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2011 Strategic Plan for Enhancing Energy Efficiency and Reducing Greenhouse Gas Emissions from Homes, Buildings, Districts and Neighborhoods

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List of Abbreviations

AIA - American Institute of Architects

ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers

BPA - Bonneville Power Administration

CELC - Washington Clean Energy Leadership Council

Commerce - Washington State Department of Commerce

DOE – U.S. Department of Energy

ICC - International Code Council

IECC - International Energy Conservation Code, International Code Council, Washington D.C., (date indicates the edition of the code if needed)

IGCC - International Green Construction Code (version) , International Code Council, Washington D.C. (version number if the reference is needed)

NAHBRC - National Association of Home Builders Research Center

NEEA - Northwest energy Efficiency Alliance

NEEC - Northwest Energy Efficiency Council

NPCC -Northwest Power and Conservation Council

PNNL - Pacific Northwest National Laboratory

SBCC - Washington State Building Code Council

Standard 90.1 - Standard 90.1 -- Energy Standard for Buildings Except Low-Rise Residential Buildings (ANSI Approved; IESNA Co-Sponsored), American Society of Heating, Refrigerating and Air-Conditioning Engineers

Standard 189.1 - Standard 189.1 - 2010 Standard for the Design of High-Performance Green Buildings (ANSI Approved; USGBC and IES Co-sponsored), American Society of Heating, Refrigerating and Air-Conditioning Engineers, 2010

WABO - Washington State Association of Building Officials

WSEC – Washington State Energy Code

WSU Energy Program - Washington State University Extension Energy Program

Strategic Plan for Enhancing Energy Efficiency and Reducing Greenhouse Gas Emissions from Homes, Buildings, Districts and Neighborhoods

Executive Summary

In 2009 Senate Bill 5854 was passed by the Washington State Legislature and signed by the Governor. Included in this bill are specific energy consumption reduction targets to be achieved through adoption of improved energy codes. The bill, now codified in RCW 19.27A.060, directed the Washington State Building Code Council to develop energy codes that achieve a 70 percent reduction in building energy use by 2030 compared to the 2006 Washington State Energy Code. To support this effort the bill directs the Department of Commerce to develop and implement a strategic plan that will support achievement of these energy use reduction targets. This strategic planning process is to be completed every three years. This is the first of the triennial strategic plans that will be developed to support reducing energy use and greenhouse gas emissions from buildings.

This strategic plan was developed with input from a wide range of interest groups. Commerce, with support from the State Building Code Council organized a work group of interested parties that provided input through a series of workshops and internet meetings. This began with work shop participants determining the priorities for the current strategic work plan. Then, based on this prioritization Commerce provided information on specific subject areas and took input from the stakeholders interested in those areas. Input from this work group informed the development of the final recommendations.

This report provides recommendations for activities that will help achieve the energy reduction targets established by the State legislature in 19.27A.060. This includes recommended activities for Commerce, the State Building Code Council and other interested parties. The recommendations cover the following subject areas:

- Development of a public benefits statement supporting the implementation of building energy codes;
- Adoption of a methodology to measure progress toward the building energy reduction targets;
- Recommendation for the development of a voluntary “aspirational” energy code as a supplement to the mandatory minimum energy code requirements;
- Enhancements to the existing performance-based energy codes and consideration of additional reporting requirements for benchmarking existing commercial buildings;
- Supporting workforce training efforts through the Evergreen Jobs Leadership Team;
- Evaluation of financial mechanisms that could enhance energy efficiency retrofits in existing buildings;
- Enhancing market recognition of the value of homes constructed to the most recent edition of the energy code;
- Development of recommendations for the cost and benefits statements that would be required to support any code changes made by the State Building Code Council; and

- Continued improvement of efforts to support energy code enforcement through classes, circuit rider trainings and the development of a third party inspection program.

In addition, Commerce lays some groundwork for developing specific energy code change proposals for the 2012 State Building Code Council code development cycle. State Building Code Council staff will begin this process by preparing a reference draft of the Washington State Energy Code in a new format based on the International Energy Conservation Code. This will be followed by the development of code change proposals that meet the targets included in RCW 19.27A.060.

Enabling Legislation

In 2009 Senate Bill 5854 was passed by the Washington State Legislature and signed by the Governor. The reason statement provided in the bill provides good context for the balance of this report. It is as follows:

> Sec. 1. 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. More than thirty percent of Washington's greenhouse gas emissions come from energy use in buildings. 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 can spur its economy and assert its regional and national clean energy leadership by putting efficiency first. Washington can accomplish this by: Promoting super efficient, low-energy use building codes; requiring disclosure of buildings' energy use to prospective buyers; making public buildings models of energy efficiency; financing energy saving upgrades to existing buildings; and reducing utility bills for low-income households.

Included in this bill are specific energy consumption reduction targets to be achieved through adoption of improved energy codes. Codified in RCW 19.27A.160, the legislature directed the Washington State Building Code Council (SBCC) to develop energy codes as follows:

> 1) Except as provided in subsection (2) of this section, residential and nonresidential construction permitted under the 2031 state energy code must achieve a seventy 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 seventy 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.

To support this path to reduce energy use in the built environment the Legislature directed the Washington State Department of Commerce (Commerce) to develop a *"strategic plan for enhancing energy efficiency in and reducing greenhouse gas emissions from homes, buildings, districts, and neighborhoods".* The Legislature has directed Commerce to provide input on a range of subjects directly related to the energy code and complementary activities that support reducing energy use in the built environment. This strategic plan is to be updated every three years. This thee year planning cycle is designed to provide a strategic planning period between each code development cycle implemented by the SBCC. The following is the legislation directing Commerce to complete this strategic plan.

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.

(3) The strategic plan must include recommendations to the council on energy code upgrades. At a minimum, the strategic plan must:

(a) Consider development of aspirational codes separate from the state energy code that contain economically and technically feasible optional standards that could achieve higher energy efficiency for those builders that elected to follow the aspirational codes in lieu of or in addition to complying with the standards set forth in the state energy code;

(b) Determine the appropriate methodology to measure achievement of state energy code targets using the United States environmental protection agency's target finder program or equivalent methodology;

(c) Address the need for enhanced code training and enforcement;

(d) Include state strategies to support research, demonstration, and education programs designed to achieve a seventy percent reduction in annual net energy consumption as specified in RCW 19.27A.160 and enhance energy efficiency and on-site renewable energy production in buildings;

(e) Recommend incentives, education, training programs and certifications, particularly state-approved training or certification programs, joint apprenticeship programs, or labor-management partnership programs that train workers for energy-efficiency projects to ensure proposed programs are designed to increase building professionals' ability to design, construct, and operate buildings that will meet the seventy percent reduction in annual net energy consumption as specified in RCW 19.27A.160;

(f) Address barriers for utilities to serve net zero energy homes and buildings and policies to overcome those barriers;

(g) Address the limits of a prescriptive code in achieving net zero energy use homes and buildings and propose a transition to performance-based codes;

(h) Identify financial mechanisms such as tax incentives, rebates, and innovative financing to motivate energy consumers to take action to increase energy efficiency and their use of on-site renewable energy. Such incentives, rebates, or financing options may consider the role of government programs as well as utility-sponsored programs;

(i) Address the adequacy of education and technical assistance, including school curricula, technical training, and peer-to-peer exchanges for professional and trade audiences;

(j) Develop strategies to develop and install district and neighborhood-wide energy systems that help meet net zero energy use in homes and buildings;

(k) Identify costs and benefits of energy efficiency measures on residential and nonresidential construction; and

(l) Investigate methodologies and standards for the measurement of the amount of embodied energy used in building materials.

(4) The department of commerce and the council shall convene a work group with the affected parties to inform the initial development of the strategic plan.

Other Relevant Legislation

State Requirements

It is important to recognize one other feature recently added to the energy-related building standards, RCW 19.27A.170. This section established requirements for commercial ***building energy disclosure*** at time of sale or lease or application for lending. This section is noted here as a complementary process that will be further addressed in the strategic plans recommendations.

As well as this strategic plan for the built environment, Commerce is leading an effort to revise the ***State Energy Strategy***, Washington's comprehensive energy plan for meeting our future energy needs. 2010 legislation (E2SHB 2658) directed the revision of the state energy strategy and declared that a successful strategy must balance three goals to 1) Maintain competitive energy prices; 2) Foster a clean energy economy and jobs; and 3) Meet obligations to reduce greenhouse gas emissions. Commerce completed work on the State Energy Strategy Update and delivered it to the Governor's Office and the Legislature in December 2010. The Update offers 17 short-term policy initiatives that can work together to fill gaps in existing policy, and encourage development of Washington's clean energy economy. To access this planning effort and information on the full revision due December 2011, it is recommended that interested parties begin by accessing this web page: http://www.commerce.wa.gov/energystrategy/

Energy Independence Act, chapter 19.285 RCW. Washington's Initiative 937, passed by voters in November 2006, requires the state's major electric utilities to acquire all cost-effective energy conservation resources in their service territories beginning in 2010. Every two years beginning in 2010 each major electric utility is required to prepare a 10 year conservation plan and set biennial conservation targets. The adoption of new editions of the energy code help utilities meet their biennial conservation targets and reduce the number of efficiency measures that must be acquired through utility programs. Utilities may count their proportionate share of savings from state building code improvements towards their conservation targets during the biennium in which the code becomes effective. Also, the efficiency measure adopted and implemented through code will not be included in the next 10 year utility conservation plan. In addition, utilities may invest in energy efficiency pilot programs implementing new technologies. Utility and customer experience with new technologies is invaluable when assessing whether those technologies may be adopted into future editions of the energy code.

