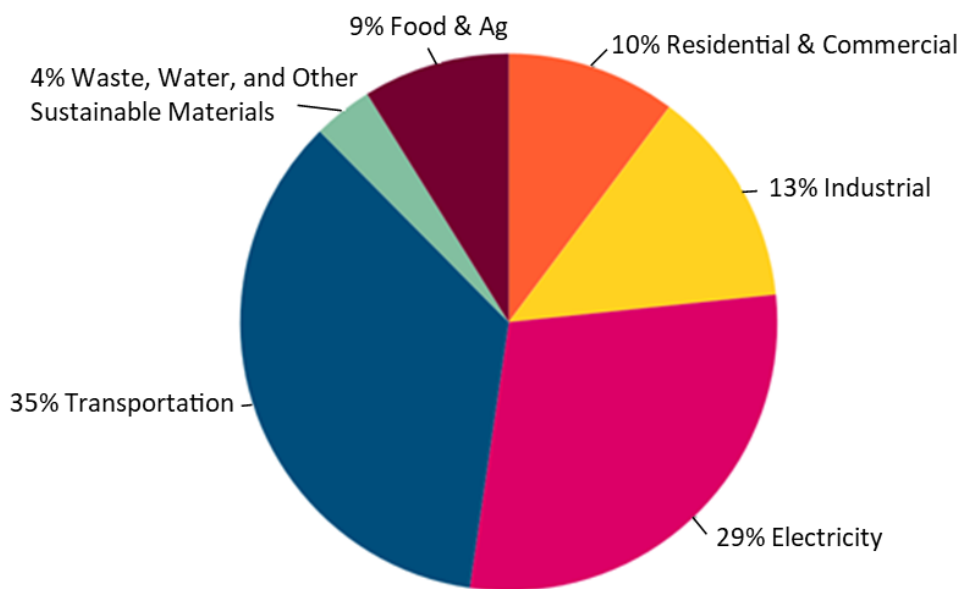
⁵ Baseline emissions are defined as the average annual GHG emissions for the years 2010, 2011 and 2012 associated with the electricity sold to retail electricity consumers.

Oregon’s goals are set as a percentage of total sector-based emissions compared to 1990 levels. The Climate Protection Program supports Oregon’s overall goals through a cap-and-reduce program designed to reduce emissions that are covered under the program: 50 percent by 2035 and 90 percent by 2050.⁶ Covered emissions primarily include those from fuels consumed for transportation, space heating, and process heating.

Sectors

While Oregon’s sector-based inventory emissions previously discussed are used as the baseline that informs the TIGHGER model BAU and BAP and the energy strategy model reference scenario, Oregon’s SBI sectors do not align with the EPA’s defined sectors. For the purposes of this CCAP, sector data is assessed and reported using the EPA-defined sector breakouts. With the exception of the transportation sector, which is the same in both, emissions data reflected in this report represent the EPA-defined sectors and are not equivalent to Oregon SBI or CBEI sector breakouts.

Figure 6. Oregon Greenhouse Gas Emissions by EPA-defined Sector (2023)



ODOE and SSG included emissions in each sector that are most relevant to the focus of the specific measure modeled. For example, sector-based emissions from electric vehicles come from the electricity generated to power them. These emissions are attributed to the transportation sector and not the electricity sector. Similarly, electricity use in buildings is attributed to the Commercial & Residential sector. A detailed description of the emissions included in each sector is provided in [Appendix D](#).

ODOE and SSG reassessed TIGHGER modeling results to allocate emissions using EPA-defined sectors. The following provides an overview of the emissions captured in each of the sectors in this report.

Electricity

This sector includes emissions from the generation of electricity that is ultimately consumed across all sectors but excludes emissions accounted for in other sector-specific programs. For example, electricity consumed in buildings is included in the residential and commercial sector, because the effects of energy efficiency and weatherization policies impact electricity consumption and emissions in that sector. Energy produced from primary sources (e.g., solar and wind) is modeled alongside energy converted

⁶ CPP program rules compare emissions reductions to baseline emissions determined as average of sector-based emissions from 2017-2019 using Greenhouse Gas Reporting Program data. This is similar to but slightly higher than the 1990-levels baseline used in assessing progress on GHG emissions reduction goals.

from imported fuels (e.g., electricity generation and combined heat and power), including accounting for conversion efficiency. The model accounts for electricity imports and exports, with Oregon producing more electricity than it consumes although it also imports some power. Demand is calibrated using data from ODOE and the U.S. Energy Information Administration. Electricity supply is calibrated using data on in-state electricity generation capacity.

Transportation

This sector includes emissions from the combustion of fuels for on-road transportation, railways, waterborne navigation, aviation, and off-road transportation, and emissions from electricity specifically for electric vehicle use and light rail. Fuels assessed include motor gasoline, distillate fuel, natural gas, residual fuel, lubricants, aviation gasoline, jet fuel, liquefied petroleum gas, and naphtha.

The TIGHGER model captures personal transportation energy use by modeling household travel. Families make trips for various purposes (work, school, socializing, errands, drop-offs, shopping), and these trips are shared out over the various modes of transportation (walk, bike, auto, transit). The energy use and emissions associated with various types of personal vehicles are calculated by assigning vehicle miles traveled to a stock-turnover personal vehicle model. This approach of tracking the consumption of energy use is used to calculate emissions.

The model is calibrated with data from an Oregon Department of Transportation [study](#) on daily travel patterns. The trip length is then adjusted to match average vehicle-miles-traveled by county, as reported by ODOT. Energy consumption for personal vehicle use is calculated from the stock of personal use vehicles by size, fuel type, efficiency, and vintage with ODOT regional VMT calculations. The projected number of personal-use vehicles is proportional to the projected number of households in the BAU scenario. This category also includes calculations of transit emissions using ODOT fuel use and VMT data, EIA State Energy Data Sets for recreational marine fuel use, and off-road fuel use. The remaining commercial vehicle energy use is then calibrated so that total transportation sector energy use aligns with the EIA SEDS.

Commercial and Residential

This sector includes emissions from fuel combustion and grid-supplied energy specifically consumed in commercial and residential buildings. This includes electricity use in commercial and residential buildings, as well as energy from natural gas, petroleum, and coal used in the building or for on-site electricity generation.

For each Oregon county, building data (building type, number of stories, number of units, and year built) were sourced from the U.S. Census for residential buildings, and from REPLICA, a proprietary provider of modelled and observed building and transportation data, for commercial and industrial buildings. Residential buildings are spatially located and classified using a detailed set of 12 building archetypes developed by SSG, capturing footprint, height, and type (single-family, duplex, semi-attached, row-housing, apartment high-rise, apartment low-rise, etc.) and year of construction. The archetypes are used to generate a “box” model that helps to estimate the floor area and energy use which is then used to simulate the impact of energy efficiency measures. Total floorspace area for each building type was calculated referencing building archetypes that are typical in Oregon.

Using [National Renewable Energy Laboratory's ResStock and ComStock](#) database assumptions on thermal envelope performance and heating and cooling degree days, the model calculates space-conditioning energy demand independent of space heating or cooling technologies. First, the model multiplies the residential building floorspace area by an estimated thermal conductance (heat flow per unit of surface area per degree day) and the number of degree days (heating and cooling) to derive the energy transferred out of the building during winter months and into the building during summer

months. The energy transferred through the building envelope, the solar gain through the building windows, and the heat gains from equipment inside the building is netted from the space-conditioning load required to be provided by the heating and air-conditioning systems.

The initial thermal conductance estimate is a regional average by dwelling type from NREL ResStock and ComStock databases North American energy systems simulator, calibrated for the Pacific Northwest. This initial estimate is adjusted through the calibration process until energy use of residential buildings tracks on residential energy use as reported in the EIA SEDS. As a reference, values for output energy intensities and equipment efficiencies are based on EIA's 2015 Residential Energy Consumption Survey.

Non-residential buildings, commercial and otherwise, are geographically located and mapped to a set of 40+ archetypes. The floor space of these archetypes varies by location. Non-residential floor space generates demand for energy and water, and provides an anchor point for locating employment of various types.

The model calculates the space-conditioning load for non-residential buildings as it does for residential buildings, with two distinctions: the thermal conductance parameter for non-residential buildings is based on floor area instead of surface area, and incorporates data from REPLICA. Using assumptions for thermal envelope performance for each building type, the model calculates total energy demand for all buildings, independent of any space heating or cooling technology, and fuel.

Starting values for output energy intensities and equipment efficiencies for non-residential end uses are taken from EIA's Commercial Buildings Energy Consumption Survey complemented by the EPA's Portfolio Manager Technical Reference that provides Energy Use Intensity by property type for some additional building types. All parameter estimates are further adjusted during the calibration process. The calibration target for non-residential building energy use is the observed commercial and industrial fuel consumption in the base year.

Industrial

This sector includes emissions from on-site stationary fuel combustion and industrial processes that emit GHGs. It includes natural gas, petroleum, and coal combustion; cement and semiconductor manufacturing; aluminum production; ammonia production; urea consumption; iron and steel production; soda ash production and consumption; limestone and dolomite use; lime manufacturing; and electricity use where the emissions reduction measure involves electricity use, such as electrification of industrial machinery or processes.

TIGHGER models industrial energy use by taking stock of the industrial floorspace by industry sector in the base year and then applying fuel and end-use specific energy intensities (Megajoules/square foot) to that floor space to obtain energy use by sector by fuel. The energy intensities are calibrated such that modelled energy use in the base year matches observed industrial energy use. Energy use is subsequently converted into emissions by applying the corresponding emission factors for each fuel. In addition to emissions from stationary energy use, the model incorporates emissions from industrial processes. Information on industrial process emissions is derived from the EPA's FLIGHT large emitters database for the base year.

This base year calibration then serves as a starting point for scenario simulation, and industrial floor space by sector is adjusted over time as directed by the scenario assumptions on economic activity growth. At the same time energy intensities can be adjusted to implement efficiency measures or can be switched between fuels and electricity to simulate industrial fuel switching. The projected energy use then is converted to projected emissions by applying fuel specific emission factors. Process emissions typically grow with the size of the industrial sector or are reduced, for example, if scrubbers are featured in the scenario.

Waste, Water, and Other Sustainable Materials

Solid waste and wastewater are generated in households, commercial buildings, and industrial settings. This sector includes emissions from waste incineration, municipal solid waste and wastewater, compost in the residential and commercial sectors, food processing wastewater, pulp and paper waste, and industrial waste. It also includes non-agricultural fertilizer waste.

The TIGHGER model used modeling data from DEQ that assessed different waste disposal, composting, and sludge creation pathways, including those which capture energy from incineration and recovered gas. Solid waste stream composition and routing data (landfill, composting, and recycling) were sourced from DEQ's Oregon Material Recovery and Waste Generation Rates Report. Historical waste production data was used to estimate the base carbon content in landfills. Total methane emissions were estimated for landfills using the first order decay model, with the methane generation constant and methane correction factor set to default, using values from Intergovernmental Panel on Climate Change Guidelines. Data on methane removed via recovery was derived from the waste module of EPA's State GHG Inventory Tool.

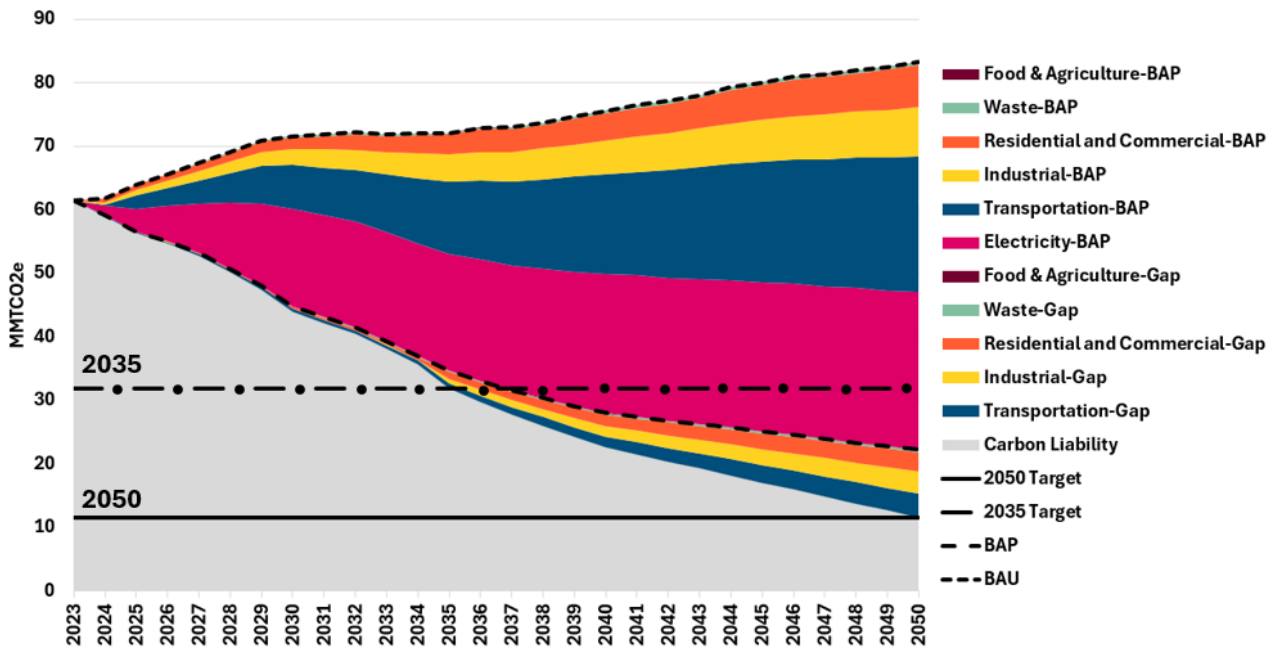
Food and Agriculture

This sector includes emissions from agricultural activities, such as fertilizer application, managing soils, livestock and livestock-related waste and waste management (including burning of agricultural residual waste), urea fertilization, liming of agricultural soils, agricultural soil management, and enteric fermentation. The base year case for the model area includes emissions from land use change and agriculture. To align the model projections with the scenarios, either land use changes are introduced or emission intensities are adjusted to indicate changing management practices. The TIGHGER model can be applied to all land use in the area, or to agriculture and forestry specific land uses.

Measures by Sector

Most of Oregon's existing emissions reduction policies and programs focus on the electricity and transportation sectors, the largest contributors of GHG emissions shown in the state's sector-based inventory. Emissions reductions for electricity are pivotal to the CCAP, because electrifying end uses is a key strategy to decarbonizing other sectors at the lowest cost. Oregon has a 100 percent clean electricity target for about 70 percent of electricity consumption (investor-owned utility customers) in the state by 2040, with much of the remaining consumption served largely by the region's clean hydropower system. Transportation is the largest source of emissions, so existing policies that support transportation electrification and the use of lower carbon fuels also play a large role in overall emissions reductions. Gap measures focus on supporting demand response, energy efficiency and electrification of heating, cooling, and other technologies. They also include using more renewable fuels for homes, businesses, and industry, and strategies to reduce emissions from food and waste and material streams. Figure 7 illustrates the sector breakout of BAP and Gap Measure contributions to GHG emissions reductions to achieve the 2050 goal.

Figure 7. Sector Breakout of BAP and Gap Measures Share of Emissions



Some policies included are bundled together into a single measure, where the resulting emissions reduction actions are similar and produce similar levers in the model. The commercial and residential sector includes four bundled policy measures: retrofits for existing buildings, energy efficient (new) buildings, heat pump programs, and energy efficiency standards for appliances. Each of these acts on specific sub-sectors within the building stock. Policies that have a small but distinct reduction, such as Climate-Friendly and Equitable Communities, or a major reduction, such as HB 2021 in the electricity sector, are represented individually. The supporting role of these policies are described in the sector-specific sections below. [Appendix D](#) provides the full list of BAP programs, including how policies and programs were bundled.

Some policies like the Climate Protection Program are implemented with multiple complementary programs. Unlike other programs, the CPP sets mandatory emissions limits which both incentivize emission reductions and leverage emissions reductions in other programs such as the Clean Fuels Program, Advanced Clean Cars II, and Advanced Clean Trucks. Since the Climate Protection Program is a program with mandatory emission limits, there would be double counting if complementary programs' sector emission reductions were calculated separately or on top of the program's mandatory emission reductions. In the charts below, rather than include "CPP" in each column with the other complimentary programs, "Climate Protection Program-'sector,'" is used to represent the remaining CPP emissions reductions not already counted in other measures in that sector.

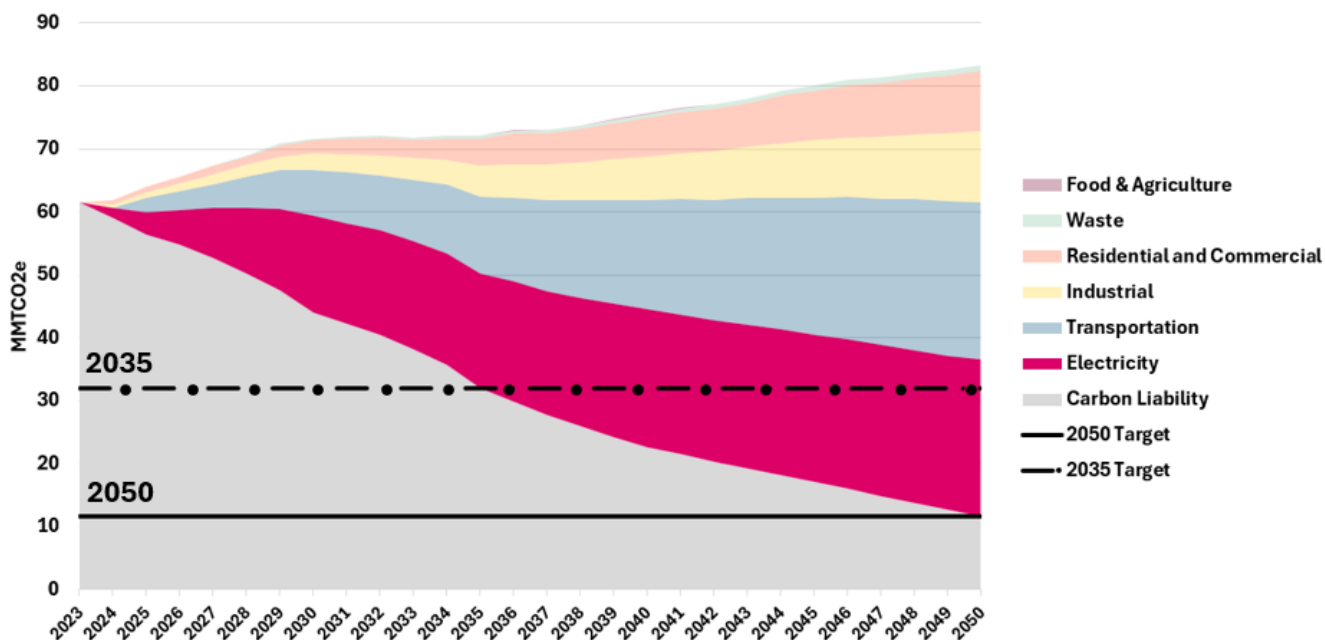
There are many policies that play a critical supporting role that are not described as a specific measure in each sector. For example, programs that support charging infrastructure for electric vehicles are critical to increasing driver confidence that fueling will be available when and where needed. Supporting policies like this are described for each measure.

Several measures were also evaluated for their potential to additionally reduce global emissions, beyond their effect on sector-based emissions. These consumption-based emissions reductions are additional to the sector-based emissions reductions used to assess progress on Oregon's 2050 goal. In many cases, consumption-based emissions reduction potential for a specific measure are considerably larger than sector-based, reflecting the fact that the majority of a product's emissions are produced in up-stream processes like mining, manufacturing and transportation. These measures highlight Oregon's potential ability to regulate or otherwise influence imported materials, national or global policies and business practices, and recycling practices that largely occur outside of Oregon.

Electricity Sector

The electricity sector includes the generation, transmission, and distribution of electricity, including electricity produced elsewhere but used in state. It does not include emissions associated with electricity that is generated in Oregon and exported. Annual emissions from the electricity sector have fallen more than 20 percent since Oregon first adopted GHG reduction goals in 2007, but are still greater than 1990 levels, which serve as the baseline year for state sector-based emissions reduction targets. In 2023, the electricity sector accounted for about 29 percent of Oregon’s sector-based GHG emissions, making it the second largest contributor to emissions after the transportation sector.

Figure 8. Projected Electricity Sector Emissions Reductions



Electricity emissions are largely attributed to those emissions from the generation of electricity that are not used for activities that occur in the transportation, residential and commercial, and industrial sectors, but these emissions are attributed to those sectors directly. Most GHG emissions resulting from the use of electricity come from generation facilities that combust fuels like coal, natural gas, and fuel oil. For this reason, electricity use is often reported as causing *indirect* emissions in those sectors. Emissions reduction measures in the CCAP, such as transportation and building end-use electrification, depend on successful decarbonization of this sector. Conversely, some activities in other sectors, such as deploying rooftop solar on buildings, are included here because they generate electricity.

Existing Programs and Regulations

The single most important existing policy for emissions reductions in Oregon’s electricity sector is the requirement to meet clean electricity targets established in HB 2021 (2021).⁷ TIGHGER BAP modeling results found that 35 percent of emissions reductions by 2050 are attributed to this policy alone. The HB 2021 targets require Oregon investor-owned utilities with the largest historic share of GHG emissions to reduce reported emissions 80 percent below baseline⁸ levels by 2030, 90 percent below by 2035, and

⁷ Oregon Legislative Assembly. (2021). [House Bill 2021: 100% Clean Energy for All](#). Oregon Laws 2021, chapter 508.

⁸ HB 2021 sets the baseline for electric utilities as “the average annual emissions of greenhouse gas for the years 2010, 2011 and 2012 associated with the electricity sold to retail electricity consumers” as reported to DEQ. It sets the baseline for most electricity service suppliers as 0.428 MT CO₂e per megawatt-hour. ORS 469A.400(1).

100 percent below by 2040. It also established the Community Renewable Energy Grant Program, which funds clean energy projects, including areas in Oregon not covered by HB 2021’s clean electricity targets. Since its passage, utilities have already reported some progress. For example, the state’s largest utility, Portland General Electric Company, recently reported a 27 percent reduction in emissions compared to baseline, based on preliminary 2024 data.⁹ Similarly, PacifiCorp dba Pacific Power reported a nearly 19 percent reduction.¹⁰ While there is much to be done, utilities continue to work with the Oregon Public Utility Commission toward further reductions to meet these targets. This measure will reduce 24.9 MMTCO₂e by 2050, or nearly 35 percent of all emissions.

⁹ Portland General Electric Company. (August 15, 2025) [Clean Energy Plan and Integrated Resource Plan Update](#) (p. 7).

¹⁰ PacifiCorp. (June 30, 2025) [Oregon 2025 Clean Energy Plan](#) (p. 2).

Table 4. Projected BAP Electricity Sector Emissions Reductions by Policy or Measure

Existing Measures (Program, Policy, or Regulation)	Milestones and Implementation Schedule	Implementing Agency or Agencies	Oregon Sector- based Emissions Reduction MMT CO ₂ e (2035)	Percentage of Total Sector- based Emission Reductions (2035)	Oregon Sector- based Emissions Reduction MMT CO ₂ e (2050)	Percentage of Total Sector- based Emission Reductions (2050)
HB 2021 Clean Energy Targets	80% below baseline emissions by 2030 90% below baseline emissions by 2035 100% below baseline emissions by 2040	OPUC	18.32	46.36%	24.90	34.74%
Community Renewable Energy Program	Community Energy Resilience: At least 50% of grant funds must support projects that: Enhance local energy reliability Provide backup power during outages Reduce dependence on centralized fossil fuel systems Additional Priorities: Projects that include energy efficiency and demand response Projects that demonstrate community engagement and support Projects that are economically feasible and scalable	ODOE	0.008	0.02%	0.008	0.01%

The Oregon Public Utility Commission is the primary state agency responsible for oversight of electricity provider compliance with HB 2021 clean electricity goals. The law applies to Oregon’s investor-owned utilities, Portland General Electric, PacifiCorp (dba Pacific Power), and Idaho Power, as well as Energy Service Suppliers providing power in Oregon. Oregon Regulatory Statute 756.036¹¹ authorizes the OPUC as the economic regulator for state IOUs and ORS 756.060¹² grants them with the authority to adopt rules and regulations in support of their duties and functions. HB 2021 directs the OPUC to review and approve IOU Clean Energy Plans, conduct rulemaking to implement the law, and provides them with the authority to reject plans or investments, require revisions, or mandate corrective actions. Electricity Service Suppliers are responsible for meeting HB 2021 targets and must report their emissions to DEQ under ORS 468A.280¹³ for the SBI. An ESS must also disclose emissions for their energy mix to the OPUC under Oregon Administrative Rule 860-038-0300.¹⁴ ODOE collects data from DEQ to produce the state’s [Electricity Resource Mix](#), including specific mixes for individual IOUs under their authority to collect and compile data on energy resources.¹⁵

Electricity providers, regulators, and policy makers in Oregon and the Pacific Northwest region are working to address concerns about the capacity of the regional grid to meet growing demand, especially on the hottest and coldest days of the year. Oregonians rely on electricity for critical needs, such as medication refrigeration, medical devices, heating and cooling, and to power critical infrastructure. HB 2021 includes temporary exemptions for a utility whose compliance might otherwise impair its ability to comply with grid reliability and resource adequacy requirements. The [Oregon Energy Strategy](#) recommends near-term actions to support a reliable clean energy transition, including:

- Study near-term grid transmission needs and identify opportunities to support transmission.
- Update and enhance Oregon’s Renewable Energy Siting Assessment Tool to inform optimized energy infrastructure siting options.
- Conduct a study on barriers to constructing and interconnecting permitted projects.
- Report on developments in emerging energy technologies, such as enhanced geothermal and advanced nuclear options to identify the role they could play.
- Study government incentives for local electricity generation and identify opportunities for the state to better advance infrastructure needs including economic development opportunities and options to support access for all Oregonians.

Recent increases in electricity rates are being primarily driven by grid infrastructure investments, the cost of electricity, and wildfires.¹⁶ They are not currently being driven by clean energy investments. More specifically, utility bill affordability is being affected by extreme weather events, including climate change exacerbated storms, which can increase utility spending for recovery and reconstruction after these extreme events. This is occurring at the same time that utilities need to be investing in distribution and transmission infrastructure needed to meet future electricity use growth. Utilities are also challenged to

¹¹ Oregon Revised Statutes § 756.036 (2023). Public Utility Commission: Duties and functions. Retrieved from https://www.oregonlegislature.gov/bills_laws/ors/ors756.html.

¹² Oregon Revised Statutes § 756.060 (2023). Public Utility Commission: Authority to adopt rules and regulations. Retrieved from https://www.oregonlegislature.gov/bills_laws/ors/ors756.html.

¹³ Oregon Revised Statutes § 468A.280 (2023). Clean diesel engine standards; rules. Retrieved from https://www.oregonlegislature.gov/bills_laws/ors/ors468a.html.

¹⁴ Oregon Public Utility Commission. (2023). OAR 860-038-0300: Direct Access Regulation: Electric Company and Electricity Service Suppliers Labeling Requirements. Oregon Secretary of State. Retrieved from <https://secure.sos.state.or.us/oard/viewSingleRule.action?ruleVrsnRsn=304995>.

¹⁵ Oregon Revised Statutes § 469.030 (2023). Energy: State Department of Energy. Retrieved from https://www.oregonlegislature.gov/bills_laws/ors/ors469.html.

¹⁶ Oregon Department of Energy. (2024 November 1). *2024 Biennial Energy Report: Electricity Rate Increase Drivers*. (p 166). <https://www.oregon.gov/energy/Data-and-Reports/Documents/2024-Biennial-Energy-Report.pdf>

invest in resilience and other infrastructure hardening measures, which include wildfire mitigation. To minimize cost pressures, utilities are having to redirect a portion of their budgets that might otherwise go to infrastructure capacity increases to fund wildfire risk mitigation efforts. Despite utility efforts to control costs, the financial risks posed by the growing severity of wildfires combined with redirected infrastructure investments are expected to lead to increased utility costs and result in higher rates for households and businesses.

Utilities have reacted to growing wildfire risk by increasing expenditures to reduce the frequency and consequence of utility-ignited wildfires through increased use of public safety power shutoffs, infrastructure hardening, increased vegetation management, and improved operational awareness and flexibility, but it is infeasible for utilities to mitigate this risk entirely. Factors outside of utility control, such as increasingly frequent and severe heatwaves, prolonged drought, increased wildland fuel loads, and housing developments in wildfire-prone areas, are exacerbating the risk and increasing the consequences and cost of wildfires across Oregon and the country. The Oregon Energy Strategy recommended that the OPUC, in coordination with ODOE, commission an expert review of balanced wildfire utility liability solutions that enable both utility accountability and ongoing customer cost containment, reliability, and decarbonization investments.¹⁷ The OPUC is currently conducting this analysis with the help of a contractor, and results are expected later this year.

As utilities work to decarbonize, there is a concern that electricity prices will rise, which could be especially harmful to low-income Oregonians and some businesses and industries. While we have not seen significant rate increases attributable to decarbonization, HB 2021 includes a cost cap on the level of required annual spending that could affect customers. If that cost cap is triggered, utilities would not have to take additional actions toward meeting the targets. This eliminates the risk that consumers would be required to foot the bill of compliance at any cost. The Legislature also passed the Energy Affordability Act (HB 2475)¹⁸ during the same session as HB 2021 to expand the OPUC's authority to consider energy burden and specific consumer affordability when determining rates.¹⁹ As a result, state investor-owned utilities now have low-income rate discounts for income-qualifying residential customers. Many consumer-owned utilities also have rate discounts or bill payment assistance programs for qualifying homes.²⁰

Many of the measures described in other sectors below, especially energy efficiency, also serve to reduce emissions associated with electricity. For example, industrial decarbonization efforts in the paper industry will reduce electricity consumption, as will programs addressing residential and commercial energy use and embodied carbon. These complimentary policies also help make achieving clean electricity targets more affordable and feasible by reducing overall electricity use – lowering individual consumer costs – and the amount of new energy resources required – which reduces upward pressure on all customer costs.

Extracting and transporting fuels, like coal and natural gas, add more than ten percent to the CBEI for the electricity sold into the Pacific Northwest. Non-emitting electricity generation and energy efficiency reduce consumption-based emissions that would otherwise come from fossil fuel-based electricity generation.

¹⁷ Oregon Department of Energy. (2025). Oregon Energy Strategy. (pp 108-109). <https://www.oregon.gov/energy/Data-and-Reports/Documents/Oregon-Energy-Strategy.pdf>.

¹⁸ Oregon Legislative Assembly. (2021). House Bill 2475. Oregon Laws 2021, chapter 82. <https://olis.oregonlegislature.gov/liz/2021R1/Downloads/MeasureDocument/HB2475/Enrolled>.

¹⁹ Oregon Public Utility Commission. (n.d.). Docket UM 2211. Oregon Public Utility Commission. <https://apps.puc.state.or.us/edockets/DocketNoLayout.asp?DocketID=23122>.

²⁰ Oregon Public Utility Commission. (n.d.) *Oregon low-income programs*. <https://www.oregon.gov/puc/utilities/Documents/LIUPWG-OR-LowIncomePrograms.pdf>.

Gap Measures

No additional proposed gap measures are provided for this sector. HB 2021 requires significant emission reductions from the Oregon utilities with the largest historic share of GHG emissions. From 2020 to 2024, the utilities subject to HB 2021 accounted for over 85 percent of all electricity sector emissions in Oregon. Most of the utilities not subject to HB 2021 have historically relied significantly on zero-emission hydro and nuclear power procured from Bonneville Power Administration.

In the last decade, electricity demand in some utility service territories has risen significantly to support data center growth, and for utilities not subject to HB 2021 it is unclear whether emitting or non-emitting resources would be used to serve these loads. The TIGHGER and Oregon Energy Strategy models assumed that half of future data center loads served by these utilities would be provided by emitting resources, but this may not be the case. Many of the larger new tech load companies, including Amazon and Google, have adopted voluntary climate goals that prioritize the use of clean electricity and aim for net-zero carbon emissions in the coming decades. The Oregon Energy Strategy recommended registration and reporting requirements for new large electric loads to inform GHG emissions analyses. Data such as energy consumption and electricity generation resources could highlight where additional policy action is needed to achieve state climate goals.

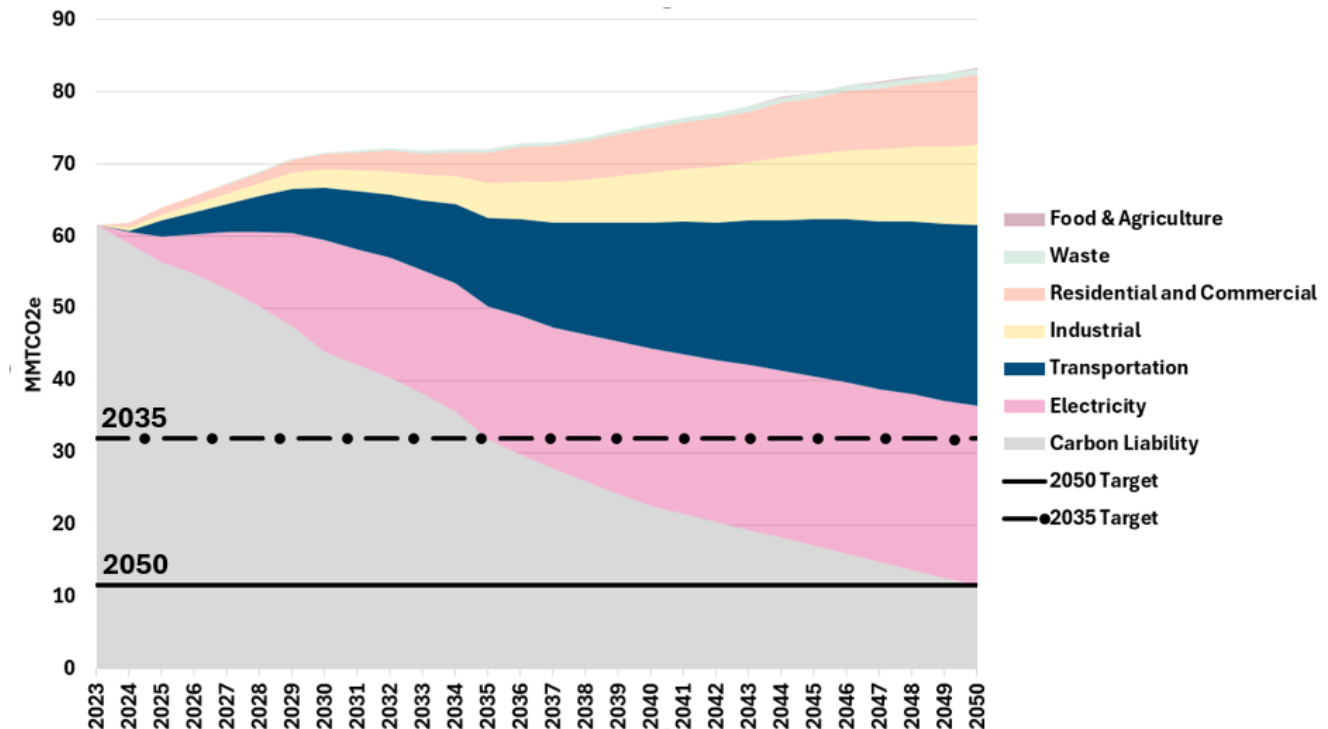
Transportation Sector

The transportation sector includes emissions from on-road vehicles like cars, trucks, and buses; industrial and agricultural vehicles and equipment; and vehicles for aviation, marine shipping, and rail.²¹ It includes personal vehicles and public transportation, as well as infrastructure for active transportation, including sidewalks and dedicated bicycle lanes. For interstate and international operations, the emissions include those attributed to fueling that occurs in Oregon. This sector was responsible for 35 percent of Oregon's sector-based GHG emissions in 2023, making it the largest source of emissions in the state. Most emissions in this sector come from on- and non-road vehicles – about 57 percent from gasoline combustion in passenger cars and other gas-powered vehicles, and 27 percent from diesel combustion in medium- and heavy-duty vehicles.²² While transportation emissions fluctuate from year to year, they remained relatively constant in the state from 1990 until 2018. After Oregon established the Clean Fuels Program (Oregon's low-carbon fuel standard), sector emissions began trending downward. In 2023, transportation sector GHG emissions reached their lowest level since 2013.

²¹ Off-road industrial and construction vehicles are included in the industrial sector.

²² Oregon Department of Environmental Quality. (n.d.). Oregon Greenhouse Gas Sector-Based Inventory Data. <https://www.oregon.gov/deq/ghgp/Pages/GHG-Inventory.aspx>

Figure 9. Projected Transportation Sector Emissions Reductions



Existing Programs and Regulations

Oregon has several programs and policies designed to reduce GHG emissions from the transportation sector, including the Advanced Clean Cars II and Advanced Clean Trucks regulations, the [Oregon Clean Fuels Program](#), the [Climate Protection Program](#), and the [Climate Friendly and Equitable Communities program](#). ACC II and ACT reduce emissions by requiring an increasing share of new vehicle sales across light-, medium-, and heavy-duty classes to be zero-emission vehicles. Recent Congressional action purports to disapprove of the EPA’s waivers for California’s Advanced Clean Cars II and Advanced Clean Trucks rules. This is a decision that the State of Oregon is challenging along with California and a coalition of other states. As a result, Oregon expects a potential short-term slowdown in the pace of ZEV adoption across the state. This forecasted slowdown is also based on actual ZEV registration amounts being lower than state targets.²³

The CFP uses a market-based approach to lower the carbon intensity of transportation fuels through a credit/debit system that supports the production and use of lower emission alternatives. The Oregon Legislature directed the Environmental Quality Commission to adopt low carbon fuels standards and a clean fuels program to facilitate compliance with those standards in ORS 468A.266-277,²⁴ including establishing an initial target of a 10 percent reduction in the average carbon intensity of Oregon’s transportation fuels over the first ten years of the program. In 2022, the EQC extended program targets to a 20 percent reduction by 2030 and 37 percent by 2035.

The ACC II and ACT programs are vehicle emission standards that Oregon adopted under Section 177 of the federal Clean Air Act, which allows states to adopt California’s motor vehicle emission standards.²⁵ These programs are designed to increase zero-emission vehicle sales in the state through 2035. Under

²³ California, Oregon, et al. (2019). California et al. v. Wheeler et al., No. 4:19-cv-07444 (N.D. Cal.).

²⁴ Oregon Revised Statutes § 468A.266 (2021). Greenhouse gas reporting program; rules; penalties. Retrieved from [ORS 468A.266 – Low carbon fuel standards; clean fuels program; rules](#).

²⁵ Oregon Department of Environmental Quality. (2022). OAR 340-257-0040: Oregon Low Emission Vehicles: Requirement to Meet California Vehicle Emission Standards. Oregon Secretary of State. <https://secure.sos.state.or.us/oard/viewSingleRule.action?ruleVrsnRsn=283343>

ACC II, the percentage of new passenger cars and light-duty trucks sold that are required to be ZEVs increases annually, reaching 100 percent ZEV sales by model year 2035.²⁶ The ACT rule requires increasing percentages of ZEV MHD trucks, with sales requirements varying by vehicle class and reaching 40 to 75 percent ZEV sales by 2035, depending on the truck type. The EQC adopted both the [ACC II and ACT](#) under its authority to regulate air quality in Oregon, pursuant to ORS 468A.025²⁷ the legislative directive in ORS 468A.360,²⁸ which directs the EQC to adopt motor vehicle emission standards.

