

**Executive
Order 20-04
Directive 6(B)
Report**



**Department of Consumer
and Business Services**

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Background

Executive Order 20-04 (EO 20-04) was signed by Governor Kate Brown on March 10, 2020. EO 20-04 is intended to build on Executive Order 17-20 (EO 17-20) to further Oregon's goal of reducing Greenhouse Gas (GHG) emissions "at least 75 percent below 1990 levels by 2050" as described in ORS 468A.205.

EO 20-04 provides one set of general directives to 16 different state commissions and agencies, along with specific directives to those commissions and agencies with various reporting requirements and deadlines. The first reporting deadline was on May 15, 2020, and required 10 specified state agencies to report "on proposed actions within their statutory authority to reduce GHG emissions and mitigate climate change impact." While not one of those agencies, the Department of Consumer and Business Services Building Codes Division (BCD) produced and provided 'Directive 3(D) Report' to the Governor's office on that date.

Directive 6(B) of EO 20-04 also states that "No later than Sept. 15, 2020, BCD should submit a report to the Governor on [the] current progress and options for achieving the goals over the next three code cycles. The report should be updated every three years thereafter." The May and September 2020 reports can be found on [BCD's EO 20-04 webpage](#) under the Code progress and updates section.

House Bill (HB) 3409, passed through the 2023 Legislative Session, was signed by Governor Tina Kotek on July 27, 2023 and codified many aspects of EO 20-04 relative to BCD including, but not limited to:

1. Adopt energy efficiency goals for 2030 for new residential and commercial buildings, representing at least a 60% reduction in annual regulated site energy consumption, from the 2006 Oregon energy codes.
2. Agree on metrics in consultation with Oregon Department of Energy (ODOE), based on best practice and academic research, to inform the baseline and reductions.
3. Update the Oregon Reach Code each time the statewide building code is updated. This shall be done through rulemaking, after obtaining approval from the appropriate advisory boards.
4. Report to an interim committee of the Legislative Assembly, not later than Dec. 31 of every third year, beginning with Dec. 31, 2023, an evaluation of progress, a list of options, and an evaluation for feasibility towards achieving the goals set herein.

In response to Directive 6(B), BCD is pleased to submit this report for the 2023 reporting cycle. An update of this report will be presented by Dec. 31, 2023 to an interim committee of the Legislative Assembly.

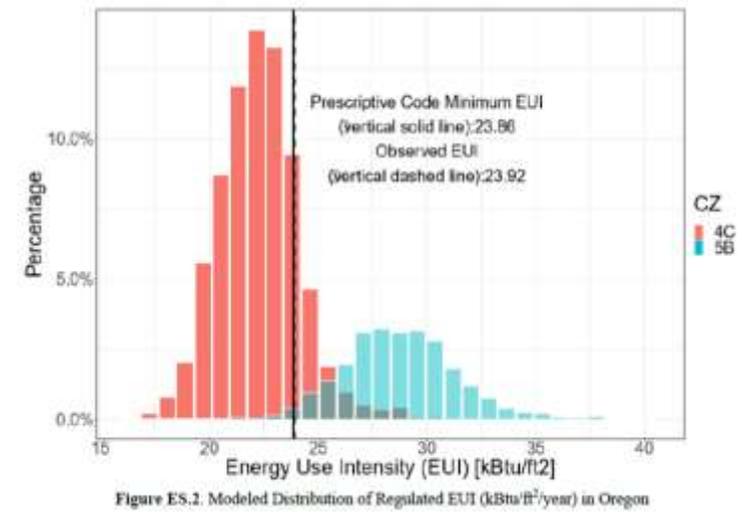
On Jan. 10, 2023, Governor Kotek signed EO 23-04, *Establishing a Statewide Housing Production Goal and Housing Production Advisory Council (HPAC)*, which added an additional layer to achieving the energy efficiency goals of EO 20-04. BCD provides support to the council as they balance social, environmental, and economic systems from a statewide perspective of resiliency.

Introduction

BCD and its boards have established Oregon as a national leader for energy efficient building codes by using its statutory authority to adopt uniform statewide building codes that are technically and economically feasible. These mandatory statewide codes provide consistency and predictability for all. This approach also helps Oregon achieve extremely high compliance rates, as designers, building officials, contractors and other stakeholders are able to train to one standard, regardless of where in the state the project is located.

BCD, in partnership with its seven advisory boards, has statutory authority to adopt and amend a state building code. To ensure that important construction industry stakeholders' voices are heard, the Oregon statute requires both the appropriate advisory board and BCD to approve any code change. In short, BCD and the appropriate advisory boards are partners in the code change process. This partnership between the boards and BCD has created a national leading energy efficiency code, while providing predictability, reliability, and stability to the building industry.

Historically, BCD has worked with its advisory boards to adopt some of the most energy efficient building codes in the country. Oregon's state codes are based on national model codes and usually incorporate additional energy efficiency measures. In 2019, Oregon was the first state in the country to adopt the "American Society of Heating, Refrigerating and Air-Conditioning Engineers (ANSI/ASHRAE/IES) Standard 90.1-2016, Energy Standard for Buildings Except Low-Rise Residential Buildings", (ASHRAE 90.1) as a mandatory, statewide, commercial energy code. Oregon has also been, and will continue to be, among the national leaders in energy efficiency for residential construction, having adopted the first mandatory, statewide residential energy code provisions in 1974.



Having an energy efficient code is only as successful as compliance with that code. Oregon's success is demonstrated in an Energy Code Field Study (ECFS)¹ funded by the Northwest Energy Efficiency Alliance (NEEA) and produced by Pacific Northwest National Laboratory (PNNL). The June 2020 ECFS showed new Oregon homes performed just 0.25% above anticipated annual Energy Use Intensity (EUI) under the previous residential energy code, the 2017 Oregon Residential Specialty Code (ORSC). This is demonstrated in the Figure ES.2. EUI is the measurement of how much energy a home uses annually, expressed in thousands of British Thermal Units (BTU's), divided by the square footage of the home

(kBtu/ft²). The higher the number, the more energy a home consumes per square foot. This ECFS, when compared to other studies in similar climate zones, demonstrates Oregon's position as a leader in energy efficient codes.²

All ECFS's use the United States Department of Energy (U.S. DOE) compliance study methodology³ as closely as possible. An ECFS is not available for Oregon's Commercial buildings. Only Florida, Nebraska, Iowa, and Nevada, in climate zones 2A and 5A, have had a commercial EFCS produced, the first of their kind published in January 2023.

¹ Oregon Residential Energy Code Field Study, June 2020. Funded by NEEA, produced by Pacific Northwest National Laboratory (PNNL), R. Bartlett, M. Halverson, and Y. Xie.

² 2019-2020 Washington Residential New Construction Code Study, June 2020. Funded by NEEA, produced by CLEAResult.

