

The multi-agency Built Environment Efficiency Working Group (BEEWG) is tasked with implementing Executive Order 17-20, a directive to improve the built environment in Oregon.

On November 6, 2017, Governor Kate Brown issued **Executive Order 17-20: Accelerating Efficiency in Oregon's Built Environment to Reduce Greenhouse Gas Emissions and Address Climate Change**.¹ This Executive Order established directives for energy efficiency leadership in state buildings, increasing energy and water efficiency in new construction, and increasing energy efficiency through retrofits of existing buildings. The Executive Order identified state building leadership as a potential strategy to address the state's energy and climate goals, including a specific directive *3.E Lifecycle Cost Analysis* for state buildings.

Excerpt from EO 17-20

3. Energy Efficiency Leadership in State Buildings

E. Lifecycle Cost Analysis. Lifecycle Cost Analysis. ODOE is directed to analyze state building costs, including lifecycle energy and water use costs or savings, when considering energy and water upgrades for state buildings. By January 1, 2019, ODOE, working with DAS, will develop analysis tools that can inform the high performance energy use targets and carbon neutral requirements for state buildings referenced above.

There are two main sections of this directive. The first focuses on state lifecycle analysis of energy and water use costs and savings when considering facility upgrades. The second lists requirements for analysis tools to inform energy and carbon-neutral goals. This summary provides information about how the two sections have been met and describes the ongoing work state agencies will perform under this directive.

3E: Lifecycle Cost Analysis

Analyze Lifecycle Energy and Water Use Costs or Savings When Considering Upgrades

Through the existing State Energy Efficient Design (SEED) program, the Oregon Department of Energy and state agencies who are contracting for new construction and retrofits analyze lifecycle energy costs and savings as an integral component of the process. This lifecycle analysis is used to help state agencies make informed decisions about energy efficiency upgrades for their projects.

¹ https://www.oregon.gov/gov/Documents/executive_orders/eo_17-20.pdf

ORS 276.915² contains the Energy Design Requirements for new state construction, and outlines the responsibility of ODOE and state agencies. ORS 276.915 also provides ODOE with rulemaking authority to carry out the provisions of this statute. These rules for the SEED program are contained in OAR 330-130-0010 through OAR 330-130-0500.

ODOE has developed and published SEED program guidelines and supplemental materials to support state agencies in navigating the SEED process, and in evaluating energy efficiency measures when considering upgrades for state buildings.³ These include supporting materials such as an Energy Conservation Measure Checklist and a Cost-Effective Analysis Worksheet that provides a format for ODOE and other state agencies to analyze lifecycle energy costs with building upgrades. This lifecycle analysis is completed by the project team, including the contracting agency, energy analyst, and ODOE, and uses the ODOE-developed analysis methods.

The SEED program has traditionally addressed only energy efficiency and conservation measures. While many water savings measures may also have direct or indirect energy savings components, water savings has not been a focus of the SEED process to date. To address the full requirement in EO 17-20, ODOE has drafted revisions to the SEED Cost Effectiveness Analysis Worksheet to incorporate water use cost and savings into the form, and to include this in the analysis process. This will help integrate water efficiency projects into overall lifecycle analysis. Beginning in 2019, upon receiving a SEED project notification and conducting a kick-off meeting in the early project planning and design stages, ODOE will work with state agencies to communicate the requirement to analyze lifecycle water savings (in addition to energy) and assist agencies, in conjunction with project design teams, in performing this analysis when considering upgrades.

ODOE has researched available third-party water consumption calculators and assessment tools that can be used for analysis and savings estimations for water projects. The United States Environmental Protection Agency (EPA) administers the WaterSense™ program, which sets voluntary water efficiency product standards. The program also provides a list of tools that commercial and institutional building owners can use to analyze lifecycle water use cost and savings.⁴ These tools include a variety of checklists, worksheets, scorecards, and calculators that could be useful to an agency or ODOE for completing an analysis of lifecycle water use costs and savings. One tool referenced by EPA WaterSense has been developed by the Brendle Group and sponsored by the City of Boulder. This calculator, *The Commercial, Industrial and Institutional Water Assessment Tool*, is offered for free and could be utilized in an agency water use analysis. The calculator allows for user-specific inputs to estimate the water savings from individual projects. ODOE does not explicitly endorse use of any one tool, but is available to assist state agencies to evaluate lifecycle water use costs and savings upon request.