The Climate Friendly and Equitable Communities program is expected to reduce driving demand through land-use and transportation planning reforms that make it easier for people to live, work, and recreate without relying on a personal vehicle. By encouraging compact, mixed-use development and expanding options for walking, biking, and public transit, CFEC helps reduce single-occupancy driving VMT 5.5 percent by 2050. DLCD's authority to implement the CFEC program derives from Executive Order 20-04, which directed all state agencies to take action to reduce GHG emissions. DLCD and their governing board, the Land Conservation & Development Commission, conducted a rulemaking under LCDC's authority to adopt land-use planning rules under ORS 197.040.²⁹

DEQ's Climate Protection Program places mandatory emissions limits on fossil fuels, including reductions from gasoline and diesel used for transportation, including personal vehicles, commercial fleets, and off-road use such as machinery and construction. It establishes a declining mandatory cap on GHG emissions from fossil fuels used in Oregon, including diesel, gasoline, and natural gas in transportation, as well as residential, commercial and certain industrial settings. It does not include emissions in the electricity sector. The program is designed to reduce covered emissions 50 percent by 2035 and 90 percent by 2050 compared to a 2017-2019 baseline. Total emissions across all sectors regulated under this program represent approximately 45 percent of Oregon's sector-based inventory. DEQ administers and enforces the rules of the program adopted in OAR 340-273³⁰ as delegated by the state's EQC through ORS 468.020.³¹

Under the CPP, DEQ distributes a set number of free compliance instruments to regulated companies each year. Each compliance instrument represents the equivalent of one metric ton of carbon dioxide, providing companies with the right to emit that amount. The total number of compliance instruments distributed by DEQ each year is equal to that year's emissions cap. As the cap declines, so do the number of compliance instruments distributed by DEQ. The program gives regulated companies the option to bank compliance instruments if they emit less than what they were distributed, trade compliance instruments with other regulated companies, or earn additional credits by contributing funds to DEQ-approved entities through the community climate investments program. Community climate investment funds must be invested in projects that reduce human-caused GHG emissions and are prioritized for projects that benefit the most affected communities, including those experiencing lower incomes, having less access to clean energy infrastructure, and most affected by pollution. For every metric ton of CO₂

²⁶ Oregon Department of Environmental Quality. (2022). OAR 340-257-0040: Oregon Low Emission Vehicles: ZEV Sales Requirements. Oregon Secretary of State. <https://secure.sos.state.or.us/oard/viewSingleRule.action?ruleVrsnRsn=297000>

²⁷ Oregon Revised Statutes § 468A.025 (2021). Air purity standards; air quality standards; treatment and control of emissions; rules. Retrieved from https://www.oregonlegislature.gov/bills_laws/ors/ors468A.html.

²⁸ Oregon Revised Statutes § 468A.360 (2021). Greenhouse gas reporting program; rules. Retrieved from https://www.oregonlegislature.gov/bills_laws/ors/ors468A.html.

²⁹ Oregon Revised Statutes § 197.040 (2021). Comprehensive Land Use Planning: Duties of commission. Retrieved from https://www.oregonlegislature.gov/bills_laws/ors/ors197.html.

³⁰ Oregon Department of Environmental Quality. (2022). OAR 340-271-0110: Greenhouse gas emissions limits. Oregon Secretary of State. Retrieved from <https://secure.sos.state.or.us/oard/viewSingleRule.action?ruleVrsnRsn=326512>.

³¹ Oregon Revised Statutes § 468.020 (2021). Duties of the Department of Environmental Quality. Retrieved from https://oregon.public.law/statutes/ors_468.020.

equivalent emissions a company is responsible for, it must submit a compliance instrument or a community climate investment credit to DEQ.

DEQ's Climate Equity and Resilience Through Action grant, which is funded through the U.S. EPA Climate Pollution Reduction Grant program, adds funds to existing state programs in support of ZEV adoption. These include:

CERTA Measure 1: provides funds for DEQ's [Oregon Clean Vehicle Rebate Program](#), to issue ZEV rebates to low- and moderate-income households. CERTA funding will support the adoption of an estimated 4,403 ZEVs. The program was established by the Legislature in HB 4109 (2017), and DEQ administers the program under their authority in ORS 468.446.³²

CERTA Measure 2: provides funds for ODOT's [Community Charging Rebate Program](#), which issues rebates for Level 2 charging in Oregon communities. CERTA funding will support the installation of an estimated 625 Level 2 charging ports and 63 Direct Current Fast Charging ports by 2027. ODOT has authority to administer funds made available for transportation purposes through ORS 367.015.³³

CERTA Measure 3: provides funds for DEQ's [Zero-emission Medium- and Heavy-Duty Vehicle Rebate program](#) to issue rebates for private, public, and non-profit entities toward purchase ZEV purchases. The funding will support the purchase of approximately 164 new MHD ZEVs by 2028, particularly in communities most affected by tailpipe pollution. The program was established by the Legislature through HB 3409 (2023), and DEQ administers the program under their authority in ORS 468.463.³⁴

CERTA Measure 4: provides funds for DEQ's [Medium- and Heavy-Duty Diesel Emissions Mitigation Grant Program](#) to issue rebates toward the purchase of ZEV trucks to replace older diesel trucks. The program will support the adoption of about 37 new ZEVs by 2050. Originally established by the Legislature in HB 2007 (2019) to received and use VW settlement funds to reduce diesel pollutants, the program has evolved to accept and use other funding sources to support reductions in diesel emissions, especially in areas closest to state freight corridors. DEQ administers the program under their authority in ORS 468A.801.³⁵

CERTA Measure 5: expands DEQ's Oregon [Zero-Emission Fueling Infrastructure](#) program, which issues rebates to private, public, and non-profit entities to increase Oregon's ZEV charging network for MHD trucks. The funding will add 20 new MHD ZEV charging stations by 2028. The program was established by the Legislature through HB 5202 and HB 4139 (2022), and DEQ administers the program under its authority in ORS 468.498.

ODOE collects transportation consumption data from DEQ, ODOT, and the EIA to produce statewide fuel consumption data in the [Biennial Energy Report](#). Data are used to report on all transportation fuel consumption in Oregon, including fuels used for aviation. These data are used to calculate the carbon intensity of all transportation fuels in Oregon and reported as a state Key Performance Indicator on the carbon content of Oregon's transportation fuels. This information is another tracking metric for the state

³² Oregon Revised Statutes § 468.446 (2017). Zero-emission and electric vehicle rebate program. Retrieved from https://oregon.public.law/statutes/ors_468.446.

³³ Oregon Revised Statutes § 367.015 (2023). Transportation Financing: Oregon Transportation Infrastructure Fund. Retrieved from https://oregon.public.law/statutes/ors_367.015.

³⁴ Oregon Revised Statutes § 468.463 (2023). Zero-emission medium- and heavy-duty vehicle rebate program. Retrieved from https://www.oregonlegislature.gov/bills_laws/ors/ors468.html

³⁵ Oregon Revised Statutes § 468A.801 (2023). Clean Diesel Engine Fund. Retrieved from https://www.oregonlegislature.gov/bills_laws/ors/ors468a.html

to assess overall progress on transportation sector decarbonization. ODOE collects and reports this information under their authorities in 469.030.³⁶

Multiple Oregon state agencies coordinate efforts to reduce emissions in the Transportation sector to efficiently conduct the work and avoid unnecessary duplication of efforts. The [Every Mile Counts](#) initiative, facilitated by ODOT with DEQ, ODOE, and DLCD, creates emissions reduction action plans where interagency coordination is necessary. The initiative was developed in response to Executive Order 20-04 in order to more effectively implement actions from ODOT's Statewide Transportation Strategy to address emissions from transportation. The Zero Emission Vehicle Interagency Working Group specifically supports interagency coordination on ZEV policies and programs across ODOT, DEQ, ODOE, OPUC, and the Department of Administrative Services. The ZEVIWG was established through Executive Order 17-21.³⁷

³⁶ Oregon Revised Statutes § 469.030 (n.d.) Energy: State Department of Energy. Retrieved from https://oregon.public.law/statutes/ors_469.030.

³⁷ Brown, K. (2017). Executive Order No. 17-21: Accelerating Zero Emission Vehicle Adoption in Oregon to Reduce Greenhouse Gas Emissions and Address Climate Change. State of Oregon. https://www.oregon.gov/gov/eo/eo_17-21.pdf.

Table 5. Projected BAP Transportation Sector Emissions Reductions by Policy or Measure

Existing Measures (Program/ Policy/ Regulation)	Milestones and Implementation Schedule	Implementing Agency or Agencies	Oregon Sector-based Emissions Reduction MMTCO ₂ e (2035)	Percentage of total Sector-based emission reductions (2035)	Oregon Sector-based Emissions Reduction MMTCO ₂ e (2050)	Percentage of total Sector-based emission reductions (2050)
Clean Fuels Program	Requires reduction in avg. carbon intensity of transportation fuels from 2015 levels, including:10% by 2025, 20% by 2030, and 37% by 2035	DEQ	4.84	12.25%	5.34	7.45%
Advanced Clean Cars II ³⁸	Requires an increasing percentage of ZEV sales for all new passenger cars/ trucks/SUVs sold in Oregon starting with 2026 model and culminating in 100% ZEV sales by 2035.	DEQ	3.22	8.15%	8.09	11.29%
Advanced Clean Trucks ³⁹	Requires an increasing percentage of ZEV sales starting with 2025 model year.	DEQ	1.65	4.18%	3.98	5.55%
Corporate Average Fuel Economy (CAFE) Standards ⁴⁰	Automakers’ 34.5 mpg national average fuel-economy target for MY 2022-2031 light-duty vehicles	U.S. DOT	0.83	2.10%	1.2	1.67%

³⁸ In June 2025, DEQ established limited enforcement discretion for model year 2026 compliance with ACC II. In light of this development, the latest TIGHGER modeling assumes a slower rate of EV adoption than what was incorporated in the original analysis conducted in 2023, while maintaining the assumption that the policy will remain in place through 2050.

³⁹ In March 2025, DEQ issued a directive to refrain from pursuing enforcement or assessing penalties for manufacturers that fail to meet early ACT ZEV sales requirements for the 2025 and 2026 model years, effectively delaying enforcement until model year 2027. The TIGHGER modeling did not consider the impacts of this enforcement delay, and actual GHG emissions for the first two compliance years may be lower.

⁴⁰ In July 2025, Congress passed H.R. 1, which eliminated civil penalties for noncompliance with CAFE standards. On December 5, 2025, the U.S. Department of Transportation and the National Highway Transportation Safety Administration proposed a draft rule that would amend existing CAFE standards for 2022-2026 model year light-duty vehicles and light trucks. This would lower existing and future standards to 34.5 miles per gallon through MY 2031. Due to the uncertainty and lack of compliance enforcement mechanisms, the TIGHGER modeling assumed compliance with existing CAFE Standards through MY 2025 and 34.5 mpg for MY 2026-2031.

Existing Measures (Program/ Policy/ Regulation)	Milestones and Implementation Schedule	Implementing Agency or Agencies	Oregon Sector-based Emissions Reduction MMTCO2e (2035)	Percentage of total Sector-based emission reductions (2035)	Oregon Sector-based Emissions Reduction MMTCO2e (2050)	Percentage of total Sector-based emission reductions (2050)
Climate Protection Program- Transportation	50% reduction by 2035 from 2017-2019 baseline levels 90% reduction by 2050 Each period includes a declining cap on emissions: 2025 cap: 24.16 MMTCO2e 2035 cap: 15.91 MMTCO2e 2050 cap: 3.18 MMTCO2e	DEQ	0.57	1.44%	1.73	2.41%
Climate-Friendly and Equitable Communities	Reduce single-occupancy driving VMT 5.5% by 2050.	DLCD	0.25	0.63%	0.89	1.24%
CERTA Measure 1 OCVRP Charge Ahead*	Implement CERTA Measure 1: Add 557,800 new light-duty EV's in Oregon by 2030.	DEQ	0.06	0.15%	0.01	0.01%
CERTA Measure 2 Light-Duty Chargers*	Implement CERTA Measure 2: Install approx. 620 Level 2 charging ports and 63 Direct Current Fast Charging ports by 2027.	ODOT	0.038	0.10%	0.038	0.05%
CERTA Measure 3 Medium- and Heavy-Duty Rebate*	Implement CERTA Measure 3: Add approx. 3,000 new MHD ZEVs in Oregon by 2028.	DEQ	0.018	0.05%	0	0.00%
CERTA Measure 4 Medium- and Heavy-Duty Grant*	Implement CERTA Measure 4: to support the replacement of 700 diesel MHD trucks with new ZEVs by 2050.	DEQ	0.004	0.01%	0	0.00%

Existing Measures (Program/ Policy/ Regulation)	Milestones and Implementation Schedule	Implementing Agency or Agencies	Oregon Sector-based Emissions Reduction MMTCO2e (2035)	Percentage of total Sector-based emission reductions (2035)	Oregon Sector-based Emissions Reduction MMTCO2e (2050)	Percentage of total Sector-based emission reductions (2050)
CERTA Measure 5 Medium- and Heavy-Duty Chargers*	Implement CERTA Measure 5: to add 20 new medium- or heavy-duty ZEV charging stations by 2028.	DEQ	0.005	0.01%	0.006	0.01%

*Emissions reductions for CERTA measures reflect amounts assessed for the Oregon CPRG application and the state’s [Priority Climate Action Plan](#), which includes methodology for determining mitigation for vehicles and chargers. Emissions reduction values were incorporated into the TIGHGER model.

Achieving Oregon’s emissions reduction goals requires a fundamental transformation of the transportation sector centered on a rapid shift to ZEVs, including battery electric and hydrogen fuel cell electric vehicles. Oregon’s existing policies lay a strong foundation, but barriers remain. Transportation electrification is central to success in this sector, which will require extensive investments in public charging infrastructure and the electric grid. Incentives to offset higher upfront costs for ZEVs and charging infrastructure are needed to support adoption. As programs work to support cleaner fuel options, it will be critical to ensure that communities and businesses that are less resilient to price increases or have difficulty transitioning to clean energy sources are not disproportionately affected.

The higher upfront cost of ZEVs continues to be a major hurdle, particularly for low-income households and especially as federal grants and tax credits are eliminated. Addressing these upfront costs is especially important for low-income households, because most households will save money on their energy bills by converting from a gas to a battery electric vehicle, as found in the Oregon Energy Strategy consumer costs analysis. See the Community Benefits section on Costs for more information. The Oregon Clean Vehicle Rebate Program helps offset these costs by offering rebates of up to \$2,500 off the cost of a new ZEV for most Oregonians. For low- and moderate-income residents, they can receive a higher rebate of \$7,500 for a new ZEV and \$5,000 for a used ZEV.

Electric MHD trucks cost on average about three times as much as a comparable diesel vehicle. DEQ’s Zero-emission Medium- and Heavy-Duty Vehicle Rebate program and Medium- and Heavy-Duty Diesel Emissions Mitigation Grant Program provide significant support for this transition to support business owners and governments in purchasing ZEV MHD vehicles. In addition, ODOE operates the [Public Purpose Charge Schools program](#), which provides funding for schools in state investor-owned utility service territories which can be used to purchase ZEVs, including electric school buses. ODOT also uses U.S. DOT [Carbon Reduction Program](#) funds to support chargers and electric vehicle purchases for public transit, and for transportation management areas and other communities. More direct financial support is likely to be needed to rapidly increase the number of zero emissions MHD vehicles operating on Oregon’s roads.

Oregonians indicate that a lack of charging infrastructure is a barrier to ZEV adoption. More chargers are needed, with solutions tailored to different individual and business needs. ODOT and DEQ lead multiple programs supporting electric vehicle charging installations and repairs to support passenger, MHD vehicles, fleet electrification, community charging, and publicly owned vehicle charging. ODOT administers [multiple federal programs](#), including the National Electric Vehicle Infrastructure and Charging and Fueling Infrastructure grant, which aim to deploy charging stations, and the Electric Vehicle Charger Reliability and Accessibility Accelerator grant, which provides funds to repair, upgrade, and expand existing chargers. Funds derived through DEQ’s CPP and CFP can be used to fund chargers for fleets and communities.

The cost of purchasing and installing EV chargers, in addition to the higher cost for the vehicle, can be a barrier for many fleets and businesses. There are some state programs that help address these costs, in addition to Oregon Zero-Emission Fueling Infrastructure program. Funds through the ODOE Public Purpose Charge Schools program can be used to pay for chargers, installations, and electrical upgrades. ODOE also administers U.S. DOE [Energy Efficiency and Conservation Block Grant](#) funds, of which about \$500,000 was awarded to the cities of Woodburn, Philomath, West Linn, and Redmond and the Port of Tillamook for EV chargers. ODOT’s Carbon Reduction Program funds are also supporting charging investments for public transit, and for transportation management areas and other communities.

A large gap in ZEV adoptions is fleet experience with and knowledge of ZEVs, their costs and benefits, and operational needs. Some electric utilities offer technical assistance for fleets, but fleets must be located in their service territory to participate. No state-led programs exist to support this issue, but the

Oregon Energy Strategy recommends the development of a statewide program to support both public and private fleets as they consider when is the best time to convert to electric formats. ODOE successfully applied for a National Association of State Energy Officials award that will fund a stakeholder activity in 2026 to assess the types of information and resources needed for a state fleet electrification technical assistance program.

Transportation electrification creates load growth for the grid, which increases risk for grid reliability issues, especially since this is occurring at the same time the state is seeing increasing electricity demand for data centers. Widespread electrification will require expansion of electricity generation and distribution grid upgrades to meet demand needs. The OPUC works with investor-owned utilities to plan for least-cost investments that maintain grid reliability, including investments and studies on how ZEVs can be used by utilities to more cost-effectively manage grid needs. The state's consumer-owned utilities largely rely on the federal BPA for reliable power resources but also conduct planning for their own distribution grid investments. ODOE supports COU planning work by providing data on EV adoption trends in their territories.

Transportation fuel costs are a major concern in Oregon, and higher fuel costs create a greater burden on low-income Oregonians, who are more frequently rural, the elderly, disabled, immigrants, and communities of color. Complying with the regulatory programs in the transportation sector creates the potential for consumer and business fuel cost increases. Impacts will vary for the residential, commercial, and industrial sectors, individuals, and businesses, depending on how intensively people currently use fossil fuels, the costs for alternative cleaner fuels, and consumers' relative ability to access them. Businesses experiencing price changes will likely pass these changes on to their customers, which has implications for consumer costs for goods and services that are transportation dependent. Fuel costs are likely to change because of these programs, but these may be cost increases or potentially decreases if fuels that reduce emissions are more cost-effective than the fossil fuels they are replacing.

The financial benefits of driving electric vehicles cannot be realized if individuals, businesses, and communities are not able to afford the upfront cost of the vehicles or have reliable vehicle availability, and as regulations mature could be subject to rising gasoline costs. Many of the programs described here are designed to reduce negative cost effects while still supporting uptake of cleaner technologies and fuels. The CFP, for example, offers advancements on program credits for Tribes, public transit agencies, school districts, and others, which can be monetized to support upfront costs for things like EV chargers, electrical upgrades, or vehicles.⁴¹ The CPP includes a compliance option for regulated parties to earn credits by providing community climate investments funds to DEQ approved nonprofits. These funds are invested in projects that reduce greenhouse gas emissions. The projects are prioritized for communities most impacted by energy costs and pollution and that lack the necessary infrastructure to transition to cleaner fuels and technologies.⁴² For example, funds could be used to install EV charging in low-income communities.

The design of regulatory programs, including providing compliance flexibility options, is important to reducing costs for businesses and consumers and supporting the economy. An [analysis conducted by ICF](#) assessed the impacts of different program options across commercial, industrial, and residential settings in Oregon to inform CPP design. Across multiple design scenarios, the analysis concluded an emissions reduction program could significantly reduce greenhouse gas emissions while maintaining the overall

⁴¹ Oregon Department of Environmental Quality. (2023). OAR 340-253-1100: General requirements for the Clean Fuels Program: Advance Crediting. Oregon Secretary of State.

<https://secure.sos.state.or.us/oard/viewSingleRule.action?ruleVrsnRsn=293961>.

⁴² Oregon Department of Environmental Quality. (2023). OAR 340-273-0900: Purposes of Community Climate Investments and eligible uses of CCI funds. Oregon Secretary of State. Retrieved from

<https://secure.sos.state.or.us/oard/viewSingleRule.action?ruleVrsnRsn=319902>.

health of the state's economy. While changes were small as compared to the size of the economy, the study showed net positive trends for gross state product, income, and jobs. Similar to the Oregon Energy Strategy study findings, investments in clean transportation were found to result in consumer fuel and energy cost savings. Reduced fuel costs were found to outweigh costs of investments, with the trend increasing over time. This increased personal income and allowed for more spending throughout the economy.

Regulations create pressure for regulated parties to shift business models, taking into account time and resources needed to innovate. The CPP includes several program features that provide flexibility to regulated companies for achieving compliance. These include trading and banking compliance instruments, the voluntary use of community climate investments credits, and multi-year compliance periods. Regulated companies can also pursue different strategies for achieving compliance which vary by business and industry. For example, a fuel supplier could increase their supply of biofuels in place of fossil fuel which would reduce emissions. There may also be changes in demand for fossil fuels. For example, a natural gas utility might provide incentives to support energy efficiency and reduce demand. During the program's first compliance period regulated companies can choose to use CCI credits to meet up to 15 percent of their compliance.

Clean technology sectors, including battery, charging, and grid services industries, are expected to provide job and economic growth opportunities. However, there are also expected job losses in due to reduced need for vehicle maintenance and repair, and fewer gas station staffing needs. The energy strategy workforce study suggests that as a result of meeting Oregon's energy goals, electricity sector employment is likely to see net gains while transportation sector employment is likely to see net losses. Although expected job gains outpace job losses overall, it will be important to consider approaches to mitigate job displacement in the transportation sector. For example, by co-locating charging stations at existing gas stations, and identifying opportunities to transition workers into areas of employment growth. Members of the public may also see economic benefits related to the creation of new green jobs, including through implementation of approved projects that receive CCI funds.

Many communities that have been underrepresented in public processes and adversely harmed by environmental and health hazards, including seniors, youth, and persons with disabilities, will benefit from measures that reduce the use of fossil fuels. Implementation of these programs brings environmental, health, and economic benefits for Oregonians, such as major reductions in tailpipe criteria air pollutants, leading to improved local air quality and public health, especially in urban and freight corridors. For example, by 2035, implementation of the ACC II program is estimated to reduce the emissions of CO by over 61,000 metric tons. By 2050, that number rises to over 127,000 metric tons. Similarly, by 2035, implementation of the ACT program is estimated to reduce NOx emissions by over 7,000 metric tons and, by 2050, that reduction increases to over 18,000 metric tons. Increased ZEV adoption also reduces Oregon's dependence on fossil resources that are extracted and refined in other states, keeping more energy dollars in state. The ICF analysis for the CPP found significant reductions statewide in adverse health impacts, along with increased co-benefits and benefits for identified communities of concern depending on how CCI funds were invested.

Gap Measures

New measures to address the 2050 gap include actions to reduce the need for driving, extending programs beyond 2035 to electrify MHD trucks, and to support the use of low-carbon fuels for rail, maritime, and marine vessels. Many of these measures are or may be influenced by the CPP and CFP, but will require separate and additional policies and incentives, including setting more specific targets and timelines. The commercial readiness of ZEVs and the relative availability and affordability of low-carbon vehicles and fuels will influence when policies can be formalized.

Table 6. Projected Gap Measure Transportation Sector Emissions Reductions by Measure

New Gap Measures (Program/ Policy/ Regulation)	Milestones and Implementation Schedule	Anticipated Implementing Agency or Agencies	Oregon Sector-based Emissions Reduction MMTCO₂e (2035)	Percentage of total Sector-based emission reductions (2035)	Oregon Sector-based Emissions Reduction MMTCO₂e (2050)	Percentage of total Sector-based Emission Reductions (2050)
Reduce Vehicle-Miles-Traveled	20% per capita reduction for light-duty vehicles by 2050.	ODOT, DLCD, Local Governments	0.002	0.01%	0.201	0.28%
Medium- and Heavy-Duty Sales Shares (post 2035)	100% ZEV sales by 2036 for transit and school buses 100% ZEV sales by 2040 for other Class 2b vehicles	DEQ	0.0152	0.04%	1.461	2.04%
Rail	20% electric, 70% hydrogen by 2050	DEQ, ODOT, ODOE	0.00	0.00%	0.036	0.05%
Maritime Shipping	Domestic: 10% electric, 20% H ₂ , 50% ammonia by 2050 International: 20% H ₂ , 60% ammonia by 2050	DEQ, ODOT, ODOE, DLCD, Port Authorities	0.00	0.00%	0.010	0.01%
Aviation	100% SAF by 2050	DEQ, ODOT, ODOE, Local Airport Authorities	0.00	0.00	1.218	1.70%

Reduce Vehicle-Miles-Traveled

Reducing light-duty per capita VMT twenty percent by 2050 can reduce GHG emissions from transportation by an additional 0.2 MMTCO₂e, representing 0.28 percent of the additional reductions needed. The energy strategy modeling found that much of this reduction occurs by 2035 because beyond this an increasingly larger proportion of light-duty vehicles are expected to be ZEVs, meaning VMT reductions will have less of an influence on GHG emissions. This measure is supported by existing policies, including ODOT's [Statewide Transportation Strategy](#) and the [Climate Friendly and Equitable Communities program](#), as well as funding programs aimed at increasing access to and safety of multimodal transportation such as [Safe Routes to School](#) and [Great Streets](#). No additional authority is needed. Implementation timelines and schedules are available through the links for each program above.

To ensure success in meeting the state's VMT reduction goals, greater investment and a stronger prioritization of multimodal transportation infrastructure is needed. Without additional funding for transit, for example, many transit agencies face the prospect of cutting service by up to 25 percent in the next several years. Adequate funding would allow agencies to expand routes and service hours, increase frequency, and serve more people, making transit a more viable and attractive option statewide. Similarly, demand for existing funding through programs like Safe Routes to School and Great Streets far outpaces available resources. Identifying new revenue streams and increasing funding for these programs and new programs focused on multimodal infrastructure would enable more Oregonians to choose cleaner, safer, and more affordable ways to get around.

Implementing agencies or those with authority include DLCD and ODOT, in coordination with local governments, particularly within Oregon's eight metropolitan areas.⁴³ Funding to support CFEC and other multimodal transportation programs comes from a combination of federal transportation funds, state general funds, payroll tax, and Oregon's Highway Trust Fund. Metrics for this measure may include per capita VMT, VMT per household, average trip length, transit ridership, bike and walk trips, and housing units in CFEC-defined climate friendly areas, among others.

Reducing VMT has a wide range of co-benefits that span environmental, economic, social, and health. Driving less reduces emissions of criteria pollutants, including nitrogen oxides, particulate matter, volatile organic compounds, and carbon monoxide, improving local air quality, and helping prevent respiratory illnesses such as asthma and bronchitis. Lower traffic volumes also decrease noise pollution and congestion, improving urban livability. VMT reduction programs support investments in walking, biking, or transit infrastructure, and increased physical activity from using these alternatives can improve cardiovascular health, reduce obesity risk, and benefit mental well-being. Economically, less driving lowers household expenses for fuel, maintenance, insurance, and vehicle depreciation, while also insulating drivers from volatile fuel prices. Alternatives to driving do not work for some trips and may not work for rural residents who do not have access to multimodal travel options.

The Oregon Energy Strategy recommends a number of [policy actions](#) that work to track, minimize, and mitigate any potential disbenefits that result from reducing per-capita VMT for passenger vehicles in Oregon. For example, the energy strategy proposes a new statewide definition of "energy burden" that includes transportation energy costs, not just home energy bills. This helps track how VMT reduction affects household costs overall, particularly for those who rely heavily on driving such as rural residents. The energy strategy also calls for an increase in funding for multimodal infrastructure such as transit and safe walking and biking paths, which helps mitigate reduced flexibility or unequal access. There is also a

⁴³ The eight metropolitan areas in Oregon are Albany, Bend, Corvallis, Eugene-Springfield, Grants Pass, Medford-Ashland, Portland, and Salem-Keizer.

proposal to create a statewide e-bike incentive program to support access to clean, affordable transportation options.

Medium- and Heavy-Duty Sales Shares

Establishing ZEV sales requirements for MHD vehicles beyond 2035, including school and transit buses, can reduce GHG emissions from transportation by an additional 1.46 MMTCO_{2e}, or provide over 2 percent of additional reductions needed. This measure would require additional regulation of MHD vehicle sales beyond the current Advanced Clean Trucks rule, and a continuation of supportive funding policies such as DEQ's clean truck and infrastructure incentives.

DEQ has broad authority under ORS 468A.025 to regulate emissions from vehicles and engines. DEQ can adopt rules that set standards for new vehicles sold in the state if they align with federal law or are identical to California standards that have received waivers from the EPA. Section 177 of the federal Clean Air Act allows states, including Oregon, to adopt California's vehicle emissions standards. The existing ACT regulation establishes zero emission sales targets through model year 2035. Implementation of further sales requirements would begin with model year 2036 vehicles through model year 2050.

Replacing diesel or gasoline trucks with electric models will significantly reduce local air pollutants in addition to GHG emissions, improving air quality in urban and freight corridors and benefiting public health. Reduced tailpipe emissions lower the number and severity of respiratory illnesses, particularly among lower income communities near highways, distribution centers, and other areas with significant vehicle traffic and idling such as construction sites, ports, and transfer stations. The COBRA analysis for this project found the greatest per capita health benefits were seen in counties along major transportation corridors. These findings emphasize the importance of reduced transportation co-pollutants in contributing to the overall estimated health benefits, discussed in more detail below. Electrification also decreases noise pollution from trucks and can lower the operating costs for fleets through reduced fuel and maintenance expenses.

Disbenefits include higher upfront costs, which can pose financial challenges for small and medium-sized businesses with fleets, and their adoption requires substantial investment in charging and fueling infrastructure or grid upgrades. Battery production relies on critical minerals, that can create negative environmental and societal outcomes in mining regions. Electrification could create greater challenges for some fleets if charging infrastructure is not as robust in low-income or rural areas.

The Oregon Energy Strategy provides a number of [policy actions](#) that work to track, minimize, and mitigate any potential disbenefits that result from establishing MHD ZEV sales requirements beyond 2035. For example, the energy strategy proposes the development of a MHD ZEV Roadmap to establish a clear strategy to operationalize electrification goals for MHD vehicles. This study will evaluate and track the maturity, availability, and suitability of MHD ZEV technologies for Oregon fleets, while also establishing investment priorities to fast-track solutions that are both practical and scalable. To minimize the upfront cost burden and the significant knowledge barrier for fleets, the energy strategy calls for funding for both vehicle and infrastructure incentives as well as low-cost financing options and a statewide technical assistance program to help businesses plan their transition. To mitigate disbenefits from battery production, Oregon can encourage the recycling or reuse of spent vehicle batteries, invest in workforce development for battery recycling, and incentivize batteries with lower risk supply chains.

This action is dependent on upholding of California's waiver under the Clean Air Act. Any final determination on the waiver may necessitate a reconsideration of authorities and policies needed to achieve the measure. Additional state legislation or regulations may be required and, in this case, an exact implementation schedule cannot be determined. Should the waiver be upheld and California expands their ACT compliance beyond 2035, the EQC could adopt these rules as well.

Funding sources for establishing and implementing additional ZEV sales requirements comes from a mix of state legislative appropriations, federal grants and settlement funds, and special purpose taxes or fees. Progress on this goal will be tracked using percentage of MHD vehicle shares that are ZEVs. This metric is already being tracked by state agencies.

Rail

Transitioning the rail sector to clean fuels, reaching approximately 20 percent battery electric and 70 percent hydrogen-powered rail by 2050, could reduce transportation-related GHG emissions by an additional 0.036 MMTCO_{2e}, representing about 0.05 percent of the additional reductions needed to meet Oregon's climate targets.

The EPA and the Federal Railroad Administration hold primary authority over locomotive emission standards under the Clean Air Act, and states are preempted from setting their own engine emission standards. Establishing these goals would be aspirational, because Oregon cannot directly regulate rail emissions. However, it can encourage federal actions to reduce emissions for these vehicles and influence rail-related emissions through land use, fuels, infrastructure, and incentive programs.

Rail emissions reductions in Oregon can be supported through a multi-agency approach, with collaboration from DEQ, ODOT, and ODOE. These agencies can collectively implement policies that influence rail emissions through clean fuel standards, infrastructure investment, and incentive programs, in coordination with EPA and FRA. To begin, agencies must complete a thorough assessment of authorities and roles in this sector and conduct outreach and engagement to develop a roadmap of policy options available to the state and specific actions for meeting targets based on available technology and tracking progress. As actions are implemented, ongoing evaluation and monitoring is needed to determine whether a change in approach is appropriate. No specific funding sources are currently available for reducing rail emissions, but funding sources could come from a combination of program fees, state legislative appropriations, and federal grants. Metrics include percentage of total rail fleet that is electric or hydrogen-powered, track length in miles served by overhead catenary lines or third rail systems, number of hydrogen refueling stations available to locomotives, and rate at which diesel locomotives are retired or converted to electric or hydrogen alternatives.

Reducing emissions from the rail sector offers significant environmental, health, economic, and systemic co-benefits. Electrifying rail lines or transitioning to hydrogen-powered locomotives lowers local air pollutants, reduces noise, and improves public health for communities near rail corridors. It can also decrease operating costs, enhance energy security, and support clean technology innovation and jobs. However, there are trade-offs: high upfront infrastructure and fleet conversion costs, potential freight disruptions during construction, environmental impacts from battery or hydrogen production, and the risk that benefits are unevenly distributed, particularly for rural or low-traffic corridors.

While tracking metrics for monitoring progress on reducing GHG emissions from the rail sector, Oregon should also track disbenefits metrics, including costs of infrastructure and fleet conversions, construction-related service disruptions, lifecycle emissions from battery or hydrogen production, and the geographic distribution of benefits. To minimize burdens, the state could phase infrastructure upgrades strategically to maintain freight reliability, provide financial incentives or low-interest financing for rail operators, and prioritize low-emission technology that reduces upstream environmental impacts. Mitigation actions should ensure equity by targeting support for rural or low-traffic corridors, offering flexible scheduling or alternative routing during construction, and implementing lifecycle stewardship programs for batteries.

Maritime Shipping

Transitioning the maritime sector to clean fuels such that approximately 80 percent of domestic and international vessels run on electricity or clean fuels, such as hydrogen, ammonia, and methanol, by 2050 could reduce transportation-related GHG emissions by an additional 0.01 MMTCO₂e, representing about 0.01 percent of the additional reductions needed to meet Oregon's climate targets.

Oregon has no direct authority to regulate emissions from vessels themselves but could indirectly influence maritime emissions through new state-level policies or clean fuel standards, port authority operations and infrastructure, and land use and energy planning. A thorough examination of existing authorities, including where new authorities might be necessary, is needed. In the meantime, maritime emissions reductions in Oregon can be supported indirectly through a multi-agency approach, with collaboration from DEQ, ODOT, ODOE, DLCD, local port authorities, and the West Coast Clean Ports Initiative, among others. In coordination with EPA, they can collectively implement policies that influence maritime emissions using clean fuel standards, infrastructure investment, and incentive programs.

DEQ can regulate onshore emissions from port operations and support clean shore power through ORS 468A.279⁴⁴ or could potentially incentivize low-carbon marine fuels through a new clean fuel standard directed at maritime fuels. ODOE and DLCD can influence siting and permitting of clean port infrastructure, hydrogen hubs, and electrification projects. Port authorities manage port infrastructure, implement voluntary emissions reduction programs, and pursue funding opportunities. ODOT leads statewide freight planning, which includes marine freight, identifying needed infrastructure improvements, funding priorities, and decarbonization strategies, and thus can play a strategic and enabling role in port development and decarbonization.

Funding is likely to come from a mix of federal, state, local, and private sources, since no single entity controls maritime decarbonization, including a mix of federal grants, program fees and state legislative appropriations. A combination of fleet, fuel, operational, and infrastructure metrics should be monitored to track progress, including share of low- or zero-emission vessels, fleet turnover rate, carbon intensity of marine fuels, diesel fuel displacement, GHG and co-pollutant emissions, shore power availability, vessel utilization or shore power, hydrogen or alternative fuel infrastructure, and electrified port equipment.

Reducing maritime GHG emissions offers strong environmental and public health benefits, including lowering air pollutant emissions, cleaner air for port communities, and reduced noise. It can also spur innovation and competitiveness in clean shipping, creating jobs in clean fuel production and port electrification while enhancing long-term competitiveness as global shipping decarbonizes. However, these gains come with trade-offs. Decarbonization will require large upfront investments in new vessels and infrastructure. Low-carbon marine fuels like hydrogen, ammonia, and methanol are not yet widely available or cost competitive. In addition, there are safety risks associated with many, such as the toxicity of ammonia. High costs could be passed on to shippers or consumers, potentially raising prices for imported goods. Smaller ports or regional shipping companies may face competitive disadvantages compared to large international carriers able to absorb or offset costs.

A plan to track, minimize, and mitigate disbenefits from reducing maritime emissions should include metrics on capital expenditures for vessels and port infrastructure, fuel availability and prices, safety incidents, and impacts on shipping costs and port competitiveness. To minimize burdens, the state should consider financial incentives, low-interest loans, or cost-sharing programs for smaller carriers and ports, while supporting the development and distribution of low-carbon fuels. Mitigation strategies

⁴⁴ Oregon Revised Statutes § 468A.279 (2021). Air Quality: Motor vehicle pollution control systems. Retrieved from https://www.oregonlegislature.gov/bills_laws/ors/ors468a.html.

should address safety and environmental risks through rigorous handling standards and training and ensure equitable access to decarbonization resources for smaller or regional operators.

Aviation

Transitioning aviation to 100 percent sustainable aviation fuels by 2050 could reduce transportation-related GHG emissions by an additional 1.22 MMTCO₂e, representing about 1.7 percent of the additional reductions needed to meet Oregon’s climate targets. SAF production, blending,⁴⁵ and use is in its infancy in Oregon. The first commercial use of SAF at the Portland International Airport occurred in 2025.⁴⁶ However, the energy strategy modeling indicates high amounts of SAF are needed primarily in the last decade of the planning horizon to meet the 2050 goal. At this stage it is uncertain what specific actions the state may have to take to meet a 100 percent adoption target. Oregon will need to monitor developments in SAF costs and availability in the coming decade to determine what additional policies may be needed to address SAF costs and availability to make progress on this measure. State agencies will engage with interested parties as developments occur to address needed policies.

Oregon has no direct authority to regulate emissions from aircraft themselves but could indirectly influence aviation emissions by supporting SAF, electrifying airport ground equipment, improving airport energy infrastructure, and incentivizing low-carbon operational practices. DEQ may support incentive programs for low-carbon aviation fuels, electric ground vehicles, and charging infrastructure at airports, or incentivize the use of SAF and shore power. The Oregon Department of Aviation has authority through ORS 835.035⁴⁷ to support airport planning, funding, and upgrades and can incentivize electric ground support equipment or low-carbon infrastructure. ODOT’s Aviation Division also has authority through ORS 367.080⁴⁸ to fund and administer aviation infrastructure grants through the [Connect Oregon Fund](#), and can include airport infrastructure, planning support, and incentives for electrification or low-carbon upgrades. Local airport authorities can implement voluntary emission reduction programs, such as offering SAF incentives for carriers.

Funding for these initiatives could come from a mix of federal airport and environmental programs, state programs, local airport budgets and bonds, and private, market-based investments such as SAF supply partnerships or utility incentives. Metrics for tracking progress will focus on fuel use, emissions reductions, technology adoption, operational efficiency, and infrastructure deployment. Examples include the volume of SAF used, gallons of diesel or jet fuel replaced, number or percentage of vehicle and equipment converted to electric or alternative fuels, or number of charging stations, electrified gates, or SAF fueling points and production locations.

Lowering aviation GHG emissions through SAF can, in some cases, reduce emissions of co-pollutants like NO_x, PM_{2.5}, SO_x, and VOCs, improving local air quality around airports and along flight corridors. Cleaner air near airports can reduce the risk of respiratory and cardiovascular diseases for communities nearby. Investments in SAF production and infrastructure can create jobs in clean technology, fuels, and airport modernization. However, high upfront costs for SAF production can lead to higher costs for airlines, which may be passed on to consumers through increased ticket prices. There is also limited

⁴⁵ According to current fuel quality standards set by ASTM, SAF must be a blend of renewable-based fuel and conventional petroleum-based jet fuel for aircraft compatibility and safety. Current SAF standards requires additional fueling infrastructure to account for blending operations until blending is no longer required.

⁴⁶ Port of Portland. (2025, September 3). Newsroom – *Delta partners with Shell and the Port of Portland for first commercial-scale uplift at Portland International Airport*. <https://www.portofportland.com/Newsroom/delta-partners-with-shell-and-the-port-of-portland>.

⁴⁷ Oregon Revised Statutes § 835 (2023). Aviation Administration; General board powers. Retrieved from https://oregon.public.law/statutes/ors_835.035.

⁴⁸ Oregon Revised Statutes § 367.080 (2024). Transportation Financing: Connect Oregon Fund. Retrieved from https://oregon.public.law/statutes/ors_367.080.

availability of SAF, and early adoption may face reliability challenges or maintenance issues. Smaller airports or operators may struggle to adopt low-carbon technologies and fuel, leading to unequal benefits across regions.