³ <https://www.energy.gov/sites/prod/files/2018/06/f52/bto-Res-Field-Study-Methodology-060618-2.pdf>

BCD Principles for Code Adoption

BCD has developed several principles to make sure the building code achieves its mission to create the foundation for safe, efficient, affordable buildings in Oregon. The principles that guide our work when considering building code revisions are listed in Appendix A. Through the continued development and implementation of advanced energy codes, BCD is committed to supporting the reduction of GHG emissions, as it has since BCD's inception in 1974.

Code adoption process

BCD's code adoption process ranges from 12 to 18 months and includes printing of the code. BCD incorporates various opportunities for stakeholders and members of the public to engage in the code change process. Under existing statutory authority, BCD is required to obtain advisory board approval for any code update. This process involves engaging with stakeholder representatives on the advisory boards along with public input at those board meetings. The boards are comprised of members ranging from the design and construction industries, building officials, public utilities, state agencies and the general public. See Appendix B of this report for board composition.

The relevant board generally kicks off the code adoption process by designating the model code that will be used for the code cycle, and by opening up a 45-day public proposal period, where code change proposals are solicited from the public. Additionally, to ensure a thorough review of proposed code amendments, a board may choose to appoint a committee of interested experts. After review, the code committee reports their recommendations back to the board for consideration. This process allows for public comment at the code committee level, the board level, and often, both.

Once a code change has been approved by the appropriate advisory board, BCD undertakes formal rulemaking. The policy is to include at least one public hearing on code adoption rules, providing another opportunity for public feedback. BCD sends out regular updates on code change processes and maintains a website with all code change information. BCD also sends out notifications to its subscriber lists and publishes all opportunities for the public to engage in the process.

In addition to the opportunities for public engagement in the code change process, existing statute provides the opportunity for any member of the public to present a code amendment at any time, at any board meeting. These amendments do not need to be timed with an existing code cycle, and have been successfully used by stakeholders to include revisions into the code before the next scheduled code update.

This open and transparent process, over an extended period of time with numerous opportunities for input, ensures that an effective and efficient code is promulgated which works for all Oregonians whether the building is constructed in an urban center such as Portland, or a rural community such as the City of Burns.

BOARDS

Board of Boiler Rules

Building Codes Structures Board

Construction Industry Energy Board

Electrical and Elevator Board

Mechanical Board

Residential and Manufactured
Structures Board

State Plumbing Board

Board archives

Completed to Date

Commercial

The 2021 Oregon Energy Efficiency Specialty Code (OEESC), Chapter 13 of the Oregon Structural Specialty Code (OSSC), became effective April 1, 2021. ASHRAE 90.1-2019 serves as the construction provisions for the OEESC. Code update training was produced and made available on [BCD's Commercial energy code compliance, training, and resources webpage](#).

Per ODOE's State of Oregon Fact Sheet⁴, "*New commercial buildings built to ASHRAE Standard 90.1-2019 save energy and experience lower operational costs, which results in lower utility bills for building owners and businesses. The results shown below are weighted averages for prominent commercial building types across all climate zones in Oregon*".⁵

Metric	Commercial Buildings ⁶	
	Public Buildings	Private Buildings
Annual reduction in energy bills (\$/ft ²)	\$0.04	\$0.04
Added construction cost (\$/ft ²)	\$(1.01)	\$(1.01)
Present value of replacement costs (\$/ft ²)	\$(1.93)	\$(1.84)
Net present value of LCC savings (\$/ft ²)	\$3.59	\$3.14
Simple payback	Immediate	Immediate

BCD is currently working with the Construction Industry Energy Board (CIEB) to adopt the next version of the OEESC. The OEESC adoption process started with the publication of ASHRAE 90.1-2022 published Jan. 25, 2023. The anticipated adoption date is Jan. 1, 2024 with a 6-month phase-in period. The process can be followed on the [OEESC adoption webpage](#).

Residential

The 2023 Oregon Residential Specialty Code (ORSC), which includes Chapter 11 (Energy Efficiency), was approved by the Residential and Manufactured Structures Board (RMSB) on March 8, 2023 with an effective date of Oct. 1, 2023 including a phase-in period of six months ending March 30, 2024, per rule OAR 918-480-0005. The process is documented on the [ORSC adoption webpage](#).

According to the University of Oregon (UO), Energy Studies in Buildings Laboratory (ESBL) the 2023 ORSC improves approximately 19% over the 2021 ORSC and improves approximately 26% over the 2017 ORSC. The ESBL results also confirm that BCD is in compliance with EO 17-20, which requires that "*newly constructed residential buildings achieve equivalent performance as 2017 U.S. DOE Zero Energy Ready Standard (ZERH)*."

Finally, in compliance with Title III of the Energy Conservation and Production Act (ECPA) of 1976, as amended, BCD certified to U.S. DOE that the 2023 ORSC energy efficiency provisions equal, or exceed, those of the 2021 International Energy Conservation Code (IECC) for low-rise residential buildings.

⁴ ODOE's State of Oregon Fact Sheet, [Energycodes.gov/sites/default/files/2021-07/EED_1365_BROCH_StateEnergyCodes_states_OREGON.pdf](https://energycodes.gov/sites/default/files/2021-07/EED_1365_BROCH_StateEnergyCodes_states_OREGON.pdf)

⁵ Building Energy Codes Program (BECP). <https://www.energycodes.gov/status/states/oregon>

Combined

Additionally, the ODOE Fact Sheet⁶, “Adopting the latest model codes in Oregon is estimated to reduce statewide greenhouse gas emissions (CO₂e) by 12,158,089 metric tons (MT) (over 30 years). For perspective, this is the equivalent to 2.6 million passenger vehicles, 3.1 coal power plants, or 1.5 million homes.” These numbers represent the cumulative savings of the 2021 IECC over the 2018 IECC and ASHRAE 90.1-2019 over ASHRAE 90.1-2016.

Metric	Residential Buildings*	Commercial Buildings**
First year statewide CO ₂ e reduction	18,664 MT	4,233 MT
Cumulative statewide CO ₂ e reductions (over 30 years)	9,111,207 MT	3,046,882 MT

Metric	Quantity
CO ₂	12,116,896 MT
CH ₄	651 MT
N ₂ O	87 MT
TOTAL (CO₂e)	12,158,089 MT

Finally, “Lower bills leave American families with more discretionary income, which when returned to local economies drives job creation. Jobs are also created through construction-related activities that result from the incremental costs of building more energy efficient buildings. State and local economies benefit from increased discretionary spending, as well as the associated construction activity.”

Value Stream	Number of Jobs (Over 30 Years)
Lower utility bills	4,959
Construction-related activities	4,691
TOTAL	9,650

Oregon exceeds the GHG emissions reductions and job creation data due to Oregon being one of the earliest states to adopt the newest version of ASHRAE 90.1, as it becomes available, and a home-grown residential code that perpetually exceeds the energy performance of the most current IECC.