RCW 70.235 Limiting greenhouse gas emissions sets specific targets for greenhouse gas emissions reductions. This includes a return to 1990 emissions levels by 2020, by 2035 reduce emissions to 25% below 1990 levels and by 2050 reduce emissions to 50% below 1990 levels. Improving building efficiency has been identified as one of the strategies that will reduce greenhouse gas emissions and help meet these targets.

Federal Requirements

The ***Energy Policy and Conservation Act (EPCA, 42 USC 6833)*** recognized two model energy codes to be used for energy code comparisons. Each time a new edition of the model energy code is published by American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) and International Code Council (ICC), the U.S. Department of Energy (DOE) is to determine if the new edition will save additional energy compared to the previous edition. After DOE determines that a code has improved, each state is to provide comment back to DOE on the status of the state adopted code compared to the model code. Washington, through the SBCC, has always provided a positive determination relative to the national model codes. The most recent editions of the EPCA reference energy codes are as follows:

- ANSI/ASHRAE/IESNA Standard 90.1 – 2010 for non residential buildings
- 2009 International Energy Conservation Code for residential buildings

American Recovery and Reinvestment Act of 2009 (ARRA) also included requirements for state energy codes. In 2009, as a condition of receiving funding from the American Recovery and Reinvestment Act, all state Governors signed agreements to adopt and demonstrate 90 percent compliance rates by 2016 with national reference energy codes or a state equivalent. Washington State has adopted an energy code that will meet or exceed the national model codes. Washington still must conduct evaluations of code compliance in the field that demonstrates 90 percent compliance by 2016.

Pacific Northwest Electric Power Planning and Conservation Act, (16 U.S.C. § 839-839h, 1980) The Act establishes the Pacific Northwest Electric Power and Conservation Planning Council (NPCC)and directs the NPCC to adopt regional energy conservation and electric power plan and a program to protect, mitigate and enhance fish and wildlife on the Columbia River and its tributaries. The Act also sets forth provisions the Bonneville Power Administrator must follow in selling power, acquiring resources, implementing energy conservation measures, and setting rates for the sale and disposition of electric energy. The implementation of the act has been instrumental in the development of research and demonstration projects that lead to the adoption of the Washington State Energy Code. Specifically, the NPCC developed the Model Conservation Standards that were the basis for much of the 1990 WSEC.

Setting Energy Use Reduction Targets

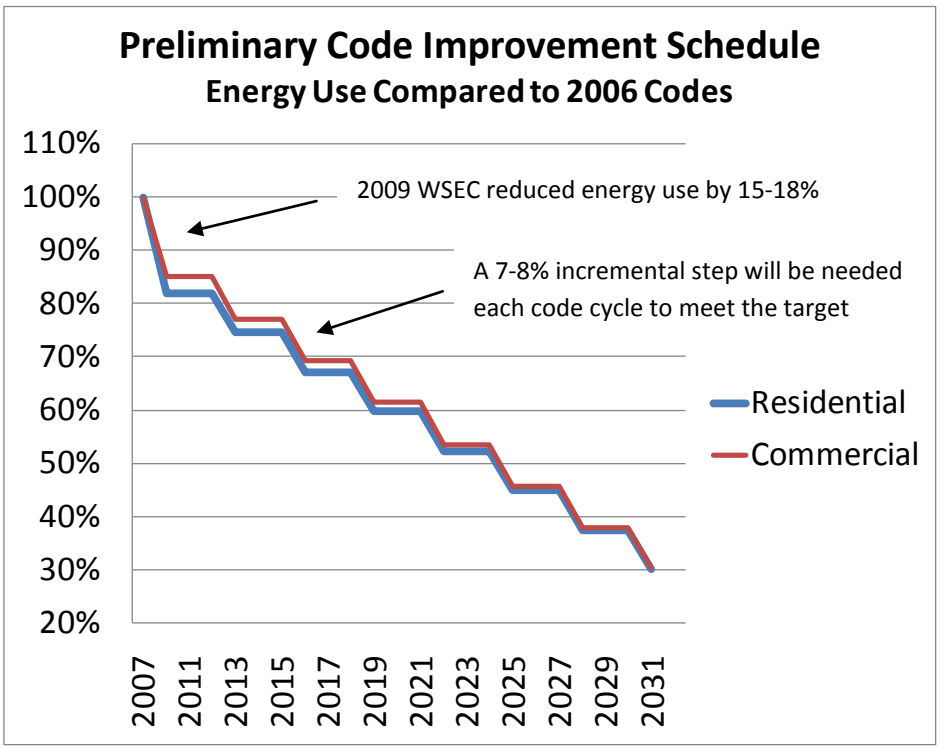
The code development schedule introduced to the SBCC in 19.27A.060 requires an incremental improvement in energy savings 2013 through 2030 that achieves a 70 percent reduction compared to the 2006 Washington State Energy Code (WSEC). Codes are modified on a three-year cycle. To set the target for the 2013 code development cycle, a detailed analysis will need to be completed first to

determine the achievement of the 2009 WSEC. Then a proportional improvement for each code cycle can be established.

A preliminary analysis of the 2009 WSEC indicates a 15 to 18 percent reduction in end use energy consumptions compared to the 2006 WSEC. To achieve the 70 percent reduction in energy use by 2030, it is estimated an average 7-8 percent reduction in energy use compared to the 2006 baseline will need to be achieved each code cycle. Figure 1 provides an illustration of preliminary analysis of these targets.

The method used to develop these estimates may be changed. Washington may adopt a method developed by Pacific Northwest National Laboratory (PNNL) to track improvement of the national model codes. This could result in minor changes in these targets.

Figure 1 Preliminary assessment of code targets



Public Process

To support the development of this strategic plan, RCW 19.27A.150 (4) requires Commerce and the SBCC to convene a work group with the effected parties. Commerce introduced the requirement s of the strategic planning process to the SBCC in January of 2010. Commerce was directed to work with the SBCC's Mechanical, Ventilation and Energy Codes Committee (MVE) on the development of a work plan. The Commerce work plan was approved by the committee in April with final approval by the full SBCC at their June 11, 2010 meeting.

Work Group Formation: As part of developing the work plan there was discussion about the make-up of the strategic planning work group. There was some discussion of selecting specific representation based on existing energy code technical advisory group or other existing SBCC participants. The final decision

was to run the strategic plan public process as an open forum with no specific participant selection. This was done to address the fact that many interested participants had shown interest in participation during the legislative process. There was no need to limit input to specific groups.

Both Commerce and the SBCC used existing lists of interested parties to provide notification of the strategic planning effort. In particular the SBCC list includes all parties that have shown interest in the development of codes in the state of Washington. Commerce made additional contacts using lists that support our communication with the regions electric and gas utilities.

The Strategic Planning Process: The strategic plan includes three phases. First a series of webinars and work group meetings was completed during May and July 2010 to inform the interested parties about the development of the plan and provide an opportunity for broad public input. Second, Commerce developed a draft strategic plan, (Sept – Nov 2010). Commerce continued to seek input, but no public meetings were conducted during this time period. Third, Commerce reviewed and revised the draft strategic plan (Nov-2010).

There were four work group meetings, one per month in May, June, July and August. A list of work group meeting participants has been included as Appendix A. The work groups were supplemented with nine informative webinars. The webinars were primarily focused on delivery of information to work group participants. The webinars were developed by Commerce by experts in the specific field, and by work group participants. The notes from the work group meetings and webinar presentations may be reviewed on the buildings strategy web page. http://www.commerce.wa.gov/site/1325/default.aspx

Prioritization: The outline provided in the enabling legislation asks Commerce and the work group to cover a wide range of subject matter. While all of the subjects in this outline are relevant in the 20-year planning time frame, some subjects needed closer attention this strategic planning period than others. The first strategic planning work group meeting held May 13, 2010 addressed this particular issue. After a broad discussion of the issues included in the legislation, the work group chose the primary subjects to be covered in the webinars and work group meetings. This is represented by the medium and high rankings presented in Table 1. While no limitations were set on discussions of other subjects, the work group agendas would primarily address the priority issues. It is important to keep in mind this is a list of priorities for this strategic planning cycle only. Other elements will be addressed in ongoing efforts by Commerce and through future strategic planning efforts.