A plan to track, minimize, and mitigate disbenefits from reducing aviation emissions should monitor metrics such as the cost and availability of sustainable aviation fuels, adoption rates by airlines and airports, maintenance or reliability issues, and regional disparities in access. To minimize burdens, the state should consider financial incentives, subsidies, or low-interest financing to reduce upfront SAF costs, support early adoption pilots, and invest in supply chain and infrastructure to improve fuel reliability. Mitigation strategies should ensure smaller airports and operators have access to low-carbon technologies and fuels, provide technical assistance for adoption and maintenance, and monitor ticket pricing to avoid disproportionate cost impacts on consumers.

Additional GHG reduction opportunities

Several measures described in other sectors also reduce sector- and consumption-based transportation emissions. Packaging and paper impact disclosure requirements and impact reduction incentives described in the Industrial sector below include both in-state (sector-based) and out-of-state (consumption-based) emissions reduction opportunities across the full life cycle of packaging and paper products, including transportation. Existing and expanded food waste prevention efforts described in the Food and Agriculture sector reduce transportation emissions associated with global and local food distribution. There are also opportunities to reduce embodied carbon emissions associated with producing concrete, steel and asphalt are described in the Waste, Water, and Other Sustainable Materials Management Sector.

Commercial & Residential Sector

The Residential & Commercial sector in Oregon accounts for 10 percent of statewide emissions. Most emissions come from natural gas consumption, with space and water heating being the largest contributors. Emissions from electricity consumption are reflected in the electricity sector. Despite growth in this sector, residential and commercial emissions have slightly reduced from a peak in 2007, largely through energy efficiency actions. Buildings used for the manufacture of goods or for agricultural purposes are included in the industrial sector.

The residential portion of this sector includes the majority of buildings used for long-term housing and some buildings used for short-term housing; these types include single family homes, manufactured homes, attached homes like duplexes, fourplexes and townhomes, and large multi-unit housing buildings like apartment buildings. The commercial portion includes buildings used for business purposes (including some used for shorter term housing, like condos, hotels, care facilities, and dormitories), buildings used for a nonprofit purpose like schools, hospitals, college campuses, government buildings, and several other service/infrastructure type facilities like data centers and other similar buildings.

Figure 10. Projected Commercial & Residential Sector Emissions Reductions

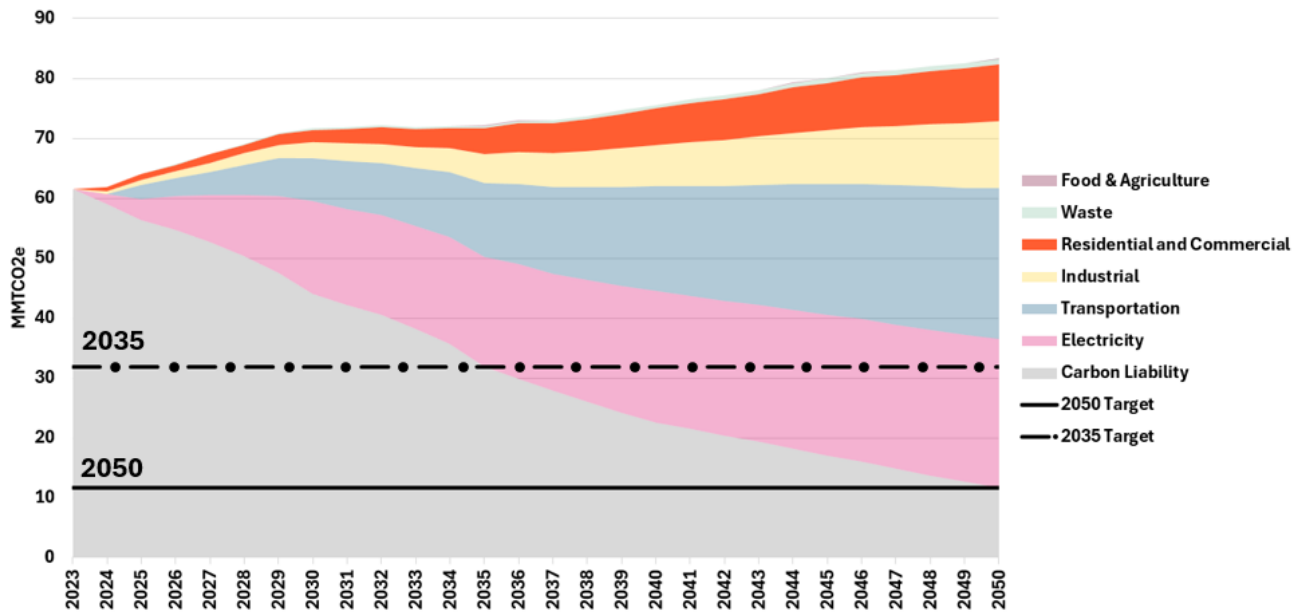


Table 7. Projected BAP Commercial & Residential Sector Emissions Reductions

Existing Measures (Program/ Policy/ Regulation)	Milestones and Implementation Schedule	Implementing Agency or Agencies	Oregon Sector-based Emissions Reduction MMTCO ₂ e (2035)	Percentage of total emission reductions (2035)	Oregon Sector-based Emissions Reduction MMTCO ₂ e (2050)	Percentage of Total Sector Emission Reductions (2050)
Energy Efficient Buildings	<p>State Building codes are established and include (ASHRAE'S) Energy Efficiency Specialty Code and appliance standards are adopted in accordance with Federal and regional standards.</p> <p>Codes and standards are updated according to planned schedule and ensure special building types comply with code-related programs.</p>	DCBS-BCD/ODOE	0.37	0.94%	0.68	0.95%
Energy Efficiency Standards for Appliances	Efficiency standards set for appliances, 2.5% savings by 2030, 4% by 2040.	ODOE	0.015	0.04%	0.009	0.01%
Existing Building Energy Efficient Upgrades and Retrofits	<p>Retrofit 10,000 residences with insulation and electric appliances via the Home Energy Rebate Programs.</p> <p>Replace 10,000 manufactured homes with energy efficient models.</p> <p>Improve energy efficiency of large commercial buildings to comply with Oregon's Building Performance Standard by 2030.</p>	ODOE/ OHCS/ ETO	0.043	0.11%	0.047	0.07%
CERTA Buildings Measure 6: New	Implement CERTA Measure 6: Support construction of 9,400	OHCS/ ETO/DEQ	0.022	0.06%	0.022	0.03%

Existing Measures (Program/ Policy/ Regulation)	Milestones and Implementation Schedule	Implementing Agency or Agencies	Oregon Sector-based Emissions Reduction MMTCO2e (2035)	Percentage of total emission reductions (2035)	Oregon Sector-based Emissions Reduction MMTCO2e (2050)	Percentage of Total Sector Emission Reductions (2050)
Residential Construction*	residential units that are at least 10% more energy efficient than Oregon's base building code between 2025-2028.					
CERTA Measure 9: Residential Weatherization*	Implement CERTA Measure 9: Retrofit 2,690 existing housing units with improved insulation, air sealing, and window/door replacements between 2025-2028.	ODOE/ OHA/ETO/ DEQ	0.005	0.01%	0.005	0.01%
CERTA Measure 7: Building Performance Standards Incentives*	Implement CERTA Measure 7: Incentivize early adoption of Oregon Building Performance Standards by 2028.	ODOE	0.008	0.02%	0.003	0.004%
Community Heat Pump and Rental Heat Pump Programs	Oregon Heat Pump Programs: Add heat pumps to 24,400 existing residences and rental properties by 2027.	ODOE/ETO	0.004	0.01%	0.03	0.04%
CERTA Measure 8: Heat Pump Program*	CERTA Buildings Measure 8: Add 12,000 heat pumps to new and existing residential buildings, including rental properties, by Dec. 2029.	ODOE/DEQ	0.014	0.04%	0.014	0.02%
Oregon Solar + Storage Rebate Program	Install 69 MW of rooftop solar, rooftop solar with battery storage, or battery storage to existing rooftop solar across OR residential buildings	ODOE	0.029	0.07%	0.029	0.04%

Existing Measures (Program/ Policy/ Regulation)	Milestones and Implementation Schedule	Implementing Agency or Agencies	Oregon Sector-based Emissions Reduction MMTCO2e (2035)	Percentage of total emission reductions (2035)	Oregon Sector-based Emissions Reduction MMTCO2e (2050)	Percentage of Total Sector Emission Reductions (2050)
	2022-2025 (see Solar & Storage data for per county basis).					
Climate Protection Program- Commercial & Residential	Reduce GHG emissions from fossil fuels by 50% by 2035 and 90% by 2050 (from 2017-19 levels)	DEQ	2.62	6.63%	5.74	8.01%

*Emissions reductions for CERTA measures reflect amounts assessed for the Oregon CPRG application and the state's [Priority Climate Action Plan](#), including the methodologies used. Emissions reduction values were incorporated into the TIGHGER model.

Oregon implements several programs and policies that reduce GHG emissions in the commercial and residential sectors. This includes programs that reduce emissions from natural gas use, energy efficiency measures which reduce total energy consumption, and support customer-side clean electricity generation.

Energy Efficient Buildings and Energy Efficiency Standards for Appliances

Oregon building codes and appliance standards can reduce emissions 0.689 MMTCO₂e by 2050, or nearly 1 percent of all emissions. Building and appliance codes include energy efficiency requirements that reduce energy consumption, thereby reducing GHG emissions from generated electricity and fossil fuel combustion used in buildings. State building codes set minimum energy and construction standards for new construction and significant renovations. This includes installations of equipment that are part of the mechanical operations of the building, such as heating, ventilation, and air conditioning systems. Appliance standards include minimum energy efficiency targets and installment requirements for many appliances and equipment, including freezers, lighting, personal computing equipment, commercial cooking equipment, and refrigeration.

Oregon aligns its building and appliance energy efficiency codes with ASHRAE⁴⁹ Specialty Energy Efficiency codes, which inform state programs targeting energy efficiency improvements, including standards for new buildings or major retrofits of existing buildings. The Building Codes Division of the Department of Consumer & Business Services administers Oregon's statewide [residential](#) and [commercial](#) building codes, including ASHRAE Specialty Energy Efficiency Codes under their authority in ORS 455.020.⁵⁰ In addition to these efficiency codes, state buildings are required to meet 20 percent higher efficiency standards, and are required to invest 1.5 percent of construction costs on green energy technologies. The Oregon Legislature designated ODOE to oversee compliance with the state's [State Energy Efficient Design](#) and [1.5% for Green Energy Technology](#) programs for state agencies in ORS 276.915⁵¹ and 279C.528⁵² respectively.

Existing Building Energy Efficient Upgrades and Retrofits

Oregon provides incentive programs to support energy efficiency improvements in existing residential and commercial buildings. These programs can reduce emissions in existing buildings by 0.047 MMTCO₂e, or 0.07 percent of all emissions by 2050. Most programs cover the incremental cost increases associated with replacing existing equipment with more efficient models and repairing or upgrading building materials with more energy efficient products. The state sets efficiency targets for large commercial buildings and runs programs that help support energy efficiency retrofits for existing buildings. Programs are run and supported by multiple agencies.

Oregon's Public Purpose Charge program provides incentives for efficiency upgrades in residential and commercial buildings served by Oregon utilities, including a 10 percent carve-out for schools. The program is funded by investor-owned utility ratepayers and overseen by the Oregon Public Utility Commission, who designated the Energy Trust of Oregon in Commission Order 01-1053⁵³ and subsequent grant agreements to administer energy efficiency adoption programs funded by Public

⁴⁹ASHRAE was originally named the American Society of Heating, Refrigerating, and Air Conditioning Engineers, but they are now known as ASHRAE.

⁵⁰ Oregon Revised Statutes § 455.020 (2024). Building Codes; Purpose. Retrieved from https://oregon.public.law/statutes/ors_455.020.

⁵¹ Oregon Revised Statutes § 276.915 (2024). Public Facilities: Energy design requirements. Retrieved from https://oregon.public.law/statutes/ors_276.915.

⁵² Oregon Revised Statutes § 279C.528 (2024). Public Contracting – Public Improvements & Related Contracts; State Department of Energy requirements and specifications. Retrieved from https://oregon.public.law/statutes/ors_279c.528.

⁵³ Public Utility Commission of Oregon. (2001, December 12). Order No. 01-1053. <https://apps.puc.state.or.us/orders/2001ords/01-1053.pdf>.

Purpose Charge revenues through their authorities in ORS 757.612.⁵⁴ BPA provides [energy efficiency programs](#) for the state’s 37 consumer-owned utilities, with some investing additional funds to expand offerings. BPA’s program is funded through revenues from its electricity sales.

State agencies also oversee policies and programs that encourage or require energy efficiency actions in planning and program implementations. Oregon’s [Building Performance Standard](#) requires owners of large existing commercial and multifamily buildings – generally those over 20,000 square feet – to track, report, and improve their energy use to meet defined efficiency targets. Established by House Bill 3409⁵⁵ (2023) and implemented by ODOE beginning in 2025 under their authority in 469.277,⁵⁶ the program is based on ASHRAE Standard 100 with Oregon-specific amendments. Building owners must benchmark their energy use to similar type buildings, calculate their Energy Use Intensity, and submit performance reports to ODOE. Compliance deadlines begin in 2028–2030, depending on the building size and type. If a building’s energy performance falls short of the standard, owners must implement operational improvements or efficiency upgrades to reduce consumption.

The Oregon Department of Land Conservation & Development oversees local government compliance with the state’s land use planning goals, including [Goal 13](#), which requires local governments to consider the effects of comprehensive planning decisions on energy consumption. Under their authority in ORS 456.555,⁵⁷ the Oregon Housing & Community Services Department requires low-income housing developers to meet minimum energy efficiency standards, and under ORS 458.505⁵⁸ administers the Weatherization Assistance Program, which uses federal funding to provide no cost energy efficiency upgrades to low-income households.

Energy efficiency actions are often used to meet compliance requirements for DEQ regulatory programs. Energy efficiency allows regulated parties to do more with less energy, reducing GHG emissions and other pollutants. For example, energy efficiency actions can be used to meet DEQ air quality⁵⁹ permitting requirements.

Energy efficiency provides many co-benefits, including lower consumer energy costs and in some cases improved indoor air quality. Energy efficient equipment reduces the amount of energy needed to do the same task, translating to lower energy bills. Improving energy efficiency in homes can help reduce energy costs for the 28 percent of Oregon households considered energy burdened.⁶⁰ Replacing natural gas or propane appliances and HVAC equipment with more energy efficient electric options also reduces indoor air pollutants, which decreases negative health outcomes from air pollutants resulting from fossil fuel combustion in homes and businesses.

⁵⁴ Oregon Revised Statutes § 757.612 (2024). Utility Regulation Generally; Requirements for public purpose expenditures. Retrieved from https://oregon.public.law/statutes/ors_757.612.

⁵⁵ 82nd Oregon Legislative Assembly. (2023). House Bill 3409. 2023 Regular Session. <https://olis.oregonlegislature.gov/liz/2023R1/Downloads/MeasureDocument/HB3409/Enrolled>.

⁵⁶ Oregon Revised Statutes § 469.277 (2024). Energy: Department adoption of performance standards. Retrieved from https://oregon.public.law/statutes/ors_469.277.

⁵⁷ Oregon Revised Statutes § 456.555 (2023). Housing: Housing and Community Services Department established. Retrieved from https://oregon.public.law/statutes/ors_456.555.

⁵⁸ Oregon Revised Statutes § 458.505 (2023). Housing & Community Service Programs: Community action agency network as delivery system for federal antipoverty programs. Retrieved from https://oregon.public.law/statutes/ors_458.505.

⁵⁹ Oregon Regulatory Statutes § 468A.310 (2023). Federal operating permit program approval. Retrieved from https://oregon.public.law/statutes/ors_468a.310.

⁶⁰ Energy burdened households are defined as those spending more than six percent of their income on electricity and heating expenses.

Energy efficiency improvements benefit all utility customers and taxpayers, because they lower the overall energy demand required to meet customer needs.⁶¹ Reducing energy consumption offsets the need for utilities to invest in more resources and infrastructure to meet growing demand that is ultimately paid for through rate increases. Further, like ZEVs, many energy efficient technologies are flexible resources that utilities and consumers can leverage to reduce energy costs by using them during times of low energy demand when wholesale energy costs are lower.⁶²

The upfront costs to purchase and install energy efficient and clean energy equipment are a barrier for many homes and businesses, especially many low-income homes where additional home maintenance is required before energy efficient technologies or weatherization measures could be taken.⁶³ The barrier is greater for many low-income Oregonians, who often live in inefficient older or manufactured homes, and therefore pay proportionally higher energy bills. Most of the programs described here are designed to apply exclusively to low-income families or have specific carve-outs in their funds for low- and sometimes moderate-income families. Some customers can leverage incentives from their local utility, where many programs have similar low-income carve-outs. The Oregon Energy Strategy includes multiple recommendations to address these barriers, including:

- [Developing a Revolving Loan Fund](#) that could provide low-cost or no-cost financing for energy efficiency investments.⁶⁴
- [Prioritizing existing energy efficiency programs](#) offering energy efficiency and weatherization improvements, particularly those that focus on low- and moderate-income households.⁶⁵
- [Earmarking flexible funding for deferred maintenance actions](#) needed to enable energy efficiency and weatherization for low- and moderate-income households.⁶⁶

All of these, if developed, could help further reduce upfront cost burdens.

Renters often have less control over or opportunity to engage in energy efficiency upgrades to reduce their energy consumption. The Oregon Housing & Community Services Department requires minimum energy efficiency standards for low-income multifamily housing in OAR 813-206-0000⁶⁷ to ensure tenants will be able to benefit from long-term energy affordability. Oregonians living in multi-family rentals that are not specifically designated as low-income, including single-family homes, must rely on building owners to make investments. Some newer programs, like Oregon's Heat Pump Purchase Program and the Manufactured Home Replacement Program (described in more detail below), focus on reducing barriers for renters. Energy Trust provides incentives for rental property owners and managers, and guidance for renters on how to work with property managers to improve energy efficiency.⁶⁸

In addition to financial barriers, lack of awareness of energy efficiency programs and opportunities often limit the reach of programs. Many state programs work directly with community-based organizations to

⁶¹ Oregon Department of Energy. (2018). *2018 Biennial Energy Report: Chapter 6* (p 5). <https://www.oregon.gov/energy/Data-and-Reports/Documents/BER-Chapter-6-Energy-Efficiency.pdf#page=5>.

⁶² Oregon Department of Energy. (2022). *2022 Biennial Energy Report* (p 532). <https://www.oregon.gov/energy/Data-and-Reports/Documents/2022-BER-Policy-Briefs.pdf>.

⁶³ Oregon Department of Energy. (2024). *Oregon Energy Strategy* (pp 99-101). <https://www.oregon.gov/energy/Data-and-Reports/Documents/Oregon-Energy-Strategy.pdf>.

⁶⁴ Oregon Department of Energy. (2025). *Oregon Energy Strategy* (p 84). <https://www.oregon.gov/energy/Data-and-Reports/Documents/Oregon-Energy-Strategy.pdf>.

⁶⁵ Oregon Department of Energy. (2025). *Oregon Energy Strategy* (p 101). <https://www.oregon.gov/energy/Data-and-Reports/Documents/Oregon-Energy-Strategy.pdf>.

⁶⁶ Oregon Department of Energy. (2025). *Oregon Energy Strategy* (p 101). <https://www.oregon.gov/energy/Data-and-Reports/Documents/Oregon-Energy-Strategy.pdf>.

⁶⁷ Oregon Secretary of State. (n.d.). Oregon Administrative Rules: Division 18 – Oregon Multifamily Energy Program (OAR 813-206). <https://secure.sos.state.or.us/oard/displayDivisionRules.action?selectedDivision=5018>.

⁶⁸ Energy Trust of Oregon. (n.d.). Residential renters. <https://www.energytrust.org/residential/residential-renters/>.

bring energy efficiency and other climate issues into community conversations and help members access programs. For example, ODOE's [Oregon Rural and Agricultural Energy Assistance program](#), which is funded through the U.S. Department of Agriculture's Renewable Energy Development Assistance Grant, provides agricultural businesses and rural small businesses with energy efficiency assessments. ODOE also hosts the "[Ask Energy](#)" program, where individuals and businesses can contact energy efficiency experts who will provide them with resources, guidance, and contacts.

General lack of awareness of the benefits of energy efficiency and options to improve it is also a barrier to increased uptake. ODOE supports [Home Energy Score programs](#) that provide energy consumption information for homeowners and prospective buyers. HES program participation is mandatory in Portland, Hillsboro, Milwaukie, and Bend, but ODOE also supports a voluntary statewide program. Information provided through energy audits shows average energy costs for a home, as well as specific actions that could be taken to reduce energy consumption and associated costs. This can be used by homeowners to determine the most cost-effective energy efficiency actions for their home and increase transparency for buyers on the energy costs they are likely to pay.

CERTA Measures 6, 7, and 9

Oregon has several programs designed to support energy efficiency improvements in existing residential and commercial buildings. These include programs that incentivize home weatherization and energy efficient appliances, and support replacing older manufactured homes and early compliance with the Building Performance Standard program for many commercial buildings. Replacing existing home heating with heat pumps also improves building performance, and programs and activities supporting this are described separately in the next section. Many existing programs received funds through DEQ's [CERTA](#) grant, in addition to state and other funding sources. Together, these incentive programs will reduce 0.028 MMTCO_{2e} of emissions, or about 0.044 percent of total emissions by 2050.

Several programs in Oregon serve to lower the upfront costs of weatherizing a home or replacing less efficient appliances. ODOE's [Home Energy Rebate Program](#) will retrofit 10,000 residences with insulation and electric appliances using U.S. Department of Energy Home Energy Rebate and Home Electrification and Appliance Rebates funds to help offset upfront costs. ODOE has statutory authority under ORS 469.030 to coordinate with federal agencies on energy programs and develop and administer energy efficiency programs. Oregon Housing & Community Services in coordination with the Energy Trust is implementing the [Manufactured Home Replacement Program](#) to replace homes that cannot be cost-effectively retrofitted. The program uses state funds, including from the Public Purpose Charge, and U.S. Housing and Urban Development Preservation and Reinvestment Initiative for Community Enhancement program funds. OHCS expects to replace about 10,000 homes, with a focus on those manufactured before 1978. OHCS has broad authority under ORS 469.356⁶⁹ to create and administer dwelling replacement loans and grants.

DEQ's CERTA provides funds that support additional efforts to improve building performance. These include:

- **CERTA Measure 6:** provides funding for Energy Trust's multi-family program and Oregon Housing and Community Services' Oregon Multifamily Energy Program to support energy efficient design and construction in new affordable multifamily buildings. The funding will provide incentives to build 9,420 homes that use 10 percent less energy than homes built to current base building code requirements. Energy Trust serves Oregon's investor-owned utility service territories comprising the majority of state metropolitan areas. Energy Trust administers the programs under the

⁶⁹ Oregon Revised Statutes § 458.356 (n.d.) Housing & Community Services Programs: Definitions. Retrieved from https://oregon.public.law/statutes/ors_458.356.

authorities delegated to them by the OPUC. OHCS authority to accept and distribute federal grants funds is codified in ORS 456.559.⁷⁰

- **CERTA Measure 9:** provides funds for home weatherization programs that improve energy efficiency in existing residential homes through programs at ODOE, Energy Trust, and the Oregon Health Authority. ODOE's program provides funds for Oregon consumer-owned utility programs, which predominantly serve small towns and rural areas through their authority under ORS 469.030. Energy Trust will use these funds to supplement their [Income-qualified Services program](#) for weatherization actions under their OPUC-delegated authorities. OHA will use funds to supplement their [Healthy Homes Grant Program](#) which provides weatherization grants for low-income housing in areas disproportionately affected by negative air quality. They implement the grant under their authority in ORS 431A.400.⁷¹
- **CERTA Measure 7:** provides funds to incentivize early and voluntary compliance with ODOE's Building Performance Standard Program through offering rebates for energy efficiency measures. Early adoption of regulatory standards will provide additional energy use reductions in these buildings.

These programs have similar benefits to other efficiency upgrades, including lower energy costs, lowering energy demand, and improving air quality and related health outcomes. Like other energy efficiency programs, efforts to improve awareness of the programs and their benefits as well as addressing upfront cost barriers are needed.

ODOE and OHCS coordinate with Energy Trust of Oregon, utilities, nonprofits, and trusted local partners to ensure residents – especially low-income and multifamily households – know about Home Energy Rebate program incentives and assistance programs. OHCS provides Manufactured Home Replacement program information directly to manufactured home park owners, managers, and residents. ODOE launched a multi-platform outreach effort to ensure commercial building owners are aware of new Building Performance Standard regulations and available incentives. Apart from the BPS regulations, all programs described in this measure are specifically designed to address upfront cost barriers.

Heat Pump Programs and CERTA Measure 8

Heat pumps reduce GHG emissions in commercial and residential buildings when they replace most types of heating. They also reduce emissions when replacing existing, less efficient electric heating by reducing the amount of electricity – and thereby emissions – needed to heat the space.⁷² Together, Oregon heat pump adoption programs will reduce 0.044 MMTCO₂e by 2050, or about 0.06 percent of all emissions. ODOE operates two programs that provide incentives and technical assistance for the installation of heat pumps in new and existing buildings. The CERTA grant provides \$25.2 million to support implementation of the [Oregon Heat Pump Purchase Program](#). The program will provide 12,000 incentives to install heat pumps in new and existing residential buildings, including rental units and single-family homes. The program prioritizes low-income housing and homes that currently use wood, heating oil, or electric resistance heating, and those that lack heating. ODOE has the authority to receive and spend federal dollars under ORS 469.030.

Energy Trust of Oregon operates two heat pump programs for customers in the state's investor-owned utility service territories. The Standard Heat Pump Incentive provides up to \$1,000 toward the cost of a

⁷⁰ Oregon Revised Statutes § 835 (2024). Housing: Power and duties of department. Retrieved from https://oregon.public.law/statutes/ors_456.559.

⁷¹ Oregon Revised Statutes 731A.400 (2024). Public Health Programs & Activities: Healthy Homes Program. Retrieved from https://oregon.public.law/statutes/ors_431a.400.

⁷² This assumes replacing existing heating or cooling only. If an installed heat pump used to provide cooling that was not previously available, energy consumption would rise.

heat pump and installation, or up to \$3,000 for low- to moderate-income customers.⁷³ The Manufactured Home Heat Pump Incentive provides up to \$4,000 for these residents. Both programs also use state Public Purpose Charge funds. Energy Trust operates the programs under their authority delegated by the OPUC.

Heat pumps provide many benefits similar to energy efficiency, including reduced consumer costs and improved indoor air quality. When replacing fuel combustion heating, heat pumps improve indoor air quality, which improves respiratory health.⁷⁴ The Oregon Energy Strategy Energy Wallet analysis found that when replacing inefficient electric heating, heat pumps reduce energy bills in most households.⁷⁵ Many Oregonians do not have access to adequate cooling equipment, and heat pumps also provide cooling, which can reduce heat-related illness and death.⁷⁶ During the 2021 Pacific Northwest heat dome event, at least 100 people died, most of whom did not have access to air conditioning.⁷⁷

Similar to energy efficiency technologies, upfront costs for heat pumps, including purchase and installation costs, and access for renters are major barriers. Heat pump programs are specifically designed to address upfront costs. The Oregon Heat Pump Purchase Program includes a carve-out for low-income renters and designates 3,000 heat pumps for rentals. Energy Trust programs can be used for rentals but typically require owners to participate. Residential heat pump programs look for cost-effective opportunities for consumers and so do not generally require installations of heat pumps where it does not make financial sense.

Solar + Storage Rebate Program

Residential solar systems provide zero-emission electricity to the home, offsetting the need for grid electricity that could include GHG emissions. This measure would support the addition of solar electricity capacity on residential homes, reducing emissions by 0.029 MMTCO_{2e}, or 0.04 percent of all emissions by 2050. [Oregon's Solar + Storage Rebate Program](#) provides rebates to lower the cost of purchasing and installing solar panels, with or without battery storage. It issues rebates to homeowners, contractors, and low-income service providers toward purchase and installation costs. Low-income service providers can qualify for additional amounts beyond the standard rebate. While behind-the-meter solar produces electricity, this program is not included in the electricity sector because it directly reduces residential energy consumption. The program was established by the Legislature in HB 2618⁷⁸ (2019) and is administered by ODOE under ORS 469.030.

Funds for the OSSRP are provided by the state and have totaled \$27 million thus far. As of May 2024, all funds in the program had been reserved. No additional funds were appropriated in 2025, but the program does not sunset until January 2, 2029 and continues to administer existing funds. More GHG emissions reductions from this program would occur if additional funds were appropriated and the sunset date extended.

⁷³ Energy Trust of Oregon. (2023). *2024 approved budget and 2024–2025 action plan*. <https://www.energytrust.org/wp-content/uploads/2023/12/2024-Approved-Budget-and-2024-2025-Action-Plan.pdf>.

⁷⁴ Oregon Department of Energy. (2025). *2025 Biennial Oregon Heat Pump Report*. (p 4).

<https://www.oregon.gov/energy/Data-and-Reports/Documents/2025-Biennial-Oregon-Heat-Pump-Report.pdf>.

⁷⁵ Clean Energy Transition Institute, Evolved Energy Research, Rockcross Consulting, Sylvan Energy Analytics. (August 2025). *Oregon Energy Strategy Complementary Analysis*. (p. 26). <https://www.oregon.gov/energy/Data-and-Reports/Documents/2025-OES-Complementary-Analysis-Tech-Report.pdf>.

⁷⁶ Oregon Department of Energy. (2023). *Oregon cooling needs study*. (p 4). <https://www.oregon.gov/energy/Data-and-Reports/Documents/2023-Oregon-Cooling-Needs-Study.pdf>.

⁷⁷ Oregon Department of Energy. (2023). *Oregon cooling needs study*. (p. 6). <https://www.oregon.gov/energy/Data-and-Reports/Documents/2023-Oregon-Cooling-Needs-Study.pdf>.

⁷⁸ 80th Oregon Legislative Assembly. (2019). House Bill 2618. 2019 Regular Session.

<https://olis.oregonlegislature.gov/liz/2019R1/Downloads/MeasureDocument/HB2618/Enrolled>.

Like many other energy efficiency actions, residential solar and storage resources can reduce energy costs – both for the consumer and ratepayers more broadly – and help the state address energy burden. Solar, when coupled with storage, could also provide backup power during outages, which benefit communities that have more frequent loss of power due to impacts of wildfires or power safety power shutoffs by utilities to reduce wildfire risk.⁷⁹

The OSSRP addresses key barriers including upfront costs and limited access for low-income Oregonians and renters. Investments in solar can take a decade or longer to pay for themselves in energy cost savings, which may be prohibitively long for many consumers. There are also limited opportunities for renters. Manufactured homeowners are eligible, and renters can apply for the program with permission from the property owner. Some Oregon utilities and Energy Trust support access to residential solar through community solar programs, where renters can purchase solar panels that operate elsewhere but can be used to offset the total cost of their electricity bill.

Climate Protection Program: Commercial & Residential

The CPP will help to reduce emissions from the use of fossil fuels for heating and cooking in residential and commercial buildings. Using lower carbon fuels, including biogas, renewable natural gas, renewable propane, and hydrogen to supplement or replace existing fossil fuels will reduce the emissions from use of these fuels in buildings. Energy efficiency programs that reduce on-site fuel consumption can also help regulated parties like gas providers to comply with emissions caps. The CPP will reduce 5.74 MMTCO₂e in the residential and commercial sector by 2050, or about 8 percent of all emissions. A more in-depth discussion of the CPP is discussed in the Transportation sector above.

Gap Measures

Additional programs and policies addressing residential and commercial building GHG emissions are needed to meet Oregon’s climate goals. The gap measures below build on existing measures for this sector, by increasing heat pump adoption for space and water heating, electrifying cooking appliances, and increasing rooftop solar adoption for homes and businesses.

⁷⁹ Oregon Department of Energy. 2022 Biennial Energy Report: Backup Power Energy 101. (p 256).
<https://www.oregon.gov/energy/Data-and-Reports/Documents/2022-BER-Energy-101s.pdf#page=51>.

Table 8. Projected Gap Measure Residential & Commercial Sector Emissions Reductions by Policy or Measure

New Gap Measures (Program/Policy/Regulation)	Milestones and Implementation Schedule	Anticipated Implementing Agency or Agencies	Oregon Sector-based Emissions Reduction MMTCO ₂ e (2035)	Percentage of Total Sector-based Emission Reductions (2035)	Oregon Sector-based Emissions Reduction MMTCO ₂ e (2050)	Percentage of Total Sector-based Emissions Reductions (2050)
Commercial Space Heating	<p>Electric heat pumps are 15% and other electric + electric hybrid systems⁸⁰ are 10% of HVAC sales by 2030.</p> <p>Electric heat pumps are 50% and other electric + electric hybrid systems⁷⁹ are 40% of sales by 2045.</p>	ODOE/ETO/DCBS-BCD	0.057	0.14%	0.243	0.34%
Residential Water Heating	<p>Incorporate federal Energy Conservation Standards for Consumer Water Heaters into Oregon Residential Building Codes by May 2029.</p> <p>95% of residential water heater sales are electric heat pumps by 2045.</p>	ODOE/ETO/DCBS-BCD	0.238	0.60%	0.728	1.01%
Commercial Water Heating	<p>Incorporate federal Energy Conservation Standards for Consumer Water Heaters into Oregon Commercial Building Codes by May 2029.</p>	ODOE/ETO/DCBS-BCD	0.035	0.09%	0.232	0.32%

⁸⁰ Some commercial space heating needs are not suitable for current heat pump technology, so the model included some residual electric resistance heat, radiant heat, thermal storage and hybrid heat pump + combustion-based systems.

New Gap Measures (Program/Policy/Regulation)	Milestones and Implementation Schedule	Anticipated Implementing Agency or Agencies	Oregon Sector-based Emissions Reduction MMTCO ₂ e (2035)	Percentage of Total Sector-based Emission Reductions (2035)	Oregon Sector-based Emissions Reduction MMTCO ₂ e (2050)	Percentage of Total Sector-based Emissions Reductions (2050)
	15% of commercial water heater sales are heat pumps and 10% are other electric technologies ⁸¹ by 2035. 50% of commercial water heater sales are heat pumps and 40% are other electric technologies ⁸⁰ by 2045.					
Cooking	95% of cooking appliance sales are electric by 2035.	OHCS/ETO/ODOE/DEQ	0.020	0.05%	0.072	0.10%
Behind-the-Meter Solar PV	924 MW of behind-the-meter solar capacity by 2030.	OPUC/ODOE	0.294	0.74%	1.18	1.65%

⁸¹ Some commercial high temperature water heating end uses are not suitable applications for heat pump technology, these targets include some electric resistance heat, and hybrid heat pump + combustion-based systems.

Commercial Space Heating

Greater heat pump adoption in the commercial buildings sector will build on emissions reductions from residential heat pump uptake. This measure would establish a goal to increase heat pump and hybrid heat pump sales for small commercial buildings⁸² to 90 percent of new space heating sales by 2050, with an interim goal of 25 percent by 2030. This includes specific targets for fully electric heat pumps or hybrid systems that operate with another form of heating, including gas furnaces or woodstoves. Achieving this goal will reduce emissions by 0.243 MMTCO₂e, or just over 0.3 percent of the total emission reductions needed. The Oregon Energy Strategy model found that these sales targets could be achieved if most heating technologies and water heaters are replaced with heat pumps at the end of their useful lifetimes.

Currently there are no targets for heat pumps in commercial buildings, but targets could be established by Oregon's Governor or Legislature. They could also be established by rule for new commercial buildings by the Building Codes Division of the Department of Consumer & Business Services. ODOE's Building Performance Standard program could encourage heat pump adoption as a compliance mechanism for existing commercial buildings, supporting consumer decisions to purchase a heat pump when existing systems fail.

Incentives may be needed to help consumers overcome initial upfront costs greater than that to purchase other forms of heating equipment. If funding were available, Energy Trust could expand existing heat pump incentive programs for commercial buildings and ODOE could support commercial building heat pump incentives. Agencies could also leverage their existing authorities to apply for and spend federal funding when there are funding opportunities. For example, the USDA continues to post funding opportunities through the Rural Energy for America Program, which ODOE could apply for to support heat pump adoption in rural communities. The Oregon Energy Strategy recommended several actions to support greater heat pump adoption, including:

- Advancing strategic electrification in buildings by [developing a building decarbonization roadmap](#) to inform policies and programs supporting state decarbonization and energy resilience goals.⁸³
- [Update existing energy efficiency and demand response programs](#) to enable greater building and other end use electrification.⁸⁴
- [Identifying gaps in estimated future occupation-level employment](#), including heat pump installation, repair, and maintenance experts, in order to support workforce development in support of those employment needs.⁸⁵

About 40 to 45 percent of commercial buildings use natural gas for space heating, which means that the 90 percent heat pump adoption goal will necessitate replacing or supplementing natural gas heating with electric heat pumps. For these businesses, the cost to adopt this technology may be an even higher barrier than others, if the heat pump energy costs are higher than their current natural gas costs. It is important that heat pump adoption programs take this into consideration, looking for the most cost-effective options for replacement in the early years, continually assessing costs for heat pump adoption for these businesses, and creating incentives designed to address these unique costs.

⁸² Small commercial buildings use HVAC systems that are similar in size and operation to residential buildings.

⁸³ Oregon Department of Energy. (2024). *Oregon Energy Strategy*. (pp 103-104). <https://www.oregon.gov/energy/Data-and-Reports/Documents/Oregon-Energy-Strategy.pdf>.

⁸⁴ Oregon Department of Energy. (2024). *Oregon Energy Strategy*. (pp 104-105). <https://www.oregon.gov/energy/Data-and-Reports/Documents/Oregon-Energy-Strategy.pdf>.

⁸⁵ Oregon Department of Energy. (2024). *Oregon Energy Strategy*. (p 87). <https://www.oregon.gov/energy/Data-and-Reports/Documents/Oregon-Energy-Strategy.pdf>.

Heat pumps may need additional heating resources for colder climates in Oregon. In these cases, dual fuel hybrid heat pump systems can supplement with gas heat on the coldest days. The 2030 and 2050 goals include hybrid systems to create flexibility in meeting the heat pump targets. The goals also leave space for buildings where it may be infeasible to switch to a heat pump system. For example, ODOE anticipates that about 20 percent of existing small commercial buildings that are currently heated by woodstoves will not adopt a heat pump by 2050. Energy Trust of Oregon's incentive program would need to modify their program to allow for dual-fuel heat pump incentives, with approval from the OPUC.

The barriers, co-benefits, and disbenefits of heat pump adoption are described in detail in the existing measures section. Greater adoption of heat pumps would continue to build on the described economic, environmental, and health benefits. No additional funding would be required to update building codes to ensure new commercial building construction requires heat pump installations.

Residential and Commercial Water Heating

Updating Oregon's residential and commercial building codes by 2029 to federal Energy Conservation Standards for water heaters will reduce the amount of energy and the associated GHG emissions needed to heat water in new buildings and for existing buildings undergoing major retrofits. Setting a target for 95 percent of residential water heater sales to be heat pumps by 2045 will enable replacement of less efficient water heating in existing homes. Similar actions in the commercial sector, including a 50 percent heat pump target by 2050 will encourage more energy efficient water heating in these buildings. The residential water heating actions alone can meet over 1 percent of the total emissions reductions needed for Oregon to meet the 2050 GHG emissions reduction goal. The commercial standards will provide about 0.3 percent of total reductions.

Water heater efficiency standards are established in state building codes for new construction and statewide appliance standards for water heater replacements. The Building Codes Division of the Department of Business & Consumer Services has the authority to, and does, adopt federal Energy Conservation Standards for water heaters into residential and commercial building codes. ODOE is responsible for recommending to the Legislature for their approval updates to the state Appliance Standards.

Like heat pumps for space heating, the Governor or Legislature can establish sales targets for heat pump water heaters. Many of the same programs that support heat pump adoption for space heating could also support heat pump water heaters, including the heat pump incentives offered by ODOE and Energy Trust, and regulations like the Building Performance Standard program for commercial buildings.

Barriers to heat pump water heater adoption are similar to those for heat pumps for space heating, including high upfront costs. Improved water heater efficiency has the benefit of saving money for many households and businesses, especially those replacing a conventional electric water heater, but possibly not for those with existing high efficiency gas water heaters, or in some cases where replacing an existing water heater may require costly retrofits. The loss of federal tax credits for heat pump installations will further exacerbate the upfront cost barrier. While the programs presented here help address these types of upfront costs, the state may need to consider additional incentives to address the gap.

