EXECUTIVE SUMMARY

Background
In 1991, the Oregon Department of Energy established the State Energy Efficient Design program as a result of ORS 276.900-915.

Adopted legislation states, “It is the policy of the State of Oregon that facilities to be constructed or purchased by authorized state agencies be designed, constructed, renovated and operated so as to minimize the use of energy resources and to serve as models of energy efficiency.” The 1991 statute required cost-effective energy conservation measures, or ECMs, to be incorporated into the design of buildings constructed by state agencies. In January 2001, the Energy Conservation Initiative was added to the statute, requiring all state agency facilities that were newly constructed or substantially remodeled to exceed the energy conservation provisions of the Oregon state building code by a minimum of 20 percent.

The SEED program divides new construction and renovation projects into two classes, depending upon their size. Class 1 buildings are 10,000 or more square feet, and Class 2 buildings are less than 10,000 square feet. Regardless of building class, state agencies must incorporate cost-effective energy conservation measures into building projects.

A requirement for state agencies to reduce energy consumption in existing state owned buildings was also added to ORS 276.900-915 in 2001. A goal was set to reduce agency level energy use by 20 percent by 2015; the goal was met in 2013. Agencies are still required to report energy use to ODOE. ODOE has worked closely and collaboratively with other state agencies to update and improve the process for state agency facility energy use reporting. The result of these efforts includes more detailed energy consumption reporting and the establishment of facility-specific energy performance targets based on national standards.

About the Report
The first section of this report covers Class 1 buildings that have completed construction during calendar years 2017 and 2018. During the past biennium, three SEED projects were renovations and two were new construction. Project highlights include the OYA New Bridge High School and the OMD Joint Force Headquarters.

The second part of the report describes state agency energy use benchmarking efforts and the platform selected for reporting energy use data. It also summarizes data collected to-date. ORS 276.900-915 directs state agencies to report energy use in state-owned facilities at the agency level. To continue the great work of agencies toward tracking and reducing energy consumption, in 2014 ODOE proposed that agencies measure energy performance in their state-owned facilities at the building level to help agencies identify opportunities for energy savings through more detailed energy tracking and benchmarking. Through a collaborative effort, agencies agreed to begin reporting building-level energy use to the ENERGY STAR Portfolio Manager platform as of January 1, 2015. The intent is to “benchmark” agency buildings and compare their energy use intensity to similar buildings and to national targets.
ODOE and state agencies have now collected 3 years of building level energy consumption, and ODOE will continue to actively work with other agencies to analyze this data and identify opportunities for energy and cost savings.

The tables included in the report show energy use intensity for each agency’s buildings. Also included are graphs that show how the buildings compare to target values.

The 2017-18 State Energy Efficient Design (SEED) report is available online:

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INTRODUCTION

In 1991, the Oregon Department of Energy established the State Energy Efficient Design program as a result of ORS 276.900-915. The legislation was in response to increasing national awareness of the environmental impacts of energy consumption and the importance of energy efficiency and sustainability. The legislature recognized that state government should be a leader in conserving energy and that state facilities should be constructed to serve as models of energy efficiency.

The adopted legislation states, “It is the policy of the State of Oregon that facilities to be constructed or purchased by authorized state agencies be designed, constructed, renovated, and operated so as to minimize the use of energy resources and to serve as models of energy efficiency.”

By constructing and renovating buildings with energy efficiency in mind, state agencies can significantly reduce long-term operating costs and redirect those savings to fund essential services. Energy efficiency also helps reduce adverse environmental impacts and improve comfort for building occupants and visitors.

The 1991 statute required cost-effective energy conservation measures to be incorporated into the design of buildings constructed by state agencies. In January 2001, the Energy Conservation Initiative was added to the statute. It required all newly constructed or substantially remodeled state agency facilities perform better than the energy conservation provisions of Oregon’s building code by a minimum of 20 percent.