⁶ ODOE’s State of Oregon Fact Sheet, [Energycodes.gov/sites/default/files/2021-07/EED_1365_BROCH_StateEnergyCodes_states_OREGON.pdf](https://energycodes.gov/sites/default/files/2021-07/EED_1365_BROCH_StateEnergyCodes_states_OREGON.pdf)

Current progress: 2023-24 code cycle

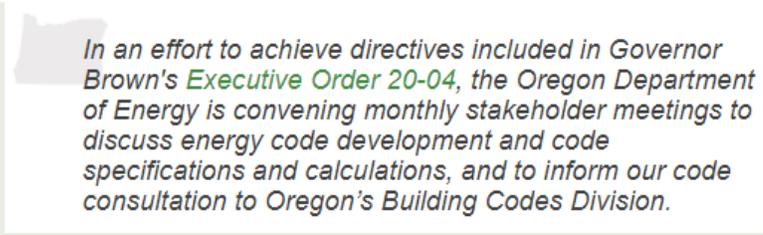
Directive 6(C)

This directive provides that BCD “*in cooperation with ODOE, is directed to agree on metrics, based on best practice and academic research, to inform the baseline and reductions associated with the code updates set forth in paragraph 6(B).*”

Directive 6(C) sets the foundation upon which directives 6(A) and 6(B) will be achieved. BCD and ODOE staff regularly collaborate on a variety of issues where there is overlap between BCD’s mission to “*create the foundation for safe, efficient, affordable buildings in Oregon,*” and ODOE’s vision of a safe, equitable, clean, and sustainable energy future. ODOE also has representation on the CIEB, providing guidance and directly affecting the forward trajectory of Oregon energy code provisions. The involvement of ODOE on CIEB is a critical component of that board, and their professional input into the process ensures that BCD maintains a leadership position relative to energy code development. The relationship between BCD and ODOE staff is synergistic and mutually beneficial. Staff from each agency regularly assist one another with programs, share policy information and ideas outside of EO directives, and collaborate on industry conference presentations.

Work between BCD and the ODOE has been ongoing as a result of EO 17-20, signed November 2017. Similar methodologies used for determining the U.S. DOE ZERH program and the ASHRAE equivalent performance levels, as required by EO 17-20, are the foundation of Directive 6(C) baselines for the 2006 Oregon residential and commercial codes.

Beginning in June 2020, BCD and ODOE conducted extensive reviews of the codes in place for the 2006 baseline and worked together to agree on the necessary metrics. The residential 2006 baseline was established in the summer of 2020. It is based on a combination of housing market characteristics for new construction and the



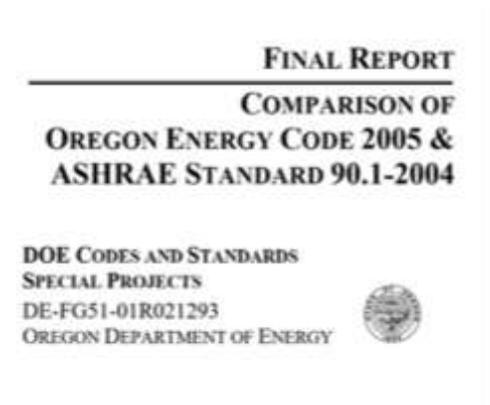
In an effort to achieve directives included in Governor Brown's Executive Order 20-04, the Oregon Department of Energy is convening monthly stakeholder meetings to discuss energy code development and code specifications and calculations, and to inform our code consultation to Oregon's Building Codes Division.

established methodology which U.S. DOE uses to make their determination that the next energy code will improve energy efficiency in residential buildings from the previous code. This work was presented and vetted through the [Oregon Energy Code Stakeholder Panel \(OECSP\)](#) meetings as further described below.

The OECSP has provided valuable input into baseline and metrics development. OECSP had met a total of 19 times and plans to meet quarterly into the future. The meetings have had between 30 and 40 stakeholders participate, giving substantive opportunities for public input from regional stakeholders. In addition to assisting in establishing the residential 2006 baseline, the OESCP stakeholder meetings have facilitated the beginning of the Reach Code process outlined in ORS 455.500, allowed for affordable housing discussions, legislative updates, training announcements, and other topics relative to energy efficiency in buildings.

In addition to the OECSP meetings, BCD and ODOE conducted monthly meetings with NEEA, to gain feedback on items such as prevailing federal minimum manufacturing standards⁷, and appropriate regional and marketplace adjustments to the residential baseline. Further feedback was also solicited from the U.S. DOE and incorporated into the process. For consistency purposes, it was determined that the methodology for EO 20-04 will be identical to the methodology used to determine EO 17-20’s prescriptive code requirement equivalencies.

⁷ <https://www.govinfo.gov/content/pkg/FR-2004-08-17/pdf/04-18533.pdf>



The commercial 2006 baseline was determined in the fall of 2020 with input gathered through the OECSP process. In order to determine the 2006 baseline, ODOE researched historical reporting and located a ODOE Report, *Comparison of Oregon Energy Code 2005 & ASHRAE Standard 90.1-2004*. After removing the unregulated loads from the report, ODOE determined that Oregon’s 2006 code approximated 4% better than ASHRAE 90.1-2004, the best commercial energy code at that time. This draft baseline determination was presented at the August 2020 OECSP meeting. Further discussions of the commercial 2006 baseline along with a high-level review of ASHRAE 90.1-2019 and its metrics relative to the 2030 goal occurred between BCD and ODOE. Finally, at the October 2020 CIEB meeting the 2005 baseline was

introduced, discussed, established, and the adoption of ASHRAE 90.1-2019 formally kicked-off for the next code cycle. BCD has held discussions with PNNL and established the metrics for ASHRAE 90.1-2019 and ASHRAE 90.1-2022 relative to our climate zones, 4C and 5B.

Both the residential and commercial 2030 targets have been set using statewide weighted averages based on construction types, permit activity, or population. The weighting used for the 2006 baseline will remain the same for the 2030 targets. BCD has described and documented the baseline methodologies used and they are available upon request. These baselines will be used to measure reductions for each code adoption under section 6(B), will be captured in the reporting requirements under that same section, and will create a path to reach the performance-based goals of EO 20-04.