Changes in federal appliance standards set to take effect in 2030 could unintentionally increase the adoption of gas water heaters. The new standards will require water heater efficiencies that can only be achieved with heat pump technology for many electric water heater options. If developers and installers lack awareness of, or comfort in installing heat pump water heaters, this could lead them to select gas water heaters for new construction or retrofits. In the near-term, state programs should continue to support heat pump water heater adoption where it is financially beneficial to the consumer, and assess cost-effective options as technologies evolve and mature.

Heat pump water heaters can reduce electricity demand when replacing existing electric water heaters but would increase overall electric load for the home or business when replacing gas. Many homes and businesses located in areas with existing natural gas services were typically built with smaller capacity electric transformers and panels as a cost-saving measure. Increasing use of electric technologies in general may instigate the need for some upgrades to the local transformer or the building's electrical panel. The state may need to consider incentives to help offset electrical upgrade costs for consumers electrifying appliances in their home. These could potentially be offered through existing energy efficiency and heat pump programs but would require additional rulemaking by the program as well as staff to administer. There is currently no funding identified for additional incentives or potential program expansion costs.

Water heaters are a flexible energy storage technology, where heating can occur during off-peak hours and “stored” for use later. This can reduce energy costs for consumers, reduce the need for utilities to purchase expensive wholesale electricity during peak load hours, and reduce utility customer costs by offsetting the need to develop more infrastructure or resources to support electric load. Oregon's appliance standards require heat pump water heaters sold in Oregon to be demand response-ready, which is a prerequisite to the Oregon Energy Strategy recommendation to update existing energy efficiency and demand response programs that enable greater building and other end use electrification. These programs would be developed by local utilities in conjunction with their regulating bodies and require no additional state funding.

Cooking

Cooking appliances have been trending toward electric in recent years, which currently make up only about 50 percent of sales. Establishing a goal of 95 percent of new appliance sales to be electric by 2035 will reduce emissions associated with gas-fueled cooking appliances, addressing about 0.1 percent of total emissions reductions by 2050, or 0.072 MMTCO₂e. This measure was based on a recommendation from the Oregon Climate Action Commission that 100 percent of residential and commercial appliance sales be electric by 2035.⁸⁶ This recommendation was discussed by the Energy Strategy's Building Efficiency, Electrification, and Distributed Energy Resources Working Group as a potential energy strategy modeling assumption. Feedback during the discussions was that the 100 percent sales target was too aggressive.⁸⁷ The group agreed to an assumption of 95 percent as more achievable, which was included in the model.⁸⁸

Establishing a goal for sales of electric cooking appliances would require legislation or executive action. There are no existing state programs or regulations that require increasing sales of electric cooktops and ovens. The state could adopt building codes standards requiring electric cooking appliances for new residential and commercial buildings. This action would require no additional funding or authorities, but it would come with some risk of litigation or industry push back. Replacing gas cooking appliances with electric formats in existing homes presents a greater challenge because there is strong resistance to mandates requiring fuel switching.

Lacking regulatory policies to support this measure, the state will need to lean on incentives that make converting more economically attractive to consumers. There are currently no incentive programs that

⁸⁶ Oregon Global Warming Commission. (2023 March). *Oregon Climate Action Roadmap*. p 16.

<https://static1.squarespace.com/static/59c554e0f09ca40655ea6eb0/t/64275befc3f5d82a60b981b2/1680301043241/2023-Climate-Action-Roadmap.pdf>.

⁸⁷ Oregon Department of Energy. (2025 February). Phase 1 Comment Response Document. p 24.

<https://www.oregon.gov/energy/Data-and-Reports/Documents/OES-Phase1-Comment-Response-Documnt.pdf>.

⁸⁸ Oregon Department of Energy. (2025 March 14). Energy Strategy Modeling Assumptions and Sources. p 6.

<https://www.oregon.gov/energy/Data-and-Reports/Documents/Oregon-Energy-Strategy-Modeling-Assumptions-Sources.pdf>.

serve to specifically support Oregonians using gas appliances who are interested in transitioning to electric formats. Through the Home Electrification & Appliance Rebate program administered by Energy Trust in collaboration with Earth Advantage, ODOE will offer incentives toward the purchase of electric induction stoves and ranges, but not for standard electric appliances.

A program specifically designed to encourage building electrification to reduce emissions may be needed to adequately support the electric cooking appliance sales goal. Authority to administer to this type of program may be included under ODOE's statutory directive to qualify for, accept, and disburse any private or federal funds or services to administer state energy policies,⁸⁹ which include supporting the development and use of permanently sustainable energy resources.⁹⁰ Funding resources would need to be identified to support such a program.

The costs to switch from a gas to electric stove can deter consumers from purchasing an electric option at the next replacement opportunity. Replacing an existing gas stove with an electric version includes costs to cap the existing gas line and potentially add a 240 Volt outlet. More costs may occur if electrical upgrades are necessary to accommodate the new load. This is particularly a risk in areas served by natural gas, where homes and businesses were typically built with smaller capacity electric transformers and panels. To achieve the 95 percent goal, the state may need to consider incentives to cover installation costs when replacing a gas stove or range with electric. There are currently no sources of funding for this, but ODOE and potentially other agencies could apply for federal funding to support this type of incentive.

Increasing awareness of the health benefits from converting to electric from gas could help encourage uptake. Like other electrification actions, replacing gas with electric stoves improves indoor air quality, creating a healthier environment and eliminates the risk of gas leaks from cooking equipment. ODOE and Energy Trust can leverage outreach and communication efforts for their energy efficiency programs to support this awareness. Transitioning cooking appliances from gas to electric would modestly increase Oregon's peak electricity load. Unlike other electric end uses like EVs, cooking loads cannot be moved to off-peak hours. This will contribute to the costs of operating the grid, which could lead to increasing costs for electricity ratepayers. The state may need to consider future efficiency standards through state building codes and appliance standards needed to minimize peak load contributions from cooking electrification. This could include regulations and incentives that encourage induction stoves, which typically use about 30 percent less energy than a comparable resistance heating appliance.

Behind-the-Meter Photovoltaic Solar

Installing 924 MW of customer-side solar PV by 2030 can reduce over 1.6 percent of additional GHG emissions needed by 2050. The target was developed from projections by the Northwest Power & Conservation Council, which conducts regional electricity planning for the Pacific Northwest.

There are two programs in Oregon that could be leveraged to support behind-the-meter solar adoption. ODOE's Solar + Storage Rebate program was established by the Legislature in 2019 through House Bill 2618 and is available statewide, and Energy Trust programs are overseen by the Oregon Public Utility Commission and were established in 1999 through Senate Bill 1149.

The barriers to achieving behind-the-meter solar adoption targets include high upfront costs, which are even greater for low-income Oregonians. Incentives to offset higher upfront costs would be needed to support achieving the target, including additional funds directed toward low-income residents. State incentives will become especially critical now that federal solar tax credits, which previously covered

⁸⁹ Oregon Revised Statutes § 469.030 (2023). Energy: State Department of Energy. Retrieved from https://oregon.public.law/statutes/ors_469.030.

⁹⁰ Oregon Revised Statutes § 469.010 (2023). Energy: Policy. Retrieved from https://oregon.public.law/statutes/ors_469.010.

about 30 percent of project costs, have been revoked. Existing programs could be leveraged to provide incentives but would require additional funding sources to be identified. Both existing state programs include direct funding requirements for low- and moderate-income households, supporting higher per-household expenditures.

There are many benefits of behind-the-meter solar, including lower electricity costs for owners and ratepayers, reduced negative effects on Oregon's lands, more jobs and economic growth, and greater energy resilience for Oregonians and their communities by generating electricity when the grid is not available. Solar energy delivered on-site reduces the need for electricity from the grid, which reduces that consumer's electricity bill. It also reduces overall demand on the grid, offsetting the need for ratepayer investments in new generation and transmission resources. Another benefit is that it limits the amount of Oregon land and water resources needed for electricity generation. Finally, behind-the-meter solar creates increased demand for workers to install and maintain distributed solar PV. The Oregon Energy Strategy workforce assessment found that between 500 to 5,000 new workers will be needed to support customer-side resources like solar.

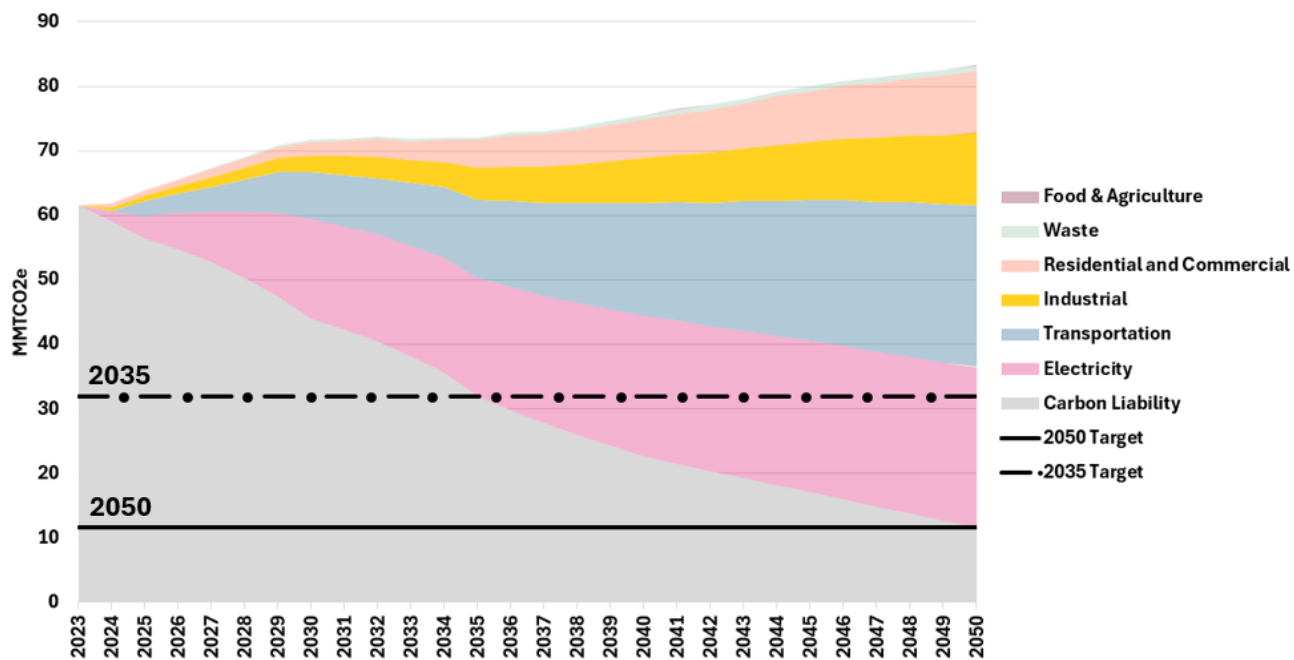
Additional GHG reduction opportunities

The construction, maintenance, and remodeling of residential and commercial buildings depend on carbon-intensive materials such as concrete, steel, roofing, and other materials. Construction activities, dominated by the emissions from material production, contribute 8 percent of Oregon's total consumption-based global emissions. Existing efforts by DEQ and the Oregon Department of Administrative Services to reduce those emissions, as well as potential to further reduce emissions through new programs and policies, are described as part of the Waste, Water, and Other Sustainable Materials Management Sector section below.

Industrial Sector

Oregon's industrial sector includes facilities used to produce, process, and manufacture products – including agriculture, fishing, forestry, manufacturing equipment (such as chip manufacturing), mining, data centers, and on-site process energy production. Total annual industrial emissions decreased from 1990 to 2023, largely due to contractions in fuel-intensive aluminum, forestry, and manufacturing industries coupled with expansions in more electricity-based technology manufacturing. In 2023, Oregon's industrial sector emitted 13 percent of total sector-based emissions. The largest source of emissions comes from the use of natural gas, coal, and other fossil fuels combusted onsite to generate heat and power equipment but also includes on-site chemical process emissions. Emissions from electricity consumption are included in the Electricity sector described above.

Figure 11: Projected Industrial Sector Emissions Reductions



Oregon’s industrial sector is diverse, with a variety of products, energy, and manufacturing needs. DEQ’s Climate Protection Program places an emissions limit on fossil fuels used in transportation, residential, commercial, and industrial applications across the state. This is particularly relevant to Oregon industry, who use these fuels for space, water, and process heating.

Table 9. Projected BAP Industrial Sector Emissions Reductions

Existing Measures (Program/Policy/Regulation)	Milestones and Implementation Schedule	Anticipated Implementing Agency or Agencies	Oregon Sector-based Emissions Reduction MMTCO ₂ e (2035)	Percentage of total Sector-based Emissions Reductions (2035)	Oregon Sector-based Emissions Reduction MMTCO ₂ e (2050)	Percentage of total Sector-based Emissions Reductions (2050)	Additional Emissions Reductions Outside of Oregon MMTCO ₂ e (2050)
Climate Protection Program-Industrial	Reduce GHG emissions from fossil fuels by 50% by 2035 and 90% by 2050 compared to baseline.	DEQ	4.21	10.65%	7.75	10.80%	NA
Packaging and Paper Decarbonization (RMA)	Implement producer responsibility packaging, paper and food serviceware impact reduction program. Reduce lifecycle GHG impacts of covered products sold into Oregon by at least 0.54% (from a non-intervention baseline) by 2030.	DEQ	0.174	0.44%	0.423	0.59%	0.7

*DEQ is conducting a rulemaking on the regulation of industrial facilities. Current modeled reductions will change based on the rules adopted.⁹¹

⁹¹ Oregon Department of Environmental Quality. (2026). Rulemaking at DEQ: Climate Protection Program EITE 2027. <https://www.oregon.gov/deq/rulemaking/Pages/cppeite2027.aspx>.

Climate Protection Program: Industrial

Most industrial sector emissions are regulated under DEQ’s Climate Protection Program, including natural gas and other process fuels as well as other on-site process emissions. It is the primary policy driving decarbonization in the industrial sector today. The CPP regulates emissions-intensive and trade-exposed industries that meet or exceed 15,000 metric tons of carbon dioxide equivalent covered emissions annually, including concrete production, semiconductor manufacturing, steel manufacturing, and pulp and paper mills. Other industrial facilities are not directly regulated by the CPP, but their fuel consumption can be affected through regulations on fuel providers that support their facilities.

These emissions-intensive trade-exposed industrial facilities are significant users of natural gas and are exposed to competition outside the state. DEQ works directly with these regulated entities to reduce the potential for leakage, that is the relocation of emissions and businesses outside of Oregon to places without comparable emission reduction programs. The CPP is designed to directly regulate these facilities, providing more options for reducing emissions and flexibility for compliance.⁹² DEQ is conducting a rulemaking focused on the regulation of these industrial facilities.⁹³ The goal is to develop GHG emission intensity targets for these facilities. Current modeled reductions will change based on the rules adopted.

Packaging and Paper Decarbonization

Oregon’s 2021 Recycling Modernization Act⁹⁴ includes three separate elements that are expected to reduce sector- and consumption-based emissions associated with the manufacture of packaging, paper, and food serviceware products (“covered products”). First, the law includes a producer-funded mitigation fund that DEQ must use to reduce the environmental impacts of these products.⁹⁵ Second, it establishes a mandate to periodically evaluate and disclose life cycle environmental impacts, including GHG emissions, from larger producers that sell their products into Oregon. Third, it provides financial incentives to members of the DEQ-approved producer responsibility organization in the form of membership fee adjustments if they voluntarily undertake such disclosure and impact reduction.⁹⁶ DEQ is responsible for periodic approval of the producer responsibility organization’s plan and annual reports and oversight of the program.

Circular Action Alliance is the producer responsibility organization authorized by DEQ to operate the extended manager producer responsibility [program](#) for packaging, food serviceware, and printing and writing paper in Oregon. Through its membership fee schedule (promulgated in accordance with its DEQ-approved program plan), Circular Action Alliance provides financial incentives to support producers of covered products to evaluate the environmental impacts of their products, and additional larger financial

⁹² Oregon Department of Environmental Quality. (2024). Oregon Administrative Rules: OAR 340-273-0000 to 340-273-9000, particularly -0410 through -0450. Oregon Secretary of State. Oregon Climate Protection program. <https://secure.sos.state.or.us/oard/displayDivisionRules.action?selectedDivision=8651>.

⁹³ Oregon Department of Environmental Quality. (2026). Rulemaking at DEQ: Climate Protection Program EITE 2027. <https://www.oregon.gov/deq/rulemaking/Pages/cppeite2027.aspx>.

⁹⁴ Oregon Revised Statutes § 459A.860 to 459A.975 (2021). Reuse and Recycling. Retrieved from https://www.oregonlegislature.gov/bills_laws/ors/ors459a.html.

⁹⁵ For purposes of this CCAP and to illustrate potential, it is assumed that approximately one-third of program funds are available to support industrial decarbonization projects in Oregon’s paper industry. Oregon Department of Environmental Quality. Oregon Administrative Rules: OAR 340-090-0690(3). Retrieved from <https://secure.sos.state.or.us/oard/viewSingleRule.action?ruleVrsnRsn=319702>.

⁹⁶ Mandates at ORS 459A.944; incentives at ORS 459A.884(4); rules at OAR 340-090-0900 through -0940. Retrieved from [oregonlegislature.gov/bills_laws/ors/ors459a.html](https://www.oregonlegislature.gov/bills_laws/ors/ors459a.html) and [Oregon Secretary of State Administrative Rules](#).

incentives to further reduce impacts.⁹⁷ Funding is provided through fees paid to Circular Action Alliance by its members. Through periodic assessment of effectiveness⁹⁸ and fee adjustments, DEQ expects to increase producer participation and responsiveness to these incentives. This will help to reduce lifecycle GHG impacts of covered products sold into Oregon by at least 0.54 percent from a business-as-usual baseline by 2023. Effects on Oregon’s sector-based inventory are small, but potential global impact is many times larger since most covered products are manufactured out-of-state and virtually all covered products sold into Oregon are also sold in many other locations.

Oregon has other existing industrial decarbonization policies and programs that indirectly reduce emissions in the industrial sector, including building codes, clean electricity targets and energy siting requirements. Many of the emissions from these indirect policies are addressed in other sections of the report.

⁹⁷ Circular Action Alliance (2026), Oregon Program Plan (2025 – 2027), amended version May 4, 2026. See in particular “Graduated Fee Algorithm and Methods” starting on page 208. Retrieved from <https://www.oregon.gov/deq/recycling/Documents/CAAamendOPPa2.pdf>.

⁹⁸ Oregon Revised Statutes § 459A.875 and 887 (2025). Retrieved from https://www.oregonlegislature.gov/bills_laws/ors/ors459a.html.

Gap Measures

Table 10. Projected Gap Measure Industrial Sector Emissions Reductions by Policy or Measure

New Measures (Program/ Policy/ Regulation)	Milestones and Implementation Schedule	Implementing Agency or Agencies	Oregon Sector-based Emissions Reduction MMTCO ₂ e (2035)	Percentage of Total Sector-based Emissions Reductions (2035)	Oregon Sector-based Emissions Reduction MMTCO ₂ e (2050)	Percentage of total Sector-based Emissions Reductions (2050)	Additional Emissions Reductions Outside of Oregon MMTCO ₂ e (2050)
Electrification	<p>100% of machine drives by 2035.</p> <p>100% of low temperature heat by 2050.</p> <p>50% of heat in bulk chemicals production by 2050.</p> <p>25% of heat in glass production by 2050.</p> <p>50% of integrated steam production by 2045.</p> <p>100% of refrigeration by 2040.</p>	ODOE/DEQ	0.564	1.43%	2.26	3.14%	NA

New Measures (Program/ Policy/ Regulation)	Milestones and Implementation Schedule	Implementing Agency or Agencies	Oregon Sector- based Emissions Reduction MMTCO2e (2035)	Percentage of Total Sector- based Emissions Reductions (2035)	Oregon Sector-based Emissions Reduction MMTCO2e (2050)	Percentage of total Sector- based Emissions Reductions (2050)	Additional Emissions Reductions Outside of Oregon MMTCO2e (2050)
	<p>75% of industrial HVAC loads by 2050.</p> <p>80% of industrial vehicles by 2050.</p> <p>50% of construction energy demand by 2050.</p>						
Hydrogen Fuel Adoption	<p>50% of heat in bulk chemicals by 2050.</p> <p>20% of integrated steam production by 2050.</p> <p>20% of construction energy demand by 2050.</p> <p>20% of industrial vehicles by 2050.</p>		0.013	0.03%	0.217	0.30%	NA

New Measures (Program/ Policy/ Regulation)	Milestones and Implementation Schedule	Implementing Agency or Agencies	Oregon Sector-based Emissions Reduction MMTCO2e (2035)	Percentage of Total Sector-based Emissions Reductions (2035)	Oregon Sector-based Emissions Reduction MMTCO2e (2050)	Percentage of total Sector-based Emissions Reductions (2050)	Additional Emissions Reductions Outside of Oregon MMTCO2e (2050)
Cement Industry Improvements	Cement process is optimized in the model, including retrofits and new build rotary kilns to include direct separation, oxy-combustion, biomass fuel, and CCS.	TBD	0.081	0.20%	0.382	0.53%	NA
Lower Carbon Boiler Adoption	Adoption of geothermal boilers <ul style="list-style-type: none"> • 3.2% in 2035 • 30.2% in 2040 • 32.7% in 2045 • 32.6% in 2050 Adoption of hydrogen boilers <ul style="list-style-type: none"> • 0.2% in 2035 • 0.9% in 2040 • 1.7% in 2045 • 2.3% in 2050 	ODOE/DEQ/ OTHER	0.017	0.04%	0.532	0.74%	NA
HFC Product Reduction	75% reduction in Oregon's HFC emissions by 2035.	DEQ	0.70	1.77%	1.49	2.08%	NA

Electrification

Industrial sector electrification is the process of replacing fossil fuel-based direct use fuels like natural gas, coal, or petroleum with equipment that uses electricity. Oregon could achieve emissions reductions of 4.37 MMTCO₂e or 25.7 percent of total sector-based emissions in 2050, primarily through electrification of low and medium temperature industrial heat technologies such as computer and electronic product fabrication, and adoption of battery and plug-in electric vehicles for light- and medium-duty industrial transportation, primarily in the agricultural sector. As the electricity sector decarbonizes to meet state 100 percent clean electricity targets, electric end uses will have immediate and ongoing emissions reductions. High heat applications are harder to electrify, but there are opportunities in glass production, bulk chemicals production, construction energy demand, and integrated steam production by 2050.

The most cost-effective opportunities to electrify vary across industrial sectors and even specific operations, meaning overall costs are often site-specific. Electric options are not practicable for every use case, and the timing for adoption will also be highly specific to on-site activities. The Oregon Energy Strategy included recommended actions to support timely and cost-effective electrification actions for industry, including:

- Creating an [industrial modernization revolving loan](#) fund to bolster uptake of electrification processes while maintaining competitiveness in the national and global economies.⁹⁹
- ODOE and Business Oregon collaborating with large industry partners to [identify and evaluate short and long-term decarbonization options for large industrial entities](#), including electrification.¹⁰⁰

The revolving loan fund could include low-cost financing or grants to help support demonstration and pilot projects that can help deploy different approaches to decarbonization. Reducing upfront costs for new equipment and supporting infrastructure, especially where they may be more expensive than updating or replacing existing fuel-based technology. It could also support collaborative forums for information sharing across industrial partners or expert technical assistance to provide real-world experience and support for facilities planning for or installing new electric technologies. These forums could help minimize adoption barriers, streamline planning and operations, and support on-site training needs. Collaboration could also point out a need for state and federal investments in higher education for new training programs or curricula for new technology innovations.

Electrification increases electricity demand, which can affect grid reliability and energy costs. Options to address this are described in the Electricity Sector.

DEQ tracks process emissions from industry through required annual GHG Inventory reporting.¹⁰¹ Electrification of on-site equipment is one option for regulated industries to comply with DEQ's Climate Protection Program and ODOE's Building Performance Standard regulations. Reporting across these programs can provide data on progress toward the goals for this measure. Ultimately the key assessment of progress on this measure is the overall reductions in emissions from industry, which are tracked through DEQ's GHG reporting program. It is anticipated that differences in the commercial availability

⁹⁹ Oregon Department of Energy. (2024). Oregon Energy Strategy. (pp 115-116). <https://www.oregon.gov/energy/Data-and-Reports/Documents/Oregon-Energy-Strategy.pdf>.

¹⁰⁰ Oregon Department of Energy. (2024). Oregon Energy Strategy. (p 117). <https://www.oregon.gov/energy/Data-and-Reports/Documents/Oregon-Energy-Strategy.pdf>.

¹⁰¹ Oregon Department of Environmental Quality. (2023). Oregon Administrative Rule 340-215-0040: General reporting requirements. Oregon Secretary of State. <https://secure.sos.state.or.us/oard/viewSingleRule.action?ruleVrsnRsn=319918>.

and on-site feasibility of different electric technologies and relative uptake may not match the specific target percentages presented here. Future energy strategy modeling will incorporate technological advancements and costs to update where the least-cost options for industrial electrification are anticipated to occur.

Industrial energy efficiency programs, like the Large Electric Consumer Public Purpose Program, verified by ODOE, support electrification actions as a method to improve on-site energy efficiency and meet program-specific goals. Large industrial customers (greater than 1 average MW) in the state’s investor-owned utility service territories can self-direct LECPPP funds for cost-effective energy efficiency measures. ODOE tracks LECPPP participation, energy savings, and/or adoption of incentives. Additional authorities to track or require electrification and/or incentives to support electrification may be needed if market forces and/or existing programs are not sufficient to drive GHG reductions.

There are limited funds supporting industrial electrification, relying significantly on private sector investments in electric technologies during normal replacement equipment replacement cycles. In-state manufacturers of “covered products” under the Recycling Modernization Act may be able to access financial incentives such as those in ORS 459A.941 to support electrification.

Electrification reduces onsite air pollution, supports industrial modernization, and in many cases can lower industry energy costs.

Hydrogen Fuel Adoption

The Oregon Energy Strategy modeling found that lower carbon fuels will be needed to decarbonize the hardest-to-electrify industrial processes such as bulk chemical production, integrated steam production, construction, and industrial vehicles to meet the 2050 emissions reduction goal. In the modeling, clean hydrogen¹⁰² was identified as an option to replace fossil fuels for these industrial processes, but because it is more expensive than using electricity for the near-term, uptake would largely occur in the decade leading up to 2050 when its cost becomes competitive. The hydrogen uptake described in Table 10 would reduce GHG emissions by 0.217 MMTCO₂e or 2.9 percent of total sector-based emissions in 2050.

Multiple existing programs support the use of hydrogen in Oregon. Replacing fossil fuels with hydrogen can help regulated parties comply with DEQ’s CPP and can be used to generate credits in the CFP for transportation fuels. These and other policies, like Oregon’s HB 2021 clean electricity target and zero-emission vehicle adoption goals, provide more certainty in demand for potential hydrogen supply developers. However, uptake faces significant challenges because a hydrogen production economy and delivery infrastructure are not commercially available at the level needed to support the amount of hydrogen needed to decarbonize this sector.

Successfully jump starting this type of economy requires a coordinated effort between producers and consumers. Production facilities, new pipelines, storage facilities, and refueling infrastructure will need to be built — requiring capital investments that need to have assurances that a market will be available when production begins. Commercial viability also requires reductions in production costs, including mass-production at scale of low-carbon hydrogen and development of necessary transportation and delivery infrastructure. Industries need assurances that the supply of hydrogen fuel will be reliable and safe, in addition to addressing concerns that converting to hydrogen will not affect their ability to compete. Commercial viability also requires reductions in the costs to create clean hydrogen, including mass-production at scale of large electrolyzers and development of a transportation and delivery infrastructure and economy.

¹⁰² The way the energy strategy model worked necessitated that the hydrogen is assumed to be low- or zero-emission hydrogen to meet 2050 economywide GHG goals.

There are very few funding opportunities currently available to support the development of a hydrogen economy. Large capital investments would be needed on both the production and consumption side. Oregon and Washington state participated as members of the Pacific Northwest Hydrogen Association in a successful application for funding through the U.S. DOE's Regional Clean Hydrogen Hubs Program. Association members include public and private partners, including businesses interested in supporting supply and demand side for a hydrogen economy in the region. The award was expected to bring in up to \$1 billion in grant funds, but in October 2025, the U.S. DOE informed the association that they were cancelling the funding. There are currently no federal funding opportunities available to support this project.

Oregon imports nearly all the fuels that it uses, meaning the state is dependent on the resilience of the existing fossil fuel supply network for electricity generation, transportation, and heating. In-state production of hydrogen could deliver improved reliability of Oregon's fuel supply. Hydrogen production could support economic development in local economies and support more fuel supply resilience in those communities. It could also help improve power system reliability by co-locating renewable hydrogen production with electricity generation to help meet peak demand.

Clear and early direction from the state is required to support shifts in fuel demand, so Oregon businesses and communities have time to prepare. The Oregon Energy Strategy recommends ODOE develop a [low-carbon fuels deployment roadmap](#) for Oregon. ODOE can track commercial development of low-carbon fuels like hydrogen, research best uses for different Oregon consumers, identify opportunities to integrate these fuels into Oregon's energy system, and evaluate the state's role in securing access. This can help industry and businesses vet the potential for hydrogen to support their activities and assess the costs. ODOE can conduct this work under their existing authorities in ORS 469.030. About two-thirds of the state's natural gas comes from Canada, so producing hydrogen in-state reduces reliance on foreign natural gas resources and would create an in-state fuel market, with new jobs, and growing demand from domestic and international export markets.

A major issue in the development of a hydrogen economy is the potential effects on water consumption. The primary technology to produce clean hydrogen today is electrolyzers, which require large amounts of water. Many parts of eastern and southern Oregon have limited supplies of water and use existing water resources to support agricultural and other needs. Areas with access to rivers and streams in the Columbia River watershed must contend with low water availability at certain times of year and fluctuations in the snowpack that feeds the system. This is particularly challenging for fish species that require river levels and temperatures for survival, including salmonid species. Oregon could identify optimal areas to site electrolyzers, taking into consideration local water resource availability and other potential effects on local environmental conditions and economies. This type of activity could be led by the Oregon Water Resources Department and used to inform water permitting rules.¹⁰³ In addition to environmental and economic considerations, siting and water resource planning for clean hydrogen projects would need to include early and meaningful consultation with Tribal governments. This engagement can take time to incorporate traditional ecological knowledge that ensures that projects do not impact cultural and natural resources or treaty-protected rights.

There are currently no policies in Oregon requiring production or use of clean hydrogen, or hydrogen generated from low-carbon electricity or other means, and over 95 percent of hydrogen produced in the U.S. is currently made from natural gas. The emissions from the production of hydrogen that is imported and used in Oregon are not subject to Oregon's GHG reporting rules, except that for hydrogen used in place of natural gas the utility or supplier must report a lifecycle carbon intensity for that hydrogen.

¹⁰³ Oregon Revised Statutes. § 537.130 (2023). Appropriation of Water Generally: Permit to appropriate water required. Retrieved at https://www.oregonlegislature.gov/bills_laws/ors/ors537.html.

Lacking policies that support low- or no-emissions hydrogen use, increased consumption could have an impact on consumption-based emissions. As a hydrogen economy evolves, the state will need to monitor the effects of market forces in conjunction with existing state programs on the carbon intensity of hydrogen fuel use. This could be tracked through DEQ's Clean Fuels Program, which is authorized to require lifecycle carbon intensity calculations for participating transportation fuels.¹⁰⁴ Hydrogen producers are not required to participate in the CFP, but DEQ could update rule to include hydrogen as a regulated fuel.

Converting to hydrogen fuel reduces co-pollutant emissions that would otherwise be emitted from fossil fuel combustion, especially particulates. This would improve air quality for workers and communities near industrial zones.

Cement

Cement manufacturing in Oregon is responsible for about 20 percent of industrial sector emissions, primarily from the combustion of coal and tire-derived fuel to heat the facility's rotary kilns. To allow for flexibility in options to meet the target, this measure is not prescriptive in actions or targets. The energy strategy model found a mix of options could reduce emissions by 0.74 MMTCO₂e or 4.36 percent by retrofitting and building new rotary kilns to include improved thermal management, direct separation, oxy-combustion, and incorporation of low-carbon fuels. Carbon capture and storage could also be incorporated to reduce emissions.

The primary barrier to these decarbonization options is the upfront costs to purchase and install new equipment and associated training for employees. Similar to electrification or hydrogen adoption, there are few funding options to offset these costs. Oregon's only cement manufacturing plant is not located in an IOU service territory that participates in the public purpose charge program and therefore does not participate in the LECPPP program, but it is regulated under the CPP.

Oregon would benefit from the improvement in air quality and reduced emissions of a decarbonized cement manufacturing plant that modernizes thermal management, equipment, and the fuels they use. More energy efficient kilns and clinker operations reduce fuel consumption needs thereby reducing co-pollutant emissions, including particulates, which improves local air quality for workers and local communities. Waste heat from kiln operations can be captured and used to generate electricity on-site, reducing grid demand which helps provide more capacity for electrification activities in all sectors.

There is the potential that early adopters of low-carbon cement technologies can gain a market advantage and attract demand from businesses wishing to become more sustainable or reduce their carbon footprint, but there isn't an established strong market demand for this product – although a low embodied carbon policy (as described in the Waste, Water, and Other Sustainable Materials Management sector below) could increase market demand. Investing in retrofitting and building new plant kilns or carbon capture and storage will have high capital costs and require large upfront investment. There are no existing state programs with incentives or financing options to help with the financial burden. These are also nascent, costly, and complex technologies with greater risk.

Hybrid Boilers

Hybrid boilers are systems that generate steam or hot water for industrial processes by switching between using electricity and natural gas as their power source. Adoption of new energy efficient hybrid or hydrogen boilers by 2050 could reduce emissions by 1.03 MMTCO₂e or 6.06 percent of total sector-based emission reductions.

¹⁰⁴ Oregon Revised Statutes. § 468A.266 (2023). Retrieved at https://www.oregonlegislature.gov/bills_laws/ors/ors468A.html.
Oregon Comprehensive Climate Action Plan – EPA Grant #02J38701
May 2026

The flexibility of hybrid boilers allows facilities to switch between electric or fuel-based process heating based on relative prices and the availability of clean electricity. Industries could negotiate incentive payment by operating as a demand response asset working with their electric utility or power provider to use electricity during times of high renewable energy generation and switch to natural gas during times of low electricity generation and high consumer demand. Used strategically, this would reduce emissions and provide some operational resiliency and improve reliability during power or fuel supply disruptions.

These benefits are expensive to realize as these systems have higher initial capital costs, require advanced control systems, and more space and maintenance by trained staff within a facility. The benefit is dependent on how often electricity is used and when, requiring thoughtful strategic planning and a commitment to use electricity at cost effective times. For some local utilities, variable increased use of electricity may strain their capacity, require system upgrades, and be challenging to plan for.

Adoption of efficient hybrid and hydrogen boilers in Oregon’s industrial sector could be tracked through a variety of programs and organizations. DEQ tracks large industrial decarbonization emissions as it pertains to permitting. ODOE tracks some energy efficiency investments through the BPS and LECPPP programs, and tracks state energy consumption trends for the Biennial Energy Report.

The use of hybrid boilers can reduce facility energy costs, and support grid reliability. The availability of backup power means that power providers can rely on this additional capacity when it is needed, reducing investments needed to ensure the grid can meet the heaviest load hours or days. It also ensures that industrial operations can continue in the event of an outage, either due to grid failure or during power safety power shutoffs necessary to reduce the risk of wildfires. Local communities may also be able to work with industrial partners to provide power services during critical emergencies and situations. Reducing on-site fuel combustion improves local air quality that has health benefits for facility employees and local communities.

Additional GHG Reduction Opportunities

Several measures described in other sectors will also reduce emissions in the industrial sector. These include measures to reduce embodied carbon in building materials (see Waste, Water, and Other Sustainable Materials Management Sector) and food waste prevention (see Food and Agriculture Sector).

Waste, Water, and Other Sustainable Materials Management Sector

The Waste, Water, and Other Sustainable Materials Management sector includes several measures that span multiple other sectors. It includes emissions from the provision of water and wastewater services, as well as solid waste handling and disposal. Collectively, waste, water and wastewater activities contributed 4.3 percent of emissions in Oregon’s sector-based inventory for 2023, up from 3.0 percent in 1990. Emissions from landfills are expected to grow because of the time lag between when waste is placed and when methane generation occurs, especially in the large, drier landfills that accept much of the state’s garbage.

This sector also includes several cross-sector measures that involve “upstream” emissions reduction potential, including measures to reduce embodied carbon in buildings and infrastructure, as well as increasing industrial use of recycled materials by improving the quantity and quality of waste separated for recycling from Oregon. The “upstream” emissions associated with materials are many times larger than emissions resulting from disposal, and as most of the materials consumed in Oregon are produced elsewhere, many of these emissions are counted only in Oregon’s consumption-based emissions inventory.

Figure 12. Projected Waste, Water, and Other Sustainable Materials Management Sector Emissions Reductions

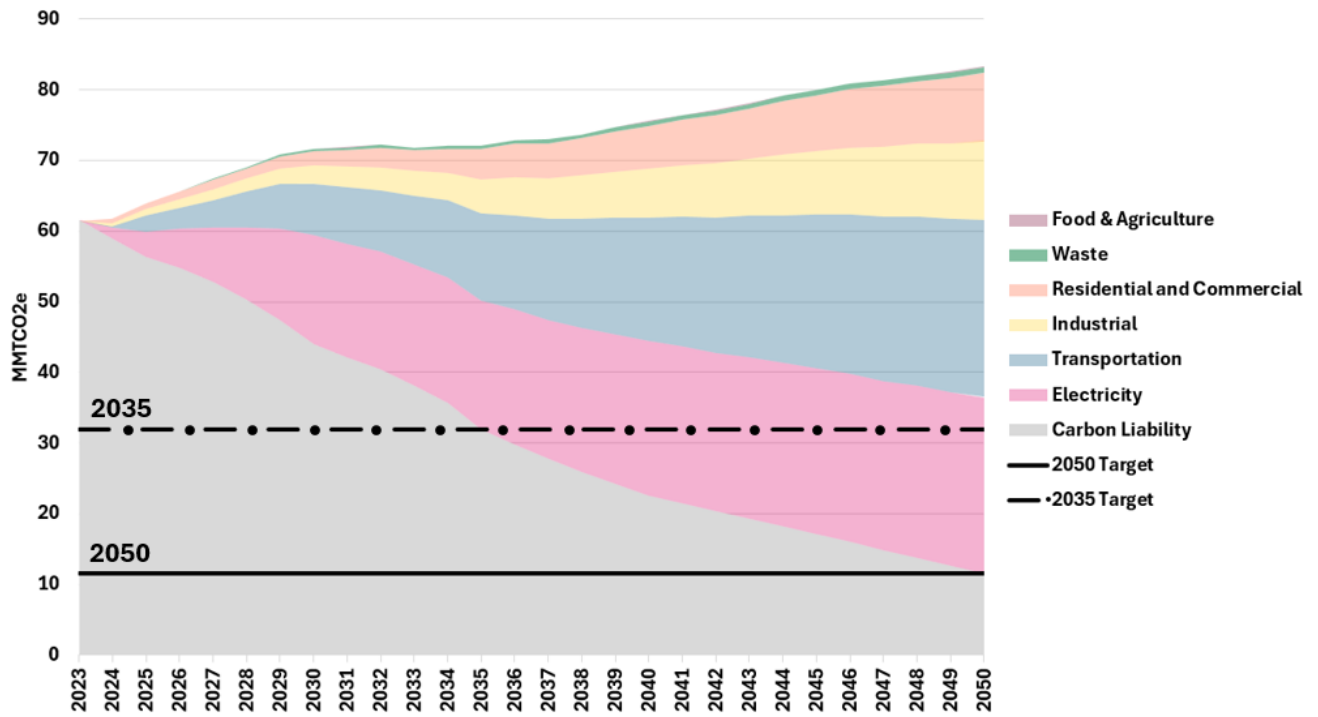


Table 11. Projected BAP Waste, Water, and Other Sustainable Materials Management Emissions Reductions

Existing Measures (Program/ Policy/ Regulation)	Milestones and Implementation Schedule	Implementing Agency or Agencies	Oregon Sector-based Emissions Reduction MMTCO ₂ e (2035)	Percentage of total Sector-based emission reductions (2050)	Oregon Sector-based Emissions Reduction MMTCO ₂ e (2050)	Percentage of total Sector-based emission reductions (2050)	Additional Emissions Reductions Outside of Oregon MMTCO ₂ e (2050)
CERTA Measure 12: Landfills*	Provides grants to landfills to integrate new equipment and technologies to reduce methane emissions.	DEQ	0.049	0.12%	0.015	0.02%	None
CERTA Measure 10: Building Reuse*	Incentivizes building reuse and space-efficient housing construction with low-embodied carbon materials for 940 residential units.	DEQ	0.013	0.03%	0.013	0.02%	0.003
Low-carbon Reductions**	Low-carbon-Development of sustainability guidelines for state capital projects (HB 3409, Section 18 direction to DAS in consultation	DEQ, DAS, ODOT	0.003	0.01%	0.003	0.004%	0.024

Existing Measures (Program/ Policy/ Regulation)	Milestones and Implementation Schedule	Implementing Agency or Agencies	Oregon Sector-based Emissions Reduction MMTCO ₂ e (2035)	Percentage of total Sector-based emission reductions (2050)	Oregon Sector-based Emissions Reduction MMTCO ₂ e (2050)	Percentage of total Sector-based emission reductions (2050)	Additional Emissions Reductions Outside of Oregon MMTCO ₂ e (2050)
	with DEQ and ODOE).						
Recycling Improvements (part of Recycling Modernization Act)**	Modernize Oregon’s recycling system through improved collection and processing of recyclables; enhanced transparency and responsibility in disposition and extended producer responsibility.	DEQ	0.001	0.003%	0.004	0.01%	0.10

*Emissions reductions for CERTA measures reflect amounts assessed for the Oregon CPRG application and the state’s [Priority Climate Action Plan](#), including the methodologies used. Emissions reduction values were incorporated into the TIGHGER model.

