OREGON DEPARTMENT OF ENERGY
Annual Performance Progress Report (APPR) for 2019

Agency Mission:

Leading Oregon to a safe, clean, and sustainable energy future.

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INTRODUCTION

The Oregon Department of Energy's mission is to lead Oregon to a safe, clean, and sustainable energy future. To achieve this mission, the agency oversees diverse programs to meet the state's energy goals and policies – including programs that are not necessarily included in the scope of this report. The areas covered by this biennium's key performance measures are important for meeting Oregon's energy goals. Areas not included in the KPMs are also critical, such as ODOE's Nuclear Safety and Emergency Preparedness division, which oversees Oregon's interests in the Hanford Nuclear Site cleanup and ensures that the state is prepared to respond to nuclear- and energy-related emergencies. Further, the KPMs do not wholly capture ODOE's work to support energy policy development and innovation – efforts such as promoting energy resilience, providing technical expertise on issues like home energy performance and residential energy codes, and tracking emerging issues like electric vehicles, energy storage, renewable natural gas, and more.

For the 2019-21 biennium, the agency is reporting on six key performance measures:

Oregon Department of Energy	**2019 KEY MEASURE ANALYSIS**
Mission: Leading Oregon to a safe, clean, and sustainable energy future.	

THE OREGON CONTEXT

ODOE oversees statewide energy policy and development, and the agency's work intersects with numerous stakeholders and partners. These include large-scale investor-owned utilities and smaller consumer-owned utilities, many of which provide incentives and other resources to their customers; non-governmental organizations that advocate on energy and climate issues and provide incentives and rebates; federal entities such as the Bonneville Power Administration; regional entities like the Northwest Power and Conservation Council; and many others. ODOE also reports to the Oregon Legislature through various annual reports. Many of the department's measures link to Oregon Benchmark #77: Carbon Dioxide Emissions.

MEASURING OUR PERFORMANCE

The Oregon Department of Energy believes in continuous improvement across all program areas. Whether KPMs hold steady, improve, or decline, the agency seeks ways to improve processes and deliverables. Following a 2019-21 Budget Note, ODOE will report to the Joint Committee on Ways and Means during the 2020 session with an analysis of existing programs, KPMs, agency administration, and more.

BUDGET

The approved budget for the 2019-21 biennium delivered a 48 percent reduction in total funds for the agency and reduced positions from 97 in 2017-19 to 81 in 2019-21.

ODOE's Legislatively Adopted Budget:	**2019-21**
General Fund	$2,000,000
General Fund Debt Service	$4,334,048
Lottery Fund Debt Service Ltd	$3,023,365
Other Funds Non-limited	$1,040,647
Other Funds Debt Service Non-limited	$39,988,071
Other Funds Limited	$32,812,879
Federal Funds Non-limited Debt Service	$104,000
Federal Funds Limited	$2,196,096
Total All Funds Budget	$85,499,106
AUTHORIZED POSITIONS	81
AUTHORIZED FTE	79.25

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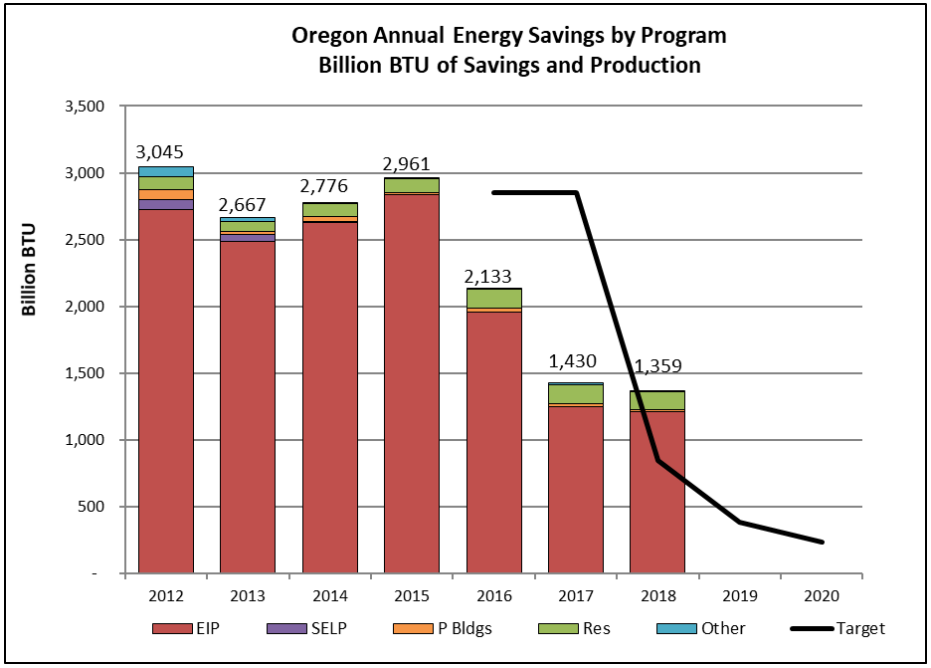
KPM #1	**ENERGY SAVINGS AND PRODUCTION - Annual energy savings and production from the agency's programs: a) Total Savings; b) Energy Incentive Program; c) Small-Scale Energy Loan Program; d) Public Buildings; and, e) Residential Programs.**	**Measure since: 1990**
Goal	Increase energy savings and production through department's energy conservation and renewable energy programs.	
Data source	Program databases	
Owner	Mary Knight, KPM Coordinator, Phone: 503-373-7562	

1. HOW WE ARE DOING

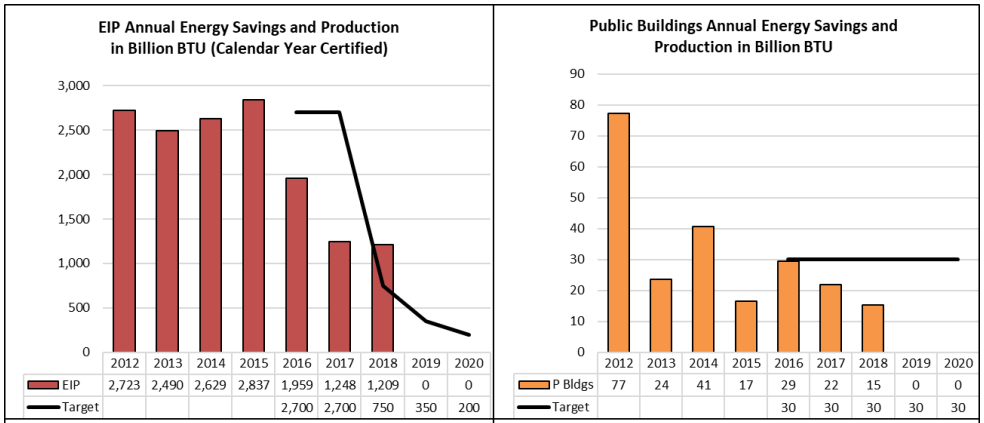
Results. For this reporting year, ODOE met the energy saving targets for the Residential Energy Tax Credit program. The agency has taken a conservative approach to energy efficiency accounting to avoid over or double counting efficiencies supported by other non-state entities. Over the years, RETC helped drive market changes in appliance efficiency. As the market more fully adopted energy efficient appliances, statute and the program were adjusted to provide support for newer and/or emerging technologies, resulting in an upswing in renewable energy projects, specifically solar photovoltaic. The department regularly updated program rules to better reflect changing market conditions and support greater energy savings. The RETC program sunset on December 31, 2017; ODOE still received some applications into 2018 for the 2017 tax year and reported the savings from those credits in this year's report. The other program targeting residential customers, the State Home Oil Weatherization Program (SHOW), transferred to the Oregon Housing & Community Services Department in 2018 and did not contribute to the energy savings for this reporting cycle.



The energy savings in public buildings target is not being met this year. Following statutory changes to exclude Oregon universities, the State Energy Efficient Design program now includes fewer participants, resulting in a reduced level of savings of 1.6 billion Btu. ODOE's Schools program continues to be active with 13.6 billion Btu energy savings reported through various measures and is a reduction from the prior year. However, reporting by the K-12 schools is often delayed, so changes in the energy savings for the prior year or two is reflected when it becomes available.

ODOE's Energy Incentives Program, which sunset in 2017, included tax credits for larger conservation and transportation projects and for "small premium projects," which were energy conservation projects under $20,000 in total costs. It also included the Biomass Producer or Collector Tax Credit Program which also sunset in 2017, so applications received in 2018 for that tax year comprise this year's energy savings. The tax credit programs operated under a cap, and participation was limited in part due to the programs ending with the 2017 tax year. Renewable Energy Development Grants are funded by tax credit auctions to provide grants for renewable energy generation that support energy savings. The Small-Scale Energy Loan Program is not currently making new loans, so no new energy savings can be reported; projects approved in previous years continue to save energy.

About the Target. In 2017, the Legislature set energy saving targets for the programs and they are displayed in the data tables within each chart.



2. FACTORS AFFECTING RESULTS

Background. ODOE's conservation, transportation, and renewable energy programs helped tribal governments, Oregon businesses and nonprofits, state and local governments, and residential consumers. Program participants include landlords and renters, farmers, and industries looking to save energy and reduce the use of fossil fuels. Among many benefits, these programs help save money and reduce CO2 emissions. Specific conservation and renewable energy programs have been designed to complement other ODOE programs and the work of external stakeholders to help Oregon meet energy load growth with conservation and efficiency; the energy savings associated with these other programs are not accounted for in this KPM. The Energy Incentives Program was capped, which limited the number of participants and number and size of eligible projects. Changes made to ODOE's Residential Energy Tax Credit program gave ODOE the ability to calibrate incentives to market conditions, and incentives were capped at 50 percent of incremental costs. ODOE worked closely with other program providers and stakeholders who also provided incentives, so some technologies could benefit from combined state and other incentives.