The requirement for state agencies to reduce energy consumption in existing state owned buildings was also added to the statute. A goal was set to reduce agency level energy use by 20 percent by 2015 was met in 2013. Even after meeting the goal, agencies are still required to report energy use to ODOE. Anticipating a new energy reduction goal may be forthcoming, all state agencies in stated owned buildings that meet an agreed-upon criteria, began recording energy use in the ENERGY STAR Portfolio Manager platform beginning January 2015. The ESPM is an existing energy reporting database built and maintained by the US Environmental Protection Agency.

The first section of this report focuses on new construction and remodels of state buildings completed during 2017 and 2018. The second part of the report shows energy use in state buildings reported to ESPM between 2015 and 2017.

Reporting energy use to ESPM resulted from the strong partnership between the Oregon Department of Energy and state agencies. ODOE would like to thank the many state agency representatives and partners who contribute to make the SEED program successful.
PART 1: NEW CONSTRUCTION AND REMODELS

The SEED process calls for state agencies to work with ODOE in the initial design of their building projects to ensure cost-effective Energy Conservation Measures are incorporated into building designs. Cost-effectiveness is determined by conducting an analysis on the Benefit-to-Cost Ratio and the Net Present Value over the life of a measure. If the BCR exceeds 1.0 and NVP is greater than 0, the project is cost-effective. Depending upon the size and complexity of the project, SEED program staff provide technical consulting services to the state agency throughout the course of a project. SEED staff work closely with state agencies and their building design teams to develop a list of Energy Conservation Measures for consideration for each project. ECMs can be either baseline measures or analyzed measures. Baseline ECMs are already known to be generally cost-effective due to past analysis and experience with the technologies. Baseline ECMs are incorporated into the proposed system design and do not receive a detailed cost-effectiveness analysis. Analyzed ECMs are evaluated for cost-effectiveness based on a life-cycle cost analysis. An ECM package is developed for each project, resulting in a building design that will perform better than energy code levels by 20 percent or more.

Buildings Covered in This Report

The SEED program divides buildings into two classes depending upon their size. Class 1 buildings are 10,000 or more square feet and Class 2 buildings are less than 10,000 square feet. Regardless of building class, state agencies must incorporate cost-effective ECMs into building projects.

For Class 1 buildings, SEED staff work closely with agency design teams to develop an ECM package for each building project, provide agencies with technical advice, and monitor the Class 1 buildings for an 18-month period once it is occupied. SEED program staff and agency design teams ensure all cost-effective energy conservation measures are included in each building’s design and that the building will perform better than the energy conservation provisions of Oregon’s building code by 20 percent or more.

Agencies administer their own Class 2 projects of less than 10,000 square feet. Although the agency is primarily responsible for incorporating all cost-effective energy conservation measures into Class 2 projects, SEED staff provide assistance if requested.

This report covers Class 1 buildings that have completed construction during calendar years 2017-2018. During the past biennium, three SEED projects were remodels and two were new construction.
Program Savings to Date

Over the course of the SEED program, 187 state building projects have been completed. Five projects were completed during calendar years 2017-2018.

Since 2003, total cost for completed construction projects exceeds $1.9 billion, with more than $30.2 million additional funds invested in energy efficiency. This has saved more than $5.6 million in annual energy costs and more than $43 million in program lifetime savings.

Biennium Summary

The following table summarizes SEED new construction and renovation projects completed in the 2017-2018 calendar years and the projected energy savings that resulted from the SEED analysis and process.

<table>
<thead>
<tr>
<th>Project</th>
<th>Construction Budget</th>
<th>Project Square Feet</th>
<th>Project Type</th>
<th>Annual Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMD Joint Force Headquarters</td>
<td>$22,500,000</td>
<td>55,078</td>
<td>New Construction</td>
<td>1415.8</td>
</tr>
<tr>
<td>OMD Maison Bldg</td>
<td>$3,351,033</td>
<td>25,190</td>
<td>Renovation</td>
<td>213.6</td>
</tr>
<tr>
<td>OMD RA Miller Readiness Center-Forest Grove</td>
<td>$2,259,188</td>
<td>37,346</td>
<td>Renovation</td>
<td>342.4</td>
</tr>
<tr>
<td>OYA New Bridge High School</td>
<td>$5,000,000</td>
<td>13,220</td>
<td>New Construction</td>
<td>187.6</td>
</tr>
<tr>
<td>OMD Medford Readiness Center</td>
<td>$4,984,448</td>
<td>47,169</td>
<td>Renovation</td>
<td>155.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$38,094,669</strong></td>
<td><strong>$178,003</strong></td>
<td>--</td>
<td><strong>2,315</strong></td>
</tr>
</tbody>
</table>