**Emissions reductions provided by DEQ and incorporated into the TIGHGER model.

Existing policies and programs aim to reduce emissions from landfills, and to reduce GHG emissions associated with materials used in the built environment and through improved recycling of packaging and paper.

DEQ's CERTA grant funded programs to reduce GHG emissions from this sector include:

- **CERTA Measure 12:** Supports the [Landfill Emissions Reduction Grant Program](#). Awardees use grant funding to integrate new equipment and technologies that reduce methane emissions from Oregon landfills. This measure provides over \$6 million in competitive funding for activities such as enhanced gas collection, early installation of horizontal wells, extracting additional gas from closed cells, installing or expanding energy recovery infrastructure, enhanced oxidation layers, enhanced automation of gas control systems, fine-tuning of engineering controls, and other approaches. DEQ administers the program under its broad authorities to regulate air emissions under ORS 468A.025 and to receive funds and enter into agreements to improve solid waste management under ORS 459.025.¹⁰⁵ The long-term impact of CERTA Measure 12 may be larger than shown here, if the competitive grant process uncovers more opportunities for emissions reductions than CERTA is able to fund in the short-term.
- **CERTA Measure 10:** Incentivizes building reuse and space-efficient housing construction with [low-embodied carbon materials](#) for 940 residential units through rebates for builders and developers to convert existing buildings into housing, or build space efficient housing using low-embodied carbon materials. Building reuse includes office-to-residential, hotel-to-residential, upper story of downtown buildings-to-residential, or others. Space-efficient housing projects must limit the square footage of new housing units. These projects may be Accessory Dwelling Units, cottage clusters, multi-family apartment buildings, or other space-efficient housing opportunities. DEQ is partnering with nine local governments to identify these projects. They implement the grant under their authority in ORS 459.¹⁰⁶

Low Embodied Carbon

Reducing embodied carbon in the built environment is another work area where Oregon has made modest progress, mostly centered around ODOT's work on collecting environmental product declarations for construction projects,¹⁰⁷ CERTA Measure 10 and other embodied carbon projects at DEQ (including education and technical assistance programs to builders and developers, such as providing licenses and training to support whole building life cycle assessment), and the Department of Administrative Services' sustainability guidelines for new construction defined in ORS 184.423.¹⁰⁸ Efforts to reduce embodied carbon through the use of material preferences, disclosure standards, and design criteria could address additional environmental and human health impacts, such as embodied toxics. DEQ implements this work under their authority in ORS 459.025.

Recycling Improvements

Improving the efficiency and efficacy of recycling reduces emissions. Recycling is an energy intensive process, which contributes to GHG emissions both in and out-of-state. Most of Oregon's recyclables are processed outside the state, shown by the relatively higher amounts of consumption-based emissions reductions. Improvements across the recycling life cycle can reduce emissions associated with the type

¹⁰⁵ Oregon Revised Statute. § 459.025 (2025). Solid Waste Management: General powers and duties of department. Retrieved at https://www.oregonlegislature.gov/bills_laws/ors/ors459.html.

¹⁰⁶ Oregon Revised Statute. Chapter 459. Retrieved at https://www.oregonlegislature.gov/bills_laws/ors/ors459.html.

¹⁰⁷ Oregon Revised Statute. § 184.879 (2025). Administrative Services & Transportation Departments: Greenhouse gas reduction program. Retrieved at https://oregon.public.law/statutes/ors_184.879.

¹⁰⁸ Oregon Revised Statute. § 184.423 (2025). Administrative Services & Transportation Departments: Findings and goals regarding sustainability. Retrieved at https://www.oregonlegislature.gov/bills_laws/ors/ors184.html.

and amount of energy consumed, as well as reducing emissions resulting from creating new materials from raw resources and materials. While the GHG reductions resulting from recycling improvements appear very small, the emissions reductions shown are for marginal, future improvements in recycling only. Further, these improvements under the Recycling Modernization Act serve to bolster existing recycling efforts, which provide about 3 MMTCO₂e in GHG reductions annually. Recycling also includes many other benefits, such as reducing Oregon’s contribution to marine plastics and associated social, environmental, economic, and reputational harms resulting from long-standing deficiencies in material processing and disposition. DEQ implements this work under their authority in ORS Chapter 459A.

Gap Measures

Table 12. Projected Gap Measure Waste, Water, and Other Sustainable Materials Management Sector Emissions Reductions

New Measures (Program/Policy/Regulation)	Milestones and Implementation Schedule	Implementing Agency or Agencies	Oregon Sector-based Emissions Reduction MMTCO ₂ e (2035)	Percentage of total Sector-based emission reductions (2035)	Oregon Sector-based Emissions Reduction MMTCO ₂ e (2050)	Percentage of total Sector-based emission reductions (2050)	Additional Emissions Reductions Outside of Oregon MMTCO ₂ e (2050)
New Low-carbon Materials Program	By 2040, reduce embodied carbon in government buildings by 27%. By 2040, reduce embodied carbon in government infrastructure projects by 16%. By 2045, reduce embodied carbon in private (non-governmental buildings) by 27%.	DEQ, DCBS-BCD, ODOT, DAS	0.106	0.263%	0.262	0.37%	>2.01*

*This estimate is for emissions within Oregon’s consumption-based emissions inventory only. The actual emissions reduction potential of this measure is much larger. Reductions in embodied carbon can be realized through both design changes (to use fewer materials overall, or to switch from one type of material to another) as well as switching to lower-carbon options within the same material category (e.g., lower-carbon steel rebar vs. higher-carbon rebar). As Oregon expands its demand signal for lower-carbon options, the expected response from national and global producers will be to shift production practices to meet this demand. In some cases, those production shifts will affect more than just products sold into Oregon (and included in the CBEI). As such, the potential GHG reductions from this measure are many times larger than shown.

Reducing Embodied Carbon in Construction (Buildings and Infrastructure)

A comprehensive policy addressing embodied carbon in materials used in building and infrastructure construction throughout Oregon has the potential to reduce GHG emissions by more than 2.2 MMTCO₂e annually in 2050, although most of these reductions would occur outside of Oregon. Such a policy would require statutory change by the Oregon Legislature and would include:

- A process to create or identify standards for consistent accounting and disclosure of lifecycle GHG emissions, to allow for comparison across products.
- Mandates on producers of certain categories of materials (e.g., concrete, steel, asphalt, glass, insulation) to evaluate and disclose impacts, coupled with progressively decreasing limits on embodied carbon.
- Requirements on private developments, public buildings, and public infrastructure projects to reduce embodied carbon for projects above certain size thresholds.

Oregon's Building Codes Division has authority to require construction materials that would achieve the measure's targets through ORS 455.060.¹⁰⁹ There are no existing state building-specific codes addressing embodied carbon, but BCD provided a framework for how this could be achieved in their [Options to Reduce Greenhouse Gas Emissions Attributable to Building Materials](#) report to the Oregon Legislature. Similarly, ODOT has the authority to approve and select materials for road and highway infrastructure.¹¹⁰ The [HB 4139 Technical Advisory Committee](#) at ODOT continues to explore how to reduce embodied carbon in materials used for transportation infrastructure projects.

Legislation and subsequent rulemaking are likely needed for this measure to move forward, including granting agencies authority to promulgate state building-specific rules. Staffing and additional funding would also be needed to design and run the program, including setting data reporting standards, establishing protocols, designing metrics, assessing and enforcing compliance, and providing training and guidance to regulated parties. There is precedent for establishing goals for state agency building design. Although it does not extend to low-carbon materials, ODOE's [State Energy Efficient Design program](#) establishes and tracks energy efficiency requirements for state-owned buildings.

Implementing agencies for such a comprehensive policy would likely include DEQ (environmental standards and assessment, policy development, coordination), DCBS-BCD (building codes), ODOT (transportation standards and assessment, policy development, state procurement of transportation infrastructure), and DAS (state procurement of buildings).

Progress as well as potential disbenefits could be tracked using a "bottom-up" approach, economywide surveys, or both. Potential disbenefits include costs of compliance, and shifting of environmental burdens to other impact categories, such as toxics. Compliance costs, if high, could be addressed with compliance exemptions, and disbenefits could be at least recognized by broadening environmental impact assessments to include more than just climate impacts.

Potential co-benefits of this approach include the ability to extend the assessment and disclosure standards to include human health impacts such as the inclusion of toxic materials and toxic releases upstream in production, and labor and human rights concerns associated with supply chains for building materials. Separately, as illustrated by CERTA Measure 10, embodied carbon can also be reduced through the reutilization of vacant commercial buildings and through building design that uses less material

¹⁰⁹ Oregon Revised Statute. § 455.060 (2025). Building Code: Rulings on acceptability of material, design or method of construction; effect of approval; fees. Retrieved at https://www.oregonlegislature.gov/bills_laws/ors/ors455.html.

¹¹⁰ Oregon Revised Statute. § 366.305 (2025). Materials, supplies and equipment. Retrieved at https://www.oregonlegislature.gov/bills_laws/ors/ors366.html.

overall, which could reduce transportation-related emissions, reinvigorate downtown areas, improve housing affordability, and reduce other consumption-based GHG emissions.

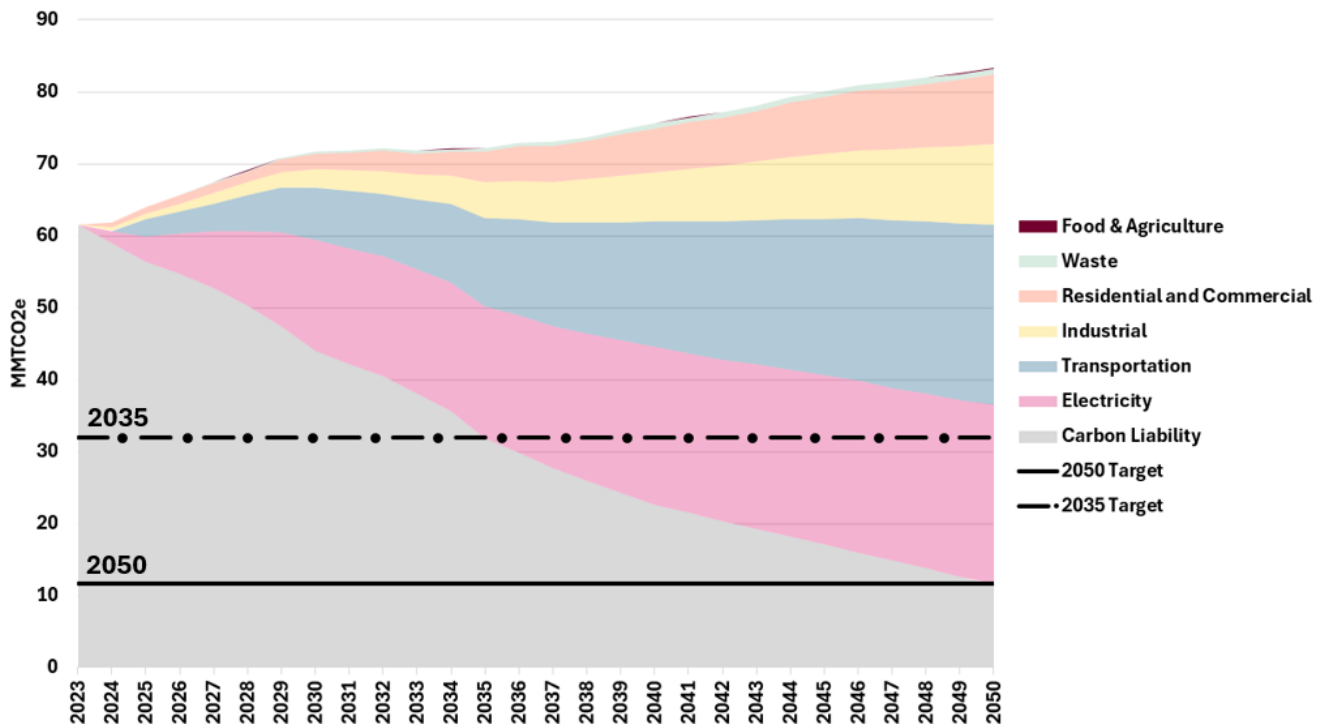
A barrier to adoption is potentially higher costs for low-carbon building materials, which could increase housing costs. This could be especially challenging when housing shortages exist. According to case studies developed by RMI, reductions in embodied carbon in building construction of up to 46 percent can be achieved for a cost premium of less than one percent associated with alternative materials.¹¹¹ As part of CERTA Measure 10, DEQ is gathering additional information about the costs and cost savings to developers from efforts to reduce embodied carbon, such as incentives to help offset higher costs.

Food & Agricultural Sector

Finally in the agriculture and food sector, policies are modeled that reduce emissions by reducing food waste and increasing composting when food is wasted. Inventory emissions from the agricultural sector (not including energy use) contributed 9 percent (5.4 MMTCO₂e) to Oregon’s sector-based inventory in 2023, while emissions from the lifecycle of food contributed 15 percent (13.9 MMTCO₂e) to Oregon’s consumption-based emissions for the same year.

Greenhouse gas emissions from Oregon’s sector-based inventory show a downward emissions trend of approximately 9 percent between 1990 and 2023, or about 0.3 percent annually, from the agricultural sector. This reduction cannot be definitively attributed to a particular program or measure, and for this reason a specific measure is not included here, but it is assumed that there is the potential for future reductions. Oregon will need to work with partners across state government and food and agricultural industries to assess where emissions reductions are occurring in this sector and identify potential future actions to further reduce emissions.

Figure 13. Project Food & Agricultural Sector Emissions Reductions



¹¹¹ Esau, R., Jungclaus, M., Olgay, V. and Rempher, A. (2021). *Reducing Embodied Carbon in Buildings: Low Cost, High Value Opportunities*. Rocky Mountain Institute.

Table 13. Projected BAP Food & Agricultural Sector Emissions Reductions

Existing Measures (Program/ Policy/ Regulation)	Milestones and Implementation Schedule	Implementing Agency or Agencies	Oregon Sector-based Emissions Reduction MMTCO2e (2035)	Percentage of total Sector-based emission reductions (2035)	Oregon Sector-based Emissions Reduction MMTCO2e (2050)	Percentage of total Sector-based emission reductions (2050)	Additional Emissions Reductions Outside of Oregon MMTCO2e (2050)
CERTA Measure 11: Food Waste Recovery*	Provide support to large-scale composting facilities and community-based composting to improve food waste recovery.	DEQ	0.071	0.18%	0.071	0.10%	0.001
Existing Programs to Reduce the Wasting of Food at the Source**	Maintain 2019-2023 progress achieved by the Pacific Coast Food Waste Commitment: a 30 percent decline in unsold food rates by participating retailers.	DEQ	0.004	0.01%	0.006	0.01%	0.03

*Emissions reductions for CERTA measures reflect amounts assessed for the Oregon CPRG application and the state’s [Priority Climate Action Plan](#), including the methodologies used. Emissions reduction values were incorporated into the TIGHGER model.

**Emissions reductions provided by DEQ and incorporated into the TIGHGER model.

Existing programs to reduce GHG emissions across the food system include efforts to reduce the wasting of food at the source and using CERTA grant funds to support food and yard waste recovery, diverting it away from disposal by increasing anaerobic digestion and composting infrastructure. Both measures reduce methane emissions from landfills, while the source reduction measure also reduces the much larger emissions associated with food production.

Oregon co-founded and funded the [Pacific Coast Food Waste Commitment](#), which between 2019 and 2023 achieved a 30 percent reduction in the rate of unsold food at participating grocers, representing more than 50 percent of the region's market share. Based on successful demonstration of proof of concept, the PCFWC is now transitioning to a U.S. Food Waste Pact. One challenge moving forward may be to maintain these reductions in Oregon.

DEQ's CERTA Measure 11 focuses on improving and expanding food waste recovery and processing infrastructure, such as anaerobic digestion and composting facilities. DEQ's Food Waste Processing Improvement program will issue funding for businesses and local governments toward equipment purchases that increase food waste processing capacity.

Another aspect of this measure is a small-scale composting program which funds projects that address a gap in organic waste collection in their franchise service area to implement a community composting solution. This funding is available for community-based organizations, businesses, local governments, and the nine federally recognized Tribal Governments. Additional supportive policy may be needed to expand collection infrastructure to supply the expanded infrastructure with source separated (compostable, digestible) waste streams.

Gap Measures

Table 14. Projected Gap Measure Food & Agricultural Sector Emissions Reductions

New Measures (Program/ Policy/ Regulation)	Milestones and Implementation Schedule	Implementing Agency or Agencies	Oregon Sector-based Emissions Reduction MMTCO₂e (2035)	Percentage of total Sector-based Emission Reductions (2035)	Oregon Sector-based Emissions Reduction MMTCO₂e (2050)	Percentage of total Sector-based Emission Reductions (2050)	Additional Emissions Reductions Outside of Oregon MMTCO₂e (2050)
Additional Food Waste Reduction Program*	By 2035, reduce generation of food waste in Oregon by an additional 9 percent through source reduction (not diversion).	DEQ	0.014	0.03%	0.033	0.05%	>0.12

*Emissions reductions provided by DEQ and incorporated into the TIGHGER model.

Additional Food Waste Prevention

While recovering wasted food, such as described in CERTA Measure 11, reduces methane emissions from landfills, preventing food waste at the source has far greater potential. The goal of the additional food waste prevention measure is to reduce Oregon’s contribution to the 38 percent of all U.S. food produced that is wasted at different points along the supply chain. This not only reduces methane from rotting food, but also GHGs associated with each step to produce and distribute that food.

Reducing food waste at the source is a highly cost-effective GHG mitigation measure, returning savings to producers and consumers that far exceed implementation costs.¹¹² A study by the Stockholm Environment Institute for DEQ estimated that this measure will save food purchasers approximately \$123 million annually by 2035 and \$140 million by 2050 (in 2025 dollars). In the SEI study, financial savings exceeded costs of implementation for all food waste prevention measures evaluated. However, a barrier to realizing these savings can be the upfront costs for technologies and operational costs to support food waste reduction actions.

Cost reduction benefits from reducing food waste can be realized by households, restaurants, grocery stores, and other food-supply chain businesses. For example, retail groceries participating in the Pacific Coast Food Waste Commitment realized a 30 percent reduction in the rate of unsold food between 2019 and 2023.¹¹³ Reducing rates of unsold food can translate into higher profitability for retailers.

DEQ has broad statutory authority under ORS 459.015¹¹⁴ to reduce the environmental effects of materials, and waste prevention and reducing material use are identified as high priorities in state policy. While DEQ continues to implement programs to curb the wasting of food at the source, current programming is limited to outreach and voluntary partnerships, and the reach of programming is constrained by limited funding. Progress and impacts can be tracked through both project-specific assessments, as well as through statewide data such as Oregon’s periodic [waste composition study](#), [material recovery survey](#), and updates to special studies, such as DEQ’s [Wasted Food Study](#) (2019).

The GHG mitigation potential of food waste prevention programming is likely higher than provided here. Estimates are based on average, not marginal, carbon values of food production, and further do not include the significant biogenic emissions associated with global food commodity production. Food waste prevention also provides a pathway to feed a growing global population without further expanding production into marginal lands that would generate higher emissions per unit of food produced (because of lower productivity), and which may provide valuable carbon storage benefits if undisturbed.

Achieving this measure’s additional reductions would likely require new state policies and programs. Legislation to standardize date labels – a common cause of consumer confusion resulting in waste – has already been introduced. Financial incentives and low-interest loan programs could help address upfront costs, and partnership programs could help provide technical assistance and resources for businesses interested in food waste prevention opportunities.

¹¹² Stockholm Environment Institute. (2024). *Technical report on opportunities to reduce greenhouse gas emissions caused by Oregon’s consumption*. <https://www.oregon.gov/deq/mm/Documents/mm-SEITechnicalReport.pdf>.

¹¹³ Pacific Coast Food Waste Commitment. (2024). *Food Waste Reduction 2024 Year End Report*, https://pacificcoastcollaborative.org/wp-content/uploads/2025/03/PCFWC-USFWP-2024-EOY-Report_Final.pdf.

¹¹⁴ Oregon Revised Statute. § 459.015 (2025). Solid Waste Management: General provisions - Policy. Retrieved at https://www.oregonlegislature.gov/bills_laws/ors/ors459.html.

Benefits Analysis

The measures outlined in this report provide additional benefits beyond meeting Oregon’s GHG emissions reduction goals. Additional quantitative analysis was undertaken to better understand the effect of the measures on co-pollutant emissions, public health, and household energy spending. Discussions with key partner organizations identified additional benefits beyond those quantitatively estimated and provided insights into potential disbenefits that need to be addressed in implementing measures. Where possible, quantitative analysis and discussions aimed to identify how communities may be affected by these additional benefits or disbenefits of the measures.

Co-Pollutant Reduction Analysis

Co-pollutant analysis was conducted for Business-as-Planned measures using the TIGHGER model to quantify their reductions. Cumulative results are provided for 2035 and 2050, broken out by measure. Some co-pollutants could not be assessed; the TIGHGER model is designed to assess co-pollutants resulting from the combustion of fossil fuels, meaning data are only available for the changes in fossil fuel consumption for all measures. Co-pollutants for measures that affect GHG emissions not associated with combustion, such as methane emissions in landfills, could not be calculated using the TIGHGER model. This is indicated as “Not Estimated” or “NE” in the tables. Where available, program-developed co-pollutant data was used. DEQ is required to report co-pollutant data for measures funded by CERTA at the completion of the grant period and has provided estimates for the purposes of this CCAP.

Co-pollutants Modeled:

- Carbon monoxide (CO)
- Nitrogen oxides (NOx)
- Particulate Matter (PM2.5 and PM10)
- Volatile organic compounds (VOCs)
- Sulfur dioxide (SO2)
- Hydrocarbons (HC)

Reducing emissions of criteria pollutants CO, NOx, PM2.5, PM10, VOCs, SO2, as well as hydrocarbons, lowers mortality rates, reduces asthma exacerbations, and decreases cardiovascular/respiratory diseases. Lowering these pollutants improves lung function, enhances cognitive abilities, and reduces adverse birth outcomes. The reduced exposure to harmful chemicals and pollutants contributes to longer life expectancy and climate co-benefits.¹¹⁵

Co-pollutant data for the Climate Protection Program could not be calculated and is not included in any of the following co-pollutant sector reductions. The Climate Protection Program is a multi-sector, market-based program that requires emissions reductions but does not specify how regulated companies must reduce emissions. Co-pollutant data for complementary measures, such as the Advanced Clean Cars II and Advanced Clean Truck rules, can be calculated because these programs have prescriptive requirements for how they will be implemented and thus what emissions will be reduced.

A co-pollutant analysis is not provided for most gap measures. Individual measure co-pollutant data was not assessed through the Oregon Energy Strategy. The purpose of the energy strategy modeling was to

¹¹⁵ World Health Organization. (n.d.). Air quality, energy and health – Health Impacts: Types of pollutants. <https://www.who.int/teams/environment-climate-change-and-health/air-quality-and-health/health-impacts/types-of-pollutants#:~:text=The%20health%20risks%20associated%20with,perinatal%20outcomes%20and%20lung%20cancer.>

assess what energy options would be the least-cost way to achieve Oregon’s economywide climate goals beyond BAP measures. That effort used an economic model to assess GHG emissions reductions at a high level as a means to track progress in meeting the 2050 GHG emissions reduction goal, but the specific choices made by the model are not easily teased out of the data to develop co-pollutant data. Gap actions produced from the Energy Strategy model will be modeled during Phase 2 of the TIGHGER project, which will assess co-pollutant emissions reductions that could be gained by additional statewide policies beyond BAP. This modeling will rely on the assumptions developed during the Energy Strategy model development in collaboration with stakeholders. Results for TIGHGER Phase 2 are expected in summer 2026.

Although specific modeling data is not available, most of the gap actions build on BAP measures and can therefore be assumed to provide additional benefits. For Oregon Energy Strategy modeled gap measures, specific co-pollutant reductions are described qualitatively in the measure descriptions of the previous section and are based on co-pollutant findings for similar BAP measures. Specific co-pollutant reductions are provided for the two gap measures that were specifically modeled using the TIGHGER model: Additional Food Waste Reduction and New Low Carbon Materials. DEQ provided data and analysis for these measures that SSG was able to use to model effects on co-pollutant emissions.

Electricity Sector Co-Pollutant Reduction Analysis

HB 2021 drives large reductions in co-pollutant emissions from the electricity sector. The Oregon Department of Energy’s Community Renewable Energy Grant Program supports development of local clean energy generation, primarily solar, which offsets the need for grid electricity and helps meet the goal of HB 2021. This underpins measures in other sectors that encourage electrification as a means to reduce GHG emissions and has the additional benefit of reducing on-site co-pollutant emissions from fuel combustion. Further, as HB 2021 encourages an increasingly higher percentage of clean energy generation, electric end uses will also produce fewer and fewer co-pollutant emissions.

HB 2021 is a major contributor to reductions for all co-pollutants and the second largest contributor to PM2.5 reductions of all the measures modeled. The majority of emissions reductions will occur prior to 2035. This is because the HB 2021 measure is currently set to be fully implemented by 2040, and the Community Renewable Energy Grant Program has limited funding remaining. If this program receives additional funding, additional co-pollutant reductions would be expected to occur.

Table 15. Electricity Sector Estimated Co-Pollutant Reductions (Metric Tons) from TIGHGER BAP Measures by 2035

Action Title	CO (MT)	Nox (MT)	PM2.5 (MT)	VOC (MT)	PM10 (MT)	SO2 (MT)
HB 2021 Compliance	2,649.10	4,436.43	1,038.77	315.76	1,183.91	4,810.63
Community Renewable Energy Grant Program	1.16	1.98	0.45	0.14	0.52	2.10

Table 16. Electricity Sector Estimated Co-Pollutant Reductions (Metric Tons) from TIGHGER BAP Measures by 2050

Action Title	CO (MT)	Nox (MT)	PM2.5 (MT)	VOC (MT)	PM10 (MT)	SO2 (MT)
HB 2021 Compliance	3,601.31	6,031.09	1,412.15	429.26	1,609.47	6,539.79
Community Renewable Energy Grant Program	1.16	1.93	0.45	0.14	0.52	2.10

Transportation Sector Co-Pollutant Reduction Analysis

Measures reducing emissions associated with the transportation sector are the primary drivers of reductions in co-pollutants. Together, Transportation sector actions contribute 95 percent of total CO reductions, and 85 percent of NOx, VOC, and PM10 reductions by 2050. This is attributed to reductions in fossil fuel for vehicles through electrification and lower carbon fuel adoption. Zero-emission vehicles, including battery and hydrogen fuel cell electric, do not emit co-pollutants. While the electricity used to fuel battery electric vehicles produces co-pollutants, these are largely addressed through the HB 2021 measure in the Electricity sector. Most hydrogen used today is produced from natural gas, which produces some co-pollutants. This fuel is not anticipated to become widely adopted until after 2035 when more hydrogen is expected to be created by electrolysis, which does not produce these pollutants.

Measures that support ZEV adoption through incentives for vehicles and charging are combined for reporting co-pollutant reductions. Both incentive programs are necessary to spur the use of ZEVs, therefore co-pollutant reductions are provided by combining all transportation-related CERTA Measures for light, medium, and heavy-duty vehicles and chargers. As previously mentioned, all co-pollutants reduced through CERTA measure implementation will be calculated per measure and within each sector at the completion of the grant and are anticipated to be greater than estimates provided for this report.

Table 17. Transportation Sector Estimated Co-Pollutant Reductions (Metric Tons) from TIGHGER BAP Measures by 2035

Action Title	CO (MT)	Nox (MT)	PM2.5 (MT) †	VOC (MT)	PM10 (MT)	SO2 (MT)	HC (MT)
Advanced Clean Cars II	61,971.54	5,079.19	129.30	4,163.08	1,949.92	39.48	4,425.56
Clean Fuels Program	5,800.00	1,551.00	~2,207.7	10,561.00	2,184.00	4,518.00	NE
Advanced Clean Trucks	3,896.81	7,861.61	164.86 ^{††}	547.99	948.32	32.96	521.92
CFEC	3,957.74	328.86	12.81	266.02	135.97	8.25	282.43
CAFE Federal Standards	0.22	0.37	0.09	0.03	451.55	27.43	NE
CERTA Measures 1.5*	146.03	55.18	3.10	11.88	0.36	0.06	4.97

*Data provided by DEQ program data and analysis.

[†]SSG calculated co-pollutants emissions for the Clean Fuels Program using EPA’s AP-42 Air Emissions Factors from Stationary Sources information for stationary internal combustion sources in order to assess effects of emissions reductions across multiple fuel types, including ethanol and renewable diesel.¹¹⁶ Stationary source calculations for PM2.5 emissions are less than typical emissions from mobile sources like vehicles. The California Air Resources Board finds that PM2.5 composes greater than 90 percent of diesel combustion particulate matter and nearly all of gasoline combustion particulate matter.^{117,118} For this reason, it is likely that the values provided here are biased low. The PM10 value is inclusive of PM2.5 emissions.

^{††}SSG was not able to calculate this value. The PM2.5 number provided is an estimate based on CARB’s 90% of PM10 emissions estimate.

¹¹⁶ U.S. Environmental Protection Agency. (n.d.). Air Emissions Factors and Quantification: AP-42: Compilation of Air Emissions Factors from Stationary Sources. Accessed on February 27, 2026. <https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors-stationary-sources>.

¹¹⁷ California Air Resources Board. (n.d.). Overview: Diesel Exhaust & Health. Accessed on February 27, 2026. <https://ww2.arb.ca.gov/resources/overview-diesel-exhaust-and-health>.

¹¹⁸ California Air Resources Board. (n.d.). Speciation Profiles Used in CARB Modeling. Accessed on February 27, 2026. <https://ww2.arb.ca.gov/speciation-profiles-used-carb-modeling>.

Table 18. Transportation Sector Estimated Co-Pollutant Reductions (Metric Tons) from TIGHGER BAP Measures by 2050

Action Title	CO (MT)	Nox (MT)	PM2.5 (MT) †	VOC (MT)	PM10 (MT)	SO2 (MT)	HC (MT)
Advanced Clean Cars II	127,147.38	10,518.16	289.08	8,544.59	4,525.52	221.63	9,075.58
Clean Fuels Program	6,270.00	2,258.00	~2,207.7 ^{††}	1,177.00	2,453.00	5,164.00	NE
Advanced Clean Trucks	9,075.06	18,301.13	391.39	1,275.73	2,190.55	113.93	1,212.61
CFEC	13,902.19	1,154.87	44.92	934.42	485.99	29.12	992.10
CAFE Federal Standards	0.06	0.09	0.02	0.01	653.70	39.23	NE
CERTA Measures 1.5*	146.03	55.18	3.10	11.88	0.36	0.06	4.97

*Data provided by DEQ program data and analysis.

†SSG calculated co-pollutants emissions for the Clean Fuels Program using EPA’s *AP-42 Air Emissions Factors from Stationary Sources* information for stationary internal combustion sources in order to assess effects of emissions reductions across multiple fuel types, including ethanol and renewable diesel. Stationary source calculations for PM2.5 emissions are less than typical emissions from mobile sources like vehicles. The California Air Resources Board finds that PM2.5 composes greater than 90 percent of diesel combustion particulate matter and nearly all of gasoline combustion particulate matter. For this reason, it is likely that the values provided here are biased low. The PM10 value is inclusive of PM2.5 emissions.

††SSG was not able to calculate this value. The PM2.5 number provided is an estimate based on CARB’s 90% of PM10 emissions estimate.

Commercial and Residential Sector Co-Pollutant Reduction Analysis

Adoption of energy efficient technologies is the primary driver of co-pollutant reductions in the Commercial & Residential sector. These technologies reduce energy consumption in the building, which reduces co-pollutant emissions associated with combusting natural gas or other fossil fuels. In addition, energy efficiency technologies reduce emissions from electricity generation and may reduce onsite fuel use, such as natural gas for space and water heating, or appliance use. Reducing on-site fuel combustion also lowers co-pollutant emissions in buildings, including particulate matter, CO, and NOx.

Heat pumps are much more energy efficient than other electric heating and cooling technologies, providing significant reductions in co-pollutants from electricity generation. The Heat Pump Programs and CERTA Measure 8 support heat pump adoption and will contribute about 5 percent of total PM 2.5 reductions, but other measures will support additional heat pump adoptions. Supportive programs in the Energy Efficient Buildings actions, such as building code updates, supportive incentive programs, and commercial building performance standards will drive additional heat pump adoption, contributing even more co-pollutant reductions. CERTA measure 6 and 9 support residential energy efficiency and weatherization. CERTA funds also support early and above-code compliance with requirements for building performance standards. All co-pollutant reductions through CERTA implementation will be calculated by measure and within each sector at the completion of the grant and are anticipated to be greater than the estimate provided for this report.

Table 19. Commercial & Residential Sector Estimated Co-Pollutant Reductions (Metric Tons) from TIGHGER BAP Measures by 2035

Action Title	CO (MT)	Nox (MT)	PM2.5 (MT)	VOC (MT)	PM10 (MT)	SO2 (MT)
Energy Efficient Buildings	760.14	136.37	118.57	106.59	120.60	65.20
CERTA Measures 6-9*	560.71	27.57	85.07	80.53	85.26	6.43
Building Retrofits	316.06	21.01	47.89	45.07	48.08	6.48
Heat Pump Programs	132.78	4.61	20.09	19.13	20.11	0.44
Solar + Storage Rebate Program	4.21	7.05	1.65	0.50	1.88	7.64
Energy Efficiency Standards for Appliances	2.41	4.10	0.67	0.27	0.77	3.05

* Data provided by DEQ program data and analysis.

Table 20. Commercial & Residential Sector Estimated Co-Pollutant Reductions (Metric Tons) from TIGHGER BAP Measures by 2050

Action Title	CO (MT)	Nox (MT)	PM2.5 (MT)	VOC (MT)	PM10 (MT)	SO2 (MT)
Energy Efficient Buildings	1,557.60	254.74	242.22	218.75	246.00	122.62
Heat Pump Programs	936.42	33.44	141.64	134.90	141.73	3.08
CERTA Measures 6-9*	533.25	23.69	80.89	76.58	81.07	6.23
Building Retrofits	330.11	22.90	50.07	47.06	50.30	7.37
Solar + Storage Rebate Program	4.21	7.05	1.65	0.50	1.88	7.64
Energy Efficiency Standards for Appliances	1.65	2.88	0.27	0.18	0.31	1.17

* Data provided by DEQ program data and analysis.

Industrial Sector Co-Pollutant Reduction Analysis

The Climate Protection Program is the primary driver of emissions reductions in the industrial sector, but as noted above, the TIGHGER analysis is not able to calculate co-pollutant data for this program.

SSG modeled additional transportation fuel-related actions that could be taken by the paper and packaging industry using financial incentives. These include reducing diesel fuel consumption through uptake of more low-carbon fuels and zero-emission vehicle adoption that are not accounted for in other sectors.

Additional co-pollutant reductions could also be achieved by using incentives for actions other than recycling. These include opportunities to reduce impacts across the life cycle of these materials through fuel switching, material substitution, dematerialization (redesign to use less material), energy efficiency, and other process improvements. For example, energy efficiency or enhanced pollution controls would reduce pollution from pulp and paper mills. Financial incentives can also be used by producers of packaging, food serviceware, printing and writing paper sold into Oregon to voluntarily assess, disclose and reduce environmental impacts across the life cycles of these products. Experience elsewhere shows that when producers assess and publicly disclose impacts, they are more likely to reduce such impacts. Because the RMA encourages more sustainable processes and materials outside Oregon, it will contribute to co-pollutant reductions outside Oregon as well.

Table 21. Industrial Sector Estimated Co-Pollutant Reductions (Metric Tons) from TIGHGER BAP Measures by 2035

Action Title	CO (MT)	NOx (MT)	PM2.5 (MT)	VOC (MT)	PM10 (MT)	SO2 (MT)	HC (MT)
RMA (Packaging and Paper Decarbonization)	7.90	24.28	1.78	1.61	2.26	1.28	0.23

Table 22. Industrial Sector Estimated Co-Pollutant Reductions (Metric Tons) from TIGHGER BAP Measures by 2050

Action Title	CO (MT)	NOx (MT)	PM2.5 (MT)	VOC (MT)	PM10 (MT)	SO2 (MT)	HC (MT)
RMA (Packaging and Paper Decarbonization)	16.85	55.79	3.93	3.74	5.07	2.90	0.70

Waste, Water, and Other Sustainable Materials Management Sector Co-Pollutant Reduction Analysis

The largest co-pollutant emissions reductions in this sector come from measures that reduce the environmental impacts of building materials. CCAP measures in this sector encourage the use of lower carbon materials in buildings, as well as building design choices that require less materials including CERTA Measure 10. These reduce co-pollutant emissions that would otherwise occur in the production of materials like cement and steel.

CERTA measure 12 provides additional co-pollutant reductions by providing funding to reduce methane emissions associated with landfill gas. Funded projects may improve landfill gas collection, combustion, or oxidation, which reduce methane emissions and potentially other landfill gas co-pollutants. Improved collection and combustion of landfill gas reduces VOCs and other odor-causing pollutants that would otherwise be emitted on site, while improving landfill gas collection for use as a fuel. On-site fuel use also offsets co-pollutants that would otherwise be associated with the production and transportation of those fuels. Improved oxidation may reduce odor-causing pollutants on site. All co-pollutants reduced through CERTA implementation will be calculated by measure and within each sector at the completion of the grant and are anticipated to be greater than the estimate provided for this report. The following tables present the Oregon sector-based co-pollutant reductions, however many of these programs have substantial co-pollutant reductions outside of Oregon, which can be found in [Appendix F](#).

Table 23. Waste, Water, and Other Sustainable Materials Management Sector Estimated Co-Pollutant Reductions (Metric Tons) from TIGHGER BAP Measures by 2035

Action Title	CO (MT)	NO _x (MT)	PM _{2.5} (MT)	VOC (MT)	PM ₁₀ (MT)	SO ₂ (MT)	HC (MT)
Low-Carbon Materials*	52.63	43.69	2.23	28.59	7.45	18.01	0.20
CERTA Measures 10 & 12*	34.83	8.24	4.85	6.61	5.44	4.01	NE
RMA (Recycling Improvements)	0.07	0.03	0.01	0.02	0.01	0.01	NE

*Data provided by DEQ program data and analysis. The methodology for the Low-Carbon materials measure co-pollutant analysis is in Appendix F.

Table 24. Waste, Water, and Other Sustainable Materials Management Sector Estimated Co-Pollutant Reductions (Metric Tons) from TIGHGER BAP Measures by 2050

Action Title	CO (MT)	NO _x (MT)	PM _{2.5} (MT)	VOC (MT)	PM ₁₀ (MT)	SO ₂ (MT)	HC (MT)
Low-Carbon Materials*	131.09	108.80	5.56	71.22	18.56	44.86	0.50
CERTA Measures 10 & 12*	31.76	5.77	4.78	4.93	4.99	2.79	NE
RMA (Recycling Improvements)	0.11	0.05	0.01	0.04	0.02	0.02	NE

*Data provided by DEQ program data and analysis. The methodology for the Low-Carbon materials measure co-pollutant analysis is in Appendix F.