Table 1 Work group Priorities for 2010

Legislative Direction Based on RCW 19.27A.150 Section 3 (3)	Emphasis
A. Aspirational Codes	High
B. Measurements and Targets	High
C. Code Training and Enforcement	Medium
D. Research / Demonstration	Low
D, E, I. Education	Low
F. Utility Impacts / Serving Low Energy Buildings	Low
G. Performance Based Codes	High
H. Financial Mechanisms	Medium
J. District Energy	Low
K. Cost / Benefit	High
L. Embodied Energy	Low

Scope of the Energy Code and Standards

To understand the range of impacts that can be expected from building energy code regulations an understanding of the scope of projects covered by the code is useful. In addition to the building energy code, state and federal equipment efficiency standards also impact building energy use. The impact of both codes and standards will be accounted for in the energy use reduction targets noted in Figure 1.

Scope of the energy code

- The energy code applies to all new buildings, additions to existing buildings and alterations to building components covered by the code during major renovation projects.
- Existing buildings must also be updated to the current code standard when there is a change in occupancy designation. For example, when an existing commercial space is converted to a residential space.
- Building systems covered by the code include exterior building assemblies (exterior walls, floors, roof, windows etc.), space heating and cooling systems, domestic hot water systems, lighting, large motors, and transformers.
- The energy code does not regulate building operation or miscellaneous plug loads

Scope of state and federal appliance, lighting and equipment standards

- Federal standards set minimum standards for the manufacture of a wide range of space heating and cooling equipment, water heating equipment and many other types of building equipment. Energy codes may not set minimum standards for equipment efficiency covered by federal standards but do allow higher efficiency equipment to be chosen as a trade off option for other regulated energy efficiency requirements. The energy code does regulate system controls, system size related to federally regulated equipment.

- In addition to the regulation of building integrated equipment, federal standards cover a wide range of appliances and office equipment that would be categorized as part of a buildings plug load. As such these appliances are not regulated by the energy code. They are only regulated by state and federal manufacturing and sale standards.[1,2]

Key Milestones for the Washington State Energy Code

The Washington State Energy code is a State developed code. An abbreviated summary of the code since 1977 is as follows.

- Washington's first energy code, adopted in 1977 by statute.
- The State Building Code Act and State Energy Code Act (SECA) were passed by the legislature in 1985. The State Building Code Act gave rulemaking authority to the SBCC, which oversees all building codes within the state. The first statewide energy code, adopted in 1986, was applicable to all new commercial buildings, and was based on ANSI/ASHRAE/IES Standard 90A-1980.
- In 1990 the Revised Code of Washington (RCW) was amended by HB 2198. HB 2198 amended RCW 19.27A (Energy-Related Building Standards) and increased the insulation requirements for residential buildings. Another amendment to RCW 19.27A resulted in a modification to the commercial energy standards that were contained in the 1986 energy code. The modifications included more restrictive exterior envelope insulation requirements, increased equipment efficiencies, more restrictive controls on HVAC equipment, minimum motor efficiencies, and reduced allowable lighting power allowances. The updated code is based on the Standard 90.1-1989 and became effective April 1, 1994.
- Broad interest in the 1990 residential and 1994 commercial energy code adoption combined with support from the Washington State Energy Office and the state's electric utilities resulted in broad adoption and enforcement of the energy code by local building departments. Broad implementation of energy codes in Washington has impacted 27 percent of housing units (1990 – 2008) and 26 percent of the non-residential building floor area (1994-2008)[3]. **Figures 2 and 3** illustrate these estimates.
- Since the 1990's the energy codes has been modified through the SBCC code adoption process. The most recent edition is the 2009 Washington State Energy Code which will be implemented January 1, 2011.
- The Washington State Energy Code is the minimum and maximum energy code for all residential construction in the state of Washington. Local jurisdictions can adopt more stringent non-residential energy codes. The City of Seattle has adopted and continues to update a non-residential energy code that achieves greater reductions in energy use than the Washington State Energy Code.

[1] Washington state appliance regulations are included in RCW 19.260
[2] A complete list of federally regulated equipment and appliances may be viewed at the DOE web site, http://www1.eere.energy.gov/buildings/appliance_standards/
[3] Based on building populations documented by the NW Power and Conservation Council

- The SBCC has approved a staff work plan to develop a new draft for the Washington State Energy Code based on the 2012, International Energy Conservation Code (IECC). The goal is to have a document by June 20, 2011 that could be reviewed by the SBCC and be made available for public comment. The document would be the basis for energy code adoption in the next Washington code development cycle which begins in March of 2012.

Figure 2 Washington State Residential Housing Unit Estimate

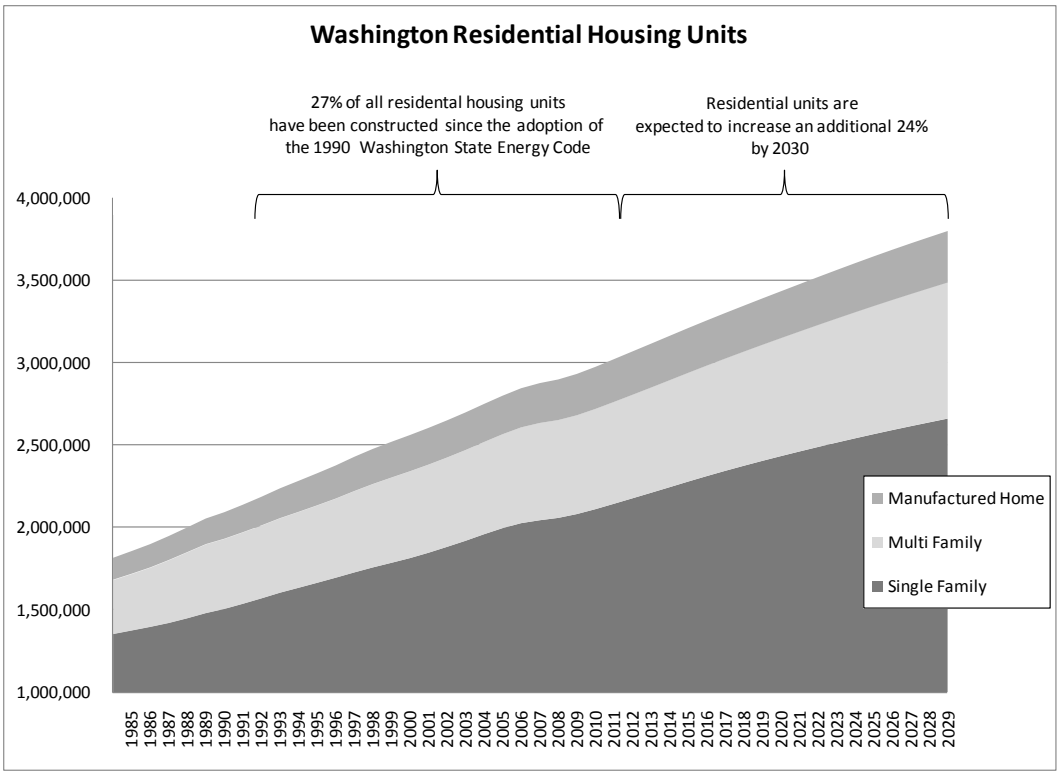
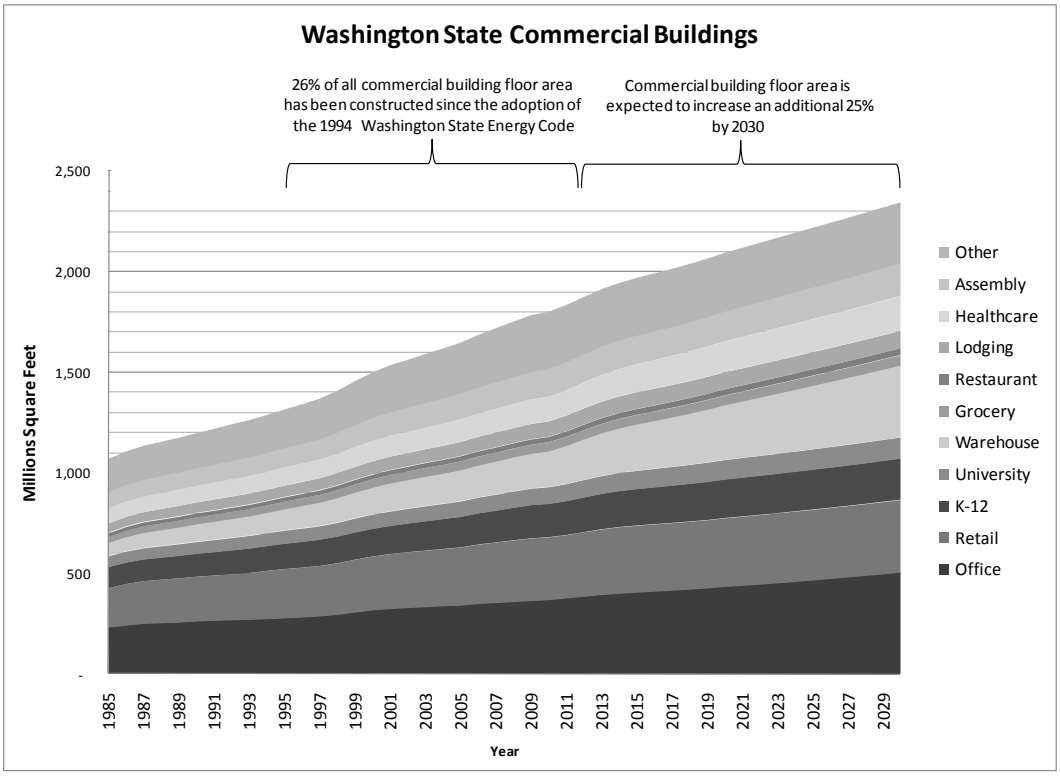