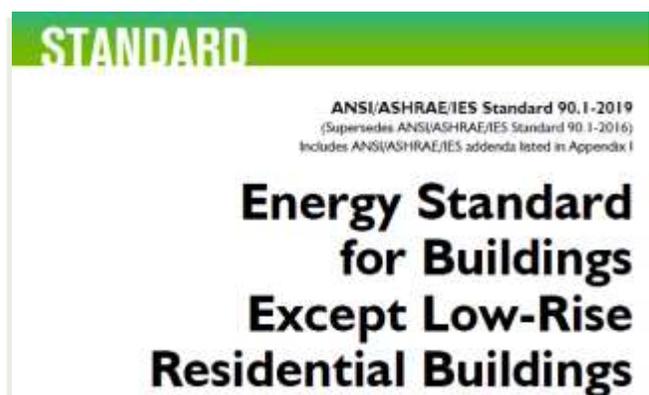
Directive 6(A)

This directive provides that BCD “*through its advisory boards and committees, and in cooperation with ODOE, is directed to adopt building energy efficiency goals for 2030 for new residential and commercial construction. That goal shall represent at least a 60 percent reduction in new building annual site consumption of energy, excluding electricity used for transportation or appliances, from the 2006 Oregon residential and commercial code.*”

Commercial: With the baseline established in the fall of 2020, BCD, through its advisory boards and committees, has officially adopted the 60% reduction goal for annual site consumption energy efficiency for 2030 from the 2005 OEEESC. The site energy use determined using best practices and academic research will become a metric of 1.0 for the commercial baseline, and the goal will be established as 0.40, or a 60 percent reduction. This approach has been communicated to the Building Codes Structures Board (BCSB) and the CIEB.

On April 1, 2021 ASHRAE 90.1-2019 became the mandatory, statewide, commercial energy code with a phase in period to October 1, 2021. ASHRAE 90.1 has been a benchmark for commercial building energy codes worldwide and a key basis for codes and standards around the world for more than 35 years.

By adopting this code, the State of Oregon became the first state in the country to adopt ASHRAE 90.1-2019. As stated earlier, BCD anticipates that at the Oct. 17, 2023 CIEB meeting, formal adoption of ASHRAE 90.1-2022 will begin, with an anticipated adoption date of Jan. 1, 2024 and a 6-month phase-in period. Oregon likely will, once again,



become the first state in the country to adopt the most recent ASHRAE Standard.

Residential: With the baseline established in the fall of 2020, BCD, through its advisory boards and committees, has officially adopted the 60% reduction goal for annual site consumption energy efficiency for 2030 from the 2005 ORSC. The metric will be 1.0 for the residential baseline and the goal will be 0.40, or a 60 percent reduction. This approach has been communicated to the RMSB and the CIEB.



BCD and its advisory boards began the process of adopting the 2023 ORSC in June of 2022. A code review committee was established over the summer and met over the fall to review draft energy efficiency provisions. BCD presented the code review committee with an energy package which aligns with Directive 4(C) of EO 17-20, directing the appropriate advisory board(s) and BCD “to conduct code amendment of the state building code to require newly constructed residential buildings to achieve at least equivalent performance levels with the 2017 U.S. Department of Energy Zero Energy Ready Standard by October 1, 2023.” In the spring of 2023, the RMSB approved the code review committee recommendations, which met the equivalent performance levels of ZERH (Figure A). As mentioned earlier, the code adoption date has been established as Oct. 1, 2023, with a phase-in period to March 30, 2024.

The BCD related directives in EO 17-20 had set out specific deliverables and timelines that generally align with existing BCD statutes, procedures, and processes. By using the prescriptive directives from EO 17-20, model codes, and leveraging this with existing and ongoing work, BCD anticipates that the performance-based goals of EO 20-04 are within reach. Challenges to continued success over the next two code cycles are discussed further down in this report. BCD has integrated the additional performance-based goals from EO 20-04 into the code adoption process while conducting stakeholder and industry outreach in order to overcome challenges and meet the goals set by BCD and EO 20-04.

Directive 6(B)

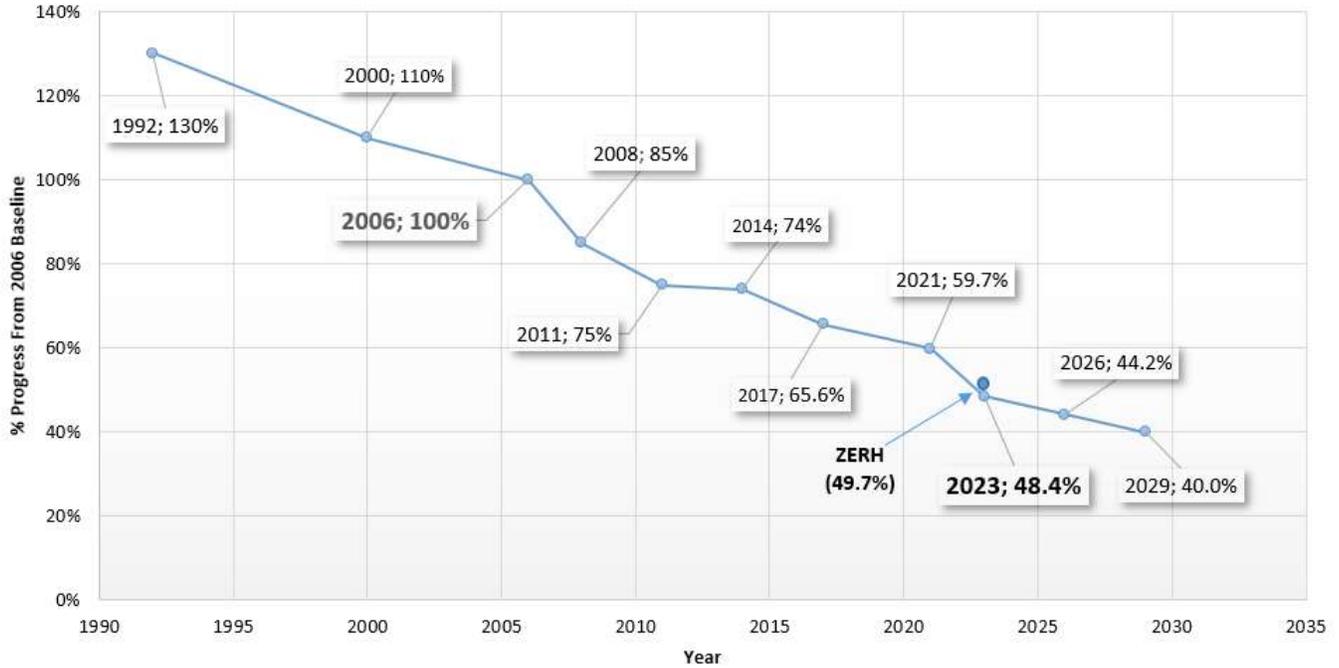
This directive provides that BCD “through its advisory boards and committees, and in cooperation with ODOE, is directed to evaluate and report on Oregon’s current progress toward achieving the goal for new residential and commercial buildings, pursuant to paragraph 6(A) of this Executive Order, and options for achieving steady progress toward the goal over the next three code cycles (2023, 2026, and 2029). Pursuant to its authority under ORS 455.500, BCD also is directed to update the Reach Code on the same timeline. No later than September 15, 2020, BCD should submit a report to the Governor on current progress and options for achieving the goals over the next three code cycles. The report should be updated every three years thereafter.”