1. OMD Medford Readiness Center was a renovation project for only a portion of the facility, with a low baseline energy consumption. As such, the project achieved good energy reduction compared to code (10.8%) but had limited opportunities for significant energy efficiency.

Post-Occupancy Metering Results

After a SEED project is completed, post-occupancy energy use is tracked for 18 months to determine if it is meeting its energy use targets. Targets are based on the building performing 20 percent better than a code baseline, and are established through comprehensive energy modeling of the building. Energy use is commonly expressed as Energy Use Intensity or EUI, which is calculated by dividing the total annual energy consumed (in units of thousand Btus, or kBtus) by the gross floor area (in units of square feet, or sf) of the building.
Post-occupancy metering data is provided in the following table for projects that have completed the measurement phase.

<table>
<thead>
<tr>
<th>Project</th>
<th>Energy Use Intensity, EUI (kbtu/ft²/yr)</th>
<th>Modeled Code Baseline</th>
<th>Modeled SEED Building</th>
<th>Actual (2017 CY)</th>
<th>Actual % Better Than Modeled Code Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>OHA Junction City Hospital</td>
<td></td>
<td>136.6</td>
<td>90.0</td>
<td>58.1</td>
<td>57.5%</td>
</tr>
<tr>
<td>DAS 550 Building</td>
<td></td>
<td>39.2</td>
<td>33.5</td>
<td>26.1</td>
<td>33.4%</td>
</tr>
<tr>
<td>OMD Roseburg Armory</td>
<td></td>
<td>31.1</td>
<td>17.7</td>
<td>21.4</td>
<td>31.2%</td>
</tr>
</tbody>
</table>

Agencies with projects that have not met the predicted goals are required to investigate the reasons and develop a corrective plan. The agency is responsible for developing an energy conservation plan that outlines modifications to be made until monitoring shows that the building meets the projected energy use, or all reasonable attempts to reduce the energy use have been made. ODOE is available as a resource for helping agencies formulate plans to bring projects into compliance.

**Project Highlights**

Two SEED projects that completed construction in 2017-2018 are highlighted below.

**Oregon Youth Authority New Bridge High School**

The energy efficiency features include:

- High-efficiency Heating Ventilation and Air Conditioning units, with demand controlled ventilation
- Increased envelope insulation
- Windows with improved thermal performance compared to code
- High efficiency LED lighting, with daylight sensing and dimming capabilities
- Condensing gas-fired hot water heater
- Dust collection return air system in woodshop
Oregon Military Department – Joint Force Headquarters

The energy efficiency features include:

- Building orientation and controls to optimize daylighting opportunities
- High-efficiency lighting
- Heat pump water heater
- Low-flow plumbing fixtures
- Increased building envelope insulation
- High performance windows
- High-efficiency variable refrigerant flow heat pumps
- Dedicated outside air units with heat recovery
- Night-flush cooling cycle
- Premium efficiency motors
- Energy Star appliances
- Data Center Power Use Index (PUE) of 1.2 employing hot aisle / cold aisle technology
- Data Center HVAC redistributes Heat to open office during winter
- Green Energy exceeding 1.5% of the construction budget
- Solar Installation @ 120.05KW roof top
- Open flexible design concept
- Built to Essential Facility Seismic structure standards
- Campus design approach for future expansion
- Connectivity Design to the Anderson Readiness Center
PART 2: ENERGY CONSERVATION IN EXISTING STATE BUILDINGS

History
In the summer of 2000, wholesale electricity prices soared to unprecedented levels as a result of the restructuring of California’s electric industry. Oregon and other western states were equally affected due to the interconnected nature of electricity generation and distribution throughout the region. Governor Kitzhaber, by way of his Energy Conservation Initiative, directed all of Oregon’s state agencies to improve energy conservation efforts in their facilities. The goal was to reduce state agencies’ energy consumption by 10 percent below levels measured in 2000.