Figure 3 Washington State Commercial Building Floor Area Estimate



Strategic Plan Recommendations and Implementation Efforts for 2011

The following provides the recommendations for implementation of the strategic plan for enhancing energy efficiency and reducing greenhouse gas emissions from homes, buildings, districts and neighborhoods. Each recommendation is supported by a short discussion and, if applicable, a comment on implementation. Some of the discussion from the work group meetings has also been included. To view all the strategic plan meeting notes, presentations and public comments, please visit the following web page: http://www.commerce.wa.gov/site/1325/default.aspx.

Public benefits statement supporting the implementation of building energy codes:

Recommendation 1: Develop and implement a broad, coordinated public outreach campaign for state policy makers, local elected officials and residential & commercial consumers on matters related to energy efficiency and carbon reduction in buildings.

Discussion: Participants in the strategy work group identified the need to provide a broad public benefits statement related to the building energy code specifically and efficiency in buildings in general. Members of the work group encouraged Commerce to pursue a strategy element that would analyze and communicate the broad range of public benefits resulting from the implementation of energy codes and community energy efficiency in general.

Implementation: Commerce will develop a broad public benefits statement specific to energy codes. The State Energy Office and Research Services unit at Commerce has received a grant from the DOE to complete a public benefits statement for energy codes by July 2011. The primary audience is local government leadership and staff who is the key to successful implementation of the state energy code. Secondary audiences are the State Legislature and the general public. The statement will identify benefits to the building occupants, reductions in the cost of energy efficient construction, local job creation, creation of new businesses in Washington, and the benefits of reduced imports of energy resources. The benefits of energy codes will be balanced against cost and will be compared to other energy efficiency and greenhouse gas reduction strategies.

Commerce will use an analytical approach in the development of the benefits statement. This will result in a range of data that can be used to develop public communications on this subject. Commerce will then develop a set of prime communications statements that summarize the findings of the analytical work. In the development of the analytical analysis and prime benefits statements, commerce will consult with outside energy and communications professionals. This may include representatives from the region's utilities, city and county associations or building department staff and national energy code support organizations. A final communications brief will then be developed for the target audience, local government officials.

Commerce recognizes this is a small step in a larger public communications effort. Commerce will continue to seek partnerships with other interested parties in developing positive messaging on the implementation of energy efficiency efforts in the buildings sector to a broad public audience.

Measurement of Achievement and Targets:

RCW 19.27A.060 directs the SBCC to adopt state energy codes from 2013 through 2031 that incrementally move towards achieving the 70 percent reduction in annual net energy consumption, using the 2006 WSEC as the baseline. To support the development and implementation of future editions of the energy code, Commerce recommends the adoption of a number of measurement and evaluation protocols. This will provide the SBCC with reasonable metrics for demonstrating that they have achieved the targets set in this law.

Recommendation 2A: Commerce recommends the adoption of a method for determining if a new edition of the energy code is predicted to save more energy than the previous edition. To accomplish this energy end use estimates for the projected population of new buildings and major retrofits are analyzed using computer simulation software. Commerce recommends the adoption of a Department of Energy method developed to test the national model codes as they are developed. This analytical approach will result in an evaluation of the whole building energy use from one standard to another. This will provide the SBCC with reasonable metrics for demonstrating that they have achieved the targets set in this law. This also provides a consistent methodology between the national model codes and Washington State.

Discussion: Commerce and the work group examined several methods being used to track achievement of energy codes as they are revised. Target Finder, the tool identified in the enabling legislation was not selected because it is focused on individual building performance. Target Finder can't capture the impact of changes to the energy code over a wide population of buildings. Several methods have been developed to track impacts of energy code changes and standards for large populations of buildings. These include a method developed by Pacific Northwest National Laboratory (PNNL) for DOE to evaluate the improvement in energy codes such as Standard 90.1 and the IECC[4]. The development of this method has occurred with broad public input from the Standard 90.1 committee and has been used to make the national determinations for energy codes in compliance with the federal Energy Policy and Conservation Act (EPCA, 42 USC 6833). The Northwest Power and Conservation Council (NPCC) has also started development a method for tracking energy savings related to codes and standards. In 2011 NPCC will examine options to provide a long-term "looking back" and "looking forward" perspective on energy codes and standards improvements in the region. The work group acknowledged that the PNNL standard and a similar method for residential construction would be a good method for measuring improvements in "code as written". However they are concerned that these methods do not capture actual compliance with the code or the range of end use energy consumption of buildings. This resulted in additional recommendations for evaluation of the energy code, recommendations 2B and 2C below.

Implementation: Commerce has received funding from the DOE to examine in detail the application of the PNNL energy code evaluation methodology. Commerce will work with engineering staff from

[4] Rosenburg, Using Reference Buildings for Standard 90.1-2010, PNNL. Presented to the building strategy work group May 18, 2010.

Washington State University Extension Energy Program to implement the use of this method on several commercial building scenarios. This will allow us to create energy utilization indexes for buildings meeting the 2006 WSEC and the 2009 WSEC. This will allow us to determine the incremental improvement target for the 2012 WSEC as prescribed for the SBCC in RCW 19.27A.060. In addition, Commerce will participate in the development of the evaluation process ongoing at the NPCC. Results and observations will be presented to the SBCC in fall of 2011 for their consideration.

Recommendation 2B: Develop and implement a field evaluation protocol to document a 90 percent code compliance rate before 2016.

Discussion: In 2009, as a condition of receiving funding from the American Recovery and Reinvestment Act (ARRA), state governors signed agreements to adopt and demonstrate 90 percent compliance rates with national reference energy codes or a state equivalent. Washington State has adopted an energy code that will meet or exceed the national model codes. But Washington must conduct evaluations of code compliance in the field demonstrating 90 percent compliance by 2016. PNNL is currently developing a field evaluation protocol for implementation by the states. This protocol involves inspecting a sample of new buildings and substantial renovations to determine if the building received the code required design review and that the energy efficiency features required by code were installed in the building. This protocol is still under development. It should be noted, that the state of Washington is not required to use this protocol. The State may develop an alternate method for demonstrating 90 percent compliance rate.

Implementation: A protocol for evaluating energy code compliance is being developed by PNNL for the Department of Energy. Washington State and the neighboring northwest states will be participating in an early demonstration of the evaluation protocol as it relates to the codes commercial building lighting requirements. Additional evaluation elements for other sections of the code will be adopted as they are developed by PNNL. By 2016 Washington will provide a full evaluation of code implementation rates through this process.

The benefits of conducting field evaluation protocol should be viewed broadly. While it is being developed to assist states in demonstrating that they met ARRA requirements, the results will most productively be used to improve code compliance resulting in reduced energy consumption in buildings. The results of field evaluation should be used to guide education efforts that lead to uniform and consistent application of the code requirements statewide.

Recommendation 2C: Commerce will examine expanding the existing energy benchmarking regulations in RCW 19.27A.070 (5) to include reporting of commercial benchmarking scores to the Department of Commerce State Energy Office. This may result in a recommendation for modifications to the legislation in 2012.

Discussion: Participants in the work group are interested in evaluation activities that document actual energy use of buildings. This will help evaluate the codes success as well as provide information for the implementation of complementary programs for existing buildings. The City of Seattle has enacted

benchmarking and disclosure rules that are similar to the State requirements[5]. In addition to the requirement to disclose energy performance to prospective buyers, renters or lenders, the City of Seattle participants are required to report the results to the City. The City requires building owners to report annually rather than just at trigger events (sale, lease, or financing). Collection of data would serve two purposes. The data would be used to record compliance rates with the existing benchmarking requirement and support broader research on building energy use. Benchmarking data is also essential to the development of several of the performance based code proposals discussed later. In creating the proposed data set, Commerce acknowledges the need to be sensitive to privacy issues related to energy data collection and will address this issue as part of the examination.

Implementation: Commerce will monitor results from the City of Seattle process and evaluate the effectiveness and applicability of data collection activities. Commerce will also contact affected parties including utilities and building owners associations to weigh the impacts of this proposal. This may result in a recommendation for modifications to the state legislation in 2012 that includes an implementation methodology and possible budget impacts.