BCD through its advisory boards and committees, and in cooperation with ODOE, has evaluated and is hereby reporting on Oregon’s current progress toward achieving the goal for new residential and commercial buildings, pursuant to Directive 6(A) above.

The appropriate advisory boards and BCD will also use this data to inform future decisions about code amendments, ensure that any increased costs in construction due to additional code requirements result in meaningful energy savings for Oregonians, while balancing affordability, as well as provide the basis for the Directive 6(B) reporting requirements.

Residential: For the residential aspect of this report, BCD contracted with the EBSL at UO to provide independent third-party verification of residential energy code progression. This also ensures that BCD is meeting its federal verification reporting for compliance with Title III of the Energy Conservation and Production Act (ECPA) of 1976.

**FIGURE A: Residential Oregon Energy Code - Regulated Energy in Buildings
Progress to 2030 Goal from Baseline Year of 2006**



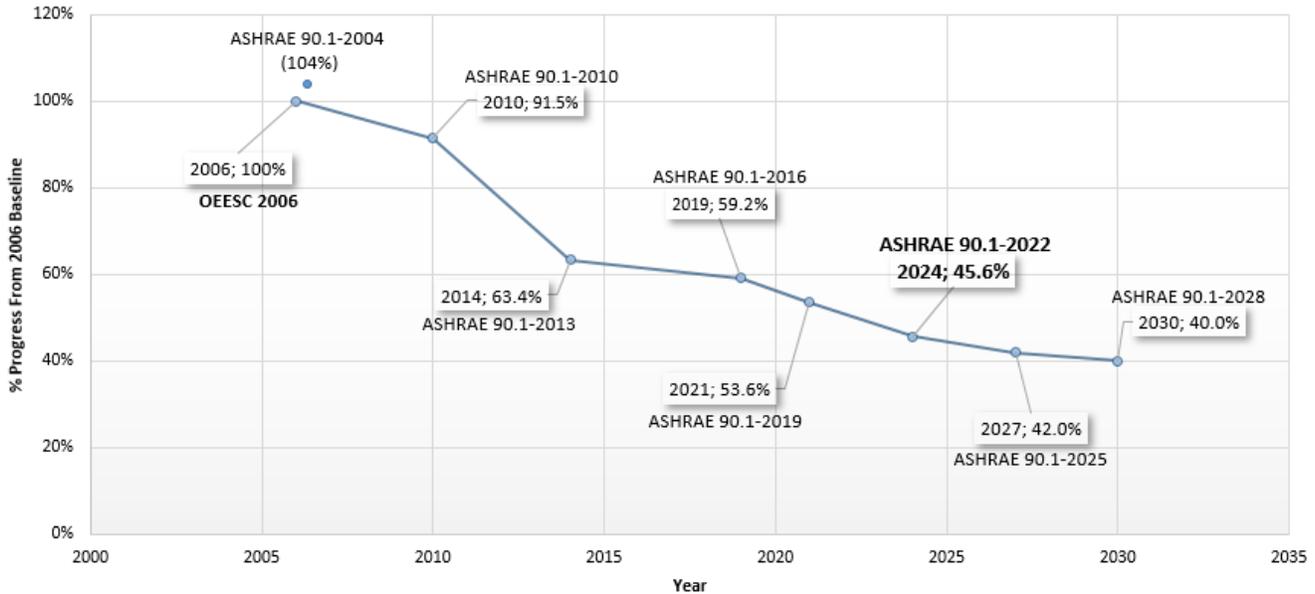
With the equivalent performance levels of ZERH being attained on Oct. 1, 2023, BCD reports the metric to be 0.484 from the baseline metric of 1.0, resulting in an additional 0.116 reduction to be achieved over the next two code cycles or approximately .058 per cycle. This represents an approximate 8.5-9.5% reduction in annual site energy consumption each cycle (2026 and 2029) over each previous cycle (Figure A).

Commercial: For the commercial aspect, BCD worked with PNNL to provide independent third-party verification of energy code progression. PNNL produces the reporting required for ASHRAE and their ECPA compliance needs. BCD will use EBSL and PNNL as the reporting mechanisms to measure progress towards the 60% reduction goal established by Directive 6(A) going forward. With the anticipated adoption of ASHRAE 90.1-2022 in 2024 BCD reports the metric to be 0.456 from the baseline metric of 1.0, resulting in an additional 0.144 to achieve over the next two cycles, or 0.072 per cycle. This represents an approximate 7.5-8.5% reduction in annual site energy consumption each cycle (2027 and 2030) over each previous cycle (Figure B).

BCD intends to continue to update the residential and commercial energy codes on approximately three-year cycles. Options for achieving steady progress toward these goals over the next two residential code cycles (2026 and 2029) and the next two commercial code cycles (2027 and 2030) are highlighted in the next section of this report.

- Current progress: 2023-24 code cycle -

**FIGURE B: Commercial Oregon Energy Code - Regulated Energy in Buildings
Progress to 2030 Goal from Baseline Year of 2006**



Reach Code: According to EO 20-04 under “BCD’s authority under ORS 455.500, BCD also is directed to update the Reach Code on the same timeline.” ORS 455.500 requires that the Reach Code be designed to increase energy efficiency, be “economically and technically feasible,” and use “published and generally accepted codes and standards.”

By statute, the Reach Code consists of optional construction standards that a builder may choose to use separate from the state building code. BCD initiated the [2021 Oregon Residential Reach Code \(ORRC\)](#) process on Nov. 2, 2020, including a standardized application form and modeling methodology guidelines for each submittal. Approximately 25 proposals were submitted from a variety of stakeholders. BCD analyzed these proposals, used the OESCP for further discussion in December, then produced a draft 2021 ORRC for consideration at a public meeting in January 2021. BCD then produced a final draft of the ORRC which was presented to the RMSB and CIEB at a combined meeting on March 16, 2021. On Aug. 6, 2021, the 2021 ORRC became effective. Internal modeling shows that utilization of the 2021 ORRC results in a 19-25% improvement over the 2021 ORSC.

On Jan. 10, 2022, BCD initiated the [2022 Oregon Commercial Reach Code \(OCRC\)](#) process, similar to the 2021 ORRC process above. On May 25, 2022 a public code review meeting was held and the 2022 OCRC was approved for adoption. The 2022 OCRC became effective on July 1, 2022. It is intended to achieve between 5-10% improved performance over the 2021 Oregon Energy Efficiency Specialty Code (OEESC), based on the measurement of regulated energy loads.