Now that most of ODOE's incentive programs have sunset, the agency will pursue new and innovative ways to advance Oregon's energy priorities, ensure continued growth in energy savings, and identify ways to track progress.

How We Compare. Oregon had previously prioritized meeting the state's electricity load growth with conservation and energy efficiency measures. In 2016, programs in the state reported 533,315 MWh of electric savings from programs provided by ODOE, Energy Trust of Oregon, the Northwest Energy Efficiency Alliance, and Bonneville Power Administration-served utilities. In 2017 that improved to 574,000 MWh. ODOE incentive programs, combined with other Oregon utility program incentives, have helped support the energy efficiency and renewable energy markets. ODOE continually modified programs to meet savings goals. The Northwest Power and Conservation Council's Regional Power Plan expects load growth to continue to be met with energy efficiency if programs statewide maintain their current pace. The American Council for an Energy Efficient Economy ranked Oregon fifth in 2017 and seventh in 2018 among most energy-efficient states – marking 12 consecutive years in the top 10. See www.aceee.org/state-policy/scorecard for more information.

About the Data. Energy savings is defined as the total estimated energy saved, produced, or displaced by department programs. The data is for the prior calendar year; therefore, the 2019 KPM for energy savings and production is for projects certified in calendar year 2018. The agency reports in billion Btus. Where program guidelines do not require specific, proven energy savings, data are industry-standard estimates. Large projects with performance requirements must prove energy savings estimates with metered actual energy billing and use data. A few of these projects will continue to require recertification, and the RED Grant program will continue until the fund is depleted.

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KPM # 2	CUSTOMER SERVICE: Percent of customers rating their satisfaction with the agency's customer service as "good" or "excellent": overall, timeliness, accuracy, helpfulness, expertise, availability of information.	Measured since: 1997
Goal	Provide customers with a high degree of satisfaction with ODOE conservation and renewable resource programs.	
Data source	Survey completed by the department	
Owner	Mary Knight, KPM Coordinator, Phone: 503-373-7562	

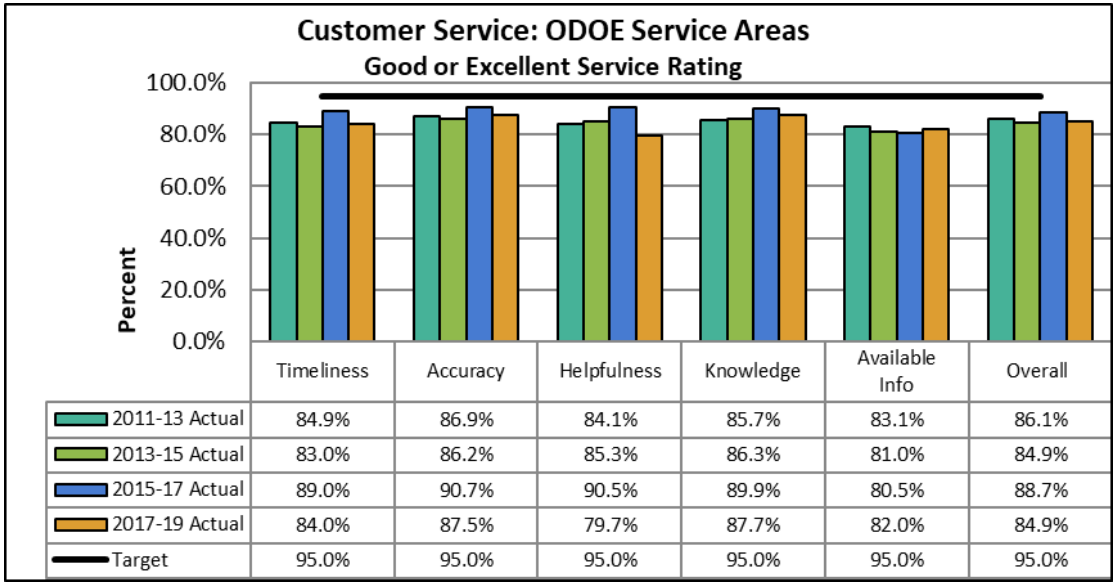
1. HOW WE ARE DOING

Results. ODOE conducted an online customer service survey in September 2019. Results represent the sum of all customer feedback, with no weighting by category. All but one category showed a decline over the last biennium; "Available Info" showed a small improvement. The average satisfaction rate for all service categories slipped almost four basis points from the last survey and is below the target goal of 95 percent.

About the Target. The target of 95 percent for all service categories was set in 2009 by the Legislature. Customer service is an integral part of ODOE's work and an essential component of meeting the agency's mission and division goals. For day-to-day operations, the agency defines "customer" broadly – from community stakeholders to industry representatives to internal team members. For the sake of this KPM, ODOE surveys external customers once a biennium using the standard customer service questions and process guidelines.

2. FACTORS AFFECTING RESULTS

Background. To improve the quality of interactions with customers, the agency regularly presents to trade and industry groups, meets with local governments, and participates in public outreach events. In January 2017, the agency launched a new, mobile-friendly website and continues to operate a blog and several social media accounts. Further, the agency continues to prioritize the importance of strong customer service from all employees, with a focus on recruiting strong candidates and improving desk manual procedures and documentation to provide more stability and awareness.



	Timeliness	Accuracy	Helpfulness	Knowledge	Available Info	Overall
2011-13 Actual	84.9%	86.9%	84.1%	85.7%	83.1%	86.1%
2013-15 Actual	83.0%	86.2%	85.3%	86.3%	81.0%	84.9%
2015-17 Actual	89.0%	90.7%	90.5%	89.9%	80.5%	88.7%
2017-19 Actual	84.0%	87.5%	79.7%	87.7%	82.0%	84.9%
Target	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%

The past biennium covered by this survey saw many changes at ODOE, particularly in Energy Development Services (incentive programs). On December 31, 2017, several incentive programs sunset, including: the Residential Energy Tax Credit program, Energy Incentives Program for conservation and transportation tax credits, and the Biomass Producer and Collector Program. In 2018, the State Home Oil Weatherization Program was moved to the Oregon Housing and Community Services Department. This left only the Small-scale Energy Loan Program, which is not currently doing any lending, and the RED Grant program. These transitions likely negatively affected customers' interactions, since application volume increased, and program staffing was dramatically reduced as program deadlines neared.

The Planning and Innovation Division showed improvements in all but one area: "Helpfulness." This group has continued to develop into a more cohesive team and was integral to development and completion of the 2018 Biennial Energy Report. This staff of energy policy leaders does outreach to the public and interfaces with various stakeholders in the energy field.

The Nuclear Safety and Emergency Preparedness Division showed a small drop but is still very close to goal. The survey response size for this group is small, which can affect the overall rating as well.

The Energy Facility Siting Division dropped in each of the six core questions. The survey was sent to the Division's general notification list, which includes nearly 1,500 people and represents a wide variety of interests. There have been several controversial projects during the last year with thousands of public comments, and the survey results could be reflective of concerns associated with those projects. ODOE may need to do more evaluation to determine if the drop is the result of those controversial projects or another issue that the division could address to increase its ratings.

How We Compare. Comparing ODOE's methodology to other non-governmental organizations reveals some differences. ODOE surveys once per biennium, whereas other entities survey customers soon after they complete projects. ODOE can learn from this methodology for the future by timing surveys to occur soon after customers interact with ODOE staff, and by analyzing data to see if there are lessons to be learned about ODOE programs and engagement strategies.

About the Data. The survey is comprised of results from individual surveys conducted in each of the department's four divisions that provide services to energy customers and stakeholders. Survey results are being carefully reviewed, and ODOE staff will follow up with respondents who indicated they would like to provide additional comments.

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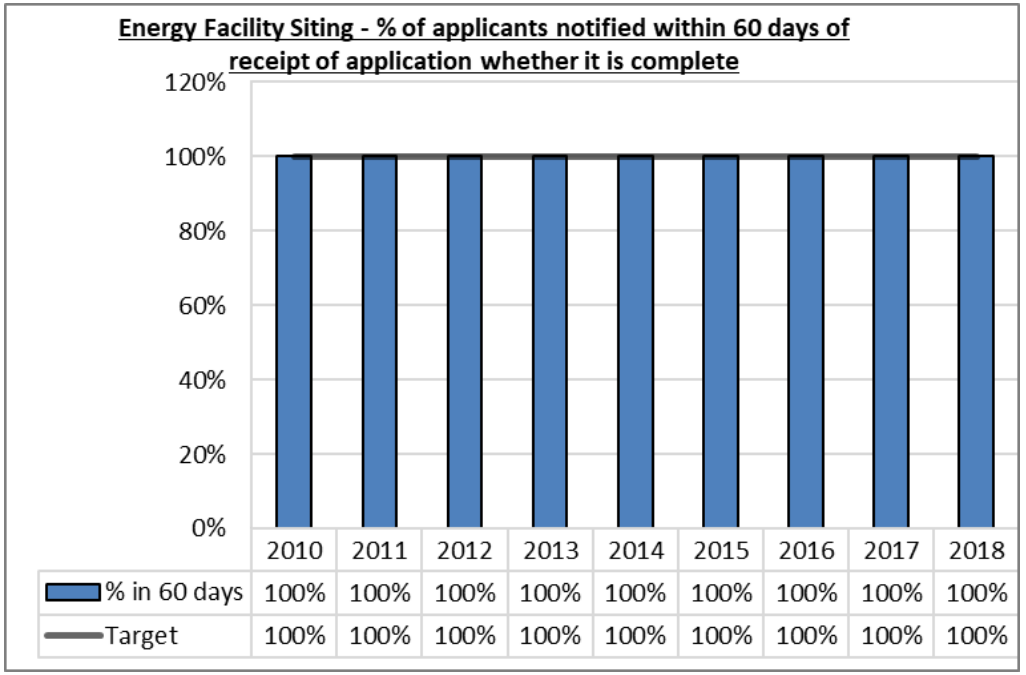
KPM #3	APPLICATION PROCESSING: Percent of applications reviewed and approved within administrative or statutory deadlines for: a) Energy Facility Siting; b) Energy Incentive Programs; and c) Residential Energy Tax Credits.	**Measure since: 2006**
Goal	Provide timely processing of site certificates and tax credits.	
Data source	Energy Facility Siting, Energy Incentive Tax Credits and Residential Energy Tax Credit databases	
Owner	Mary Knight, KPM Coordinator, Phone: 503-373-7562	

1. HOW WE ARE DOING

Results. The Energy Facility Siting division met this target. The target was not met in the Energy Development Services division. For the Energy Incentive Program, the agency saw improvement in 2018 results for EIP but a decline in RETC primarily due to staffing issues related to the sunset of the program. Percentage of applications processed within 60 days decreased for the RETC program.