ORS 276.915 was amended in 2001 to make the 10 percent savings a requirement for all state-owned buildings effective June 30, 2003. The SEED statute was amended again in 2007 to reset the savings goal to 20 percent by June 30, 2015. Agencies collectively met the 20 percent energy use reduction requirement two years before the 2015 deadline.

Current Energy Use Reporting
ORS 276.900-915 directs state agencies to report energy use in state owned facilities at the agency level. The energy reduction goal of 20 percent was met in 2013, and no new energy reduction requirement for state agency energy use was set. As the state discussed various energy-related goals, ODOE initiated agency stakeholder meetings in the fall of 2014 to discuss how energy use reporting would continue. ODOE proposed that agencies measure energy performance in their state owned facilities at the building level in order to inform future decisions that could mandate energy use reduction and more importantly help agencies identify opportunities for energy savings through more detailed energy tracking and benchmarking. Through this collaborative effort, agencies agreed to begin reporting building-level energy use to the ENERGY STAR Portfolio Manager platform as of January 1, 2015. A series of meetings with agency stakeholders took place to develop the reporting criteria and subsequent training sessions were conducted to develop the capabilities for reporting into ESPM. Stakeholders and ODOE agreed that electrical and fossil fuel use would be reported for state owned facilities over 5,000 square feet using more than 10 kBtu/sf/yr; an agreement that was then incorporated into SEED rules OAR 330-130-0080.

The baseline energy use for 2015 has been used to determine each building’s Energy Use Intensity, with subsequent years through 2017 now available. EUI is energy use per square foot per year, which is calculated by dividing the total annual energy consumed (in units of thousand Btus, or kbtus) by the gross floor area (in units of square feet) of the building. EUI for each facility can then be compared to average EUIs for similar building types such as offices, hospitals, laboratories, etc.

The charts in the following section summarize energy use in the buildings belonging to each agency. The intent is to benchmark agency buildings, compare their EUIs to similar buildings.
and national targets, and track the usage over time. The target EUIs are based on ASHRAE Standard 100-2015 for climate zones 4C (Western Oregon) and 5B (Eastern Oregon). ASHRAE Standard 100-2015 is a data-driven and internationally recognized standard for improving energy efficiency in existing buildings. It provides a comprehensive approach for addressing energy efficiency in a quantitative and objective manner. This standard’s targets represent high performing buildings for each building category and region and is represented by the horizontal lines. For those buildings without ASHRAE targets, Oregon Department of Energy staff work with the agencies to establish high performance targets. When available, energy use targets from ASHRAE are indicated on the chart to show performance compared to targets.

The data represents three years of energy consumption data (2015 left bar, 2016 middle bar, and 2017 right bar). Complete agency data for 2018 is in the process of being reported to ODOE and was not available at the time of this report’s publishing, but will be included in future reports.

With three years of complete data now available, specific building energy consumption trends can begin to be formed and analyzed. The following charts show that some individual facility energy EUIs have decreased over the three years of available data, while some have increased. This can be due to changes in operational profiles such as operating hours or occupancy, occupant behavior, equipment changes, or external factors such as weather. The data presented in the graphs below represents actual energy consumption and has not been normalized for variables such as weather.

