

2018

WASHINGTON STATE ENERGY CODE Progress toward 2030

Progress toward Reducing Energy Consumption in Buildings
Required by RCW 19.27A.160 (ESSSB 5854, Chapter 423, Laws of 2009)

2018 Report to the Legislature
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Executive Summary:

On-Track Incremental improvement in the 2015 Washington State Energy Code

The Washington State Building Code Council (Council) submits this report to the Legislature as required by RCW 19.27A.160. The report addresses progress toward a 70 percent reduction in net annual energy consumption in newly constructed residential and nonresidential buildings by 2031, compared to the 2006 Washington State Energy Code (WSEC),

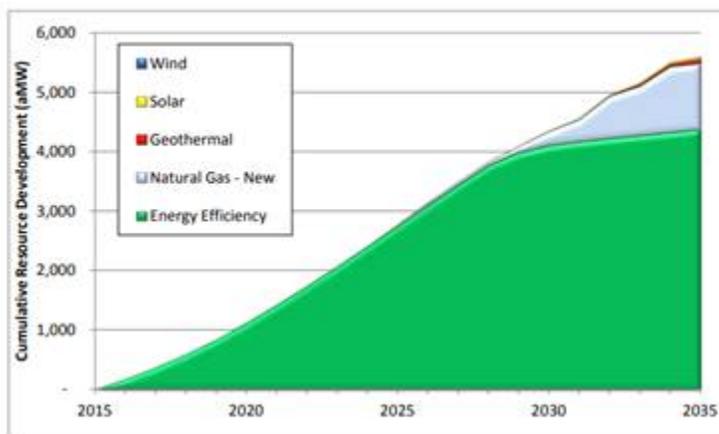
Building energy efficiency is the single largest factor in the region’s future electric needs.

“The Northwest Power Act defines cost-effective energy efficiency as the resource of first choice when considering new resources.” From 2021 Regional Power Plan

<https://www.nwcouncil.org/regional-power-planning-pacific-northwest>

Also from: https://www.nwcouncil.org/sites/default/files/7thplanfinal_allchapters_1.pdf

Figure 1 - 1: Seventh Plan Resource Portfolio¹



The 2018 WSECs are an incremental improvement over the 2015 codes. The 2018 WSECs are predicted to achieve between ** and ** percent cumulative energy savings for all new buildings compared to the 2006 WSEC and an estimated incremental savings between ** and ** percent for residential and between ** and ** percent for commercial from the 2015 codes.

A major impediment to the acceptance of the ever-increasing building energy consumption reduction is training for the designers, contractors and those responsible for compliance. A major impediment to training is funding. Adequate funding, or at least increased funding, will have immediate results in reducing building energy consumption.

Significant Measures

Significant measures for the Commercial Energy Code adopted by the Council that save energy compared to the 2015 WSEC:

Section/Subject	Energy Saving/Year

Significant measures for the Residential Energy Code adopted by the Council that save energy compared to the 2015 WSEC:

Section/Subject	Energy Saving/Year
R402.4.1.2 Testing: Air leakage testing is standardized to a set ceiling height. An exception has been added for testing of some multi-family buildings.	***
R402.4.2.1 Gas fireplace efficiency: A new requirement for a minimum efficiency standard for fireplaces is added.	***
R403.1.3 Continuously burning pilot lights: A new general section is added to prohibit continuously burning pilot lights.	***
R403.3.6/R403.3.6.1 Buried ducts: A new section is added dealing with ducts buried in attic insulation.	***
R403.3.7 Ducts located in conditioned space: This new section sets requirements for ducts to be considered within conditioned space.	***
R403.7 Equipment sizing and efficiency rating: Language stating equipment had to meet federal requirements is replaced with a reference to the commercial efficiency tables with said requirements.	***

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R405.3 Performance based compliance: Site energy use has been replaced with carbon emissions as a measuring metric for this compliance method. The emissions thresholds were adjusted to correlate with the requirements of Section R406 for other compliance methods. ***