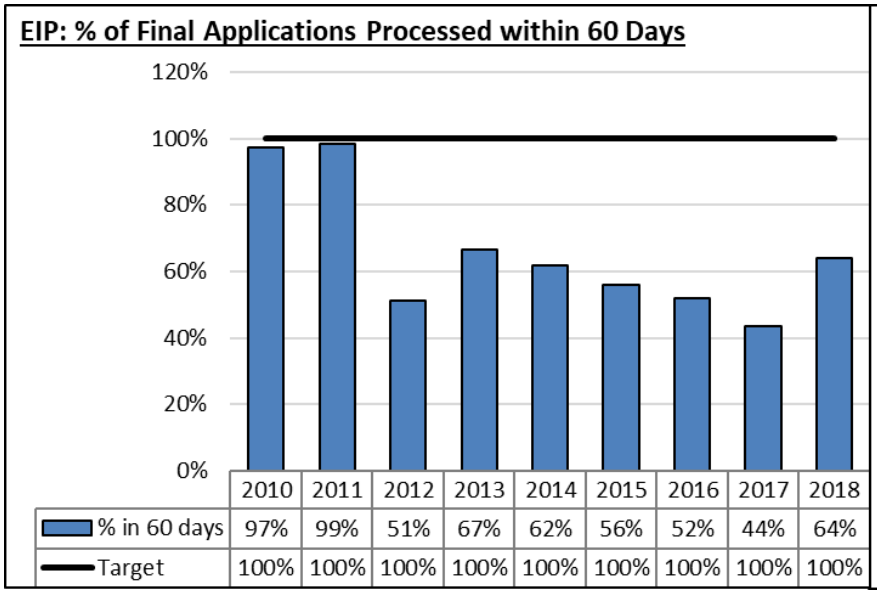


About the Target. Part of the agency's commitment to stakeholders is providing reliable resources and services. To measure this, ODOE monitors application processing timeliness for Energy Facility Siting and Energy Incentive Programs to identify delays and make improvements to turnaround times. This measure contains three parts:
a) Energy Facility Siting: percent of new energy facility applicants notified by ODOE within 60 days of application receipt on whether application is complete.
b) EIP: Percent of final applications processed within 60 days of receipt of a complete final application.
c) RETC: Percent of applications approved or denied within 60 days of receipt of a complete application for a final certificate.

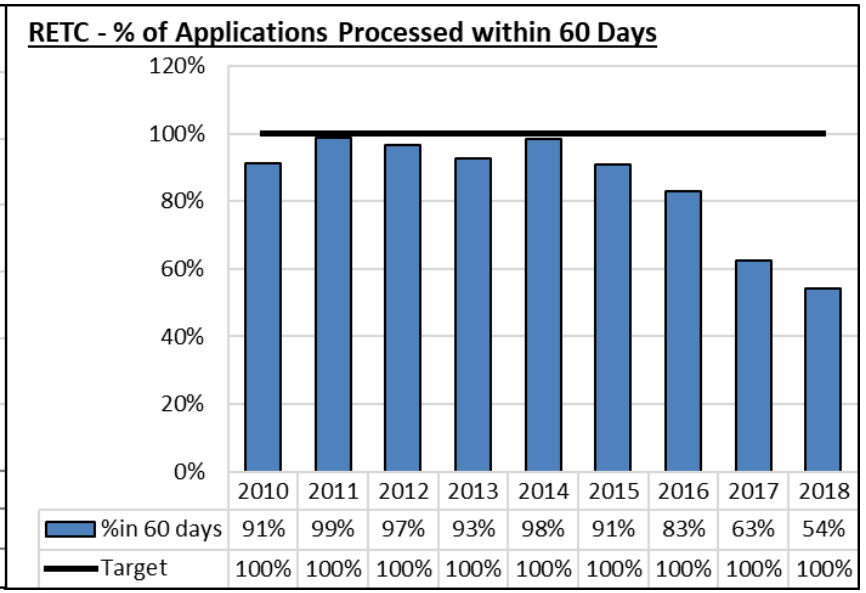
2. FACTORS AFFECTING RESULTS

Background. The incentive programs sunset with the 2017 tax year. Increased requests for information, development of performance agreements, and decreased staffing levels affected processing times. The RETC applications experienced a drop in this metric. Staffing was

an issue as people sought other employment as the program sunset approached, and the agency was required to bring in temporary help for processing applications. EIP showed an improvement in processing time over last year but still far short of the goal. The improvement may be due to a significant drop off in volume, even though staffing was still an issue.



	2010	2011	2012	2013	2014	2015	2016	2017	2018
% in 60 days	97%	99%	51%	67%	62%	56%	52%	44%	64%
Target	100%	100%	100%	100%	100%	100%	100%	100%	100%



	2010	2011	2012	2013	2014	2015	2016	2017	2018
%in 60 days	91%	99%	97%	93%	98%	91%	83%	63%	54%
Target	100%	100%	100%	100%	100%	100%	100%	100%	100%

About the Data. The reporting cycle for this measure is by calendar year. The data for the Energy Facility Siting measures represents actual processing time data for all applications received during the reporting period. The EIP and RETC measures are likewise based on actual data. ODOE enters the date the application is received, and date approved for all tax credit applications in its databases and pulls reports that compare actual processing timeframes to targets. The current tracking system does not take into consideration the length of time that an EIP application may be on hold due to being incomplete.

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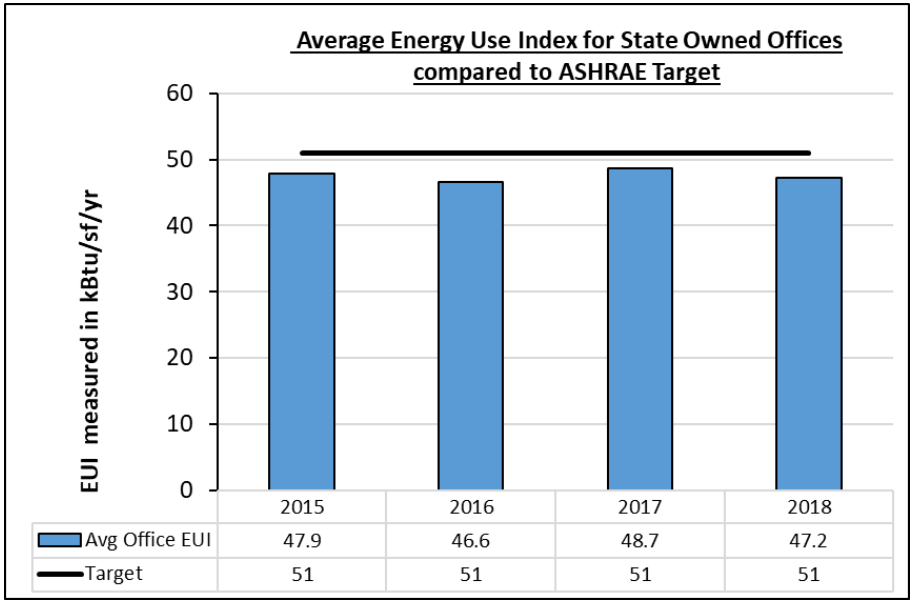
KPM # 4	**ENERGY USE BY STATE BUILDINGS: Electrical and fossil fuel energy use in state-owned buildings by use, type and building area.**	**Measure since: 2015**
Goal	Establish a robust data set of building level energy use for state-owned buildings more than 5,000 square feet to facilitate energy reduction.	
Data source	Agencies reporting	
Owner	Mary Knight, KPM Coordinator, Phone: 503-373-7562	

1. HOW WE ARE DOING

Results. ODOE helped state agencies keep their office energy use below average, meeting this target for the reporting year. To make informed energy efficiency investment decisions, state agencies need data about energy use in their buildings. ODOE developed a comprehensive dataset for baseline energy use in state-owned facilities with the goal of improving data quality and reliability over time. In 2015, 20 state agencies reported building or meter level energy use into the ENERGY STAR® Portfolio Manager platform, establishing facility baseline energy use. Energy use in 2018 was compared against the baseline, and ODOE provided each agency with a report card identifying buildings exceeding building type specific target energy use index (EUI). With this information, agencies can prioritize facilities for energy use reduction, as resources allow.

About the Target. Because the target is a metric of energy use, an EUI below the identified target is the goal – lower EUI means less energy use. ODOE established a target for office buildings, shown in the chart, based on the American Society of Heating, Refrigerating, and Air-conditioning Engineers (ASHRAE) Standard 100 high-performance EUI. The target EUIs for each building type are based on ASHRAE Standard 100-2018 targets for climate zones 4C (Western Oregon) and 5B (Eastern Oregon). EUI is a common industry metric for evaluating building energy use and is calculated by determining kBtu/square foot/year. EUI targets enable agencies to compare energy used by an individual building to similar type buildings in the state or region. These macro level indicators support agencies in identifying which buildings need to be evaluated to determine if the higher level of energy use is warranted by a building's characteristics and use profile or if a comprehensive



energy audit should be considered. ODOE delivers technical assistance, if requested, to help agencies identify solutions to lower energy use over time and reach target EUI levels. Each agency determines the energy efficiency methods to pursue. ODOE supports agency decision-making by providing reliable building energy use information and energy efficiency consultation.