The aforementioned HB 3409 requires that BCD “update the Reach Code ... through rulemaking and after obtaining approval from the appropriate advisory boards to reflect incremental progress toward the goals of EO 20-04 each time the Department of Consumer and Business Services updates the statewide building code and applicable specialty codes.” BCD began rulemaking on September 5, 2023 and anticipates the Reach Code to stagger the base code adoption process by three to six months, since it is best practice to develop a Reach Code after the base code has been established. Thus BCD, after appropriate advisory board approval and rulemaking, intends to update the Reach Code on three-year cycles in alignment with the code adoption cycles.



- Challenges over the next two code cycles -

Directive 7(D)

Third-Party Validation for Cost Savings. This directive provides that ODOE, “*in cooperation with BCD, is directed to contract with a third-party consulting firm to assess cost implications, including long-term energy cost savings, of the energy efficiency and building code actions set forth in paragraph 6(A)-(B) of this Executive Order*”.

EO 20-04 directed ODOE, in cooperation with BCD, to contract with a third-party consulting firm to assess cost implications, including long-term energy cost savings, of the energy efficiency and building code actions set forth in Directives 6 (A-B).

Currently, when adopting code, the relevant advisory board must make a determination that “*the added cost, if any, is necessary to the health and safety of the occupants or the public or necessary to conserve scarce resources*” (ORS 455.030). In addition, when filing administrative rules to adopt code changes, BCD, with input from the relevant board and code committee, must create a fiscal impact statement and a housing cost impact statement. The boards and BCD take these obligations to evaluate cost seriously, understanding the impact that increased construction costs can have on consumers. These cost considerations must be balanced against the safety and resource conservation considerations built into the board cost finding.

ODOE and BCD have investigated existing reports, assessments, and other documentation, determining that existing resources can be used to fulfill the intent of this section. For example, both NEEA and PNNL assess the energy savings of energy codes. NEEA completed a study of the 2006 residential baseline, the 2021 ORSC, and recommended code changes for the next two code cycles to achieve the goals of EO 20-04. In addition, ASHRAE, with support from U.S. DOE, assesses the commercial code and determines cost effectiveness as it develops each iteration of Standard 90.1, which is now the basis for the Oregon commercial energy code.

However, due to a wide range of incremental cost reporting by stakeholders in the residential code development processes, BCD and ODOE are currently discussing the development of a scope of work and budget to more accurately assess the cost implications of the 2026 and 2029 residential codes, especially as they relate to affordability and the concerns outlined in EO 23-04.

Challenges over the next two code cycles

Technology: One variable which is hard to predict, but that could impact our progress towards achieving the goals over the next two code adoption cycles, is the emergence of new technology. For instance, in 2017 the U.S. DOE’s Building Technologies Office’s (BTO) produced a report titled, “*Energy Savings Potential and RD&D Opportunities for Commercial Building HVAC Systems*”⁸ they identified “*18 high priority*



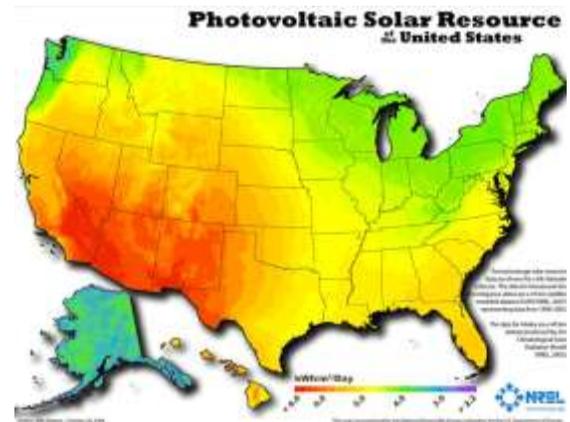
technology options for further evaluation that could provide significant HVAC energy savings in commercial buildings” and grouped them into four categories. They also “*developed a detailed profile of each technology that provides an overview of the technology, its current development status and key R&D efforts, projections of performance and energy savings, as well as other attributes that may affect its market uptake.*” BCD will use past and future reports such as these to develop cost effective strategies for achieving the EO 20-04 directives.

⁸ <https://www.energy.gov/sites/prod/files/2017/12/f46/bto-DOE-Comm-HVAC-Report-12-21-17.pdf>

- Challenges over the next two code cycles -

Two years prior, a report titled the “*Development of Maximum Technically Achievable Energy Targets for Commercial Buildings*”⁹, was produced by GARDAnalytics for ASHRAE. In their report, the maximum efficiency of technology (Max Tech) represents the highest efficiency either currently available or that can be reasonably expected to be available by 2030 by at least two manufacturers. By modeling 30 potential energy efficiency measures across 16 commercial building types, the report indicated that the Max Tech site energy reduction from ASHRAE 90.1-2013 was 45.3% for Oregon’s climate zones. This indicates that the 60% goal of EO 20-04 is within reach by 2030 when measured from 2006. However, energy reductions from unregulated loads will remain outside BCD authority. Many measures may also not be feasible or cost effective in every building type as the Max Tech study did not consider cost. While BCD can achieve the goals set by EO 20-04, attaining them may not be cost-effective and is addressed further down in the Affordability, Cost Effectiveness, and Housing Production section.

Renewable Energy: Recognizing that the Max Tech threshold is fast approaching with fewer cost-effective efficiency options for code adoption, model codes are looking to inclusion of on-site Renewable Energy (RE) systems on new buildings as one way to continue improvement of the energy codes. Although the cost of RE has dropped significantly over the last decade, the cost reductions are slowing over time and beginning to flatten. Additionally, cost effectiveness only occurs when incentives, such as rebates and tax credits, are applied. Solar production also varies widely across Oregon, impacting the cost effectiveness of the code in one corner of the state versus another.



Complicating code mandates further are matters which vary from geographical to statutory. Not all building sites have a solar resource, some structures (such as taller buildings), do not have enough roof space for solar to meet increasing code-minimum targets, and current statutes for renewable metering limit the application options for many building types. Another challenge remains, which is creating an equitable, enforceable method for offsetting renewable energy on those buildings which cannot install on-site renewable energy. Renewable Energy Credits (REC’s) are one option, but codes can’t enforce purchase of off-site REC’s after the building is occupied.

Air Quality: National experience with the COVID-19 pandemic, wildfire smoke events, and indoor contaminant concerns have renewed focus on indoor air quality for building occupants. The Oregon building codes already incorporate the most current ventilation standards. Addressing these multiple concerns could require contradictory building code measures. Moving beyond national ventilation standards could represent significant increases in energy use, undoing previous energy code progression. Some air quality solutions present extensive new costs to the consumer for operation and maintenance. BCD and its boards will continue to balance these factors to optimize health and energy outcomes in code.