Aspirational Code:

Recommendation 3: Commerce recommends that the SBCC develop and adopt a voluntary, aspirational energy code in conjunction with the development of the 2012 edition of the Washington State Energy Code.

Discussion: The code development schedule in RCW 19.27A.060 results in a continuous upgrade of minimum energy codes every three years. Aspirational energy codes are voluntary energy efficiency standards that represent future editions of the energy code. They are developed to clearly indicate regulatory progression in the next energy code cycle providing the building industry with a long-term path to improved energy efficiency in buildings. The aspirational code can serve as the focus of government or utility incentive programs. Massachusetts has adopted a "stretch"[6] code and Oregon is currently developing a "reach"[7] code with similar objectives to this proposal.

The work group provided favorable feedback on the development of an aspirational energy code. There are some concerns this approach may make existing green building programs less relevant with respect to energy efficiency. Consideration of this issue during the development of the aspirational energy code could be used to complement the energy efficiency components of green building programs. The cost to the construction industry is an additional concern. The design should mitigate this risk. First it is a voluntarily standard. Potentially the aspirational code could reduce cost by focusing any state, local or utility efficiency incentive programs on a single standard. To assure that the aspirational code is clearly defined as a voluntary standard, dropping the term "code" from the standard and selecting an alternate descriptor may be advisable.

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[5] City of Seattle **Ordinance Number: 123226**

[6] Massachusetts Building Code, Appendix 120 AA Stretch Energy Code

[7] Oregon AB 79 requires the Oregon Building Code Division to develop a reach energy code. The rulemaking is currently underway.

Implementation: It is recommended that the SBCC include the adoption of an aspirational code as an appendix to the 2012 edition of the Washington State Energy Code in their 2011-2012 work plans. The aspirational code should be developed using the same compliance methodology as in the minimum mandatory code, with revisions that will achieve additional energy savings. The aspirational energy code appendix should achieve savings that represent the targets for the 2016 edition of the energy code. It is recommended that a broad range of interested parties participate in the development of an aspirational energy code appendix through the established SBCC code development process. While this represents additional work for the SBCC and participants during the 2012 code development cycle, this process should reduce the work load in 2016. It needs to be recognized that this effort should be second in priority to the development of the mandatory 2012 WSEC.

Performance Based Energy Codes:

Recommendation 4: Continue to improve support for systems analysis in building design as an option for demonstrating energy code compliance.

Discussion: The legislative direction on this subject suggests that achieving high levels of energy efficiency buildings may not be achievable using the existing prescriptive code methods and that they should be replaced with performance based codes. Based on several examples, we do not think that we have reached the energy efficiency limits of prescriptive code. A home constructed to the prescriptive "passive house" standard would meet the 2030 goals for the State of Washington. For commercial buildings, the DOE in conjunction with ASHRAE have developed ASHRAE 50% Advanced Energy Design Guides for commercial building design that prescriptively achieve a 50% reduction in energy use compared to the national model energy codes.

For many years the Washington State Energy Code has included three methods for demonstrating code compliance for both residential and commercial buildings: prescriptive, building envelope component trade off and a building design by systems analysis approach. The systems analysis approach is the current "performance-based" methodology used in the state. In 2009 the SBCC modified the method to conform it to Appendix G from ANSI/ASHRAE/IESNA Standard 90.1 – 2007. It is anticipated that this change will increase the use of performance based code compliance in commercial buildings.

It should be noted that even though a range of compliance options are available most low-rise residential building permit applications are submitted using the energy code's prescriptive method. Non-residential building permit applications typically use the component performance approach to demonstrate compliance with the energy code. Few buildings are permitted using the performance-based approach in Washington. Even through performance-based energy code compliance methods have been an option for demonstrating compliance with the energy code for many years, building permit applicants have not see value in utilizing them.

More widespread use of the performance based approach would require a great deal of professional development. Designers and code enforcement personnel would need to develop new skills to apply the performance based rules or rely on third party professionals for this work.

During the strategic planning work group meetings and webinars, two additional performance-based approaches to code compliance were introduced: an "Absolute Performance" approach and an "Outcome"-based code. Below we provide a brief comparison between the current performance comparison method and the two proposed methods. The complexities of these two approaches cannot be discussed in detail here. Please refer to the presentations and comments on this subject that are posted on the building strategy web page for a more complete discussion.

Performance Comparison: The current performance-based code compliance method requires the applicant to prepare two energy use estimates comparing the proposed building design to a building of similar design incorporating code-required building elements. The proposed design complies with the energy code if the model demonstrates the design will use less energy than the design incorporating code-required building elements.

Absolute Performance: Using the "absolute performance" to demonstrate energy code compliance, the designer would be required to prepare an energy model that demonstrates that the proposed design would use no more energy per floor area than a code-specified target energy use per floor area. An example of this approach from the Danish Building Code follows:

> **7.2.3 Energy performance frameworks for offices, schools, institutions:** 7.2.3(1) The total demand of the building for energy supply for heating, ventilation, cooling, domestic hot water and lighting per m² of heated floor area may not exceed 95 kWh/m²/year plus 2200 kWh/ year divided by the heated floor area.[8]

Outcome-Based Code: Under this proposal the code would establish a predetermined energy utilization target for the specific building occupancy. The design / build team would have the flexibility to achieve the target energy utilization using any combination of construction and building operation enhancements needed. Demonstration of compliance would be based on the record of actual energy use of the building, reported to the building department at a specified post occupancy interval. For example, after 2 years, the energy bills from the building would be compared to a pre-negotiated target. If the building failed to use less energy than the target corrective action would be required. This approach would bring all energy end use under regulatory control. In addition to the existing building design and component regulations, plug loads and building operations would be regulated.

A more detailed description of each of the performance-based proposals has been posted on the Commerce building strategy web site. This includes the June 15 webinar presentations by Jonlin, Antonoff and Cherniack, a white paper by Colker and public comments from Antonoff.

Implementation: For low-rise residential buildings, modifications are needed to systems analysis software to assure they meet the requirements of the performance-based method in the WSEC. Washington State University, Extension Energy Program will be contacting several software developers

[8] It is important to note that the Danish Building Code also establishes minimum requirements for building envelope heat loss, air leakage control, equipment efficiency and building commissioning.

asking them to implement Washington specific rules in existing software products. The results of this effort will be communicated to the SBCC in the fall of 2011. If this effort is successful it is expected that WSU will add additional systems analysis training to their current code enforcement curriculum by 2012.

Commerce will request that the Northwest Energy Efficiency Council (NEEC) develop recommendations for training specific to the new non-residential building performance-based standards adopted in the 2009 WSEC. This is a limited request to identify training needs and training providers in the Northwest.

To develop either the Absolute Performance or Outcome-Based energy code, research will need to be conducted to define reasonable limits for energy use in a wide range of building types. Under Recommendation 2C, Commerce will examine expanding the existing energy benchmarking regulations in RCW 19.27A.070 (5) to include disclosure to the Department of Commerce. This will provide energy end use data needed to establish either of these methods.

Workforce Training

Recommendation 5: Commerce will continue to support the Evergreen Jobs Leadership Team in the development of workforce training specific to energy efficiency in buildings.

Discussion: The legislative directions provided in RCW 19.27a.050 (3) (d,e,i) ask this strategic plan to include the development of a strategy for workforce training in several specific areas including education programs supporting trades and professional services that implement energy efficient building technologies. Early in the development of this strategy Commerce recognized that significant work related to this subject matter was underway under the guidance of the Evergreen Jobs Leadership Team. Commerce Deputy Director Daniel Malarkey co-chairs this team. Substantial implementation efforts are underway targeting energy efficiency in the residential and commercial building sectors. Numerous progress reports will be issued by the Evergreen Jobs Leadership Team detailing their strategy and accomplishments.[9] As a result, Commerce will not be suggesting additional steps in this strategic plan.

Implementation: Commerce will continue to develop workforce development recommendations through a leadership position at the Evergreen Jobs Leadership Team.

Financial Mechanisms

Recommendation 6: Commerce will evaluate financial mechanisms that support increasing energy efficiency in existing buildings in conjunction with implementation of the State Energy Strategy Update. This is the key strategic mechanism for improving efficiency in existing buildings.

Discussion: Commerce staff supporting both the Building Strategy and State Energy Strategy Update recognized this as a complex but important subject that merits further work, and is addressed in the State Energy Strategy Update as follows:

[9] Evergreen Jobs Act Activities reporting, http://www.wtb.wa.gov/Pubs_Publications.asp

Energy efficiency investments often pay for themselves, but over a period of several years as lowered energy bills gradually recoup the up-front investment in capital equipment or building improvements. Providing energy consumers with simple and low-cost financing tools that neutralize the up-front investment could significantly accelerate the implementation of energy efficiency measures. Financial tools face a complex legal landscape including recent blockage of property-assessed clean energy loans by the Federal Housing Finance Agency, and a Washington State constitution prohibition against lending by the state government.