ORS 276.915 requires state agencies to track annual energy use at the agency level. Agencies report more detailed facility-level data to identify additional opportunities for energy savings. Beginning in 2015, participating agencies have entered annual energy use for state-owned buildings that are more than 5,000 square feet into the EPA ENERGY STAR® Portfolio Manager platform. For 2018, agencies reported a total of 1,467,680 million Btu, representing a total 17,622,771 square feet.

Oregon's agency reporting portfolio grew from 232 buildings in 2017 to 312 in 2018, a year over year increase of 34 percent. Not all building types in agency portfolios have established high-performance target EUIs. A total of 312 buildings/campuses report energy use. Forty-four percent of those buildings do not have established targets. ODOE works with each agency to determine appropriate performance targets for buildings without established targets. State-owned buildings without an EUI target make up 50 percent of the total square footage and use 68 percent of the total energy. Of the state-owned facilities with target EUIs, offices represent 58 percent of that total energy use. Other-services buildings comprise eight percent and laboratories make up nine percent of that total energy use. Libraries, distribution centers, repair shops, senior care facilities, and hospitals combine to represent the remaining 26 percent of the energy use in buildings with target EUIs. For all state buildings, 43 percent are at or below established high-performance targets and 57 percent are over target EUIs.

2. FACTORS AFFECTING RESULTS

Background. Not all state-owned buildings have building-level utility meters. Some facilities share a meter between two or more buildings, as in a campus or complex. Those situations complicate the ability to track energy use at the building level. In such situations, utility use needs to be pro-rated by building square footage and may not give an accurate picture of building performance. Additionally, utility data is manually reported by agencies, which increases the need for data verification. Although some agencies have facility level personnel with energy management skills, many agencies assign the reporting duties as an add-on to clerical duties. ODOE works with all agencies to review data and maintain integrity.

Regarding energy consumption and performance, there are many factors that can impact EUI results. Energy efficiency projects and conservation measures can improve energy performance. Facility characteristics such as occupancy, operating hours, functions, and equipment affect energy use. Other external factors, such as weather, also affect energy use. ODOE provides technical assistance, when requested, to help agencies better understand the factors that have the most significant effect on a facility's energy consumption.

ODOE provides progress reports to agencies with information about how each of its facilities compares to similar type buildings. Agencies with buildings exceeding their targets may investigate further to determine if the higher energy use is justified. For those buildings where a

satisfactory explanation is not found, ODOE supports the agency, if requested, to identify opportunities for energy reduction, such as continuous commissioning in which building managers routinely track building equipment operating conditions, setpoints, and energy use to maintain peak performance. ODOE provides expert technical assistance to help agencies identify valuable energy improvements. Governor Brown's Executive Order 17-20 adds guidance for energy efficiency in existing state buildings. The EO directs ODOE and DAS to work with agencies to identify retrofits to buildings where energy use does not meet energy use targets. By benchmarking against a standard, agencies can focus on buildings where the most savings are achievable.

How We Compare. Other states in the region require state-owned facilities to report building energy use into EPA ENERGY STAR® Portfolio Manager. Minimum square footage that triggers reporting varies between states, as do disclosure requirements.

California Executive Order (EO) B-18-12 mandates that state energy and water use be benchmarked and reported as of 2013. The goal is to reduce energy use by 20 percent by 2018. Thirty-five departments report under EO B-18-12. Washington, through EO 12-06, has required state agencies, colleges, and universities to track and report energy use in buildings over 10,000 square feet since 2012. Energy use is reported using EPA ENERGY STAR® Portfolio Manager. The Department of Enterprise Services posts the energy use for public viewing. In April 2014, the governor of Montana directed state agencies to begin monitoring energy use in state buildings and to begin publicly disclosing the energy numbers online. The listings will eventually encompass state buildings and facilities of 5,000 square-feet or larger. Idaho does not have benchmarking requirements for state buildings.

About the Data. In January 2015, state agencies began reporting energy use at the building level into EPA ENERGY STAR® Portfolio Manager. Prior to that, agencies reported aggregated annual agency energy use into an ODOE database. As agencies become more familiar with reporting energy use data into the database, they are refining their data input and building category designations. By tracking annual energy use, agencies see how their buildings are performing over time and can make informed decisions to determine if operational adjustments or capital investments are needed.

Building performance is typically measured in EUI, in units of kBtu/square foot/year. Electrical and fossil fuel annual energy use data is converted into common units (British thermal units or Btu) and combined with building square footage to calculate EUI. The ASHRAE target is a EUI value that represents high performance by building type.

KPM #5a-b	GREENHOUSE GAS CONTENT OF OREGON'S ELECTRICITY AND STATIONARY FUEL: Greenhouse gas emissions per unit of: a) electricity used in Oregon and b) electricity generated in Oregon.	Measure since: 2015
Goal	Assist in meeting Oregon's greenhouse gas emission reduction goals in the state's electricity sector.	
Data source	Retail electricity sales from the investor owned utilities, sales to BPA customers, and the Northwest Power Pool unspecified market purchases mix from Washington State University	
Owner	Mary Knight, KPM Coordinator, Phone: 503-373-7562	

1. HOW WE ARE DOING

Results. Overall, the carbon intensity of Oregon's electricity *consumption* has decreased from 0.484 metric tons CO_2/MWh in 2005 to 0.335 metric tons/MWh in 2017 but remains higher than the 2035 interim target. The carbon intensity of Oregon's consumption is likely to continue to improve as utilities work toward phasing out imports of electricity generated by coal-fired power plants from Oregon utility rates by 2035, and as they work toward meeting the 50 percent RPS targets for 2040. Utilities in Oregon are currently meeting the annual RPS targets and are on track to meet the 2025 RPS targets.

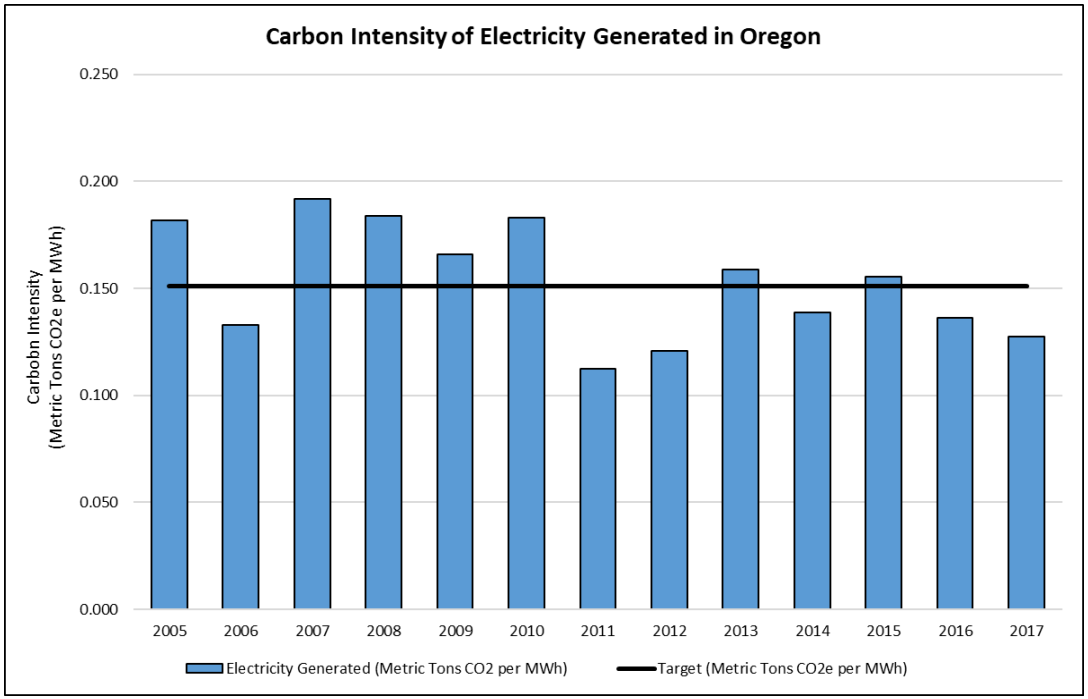
The carbon intensity of Oregon's electricity *generation* has decreased from 0.182 metric tons/MWh in 2005 to 0.127 metric tons CO_2/MWh in 2017 and has been lower than the 2035 interim target for five of the past seven years. This is because of the Oregon's significant in-state hydropower, wind, and other low and zero-carbon resources. The carbon intensity of in-state generation is likely to continue to improve as the state's sole coal-fired power plant is phased out by the end of 2020. Despite the overall downward trends in the carbon intensity of Oregon's electricity generation and its electricity consumption, significant year-to-year variations in these values occur and are mainly driven by fluctuating water resources available for hydropower generation due to natural variation in annual precipitation.

Thanks to highly effective energy efficiency programs, Oregon's total electricity consumption has grown by only about two percent over the last decade despite population growth of about 10 percent. In its Seventh Power Plan, adopted in February 2016, the Northwest Power and Conservation Council forecasted that energy efficiency will meet all the region's future load growth over the next 20 years. While new generation may be needed in some individual utility service districts, the Power Council found that energy efficiency is the most cost-effective resource option for the region.

