STATE OF WASHINGTON

STATE BUILDING CODE COUNCIL

Washington State Energy Code Development

Standard Energy Code Proposal Form

Jan 2022

Log No. 24-RE-19 Vers. 3 Rec'd 6/25/25
(Changes marked in red)

Code being amended: ☐ Commercial Provisions ☒ Residential Provisions

Code Section # R503

Brief Description:

This code proposal creates a code mechanism to encourage heat pump adoption when air conditioners need to be replaced.

Proposed code change text: (Copy the existing text from the Integrated Draft, linked above, and then use underline for new text and ~~strikeout~~ for text to be deleted.)

R503.1.2 Heating and cooling systems. New heating and cooling systems and *ductwork* that are part of the alteration shall comply with Section R403 and this section. *Alterations* to existing heating and cooling systems and *ductwork* shall comply with this section.

Exceptions:

1. Where *ductwork* from an existing heating and cooling system is extended, duct systems with less than 40 linear feet in unconditioned spaces shall not be required to be tested in accordance with Section R403.2.2.
2. Existing duct systems constructed, insulated or sealed with asbestos.

R503.1.2.1 Ductwork. HVAC *ductwork* newly installed as part of an *alteration* shall comply with Section R403.

Exception: Where *ductwork* from an existing heating and cooling system is extended.

R503.1.2.2 System sizing. New heating and cooling equipment that is part of an *alteration* shall be sized in accordance with Section R403.7 based on the *existing building* features as modified by the *alteration*.

Exception: Where it has been demonstrated to the *code official* that compliance with this section would result in heating or cooling equipment that is incompatible with the remaining portions of the existing heating or cooling system.

R503.1.2.3 Duct system leakage. Where an *alteration* includes any of the following, *duct systems* shall be tested in accordance with Section R403.3.7 and shall have a total leakage less than or equal to 12.0 cubic feet per minute (339.9 L/min) per 100 square feet (9.29 m2) of *conditioned floor area*:

1. Twenty-five percent or more of the registers that are part of the *duct system* are relocated.
2. Twenty-five percent or more of the total length of all *ductwork* in the *duct system* is relocated.
3. The total length of all *ductwork* in the *duct system* is increased by 25 percent or more.
4. Cooling system alterations complying with Section R503.1.2.5.2.

Exception:

1. If it is not possible to meet the duct sealing requirements, all accessible leaks shall be sealed and verified through a visual inspection and a smoke test by a RS-33 certified tester.
2. *Duct systems* located entirely inside a *conditioned space* in accordance with Section R403.3.4.

R503.1.2.4 Controls. New heating and cooling equipment that is part of the *alteration* shall comply with

Sections R403.1 and R403.2.

R503.1.2.5 Cooling Systems. When an *alteration* of an existing space conditioning system includes the installation or replacement of a ducted air-conditioner, the altered system shall comply with either Section R503.1.2.5.1 or Section R503.1.2.5.2.

R503.1.2.5.1 Heat Pump. A ducted heat pump shall be configured to be the primary heating source and shall be sized to be the greater of either:

1. The required capacity of an air conditioner to meet the design cooling load, or
2. The capacity of the existing air conditioner,

The existing heating system shall be configured to meet the remaining heating load. Documentation of the existing air conditioner's capacity and the heating and cooling load calculations per R403.7 must be submitted to the enforcement agency before permitting the heat pump.

R503.1.2.5.2 Air Conditioner. A ducted air conditioner shall meet all of the [following] requirements: ~~of either Section R503.1.2.5.2.1 or Section R503.1.2.5.2.2~~

~~**R503.1.2.5.2.1 Systems with Existing Duct Distribution Systems.** Systems with existing duct distribution systems shall comply with all of the requirements of this section.~~

1. The duct system measured air leakage shall meet the requirements of Section R503.1.2.3.

~~2. Demonstrate, in every control mode, airflow greater than or equal to 300 CFM per ton of nominal cooling capacity through the return grilles, and an air-handling unit fan efficacy less than or equal to 1.2 CFM/W. The airflow rate and fan efficacy requirements in this section shall be confirmed through field verification and diagnostic testing, following the procedures outlined in R403.6.~~

~~**Exceptions:**~~

~~1. Systems unable to comply with the minimum airflow rate and system efficacy requirements shall demonstrate compliance by installing a system thermostat that complies with the credit option 3.12 in Table R406.3;~~

~~2. Multispeed compressor systems or variable speed compressor systems shall verify air flow (cfm/ton) and fan efficacy (Watt/cfm) for system operation at the maximum compressor speed and the maximum air handler fan speed.~~