Food and Agriculture Sector Co-Pollutant Reduction Analysis

Reducing food waste reduces co-pollutant emissions, primarily by reducing landfill emissions but also supporting cleaner alternatives to landfill disposal of food waste. CERTA Measure 11 supports actions to reduce organic waste in landfills. Additional measures include preventing food waste, increasing composting and anaerobic digestion of organic waste and improving collection systems. This reduces VOC and methane emissions from organic decomposition but also reduces co-pollutants from combusting landfill gases. All co-pollutants reduced through CERTA implementation will be calculated per measure and within each sector at the completion of the grant.

Co-pollutant reductions for the food and agriculture sector actions are primarily a result of shifts in how much food waste is generated and then how that food waste is managed at end of life. By preventing food waste in the first place, co-pollutant emissions associated with composting, anaerobic digestion, or landfilling are also reduced. Reductions are limited by the inherent uncertainty in modeling environmental impacts over space and time and by the fact that they are relative expressions of emissions associated with a reference unit (for example 1 ton of food waste landfilled). Co-pollutant emissions would change with more precision in the underlying assumptions (conditions, technologies, and production methods). The following tables present the Oregon sector-based co-pollutant reductions, however many of these programs have substantial co-pollutant reductions outside of Oregon, which can be found in [Appendix G](#).

Table 25. Food & Agriculture Sector Estimated Co-Pollutant Reductions (Metric Tons) from TIGHGER BAP Measures by 2035

Action Title	CO (MT)	NO _x (MT)	PM _{2.5} (MT)	VOC (MT)	PM ₁₀ (MT)	SO ₂ (MT)	HC (MT)
CERTA Measure 11*	219.92	149.51	15.28	261.37	8.61	43.22	0.05
Pacific Coast Food Waste Commitment	0.23	0.36	0.02	0.05	0.05	0.02	0.02

*Data provided by DEQ program data and analysis. The methodology for Food & Agriculture Sector co-pollutant analysis is in Appendix G.

Table 26. Food & Agriculture Sector Estimated Co-Pollutant Reductions (Metric Tons) from TIGHGER BAP Measures by 2050

Action Title	CO (MT)	NO _x (MT)	PM _{2.5} (MT)	VOC (MT)	PM ₁₀ (MT)	SO ₂ (MT)	HC (MT)
CERTA Measure 11*	623.33	418.89	42.57	772.69	24.71	118.25	0.11
Pacific Coast Food Waste Commitment	0.45	0.80	0.04	0.08	0.10	0.02	0.05

*Data provided by DEQ program data and analysis. The methodology for Food & Agriculture Sector co-pollutant analysis is in Appendix G.

Additional Co-Pollutant Reduction Analysis

In addition to the BAP measures, SSG used the TIGHGER model to produce co-pollutants analysis for two gap measures: a new Low-Carbon Materials measure in the Waste, Water, and Other Sustainable Materials Management Sector and the Additional Food Waste Reduction Program measure in the Food & Agriculture sector. Additional food waste reductions and new low-carbon materials measures are additive to co-pollutant emissions reductions described previously. The following tables present the Oregon sector-based co-pollutant reductions, however many of these programs have substantial co-pollutant reductions outside of Oregon, which can be found in [Appendix G](#).

Table 27. Estimated Co-Pollutant Reductions (Metric Tons) Gap Measures in the Food & Agriculture and Waste, Water, and Other Sustainable Materials Management Sectors by Measure by 2035

Action Title	CO (MT)	NOx (MT)	PM2.5 (MT)	VOC (MT)	PM10 (MT)	SO2 (MT)	HC (MT)
Additional Food Waste Reduction	85.50	31.71	13.10	17.69	7.11	24.80	0.10
New Low Carbon Materials	648.98	538.66	27.54	352.57	91.86	222.11	0.51

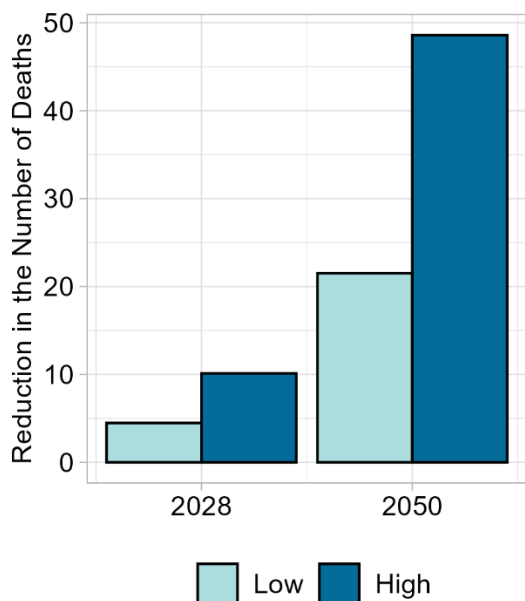
Table 28. Estimated Co-Pollutant Reductions (Metric Tons) Gap Measures in the Food & Agriculture and Waste, Water, and Other Sustainable Materials Management Sectors by Measure by 2050

Action Title	CO (MT)	NOx (MT)	PM2.5 (MT)	VOC (MT)	PM10 (MT)	SO2 (MT)	HC (MT)
Additional Food Waste Reduction	1,746.46	647.79	267.53	361.37	145.29	506.68	2.10
New Low Carbon Materials	6,740.10	5,594.31	285.99	3,661.65	954.07	2,306.73	25.49

Co-benefits Analysis

Co-pollutant reductions in the BAP measures will provide improved public health outcomes in Oregon. Using the available data, EPA’s COBRA model found total reductions in co-pollutants lead to improved public health outcomes. Estimates suggest that improved air quality can reduce the occurrences of asthma and respiratory symptoms as well as lead to substantial reductions in annual all-cause mortality. The model estimates that BAP measures alone would lead to between five and 10 fewer lives lost in 2028 and 22 to 49 fewer mortality incidents per year by 2050 (see Figure 14). The cumulative economic value of these health benefits is large, ranging from approximately \$2 billion to \$5 billion (net present value).

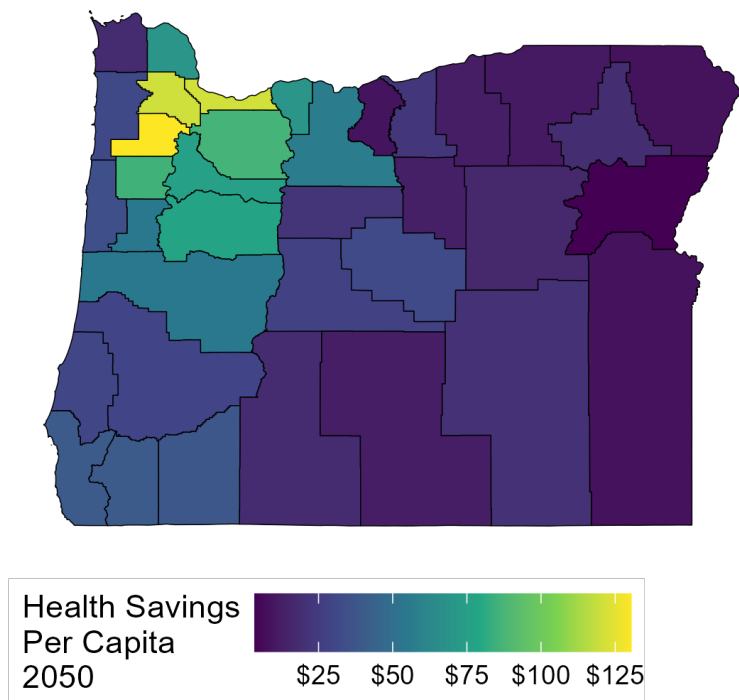
Figure 14. Estimate of Annual Mortality Reductions from BAP Measures



The COBRA model provides “high” and “low” estimates for mortality outcomes to demonstrate the uncertainty in these estimates. More details can be found on the [EPA COBRA FAQ](#).

These public health improvements are expected to benefit Oregonians across the state, including those living in rural Oregon and counties with lower average annual incomes. Figure 15 shows per capita health savings for all 37 Oregon counties. The highest savings occur in areas of the state where the population is highest and where more co-pollutant emissions tend to occur, such as high traffic corridors and large industrial areas.

Figure 15. Estimate of Annual Per Capita Health Savings from BAP Measures



As detailed above, the gap measures that were not individually quantified are also expected to lead to reductions in co-pollutants. Since reductions in co-pollutants have been shown to lead to improvements

in health outcomes, it is likely that the gap measures will provide further health benefits beyond the benefits shown in the COBRA modeling for the BAP measures.

Household Energy Costs

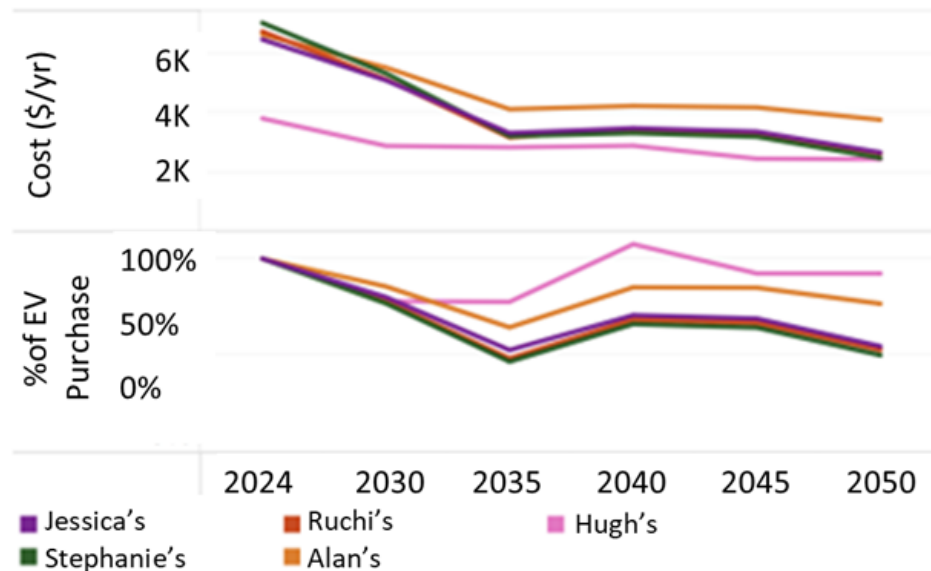
Quantitative analysis was also conducted to examine households’ energy use and associated costs as they switch to electric vehicles and heat pumps. The analysis considers five realistic sample homes based on public comments and a review of household profiles. These homes are referenced by the hypothetical head of household: Jessica, Ruchi, Alan, Hugh, and Stephanie.

In most circumstances, the sample households suggest savings from adopting EVs compared to continuing to use and purchase internal combustion engine vehicles. Figure 16 shows potential savings for the five sample households if they replace their two vehicles with EVs in 2030 and 2035 (with Hugh’s household replacing its only vehicle in 2030). The energy wallets shown here assume an electricity rate of \$0.20/kWh, natural gas rate of \$1.50/therm, and a gasoline rate of \$3.79/gallon.

Figure 16. Oregon Energy Strategy Consumer Cost Analysis for Electric Vehicle Use

Savings Across Sample Households

(\$0.20/kWH, \$1.50/therm)

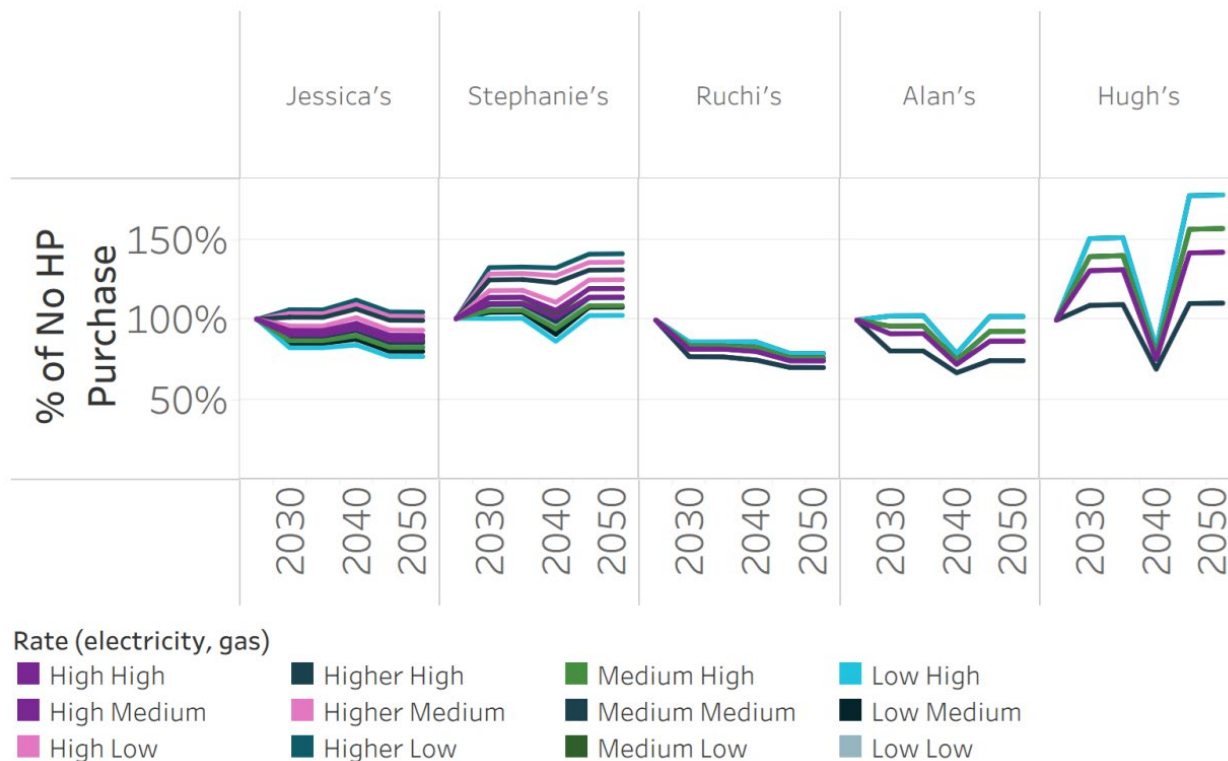


The energy wallet for Hugh’s household, which is a multifamily apartment unit, assumes that 80 percent of Hugh’s charging occurs outside the home using a commercial charger at a rate of \$0.43/kWh. In the top panel, which shows costs over time, the model results suggest that all sample households experience some level of cost savings out to 2050. The bottom panel indicates how these costs compare as a percentage of an alternative where the household purchases internal combustion engine vehicles instead of EVs when their current vehicles reach the end of their life. These results show that transportation electrification may provide an opportunity for energy wallet savings a savings varying based on household characteristics. For example, Hugh’s household could experience higher savings from switching to an EV if they did more EV charging at home at a residential electricity rate.

Not all sample households see cost savings from adopting a heat pump, as can be seen in Figure 17. These savings depend on variables such as electricity and natural gas prices, and capital costs for current technology relative to heat pump technology. While Ruchi’s and Alan’s households show cost savings in most cases, Jessica’s household shows cost savings in only some of the wallets tested, and Stephanie’s household rarely sees cost savings. Hugh’s household shows no savings regardless of energy prices tested in the energy wallet because of the high prices for heat pump technology in multifamily homes, based on

the source used for this analysis. These results emphasize two potential disbenefits discussed further below.

Figure 17. Oregon Energy Strategy Energy Wallet Consumer Cost Analysis Results



Beyond these quantitative analyses, further benefits were identified through discussions with key partner organizations. Electrification of end use products often has health benefits beyond those estimated in the EPA COBRA model. For example, replacing a wood stove with a heat pump can improve indoor air quality and provide direct respiratory health benefits to household members. Additionally, replacing a natural gas heating system with a heat pump that also provides cooling can deliver health benefits during days of extreme heat, particularly for young and elderly household members. Outside of electrification measures, energy efficiency measures can shrink overall energy use, reducing the need for investment across the energy system and alleviating impacts of development on land and water. Finally, weatherization, distributed resources, and heat pumps for cooling can all strengthen household resilience.

Discussions with key partner organizations also helped identify areas of disbenefit. One primary disbenefit acknowledged in these discussions is the challenges households and businesses face to obtain new technologies with high upfront costs such as electric vehicles or heat pumps. Participants in these discussions suggested supportive funding mechanisms, such as a revolving loan fund, to help alleviate this disbenefit in implementing these measures. A related disbenefit that was noted by several working group members, and in part verified by the energy wallet analysis, is that there are higher operating costs for newer electric technologies in some cases, such as heat pumps. Additional financial support or incentives may be needed to encourage broad uptake of these technologies.

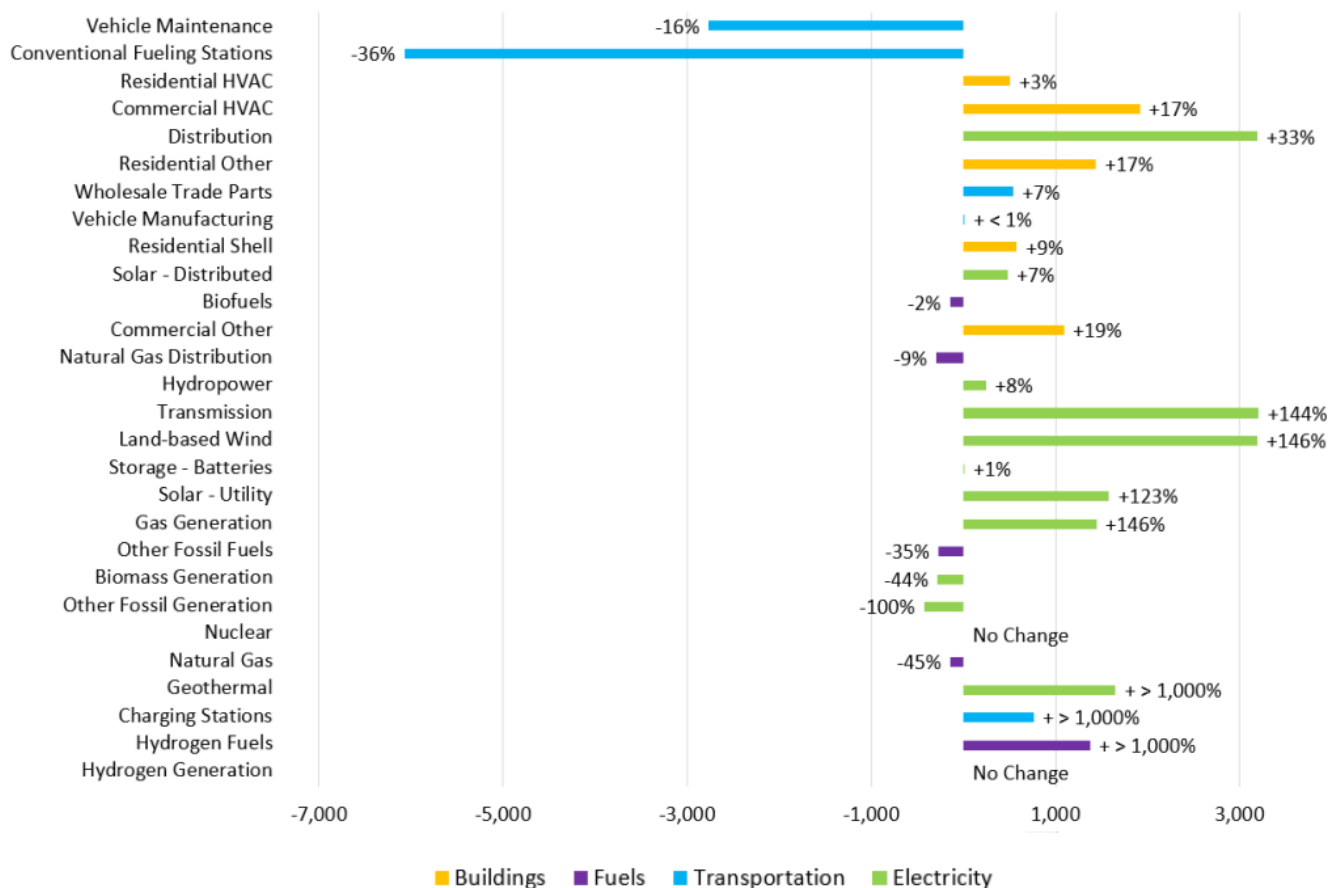
Finally, any new investments needed for electricity generating resources to meet future electricity demand are likely to lead to increases in electricity prices. Greater assistance will be necessary, particularly in the near term, to support households struggling to pay their energy bills. Policies that

support economic development in the state can also help ensure that Oregonians have access to high quality, high wage jobs and are able to afford higher future energy bills.

Jobs and Workforce Analysis

A Jobs and Workforce analysis was conducted for the Oregon Energy Strategy to understand how meeting our state energy goals through the least-cost Reference Scenario affects the demand for workers in different industries and occupations. Across the energy sector, demand for jobs is expected to see a net increase of approximately 13,000 by 2035. Jobs in the electricity sector are expected to see the greatest levels of demand growth. Over the next 5-10 years, this job growth is driven by new investment in distribution and transmission infrastructure and utility-scale solar.

Figure 18. Energy Employment by Subsector 2024-2035 Oregon Energy Strategy



By 2035, eastern and western Oregon are expected to gain nearly the same number of total net jobs across these energy sectors. Approximately 6,500 net jobs are estimated to be needed to the east of the Cascades and 6,400 net jobs to the west. For both regions, these jobs gains are realized across a range of energy subsectors, such as electricity distribution and transmission, biofuels, land-based wind, utility-scale solar, and HVAC. The jobs analysis estimated net job growth across three wage tiers¹¹⁹ with roughly

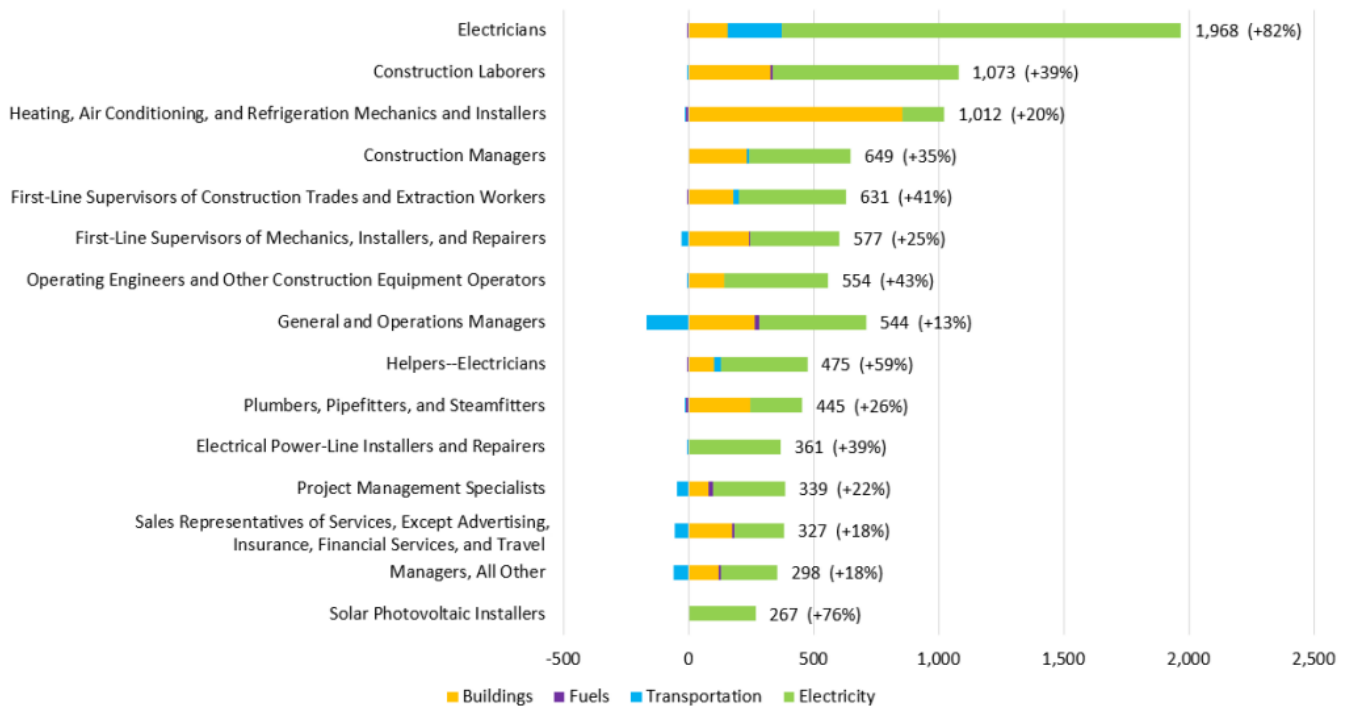
¹¹⁹ Wage tiers were developed with information from the MIT Living Wage Calculator for Oregon and are defined for the following ranges: Below a Living Wage: Less than \$33/hour; At a Living Wage: \$33-\$48/hour; Above a Living Wage: More than \$48/hour.

a 13 percent gain in jobs with earnings above a living wage, a 20 percent gain in jobs with earnings at a living wage, and a 2 percent gain in jobs with earnings below a living wage.

Despite these differences, the distribution of total jobs, new and existing — estimated by the model in 2035 across the three wage tiers — remains approximately equivalent to the distribution in 2024, with roughly half of all jobs continuing to be classified as below a living wage. This underscores a need for early planning and investment in workforce training and development to ensure quality job growth. This jobs analysis also identified 15 high demand priority occupations (see Table 29).

The three occupations with the greatest new expected demand are electricians, construction laborers, and HVAC and refrigeration mechanics and installers. Results from the modeling indicate a demand for roughly 2,000 more electricians by 2035, 1,000 more construction laborers, and 1,000 more HVAC and refrigeration mechanics and installers (see Table 30).

Figure 19. Net Change in Energy Jobs by Occupation by 2035



The occupations that are expected to grow most between now and 2035 differ somewhat between eastern and western Oregon. For example, the jobs analysis estimates a greater percentage growth in HVAC and refrigeration mechanics and installers, and plumbers, pipefitters, and steamfitters in western Oregon, while estimating a greater percentage growth in solar photovoltaic installers and wind turbine service technicians in eastern Oregon. Electricians remain the occupation with the top total job gains across the state, with roughly 600 new jobs in eastern Oregon and 1,400 new jobs in western Oregon.

Jobs in the transportation sector are expected to see net demand decline. While employment in the charging stations, vehicle manufacturing, and wholesale trade parts subsectors grows, these gains are outstripped by declines in demand for jobs in fueling stations and vehicle maintenance. These job displacements reflect reduced demand for fueling stations as vehicles electrify, as well as lower maintenance needs of electric vehicles. Notably, these estimates are based on modeling that assumed the continuation of programs such as Advanced Clean Cars II and Advanced Clean Trucks, which are currently facing uncertainty based on recent federal action and pending court cases.

Table 29. High Demand Occupations Identified in Oregon Energy Strategy Jobs Study

Occupation Title	Occupation Description
Electricians	Electricians are skilled professionals responsible for installing, maintaining, and repairing electrical wiring, equipment, and fixtures. They ensure that all work complies with relevant electrical codes and safety standards. In addition to residential and commercial electrical systems, Electricians may also install and service power generating, transmission, distribution, and storage systems and various electrical control systems, contributing to the overall functionality and safety of electrical infrastructure. Their expertise is essential for both new installations and the upkeep of existing systems. ¹²⁰
Construction Laborers	Construction Laborers are the primary physical laborers at construction sites. They perform a wide range of tasks necessary for construction site operations, such as site preparation, (un)loading materials, erecting scaffolding, rubble disposal, and more. Additionally, they may be expected to assist any of the more specialized workers in performing their duties. Due to the variety of tasks a construction laborer may be asked to perform, they should be able to use many different types of hand and power tools. ^{121, 122}
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	Heating, Ventilation, Air Conditioning, and Refrigeration (HVAC/R) Mechanics and Installers work to install and maintain a wide variety of temperature control systems. They can work on oil burners, stoves, refrigeration units, or many other types of systems and can also specialize in certain types of systems. They work in all kinds of buildings, from homes to hospitals. Employers commonly prefer mechanics with additional training, certification, or education, as systems become more complicated over time. Additionally, those who work directly with refrigerants must be certified to handle these hazardous substances. ^{123, 124}
Construction Managers	Construction Managers oversee and coordinate all the efforts on construction projects to ensure they are completed efficiently and correctly. This includes components such as scheduling, budgeting, and implementation. They ensure the team meets safety and quality standards as well as client expectations. ¹²⁵

¹²⁰ U.S. Department of Labor. (n.d.). O*Net OnLine. Electricians: 47-2111.00. Detailed Work Activities. <https://www.onetonline.org/link/details/47-2111.00>.

¹²¹ U.S. Bureau of Labor Statistics. 2023 May. OEWS Data: Occupation Employment and Wage Statistics. Accessed August 2024. <https://www.bls.gov/oes/current/oes472061.htm>.

¹²² U.S. Bureau of Labor Statistics. Publications: *Occupational Outlook Handbook*. Accessed August 2024. <https://www.bls.gov/ooh/construction-and-extraction/construction-laborers-and-helpers.htm>.

¹²³ U.S. Bureau of Labor Statistics. 2023 May. OEWS Data: Occupation Employment and Wage Statistics. Accessed August 2024. <https://www.bls.gov/oes/current/oes499021.htm>.

¹²⁴ U.S. Bureau of Labor Statistics. *Occupational Outlook Handbook*. <https://www.bls.gov/ooh/installation-maintenance-and-repair/heating-air-conditioning-and-refrigeration-mechanics-and-installers.htm>

¹²⁵ U.S. Department of Labor. (n.d.). O*Net OnLine. Construction Manager: 11-9021.00 Detailed Work Activities. <https://www.onetonline.org/link/details/11-9021.00>.

Occupation Title	Occupation Description
First-Line Supervisors of Construction Trades and Extraction Workers	<p>Construction Supervisors directly supervise and coordinate the activities of construction or extraction workers. Their responsibilities include inspecting workers' progress in completing tasks and assignments as well as construction site equipment to verify specifications are met. More specifically, they review blueprints and work plans; assign work to those they supervise based on specific project needs; coordinate the assigned work activities; and estimate project costs, to name a few of their duties. In energy, Construction Supervisors coordinate and direct the work of crews involved in building, installing, or maintaining energy generation and energy efficiency infrastructure, from utility-scale and distributed solar projects to battery storage facilities, commercial and residential building electrification and energy efficiency projects, and grid-modernization upgrades.^{126,127}</p>
First-Line Supervisors of Mechanics, Installers, and Repairers	<p>First-Line Supervisors of Mechanics, Installers, and Repairers are responsible for overseeing the work of mechanics and installation and repair workers. They review and interpret blueprints and job orders to coordinate work among employees, monitor employees' performance, and inspect and test completed work to ensure that it meets safety standards and repair requirements. Supervisors are also responsible for completing more rigorous and complicated repair and maintenance tasks.^{128,129}</p>
Operating Engineers and Other Construction Equipment Operators	<p>Operating Engineers and Other Construction Equipment Operators operate the heavy equipment used in construction such as derricks, scrapers, and bulldozers. Using this machinery, they transport earth and various other materials, clear sites in preparation for new projects, pour hard surface pavements like concrete, and more. Operating Engineers and Other Construction Equipment Operators support energy projects by performing the heavy equipment work needed for site preparation, foundation construction, and equipment installation on electric generation, transmission, distribution, storage, and building electrification and energy efficiency projects.^{130,131}</p>

¹²⁶ U.S. Bureau of Labor Statistics. 2023 May. OEWS Data: Occupation Employment and Wage Statistics. Accessed September 2024. <https://www.bls.gov/oes/2023/may/oes471011.htm>.

¹²⁷ U.S. Department of Labor. (n.d.). O*Net OnLine. First-Line Supervisors of Construction Trades and Extraction Workers: 47-1011.00. Accessed January 2025. <https://www.onetonline.org/link/summary/47-1011.00>.

¹²⁸ U.S. Bureau of Labor Statistics. 2023 May. OEWS Data: Occupation Employment and Wage Statistics. Accessed September 2024. <https://www.bls.gov/oes/2020/may/oes491011.htm>.

¹²⁹ U.S. Department of Labor. (n.d.). O*Net OnLine. First-Line Supervisors of Construction Trades and Extraction Workers: 47-1011.00. Accessed January 2025. <https://www.onetonline.org/link/summary/49-1011.00>.

¹³⁰ U.S. Bureau of Labor Statistics. 2023 May. Occupation Employment and Wage Statistics. Accessed August 2024. <https://www.bls.gov/oes/2023/may/oes472073.htm>.

¹³¹ U.S. Bureau of Labor Statistics. Publications: *Occupational Outlook Handbook*. Accessed August 2024. <https://www.bls.gov/ooh/construction-and-extraction/construction-equipment-operators.htm>.

Occupation Title	Occupation Description
General and Operations Managers	General and Operations Managers oversee the various workers and operations of a project. They plan, direct, and coordinate the various components of the project, they handle the budget and timeline of the project, and they make the big decisions that may affect the finished product. These managers also address emergencies or problems that arise and complete many administrative tasks. ^{132, 133}
Helpers - Electricians	Helpers for Electricians are construction laborers who work under the supervision of licensed electricians to carry out support tasks that require less training. Their responsibilities include measuring, cutting, and bending wire and conduit, assisting with wire stripping and soldering, examining electrical units to identify potential issues, and maintaining tools, equipment, and work areas. In the energy industry, these workers can be found on a breadth of projects similar to that of an electrician, from supporting construction and installation activities for transmission and distribution upgrades to assisting in the assembly of a wind turbine’s electrical system, to helping install building electrification measures. ¹³⁴
Plumbers, Pipefitters, and Steamfitters	Plumbers and Fitters ensure residential, commercial, and industrial buildings have the necessary infrastructure to enable the transportation of liquids, gases, and other substances. They are responsible for installing, maintaining, and repairing the piping systems in which these elements travel. They use instruments like saws, cutting torches, pipe benders, and pipe threaders to cut, thread, or hammer pipes to precise lengths. Additionally, to assemble these pipe sections, they perform basic welding activities like soldering and brazing using various materials such as couplings, clamps, screws, bolts, cement, plastic solvent, caulk, and other welding equipment. After a completed job, they will often use various techniques and equipment, including hydrostatic testing, pressure gauges, and more, to inspect, evaluate, and test the installed piping systems. ^{135, 136}

¹³² U.S. Bureau of Labor Statistics. 2023 May. Occupation Employment and Wage Statistics. Accessed August 2024. <https://www.bls.gov/oes/2023/may/oes111021.htm>.

¹³³ U.S. Department of Labor. (n.d.). O*Net OnLine. General and Operations Managers: 11-1021.00. Accessed January 2025. <https://www.onetonline.org/link/summary/11-1021.00>.

¹³⁴ U.S. Department of Labor. (n.d.). O*Net OnLine. Helpers—Electricians: 47-3013.00. Accessed January 2025. <https://www.onetonline.org/link/summary/47-3013.00>.

¹³⁵ U.S. Department of Labor. (n.d.). O*Net OnLine. Plumbers, Pipefitters, and Steamfitters: 47-2152.00. Accessed August 2024. <https://www.onetonline.org/link/summary/47-2152.00>.

¹³⁶ U.S. Bureau of Labor Statistics. Publications: *Occupational Outlook Handbook*. Accessed August 2024. <https://www.bls.gov/ooh/construction-and-extraction/plumbers-pipefitters-and-steamfitters.htm#tab-4>.

Occupation Title	Occupation Description
Electrical Power-Line Installers and Repairers	Electrical Power-Line Installers and Repairers maintain the power grid by installing and repairing electrical cables and wires used in electrical transmission and distribution systems. Their work involves climbing poles or using truck-mounted buckets to string and repair cables, troubleshoot outages, inspect and test electrical components, and replace damaged hardware like transformers, switches, and voltage regulators. ¹³⁷
Project Management Specialists	Project Management Specialists are responsible for planning, coordinating, and executing projects from initiation through completion. These workers have a large range of tasks, including communicating with clients to establish project requirements, developing project plans, selecting vendors, coordinating and directing project staff, and monitoring project costs and milestone progression. Project Management Specialists can oversee a broad range of projects across sectors, including managing building electrification and energy efficiency upgrades in residential and commercial buildings, the deployment of charging infrastructure for electric vehicles, or electricity transmission and distribution upgrades and modernization. ¹³⁸
Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	Sales Representatives of Services sell a wide range of non-financial, non-insurance, and non-travel services to consumers and businesses by identifying client needs, presenting service offerings, preparing cost estimates, negotiating terms, and maintaining long-term customer relationships. In energy, these representatives focus on assessing clients' energy needs and presenting, explaining, and recommending energy-efficiency and distributed energy solutions, including solar PV systems and building electrification measures. ¹³⁹
Managers, All Other	Managers, All Other is a broad occupational group including Regulatory Affair Managers, Compliance Managers, Loss Prevention Managers, Wind Energy Operations Managers, Wind Energy Development Managers, and Brownfield Redevelopment Specialists and Site Managers. Managers are generally responsible for supervising employees to ensure adherence to quality of work and safety standards, training employees, creating project plans, and coordinating workstreams to ensure objectives and deadlines are met. ¹⁴⁰

¹³⁷ U.S. Bureau of Labor Statistics. Publications: *Occupational Outlook Handbook*. Accessed September 2025. <https://www.bls.gov/ooh/installation-maintenance-and-repair/line-installers-and-repairers.htm>.

¹³⁸ U.S. Bureau of Labor Statistics. Publications: *Occupational Outlook Handbook*. Accessed September 2025. <https://www.bls.gov/ooh/business-and-financial/project-management-specialists.htm>.

¹³⁹ U.S. Department of Labor. (n.d.). O*Net OnLine. Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel: 41-3091. Accessed November 2025. <https://www.bls.gov/oes/2023/may/oes413091.htm>.

¹⁴⁰ U.S. Department of Labor. (n.d.). O*Net OnLine. Managers, All Other: 11-9199.00. Accessed November 2025. <https://www.onetonline.org/link/summary/11-9199.00>.

Occupation Title	Occupation Description
Solar Photovoltaic Installers	Solar Photovoltaic Installers assemble, install, and maintain solar PV systems on roofs or other structures in compliance with site regulations. Frequent elements of the job include measuring, cutting, assembling, and bolting structural framing and solar panels, as well as performing basic electrical work such as checking currents. ^{141, 142}

Consistent with the modeled 2035 new demand for employment (far right column in the chart below) the Oregon Employment Department has also projected that 10 of these 15 occupations are likely to experience high demand economywide from 2023-2033, with expected growth faster than the average overall occupational growth rate in the state (see Table 30). Electricians, heating, air conditioning, and refrigeration mechanics and installers, and solar photovoltaic installers are all occupations that are expected to grow much faster than the statewide average. The additional demand for these jobs from the measures outlined here could lead to shortages in these occupations where economywide demand is likely to already be exerting pressure. Since these priority occupations are high quality careers with wages at or above the state median wage, it is important that Oregon is prepared to meet this need to ensure Oregonians can benefit, particularly those who are unemployed, underemployed, or currently earning below a living wage.

¹⁴¹ U.S. Department of Labor. (n.d.). O*Net OnLine. Solar Photovoltaic Installers: 47-2231.00. Accessed November 2025. <https://www.onetonline.org/link/summary/47-2231.00>.

¹⁴² U.S. Bureau of Labor Statistics. Publications: *Occupational Outlook Handbook*. Accessed August 2024. <https://www.bls.gov/ooh/construction-and-extraction/solar-photovoltaic-installers.htm>.

Table 30. Past, Current, and Forecasted Demand for High Demand Jobs

Occupation Title	2019 Employment ¹⁴³	2023 Employment	2033 Projected Economywide Employment	2035 Modeled New Employment
Electricians	9,920	10,029	12,016	1,968
Construction Laborers	13,270	18,041	20,995	1,073
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	3,260	4,373	5,208	1,012
Construction Managers	5,020	5,622	6,480	649
First-Line Supervisors of Construction Trades and Extraction Workers	6,300	11,128	12,692	631
First-Line Supervisors of Mechanics, Installers, and Repairers	4,720	7,404	7,981	577
Operating Engineers and Other Construction Equipment Operators	4,960	4,914	5,505	554
General and Operations Managers	34,050	48,582	53,134	544
Helpers--Electricians	390	396	429	475
Plumbers, Pipefitters, and Steamfitters	5,530	5,185	5,952	445
Electrical Power-Line Installers and Repairers	1,230	1,436	1,545	361
Project Management Specialists	*	18,384	20,583	339
Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	9,500	9,603	10,306	327
Managers, All Other	*	16,341	17,760	298
Solar Photovoltaic Installers	**	302	428	267

*2019 employment estimates did not include this occupational category.