About the Targets. While a state and sector-specific target for the carbon intensity of electricity has not been formally set, ODOE has derived an interim target for the purposes of this report from the greenhouse gas reduction goals in ORS 468A.205, the Oregon Global Warming Commission's Interim 2035 GHG reduction goal, and utility projections for future electricity loads. This target represents the carbon intensity that Oregon's electricity resource mix would need to reach in 2035 for the sector to achieve its proportional share of the

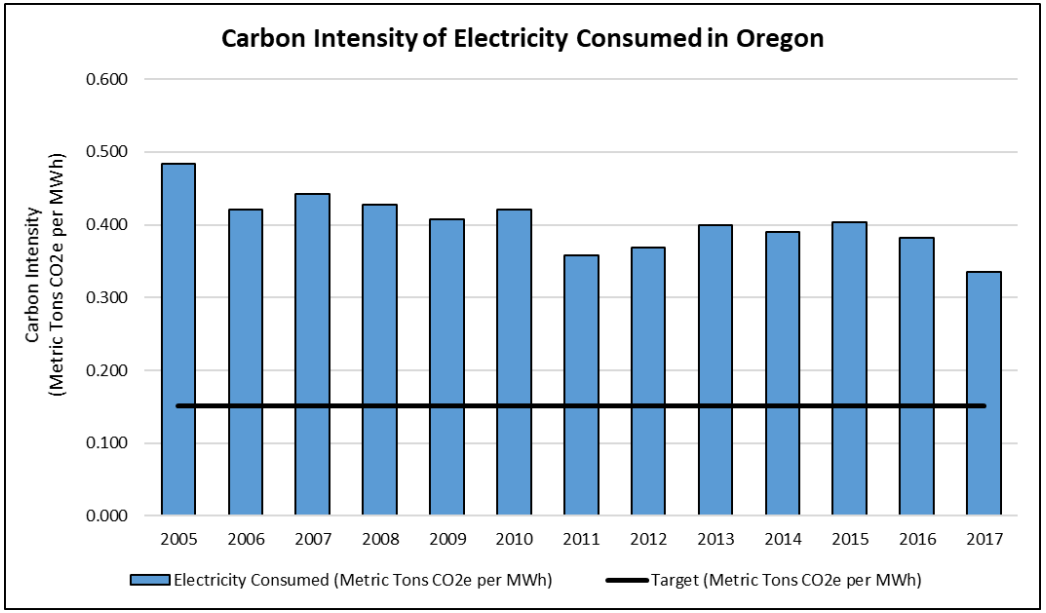
state's overall emissions reduction goal. Depending on the reductions that can be achieved in other sectors, the electricity sector may need to achieve more or less than this target to meet the state's overall goals in the future.

In 2015, the Oregon Global Warming Commission developed an interim greenhouse gas reduction goal for 2035, which is interpolated between the goals for 2020 and 2050 set in ORS 468A.205. Meeting this goal would require a 42.5 percent decrease in total greenhouse gas emissions from 1990 levels. If the electricity sector achieved an equivalent reduction from 1990 levels, emissions in 2035 would be 9.5 million metric tons CO_2. Dividing this by the utility forecast of 2035 load yields an interim carbon intensity target of 0.151 tons of CO2/MWh. The electricity sector includes all in-state and out-of-state generation that serves Oregon's total annual electricity load. This includes electricity provided by investor-owned utilities, consumer-owned utilities, electricity service suppliers, and Independent Power Producers. In 2016, this sector accounted for approximately 26 percent of all greenhouse gas emissions in Oregon.



Carbon dioxide emissions (carbon emissions) released from the combustion of fossil fuels to generate electricity make up the vast majority of greenhouse gas emissions from the electricity sector. Carbon emissions in the electricity sector can primarily be reduced in two ways: 1) implementing energy efficiency and conservation measures to reduce the amount of electricity required to be generated, and 2) replacing electric generating resources that have carbon emissions with resources that have lower or zero-carbon emissions. Energy efficiency and conservation help to reduce the magnitude of carbon emissions by reducing the total amount of electricity generated, but do not reduce the carbon intensity (emissions per unit of energy) of the electricity resource mix. Replacing generating resources that emit carbon with resources that emit lower or zero-carbon help to reduce both the magnitude of carbon emissions and the carbon intensity of the electricity resource mix. Both approaches are used in Oregon to reduce greenhouse gas emissions and achieve other energy and environmental benefits in the electricity sector.

The carbon intensity of the electricity resource mix is expressed as metric tons of carbon dioxide per Megawatt Hour (MWh)[1]. Oregon has two different electricity resource mixes, the resource mix of the electricity it generates within the state and the resource mix of the electricity it consumes (a combination of electricity generated both in-state and out-of-state). The two mixes are different because Oregon neither consumes all the electricity it generates, nor generates all the electricity it consumes. This is because competitive energy markets encourage Oregon to both import and export electricity across its borders. While a significant portion of the electricity consumed in Oregon is generated by Oregon's vast amount of zero-carbon hydropower resources, a significant portion of the electricity consumed in Oregon is also generated by out-of-state fossil-fuel resources. Oregon's consumption of out-of-state fossil fuel resources is one factor that leads to the carbon intensity of the electricity consumed in Oregon to be higher than the carbon intensity of the electricity generated in Oregon (other factors are discussed on the next page).



2. FACTORS AFFECTING RESULTS

Background. A major driver helping to further reduce the carbon intensity of electricity consumed in Oregon is the 2016 state law that requires utilities to eliminate imports of electricity generated by coal-fired power plants from Oregon utility rates by 2035 (SB 1547). Another factor reducing the carbon intensity of both the electricity consumed and generated in Oregon is the state Renewable Portfolio Standard (RPS), which sets renewable energy requirements for the state's utilities. The Oregon RPS requires large utilities to have 50 percent of their electricity sales come from qualifying renewable energy sources by 2040; smaller utilities have lesser requirements. In addition, the Federal Public Utility Regulatory Policies Act (PURPA), which requires utilities to purchase the power offered to them from independent (non-utility) renewable generators with capacities of 80 MW or less, has led to increased renewable and carbon-free electricity. Green power and other voluntary programs increase the mix of renewable resources used to meet Oregon's electric load. In effect, these laws, policies, and programs help lower the carbon emissions of the average megawatt hour generated and consumed. ODOE supports this work

[1] The data used in this report reflect only carbon dioxide emissions and do not include emissions of other greenhouse gases at this time.

by providing technical assistance for renewable energy projects, certifying eligible resources for the RPS, reporting the electricity resource mix annually, and participating in statewide energy policy development work.

The carbon intensity of electricity *generated in the state* is much lower than the carbon intensity of electricity *consumed in the state* because hydropower and other low and zero-carbon resources comprise a substantially larger percentage of the resource mix of the electricity generated in Oregon relative to the resource mix of the electricity consumed in Oregon – and because Oregon has only one coal-fired power plant, located in Boardman. This sole coal plant is scheduled to cease operations and be retired at the end of 2020. Additional in-state generation comes from natural gas-fired power plants, which have about half the carbon intensity of coal-fired generation. Additionally, new fossil fuel-fired power plants sited in Oregon with the capacity to generate 25 megawatts or more are required to meet the Oregon Energy Facility Siting Council's carbon dioxide standard. This regulation encourages large in-state fossil-fueled generating resources of this size to be the most efficient and least carbon intensive as possible by requiring developers to procure greenhouse gas offsets (typically in the form of a monetary payment to The Climate Trust) for any carbon emissions above the EFSC standard.

Oregon's total forecasted electricity load used to generate the interim 2035 target depends on: Oregon's population growth; the growth of industry in Oregon; the growth of electric vehicles and other electrically powered devices and machines in Oregon; and the effectiveness of energy efficiency and conservation programs implemented by utilities, the Bonneville Power Administration, the Oregon Department of Energy, the Energy Trust of Oregon, and others. In addition, climate change could result in increased summer load for air conditioning and irrigation needs for agriculture, while at the same time resulting in decreased snowpack and shifting periods of runoff. If this were to occur, the ability of Oregon's zero-carbon hydropower resources to continue to supply the same, large portion of the state's annual electricity loads (especially in summer months) could be negatively affected.

Over the next decade, research and policy development will be needed to enable the electricity system to safely and reliably incorporate increasing levels of renewable generating resources in a cost-effective manner. This could include creative and collaborative efforts on: carbon pricing, power asset depreciation, participating in regional energy and transmission markets, energy storage, demand response, customer incentives and financing for distributed resources such as solar and storage, emerging renewable resources (e.g., offshore wind, marine energy, and geothermal energy), and electricity system resiliency. Participation in a regional energy and transmission market would reduce transmission rates, thereby reducing the costs to transfer electricity across vast distances, which could enhance the ability of Oregon and the western region to better leverage the best-performing and diverse set of low and zero-carbon generation resources geographically scattered across the west. The topic of regionalization is being discussed robustly in 2019, and the state should continue to engage in discussions around this issue with the California Independent System Operator (CAISO) and other western states.

Continuation and enhancement of energy efficiency and conservation programs will be needed to achieve the Northwest Power and Conservation Council's projection that energy efficiency can meet the region's future load growth over the next 20 years. In addition, efforts

are needed to meet the Council's projection that demand response (including storage) can help offset the need for new fossil-fueled power plants to meet peak loads.

How We Compare. Due to the Federal Columbia River Power System and other private and publicly owned hydropower facilities in Oregon, Oregon generally has an electricity resource mix with a lower carbon intensity than states in other regions. The carbon intensity of the state of Washington's electricity sector, however, benefits from an even higher percentage of zero-carbon hydropower than Oregon. For example, in 2016, 48.9 percent of Oregon's electricity consumption was generated from zero-carbon resources. In that same year, 73.9 percent of Washington's electricity consumption was generated from zero-carbon resources.

Washington state also passed SB 5116 in 2019, which established new goals for reducing carbon emissions in their electricity sector. The bill requires utilities to remove coal from the electricity resource mix consumed in Washington by 2025 and requires 100 percent of electricity consumed in Washington to be carbon neutral by 2030.

About the Data. The department utilized information from the Oregon Global Warming Commission's 2015 legislative report, data from the US Department of Energy's Energy Information Administration (EIA), and utility load projections to derive the 2035 interim target. The Department utilized the Oregon Electricity Resource Mix to determine the carbon intensity of electricity that is consumed in Oregon. The Electricity Resource Mix is developed based on generation, fuel mix, and CO_2 emissions data submitted by utilities and this has yet to be compiled for 2018 or 2019. The Department used EIA data to determine the carbon intensity of electricity generated in Oregon. Because EIA publishes annual data for the total MWh of electricity generated in each state and the carbon dioxide emissions associated with each states' generation in December of the following year, the carbon intensity data of electricity generated in Oregon for 2018 and 2019 is not yet available. The chart above depicting carbon intensity of electricity generated in Oregon uses data through 2017, which is the most current available data set.