~~3. Gas furnace air-handling units manufactured prior to July 3, 2019 shall comply with a fan efficacy value less than or equal to 0.58 W/cfm as confirmed by field verification and diagnostic testing in accordance with the procedures outlined in R403.6.~~

~~b. Vented attic insulation shall be replaced as specified in Section R402. Luminaires not rated for insulation contact must be replaced or retrofitted as specified by Section R402.5.3.~~

~~**Exceptions:**~~

~~1. Dwelling units with at least R-38 existing insulation installed at the ceiling level.~~

~~2. Dwelling units where the alteration would directly cause the disturbance of asbestos unless the alteration is made in conjunction with asbestos abatement.~~

~~3. Dwelling units with knob and tube wiring located in the vented attic.~~

~~4. Where the accessible space in the attic is not large enough to accommodate the required R-value, the entire accessible space shall be filled with insulation provided such installation does not violate Section 806.3 of the *International Residential Code*.~~

~~c.~~ 2. Air seal all accessible areas of the ceiling plane between the attic and the conditioned space including all joints, penetrations and other openings that are potential sources of air leakage by caulking, gasketing, weather-stripping or otherwise sealing to limit infiltration and exfiltration.

Exceptions:

1. Dwelling units with at least R-38 existing insulation installed at the ceiling level.
2. Dwelling units where the alteration would directly cause the disturbance of asbestos unless the alteration is made in conjunction with asbestos abatement.
3. Dwelling units with atmospherically vented space heating or water heating combustion appliances located inside the pressure boundary of the dwelling unit.

~~**R503.1.2.5.2.2 Entirely New or Complete Replacement Duct Systems:** Systems with new or complete replacement of duct systems shall comply with all of the requirements of this section.~~

~~1. The duct system measured air leakage rate shall meet the requirements of Section R503.1.2.3.~~

~~2. If the air handler and ducts are located within a vented attic, the vented attics shall have insulation replaced as specified in Section R402. Luminaires not rated for insulation contact must be replaced or retrofitted as specified by Section R402.5.3.~~

~~**Exceptions:**~~

~~1. Dwelling units with at least R-19 existing insulation installed at the ceiling level.~~
~~2. Dwelling units where the alteration would directly cause the disturbance of asbestos unless the alteration is made in conjunction with asbestos abatement.~~
~~3. Dwelling units with knob and tube wiring located in the vented attic.~~
~~4. Where the accessible space in the attic is not large enough to accommodate the required R-value, the entire accessible space shall be filled with insulation provided such installation does not violate Section 806.3 of the *International Residential Code*.~~

~~3. Air seal all accessible areas of the ceiling plane between the attic and the conditioned space including all joints, penetrations and other openings that are potential sources of air leakage by caulking, gasketing, weather-stripping or otherwise sealing to limit infiltration and exfiltration.~~

~~**Exceptions:**~~

~~1. Dwelling units with at least R-19 existing insulation installed at the ceiling level.~~
~~2. Dwelling units where the alteration would directly cause the disturbance of asbestos unless the alteration is made in conjunction with asbestos abatement.~~
~~3. Dwelling units with atmospherically vented space heating or water heating combustion appliances located inside the pressure boundary of the dwelling unit.~~

Purpose of code change:

When central AC systems breakdown, it is a prime opportunity to replace those systems with a central heat pump. The proposal encourages the installation of heat pumps when central AC's breakdown. The code language is adapted from Title 24 Part 11 code language in the State of California.[1] Alternative pathway allows for AC systems to still be installed, along with a series of energy efficiency measures. CEC analysis shows the approximate cost equivalency of the AC pathway to the HP pathway, depending on the climate zone.[2]

When sized for cooling load, this has a modest increase in upfront cost, but a massive reduction in CO2 emissions. Over a 25 year timeframe, this proposal is estimated to reduce 22.3 to 34.2 metric tons of CO2 per home. See Green Upgrade Calculator analysis in the Economic Impact Data Sheet section for more information.