R406 Additional energy efficiency requirements: This section has been significantly revised. The number of points has increased for all residences, and an additional equalization factor has been added based on the carbon emissions of the installed heating (New Table R406.2). Table R406.3 (previously R406.2) has been reformatted for clarity, moving the footnotes into the body of the table and revising the numbering of the options. The options and credits have been revised to base them on energy savings—each half point is roughly equivalent to 600 kWh. New options have been added for triple pane windows (1.2), a 49% UA reduction (1.6), advanced framing with 0.28 windows (1.7) tighter envelopes with ERV (2.4), various heat pump systems (3.5, 3.6), ducts buried in ceiling insulation (4.1), drain water heat recovery systems (5.1), heat pump water heating systems (5.4, 5.5, 5.6), and high efficiency appliances (7.1). HVAC efficiency requirements were modified based on federal minimums. The option for low flow fixtures has been removed since this is now a base requirement. ***

R407 Certified: Two passive house standards are now included as compliance options, PHIUS and PHI. ***

Method

The SBCC conducted a national search for a consultant to evaluate building performance improvements as well as unregulated energy loads affecting buildings over the 2006 to 2018 code time. The SBCC consulted with Ecotope.

To model the energy consumption, Ecotope followed the framework developed by the Regional Technical Forum as well as processes used to develop the State's residential energy code. Ecotope also relied on historical studies including building stock assessments, metering studies, and surveys. The consultant used EnergyPlus and Simple Energy Enthalpy Model programs to produce annual energy use estimates from all regulated and unregulated loads. Batch modeling processes were used to complete over 200 residential and 90 commercial modeling runs to simulate each prototype under various combinations of location, HVAC system, and code year.

Estimated Energy Savings

The estimated energy savings reported here were derived from the *Modeling the Washington State Energy Code – 2006 & 2018 Baseline Energy Consumption* report. See Appendix A.

Outlook

The Council continues making steady progress to achieve the goal of 70 percent net annual reduction in building energy consumption by 2031. The Council is mindful that with each code cycle the cost to achieve the additional energy reduction is higher than it was for the previous code.

Background

The WSEC is based on a national model code that is less energy efficient than the WSEC, therefore, the State adoption process requires significant work prior to considering new energy saving amendment proposals. This preliminary process alone requires approximately *** staff and volunteer hours.

Completing the code adoption process involves multiple additional steps of code development including technical advisory group review and revision, the Council's Mechanical Ventilation and Energy Standing Committee review, Council approval of proposed rules, public comments and hearings, and final action.

Transparency throughout the process is crucial requiring extensive staff support.

The public process for code development represents a major time commitment for preparation, meetings and reporting.

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The energy code has historically drawn opposition due to differences in political and economic philosophies. Full consideration of these opposing perspectives has resulted in additional staff and volunteer time as well as the need, at times, for legal counsel.

The law mandates continuous improvement to energy efficiency in buildings. However, the law also states that if economic, technological, or process factors impede adoption, the Council may defer adoption, and that all measures must be cost effective to building owners and tenants. Various stakeholders disagree on whether or not the new rules increasing energy efficiency in buildings are cost effective, and those who believe they are not advocate for deferral stating the economic burden and technological unknowns do not justify new regulations.

The Council does not operate in isolation. State law also directs the Department of Commerce to develop and implement a strategic plan for enhancing energy efficiency, which must be used to help direct the future code increases in RCW [19.27A.020](#), with targets for new buildings consistent with RCW [19.27A.160](#). While this legislation anticipates that the plan will help inform the WSEC update process, funding that would enable the anticipated level of planning and guidance from Commerce is lacking.

The Council consists of 15 voting members appointed by the Governor, four ex-officio legislators appointed by the Legislature, and the chief electrical inspector. The Council provides independent analysis and objective advice to the Legislature and the Governor's Office on state building code issues.

The Council establishes the minimum building, mechanical, fire, plumbing and energy code requirements necessary to promote the health, safety and welfare of the people of the state of Washington by reviewing, developing and adopting the state building code.