Implementation: *Commerce will research these available financial tools, identifying any legal, marketing or administrative barriers others have encountered in deploying them, and identify those that show the most promise for Washington State. Just a few examples of tools that will be explored include:*

- *On-bill financing. Loans taken for energy efficiency improvements to homes, businesses or industry are repaid through the utilities energy billing system. There are many variations of on-bill financing, depending on the lessor, the lessor's relationship to the utility, the terms of the loan, and other parameters.*
- *Energy efficiency tariff. The utility may pay for a specified, allowable energy efficiency improvement, and then attach an additional tariff to the affected building's meter. The tariff is specific to the energy meter, not the building occupant, so that a change in owner or renter does affect the tariff.*
- *Conservation utility. This approach involves authorizing municipal governments to provide energy efficiency loans to their residents and businesses.*
- *Electric revenue loan security. In a few cases, electricity sales from consumer-owned renewable energy installations can offer a revenue (repayment) stream to the lender funding the installation. This tool could benefit a retrofit package that includes both generation and efficiency.*
- *Energy efficiency rebate program. Building departments would fund a revenue-neutral incentive pool with variable permit fees, such that projects designed to meet the highest levels of energy performance would receive incentive payments from the pool, rather than being assessed a fee.*

Financing – Market recognition of the value of homes constructed to the 2009 WSEC.

Recommendation 7: In collaboration with residential builders, Commerce will develop public information on the benefits of the energy efficiency features and quality assurance protocols included in homes constructed to the 2009 WSEC.

Discussion: The value of the energy efficiency features and quality assurance protocols included in the most recent edition of the WSEC will be difficult for home buyers to recognize. These benefits are not well marketed and as a result may not be easily recognize by the new home buyer. The features that were included in an "Energy Star" homes last year will be included in all new homes. The code in fact turns what was once exceptional energy efficiency into a commodity. Building industry representatives attending work group meetings identified this as a key concern. Without market recognition for the benefits of features required in their new product, they may not be able to recover the cost of adding

these features. The building industry is concerned how the lack of market recognition will limit their ability to recover cost of complying with the energy code.

We are able to identify new homes as more energy efficient than older homes. With the right supporting information it should be easy enough to distinguish homes built to one edition of the energy code from another. As a result energy use comparisons may be estimated. This is reinforced with the introduction of the 2009 WSEC. The 2009 WSEC requires a label listing the energy efficiency features of the home be posted near the electrical panel. Also, new air leakage and duct leakage testing standards eliminate one of the largest variables in home construction related to energy efficiency.

There are many advocates that would like to see the development energy efficiency product differentiation across the entire housing sector. In this case Commerce has chosen to limit the scope to an easily identifiable market segment.

Implementation: With cooperation with the home building industry, Commerce will develop public information on the increased energy efficiency of new homes built to the 2009 WSEC. This will help differentiate the new housing stock from existing homes and could result in increase market value for the property.

Identify Costs and Benefits

Recommendation 8: Commerce recommends that the SBCC more explicitly sets forth cost and benefit criteria expectations prior to the 2012 code cycle. Commerce recommends that the SBCC hold a workshop on cost and benefits information requirements for building codes. Based on this workshop, SBCC would consider modifications to the information they require to be submitted in support of code change proposals.

Discussion: The work group objective was to recommend methodologies for cost and benefit studies used to support upgrades to the energy code. There is a great deal of recognition that this is a sensitive subject that is difficult to resolve because for any proposal there is a range of possible costs and benefits.

The work group schedule included several presentations on cost and benefit methods. This included a presentation of a cost study conducted by the National Association of Home Builders Research Center (NAHBRC) and another by NPCC staff.

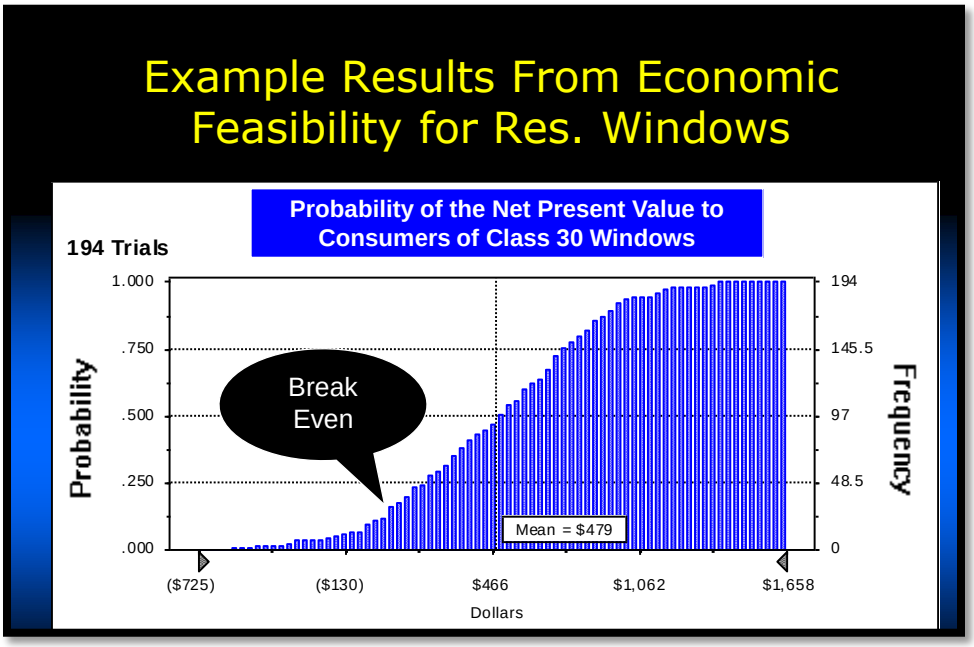
The NAHBRC study concentrated on a single method used to collect costs imputed by energy code changes. This study developed a detailed set of costs of efficient construction by querying four home building companies located in different regions of the U.S.

The most robust example of a methodology for cost and benefit analysis was presented to the work group by The NW Council, which used a significant set of construction cost data in the development of their analysis. The cost data is developed using multiple methodologies to assure they can represent a range of construction scenarios. While the leading method used to gain price information is through

consultation with builders, subcontractors and suppliers, the NW Council may also use published labor cost, efficiency tax credit databases, blind quotes or tear-down analysis to name a few.

The NW Council also presented the analysis method they have used to determine the life cycle cost of efficiency measures. This includes the construction cost as well as numerous costs associated with lending, mortgage insurance, taxes, utility rates, escalation factors and others. Energy end use reductions are on the savings (benefit) side. To handle uncertainty with any specific outcome, they develop a range of outcomes and present them on a probability curve. An illustrated example of this method is in Figure 4 below.

Figure 4 NW Power Council Measure Analysis Example



The legislature has made a request to describe costs and benefits of energy codes. This is not a request for a fully integrated cost / benefit study. While Commerce recommends employing more robust methods of cost collection and supporting analysis, it may not always be necessary or feasible. The primary shortcoming of employing complex cost or benefit methodology is resource constraints. An important secondary constraint is the availability of unbiased data. The key will be providing enough information for the SBCC to proceed with confidence. The SBCC will need to continue to consider code changes with less robust analysis. Commerce recognizes that any methodological requirements to be used in a code development rulemaking will need to be adopted by the SBCC.

Commerce would like to note that the complex nature of accounting for the cost and benefits of numerous code change proposals may not always fit well with providing analysis with each initial code change proposal. A midcourse analysis during the code development cycle may be needed to capture the interaction of multiple measures.

Additional information on the cost and benefits of energy codes will also be developed to support Recommendation 1, Outreach. This is a project funded to provide additional detail on this subject and others.

Implementation: At the request of the SBCC, Commerce will facilitate a discussion of cost and benefits of energy codes. Commerce can develop a workshop agenda that includes state, regional and national experts in this field. The workshop would discuss a range of cost and benefit issues. This would provide the SBCC with the background needed to refine their request for information with code change submissions.

Energy Code Training and Enforcement

Recommendation 9: Continue to seek funding for code training and enforcement activities. Consider increased implementation of code circuit rider support activities and reestablishing the Special Plans Examiner / Inspector Program.

Discussion: There will be a continuous need to provide energy code training and enforcement assistance. Each time the code is updated, both the code enforcement and construction industry employees need to be informed of the new requirements. This includes newcomers to the field as well as experienced individuals.

Washington State University Extension Energy Program is the primary training provider for residential portions of the energy code. NEEC has covered commercial energy code support for many years. These organizations provide a range of energy code support documents, provide trainings, and are available to answer questions from code enforcement personnel and the construction industry. Funding for this activity is provided by the DOE and the Northwest Energy Efficiency Alliance (NEEA)[10]. Over the last 20 years, funding for this work has varied a great deal.