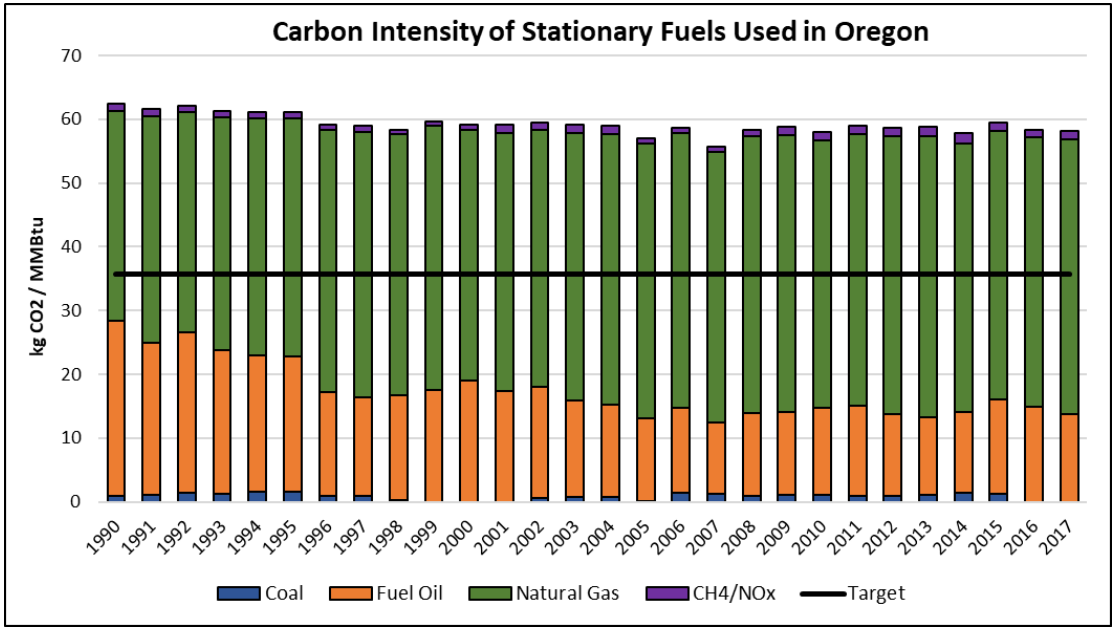
This 2019 KPM report includes the carbon intensity values for electricity consumed and generated in Oregon across years 2005 through 2017. This report also corrects the 2015 carbon intensity value for electricity generated in Oregon that was previously reported in short tons rather than metric tons.

Information about Oregon's Electricity Resource Mix can be found here: https://www.oregon.gov/energy/energy-oregon/Pages/Electricity-Mix-in-Oregon.aspx. Information about Washington's Electricity Resource Mix can be found here: https://www.commerce.wa.gov/growing-the-economy/energy/fuel-mix-disclosure/.

KPM #5c-d	GREENHOUSE GAS CONTENT OF OREGON'S ELECTRICITY AND STATIONARY FUEL: Greenhouse gas emissions per unit of: c) the mix of other stationary fuels used in Oregon and d) the mix of other stationary fuels produced in Oregon.	Measure since: 2015
Goal	Assist in meeting Oregon's greenhouse gas emission reduction goals in the state's stationary fuels sector.	
Data source	Oregon Department of Environmental Quality Greenhouse Gas Reporting Program statistics, the 2015 Oregon Global Warming Commission Report to the Legislature, U.S. Energy Information Administration data, and internal ODOE reports addressing energy mix and conservation efforts.	
Owner	Mary Knight, KPM Coordinator, Phone: 503-373-7562	

1. HOW WE ARE DOING

Results. The stationary fuels sector includes all fuels used in Oregon other than fuel used for electricity generation and transportation. This includes fuel used for residential and commercial buildings and fuel used for manufacturing. Stationary fuel use typically includes heating of spaces and liquids, cooking, and industrial process heat. In 2017, this sector accounted for approximately 25.5 percent of all GHG emissions in Oregon.[2] From 1990 to 2017, the carbon intensity of stationary fuel used in Oregon declined slightly but is well above the interim target for 2035. Most of the reduction came from a shift from petroleum to natural gas in the industrial sector which resulted in less greenhouse gases (GHG) emitted per British thermal unit (Btu) due to natural gas' lower carbon density. When coupled with energy efficiency measures, the result is a slight decrease in total emissions from industrial fuel use. This was partly offset by a slight increase in emissions for the residential and commercial sectors, driven primarily by population and economic growth.



[2] EIA, 2019. Energy-Related Carbon Dioxide Emissions by State, 2005-2016. Retrieved from: https://www.eia.gov/environment/emissions/state/analysis/

Looking to the future, the U.S. Department of Energy's Energy Information Administration[3] forecasts energy usage out to the year 2050 at the national scale which indicates 0.2 percent increase per year in energy consumption for stationary fuels, mostly for electricity, which is covered in a separate KPM. EIA predicts that consumption of natural gas in the residential sector will fall by 0.3 percent per year. Much of the increased energy use is expected to be met with renewable energy sources, which will slightly reduce the carbon intensity of the fuel mix. EIA predicts that total CO_2 emissions are expected to decline by an average of 0.2 percent per year in the residential sector, increase by 0.3 percent per year in the commercial sector, and increase by 0.5 percent per year in the industrial sector.

About the Target. Emissions from stationary fuel use can be reduced in two ways: implementing energy efficiency and conservation measures to reduce the amount of fuel used and shifting to lower carbon renewable fuels to reduce the carbon intensity (carbon emissions per unit of fuel) of the stationary fuel mix. Currently, energy efficiency and conservation are the primary tools used to reduce fuel consumption and related emissions in this sector. This includes ODOE's statewide technical assistance programs for building and industrial energy efficiency, utility energy efficiency programs, building energy codes, and industrial combined heat and power initiatives.

The GHG intensity of the stationary fuel mix is expressed as kilograms of carbon dioxide equivalent (CO_2e) per Btu.[4] To reduce the GHG intensity of the fuel mix, ODOE and others implement a variety of technical assistance programs to increase the mix of low- and no-carbon renewable fuels such as biomass, solar thermal energy, and renewable natural gas.

GHG emissions from the production, transport, and storage of stationary fuels in Oregon primarily come from methane leaks associated with natural gas production. Oregon is a relatively small producer of natural gas, totaling about 659 million cubic feet in 2017 from the Mist natural gas field in northwestern Oregon.[5] Industry and alternative fuels companies are developing programs to help reduce methane releases from oil and gas production and distribution. The U.S. Environmental Protection Agency has released a proposed rule change that would exclude natural gas transmission and storage systems from methane emissions limitations.[6] Oregon does not currently mine coal or refine petroleum.

While a sector-specific target has not been formally set for stationary fuels, ODOE has derived an interim target for purposes of this report from the GHG reduction goals in ORS 468A.205 and the stationary fuel use forecast developed by the U.S. Department of Energy's EIA. This

[3] Annual Energy Outlook 2019 with Projections to 2050. Retrieved from https://www.eia.gov/outlooks/aeo/

[4] Carbon dioxide equivalent is a measure of all greenhouse gas emissions adjusted to the equivalent amount of carbon dioxide based on the global warming potential of each greenhouse gas.

[5] Oregon Department of Geology, Minerals Industries, 2019. Oil & Gas Permits and Production Information. Retrieved from: https://www.oregongeology.org/mlrr/oilgas-report.htm.

[6] EPA Proposes Policy Amendments to the 2012 and 2016 New Source Performance Standards for the Oil and Natural Gas Industry. Retrieved from: https://www.epa.gov/sites/production/files/2019-08/documents/fact_sheet._proposed_amendments_to_nsps_for_oil_and_natural_gas_industry.8.28.19.pdf

target represents the carbon intensity that Oregon's fuel mix would need to reach in 2035 for the sector to achieve its proportional share of the state's overall emissions reduction goal. Depending on the reductions that can be achieved in other sectors, the stationary fuel sector may need to achieve more or less than this target to meet the state's overall goals in the future.

In 2015, the Oregon Global Warming Comission developed an interim greenhouse gas reduction goal for 2035, which is interpolated between the goals for 2020 and 2050 set in ORS 468A.205. Meeting this goal would require a 42.5 percent decrease in total greenhouse gas emissions from 1990 levels. If the stationary fuel sector achieved an equivalent reduction from 1990 levels, emissions in 2035 would be 5.3 million metric tons CO_2e. Dividing this by the EIA forecast of stationary fuel use in 2035 yields an interim target of 35.68 kilograms/MMBtu. This target could change if forecast fuel use changes due to fuel prices, energy efficiency measures, changes in technology and other factors. Again, there is no requirement for the stationary fuel sector to meet this target, and technological barriers may limit the stationary fuel sector's ability to achieve this level of carbon intensity. Nevertheless, the interim target provides a point of reference for comparison to the trend in carbon intensity from this sector.

2. FACTORS AFFECTING RESULTS

Background. Stationary fuel use over time is largely driven by population growth, the economy, technology, and climate change policy. As an example, the recent increase in residential and commercial greenhouse gas emissions from fuel use is being driven by Oregon's population growth of a little more than 1.3 percent a year (faster than most other states).[7] Yearly fluctuations in weather, introduction or commercialization of technology, new policy, and energy prices will all impact the type of fuel and use patterns for stationary energy. There is the possibility that the sunset of Oregon's energy incentive programs will affect long term investments in energy efficiency and in low carbon stationary fuels development. EIA long-term modeling indicates that residential GHG emissions from fuel use will decline at a rate of about 0.2 percent per year primarily due to improvements in building and appliance energy efficiency, while the commercial and industrial sector GHG emissions from fuel use will increase because of increased economic growth, low fossil fuel prices, and increased manufacturing.