**2019 employment estimates are not available.

Working group discussions identified several solutions for avoiding shortages and ensuring that the jobs created are high quality. Many of these solutions identified apprenticeship support as a key approach. Some suggestions included setting apprenticeship utilization goals and promoting greater collaboration

¹⁴³ Estimates for 2019 employment levels come from the BLS OEWS. Limitations to making temporal comparisons with these data are discussed in the [BLS OEWS FAQ page](#).

between apprenticeship programs, community colleges, local institutions, and current energy specific training programs. Outside of suggestions around apprenticeships, many discussants emphasized the need to upskill and re-skill the current workforce. As part of this upskilling and re-skilling, working group members emphasized a need for consistent standards or certificates to ensure workers are sufficiently trained in specific installation techniques needed for newer technologies. It was also determined that the state would benefit from follow-up research to better understand how these potential solutions may interact with current workforce development efforts across Oregon. Labor organizations, community colleges, state and local workforce development boards, and non-profits were all identified as key partners for engaging in further developing solutions.

Funding to support necessary workforce development is likely to come from a variety of sources. For example, union apprenticeship programs are typically self-sustaining, with dues from union members covering the costs of training new apprentices. Other programs are supported with federal grants and will likely need additional funding support from public or private dollars to scale up. Examples of these programs are the Training for Residential Energy Contractors, which is funded through a grant from the U.S. Department of Energy, and the Union Pre-Apprenticeship Construction Training program for adults in custody, which is funded through a grant from the U.S. Department of Labor. New programs and programs with a need for additional funding to scale could look for support in identifying sources of funds from organizations like the Oregon Clean Energy Workforce Coalition and local workforce development boards. In particular, it will be important to identify funding sources to sustain workforce development solutions in rural and low-income areas where working group members identified a specific need.

Oregon Comprehensive Climate Action Plan Next Steps

Planned Supplemental Analyses

The CCAP will help Oregon sustain emissions reductions and continue progress while providing flexibility in our actions. It brings together multiple agencies and therefore needs to be a dynamic plan that can change and evolve with state policies, programs, and funding.

TIGHGER 2.0 Phase 2

In 2026, ODOE is continuing its work assessing the state's progress toward meeting its GHG reduction goal as part of the TIGHGER 2.0 project. The initial phase of this project was aimed at updating the forecast and assessment of Oregon's progress toward meeting its GHG reduction goals based on the programs and regulations currently in effect, while incorporating changes in certain parameters (e.g., the anticipated load growth associated with data center development). Moving forward, ODOE will work across agencies to identify a robust menu of additional actions that will go beyond those that are highlighted in this CCAP, guided by the pathways and policy recommendations of the Oregon Energy Strategy. The additional modeling results will provide sufficient options and flexibility for actions to meet or exceed the 2050 GHG reduction goal and ensure that actions are aligned with the economywide least-cost reference scenario identified in the strategy. This work will include sensitivity analyses that account for variability in circumstances that may affect load growth and effectiveness of state programs. This work is scheduled to be completed in Summer 2026 and will inform future actions to meet energy demand and emissions goals.

In 2025, the Oregon Legislature passed HB 3409, which required the Oregon Climate Action Commission to work with ODOE to periodically update GHG emissions reduction forecasts of existing programs and policies. ODOE anticipates updating reductions forecasts like the TIGHGER analysis about every four

years to help monitor state progress on goals and assess how existing programs and policies have made progress on goals and will contribute toward meeting the 2035 and 2050 goals in the future.

Oregon Energy Strategy

ODOE will be conducting the Oregon Energy Strategy Jobs and Workforce Development Phase 2 study in 2026. Building on the findings of the Jobs and Workforce study for the Oregon Energy Strategy, ODOE is conducting a follow-up study to better understand energy job training opportunities and needs in the state. Specifically, this analysis will examine the extent to which Oregon's current workforce and training opportunities are prepared to meet the estimated employment needs of Oregon's energy future. This study will include defining and estimating gaps in training and education opportunities by occupation using quantitative and qualitative research approaches. This work is scheduled to be completed by fall 2026 and will support the development of a workforce that can meet Oregon's future energy needs and emissions goals.

Natural Climate Solutions and Metrics Analysis

As directed by the Oregon Legislature in HB 3409, ODOE and the Oregon Climate Action Commission are in the process of conducting an analysis of natural climate solutions and associated metrics to track progress toward reaching non-binding carbon sequestration and storage goals on Oregon's natural and working lands. These will be based on the Land-based Net Carbon Inventory completed in December 2025 and will include establishing activity-based metrics to evaluate progress toward the goals and community-based metrics to evaluate the positive and negative effects of natural carbon sequestration strategies on landowners, land managers, and communities. The analysis will inform the development of an Oregon-specific suite of natural climate solutions and compiling a data and methods library. This work is expected to be completed in Summer 2026. ODOE in collaboration with the OCAC will produce an updated Land-based Carbon Inventory every two years.

The OCAC with ODOE will also be assessing the effects of different natural carbon sequestration strategies on Oregon's workforce. This will build off of the [Natural Climate Solutions Workforce Development and Training Program Needs Study](#) published in December, which illuminated opportunities and barriers for a nature-based workforce, but stopped short of estimating numbers or workers needed to increase the pace and scale of NCS implementation. The study looked at NCS-related jobs as a whole and identified industries associated with nature-based work in Oregon. This data could be used to model scenarios that achieve the goal set in June, that assess and estimate how many workers will be needed over the next 10 years for different strategies. Experts indicate that 10 years is the most meaningful for establishing NCS and realizing a nature-based mitigation and adaptation benefit from these actions in the coming decades.

Status Report

The final deliverable led by DEQ, due to the EPA by May 31, 2027 will include updates on efforts to mitigate GHG emissions and ODOE's Phase 2 Jobs & Workforce Development Study as highlighted in the previous section. The final deliverable will evaluate the [CPRG implementation grant's](#) impact across Oregon. It will also discuss lessons learned midway through the implementation process.

Beyond an assessment of how the state is advancing on existing plans, this report will also include:

- Additional efforts at DEQ

- Community engagement activities and opportunities
- Discussion and opportunities within the climate and public health nexus

Additional Efforts at DEQ

This will include additional planning studies and data analysis to support existing and new regulations such as a collaboration with University of California Davis to understand policy change impacts on Oregon’s Clean Fuels Program and assessing GHG inventories at county levels. This will also include supporting community involvement for climate advising at DEQ, such as providing participant support costs for committees so that community perspectives that may otherwise be left out due to capacity can advise on climate efforts and issues.

Community Engagement Activities and Opportunities

DEQ will be partnering with community-based organizations throughout the state to collect feedback directly from community members about climate planning efforts and gaps they see and their experience with climate hazards. DEQ also has agreements in place with two Tribes to support their ongoing efforts to address climate impacts. The goal is to inform the final deliverable about what actions are working at various scales, what may not be working, and to highlight diverse community perspectives on GHG mitigation efforts.

Climate and Public Health Nexus

The Oregon Health Authority is collaborating with DEQ to crosswalk county level climate adaptation planning with climate mitigation opportunities. We will center the nexus with public health through this partnership with OHA to support adaptation efforts that additionally reduce GHGs as well as examining the health impacts from GHGs. The goal for this aspect of the work is to plan for climate mitigation opportunities while also considering community resilience.

Funding Acknowledgement

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Appendix A: Additional Sector-Based Inventory Data

Table A-1 is a further breakdown of Oregon’s GHG emissions by economic sub-sector or category.

Table A-1: Oregon Greenhouse Gas Emissions in MMT CO₂e by Economic Sub-Sector or Category

Sector/Source	1990	2021	2023
Transportation	-	-	-
Motor Gasoline	11.61	11.97	11.66
Distillate Fuel	4.54	7.24	5.48
Jet Fuel, Kerosene	1.25	1.75	1.60
Natural Gas	0.49	0.43	0.46
Residual Fuel	1.75	0.00	0.00
Lubricants	0.22	0.10	0.10
Aviation Gasoline	0.04	0.02	0.02
LPG	0.04	0.00	0.00
Light Rail Electricity Use - Other	0.00	0.01	0.01
Jet Fuel, Naphtha	0.08	0.00	0.00
Passenger & Light Vehicles	0.06	0.01	0.01
Non-Road Vehicles & Equipment	0.02	0.01	0.01
Heavy-Duty Vehicles	0.00	0.00	0.00
Natural Gas Distribution (sector share)	0.04	0.03	0.03
Passenger & Light Vehicles	0.46	0.07	0.06
Non-Road Vehicles & Equipment	0.09	0.10	0.09
Heavy-Duty Vehicles	0.01	0.04	0.04
Refrigerants, A/C, Fire Protection Use	0.00	0.87	0.87
Residential & Commercial	-	-	-
Residential Electricity Use	5.93	6.63	6.29
Commercial Electricity Use	4.66	5.49	5.20
Residential Natural Gas Combustion	1.27	2.52	2.71
Commercial Natural Gas Combustion	1.11	1.62	1.74
Commercial Petroleum Combustion	0.79	0.73	0.65
Residential Petroleum Combustion	0.76	0.31	0.25
Waste Incineration	0.08	0.10	0.11
Residential Coal Combustion	0.00	0.00	0.00
Commercial Coal Combustion	0.00	0.00	0.00
Municipal Solid Waste Landfills	1.15	1.44	1.59
Natural Gas Distribution (sector share)	0.20	0.28	0.26
Municipal Wastewater	0.18	0.26	0.26
Residential Combustion Byproducts	0.06	0.20	0.20
Commercial Combustion Byproducts	0.02	0.03	0.03
Waste Incineration	0.00	0.00	0.00
Compost	0.00	0.06	0.05
Fertilization of Landscaped Areas	0.06	0.08	0.08
Residential Combustion Byproducts	0.01	0.03	0.03
Waste Incineration	0.01	0.01	0.01
Compost	0.00	0.05	0.05

Sector/Source	1990	2021	2023
Commercial Combustion Byproducts	0.00	0.01	0.01
Municipal Wastewater	0.08	0.13	0.13
Refrigerants, Aerosols, Fire Protection Use	0.00	0.58	0.58
Industrial	-	-	-
Industrial Electricity Use	5.98	5.71	5.41
Natural Gas Combustion	2.46	2.94	3.15
Petroleum Combustion	2.53	1.45	1.37
Cement Manufacture	0.22	0.48	0.41
Coal Combustion	0.13	0.12	0.06
Ammonia Production & Urea Consumption	0.07	0.03	0.02
Waste Incineration	0.07	0.02	0.01
Iron & Steel Production	0.70	0.03	0.03
Soda Ash Production & Consumption	0.03	0.03	0.03
Limestone & Dolomite Use	0.01	0.01	0.00
Lime Manufacture	0.09	0.05	0.05
Pulp & Paper Wastewater	0.00	0.00	0.00
Natural Gas Distribution & Production	0.25	0.73	0.69
Industrial Landfills	0.07	0.27	0.27
Combustion Byproducts	0.03	0.03	0.03
Food Processing Wastewater	0.02	0.01	0.01
Waste Incineration	0.00	0.00	0.00
Combustion Byproducts	0.05	0.05	0.05
Waste Incineration	0.00	0.00	0.00
Nitric Acid Production	0.00	0.02	0.01
Semiconductor Manufacturing	0.33	0.97	0.79
Refrigerant, Foam, Solvent, Aerosol Use	0.00	0.13	0.03
Aluminum Production	0.31	0.00	0.00
Agriculture	-	-	-
Urea Fertilization	0.06	0.10	0.10
Liming of Agricultural Soils	0.03	0.05	0.05
Enteric Fermentation	2.60	2.70	2.70
Manure Management	0.30	0.35	0.35
Agricultural Residue Burning	0.01	0.00	0.00
Agricultural Soil Management	2.83	2.04	2.04
Manure Management	0.14	0.17	0.17
Agricultural Residue Burning	0.00	0.00	0.00
Total Emissions	56	62	59

Gas/Source	1990	2021	2023
Carbon Dioxide (CO2)	-	-	-
Motor Gasoline	11.61	11.97	11.66
Distillate Fuel	4.54	7.24	5.48
Jet Fuel, Kerosene	1.25	1.75	1.60
Natural Gas	0.49	0.43	0.46

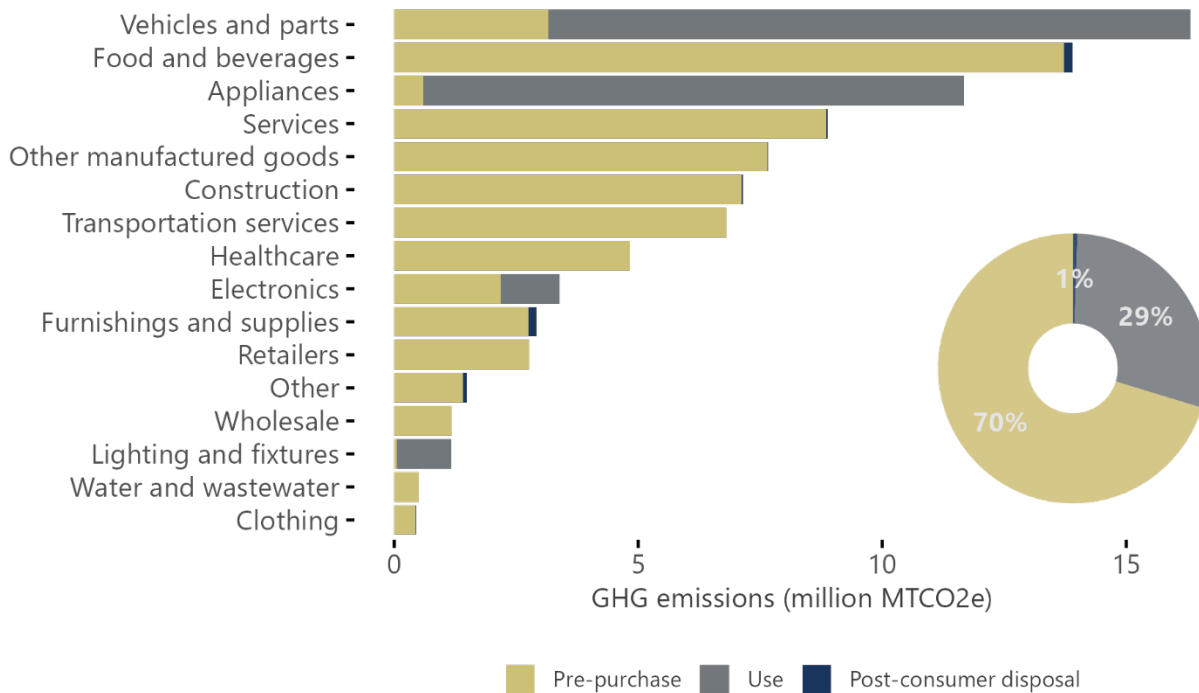
Gas/Source	1990	2021	2023
Residual Fuel	1.75	0.00	0.00
Lubricants	0.22	0.10	0.10
Aviation Gasoline	0.04	0.02	0.02
LPG	0.04	0.00	0.00
Light Rail Electricity Use - Other	0.00	0.01	0.01
Jet Fuel, Naphtha	0.08	0.00	0.00
Residential Electricity Use	5.93	6.63	6.29
Commercial Electricity Use	4.66	5.49	5.20
Residential Natural Gas Combustion	1.27	2.52	2.71
Commercial Natural Gas Combustion	1.11	1.62	1.74
Commercial Petroleum Combustion	0.79	0.73	0.65
Residential Petroleum Combustion	0.76	0.31	0.25
Waste Incineration	0.08	0.10	0.11
Residential Coal Combustion	0.00	0.00	0.00
Commercial Coal Combustion	0.00	0.00	0.00
Industrial Electricity Use	5.98	5.71	5.41
Natural Gas Combustion	2.46	2.94	3.15
Petroleum Combustion	2.53	1.45	1.37
Cement Manufacture	0.22	0.48	0.41
Coal Combustion	0.13	0.12	0.06
Ammonia Production & Urea Consumption	0.07	0.03	0.02
Waste Incineration	0.07	0.02	0.01
Iron & Steel Production	0.70	0.03	0.03
Soda Ash Production & Consumption	0.03	0.03	0.03
Limestone & Dolomite Use	0.01	0.01	0.00
Lime Manufacture	0.09	0.05	0.05
Pulp & Paper Wastewater	0.00	0.00	0.00
Urea Fertilization	0.06	0.10	0.10
Liming of Agricultural Soils	0.03	0.05	0.05
Methane (CH4)	-	-	-
Passenger & Light Vehicles	0.06	0.01	0.01
Non-Road Vehicles & Equipment	0.02	0.01	0.01
Heavy-Duty Vehicles	0.00	0.00	0.00
Natural Gas Distribution (sector share)	0.04	0.03	0.03
Municipal Solid Waste Landfills	1.15	1.44	1.59
Natural Gas Distribution (sector share)	0.20	0.28	0.26
Municipal Wastewater	0.18	0.26	0.26
Residential Combustion Byproducts	0.06	0.20	0.20
Commercial Combustion Byproducts	0.02	0.03	0.03
Waste Incineration	0.00	0.00	0.00
Compost	0.00	0.06	0.05
Natural Gas Distribution & Production	0.25	0.73	0.69
Industrial Landfills	0.07	0.27	0.27
Combustion Byproducts	0.03	0.03	0.03
Food Processing Wastewater	0.02	0.01	0.01

Gas/Source	1990	2021	2023
Waste Incineration	0.00	0.00	0.00
Enteric Fermentation	2.60	2.70	2.70
Manure Management	0.30	0.35	0.35
Agricultural Residue Burning	0.01	0.00	0.00
Nitrous Oxide (N2O)	-	-	-
Passenger & Light Vehicles	0.46	0.07	0.06
Non-Road Vehicles & Equipment	0.09	0.10	0.09
Heavy-Duty Vehicles	0.01	0.04	0.04
Fertilization of Landscaped Areas	0.06	0.08	0.08
Residential Combustion Byproducts	0.01	0.03	0.03
Waste Incineration	0.01	0.01	0.01
Compost	0.00	0.05	0.05
Commercial Combustion Byproducts	0.00	0.01	0.01
Municipal Wastewater	0.08	0.13	0.13
Combustion Byproducts	0.05	0.05	0.05
Waste Incineration	0.00	0.00	0.00
Nitric Acid Production	0.00	0.02	0.01
Agricultural Soil Management	2.83	2.04	2.04
Manure Management	0.14	0.17	0.17
Agricultural Residue Burning	0.00	0.00	0.00
High Global Warming Potential Gases (GHG)	-	-	-
Refrigerants, A/C, Fire Protection Use	0.00	0.87	0.87
Refrigerants, Aerosols, Fire Protection Use	0.00	0.58	0.58
Semiconductor Manufacturing	0.33	0.97	0.79
Refrigerant, Foam, Solvent, Aerosol Use	0.00	0.13	0.03
Aluminum Production	0.31	0.00	0.00
Total Emissions	56	62	59

Appendix B: Additional Consumption-Based Emissions Inventory Data

Figure B-1 shows Oregon’s 2023 consumption-based GHG emissions, organized by category and lifecycle stage.

Figure B-1. Oregon’s 2023 consumption-based GHG emissions by category and lifecycle stage



One category – vehicles and parts – represents 18 percent of all of Oregon’s consumption-based emissions, followed closely by food and beverages (15 percent). 72 percent of all emissions are associated with just the six highest-emitting categories: vehicles, food and beverages, appliances, services, “other manufactured goods” (which are dominated by capital and inventory investments by businesses) and construction.

Seventy percent of all emissions occur upstream of the consumer as “pre-purchase” emissions.

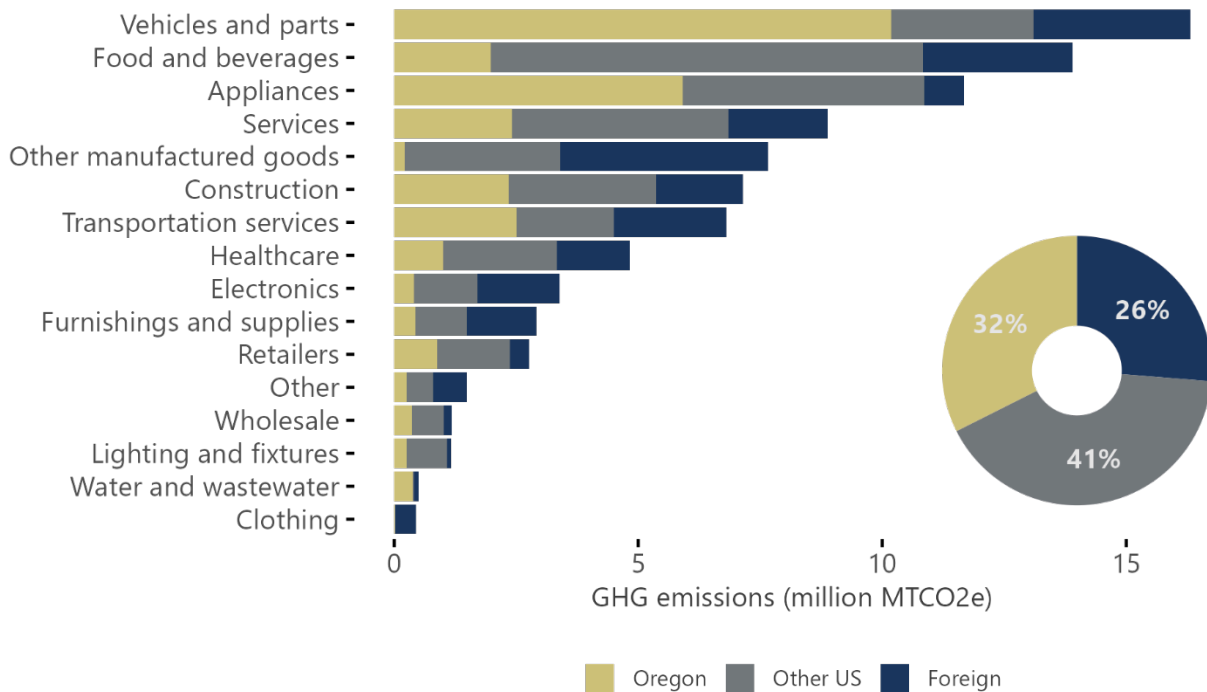
Emissions from the use of energy, refrigerants and engine lubricants (to operate vehicles, appliances, electronics and lighting) contribute another 29 percent. Less than 1 percent of emissions stem from post-consumer disposal of wastes. But within different categories, the relative contribution of different life cycle stages varies:

- For appliances and lighting, the vast majority of emissions are a result of use; production and transportation of the appliances and lighting fixtures contribute very little.
- Tailpipe emissions during the use of vehicles also dominate that category, although emissions from production (auto manufacturing) and parts are not trivial. At 3.1 MMTCO2e, emissions from vehicles and parts are 150 percent larger than all emissions associated with the use of lighting, the purchase of clothing, and wastewater treatment combined.
- Production also dominates many other categories, including food, where emissions are almost entirely upstream of the consumer, in farms and factories and their supply chains.

Figure B-2 shows that most of Oregon's consumption-based emissions, while driven by consumption by Oregonians buying and using goods and services (mostly) in Oregon, actually occur elsewhere. While this

is difficult to estimate precisely, **just under one-third (32 percent) of Oregon's consumption-based emissions are estimated to physically originate within Oregon's borders.** Forty-one percent originate elsewhere in the U.S., and approximately 26 percent occur in other nations (totals do not equal 100 percent due to rounding).

Figure B-2. Oregon’s 2023 consumption-based GHG emissions by category and location of emission



The location of emissions varies by type of consumption. For example, nearly all emissions associated with clothing are a result of foreign manufacturing, while food-related emissions primarily occur elsewhere in the U.S., such as in California and the Midwest. The only categories where more than half of emissions occur in Oregon are vehicles and parts (due to vehicle use) and appliances (due to appliance use).

Figure B-3 illustrates how Oregon’s consumption-based GHG emissions, by category, have changed over the five inventory years of 2005, 2010, 2015, 2021, and 2023.

Figure B-3. Oregon’s consumption-based GHG emissions by category, 2005 - 2023

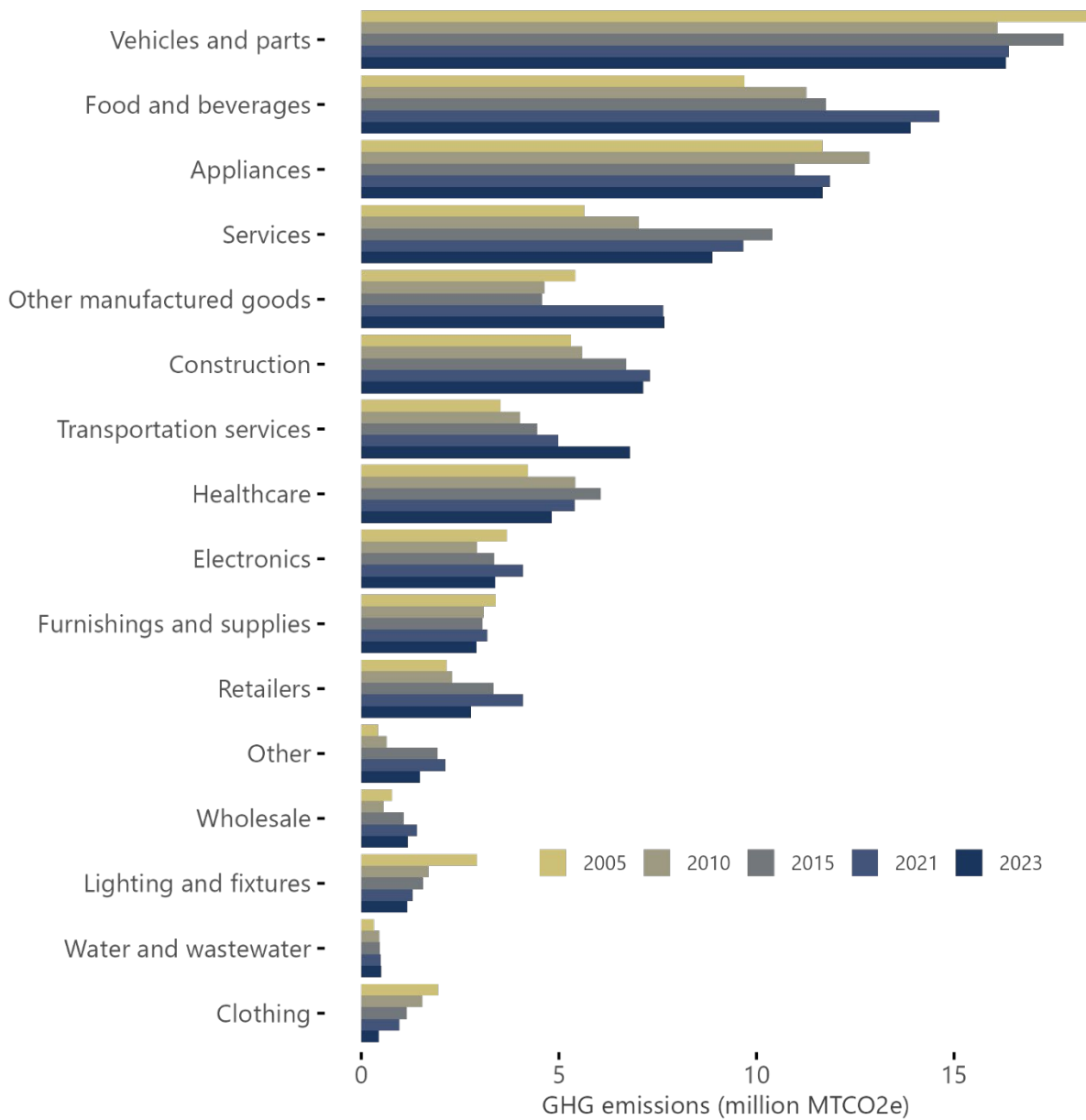
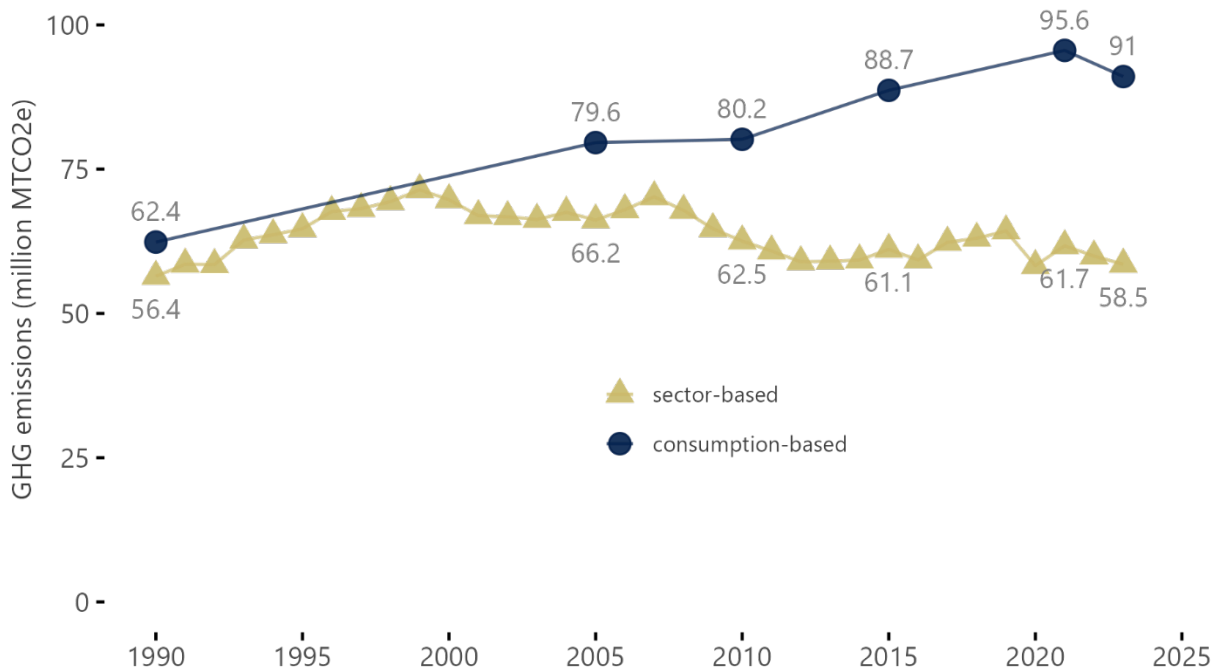


Figure B-4 illustrates how Oregon’s consumption-based and sector-based emissions have changed over a 33-year long time span.

Figure B-4. Comparison of Oregon’s sector-based and consumption-based GHG emissions, 1990 - 2023



Sector-based emissions are drawn from the state’s sector-based inventory, which has estimated emissions for all years 1990 – 2023. Estimates of consumption-based emissions are available only for the years 1990, 2005, 2010, 2015, 2021 and 2023.

Regardless, Figure B-4 illustrates several significant trends.

Oregon’s consumption-based emissions have risen steadily over most of the 33-year period studied, with the first marked decrease observed between 2021 and 2023. In contrast, Oregon’s sector-based emissions rose during the 1990s, peaked in 1999, fluctuated some and then have generally fallen from that peak, with some movement between years (in both directions). Emissions in 2020 were low, corresponding to the circumstances surrounding the COVID 19 public health emergency, and returned in 2021 to pre-COVID levels, but have fallen since. The decline in both sector-based and consumption-based emissions between 2021 and 2023 may partially be a result of unusually high levels of economic activity in 2021 associated with post-COVID 19 stimulus spending and the end of the public health emergency.

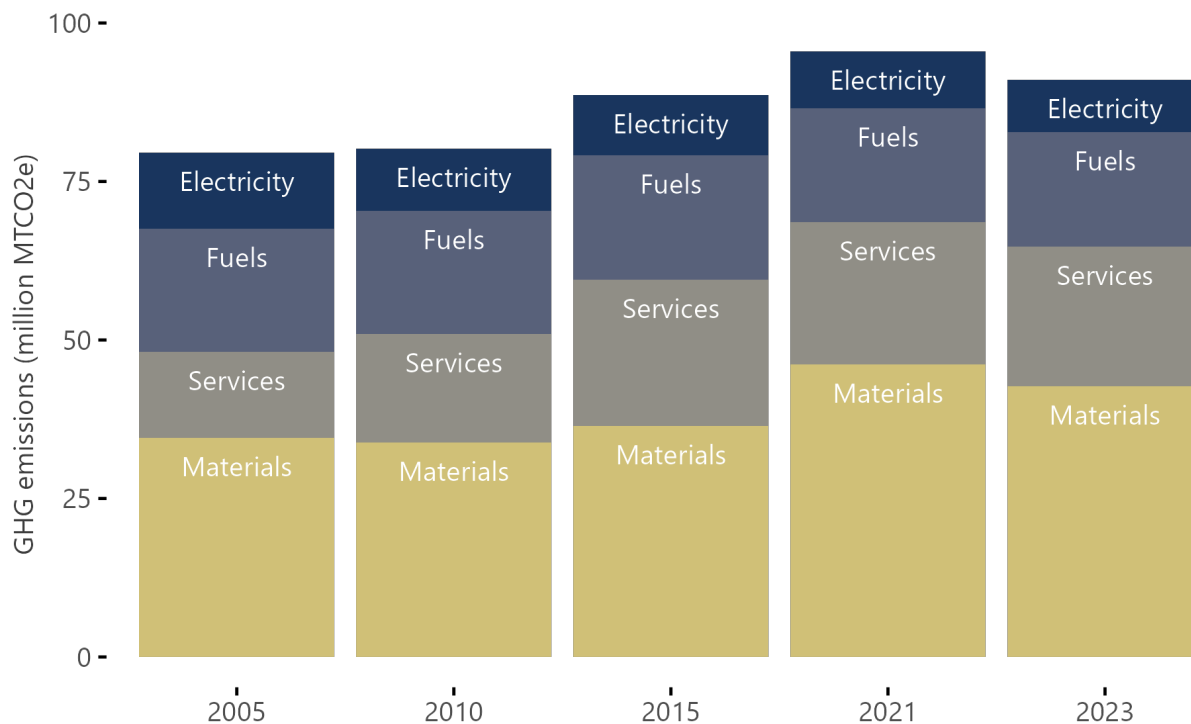
Importantly, the gap between the two inventories has grown significantly: consumption-based emissions were about 6 MMTCO₂e higher in 1990, with the gap widening to 13 MMTCO₂e (2005), 18 MMTCO₂e (2010), 28 MMTCO₂e (2015) and most recently (2023), 33 MMTCO₂e. This widening gap might be explained by several concurrent factors including: rising consumption by Oregon, increased reliance on imports (from outside of Oregon), offshoring of domestic (and in-state) production, and Oregon decarbonizing its sector-based emissions at a faster rate than states and nations that produce items consumed by Oregon.

Another way to consider the relative contribution to consumption-based GHG emissions is through the use of “metacategories.” This concept reduces all forms of consumption into just four groups: materials, services, electricity and fuels. Emissions are assigned to the metacategory associated with the item being consumed – so even though many of the emissions associated with materials are due to fossil fuels used to produce those materials, the metacategory view assigns such emissions to “materials”, since it is the

consumption of materials which cause the energy to be used. In this view, electricity and fuels are limited to direct consumption (final demand) of those commodities.

Figure B-5 illustrates Oregon’s consumption-based emissions by metacategory for years 2005, 2010, 2015, 2021 and 2023.

Figure B-5. Oregon’s consumption-based GHG emissions by metacategory, 2005 - 2023



Certain commodities in the underlying model might be considered either a material, or a service. Chief among these are construction and consumption at restaurants. In these cases, emissions are allocated equally between the two metacategories.

Figure B-5 illustrates some important trends. Materials contribute the most to consumption-based emissions, and now contribute almost half (47%) of all consumption-based emissions for Oregon. Services contribute close to one-quarter of the total (24%) and in terms of relative change have increased the most (although materials added almost as much in absolute terms between 2005 and 2023). Emissions from direct consumption of fuels has been generally flat during the study period, with a small decrease observed between 2015 and 2021. Finally, emissions from the consumption of electricity have demonstrated a steady decrease, both in absolute terms (12 MMTCO2e in 2005 to 8.3 MMTCO2e in 2023) and as a percentage of the whole (15% in 2005 to 9% in 2023).

Appendix C Land-Based Net Carbon Inventory

Methodology

In December 2025, ODOE published its first Land-based Net Carbon Inventory, which estimates emissions and removals from Oregon’s natural and working lands between years 1990-2024. A summary of the modeling methodology is provided below. The full [methodology](#) is available on ODOE’s website.

Land Use Definitions

All land in Oregon must be classified and accounted for without duplication or omission. The Inventory applies International Panel on Climate Change (IPCC) definitions of land use categories, which are also used in the U.S. National Greenhouse Gas Inventory (NGHGI). Applying a consistent approach to the NGHGI enables comparisons across states and the use of national estimates to fill in gaps in state-level inventories. The approach is grounded in consistent land representation – defining and characterizing all the land in the State of Oregon – to ensure that emissions and removals associated with different land uses and land covers are accurately estimated, avoiding double counting or omissions.

IPCC guidance is to segment the total geographical area covered by the inventory into six main land categories: Forest Land, Cropland, Grassland, Wetlands, Developed Land, and Other Land (typically barren land such as rock, ice, etc.). Land is further defined as land remaining in a land category (e.g., Forest Land remaining Forest Land) and land converted to another land category (Cropland converted to Forest Land). This allows for an inventory to reflect carbon dynamics and estimate carbon emissions and removals associated with different ecological/management systems and land use change. The state entity developing the inventory refines the definitions for each land category to ensure that all land can be classified into a discrete land category. Currently, land definitions are based on the National Land Cover Dataset (NLCD) classifications.

NLCD is used because it provides a consistent land representation dataset with wall-to-wall coverage of the state area over the inventory time series, starting in 1990 to present. The main differences between the land category definitions employed by Oregon (through assignment of NLCD classes) and those adopted for use in the NGHGI include thresholds on vegetation cover and size of land tract for forests, threshold for the size of land tract for Developed Land, allocation of pastures and hay production, agroforestry, and wooded wetlands. All land in Oregon is designated as managed land following the convention established for land-based GHG inventories.¹⁴⁴

IPCC Methodological Approaches

IPCC Guidelines indicate the basis for estimating GHG emissions is to multiply activity data that represents activities associated with emissions or removals, by an appropriate emission factor or a set of emission parameters that represent emissions or removals associated with a given activity. The approaches differ for estimating non-CO₂ emissions and CO₂ emissions and removals from carbon dynamics. Generic equations are provided below.

¹⁴⁴ Ogle, S. M., Domke, G., Kurz, W. A., Rocha, M. T., Huffman, T., Swan, A., Smith, J. E., Woodall, C., & Krug, T. (2018). Delineating managed land for reporting national greenhouse gas emissions and removals to the United Nations Framework Convention on Climate Change. *Carbon Balance and Management*, 13(1), 1–11. <https://link.springer.com/article/10.1186/s13021-018-0095-3>.

To calculate non-CO₂ emissions, for example, from biomass burning or managed soils, activity data is multiplied by an appropriate emission factor as indicated by the equation below¹⁴⁵:

Equation C-1: Non-CO₂ Emissions to the Atmosphere

$$\text{Emissions} = \text{AD} \times \text{EF}$$

Where:

Emissions	= Metric Tons of emissions
AD	= Activity data relating to the emissions source
EF	= Emission factor for a specific gas and source category (tonne of emissions per unit of AD)

Calculations are conducted for each emission category and GHG and can then be converted to units of carbon dioxide equivalent (CO₂e) based on each GHG's global warming potential (GWP). More information on GWPs is provided below.

For estimating CO₂ emissions and removals from carbon stock changes, IPCC Guidelines provide two different approaches: the Stock Difference Approach and the Gain-Loss Approach. Calculating the total annual carbon stock change using the **Stock Difference Approach** is done by applying Equation 2¹⁴⁶:

Equation C-2: Carbon stock change in a given pool as an annual average difference between estimates at two points in time

$$\Delta C = (C(t_2) - C(t_1)) / (t_2 - t_1)$$

Where:

ΔC	= annual carbon stock change in the pool, metric ton C yr ⁻¹
C_{t_1}	= carbon stock in the pool at time t_1 , metric ton C
C_{t_2}	= carbon stock in the pool at time t_2 , metric ton C
t_1	= time point 1, at which carbon stock is estimated (previous year)
t_2	= time point 2, at which carbon stock is estimated (estimated year)

The stock-difference approach estimates carbon stock change in a given pool as an annual average difference between estimates at two points in time.