The Council updates the state building codes every three years, on schedule with updated editions of the national model codes. There was a one time extension to four years for the 2018 codes to accommodate a revision in the SBCC review process. The Energy Related Building Standards law (RCW 19.27A) directs the Council to update the Washington State Energy Code every three years, synchronized with the code development cycle. In each cycle, the Council must make an incremental step toward the 70 percent reduction by 2030.

Energy Code Development Process

The Council relies on a large number of volunteers to develop energy code amendments, submit proposals, participate in the technical review, and submit testimony for SBCC consideration at final adoption.

- Of *** proposals received, ** were significant energy saving proposals; the remainder were either editorial clarifications or not approved. Of the ** significant proposals, * were not adopted.

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- The ** members of the Energy Code Technical Advisory Group each logged between 60 to 80 hours of meeting time and countless additional hours of review time over a **-month period.
- The Council used a form requiring more detailed information about energy savings and cost for each proposal. See Appendix *.

State and Federal Law on Building Energy Codes

The Washington State Legislature and the Governor's Office have directed the state Building Code Council to adopt energy codes. Federal Law also requires the state to meet minimum standards.

Targets set by the Climate Pollution Reduction--Energy Efficiency Act of 2009

The goal to reduce energy savings by 70 percent compared to 2006 by 2030 relates to an initiative of the American Institute of Architects (AIA). The AIA's Architecture 2030 Challenge was adopted in 2009 by the Washington State Legislature. As emphasized in testimony by Washington Environmental Council, Washington is one of nine states to adopt the Architecture 2030 initiative. According to the Architecture 2030 website, only California and Washington have adopted the 2030 challenge as mandatory for all buildings; other states have adopted Architecture 2030 for government buildings or directed that the challenge must be considered during administrative code adoption.

- Energy-Related Building Standards Law (RCW 19.27A)
- The Legislature directed the Council to reduce energy consumption in buildings, as codified in RCW 19.27A.160 **Residential and nonresidential construction — Energy consumption reduction — Council report:**

(1) Except as provided in subsection (2) of this section, residential and nonresidential construction permitted under the 2031 state energy code must achieve a 70 percent reduction in annual net energy consumption, using the adopted 2006 Washington State Energy Code as a baseline.

(2) The Council shall adopt state energy codes from 2013 through 2031 that incrementally move towards achieving the 70 percent reduction in annual net energy consumption as specified in subsection (1) of this section. The Council shall report its progress by December 31, 2012, and every three years thereafter. If the Council determines that economic, technological or process factors would significantly impede adoption of or compliance with this subsection, the Council may defer the implementation of the proposed energy code update and shall report its findings to the Legislature by December 31st of the year prior to the year in which those codes would otherwise be enacted.

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The International Energy Conservation Code (IECC) is the base model energy code adopted by the state of Washington. The IECC defines buildings in terms of “commercial” and “residential.”

- Residential buildings are defined as detached one and two family dwellings and multiple single family dwellings (townhouses) as well as apartment buildings three stories and less in height.
- Commercial buildings are defined as all buildings other than residential buildings, and include residential apartment buildings over three stories.

RCW 19.27A.150: Strategic plan—Development and implementation.

- (1) To the extent that funding is appropriated specifically for the purposes of this section, the department of commerce shall develop and implement a strategic plan for enhancing energy efficiency in and reducing greenhouse gas emissions from homes, buildings, districts, and neighborhoods. The strategic plan must be used to help direct the future code increases in RCW [19.27A.020](#), with targets for new buildings consistent with RCW [19.27A.160](#). The strategic plan will identify barriers to achieving net zero energy use in homes and buildings and identify how to overcome these barriers in future energy code updates and through complementary policies.
- (2) The department of commerce must complete and release the strategic plan to the legislature and the council by December 31, 2010, and update the plan every three years.

Federal law influencing state code development and adoption

Federal law requires states to periodically certify that the energy code adopted in their jurisdiction meets or exceeds specific national reference standards. ¹ This certification is to be submitted to the Secretary of the U.S. Department of Energy (DOE). The most recent rules require each state to report that their adopted commercial building energy code meets or exceeds American Society of Heating, Refrigerating and Air conditioning Engineers (ASHRAE) Standard 90.1-2013.