Significantly reducing the carbon intensity of stationary fuel used in Oregon would require a shift from fossil fuels to low- or no-carbon renewable fuels (e.g., renewable natural gas, renewable hydrogen, and biomass). New policies may be needed to support such a shift, including policies to support the production and distribution of renewable fuels, along with policies to enable and encourage use of renewable fuels.

Policies to move toward zero net energy buildings could significantly reduce stationary fuel emissions in the residential and commercial sectors. Industrial energy efficiency measures and highly efficient on-site combined heat and power systems using renewable fuel can also

[7] World Population Review. Retrieved from http://worldpopulationreview.com/states/oregon-population/

reduce emissions from this sector. In 2017 the Governor of Oregon signed executive order 17-20.[8] The EO requires Oregon to develop a timeline to achieve net zero energy ready buildings across the state. Furthermore, it directs improvements to the state energy building code for energy efficiency, electric vehicle readiness, and solar installation readiness. EO 17-20 also includes a focus on retrofitting older, less-efficient buildings, and demonstrating energy efficiency leadership in state-owned and state-leased buildings.

Renewable Natural Gas is a lower carbon alternative to fossil-based natural gas. RNG is derived from the anaerobic digestion of waste that can occur in wastewater treatment plants, dairy digesters, and landfills. RNG can also be produced via the thermal gasification process of cellulosic material. In July 2017 the Oregon Legislature passed SB 334, which required ODOE to conduct a renewable natural gas resource inventory and to report the preliminary findings to the relevant legislative group by mid-September 2018. This inventory provides an overview of current and potential RNG resources across the state and supports the continued development of this less carbon-intense resource. RNG resources have carbon intensities that are significantly lower than fossil-based natural gas, and in some instances have negative carbon intensities (not only reduces emissions but also utilizes waste streams that would otherwise have emitted GHGs).

Research is needed to better understand the net GHG emissions from the growth and use of biomass as a stationary fuel. Production of biomass as a fuel source initially results in a decline in atmospheric carbon as plants take up and sequester CO_2 during the growth phase. This sequestered CO_2 is released when the biomass is combusted. The net emissions can also be affected by changes in land use and a variety of other factors. Steady increases in measured atmospheric carbon may indicate that plant uptake of carbon from the atmosphere is not keeping up with anthropogenic driven rates of atmospheric carbon emissions.

How We Compare. Oregon's GHG emissions from stationary fuels were slightly lower than Washington and California, and significantly lower than many eastern and mid-western states. This is due to differences in the level of fuel use, the mix of fuels, climate, and types of industry. Stationary fuel use in Oregon is a lower percentage of total in-state GHG emissions than in each of our neighboring states.[9]

About the Data. Formal tracking of the GHG emissions from stationary energy use is based on the data provided by the Oregon Department of Environmental Quality Greenhouse Gas Reporting Program and the U.S. Energy Information Administration. For stationary fuel use, the report uses a combination of reported emissions from parts of the industrial sector and fuel suppliers (fossil fuels, but not biomass) as well as modeling of emissions from residential / commercial buildings and small manufacturing. The data include GHGs directly emitted in Oregon and do not account for the out-of-state emissions of stationary fuels used in the production, transport, and disposal of goods consumed by Oregonians. The data in this report will be updated in September 2020 when new estimates are released.

[8] Oregon 2017. Executive Order 17-20. Retrieved from: https://www.oregon.gov/gov/Documents/executive_orders/eo_17-20.pdf
[9] EIA 2019. Energy Related Carbon Dioxide Emissions by State, 2015-2016. Retrieved from: https://www.eia.gov/environment/emissions/state/analysis/

The EIA fuel consumption forecast used to calculate the interim target for Oregon may under or overestimate Oregon's fuel consumption due to the use of national scale energy-use growth data.

ODOE is not able to report on KPM 5d) "the mix of other stationary fuels produced in Oregon" because Oregon does not mine or refine coal or petroleum, and the Mist natural gas field is primarily used as a natural gas storage facility rather than a natural gas producer and there is no verifiable data currently available to estimate methane leaks from natural gas production in Oregon. Additionally, accurate tracking of GHG emissions from wood used for residential heat is problematic at this time due to a lack of state-level data. The amount of renewable natural gas and other biomass-derived stationary energy use is also not uniformly tracked at the state-level.

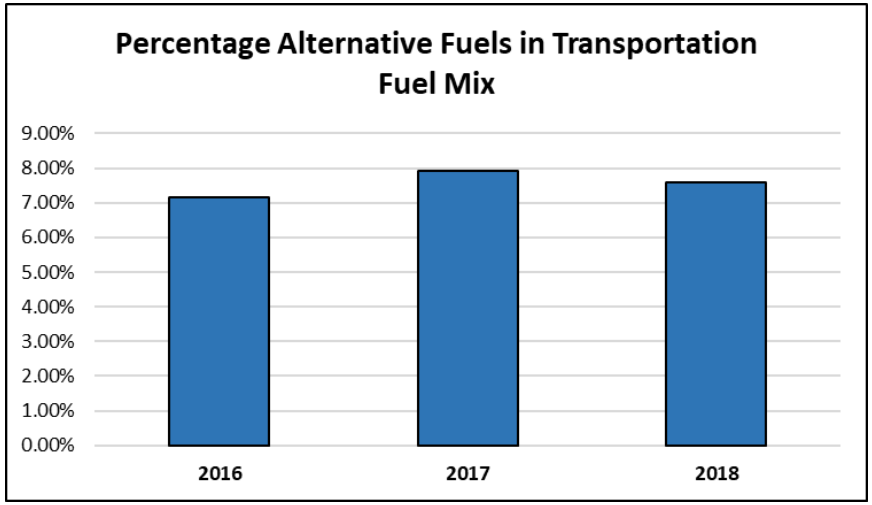
Oregon Department of Energy	**2019 KEY MEASURE ANALYSIS**
Mission: Leading Oregon to a safe, clean, and sustainable energy future.	

KPM #6	**Transportation Fuels Used in Oregon – Percentage of petroleum vs non-petroleum fuels used for transportation in Oregon: a) On Road Percentage Non-petroleum b) Non-Road Percentage Non-Petroleum** **Measure progress in diversifying the transportation fuel mix.**	**Measure since: 2017**
Goal	Diversify fuel used in Oregon in the transportation sector to include alternative and renewable fuels for the economic, health and environmental benefit of all Oregonian's.	
Oregon Context	ORS 469.010	
Data source	Energy Information Administration State Energy Data Systems, U.S. Department of Energy, U.S. Department of Transportation Federal Highway Administration, Oregon Department of Transportation motor vehicle fuel taxable distribution reports, Oregon Department of Environmental Quality Clean Fuels Program, Clean Cities annual surveys, Oregon Department of Energy survey of large fleets.	
Owner	Mary Knight, KPM Coordinator, Phone: 503-373-7562	

1. HOW WE ARE DOING

Results. Overall alternative fuel consumption and diversity have trended upward as a percentage of fuels consumed. In 2005, petroleum products gasoline and diesel accounted for 98.3 percent of the fuel consumed in the on-road transportation fuel mix. In 2018 these petroleum products accounted for 92.4 percent and alternative fuels accounted for 7.6 percent. Most of the increase is due to the Oregon Renewable Fuels Standard program that blends biofuels into petroleum products gasoline and diesel. Biofuels are also eligible to generate credits in the Oregon DEQ's Clean Fuels Program.

Mixing alternative fuels with traditional petroleum-based fuels continues to be the most widely-used source of alternative fuels in the state. Fuel retailers sold over 18 million gallons of B20 (20 percent biodiesel with 80 percent petroleum-based diesel) from used cooking oil at Oregon retail gas stations in 2018 as part of the Oregon Department of Transportation used cooking oil biodiesel highway tax forgiveness program. This program is scheduled to sunset in 2019.



Alternative fuel diversity has increased since 2005. The 2018 fuel mix includes renewable diesel, bio-compressed natural gas, and bio-liquid natural gas, which were not available in 2005. Additional increases in alternative fuel use are due to growth in the availability of alternative fuel vehicles and the alternative fuels themselves. Electricity as a fuel is experiencing rapid growth as a transportation fuel. As of August 31,

2019, there are 27,236 electric vehicles registered in Oregon. In 2019, SB 1044 established a policy for the state of Oregon promoting the adoption of electric vehicles to reduce GHG emissions in the light-duty transportation sector.

Strategy. The 2018 Oregon Global Warming Commission's report to the legislature indicates all emitting sectors will need to reduce their overall emissions for the state to achieve its greenhouse gas emission reduction goals. Adoption of lower carbon intensity transportation fuels is a key reduction strategy because this sector bears the largest proportional share of GHG emissions in Oregon. In addition to reducing GHGs, diversification of transportation fuels is key in developing a more robust and resilient transportation fuel supply for the state. These data help provide an indication of the effectiveness of the strategy to expand the use of alternative fuels in Oregon on-road transportation fuel mix. Although fuel use in non-road vehicles is also important for the reasons mentioned above, KPM 6b is not reported because there is limited data available on fuels for off-road vehicles.

The intent of this KPM is to assess the adoption rate of alternative fuels into the transportation fuel mix in Oregon. The adoption of alternative fuels, such as compressed natural gas, propane, and electricity has beneficial social, economic, and environmental effects on individuals and businesses in Oregon. ORS 468A.205 established a goal to reduce GHG emissions to 75 percent below 1990 emission levels by 2050. The transportation sector is responsible for 39 percent of Oregon's GHG emissions. Traffic-related air pollution is linked to respiratory conditions such as decreased lung function, wheezing, cardiovascular disease, and long-term exposure to air pollution from vehicles is linked to childhood asthma. In 2018, transportation fuel costs were 5.3 percent of the median Oregon household income.