Energy code enforcement is conducted in Washington by local government building department staff. Local government funds these positions using a variety of sources, but mostly through building permit fees. The effects of the current economic downturn have impacted the building departments. Reductions in staff and budget make it difficult for remaining staff to participate in training activities and make it difficult for them to participate in policy work related to the buildings strategy or code development processes.

To assure that building enforcement staff are able to participate in code trainings and code development activities, several suggestions were presented by the government affairs representative of the Washington Association of Building Officials (WABO):

- Support training program for code officials for effective enforcement of new and existing energy codes by providing funding mechanism related to the energy conservation component of code official responsibilities.

[10] NEEA is funded by electric utilities in the Pacific Northwest.

- Re-institute circuit rider program for staff training. This brings training and enforcement support to building departments.
- Re-invigorate SPE/SI program. This is a program of third party inspectors and plans examiners that provide enforcement support as a fee based service. In the past these professionals were paid by the building owner with support from energy utilities.

The increasing level of code complexity, and pressure to implement performance-based code approaches, will only increase the need for training and special inspection services. This will be a continued theme as Washington implements new editions of the energy code over time, and will have particular bearing on the local government cost of implementing the energy code.

Implementation: An energy code training plan including a budget will be developed by Commerce. Commerce will seek input from the active training organizations and funders to establish their education budgets. Commerce will also seek input from local government on cost related to employee participation in energy code trainings. With this Commerce can develop an estimated cost for training energy code enforcement staff.

Currently the code training organizations have good short term funding, but a continued effort is needed to sustain the funding over time. Commerce will communicate the need for training with federal elected officials to assure funding from DOE continues to be available and will also seek funding from other sources such as NEEA. .

Current training activities will address some of the concerns of WABO. There will be increased local training opportunities with limited circuit rider site visits. NEEC will be investigating reestablishment of the SPE/I program but will require collaboration from WABO.

Commerce will facilitate a discussion of the development of a funding mechanism that could be used to offset local government training cost with WABO, local government officials and potential funding sources. This will include a discussion of development of funding for the energy code portions of the Code Official Apprenticeship Program currently deployed by WABO.

State Strategies to Support Research, Demonstration

Recommendation 10: State agencies and research institutions continue to build collaborative efforts in research and demonstration of building efficiency programs.

Discussion: Washington State participates in collaborative research and demonstration projects. Many of these have played a key role in the development of building efficiency measures that eventually find their way into code. State institutions have been a participant in the developmental and implementation of the research agendas and the implementation of demonstration projects. A few examples follow:

- Bonneville Power Administration (BPA) recently initiated an Energy Efficiency Emerging Technology (E3Tinitiative) to engage in a collaborative effort to "fill the pipeline" with innovative energy efficiency solutions and technologies that promise significant region-wide energy

savings. The collaboration includes the region's utilities, national laboratories, universities and consultants. Both WSU Energy Program and Commerce have provided input to this process.

- The State Energy Office has traditionally played a role as research implementer for housing demonstration projects. This history began in the early 1980s and continues today through WSU Energy Program. Building America is DOE's premier housing research and demonstration program. Idaho, Oregon and Washington have all participated in Building America research. WSU Energy Program is currently the leading researcher in building efficiency research in marine climates and in industrialized (factory built) housing. This includes lab and field testing of building assemblies, HVAC systems and demonstration of technologies with production builders.
- Pacific Northwest Smart Grid Demonstration Project is a multi-stakeholder project. The proposed project is led by PNNL. It involves 12 utilities in the five-state region, the Bonneville Power Administration and multiple technology partners. State participation includes the University of Washington and Washington State University

To provide additional research and demonstration leadership the State legislatively created Washington Clean Energy Leadership Council (CELC). The CELC supports research, and demonstration to achieve market transformation for new clean energy products and services. Their vision includes integrated development of building efficiency, renewable and smart grid concepts. The CELC has recently released a consultant-supported study detailing their efforts.[11]

Implementation: Continue to collaborate with BPA, PNNL, and DOE in research activities.

District and Neighborhood Energy Systems:

Recommendation 11: Seek partnerships and funding for the development of a detailed district energy policy for the State of Washington.

Discussion: District and neighborhood energy systems were not selected as a high priority for the building strategy work group. As a result this subject was not well covered by this year's buildings strategy. Commerce recognizes that development of policies that eliminate barriers and encourage the cooperative use of energy systems in districts and neighborhoods would be beneficial. To appropriately address this subject will require additional resources.

District energy is typically understood as a central heating and/or cooling plant serving multiple buildings, though a shared, small electric generator can meet some definitions of district energy. Energy sources powering district energy systems might include combined heat and power systems, biomass boilers, heat recovery systems in municipal sewers, photovoltaic panels, geothermal resources, or one of many others. Sewer system heat exchangers can be used to significantly boost the efficiency of geothermal heat pump systems that condition our buildings. Cooperative agreements for the deployment of photovoltaic panels could site a large system on a warehouse, providing power both for the warehouse and for nearby buildings having designs that are more difficult to equip with the

[11] Navigant Consulting, Washington State Clean Energy Leadership Plan Report, Executive Summary and Overview October 2010. Available from http://www.washingtoncelc.org/documentarchive/134/

technology. It is important to recognize the development of combined heat and power in districts has been a primary driver for energy savings and carbon reduction in a number of European nations.

Implementation: Over the next year Commerce will seek direct funding or in-kind services for the development of district and neighborhood energy policies. Commerce will contact the DOE, the International District Energy Association and others to create cooperative agreements for the development of this policy. If project funding is secured, Commerce will engage additional state participants in this process. Commerce will also be providing overview of a Recovery Act funded project implementing energy efficiency measures in buildings served by a district energy system.

Address barriers for utilities to serve net zero energy homes and buildings

Discussion: This item was not given high priority by the work group and as a result was not discussed in any detail. The work group noted this is an issue that will need to be addressed in the future.

Commence does want to include recognition of activities underway at the Utilities and Transportation Commission. This is an example of a method for providing policy guidance with respect to utility cost recovery in a population of buildings with low energy use.

The UTC has examined declines in customer use of gas and electricity due to conservation, and regulatory mechanisms that may be necessary or desirable to avoid disincentives to utilities for achieving all cost-effective conservation required by law. A report and policy statement has been posted at this web site. http://www.wutc.wa.gov/webimage.nsf/0/77EE14061ED7C28C882576FE0067A337

In addition, there may be other issues technical issues that utilities may encounter in serving zero energy home such as backup power and interconnection of more numerous sources of distributed generation (e.g. solar panels). Commerce has been following developments in zero energy homes and will continue to track these and related issues.

Investigate methodologies and standards for the measurement of the amount of embodied energy used in building materials

Discussion: This item was not given high priority by the work group and as a result was not discussed in any detail. Commerce offers the following observations.

Washington State Department of Ecology, Beyond Waste program made a set of recommendations with respect to this subject in 2008[12]. This included:

1) Incorporation of life cycle cost (LCA) into green building standards
2) Revisions to the state building code
3) Allowance for the use of low embodied greenhouse gas building materials as a potential mitigation measure under SEPA
4) Carbon labeling of building materials

[12] Support building materials with low embodied greenhouse gas emissions as way to keep working forests as forests www.ecy.wa.gov/climatechange/2008FAdocs/081208_FA_embodied_ghg_emissions.pdf

The Department of Ecology document also provides some reporting on the environmental benefits of using wood-based building systems when they can reasonably substitute for other building materials.

In British Columba, the Wood First Act[13] requires wood to be considered as the primary building material in all new publicly-funded buildings, such as schools, libraries or sports complexes. Local governments are also encouraged to develop their own wood first policies.

Commerce believes that the LCA approach will be a challenge to adapt to building codes. LCAs are complex, the data sets are not specific to local resources and application would add cost to construction. If building material environmental assessments are to be a consideration in building codes, recommendations should be developed to the point where a prescriptive standard could be implemented. Such an approach should be limited to major building systems, mass, steel and wood. This would need to be developed specific to Washington State. This would likely result in a general benefit for wood construction. Any standard should recognize benefits of improving process of manufacturing and delivering materials in other categories that produce reductions in carbon emissions.

Commence is not making a recommendation at this time or developing an implementation activity for this subject.

Commerce Recommendations for Energy Code Upgrades

The enabling legislation for this strategy states that the strategic plan must include recommendations to the SBCC on energy code upgrades. Commerce will not be presenting energy code recommendations in the form of code text in this strategy report, which would be well beyond the budget and timeline legislated. Instead the following outlines the role of Commerce in the development code upgrades and provides broad outlines of some of the recommendations that Commerce may offer. Specific proposals will be developed over the next 14 months for submission to the SBCC by March of 2012. Commerce will work with stakeholders to develop a set of code change proposals that meets the targets set for energy use reduction.

Commerce's role in the code revision process: Commerce would like to recognize that the rulemaking body for the Washington State Energy code is the Washington SBCC. Commerce participates in the SBCC by preparing specific code change proposals and supporting information. Commerce is no different than many other participants in this respect. Commerce does fill the specific role of a State Energy Office with respect to code development. The State Energy Office has a long history of implementing the executive branch policy initiatives for energy. This includes detailed participation in the development of specific energy code proposals.