1-42 U.S.C 6833(b)(2)(B)(i)

Commercial Buildings

On Sept. 26, 2014, DOE issued a determination that Standard 90.1-2013 would achieve greater energy efficiency in buildings subject to the code. DOE estimates national savings in commercial buildings of approximately:

- 8.7% energy cost savings
- 8.5% source energy savings
- 7.6% site energy savings

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State Certification

Upon publication of an affirmative determination, States are required to certify that they have reviewed the provisions of their commercial building code regarding energy efficiency, and, as necessary, updated their codes to meet or exceed the updated edition of Standard 90.1.

Additionally, DOE provides guidance to States on submitting certification statements and requests for deadline extensions. State certifications for Standard 90.1-2013 **must be submitted by September 26, 2016.**

Residential Buildings

On **June 11, 2015**, DOE issued a determination that the **2015** IECC would achieve greater energy efficiency in buildings subject to the code. DOE estimates national savings in residential buildings of approximately:

- 0.73% energy cost savings
- 0.87% source energy savings
- 0.98% site energy savings

State Certification

Upon publication of an affirmative determination, States are required to certify that they have reviewed the provisions of their residential building code regarding energy efficiency, and made a determination as to whether it is appropriate for them to revise their code to meet or exceed the updated edition of the IECC. Additionally, DOE provides guidance to States on submitting certification statements and requests for deadline extensions. State certifications for the **2015** IECC must be submitted by **June 12, 2017**

Equipment Efficiency

Federal efficiency standards for building heating and cooling equipment must be applied. For residential and small commercial equipment this is primarily regulated by restricting the manufacture and sale of the equipment. Any minimum efficiency that is referenced in the energy code must be consistent with the minimum federal standards. For commercial energy codes this largely means adopting the minimum equipment efficiency tables listed in the most recent edition of ASHRAE Standard 90.1.

Most Recent Washington Certification

The most recent state certifications were submitted to the Department of Energy **July 2013** by the Washington State Department of Commerce, State Energy Office. This certified that the state code in general provided greater energy efficiency than the commercial building reference standard ASHRAE 90.1 – 2010 and the residential standard, the 2012 International Energy conservation code. There were a few specific measures where Washington did not meet the federal standards.¹

¹ Washington State Department of Commerce, 2012 Washington State Energy Code compared to National Reference Standards, July 2013. <http://www.commerce.wa.gov/Documents/2012-energy-code-comparison.pdf>

Washington amendments to the 2018 IECC

2018 Energy Code Development

The Council relies on individuals and interest groups to submit proposals to improve the WSEC and meet the goals set by the Legislature. A complete list of proposals is posted on the Council website. [Full list of code change proposals link](#). The amendment proposals include information on proponents, specific code language and data on the cost and benefit where the amendment has an impact.

Number of proposals	Approved as submitted	Approved as modified	Disapproved	Withdrawn
154	44	72	18	20

Of 116 proposed amendments integrated into the proposed rule:

- 15 were substantive
- 9 of those had a significant cost and benefit
- The remaining 101 items were editorial clarifications.

Technical Advisory Group (TAG) activities

The Energy Code TAG held 12 meetings in 2018-2019, each work session was typically 5 hours long. The TAG was composed of 21 members, plus several alternates, with 14 – 18 members typically in attendance at any one meeting, depending on the discussion topic. Proponents were invited to make a short presentation of their proposal(s), after which any TAG members can make a motion and a second to approve it. Straightforward code improvements are often approved or modified within a few minutes, while more substantial or controversial proposals were debated for hours and often extensively modified in the process. Some proposals were tabled, and the proponents and opponents asked to return with more information or compromise proposals.

As part of proposing a code change, proponents were required to provide recommended changes to the code text and to complete an updated form (See Appendix D). This form asked the proponent to provide a statement justifying the code change and provide some general information of the cost and benefits associated with the proposal. Proposals were required to show economic information, data estimating costs and benefits. Many of the adopted proposals were extensively modified during the TAG and Council processes, which would have reduced the value of the original cost/benefit analyses.