[1] https://efiling.energy.ca.gov/GetDocument.aspx?tn=256432-2&DocumentContentId=92250, page 39

[2] https://efiling.energy.ca.gov/GetDocument.aspx?tn=256432-2&DocumentContentId=92250, page 35

Your amendment must meet one of the following criteria. Select at least one:

- ☐ Addresses a critical life/safety need.
- ☐ The amendment clarifies the intent or application of the code.
- ☒ Addresses a specific state policy or statute. (Note that energy conservation is a state policy)
- ☐ Consistency with state or federal regulations.
- ☐ Addresses a unique character of the state.
- ☐ Corrects errors and omissions

Check the building types that would be impacted by your code change:

- ☒ Single family/duplex/townhome
- ☒ Multi-family 1 – 3 stories
- ☐ Multi-family 4 + stories
- ☐ Commercial / Retail
- ☐ Institutional
- ☐ Industrial

Your name	Dylan Plummer	Email address	dylan.plummer@sierraclub.org
Your organization	Sierra Club	Phone number	1-541-531-1858
Other contact name			

Economic Impact Data Sheet

Is there an economic impact: ☒ Yes ☐ No

Briefly summarize your proposal's primary economic impacts and benefits to building owners, tenants, and businesses. If you answered "No" above, explain your reasoning.

This proposal will increase upfront costs but save costs over in the long term. Analysis was performed using RMI's Green Upgrade Calculator with the inputs as required by the OFM Life Cycle Tool. Documentation of the analysis can be found here: Additional Analysis

Provide your best estimate of the **construction cost** (or cost savings) of your code change proposal? (See OFM Life Cycle Cost **Analysis tool** and **Instructions;** use these **Inputs**. **Webinars on the tool can be found Here and Here**)

Upfront cost for a heat pump, sized for cooling load, is $2,259 more than an AC unit.[3] The life cycle savings for this policy is estimated to be around $2,298 when including the social cost of carbon. Assuming a 1750 sq ft house, this would be $1.31/sq ft (w/ SCC).

Provide your best estimate of the **annual energy savings** (or additional energy use) for your code change proposal?

Energy savings is lowered by between $66 and $72 a year, according to the Green Upgrade Calculator analysis.

List any **code enforcement** time for additional plan review or inspections that your proposal will require, in hours per permit application:

This will have little impact on code enforcement.

Small Business Impact. Describe economic impacts to small businesses:

This has no impact to businesses, since it is a residential proposal.

Housing Affordability. Describe economic impacts on housing affordability:

This will have a small impact on upfront costs but will lower operating costs.

Other. Describe other qualitative cost and benefits to owners, to occupants, to the public, to the environment, and to other stakeholders that have not yet been discussed:

[3] https://efiling.energy.ca.gov/GetDocument.aspx?tn=256432-2&DocumentContentId=92250 , page 31

Instructions: Send this form as an email attachment, along with any other documentation available, to: sbcc@des.wa.gov. For further information, call the State Building Code Council at 360-407-9255.

All questions must be answered to be considered complete. Incomplete proposals will not be accepted.

Office of Financial Management
Olympia, Washington - Version: 2020-A
Life Cycle Cost Analysis Tool

Executive Report

Project Information	
Project:	
Address:	N/A, N/A, N/A
Company:	RMI
Contact:	Jonny Kocher
Contact Phone:	619-459-4267
Contact Email:	jkocher@rmi.org

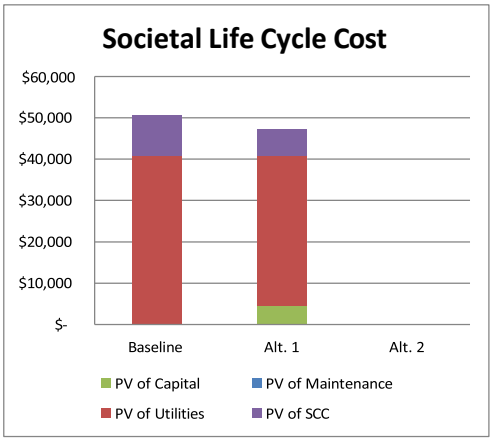
Key Analysis Variables		Building Characteristics	
Study Period (years)	50	Gross (Sq.Ft)	1,750
Nominal Discount Rate	5.00%	Useable (Sq.Ft)	1,750
Maintenance Escalation	1.00%	Space Efficiency	100.0%
Zero Year (Current Year)	2025	Project Phase	0
Construction Years	0	Building Type	0

