

2015

WASHINGTON STATE ENERGY CODE **Progress toward 2030**

Progress toward Reducing Energy Consumption in Buildings
Required by ESSSB 5854, Chapter 423, Laws of 2009

December 2015 Report to the Legislature

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WASHINGTON STATE ENERGY CODE Progress toward 2030

Table of Contents

Executive Summary	1
New Measures	3
Methods & Data	4
Background	8-15
State & Federal Law	9-11
Washington State Amendments	12
Council Goals for Code Development	14-15
Life Cycle Cost Analysis of Energy Code Measures.....	16-17
Moving Toward 2018 Targets	18-19

Appendix A: [Final cost benefit analysis](#)

Appendix B: [OFM life cycle cost tool](#)

Appendix C: [Energy Code Technical Advisory Group](#)

Appendix D: [Washington State Building Code Council Application for Review of a Proposed Statewide Amendment to the Washington State Building Code](#)

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.

On Track to Meet Savings Targets for 3-year cycle (2012-2015)

For the 2015 adoption cycle, the goal was to achieve between 26 and 36 percent cumulative energy savings for all new buildings compared to the 2006 WSEC. An incremental savings between 3 and 12 percent for residential and between 8 and 18 percent for commercial was needed to achieve the goal for the 2012-2015 cycle. RCW 19.27A.160 directs the council to move incrementally toward the 70 percent goal with each WSEC update.

At the final adoption in November 2015, the Council modified several of the 14 WSEC amendments with the most significant impact on energy use. Based on initial estimates, the Council believes final adoption of these amendments achieves the incremental savings needed to achieve the goal for the 2012-2015 cycle. Further study of the expected savings is needed to confirm initial estimates.

WASHINGTON STATE ENERGY CODE Progress toward 2030

New measures adopted by the Council save energy compared to the 2006 WSEC:

Proposal Number	Proponent	Section/Subject	Energy Saving/Year
<u>15-E009</u>	Tacoma Public Utilities	R403.7.1 Ductless mini-split heat pumps	2.19 kWh/ft ²
Requires one and two unit dwellings and townhouses using over 2kW electric resistance heat to include a ductless heat pump.			
<u>15-E012 (Mod 2)</u>	Department of Commerce	R406.2 Additional Requirements	Approximately 6 percent per credit
Requires additional credits from a menu of energy saving options. Number of credits required depends on size of the residential building.			
<u>15-E070 & E69</u>	Ecotope Northwest Energy Efficiency Alliance	C403.2.6.1 Dedicated Outdoor Air Systems (DOAS)	40-50 % reduction in ventilation and space conditioning energy use where installed in specific buildings
Specifies an alternate mechanical system, effective in 2017			
<u>15-E098</u>	Kennedy Northwest Energy Efficiency Alliance	C405.14 Controlled Receptacles	0.49 kWh/ft ² small office 0.61 kWh/ft ² large office
Requires an occupant sensor or time of day control to turn off receptacle power for 50 percent of receptacles not designated for 24 hour use.			
<u>15-E114</u>	Kennedy Northwest Energy Efficiency Alliance	C405.4.2 Lighting Power Allowance	1.2 kWh/ft ² to 6.0 kWh/ft ²
Reduces interior lighting power allowances			
<u>15-E121</u>	New Buildings Institute	C406 Additional package options (two options required)	Approximately 3 % savings per option package (total 6%)
Commercial buildings required to comply with at least two additional efficiency packages.			

Methods

To document the costs and savings for broad application of the energy code, the Council uses the same methodology adopted for the Northwest Power Plan. This calculation involves energy savings achieved through code for a large population of buildings over time. The Northwest Power Planning Council model has accurately been used to forecast energy use in the region for several decades.

In some cases, costs for energy efficiency 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 the number of years to positive cash flow as well as net present value (NPV), which is a calculation that analyzes costs and savings over a 50-year period.

Additional information on the life cycle cost analyses presented during the 2015 code adoption is available on the Council website.

Estimating Energy Savings

Savings are estimates based on data and life cycle cost analysis presented to the Council by proponents of new amendments.

Historically the utilities have used the current code to model conservation savings. A more precise estimate of energy savings achieved by the 2015 WSEC may be available in 2016. When more data is available, with comparison between the 2006 code and the 2015 code, the Council may update the report.

Outlook

The Council continues making steady progress, but must address a number of process, economic and technical factors to achieve the goal of 70 percent net annual reduction in building energy consumption by 2031.

Process Factors

Significant workload, diminishing resources

- The WSEC is based on a national model code which is less energy efficient than the WSEC so the State adoption process requires significant work prior to considering new energy saving amendment proposals. This preliminary process alone requires 1,000 staff hours.
- Completing the full adoption process involves multiple additional steps of code development including technical advisory group review and revision, Council approval of proposed rules, public comments and hearings, and final action.
- Due to limited funding, the Council is supported by only four staff members.
- The State Building Code Council fund reserve is diminishing, so less staff support is likely be available for the 2018 code development cycle.

Process and transparency factors

- Transparency in the technical review of proposals is crucial, and requires extensive staff support.
 - The public process for code development represents a major time commitment for preparation, meetings and follow-up reporting.
 - The energy code draws opposition due to differences in political and economic principles, and full consideration of these opposing views requires additional time for meetings and correspondence.

Technical Factors

- To adequately support the open and transparent process necessary to achieve mandated Energy Code improvements, funding for expert-level staff support is needed. Needs include:
 - Research on contentious issues or new technologies.
 - Collecting objective information on construction costs, energy savings, product availability and employment impacts.