Commerce also recognizes that the SBCC may choose to adopt energy code upgrades that achieve less than the legislated targets. The legislation states:

[13] Wood First Initiative: Creating a Culture of Wood. http://www.for.gov.bc.ca/mof/woodfirst/

> "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."

Commerce believes the role of the state energy office is to prepare recommendations for code updates that meet the legislative targets for reduction in energy use. Commerce will support proposals with documentation that allow the council to make reasonable determinations about adoption.

Commerce recommendations for energy code upgrades will include Commerce-developed code proposals as well as Commerce support of code proposals developed by others. Commerce does not have the expertise or budget to develop a complete set of code changes. While Commerce will develop some of the code changes, many will be developed by other individuals and organizations. In the past Commerce has collaborated with the City of Seattle, WSU Energy Program, Seattle Lighting Design Lab, NEEC and NEEA.

In 2011, the SBCC staff will change the format of the WSEC to the format of the IECC. The SBCC has determined that it would be beneficial to use the IECC format to align the energy code with other ICC codes adopted in the State. SBCC staff will develop a "reference draft" based on the 2012 IECC with amendments required to meet specific Washington statutory and energy efficiency requirements. The reference draft should be made available in the summer of 2011. After the SBCC staff completes development of the reference draft, public review will be needed to assure the new draft is consistent with the existing 2009 WSEC. Commerce will participate in this review and provide comments if needed. Commerce will support energy analysis of the reference draft to provide an evaluation of energy equivalency if funding is available.

Based on the reference draft, Commerce will work with other interested parties to develop a set of code upgrades that meet the legislations targets. This will include code upgrades developed by Commerce as well as code upgrades developed by others.

Work group notes on code upgrades: The strategy work group sessions included discussion of a range of options for upgrading both the residential and non-residential sections of the energy code. There was a wide range of opinions and little consensus on specifics. For notes and presentations documenting the broader discussion, we refer readers to the Building Strategy web site.

Commerce anticipates many other code proposals more specific than those discussed to date will be submitted by others. Commerce will include complementary code proposals in any analysis they provide to the SBCC.

Below are recommendations developed by Commerce for consideration during the 2012 SBCC code development cycle.

Anticipated recommendations for low rise residential buildings: Recommended code upgrades for low rise residential buildings will concentrate on the adoption of additional energy efficiency features that

result in a incremental improvement in the code meeting the legislative direction given the council in RCW 19.27A.050.

During the 2009 code development process, numerous options for increasing the efficiency in homes were introduced in *Chapter 9 - Additional Single-family Residential Energy Efficiency Requirements*. In the 2009 WSEC most building permit applicants are required to select one of 16 alternative prescriptive options or, through a systems analysis approach, document an 8 percent reduction in energy use. To achieve the energy use reduction targets, the adoption of one additional prescriptive option, or demonstration of an additional 8 percent reduction in energy use (16% total) using the performance compliance approach is recommended.

These anticipated recommendations assume that the reference draft developed by SBCC staff will include the Chapter 9 options method. If not, the content of Chapter 9, Table 9-1 represents the energy efficiency measures that Commerce will most likely propose to achieve energy use reductions in homes.

Anticipated recommendations for commercial buildings, including multi-family housing

1. Encode incremental improvements in equipment efficiency reflected in federal regulations.

It is anticipated that Congress will legislate various mandatory federal standards for HVAC equipment and lighting before the next code cycle. The energy code should be developed to capture these savings. First adopt the mandatory standards as prescriptive minimums. Second, assure that trade off methods or exceptions in the code do not inadvertently provide credit for meeting the prescriptive minimums. This assures we will achieve the incremental savings provided through the mandatory standards.

2. Adopt a list of additional energy efficiency options to be included in the next edition of the energy code.

The 2012 IECC implements additional energy efficiency requirements in a method similar to the Chapter 9 requirements of the 2009 WSEC. A list of eligible measures was developed to achieve a specific energy savings target. As an alternative to this list the IECC has incorporated a set value of energy savings that must be demonstrated if the systems analysis approach is used to demonstrate compliance. The new section in the 2012 IECC includes the following:

> 506.1 Requirements. Buildings shall comply with at least one of the following:
>
> 1. 506.2 Efficient HVAC Performance Requirement
> 2. 506.3 Efficient Lighting System Requirement
> 3. 506.4 On-Site Supply of Renewable Energy

For the next edition of the Washington energy code, Commerce recommends further developing this methodology. A fourth category designed to recognize building envelope heat loss control should be added to the list of options. Also, modifications of the requirements of each section is likely to be needed to provide savings relative to the existing Washington energy code requirements and/or proposed 2012 Washington standards.

3. Differentiate between efficiencies of HVAC equipment types.

Equipment efficiency requirements are organized in silos that do not recognize the relative efficiency of different equipment types. For example, electric resistance heating, air source heat pumps and ground source may all be used to show minimum energy code compliance with little recognition of the benefits the more efficient system will provide. The Advanced Energy Design Guides[14] developed by ASHRAE, AIA and DOE, approach energy use reduction primarily through selection of more efficient types of equipment. Implementation of this recommendation would be accomplished by ensuring that the *Efficient HVAC Performance Requirement* noted in the previous recommendation allows only equipment types that provide optimum system performance. The value of the efficiency improvement demonstrated through the systems analysis approach would need to be adjusted for consistency with this concept.

[14] The ASHRAE *Advanced Energy Design Guides* (AEDG) are a series of publications designed to provide recommendations for achieving energy savings over the minimum code requirements of Standard 90.1-1999.

Appendix A. Work group Participants

May 13, 2010 Work group Participants	
Name	**Affiliation**
Gary Allsup	City of Lacey
Michael Barth	Washington Association of Building Officials
Paul Burckhard	Lozier Homes Corp.
John Cochran	SBCC Member - Architect
David Cohan	NW Energy Efficiency Alliance
Lou D'Ambrosio	Laborers' International Union
Carrie Dolwick	Sierra Club
Kim Drury	NW Energy Coalition
Richard Ferry	Quadrant Homes
Joe Giampietro	PHNW.org, Passive House NW, JBDG, Inc., AIA
Mari Hamasaki	SBCC Member - Mechanical Engineer
Angie Homola	SBCC Member - County Gov. West
Duane Jonlin	American Institute of Architects
Jeanette McKague	Washington Realtors
Jerry Mueller	SBCC Member
Gary Nordeen	WSU Energy Program
Tien Peng	SBCC Member
Lisa Rosenow	NW Energy Efficiency Coalition
Kate Tate	Quadrant Homes
Dale Wentworth	SBCC Member - Labor

June 10, 2010 Work group Participants	
Name	**Affiliation**
Luis F. Borrero	I-SUSTAIN
Jayson Antonoff	City of Seattle
Carrie Cobb	Bonneville Power Administration
John Cochran	SBCC Member - Architect
Carrie Dolwick	Sierra Club
Kim Drury	NW Energy Coalition
Mari Hamasaki	SBCC Member - Mechanical Engineer
Duane Jonlin	American Institute of Architects
Eric Lohnes	Building Industry Association of Washington
Jeanette McKague	Washington Realtors
Jerry Mueller	SBCC Member - General Public
Tien Peng	SBCC Member - Residential
Kraig Stevenson	International Code Council
Dale Wentworth	SBCC Member - Labor

July 8, 2010 Work group Participants	
Name	**Affiliation**
Donna Albert	Dept. of General Administration
Kraig Stevenson	International Code Council
Jayson Antonoff	City of Seattle
Carrie Cobb	Bonneville Power Administration
Laura Feinstein	Puget Sound Energy
Duane Jonlin	American Institute of Architects
Mary Kate McGee	Association of Building Officials, Spokane Valley
Alli Kingfisher	Dept. of Ecology
John Miller	
Jerry Mueller	SBCC Member - General Public
Lisa Rosenow	NW Energy Efficiency Council
Jim Wavada	Dept. of Ecology
Dale Wentworth	SBCC Member - Labor

August 12, 2010 Work group Participants	
Name	**Affiliation**
Rich Arneson	Tacoma Power
Jim Brianblock	
Kristyn Clayton	SBCC Member - General Construction
Ted Clifton	CVH Inc.
Kim Drury	NW Energy Coalition
Mike DeVleming	Vera Water and Power
Daimon Doyle	Doyle Homes, Viridian NW
Ken Ekland	WSU Energy Program
Laura Feinstein	Puget Sound Energy
Duane Jonlin	American Institute of Architects
Tony Kantas	Thurston County
Mark Lenssen	Puget Sound Energy
Mary Kate McGee	Association of Building Officials, Spokane Valley
Jerry Mueller	SBCC Member - General Public
Gary Nordeen	WSU Energy Program
Emily Salzburg	WSU Energy Program
Jim Wavada	Dept. of Ecology