Preemption: As referenced in a 2017 report titled “*Federal Preemption as a Barrier to Cost Savings and High Performance Buildings in Local Energy Codes*” written by New Buildings Institute, “When Congress first enacted the National Appliance Energy Conservation Act (NAECA) in 1975 to set national standards, they also disallowed states and other jurisdictions from setting their own more stringent standards on these same products” and “The Energy Policy and Conservation Act (EPCA) of 1975 extended preemption to certain HVAC and hot water equipment.”

For example, on July 27, 2023 the U.S. DOE published a proposed rulemaking, [EERE-2017-BT-STD-0019-0063](#), relative to the Energy Conservation Standards for Consumer Water Heaters. If approved as written, Electric Storage Water Heaters would have a minimum Uniform Energy Factor (UEF) of 2.3 where the modeled efficiency of the 2023

⁹ RP-1651 -- Development of Maximum Technically Achievable Energy Targets for Commercial Buildings, ASHRAE 2016

- Challenges over the next two code cycles -

ORSC requires a UEF of 0.64. A higher UEF means a water heater is more energy efficient and will cost less to operate. Once the proposed rulemaking is finalized, the effective date will be five years after the publication. This final rule is a critical piece to attaining the goals of EO 20-04.

Given this timeline for water heater efficiency, some states have explored a petition application for a waiver to preemption. U.S. DOE can [grant waivers of federal preemption](#) for particular state laws or regulations. Any state with a state regulation regarding energy-use, energy-efficiency, or water-use requirements for products regulated by U.S. DOE may petition for an exemption from federal preemption to apply its own state regulation. However, only California and Massachusetts have undertaken this process and both states were denied.

Affordability, Cost Effectiveness, and Housing Production

Cost effective strategies are essential since affordability will be a critical component to future energy code development cycles. Affordability has seen renewed focus for each code board during their code adoption reviews and has been a noted concern at every OECSP meeting thus far. Developing a more efficient energy code will certainly lead to higher home prices and thus a higher mortgage payment, which must be balanced against the long-term energy savings.

The Oregon Office of Economic Analysis presented a report titled, “[Addressing Oregon’s Housing Shortage](#)”, on March 10, 2023 at the HPAC. The report stated that 54% of Oregon households which rent do not have enough residual income left over after paying for housing. Thus, the majority of Oregonians are unable to save for a down payment on a home.

Further, according to the U.S. Census Bureau, Oregon’s Household Area Median Income (AMI), from 2017-2021 is [\\$70,084](#) (in 2021 dollars). The often-referenced [28% rule](#) notes that a household should not spend more than that percentage of their monthly gross income on their mortgage payment, including property taxes and insurance. This translates to a mortgage payment of \$1,635 per month, including PMI. At an interest rate of 6.75%, an average cost of annual insurance of [\\$943](#), and an Oregon property tax rate of 0.9%, the median household can afford to purchase a home priced at [\\$207,000](#), with 5% down, equaling a \$1,635 monthly payment (Figure C). However, per data provided to BCD by CoreLogic, the average home sold in Oregon is \$387,500, a \$180,500 disparity for the AMI household. Metropolitan regions face a higher disparity with homes averaging over \$500,000.

Figure C

Estimated payment	\$1,634 /mo
Loan amount	\$196,650
Down payment	\$10,350
Interest rate	6.75%
Loan term	30 years
Taxes & insurance included?	Yes
Property tax	0.9%/yr
Homeowner's insurance	\$943/yr
Mortgage insurance	\$125/mo

- Challenges over the next two code cycles -

A BCD analysis of the proposed changes for the 2023 ORSC indicated an approximate incremental construction cost increase of approximately \$1,450, with an approximate annual energy savings of \$185, or \$15 per month. The final sales price to the homeowner is likely double the construction cost, or \$2,900. The additional sales price to the consumer adds approximately \$15 a month to a typical 30-year mortgage payment, a breakeven scenario for this code cycle. The 8-9% energy use improvements required in future codes cycles will be more difficult and more expensive to attain, meaning the breakeven scenario which occurred this cycle will be challenging to achieve in future cycles.

It is important to recognize that, after mortgage payments, a home's energy bills are the largest component of home ownership and the cost of decarbonizing the grid will also increase the cost to the consumer. Additionally, the unregulated loads in a home are fixed, so they won't be impacted by energy code advancements. The percentage of unregulated loads has gone from 14% in 2006 to 24% in 2023 and will continue to increase each cycle, thus making cost-effective reductions to the regulated portion of the energy code a perpetual challenge. The same is true for multi-family housing.

As BCD balances increased energy code construction costs versus energy savings to the owner, the building code is generally not the most significant driver of the current affordability crisis. More significant drivers are land (zoning, availability, off-site construction costs) and market (supply versus demand and interest rates) related. Harvard University published the *State of the Nation's Housing 2023*¹⁰ report, finding that single-family homebuilding has declined significantly, causing supply issues, while multi-family construction has remained strong. The report also recognizes that *"more lower-cost housing is clearly needed, but expanding development will require zoning reform to support a broader range of housing types and investments in off-site construction methods that could reduce development costs."*

Nonetheless, it remains critical that BCD strike a balance between the cost of home ownership, federal preemption, technological advances, and air quality, along with the long-term operation of a home, its resiliency, GHG emissions, and marketplace demands of consistency and predictability. Oregon can be proud of its 50 years of national leadership in providing safe, efficient buildings and BCD will continue with a balanced approach to implementing EO 20-04 and compliance with HB 3409.

Options for achieving the goals over the next two code cycles

The performance-based 60% reduction goal will be accomplished via regularly scheduled code updates which take place on approximately three-year cycles. Current statutory authority will allow BCD, with its stakeholder advisory boards, to continue to adopt increasingly energy efficient codes on a predictable timeline. This will maintain Oregon's place as a national leader for both residential and commercial energy efficiency, reduce the built environment's energy consumption, which in turn reduces atmospheric emissions, and establishes a path for Oregon buildings to achieve net-zero energy use.

BCD boards will maintain their role in energy efficiency leadership by continuing to adopt and update energy codes in Oregon on a predictable three-year schedule, based on the most recent published versions of national model codes. The commercial energy code will continue to be based off the most recent published version of ASHRAE 90.1, while the residential energy code will continue to advance the existing Oregon residential energy code provisions, which exceed published national model codes. BCD will continue to work with the boards to make amendments as necessary to meet the goals as outlined in EO 20-04, having met the goal of EO 17-20.

BCD intends to continue the stakeholder process established with ODOE. The OECSP meetings will provide additional opportunities for input from affected stakeholders. This collaboration has been valuable for determining

¹⁰ Harvard Joint Center for Housing Studies. The State of the Nation's Housing 2023 (Page 9).
https://www.jchs.harvard.edu/sites/default/files/reports/files/Harvard_JCHS_The_State_of_the_Nations_Housing_2023.pdf

- Conclusion -

metrics and measurement for Directives 6(A) and 6(B) and led to the establishment of baselines required by Directive 6(C). BCD also intends to independently continue working with all relevant stakeholders, and will continue collaboration with other state agencies through staff communications, board meetings, committees, and workgroups as needed. BCD will continue these practices to execute the directives contained in EO 20-04 and HB 3409.