Calculating the total annual carbon stock change using the **Gain-Loss Approach** is done by applying Equation 3¹⁴⁷:

¹⁴⁵ Intergovernmental Panel on Climate Change. (2006). 2006 IPCC guidelines for national greenhouse gas inventories: Volume 4—Agriculture, forestry and other land use; Chapter 2: Generic methodologies applicable to multiple land-use categories. Institute for Global Environmental Strategies. Equation 2.6

¹⁴⁶ Intergovernmental Panel on Climate Change. (2006). 2006 IPCC guidelines for national greenhouse gas inventories: Volume 4—Agriculture, forestry and other land use; Chapter 2: Generic methodologies applicable to multiple land-use categories. Institute for Global Environmental Strategies. Equation 2.5

¹⁴⁷ Intergovernmental Panel on Climate Change. (2006). 2006 IPCC guidelines for national greenhouse gas inventories: Volume 4—Agriculture, forestry and other land use; Chapter 2: Generic methodologies applicable to multiple land-use categories. Institute for Global Environmental Strategies. Equation 2.4

Equation C-3: Annual carbon stock change in a given pool as a function of gains and losses

$$\Delta C = \Delta C_G - \Delta C_L$$

Where:

ΔC = annual carbon stock change in the pool, metric ton C yr⁻¹

ΔC_G = annual gain of carbon, metric ton C yr⁻¹

ΔC_L = annual loss of carbon, metric ton C yr⁻¹

Net carbon stock change is the summation of carbon stock change in each relevant carbon pool, which depends on the ecosystem.

The following is a complete list of carbon pools considered when estimating carbon stocks and fluxes on land:

- Above-ground biomass (AGB)
- Belowground biomass (BGB)
- Deadwood (DW)
- Litter (LI)
- Soil organic carbon (SOC)
- Harvested wood products (HWP)

Uncertainty

Uncertainty is a fundamental consideration in GHG inventories. The accuracy of emission and removal estimates relies on the quality of activity data, the accuracy of emission factors, and the extent to which all relevant land categories are stratified and characterized. In future updates of the LCI data accuracy will increase and uncertainty will decrease.

Land Category Global Warming Potentials

Non-CO₂ emissions need to be converted to CO₂ equivalent (CO₂e) using their associated GWP. As a default, the 100-year time horizon values from the IPCC Fifth Assessment Report (AR5) will be used.

Category: Forest Land

Four GHG emission and removal categories are estimated under the Forest Land category:

1. CO₂ emissions and removals from forest carbon stock changes on forest land remaining forest land (biomass, deadwood, litter, soil)
2. CO₂ emissions and removals from forest carbon stock changes on land converted to forest land (biomass, mineral soils)
3. N₂O emissions from application of fertilizer to soil
4. CO₂ emissions and removals from harvested wood products

CO₂ emissions and removals from forest carbon stock changes are estimated separately for Forest Land remaining Forest Land and land converted to Forest Land. All other categories are estimated at the level of Forest Land.

For Forest Land remaining Forest Land category, the CO₂ emissions occur when trees are harvested. For inventory purposes, all the CO₂ stock is assumed to be emitted. Living trees remove CO₂ from the atmosphere through the process of photosynthesis and accumulate carbon as biomass as they grow. The growth rate of trees is used to estimate annual carbon accumulation (density), which is used to quantify

CO₂ removal from the atmosphere. This inventory used CO₂ accumulation rates from Forest Inventory and Analysis (FIA) measurement sites in Oregon. CO₂ emissions associated with loss of biomass from wildfires are captured in the biomass flux category to the extent that FIA data is able to capture changes in carbon density and accumulation. CH₄ and N₂O emissions from biomass burning are addressed in section on biomass burning emissions.

For the land converted to Forest Land category, it is assumed that the trees are planted or regenerated from seed pools from existing forests. Growth curves are used to estimate CO₂ accumulations in trees and are used to estimate CO₂ removal from the atmosphere per unit area per year.

Emissions and removals from the HWP pool are reported under the Forest Land category. Oregon Department of Forestry (ODF) uses a production approach model consistent with the Tier 3 Production Approach in the IPCC Guidelines (2006 IPCC Guidelines, Vol. 4, Ch. 12) to account for HWP carbon fluxes. This approach includes all timber harvested and processed in Oregon, even if it's ultimately used and/or disposed of outside of the state. The methodology is considered to be Tier 3 because it uses a detailed state-specific model. This inventory applies the ODF methodology and calculations are conducted using a web-based tool called HWP-C-vR.¹⁴⁸

Category: Grassland

The Inventory includes these subcategories in the Grassland category:

- CO₂ fluxes from mineral soils
- CO₂ fluxes in biomass

Biomass carbon fluxes on grasslands reflect the balance of growth, mortality, and disturbance. In Oregon, grasslands and shrublands span a wide range of ecological regions—from semi-arid sagebrush steppe in the east to coastal prairies and valley grasslands in the west—resulting in substantial geographic variability in biomass stocks and turnover. These ecosystems typically have lower biomass than forests, but their carbon dynamics are highly responsive to drivers such as fire, grazing, invasive species encroachment, and land-use change. Biomass carbon fluxes estimates are disaggregated by ecoregions to capture variability across the state.

USDA, in collaboration with Colorado State University, has taken the methodological approach in the publication and created a web-based decision-support tool to quantify GHG emissions and removals associated with grassland. This tool, [called COMET-Farm](#), implements a process-based, Tier 3 model, DayCENT. It is designed to estimate a complete GHG inventory of major on-farm emission sources, focusing on CO₂, N₂O, and CH₄, including CO₂ fluxes in biomass and mineral soil within the farm-gate. For this category, only mineral soil CO₂ fluxes are included. The DayCENT model is also used to estimate emissions and removals on grassland and cropland for the U.S. national GHG inventory.

COMET-Farm is able to model both the grasses and animal interactions on rangelands and grasslands. The tool has multiple crops that can be used to represent different grazing lands, such as a generic category of grass and detailed crops including rye, clover, blue grass, buffalo grass, fescue, and vetch. It models soil Carbon fluxes based on land management information related to grazing such as the percent daily utilization of the grassland, rest days, and start and end grazing dates.

Category: Cropland

The cropland inventory includes the GHG emissions and removals on land dominated by the cultivation of annual crops, managed pasture and hay production, and perennial crops such as orchards and vineyards.

¹⁴⁸ <https://groomanalyticsllc.shinyapps.io/HWP-C-vR/>

The inventory includes:

- CO₂ fluxes from mineral soils
- CO₂ fluxes in biomass from perennial woody crops
- CO₂, CH₄, and N₂O emissions from organic soils

USDA, in collaboration with Colorado State University, has taken the methodological approach in the USDA Methods and created a web-based decision-support tool to quantify GHG emissions and removals associated with grassland. This tool, called COMET-Farm, implements a process-based, Tier 3 model, DayCENT. It is designed to estimate a complete GHG inventory of major on-farm emission sources, focusing on CO₂, N₂O, and CH₄, including CO₂ fluxes in biomass and mineral soil within the farm-gate. For this category, only mineral soil CO₂ fluxes are included. The DayCENT model is also used to estimate emissions and removals on grassland and cropland for the U.S. national GHG inventory.

COMET-Farm only includes crops for which sufficient data are available to produce credible estimates as determined by the model development team. As a result, COMET-Farm does not include all the crops grown in the state of Oregon. For crops not included in COMET-Farm, Tier 2 quantification approaches from the USDA Methods document are used. COMET-Farm is also not able to quantify GHG emissions in organic soils.

Category: Wetlands

This section outlines the technical approach for quantifying GHG emissions and removals from Oregon's coastal (tidal and non-tidal) and inland wetlands from 1990 to 2024. The work adheres to best-practice inventory protocols recognized by the IPCC, the U.S. NGHGI, and recent region-specific research—it is designed to meet both state and national greenhouse gas reporting standards. The methodology estimates emissions and removals from wetlands by: (1) disaggregating the coastal wetland from inland wetland, (2) mapping spatial extent of wetland, (3) tracking land cover or land use change over time, (4) applying carbon stocks, accumulation rates, and methane and nitrous oxide emission factors to wetland classes to estimate GHG emissions and removals, and (5) summing emissions and removals for wetlands that remain or land that is converted to a wetland from another land type.¹⁴⁹

Following this approach, emissions and removals of carbon dioxide and methane are estimated from soils, above and below ground biomass across land use categories: **Wetland Remaining Wetland**, which includes **Wetland to Open Water** and **Open Water to Wetland**, and **Land Converted to Wetland**.

The Inventory separates coastal wetland into estuarine (wetlands with salinities greater than 0.5 ppt) and palustrine (wetlands with salinities less than 0.5 ppt) based on C-CAP classification, while inland wetland is all palustrine. Additionally, emissions of nitrous oxide from fish hatcheries are estimated across all wetlands.

Category: Developed Land

The Developed Land include the following categories:

- CO₂, CH₄, and N₂O emissions from drained organic soils on Developed Land remaining Developed Land
- CO₂ emissions and removals in biomass (urban trees)
- CO₂, CH₄, and N₂O emissions from drained organics soils on land converted to Developed Land
- CO₂ emissions and removals in mineral soils and biomass on land converted to Developed Land

¹⁴⁹ (Crooks et al., 2018).

The IPCC Tier 1 assumption that CO₂ emissions and removals from mineral soils are '0' in Developed Land remaining Developed Land is applied, and thus this category is not estimated.

The area of land in Developed Land remaining Developed Land and land converted to Developed Land is processed according to the approach described in the cross-cutting section. Carbon emissions and removals in mineral soil are accounted for separately in Developed Land remaining Developed Land and land converted to Developed Land. For all other categories, emissions and removals are calculated at the level of Developed Land. Therefore, information in the following sections is organized by GHG source categories at the highest level, rather than by Developed Land remaining Developed Land and land converted to Developed Land.

Category: Biomass Burning

The following two categories are included in this section:

- Non-CO₂ emissions from wildfires
- Non-CO₂ emissions from prescribed burns

Wildfires and prescribed burning occurring in Oregon result in emissions of CO₂, CH₄ and N₂O. CO₂ emissions are accounted for as changes in biomass Carbon stocks. This section describes the methods for estimating non-CO₂ emissions (i.e., CH₄ and N₂O) from biomass burning occurring on all lands other than croplands. Non-CO₂ emissions from agricultural residue burning are reported in the Oregon Sector Based GHG Inventory. The methodology for estimating non-CO₂ emissions from wildfires is based on the [Wildland Fire Emissions Inventory System calculator](#) (WFEIS), the same tool used by the U.S. EPA to estimate forest fire emissions for the National GHG Inventory. This tool estimates emissions from the wildfire and enables disaggregation of emissions by land category based on fuel type. Emissions from prescribed burns are also estimated. The methodology is applied at the land category level (not disaggregated by land remaining and land converted).

Appendix D: TIGHGER 2.0 Sectoral Assumptions and Policies and Programs

Residential and Commercial

BAP Scenario Assumption	Parameterization (of both overarching and supporting assumptions)	Related Programs/Policies
Retrofit Existing Buildings	<p>Replace 10% of 1954–1994 small detached homes (~9,000–10,000 units) by 2036, with funding secured by 2032 to allow for implementation lag.</p> <p>New code-compliant buildings to save ~25,000 kWh per unit in year one.</p>	Manufactured Home Replacement
Retrofit Existing Buildings	<p>Retrofit 1,246 homes (units) statewide (using ~ \$4.2 million) from 2025 to 2027.</p> <p>Achieve average thermal savings of 50% and plug load savings of 5%.</p>	Healthy Homes Grant Program
Retrofit Existing Buildings	<p>Reduce energy use in 321 commercial buildings (≥ 20,000 sq ft) statewide by 2028, averaging 81 buildings per year from 2025.</p>	Climate Equity and Resilience Through Action (CERTA) Climate Pollution Reduction Grant (CRPG)
Retrofit Existing Buildings	<p>Retrofit Timeline & Compliance:</p> <ul style="list-style-type: none"> ≥200,000 sq ft buildings by 2028 ≥90,000 sq ft buildings by 2029 ≥35,000 sq ft buildings by 2030 <p>Meet EUI targets per ASHRAE Standard 100; see Appendix Z, Table 7-2a of the Building Performance Standard).</p> <p>Minimum 50% compliance rate per size category.</p>	Building Energy Performance Standards
Retrofit Existing Buildings	<p>Install 12,000 heat pump units in existing homes (mainly multifamily and mobile) statewide by 2027, prioritizing LIDACs and residences</p>	Climate Equity and Resilience Through Action (CERTA) Climate Pollution Reduction Grant (CRPG)

BAP Scenario Assumption	Parameterization (of both overarching and supporting assumptions)	Related Programs/Policies
	using wood, oil, electric resistance, or no heating.	
Retrofit Existing Buildings	Retrofit 2,690 existing housing units statewide between 2025 and 2028.	Climate Equity and Resilience Through Action (CERTA) Climate Pollution Reduction Grant (CRPG)
Retrofit Existing Buildings	Improve energy efficiency by at least 20% for 4,308 residential units.	Home Energy Rebates: Home Efficiency Rebate Program (HOMES)
Retrofit Existing Buildings	Retrofit up to 3,112 homes with first-time electric appliances and insulation, or build all-electric new units between 2025 - 2031.	Home Energy Rebates: Home Electrification and Appliance Rebate Program (HEAR)
Retrofit Existing Buildings	Increase energy efficiency of 900 multifamily buildings by an average of 20% within PGE/PacificCorp service area counties between 2025 and 2036.	Multifamily Energy Program HB 2021 100% Clean Energy Standard
Energy Efficient Buildings	Build 9,420 multifamily units statewide between 2025–2028, averaging 2,355 units per year. All units will exceed Oregon’s base building code by at least 10% in energy efficiency.	Climate Equity and Resilience Through Action (CERTA) Climate Pollution Reduction Grant (CRPG)
Energy Efficient Buildings	90% of new or renovated large public buildings have onsite renewable electricity.	ODOE's 1.5% for Green Energy Technology (GET)
Energy Efficient Buildings	Use rates of growth for housing types for each county based on 2022 and 2023 values compared to baseline.	Middle Housing (HB 2001)
Energy Efficient Buildings	Build 940 low-embodied carbon housing units and reduce emissions across key sectors—residential energy use, combustion byproducts (CH ₄ , N ₂ O), and transportation fuel (motor gasoline)—in line with DEQ MM Program CCAP measure projections for 2027–2050.	Climate Equity and Resilience Through Action (CERTA) Climate Pollution Reduction Grant (CRPG)

BAP Scenario Assumption	Parameterization (of both overarching and supporting assumptions)	Related Programs/Policies
Energy Efficient Buildings	Reduce energy use (increase energy efficiency) by 15% compared to previous construction.	Oregon Commercial Energy Efficiency Specialty Code
Heat Pump Programs	Spilt between owner occupied (SF) (2000, \$4,000,000), rentals (MF) (4000, \$12,000,000).	Heat Pump Rebate Program (Federally Funded)
Heat Pump Programs	Add heat pumps to new builds throughout the state (4000 buildings, \$8,000,000).	Heat Pump Rebate Program (Federally Funded)
Heat Pump Programs	Provides financial assistance to homeowners towards the purchase and installation of heat pumps in owner-occupied residences through the end of 2024.	Community Heat Pump Deployment Program, Oregon Rental Home Heat Pump Program
Energy Efficiency standards for appliances	2.5% savings by 2030, 4% by 2040.	Energy Efficiency Standards for Appliances
Solar + Storage Rebate Program	Install 69 MW on residential buildings across OR 2022-2025.	Solar + Storage Rebate Program

Electricity

BAP Scenario Assumption	Parameterization (of both overarching and supporting assumptions)	Related Programs/Policies
Implement HB2021	Electricity emissions achieve an 80% reduction by 2030, 90% by 2035 and zero-emission retail electricity sales by 2040 applied to PGE, PAC, and ESSs.	HB 2021 100% Clean Energy Standard Increase distributed energy resources Community Solar Program Renewable Portfolio Standards
Implement HB2021	Assume 3.4 GW of future data center electricity load using NWPCC Medium-High forecast. Growth is split 50/50 between IOU and COU service areas Electricity is assumed to be obtained from unspecified sources with an emissions intensity of 0.428	Data Center Load Projection

	MtCO ₂ e/MWh (DEQ's default emissions factor).	
Community Renewable Energy Grant Program	Projected addition of 22 MW of nameplate capacity in solar, storage, hydro, biomass projects by 2027.	Community Renewable Energy Grant Program

Climate Protection Program

BAP Scenario Assumption	Parameterization (of both overarching and supporting assumptions)	Related Programs/Policies
CAFE federal standards	Apply federal CAFE standards enforcement through 2025.	Corporate Average Fuel Economy
Clean Fuels Program	<p>Reduce average carbon intensity of transportation fuels by:</p> <p>10% from 2015 levels by 2025 (model as achieved in 2024)</p> <p>20% by 2030</p> <p>37% by 2035</p> <p>So far, renewable and biodiesels are replacing up to 1/3 of the diesel pool.</p>	<p>Clean Fuels Program Expansion</p> <p>Statewide Transportation Strategy programs</p> <p>Clean Fuels Program (CFP)</p>
Advanced Clean Cars II	<p>Ensure 14% of new vehicle sales are EVs in 2026, ramping to 100% by 2035.</p> <p>Allow manufacturers to meet up to 20% of annual EV sales requirements with plug-in hybrid vehicles (PHEVs).</p> <p>Permit up to 5% of annual compliance to be met through environmental justice (EJ) allowances.</p> <p>Model slower EV adoption from 2027–2029, followed by accelerated uptake through 2035.</p>	<p>Advanced Clean Cars II Rules (CPP)</p> <p>Oregon Clean Vehicle and Charge Ahead Rebate Program</p> <p>Statewide Transportation Strategy program, Low Emission Vehicle Program</p> <p>Clean Fuels Program Utility Credits</p> <p>West Coast Electric Highway</p> <p>National EV Infrastructure (NEVI) program</p> <p>Community EV Charging Rebate program</p> <p>Electric Vehicle Reliability Accessibility Accelerator Program</p>

		Carbon Reduction Program
	Increase the number of new EVs purchased across the state by 3.6 million compared to a baseline scenario: 2025: 18,100 more new EVs 2026: 42,500 2027: 72,00 2028: 107,800 2029: 144,600 2030: 172,800	Climate Equity and Resilience Through Action (CERTA) Climate Pollution Reduction Grant (CRPG)
Advanced Clean Cars II	Based on EVs and EV chargers put into place in select cities in the state (see program/policy record).	Energy Efficiency and Conservation Block Grant Program
Advanced Clean Trucks	Increase new medium- and heavy-duty vehicle sales from 2027–2035 to meet the following zero-emission targets: Class 2b–3 pickup trucks and vans: 55% ZEV Class 4–8 rigid trucks: 75% EV Class 7–8 tractor trucks: 40% EV, 10% hydrogen Exclude emergency vehicles, transit buses, motor coaches, articulated shuttles, and double-decker buses from ACT rule modeling to reflect their exemption and lower fleet transition impact.	Advanced Clean Trucks Rule Statewide Transportation Strategy programs Diesel Emissions Mitigation Grant Program Oregon Zero-Emission Fueling Infrastructure Grant Program Medium-and Heavy Duty Emissions Vehicle Rebate Charging and Fueling Infrastructure Grant Program
Advanced Clean Trucks	Add 20 new MHD ZEV charging stations in 2026.	Oregon Zero-Emission Fueling Infrastructure Grant Program
Advanced Clean Trucks	Beginning in 2025, 100 percent of new light-duty state fleet purchases and leases for applicable uses, to the extent available, will be ZEVs.	Statewide Fleet Policy 107-011-040: Conversion of State Fleet to ZEVs
Advanced Clean Trucks	New heavy-duty vehicles for sale in Oregon from 2026 onward must meet GHG efficiency standards as per California statute.	Heavy-Duty Engine and Vehicle Omnibus Rule

Climate Protection Program Transportation	Reduce emissions 50% by 2035, and 90% by 2050 from a 2017-2019 baseline.	Climate Protection Program 2024
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Transportation

BAP Scenario Assumption	Parameterization (of both overarching and supporting assumptions)	Related Programs/Policies
Climate-Friendly and Equitable Communities	<p>Align VMT estimates with ODOT modeling, reduce driving alone VMT by 5.5% statewide by 2050 (CFEC) statewide, 20% in metro areas.</p> <p>Reduce vehicle ownership per household by 3.5% by 2050 (CFEC).</p> <p>Shift 1% of statewide auto trips to transit (CFEC-Metro).</p>	Climate-Friendly and Equitable Communities (CFEC)

Industrial

BAP Scenario Assumption	Parameterization (of both overarching and supporting assumptions)	Related Programs/Policies
Climate Protection Program Industry	Reduce emissions 50% by 2035, and 90% by 2050 from a 2017-2019 baseline.	
RMA (Packaging and Paper Decarb)	Reduce industrial transportation emissions CO ₂ , CH ₄ , and N ₂ O emissions and CO ₂ (distillate fuel) by between -0.0561% and -0.1422% per year (see spreadsheet) between 2025-2050 for a total cumulative reduction in emissions of -0.520 MMTCO ₂ e by 2050 (as per DEQ).	Packaging and paper industrial decarbonization program
RMA (Packaging and Paper Decarb)	<p>Reduce industrial sector emissions from 0.01 MMTCO₂e/year in 2026 to 0.41 MMTCO₂e/year by 2050.</p> <p>Achieve reductions by targeting:</p>	Packaging and paper impact disclosure requirements (RMA)

	<p>CO₂ from natural gas and petroleum combustion.</p> <p>CO₂ from electricity use.</p> <p>CH₄ from natural gas production/distribution and combustion byproducts.</p> <p>N₂O from combustion byproducts.</p>	
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Waste

BAP Scenario Assumption	Parameterization (of both overarching and supporting assumptions)	Related Programs/Policies
RMA (Recycling Improvements)	Increase recycling collection and processing. Increase the quantity of materials recycled (both by increasing collections, and also improving processing of mixed recyclables, so that a higher percentage of collected materials are properly separated and sent to markets that can use them) such that emissions in Oregon reduce by between 0.001-0.006 MMTCO ₂ e between 2025-2050 (for a total of 0.117 MMT CO ₂ e reduced) (as per DEQ).	Plastic Pollution and Recycling Modernization Act
CERTA Measure 12 Landfill	Reduce methane emissions from landfills by between 0.01 MMTCO ₂ e (starting in 2026) to 0.02 MMTCO ₂ e by 2050. In addition, model energy recovery benefits.	Climate Equity and Resilience Through Action (CERTA) Climate Pollution Reduction Grant (CRPG)
Low-carbon Materials	Reduce emissions from implementation of existing policies and programs to reduce embodied carbon in the built environment by between 0.001 MMTCo ₂ e in 2024 to 0.003 MMTCO ₂ e in 2050 for a cumulative reduction of 0.069 MMTCO ₂ e by 2050. Includes DAS Sustainability Guidelines, ODOT EPD requirements and DEQ industry partnership and technical + financial	Existing Embodied Carbon Projects

	assistance and outreach to support developers, builders and architects.	
Low-carbon Materials	Build 9,420 multifamily units statewide between 2025–2028, averaging 2,355 units per year. All units will exceed Oregon’s base building code by at least 10% in energy efficiency.	Climate Equity and Resilience Through Action (CERTA) Climate Pollution Reduction Grant (CRPG)
CERTA Measure 11 Food	Divert 263,000 tons per year of organic waste from landfills. Model the downstream impacts of composting and landfill avoidance. Incorporate upstream benefit (fertilizer displacement).	Climate Equity and Resilience Through Action (CERTA) Climate Pollution Reduction Grant (CRPG)

Food & Agriculture

BAP Scenario Assumption	Parameterization (of both overarching and supporting assumptions)	Related Programs/Policies
Pacific Coast Food Waste Commitment	<p>Divert 3,394 short tons of food waste from composting annually from 2023-2050.</p> <p>Divert 3,606 short tons of food waste from landfilling annually from 2023-2050.</p> <p>For this enhanced measure to reduce food waste, net costs were assessed based on estimated costs and savings for food purchasers (consumers, retailers, restaurants, etc.). Reduce emissions associated with growing food, transporting food and waste, processing waste, and producing natural gas from waste by percentages listed in the calculations spreadsheet from 2023-2050 (as per DEQ).</p>	Food Waste Reduction Strategy / Reducing Food Impacts: A Strategic Plan for Oregon (2025)

Appendix E: Workforce Analysis Methodology

The Oregon Department of Energy developed the Oregon Energy Strategy, which will identify pathways to achieve the state’s energy objectives. The energy strategy will evaluate benefits and challenges of different pathways, present policy recommendations, and reflect input from Oregonians who informed the strategy.

Using input from Tribes, the energy strategy’s Advisory and Working Groups, staff-to-staff conversations with state agencies and participation in an Inter-Agency Steering Group, and comments from the public, ODOE and its technical contractors have developed scenarios that represent different energy pathways the state could take to achieve its energy policy objectives by 2050. The model compares energy pathways from a Reference Scenario to six Alternative Scenarios. For more information on how the model works and the key assumptions for the Reference and Alternative Scenarios, see the [Energy Strategy Modeling Assumptions and Sources](#) document.

Building on the results of the energy pathways modeling, the technical analysis evaluated effects of different pathways on energy sector employment. Using an input-output model, the jobs analysis estimated how investments from the modeled energy pathways may affect net energy sector employment. This document outlines the methodology for the jobs analysis at a high level. A full technical approach will be included in the final Oregon Energy Strategy report.

Summary of Input-Output Models

Input-output (I/O) modeling is used to generate employment estimates based on different investments or changes in a given economy over time. The research team used two different I/O models:

1. **IMPLAN**, short for “impact analysis for planning”.
2. **JEDI**, National Renewable Energy Laboratory’s Jobs and Economic Development Impact model.

I/O modeling outputs are broken down into direct, indirect, and induced impacts:

- **Direct effects** show the change in the economy associated with the initial economic activity.
- **Indirect effects** include all the backward linkages or the supply chain responses resulting from the initial direct economic activity.
- **Induced effects** refer to the effects of increased household spending and are the result of direct and indirect workers spending their wages within the local economy.

Sector Framework

The technical analysis estimated employment across Oregon’s Electricity, Fuels, Buildings, and Transportation sectors. Employment outputs do not extend to parts of the economy that are not connected to the four primary sectors. The **Electricity, Fuels, Buildings, and Transportation** sectors are further broken down into the following 27 sub-sectors:

Electricity

- Distributed Solar
- Utility Solar
- Land-based Wind
- Hydropower
- Distribution
- Transmission
- Storage
- Natural Gas Generation

- Other Fossil Generation
- Nuclear
- Other Renewable Generation - Biomass
- Other Renewable Generation - Geothermal

Fuels

- Hydrogen
- Biofuels
- Natural Gas
- Natural Gas Distribution
- Other Fossil Fuels

Buildings

- Commercial HVAC
- Commercial Other
- Residential HVAC
- Residential Shell
- Residential Other

Transportation

- Vehicle Manufacturing
- Wholesale Trade Parts
- Vehicle Maintenance
- Charging Stations
- Conventional Fueling Stations

Initial Employment Output Methodology

The Initial Employment Outputs (IEOs) estimated the quantity of jobs by value chain in the baseline year (2023) and in 2025, 2030, 2035, 2040, 2045, and 2050. The value chain details the industry area in which direct and indirect jobs are employed, which include **Construction, Manufacturing, Professional Services, Other Supply Chain, and Induced** employment. IEOs are provided for each sub-sector and scenario. IEOs for the Reference Scenario are broken down by region—with outputs presented for **Oregon state, Western Oregon, and Eastern Oregon**—while IEOs for each of the six alternative scenarios are presented only at the state level. The IEO methodology follows five steps:

1. The research team **determines the unit inputs** for the model. Unit inputs typically come from the forecasts developed by Evolved Energy Research (EER) data and take the form of device stocks and sales, MW of electric capacity, and fuel demand over time.
2. The research team **determines the total investments** associated with the unit inputs described in Step 1 above. Investment inputs come from the forecasts developed by EER data where provided, and additional investments are developed based on secondary sources where needed.
3. The research team **allocates the investment data into the relevant industry categories** based on the activities associated with the investments by using technical cost data from secondary sources.
4. The research team **applies IMPLAN/JEDI industry employment multipliers** based on the allocation described in Step 3 to calculate employment outputs.
5. **Employment outputs are reported** by industry category (Construction, Professional Services, Manufacturing, Other Supply Chain, and Induced). The 2023 baseline employment is derived from the [2024 United States Energy and Employment Report](#) (USEER).

Secondary Employment Output Methodology

The Secondary Employment Outputs (SEO) translate the direct and indirect employment estimates generated by the IEOs into occupational outputs, illustrating how jobs would change by occupation and wage distribution across the region. SEOs are presented for the baseline year (2023) and 2035 by detailed occupations and wage tiers and were only be run for the Reference Scenario. This SEO work will:

- Complete a crosswalk of IMPLAN industry categories to North American Industry Classification System (NAICS) codes for each of the sub-sectors by four of the value chain categories as defined in the IEOs – Construction, Manufacturing, Professional Services, and Other Supply Chain – omitting induced employment.
- Run direct and indirect employment from IEOs through proprietary staffing patterns (NAICS to SOC) for each of the value chain categories within each sub-sector for 2023 and 2035 to estimate employment by detailed occupations.
- Using finalized occupational employment within sub-sector and value chain categories, wages are grouped into three tiers: Tier 1, or above a sustaining wage; Tier 2, or at a sustaining wage; and Tier 3, or below a sustaining wage, defined by the MIT Living Wage Calculator. Occupational wages are held constant from 2024 to 2035, and do not incorporate any wage changes due to changes in supply or demand of workers in any given occupation. The outputs presented for the wage analysis show the number of jobs in 2024 and 2035 by their wage tier categorization in 2024, using 2024 dollars.

Appendix F: Methods for calculating co-pollutant benefits of measures on low-embodied-carbon building materials

Oregon's CCAP documents already describe the methods Oregon DEQ used to project the GHG reduction benefits of existing and new measures focused on low-embodied-carbon building materials. Some of those methods relied on life cycle and consumption-based analyses that were GHG-specific and could not produce equivalent outputs in co-pollutants such as PM2.5.

To estimate the benefits of those measures in terms of co-pollutants CO, NOx, PM2.5, VOC, PM10, SO2, and HC, Oregon DEQ followed a 4-step process.

First, DEQ simplified the list of product categories used to characterize the broad field of "building materials". "Building materials" as an economic category includes hundreds of products -- lumber, wire, asphalt, etc. It was impractical to study them all for all co-pollutants. However, the new and existing low-embodied carbon measures are strongly oriented towards government spending on infrastructure. Oregon DEQ's past examinations suggest such spending is dominated (by an order of magnitude) by highway, bridge, and similar projects, whose predominant materials are concrete and asphalt. Concrete and asphalt serve as a proxy for all "building materials" for the purpose of estimating co-pollutants.

Second, considering only those two materials, DEQ used life cycle databases (GaBi LCA for Experts and EcoInvent) to establish documented, defensible ratios of co-pollutant emissions (per kg of building material produced) to GHG emissions (per kg of building material produced). This resulted in 14 ratios (2 materials x 7 co-pollutants). This was reduced to 7 ratios (one per co-pollutant) by averaging the ratios for concrete and asphalt, because a survey of material ratios used in infrastructure projects suggested a rough equivalence between the masses of concrete and asphalt used on a statewide basis. The units of the ratios were "kg [co-pollutant] per kg CO2e GHG emission".

Third, these 7 ratios were applied to the GHG emissions reductions estimated for the existing and new low-embodied carbon measures.

Finally, the co-pollutant emission reductions were differentiated by those emissions expected to occur within the geographical boundary of the State of Oregon ("In State") and those which are expected to occur elsewhere or are additional reductions ("Global"). This differentiation is based on the same ratio used to estimate In State vs. Global GHG emissions for each measure.

Table 23b. Waste, Water, and Other Sustainable Materials Management Sector Estimated Co-Pollutant Reductions (Metric Tons) from TIGHGER BAP Measures by 2035

Action Title	Scope	CO (MT)	NOx (MT)	PM2.5 (MT)	VOC (MT)	PM10 (MT)	SO2 (MT)	HC (MT)
Low Carbon Materials*	In-State	52.63	43.69	2.23	28.59	7.45	18.01	0.20
Low Carbon Materials*	Global	352.25	292.36	14.95	191.36	49.86	120.55	1.33
Low Carbon Materials*	Total	404.88	336.05	17.18	219.95	57.31	138.56	1.53
CERTA Measures 10 & 12*	Total	34.83	8.24	4.85	6.61	5.44	4.01	NE
RMA (Recycling Improvements)	In-State	0.07	0.03	0.01	0.02	0.01	0.01	NE

RMA (Recycling Improvements)	Global	0.53	0.23	0.04	0.20	0.08	0.12	NE
RMA (Recycling Improvements)	Total	0.6	0.26	0.05	0.22	0.09	0.13	NE

*Data provided by DEQ program data and analysis.

Table 24b. Waste, Water, and Other Sustainable Materials Management Sector Estimated Co-Pollutant Reductions (Metric Tons) from TIGHGER BAP Measures by 2050

Action Title	Scope	CO (MT)	NOx (MT)	PM2.5 (MT)	VOC (MT)	PM10 (MT)	SO2 (MT)	HC (MT)
Low Carbon Materials*	In-State	131.09	108.80	5.56	71.22	18.56	44.86	0.50
Low Carbon Materials*	Global	877.28	728.15	37.23	476.59	124.18	300.24	3.31
Low Carbon Materials*	Total	1,008.37	836.95	42.79	547.81	142.74	345.1	3.81
CERTA Measures 10 & 12*	In-State	31.76	5.77	4.78	4.93	4.99	2.79	NE
CERTA Measures 10 & 12*	Global	n/a	n/a	n/a	n/a	n/a	n/a	NE
CERTA Measures 10 & 12*	Total	31.76	5.77	4.78	4.93	4.99	2.79	NE
RMA (Recycling Improvements)	In-State	0.11	0.05	0.01	0.04	0.02	0.02	NE
RMA (Recycling Improvements)	Global	0.85	0.37	0.07	0.31	0.12	0.19	NE
RMA (Recycling Improvements)	Total	0.96	0.42	0.08	0.35	0.14	0.21	NE

*Data provided by DEQ program data and analysis.

Appendix G: Method for Estimating Criteria Pollutant Emissions for Food and Agriculture Related Measures in the CCAP

Introduction

Oregon Department of Energy requested assistance from Oregon Department of Environmental Quality to estimate criteria pollutant emissions associated with specific measures from Oregon’s Comprehensive Climate Action Plan (CCAP). The specific measures all pertain to food or agriculture systems, they are:

- Measure 6 – Existing Food Waste Reduction
- Measure 7 – Certa Measure 11 Food Waste Recovery
- Measure 8 – Additional Food Waste Reduction
- Estimates were derived from the following criteria pollutant categories, shown in Table G-1.

Table G-1. List of Criteria Pollutants for Emissions Estimation

Full Name	Short Name
Carbon Monoxide	CO
Nitrogen Dioxide	NO _x
Volatile Organic Compounds	VOC
Particulate Matter (10 micrometers or smaller)	PM 10
Particulate Matter (2.5 micrometers or smaller)	PM 2.5
Hydrocarbons	HC
Sulfur Dioxide	SO ₂

Methodology

To estimate criteria pollutants associated with these four measures DEQ used life cycle inventories drawn from DEQ’s Waste Impact Calculator.¹⁵⁰

These inventories include potential emissions of criteria pollutants associated with specific materials (food, fertilizer) or activities (composting, landfilling, anaerobic digestion, transportation).

For these measures, the material tonnages estimated within each measure were multiplied by the expected/potential emissions from relevant life cycle inventories directly generate criteria emissions. This calculation was performed annually, to derive total criteria emissions (CP_{total}) from 2023-2050, where CP total is the sum of criteria pollutant emissions associated with a given measure over time (t). This calculation was performed for each criteria pollutant listed in Table G-1.

$$CP_{total} = \sum_{t=2023}^{t=2050} Mass \times EF$$

The co-pollutant emission reductions associated with these food measures were further differentiated by those emissions expected to occur within the geographical boundary of the State of Oregon (“In State”) and those which are expected to occur elsewhere, Outside of Oregon or

¹⁵⁰ DEQ Waste Impact Calculator - <https://or-dept-environmental-quality.github.io/wic/>

additional (“Global”). This differentiation is based on the ratio used to estimate In State vs. Other (Global) GHG emissions for each measure.

As with any model, these results are estimates extrapolated from average expected criteria pollutant emissions associated with various technologies (AD, Composting, Landfilling) and materials (Fertilizers, Food Production) and so should be considered directionally appropriate.

Table 25b. Food & Agriculture Sector Estimated Co-Pollutant Reductions (Metric Tons) from TIGHGER BAP Measures by 2035

Action Title	Scope	CO (MT)	NOx (MT)	PM2.5 (MT)	VOC (MT)	PM10 (MT)	SO2 (MT)	HC (MT)
CERTA Measure 11*	Total	219.92	149.51	15.28	261.37	8.61	43.22	0.05
Pacific Coast Food Waste Commitment	In-State	0.23	0.36	0.02	0.05	0.05	0.02	0.02
Pacific Coast Food Waste Commitment	Global	1.67	2.62	0.11	0.34	0.36	0.12	0.16
Pacific Coast Food Waste Commitment	Total	1.9	2.98	0.13	0.39	0.41	0.14	0.18

*Data provided by DEQ program data and analysis.

Table 26b. Food & Agriculture Sector Estimated Co-Pollutant Reductions (Metric Tons) from TIGHGER BAP Measures by 2050

Action Title	Scope	CO (MT)	NOx (MT)	PM2.5 (MT)	VOC (MT)	PM10 (MT)	SO2 (MT)	HC (MT)
CERTA Measure 11*	Total	623.33	418.89	42.57	772.69	24.71	118.25	0.11
Pacific Coast Food Waste Commitment	In-State	0.45	0.80	0.04	0.08	0.10	0.02	0.05
Pacific Coast Food Waste Commitment	Global	3.27	5.83	0.29	0.57	0.75	0.16	0.37
Pacific Coast Food Waste Commitment	Total	3.72	6.63	0.33	0.65	0.85	0.18	0.42

*Data provided by DEQ program data and analysis.

Table 27b. Estimated Co-Pollutant Reductions (Metric Tons) Gap Measures in the Food & Agriculture and Waste, Water, and Other Sustainable Materials Management Sectors by Measure by 2035

Action Title	Scope	CO (MT)	NOx (MT)	PM2.5 (MT)	VOC (MT)	PM10 (MT)	SO2 (MT)	HC (MT)
Additional Food Waste Reduction	In-State	85.50	31.71	13.10	17.69	7.11	24.80	0.10
Additional Food Waste Reduction	Global	364.49	135.20	55.83	75.42	30.33	105.75	0.44

Additional Food Waste Reduction	Total	449.99	166.91	68.93	93.11	37.44	130.55	0.54
New Low Carbon Materials	In-State	648.98	538.66	27.54	352.57	91.86	222.11	0.51
New Low Carbon Materials	Global	4,343.21	3,604.88	184.28	2,359.50	614.79	1,486.42	3.45
New Low Carbon Materials	Total	4,992.19	4,143.54	211.82	2,712.07	706.65	1,708.53	3.96

Table 28b. Estimated Co-Pollutant Reductions (Metric Tons) Gap Measures in the Food & Agriculture and Waste, Water, and Other Sustainable Materials Management Sectors by Measure by 2050

Action Title	Scope	CO (MT)	NOx (MT)	PM2.5 (MT)	VOC (MT)	PM10 (MT)	SO2 (MT)	HC (MT)
Additional Food Waste Reduction	In-State	1,746.46	647.79	267.53	361.37	145.29	506.68	2.10
Additional Food Waste Reduction	Global	7,445.41	2,761.63	1,140.51	1,540.60	619.41	2,160.05	8.95
Additional Food Waste Reduction	Total	9,191.87	3,409.42	1,408.04	1,901.97	764.70	2,666.73	11.05
New Low Carbon Materials	In-State	6,740.10	5,594.31	285.99	3,661.65	954.07	2,306.73	25.49
New Low Carbon Materials	Global	45,106.85	37,438.87	1,913.91	24,504.90	6,384.91	15,437.38	170.60
New Low Carbon Materials	Total	51,846.95	43,033.18	2,199.90	28,166.55	7,338.98	17,744.11	196.09