Upon issuing energy use report cards to each agency, ODOE offers assistance to state agencies in performing a more in-depth analysis to understand building energy performance. As more data is collected and trends are established, ODOE plans to work with agencies to perform more in-depth analysis on specific buildings to help prioritize opportunities for energy and cost savings.
PART 3: STATUS REPORT CHARTS

Department of Agriculture

Department of Administrative Services

DAS Offices
Department of Aviation

![Bar Chart: EUI Comparison]

- 2015 EUI
- 2016 EUI
- 2017 EUI
- ASHRAE Std 100 EUI Target

kBtu/sf/yr
Department of Corrections
Note: Department of Corrections Target EUIs are based on a 20% reduction vs a 2013 Baseline
Employment Department

Employment Department Offices

<table>
<thead>
<tr>
<th>Location</th>
<th>2015 EUI</th>
<th>2016 EUI</th>
<th>2017 EUI</th>
<th>ASHRAE Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albany</td>
<td>270</td>
<td>100</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>Bend U.I.</td>
<td>700</td>
<td>110</td>
<td>80</td>
<td>60</td>
</tr>
<tr>
<td>Medford</td>
<td>410</td>
<td>80</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>Oregon City</td>
<td>180</td>
<td>90</td>
<td>70</td>
<td>50</td>
</tr>
<tr>
<td>Ontario Falls</td>
<td>910</td>
<td>100</td>
<td>80</td>
<td>60</td>
</tr>
<tr>
<td>Klamath Falls</td>
<td>710</td>
<td>60</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>Salem</td>
<td>210</td>
<td>70</td>
<td>50</td>
<td>35</td>
</tr>
<tr>
<td>Eugene</td>
<td>310</td>
<td>80</td>
<td>60</td>
<td>45</td>
</tr>
<tr>
<td>Roseburg</td>
<td>320</td>
<td>90</td>
<td>70</td>
<td>55</td>
</tr>
</tbody>
</table>

kbtu/sf/yr
Oregon Department of Fish and Wildlife

- Rock Creek Hatchery
- High Desert HQ
- Enterprise FO & Screen Shop
- Big Creek
- Oregon Hatchery Research
- The Dalles Screen Shop/Office
- Klamath Hatchery
- S Willamette Watershed Office
- ODFW HQ

2015 Site EUI
2016 Site EUI
2017 Site EUI
ASHRAE Target

kBtu/sf/yr
Department of Forestry

Forestry Offices

- Tillamook District Headquarters Main Office #1
- West Oregon District Headquarters
- Salem - Building C - Administration Bldg
- Salem - Building D - Operations Bldg
- Klamath Lake District Headquarters
- John Day Unit Headquarters Main Office
- Grants Pass Unit Headquarters Main Office
- Sisters Sub-Unit

kBtu/sf/yr

2015 EUI  2016 EUI  2017 EUI  ASHRAE Target
Forestry Distribution Centers

Western Lane District Headquarters Shop
Salem - Building J - Aircraft Hangar

kBtu/sf/yr

2015 EUI  2016 EUI  2017 EUI  ASHRAE Target -Zone 4C
Oregon Health Authority

OHA - State Hospitals

kBtu/sf/yr

Salem

Junction City

2015 EUI

2016 EUI

2017 EUI

ASHRAE Target Zone 4C
Oregon Military Department

Note: No ASHRAE targets are available for OMD
Note: No ASHRAE targets are available for OMD
Note: No ASHRAE targets are available for OMD
Note: No ASHRAE targets are available for OMD
Oregon Parks and Recreation

![Graph showing energy usage per square foot per year for various locations. The graph includes data for Silver Falls Lodge, Champoeg Visitor Center, Silver Falls New Ranch, S Willamette Lowell Compound, Thompson's Mill, and Wolf Creek Inn. The colors represent different years: blue for 2015, orange for 2016, and purple for 2017. The green line indicates the ASHRAE Target Zone 4C.]
Public Employees Retirement System

![Bar chart showing the energy usage intensity (EUI) in kBTU/sf/yr for Public Employees Retirement System from 2015 to 2017. The chart also includes the ASHRAE target EUI.](chart.png)
Note: No ASHRAE target for Building O
Oregon School for the Deaf
Oregon State Capitol

- 2015 EUI
- 2016 EUI
- 2017 EUI
- ASHRAE Target Zone 4C
Note: No ASHRAE targets are available for maintenance stations
Note: No ASHRAE targets are available for maintenance stations
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Note: No ASHRAE targets are available for maintenance stations.
Note: No ASHRAE targets are available
FOR MORE INFORMATION

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