WASHINGTON STATE ENERGY CODE Progress toward 2030

- The Council members are established in statute and represent a diversity of backgrounds involved in building design, construction, regulation and policy. The Council covers codes with a focus on fire safety, seismic safety, public health and accessibility in addition to energy conservation.
 - Without an objective source of technical expertise providing specific information on energy codes, the Council only hears the partisan views from proponents and opponents.
 - The Council would benefit from objective, in-depth studies of promising energy code advances, with recommendations for optimal implementation.
 - Current staff support the council by performing duties related to regular meeting requirements that provide documentation of, and access to, all meetings.
 - For the Energy Code Technical Advisory Group (TAG) and Committees to be properly supported, there is need for additional expertise on the council for energy analysts, sustainability consultants, commissioning agents, and/or other design professionals to lead the development of the WSEC. This could be accomplished via additional funding to provide additional staff or contracted services.

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.

Economic Factors

- The Council adopted a definition of “cost effective” to be a positive net present value (NPV) based on a 50 year time frame using the Office of Financial Management (OFM) method of calculating NPV.
- The method includes assumptions for capital, construction, maintenance, utility and interest amounts.
- The calculation weighs cost and energy use to evaluate if an investment in a proposed measure pays back over time.
- Construction cost estimates, which are used in the calculation of the NPV for both current and future investments, are highly variable.

WASHINGTON STATE ENERGY CODE Progress toward 2030

- Actual cost can vary based on manufacturer, geographical location, inflation rates and other factors.

Other Factors

- 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 as they say the economic burden and technological unknowns do not justify new regulations.
- Costs for measures were based on estimates provided by code amendment proponents. Upon review at the TAG and Economic Workgroup, some of the cost data was disputed and varying costs presented. 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. Several measures showed a range of over 1,000 percent difference between conflicting estimates of life cycle cost, which had an effect on the final adoption. Council members with professional construction experience use their best judgment to inform the decision making process.

Background

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. 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 154 proposals received, 15 were significant energy saving proposals; the rest were either editorial clarifications or not approved. Of the 15 significant proposals, 3 were not adopted.
- The 21 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 six-month period.
- The Council used an updated form requiring more detailed information about energy savings and cost for each proposal.

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.

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.

WASHINGTON STATE ENERGY CODE Progress toward 2030

- 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

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.

WASHINGTON STATE ENERGY CODE Progress toward 2030

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 2015 IECC

a. Process of transition from 2012 WSEC to 2015 IECC

The 2015 IECC with 2012 Washington amendments served as the base document for further improvements to meet Washington state goals.

As a base document the 2015 IECC provided a good standard for energy savings, but there are unique features in the 2012 WSEC that contribute additional energy savings beyond that achieved by the IECC. To adopt the 2015 IECC without incorporating elements of the 2012 WSEC would have resulted higher energy use in new buildings than are allowed under the existing code.

The council initiated the energy code development process in October 2014 by creating a base code document that combined the features of the 2012 WSEC and the 2015 IECC. This base document was known as the Integrated Draft. During approximately 10 hours of meetings, the Energy Code Technical Advisory Group (TAG) reviewed and refined the staff markup of the Integrated Draft, which then served as the basis for public code change proposals. In general, the 2015 IECC provisions were accepted except where existing WSEC provisions were already more stringent, and in a few instances where the TAG had been given specific direction otherwise from earlier legislative or Council decisions.

Link: [Full list of code change proposals](#)

b. 2015 Energy Code Development

The Council relies on 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. 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.

TAG activities

The Energy Code TAG held 12 meetings in 2014-2015, each work session typically 5 hours long. The TAG is composed of 21 members, plus several alternates, with 14 – 18 members typically in attendance at any one meeting, depending on the discussion topic. Proponents are invited to make a short presentation of their proposal, 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 are debated for hours and extensively modified in the process. Some proposals are 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.

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

WASHINGTON STATE ENERGY CODE Progress toward 2030

- 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 methodology 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 2015 code adoption is available on the Council website.

New Measures Bring Incremental Improvements

An initial estimate of savings under the 2015 WSEC provides some round figures based on initial proposals, TAG review and input, and public testimony.

A comparison between the 2006 code and the 2015 code needs to be performed to provide an accurate representation of savings, and then the actual energy use of new construction should be monitored to validate the estimates.

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.

WASHINGTON STATE ENERGY CODE Progress toward 2030

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 2018 targets for building energy savings

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
- Technical advisory group review and revision
- Council approval of proposed rules
- Public process, including taking public comments and holding hearings
- Final revision and action

Challenges

The Council faces several challenges in moving forward to the next level of energy efficient building code.

Concurrent work requirements

Implementation of the current code overlaps with development of new proposals for the next round.

- The 2015 WSEC will be effective on July 1, 2016.
- The deadline for new proposals to the 2018 International Energy Conservation Code was Jan. 11, 2016.

Also during this time frame:

- Other portions of the state building code must be implemented.
- The Council must conclude rulemaking on an amendment to the state fire code that allows local fire departments, which are required by the state Liquor and Cannabis Board to inspect marijuana processing and extraction facilities, to issue permits for such facilities.

Resources

Funding for the Council activities comes from a building permit fee that has not changed since 1989.

The staff support is at half the 1990 level and will be further reduced without an increase in the fee.

WASHINGTON STATE ENERGY CODE Progress toward 2030

Meanwhile, as technology advances, building code issues are becoming more complex. Staffing needs include an energy code coordinator responsible for conducting research and gathering case studies on energy improvements. The Council and the public would benefit from timely and objective information, in addition to staff support to maintain – and even improve – access and transparency.