Goals for Energy Code Development

Making buildings more energy efficient has been identified as a priority by the Legislature and the Washington State Building Code Council (Council).

- Improved energy efficiency:
- Saves money
- Creates good local jobs
- Enhances energy security
- Reduces pollution that causes global warming
- Speeds economic recovery
- Reduces need to invest in costly new generation

The Washington State Building Code Council (Council) finds that the following provides a guide to the Goals of the Washington State Energy Code (WSEC) per RCW 19.27A for both Residential & Nonresidential Buildings:

1. The WSEC must achieve a reduction in annual net energy consumption in buildings

- a. By 2030, the code must achieve a reduction of 70 percent compared to the 2006 Washington State Energy Code.
- b. Each code cycle, the Council must adopt a code requiring increasingly energy efficient homes and buildings
- c. The Council must determine and evaluate the costs and benefits of the WSEC

2. The Council must adopt more stringent energy codes

- a. The Legislature finds that energy efficiency is the cheapest, quickest, and cleanest way to meet rising energy needs, confront climate change, and boost our economy
- b. The Legislature promotes super-efficient, low-energy use building codes
- c. The law directs the council to review the Washington state energy code every three years.
- d. In addition, RCW 19.27A.020 states that the Washington state energy code shall be designed to: “construct increasingly energy efficient homes and buildings that help achieve the broader goal of building zero fossil-fuel greenhouse gas emission homes and buildings by the year 2031”

Amendments adopted by the council must increase the energy efficiency of newly constructed buildings.

3. The Council must evaluate and determine the costs and the benefits

- a. The Legislature finds making homes, businesses, and public institutions more energy efficient will save money, create good local jobs, enhance energy security, reduce

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pollution that causes global warming, and speed economic recovery while reducing the need to invest in costly new generation

- b. Any new measures, standards, or requirements adopted by the Council must be technically feasible, commercially available, and cost-effective to building owners and tenants.
- c. The Council has adopted a definition of cost-effectiveness based RCW 39.35 recommended by Department of Commerce
- d. Executive Order 14-04 from Washington Governor Jay Inslee directs the Council to “achieve early and widespread deployment of energy-neutral buildings prior to the 2031 statutory requirement in RCW 19.27A.160”
- e. A guide on how to evaluate cost-effectiveness is therefore defined by the Council as a code change that has a net present savings over a 50-year life-cycle of a building utilizing the Life Cycle Cost Tool (LCCT) as developed by the Washington State Office of Financial Management (OFM).

The method of the LCCT is based on the NIST Handbook 135 methodology and utilizes specific inputs as determined by the Council with guidance from the Washington State Department of Commerce.

- f. If the council determines that economic, technological, or process factors would significantly impede adoption of or compliance with incremental progress towards the 70 percent reduction in annual net energy consumption, the council may defer the implementation of the proposed energy code update and shall report its findings to the Legislature by December 31st of the year prior to the year in which those codes would otherwise be enacted.

4. The Council has established rules for amendment of the WSEC

- a. Residential energy code covers residential buildings including single family homes, townhouses, and multi-family buildings that are 3 stories and less.
- b. Commercial energy code covers all non-residential buildings and residential buildings that are 4 stories and more.
- c. The International Energy Conservation Code is the base document for the development of the WSEC. Washington state amendments are integrated into the base document.
- d. In considering amendments to the state energy code, the Council established and consulted with a technical advisory group including representatives of appropriate state agencies, local governments, general contractors, building owners and managers, design professionals, utilities, and other interested and affected parties

Life Cycle Cost Analysis of Energy Code Measures

Evaluating costs and benefits

In order to evaluate proposals to improve energy efficiency in buildings, the Council adopted the Life Cycle Cost Tool ([LCCT-Appendix B](#)) developed by the Washington State Office of Financial Management (OFM). All measures must be cost effective, and the Council determined that a net present savings over a 50 year period meets the cost effectiveness criteria.