Conclusion

BCD is excited to be a part of Oregon's leadership on reduction of GHG emissions. While the built environment's impact on GHG emissions is largely indirect, more efficient homes and commercial buildings benefit all Oregonians. BCD and its boards take pride in Oregon's place as national leader in energy efficiency, and intend to continue that leadership with cutting edge, cost effective updates to the codes.

BCD recognizes that we cannot get there alone. It is only with our expert board member volunteers, government partners, and robust public participation that we are going to achieve the ambitious goals laid out in this Executive Order. We are well on our way, and we are up to the challenges we will face going forward.

Appendix A

BCD Principles for Code Adoption

BCD has developed several principles to make sure the building code achieves our mission, which is to work with Oregonians to ensure safe building construction while supporting a positive business climate. Here are some of the principles that guide our work when considering revisions to the building code:

Take a long view. A long-term strategy ensures predictability in the code. Code cycles generally vary from 3-6 years, and different states can be at different stages in the code cycle at a given time. It takes significant time to develop revisions to the code, and it is important to ensure stakeholders, boards, labor, and industry have the time and space to develop the best possible standards.

Coordinated approach. Oregon relies on builders, labor, contractors, and stakeholders to participate in policy work by leading the discussion through the seven advisory boards that assist in directing code adoption. Their expertise results in a better building code. Adopting the building code is not enough, labor and industry have to be trained to follow the code, and inspectors have to be trained to ensure compliance with the code. Rigorous training for labor, industry and inspectors mean that from the beginning of a project to its completion, all parties involved have the tools necessary to ensure the standards that are carefully developed through the code process are followed. BCD doesn't just set policy goals, it achieves them.

Focus on performance and choice. It is important in the building code not to create narrow paths that benefit particular companies or industries, but to instead ensure construction practices are the safest and most efficient for all buildings in Oregon. Proponents of proprietary products, testing, and inspection techniques may have incentives beyond what is safest, most efficient, and most cost effective. BCD's duty to all Oregonians, including labor, industry, and other stakeholder groups is to focus on creating choices to achieve technically feasible, safe, efficient, and cost-effective buildings.

Evidence based. BCD collects evidence and best practices from across the nation and the world to develop codes that best suit Oregonians. Our goal is always to rely on good research to make evidence-based decisions.

Independent verification. BCD uses an independent review process to verify that Oregon is achieving its efficiency goals. First through the University of Idaho, and now through the University of Oregon, BCD submits the commercial and residential energy codes for review to ensure Oregon is on pace to remain a national leader and that BCD is making data driven decisions about efficiency standards.

Consistency across the state. Any building in this state, whether urban, rural, affordable or extravagant, has the benefit of the same minimum efficiency standards. All Oregonians should have the benefit of a safe, affordable, and efficient home. This advantage of consistent, predictable codes, creates extremely high compliance rates and is part of what makes the Oregon model unique. Other states may say they have adopted a particular cutting-edge code, but if local jurisdictions never adopt it, state or local inspectors never enforce it, and labor is not trained to it, it is only as good as the paper it's written on. That's not the case in Oregon.

Appendix B

Board composition

State Plumbing Board ORS 693.115 Seven members	A journeyman plumber with 10 or more years of experience in the trade
	A licensed plumbing contractor
	A local plumbing inspector who is also a journeyman plumber
	A registered professional mechanical engineer
	An officer or employee of the Oregon Health Authority
	A plumbing equipment supplier who otherwise qualifies to sit on the board by industry experience OR a building official
	A member of the general public
Construction Industry Energy Board (CIEB) ORS 455.492 Eleven members	Two members of the Electrical and Elevator Board who have electrical experience, to be selected by the Electrical and Elevator Board
	Two members of the RMSB who have practical experience in either the residential structure industry or the manufactured structure industry, to be selected by the RMSB
	Two members of the BCSB with practical experience in construction, to be selected by the BCSB
	Two members of the Plumbing Board with practical experience in construction, to be selected by the Plumbing Board
	Two members of the Mechanical Board with practical experience in construction, to be selected by the Mechanical Board
	An employee or officer of ODOE appointed by the director of the ODOE
Mechanical Board ORS 455.140 Ten members	A representative of the plumbing industry
	A sheet metal and air conditioner installer
	A municipal mechanical inspector with the highest level of certification issued by DCBS
	A Heating Ventilation and Air Conditioning Contractor
	A Heating Ventilation and Air Conditioning Installer
	A Sheet Metal and air conditioner installer
	An insulation craftsman with experience with heat and frost insulation
	A representative of a natural gas company or other utility
	A member of the general public not receiving a compensation from any interest represented by one of the other represented stakeholders
	At least one member of the board must be an owner or operator of a contracting business with 10 or fewer employees at the time of their appointment
Electrical and Elevator Board ORS 455.138 Fifteen members	A fire and casual underwriter
	A representative of industrial plants regularly employing licensed electricians
	A representative of the power and light industry
	An electrical equipment supplier who otherwise qualifies by experience and training in the industry
	Two journeyman electricians
	An electrical inspector
	Two electrical contractors
	A municipal building official
	A journeyman elevator installer
	An owner or manager of a commercial office building
A member of the general public not receiving a compensation from any interest represented by one of the other represented stakeholders	

- Appendix B -

Residential and Manufactured Structures Board (RMSB) ORS 455.135 Eleven members	A contractor specializing in the construction of residential structures
	A contractor specializing in remodeling of residential structures
	A contractor specializing in multifamily structures three stories or fewer above grade
	A home designer or architect
	A building official
	A representative of residential building trade subcontractors
	A structural engineer
	A representative of a utility or energy supplier
	A manufacturer of manufactured dwellings
	A seller or distributor of manufactured dwellings
A member of the general public not receiving a compensation from any interest represented by one of the other represented stakeholders	
Building Codes Structures Board (BCSB) ORS 455.132 Nine members	An architect or engineer
	A general contractor specializing in buildings more than three stories above grade A contractor specializing in heavy industry construction
	A representative of the building trade
	A representative of a utility or energy provider A representative of a fire protection agency
	A building official
	An owner or manager of a commercial office building
A representative selected from a list of individuals recommended by the Oregon Disabilities Commission	

FOR MORE INFORMATION CONTACT

Oregon Building Codes Division
P.O. Box 14470
Salem, OR 97309-0404
503-378-4133 (main)
800-442-7457 (toll-free)

<https://www.oregon.gov/bcd/codes-stand/Pages/energy-efficiency.aspx>