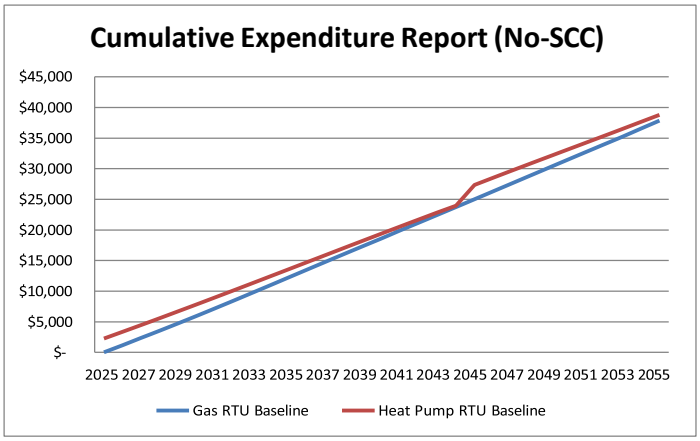
Life Cycle Cost Analysis	BEST		
Alternative	Baseline	Alt. 1	Alt. 2
Energy Use Intenstity (kBtu/sq.ft)	41.1	32.3	
1st Construction Costs	$ -	$ 2,259	$ -
PV of Capital Costs	$ -	$ 4,418	$ -
PV of Maintenance Costs	$ -	$ -	$ -
PV of Utility Costs	$ 40,699	$ 36,488	$ -
Total Life Cycle Cost (LCC)	**$ 40,699**	**$ 40,905**	**$ -**
Net Present Savings (NPS)	**N/A**	**$ (206)**	**$ -**

Societal LCC takes into consideration the social cost of carbon dioxide emissions caused by operational energy consumption

(GHG) Social Life Cycle Cost		BEST	
GHG Impact from Utility Consumption	Baseline	Alt. 1	Alt. 2
Tons of CO2e over Study Period	144	92	-
% CO2e Reduction vs. Baseline	N/A	36%	157%
Present Social Cost of Carbon (SCC)	$ 9,823	$ 6,307	$ -
Total LCC with SCC	**$ 50,522**	**$ 47,213**	**$ -**
NPS with SCC	**N/A**	**$ 3,310**	**$ -**

Warning: OFM Assigned Variables Not Used





Baseline Short Description
AC Replacement
Alternative 1 Short Description
HP Replacement
Alternative 2 Short Description

Office of Financial Management
Olympia, Washington - Version: 2020-A
Life Cycle Cost Analysis Tool

Executive Report

Project Information	
Project:	
Address:	N/A, N/A, N/A
Company:	RMI
Contact:	Jonny Kocher
Contact Phone:	619-459-4267
Contact Email:	jkocher@rmi.org

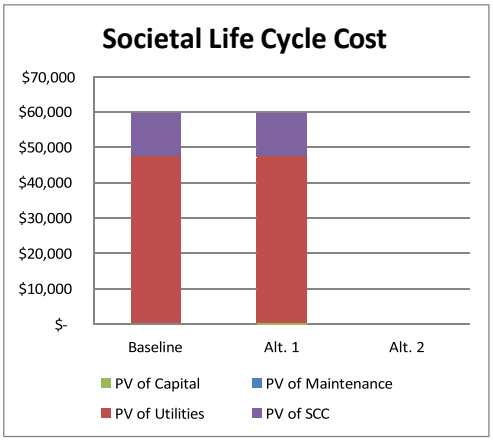
Key Analysis Variables		Building Characteristics	
Study Period (years)	50	Gross (Sq.Ft)	1,750
Nominal Discount Rate	5.00%	Useable (Sq.Ft)	1,750
Maintenance Escalation	1.00%	Space Efficiency	100.0%
Zero Year (Current Year)	2025	Project Phase	0
Construction Years	0	Building Type	0

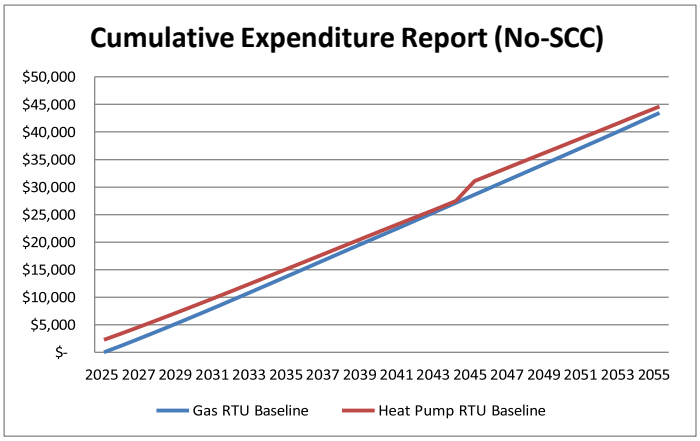
Life Cycle Cost Analysis	BEST		
Alternative	Baseline	Alt. 1	Alt. 2
Energy Use Intenstity (kBtu/sq.ft)	49.3	42.3	
1st Construction Costs	$ -	$ 2,259	$ -
PV of Capital Costs	$ -	$ 4,418	$ -
PV of Maintenance Costs	$ -	$ -	$ -
PV of Utility Costs	$ 46,870	$ 43,040	$ -
Total Life Cycle Cost (LCC)	**$ 46,870**	**$ 47,458**	**$ -**
Net Present Savings (NPS)	**N/A**	**$ (588)**	**$ -**