The Council established an Economic Workgroup to review the proposed amendment and the economic criteria. The workgroup met twice to review the TAG recommendations. The workgroup is composed of Council members. Minutes and meeting documents for the Economic Workgroup are available on the Council website.

Some members of the workgroup expressed concern over the 50 year life cycle. For some of the measures, 50 years exceeds the expected life of the equipment. Future replacements costs and available technology are not known. The Workgroup did adopt the goals stated earlier in Section 3 of this report, with an explanation that the Life Cycle Cost Analysis would factor in equipment replacement costs and use an agreed upon set of parameters for inflation, discounts, and fuel escalation among other costs.

The methodology used to calculate the energy savings achieved through code for a large population of buildings is that used for development of the Northwest Power Plan. This method is most appropriate for documenting the costs and savings for broad application of the energy code. The NPPC model has accurately forecast energy use in the region for several decades.

In some cases, costs for measures based on estimates provided by code amendment proponents varied widely. In those cases, the Council considered a range of costs and values such as years to positive cash flow as well as net present value. Information on the Life cycle cost analysis presented during the 2018 code adoption is available on the Council website.

New Measures Bring Incremental Improvements

An initial estimate of savings under the 2018 WSEC provides some round figures based on initial proposals, TAG review and input, and public testimony.

A comparison between the 2006 code and the 2018 code was performed to provide an accurate representation of savings, and then the actual energy use of new construction should be monitored to validate the estimates. See Appendix *

For residential buildings, defined as one and two family and town houses regulated by the International Residential Code, and apartment buildings three stories and under, the incremental improvements have followed the more aggressive progress and appear to exceed the steady incremental savings target.

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For commercial buildings, which include all buildings not covered by residential, the progress has followed the steady track and appears to fall just outside the target. The state law directs the Council to “incrementally move toward” the 70 percent reduction in energy use. The improvement targets are based on equivalent savings in each three year cycle through 2030.

Moving toward 2021 and 2031 targets for building energy savings

The Council has already begun considering the 2021 codes, including the 2021 energy code. The code development process involves several stages over the three year cycle, all of which must engage stakeholders and be transparent:

- Preliminary process to examine national model code and align proposed updates with state mandates. The 2021 IECC, on which Washington will base the 2021 WA Energy Code, will soon be published.
- Technical advisory group review and revision
- Council approval of proposed rules
- Public process, including taking public comments and holding hearings
- Final revision and action

The path to achieve the 70% energy use reduction required by 2031 (RCW 19.27A) will involve continuing and accelerating the transformation of the building industry. While training is not the purview of the Council, we understand that this significant transformation requires robust training to be successfully implemented. The energy code has become more complex and incorporates more testing and skill and will continue to do so as we get closer to 2031. This will need to be paired with increasingly robust funding of training for designers, contractors, trades, and other parties to implement the energy codes.

There are several new considerations that have a relationship with the energy code development:

- 2019 Clean Buildings Law. This requires audits and potential retrofits of new and existing buildings that use more energy than the average building of that type. Deep energy retrofits will fall under the energy code as will new buildings built under the new energy code that do not meet the energy use targets. Rule-making is ongoing and the state building code council should be proactive to ensure that new buildings built to code are likely to meet the energy use targets.
- 2019 Clean Energy Transformation Act. This requires electric utilities to supply Washington customers with carbon neutral electricity by 2030, with limited offsets

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possible. By 2045, utilities must supply Washington customers with electricity that is 100% renewable or non-emitting, with no provision for offsets. This means that the carbon emissions from Washington buildings that do not combust fossil fuels will reach zero within the reasonable lifetime of buildings built under current and future codes. RCW 19.27A.020 states that the Washington state energy code shall be designed to: “construct increasingly energy efficient homes and buildings that help achieve the broader goal of building zero fossil-fuel greenhouse gas emission homes and buildings by the year 2031.” With the electricity sector required to have zero fossil fuel emissions, this means that the code council has a pathway to achieve zero fossil fuel greenhouse gas emissions homes and buildings by pursuing efficient electrification.