While the SEED program has an established framework for considering lifecycle cost analysis for state agency building upgrades, a separate but related directive in EO 17-20 is item 6: *Analysis of Cost*. This section directs state agencies to implement the EO using least-cost methods available, and to adopt a cost-

² <https://www.oregonlaws.org/ors/276.915>

³ <https://www.oregon.gov/energy/energy-oregon/Pages/SEED-Program-Guidelines.aspx>

⁴ <https://www.epa.gov/watersense/tools-ci-facilities>

analysis tool by December 1, 2019 that can be applied to the Executive Order directives. Because the tool required by EO 17-20 item 6 is not yet completed (as of December 2018), it is not available for use and incorporation for Directive 3E. However, it is closely related to 3E and involves agency collaboration to develop a cost-analysis tool to use for the Executive Order directives. The agencies involved with EO 17-20 have had discussions on the various cost-effectiveness frameworks used across the agencies, and a public meeting was held to receive stakeholder input and feedback. Agencies will continue to discuss and develop this tool in 2019. When the tool for Item 6 is available, it is anticipated that it will also inform EO Directive 3E, and ODOE intends to incorporate the output of the collaborative BEEWG agency work on cost analysis into its framework for state buildings.

Analysis Tools to Inform the High Performance Energy Use Targets and Carbon Neutral Requirements for State Buildings

ODOE uses ENERGY STAR™ Portfolio Manager (available free of charge from the EPA) to track energy and water consumption metrics for state-owned buildings. These metrics are used for agency energy use benchmarking and reporting through the SEED program. ODOE has conducted agency training on energy reporting, and continues to support agencies regarding energy data tracking, reporting, and benchmarking.

To provide agencies with an analysis tool for informing progress toward the high performance energy use targets referenced in EO 17-20 Item 3A *High Performance Energy Targets for Existing State Buildings*, ODOE collects and analyzes the energy consumption data that state agencies report into EPA Portfolio Manager and issues annual report cards for each state agency that document the energy use intensity of state buildings relative to performance targets. Subsequent to EO 17-20's release in November 2017, energy use report cards for calendar year 2017 were issued to agencies in May 2018, and ODOE plans to continue to develop and issue report cards annually to assist state agencies and inform the high performance energy use targets that have been established for agency properties.

Item 3E also includes a directive for development of an analysis tool to inform state building carbon neutral requirements from the Executive Order. ODOE and DAS, in consultation with the BEEWG, have evaluated options for analysis tools to help inform those targets. Existing tools can be directly referenced and are well positioned to help ODOE, DAS, and state agencies inform the energy and carbon neutral targets and requirements of EO 17-20. Given the existence of advanced analysis tools, and the directive of state agencies to implement EO 17-20 using least cost methods available, ODOE recommends using an existing tool to help inform the energy use targets and carbon neutral requirements for state buildings. Specifically, the Zero Code™ initiative⁵ from Architecture 2030, and the associated Zero Code Energy Calculator⁶ can be used for new state construction to estimate a building's energy consumption and the renewable energy required to achieve net zero-energy and carbon-neutral operation. This tool, combined with the advanced energy models (using programs like eQuest, TAS, Trane Trace 700, or other energy modeling platforms) that are inherent to the SEED process will serve as the analysis tools to inform carbon neutral requirements for state buildings. The Zero Code™ Energy Calculator accepts simple inputs related to a building's characteristics and location, and uses background energy modeling and renewable energy

⁵ <https://zero-code.org/>

⁶ <https://zero-code.org/energy-calculator/>

software to estimate the energy consumption, energy use intensity, on-site renewable potential, and required renewables needed to achieve carbon neutral building operations. The Zero Code™ Energy Calculator is primarily applicable to new construction; however, Architecture 2030 also offers a complementary Zero Tool™ calculator⁷ for existing buildings that can inform existing building progress towards high performance energy use targets. Both of these tools, in combination with the state agency energy use benchmarking reported in ENERGY STAR™ Portfolio Manager, can be used to inform the high performance energy use targets and carbon neutral requirements for state buildings referenced in EO 17-20.

These tools are in conjunction with work by the Oregon Building Codes Division (BCD). In the fourth quarter of 2018, BCD proposed and adopted, through its board review process, a Statewide Alternate Method (SAM) 18-02⁸ that directly references the Zero Code™ and provides an alternative path for energy code compliance. The SAM includes a high efficiency baseline code plus documentation of renewable requirements needed for a net zero-energy, carbon-neutral building (though the SAM does not require actual installation of the renewables for compliance). Referencing a common tool provides a degree of synergy and support between state programs.

Conclusion

Lifecycle cost analyses for energy and water savings projects are important for state agencies to perform when considering upgrades for their facilities. The existing State Energy Efficient Design (SEED) program has a comprehensive framework for evaluating energy lifecycle considerations, and water considerations can be incorporated into this framework. ODOE has developed energy use tracking and benchmarking programs, as well as issued state energy use report cards, to inform the high performance energy use targets that have been set for state buildings. Tools such as the SEED program and the Architecture 2030 Zero Code™ can be leveraged to inform the carbon neutral requirements in the Executive Order. These activities, along with other elements of Executive Order 17-20, will help reduce the energy and greenhouse gas emissions footprint of state buildings.

⁷ <https://zerotool.org/zerotool/>

⁸ <https://www.oregon.gov/bcd/codes-stand/Documents/sam-18-02-OregonZeroCodeEfficiencyStandard.pdf>