Societal LCC takes into consideration the social cost of carbon dioxide emissions caused by operational energy consumption

(GHG) Social Life Cycle Cost		BEST	
GHG Impact from Utility Consumption	Baseline	Alt. 1	Alt. 2
Tons of CO2e over Study Period	182	143	-
% CO2e Reduction vs. Baseline	N/A	22%	127%
Present Social Cost of Carbon (SCC)	$ 12,397	$ 9,763	$ -
Total LCC with SCC	**$ 59,266**	**$ 57,221**	**$ -**
NPS with SCC	**N/A**	**$ 2,046**	**$ -**

Warning: OFM Assigned Variables Not Used





Baseline Short Description
AC Replacement
Alternative 1 Short Description
HP Replacement
Alternative 2 Short Description

Sea e

Year	0	50	50 with see
HP	2259	$47, 458	$57, 221
Ae	0	$46, 870	$59, 266

Sp::kare

Year	0	50	50 with see
HP	2259	$40, 905	$47, 21 3
Ae	0	$40, 699	$50, 522

	Seattte	Spokane
Percent Bu4td	06 8	06 2
We4gf-ed Ave	-$470	-$41
Est4rrated L4ie Cycte Cost Sav4n	-$51 2	
$/sq it	-$06 29	
We4gf-ed Ave (w SCC)	$1 ,636	$662
Est4rrated L4ie Cycte Cost Sav4n	$2, 298	
$/sq it (w SCC)	$1 6 31	

	AC Horre	HP Horre
Etec	6l,294	7l901
NG	504	,296

	AC Horre	HP Horre
Ete	6l,269	7l,221
NG	648	494

Annual Direct Fossil Fuel Use Reduced by 22 MMBtu, or 41%

	Traditional Replacements	Green Upgrades
Direct Fossil Fuel Use (MMBtu)	**52**	**31**
Natural Gas Usage (ccf)	504	296

Annual Electricity Consumption Increased by 1607 kWh, or 26%

	Traditional Replacements	Green Upgrades
Net Electricity Consumption	**6,294**	**7,901**
At-Home Electricity Usage (kWh)	6,294	7,901
At-Home Electricity Generation (kWh)	0	0
Other Electricity Use (kWh)	0	0

Annual Energy Reduced by 16 MMBtu, or 22%

	Traditional Replacements	Green Upgrades
Annual Energy Use (MMBtu)	**74**	**58**
HVAC Use (MMBtu)	34	18
Water Heating Use (MMBtu)	17	17
Cooking Use (MMBtu)	2	2
Other Use (MMBtu)	19	19

My Impact

Timeframe: 25 years

Upfront Emissions Lowered by 0.1 MTCO2e

Annual Emissions in the First Year Lowered by 1.2 MTCO2e

Lifetime Emissions Lowered by 34.2 MTCO2e

	Traditional Replacements	Green Upgrades
Net Lifetime Emissions	**99.8**	**65.6**
Lifetime Manufacturing Emissions	0.4	0.4
Lifetime Operating Emissions	99.4	65.2

Annual Direct Fossil Fuel Use Reduced by 16 MMBtu, or 24%

	Traditional Replacements	Green Upgrades
Direct Fossil Fuel Use (MMBtu)	**67**	**51**
Natural Gas Usage (ccf)	648	494

Annual Electricity Consumption Increased by 952 kWh, or 15%

	Traditional Replacements	Green Upgrades
Net Electricity Consumption	**6,269**	**7,221**
At-Home Electricity Usage (kWh)	6,269	7,221
At-Home Electricity Generation (kWh)	0	0
Other Electricity Use (kWh)	0	0

Annual Energy Reduced by 13 MMBtu, or 14%

	Traditional Replacements	Green Upgrades
Annual Energy Use (MMBtu)	**89**	**76**
HVAC Use (MMBtu)	54	42
Water Heating Use (MMBtu)	14	14
Cooking Use (MMBtu)	2	2
Other Use (MMBtu)	18	18

My Impact

Timeframe: 25 years

Upfront Emissions Lowered by 0.1 MTCO2e

Annual Emissions in the First Year Lowered by 1.0 MTCO2e

Lifetime Emissions Lowered by 22.3 MTCO2e

	Traditional Replacements	Green Upgrades
Net Lifetime Emissions	**124.9**	**102.6**
Lifetime Manufacturing Emissions	0.4	0.4
Lifetime Operating Emissions	124.5	102.2