Alternative fuels with lower carbon intensity and reduced criteria pollutant emissions improve air quality and reduce GHG emissions in the transportation sector. Because electricity and certain biofuels can be produced and sold in-state these transportation fuels help retain more dollars in the state. Electricity and other alternative fuels do not use the same transportation system as traditional petroleum fuels, and therefore can increase the resilience of Oregon's fuel infrastructure in the case of a catastrophic event.

About the Targets. There are no specific state goals related to transportation fuel diversification and no target has been set for this measure; however, several state programs and goals include the adoption of alternative fuels. In addition to the statewide goal to reduce GHG emissions across the state by 75 percent from 1990 levels by 2050 here are some of Oregon's commitments to reduce transportation's impact on GHG:

- The Oregon Department of Environmental Quality Clean Fuels Program has a goal to reduce GHG emissions from the transportation fuel sector by 10 percent over 10 years by creating a market for the sale of credits for lower carbon intensity fuels.
- The Oregon Renewable Fuels Standard requires most gasoline to blend 10 percent ethanol per gallon and 5 percent biodiesel to standard diesel per gallon.

- The Oregon DEQ Low-Emission Vehicle/Zero-Emission Vehicle (ZEV) Program currently requires battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) be approximately four percent of light-duty vehicle deliveries to Oregon auto dealers, with an increase to nine percent in 2025.
- Governor Kate Brown's Executive Order 17-21 *Accelerating Zero Emission Vehicle Adoption in Oregon to Reduce Greenhouse Gas Emissions and Address Climate Change* establishes a goal of 50,000 registered zero emission vehicles (ZEVs) by 2020.
- SB 1044 (2019) established aspirational goals on ZEV adoption in Oregon through 2035 and requires state agencies to procure 25 percent of eligible vehicles as ZEVs.
- As a member of the International ZEV Alliance, Oregon has established a goal that 100 percent of new passenger vehicles in Oregon will be ZEVs by 2050.
- The Oregon Department of Administrative Services signed onto the West Coast Electric Fleets Pledge, which currently asks for 10 percent of eligible new vehicle procurements be EVs by 2020.
- As a member of the multi-state ZEV Task Force Oregon has agreed to a collective 10-state goal of 3.3 million EVs operating on state participant roadways.

2. FACTORS AFFECTING RESULTS

Background. Overall, consumption of alternative fuels continues to rise. Biofuels, which are frequently blended with traditional petroleum-based fuels to meet federal and state standards, are widely available in the market. The state and federal governments have deployed several programs to increase the use of alternative fuels & alternative fuel vehicles such as the federal and Oregon Renewable Fuel Standards, Clean Fuels Program, Oregon DEQ's Clean Vehicle and Charge Ahead rebates, Zero Emission Vehicle program, as well as federal, state, local, and other incentives for alternative fuels and vehicles. The Oregon Department of Energy and Clean Cities Coalitions work with fleets to provide technical assistance and outreach to fleets interested in adopting alternative fuel vehicles. Oregon state agencies in collaboration with local governments and neighboring state enable the development of EV charging infrastructure through projects like the West Coast Electric Highway, the EV Project, Electrify America, and utility transportation electrification projects.

Relatively low petroleum fuel prices have affected alternative fuel use over the last three years by spurring sales of less fuel-efficient vehicles and increasing overall vehicle miles travelled. Additionally, the availability of some alternative fuels is inconsistent. For example, Compressed Natural Gas is a fuel resource that can be used in medium- and heavy-duty trucks; however, there are only five public fueling stations located in Oregon, and there are no stations located in the Portland metropolitan areas. In 2018 DEQ's Clean Fuels Program reported 1,336,660 diesel gas equivalents for bio-CNG and 382,675 dge of bio-LNG. Additional fueling infrastructure would help to increase these numbers.

How We Compare. It is not possible to compare information on alternative fuel use in other states because there is no known published data of this kind. However, data are available to compare access to alternative fuel infrastructure. In 2018 Oregon ranks 15th in the nation,

down from 12th in 2017, in the total number of alternative refueling stations on the U.S. Department of Energy's Alternative Fuel Data Center locator. California ranks number one and the state of Washington ranks fifth. In 2015 Oregon was ranked seventh in this category and Washington was ranked third. Oregon was an early adopter of EV charging infrastructure; however, more populous states are beginning to ramp up the installation of charging infrastructure. Oregon is ranked 27th in population and 29th in transportation sector energy consumption out of the 50 states. Oregon has more charging infrastructure per capita than California or Washington.

Electric vehicles have the most potential to reduce petroleum consumption and GHG emissions in the sector. Although electric vehicles have a cost advantage in maintenance and operations, the higher average purchase cost of electric vehicles continues to be a barrier to broader EV adoption. As battery costs decline the overall cost of the vehicles will also come down. Bloomberg, the California Air Resources Board, and Forbes have all estimated that sometime around 2022 to 2025, electric vehicles will reach first cost parity with conventional vehicles and by 2030 will be less expensive. The Oregon Clean Vehicle Rebate program, the federal EV tax credit, as well as incentives from other public and private entities can help bridge the cost gap. Tesla and General Motors have already hit the 200,000-vehicle limit allowed and tax credits available for these manufacturers have begun to phase out. There is some support in Congress to change the credit eligibility from a vehicle manufacturer volume to a sunset date of 2023 for all vehicle manufacturers. The federal tax credit is often the largest incentive to bringing the cost of an EV in line with a similar internal combustion vehicle.

Although the backbone infrastructure for electric fuel is in place there is a need to provide the physical electric chargers in places where ready charging outlets are not available. This includes multi-unit dwellings, rural areas, workplaces, and travel thoroughfares. Much of the first generation of Direct Current Fast Charging (DCFC) infrastructure in Oregon included only one of the two non-Tesla charging platforms, which do not support many of the EVs being marketed today. The state has been successful in two proposals to Electrify America for the development of DCFCs along the I-84 and I-5 corridors, as well as highways leading from Portland to Bend and Astoria. In addition, Electrify America is installing Level 2 charging throughout the Portland Metropolitan Area. Additional efforts to secure funding for charging infrastructure will be needed to accommodate the growing number of EVs on Oregon roads.

The U.S. Department of Energy estimates that petroleum-based fuels will not see price spikes in the next two to three years and will remain essentially flat with a slight increase. Low fuel prices encourage adoption of less efficient and larger vehicles. The state should continue to support programs that encourage alternative fuel adoption and identify other opportunities to encourage the use and production of these fuels. Large fleets should continue to be encouraged to introduce and increase alternative fuel vehicles in their inventories and to provide public access to their alternative fuel refueling infrastructure. Additionally, continued education and outreach to the general consumer and auto dealerships should be a high priority as Oregon has seen a steady increase in the consumption of alternative fuels by consumers, and more alternative fuel is now consumed by the general market than by fleets. Adoption rates of electric vehicles have risen at a year-over-year average of 29 percent over the last several years. Automobile manufacturers have plans to increase production and model availability

over the next few years. Providing the public and fleets with a basic understanding of the use and impact of alternative fuels should remain a top priority for the state.

Biogas and Renewable Natural Gas have the potential to help the state meet GHG emissions goals as well as provide economic benefits. Oregon already produces this biofuel from landfills, waste water treatment plants, and dairies. This gas is typically used for thermal process and to generate electricity. To be used in the transportation sector the gas would need to be cleaned to a higher standard and injected into existing natural gas pipeline infrastructure to enable fueling throughout the states. When used as a transportation fuel RNG can receive national Renewable Fuels Standard credits and Oregon Clean Fuels or California Low Carbon Fuels Credits, which can offset the higher cost of the fuel.

About the Data. The data provide a snapshot of total alternative fuel measured in gasoline gallon equivalents consumed in the on-road transportation sector. As outline above, off-road alternative fuel use data is not sufficiently available to do an analysis. The on-road data is compiled from several sources. Gasoline data is gathered from the Oregon Department of Environmental Quality, diesel data is obtained from the USDOE's Energy Information Administration, and the Oregon Department of Transportation Fuel Group. Biodiesel information is collected from several sources, including the ODOT Fuels Group, fleet surveys, and USDOE EIA data. LPG, CNG, and LNG data is acquired through surveys of fuel suppliers and fleets. Electricity use is sourced from Tri-Met for MAX and Portland Streetcar, DEQ analyzed DMV data, public charging providers, and fleet surveys. Some fleet data are based on a calculation that uses an equation derived by USDOE that is applied to the number and types of vehicles in large fleets. This calculation has become an industry standard approach because many fleets consider fuel use proprietary.

Prior to the implementation of the Oregon Clean Fuels program ODOE assessed liquid biofuels using the data resources described above. Since 2016 ODOE has incorporated the Clean Fuels program data for liquid biofuels. Because the sources of data have differences in how they are collected the resulting trend line had an artificial jump between 2015 and 2016. ODOE continues to collect the all data points but for clarity displays only data points since 2016.

This KPM identifies the percentage of alternative fuel types of the total fuel used in the on-highway transportation sector on a gasoline gallon equivalent basis. This makes it possible to compare one fuel to another in quantity. Electric motors are much more efficient than internal combustion engine vehicles, meaning electric motors use less energy to accomplish the same amount of work. In most cases when comparing fuels such as biodiesel to diesel there is no impact to the data as the engine is the same in both cases and the amount of work accomplished is similar. A conventional vehicle varies between zero percent, when idling, to somewhere in the low to mid 30 percent efficiency when driving. By comparison, electric motors are in the mid-80 to mid-90 percent efficiency range. As a result, it requires less overall energy to drive the same distance in an electric vehicle than a non-electric vehicle. This higher efficiency is not accounted for in this KPM and would generally indicate a significantly lower energy consumption for electric vehicles.