

# Highest Efficiency Equipment Standards

## Regulatory Consultation

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December 22, 2023

### BACKGROUND

The Province of British Columbia (B.C.) is developing a policy to implement the Highest Efficiency Equipment Standards for Space and Water Heating (HEES) commitment outlined in the CleanBC Roadmap to 2030, which states:

*Space and water heating are the primary drivers of GHG emissions from buildings. To meet our targets, we need to ensure these functions are super-efficient, improve resilience and, wherever possible, run on clean electricity or other renewable fuels. To help accelerate this transition, we're committing to highest-efficiency standards for new space and water heating equipment by 2030, and earlier where feasible.*

*After 2030, all new space and water heating equipment sold and installed in B.C. will be at least 100% efficient, significantly reducing emissions compared to current combustion technology. Electric resistance technologies like baseboard and electric water heaters are 100% efficient: they convert all the energy they use into heat. But heat pump technologies exceed 100% efficiency by capturing and moving ambient heat, without having to produce it. The new requirements will encourage more people to install electric heat pumps while continuing to allow the use of electric resistance technologies. They will also allow hybrid electric heat pump gas systems and high-efficiency gas heat pumps.*

The CleanBC Roadmap to 2030 was informed by modelling of climate policies and targets, technology adoption, energy use, and market trends, as well as stakeholder consultation.

Following the CleanBC Roadmap to 2030 mandate, the Ministry of Energy, Mines and Low-Carbon Innovation (EMLI) began preliminary policy development.<sup>1</sup> EMLI completed a cost-benefit and market readiness assessment of compliant equipment and considered legislation and administrative options for implementation. Regulatory partners and subject matter experts were consulted on the compliance options as well as the administrative options.

Once they come into effect in 2030, the standards will drive the adoption of high-efficiency, low carbon equipment across BC's residential and small-to-medium commercial and institutional buildings. Although the standards apply to both existing buildings and new construction, the primary impact is on existing buildings. That is because there is a CleanBC commitment that all new buildings will be zero carbon by 2030, which is a higher bar than what will be required by the HEES.

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<sup>1</sup> EMLI leads policy on energy efficiency standards and market transformation of space and water heating equipment. The Office of Housing and Construction Standards (under the Minister Responsible for Housing) is responsible for the *Building Act*, *BC Building Code*, and *Safety Standards Act*.

## APPROACH

The Province is planning to advance the highest efficiency equipment standards through two mechanisms:

1. Point of sale standards - For common, mass-produced heating equipment, to be incorporated in the Energy Efficiency Standards Regulation (EESR) under the *Energy Efficiency Act*, to take effect in 2030. This will be done in phases:
  - Adopt prescriptive standards in the EESR immediately (effective January 1st, 2030), which will provide industry and building owners an early signal on future requirements.
  - Advance technical standards for dual-fuel equipment with standards-making bodies and incorporate them into regulation by 2028 (effective January 1st, 2030). This will provide greater clarity on the specific requirements for this technology.
2. Point of installation standards - Complementing the point of sale standards and covering complex systems, to be incorporated into the BC Building Code (for both new construction and existing buildings) by 2030, working with the national model codes process where feasible.

**Point of sale standards** regulate the performance of specific products at the time they are *sold*. They are simple tools that yield high compliance rates with a relatively low administration burden. Point of sale standards typically rely on product certification programs and product directories for enforcement. This type of regulation is well suited to single-packaged products (e.g., rooftop units) and systems sold as a bundle (e.g., residential forced air systems) which are covered by product certification programs and product directories.

**Point of installation standards** regulate the performance of products and systems when they are *installed*. Although administratively more complex, this approach is better able to cope with “field integrated” systems – for example, some large hybrid (dual-fuel) systems consist of products that are sold separately and then integrated at the time of installation with conventional gas equipment. These systems are unique to each building and are therefore challenging to regulate through product certification programs. Field-integrated systems instead require a more flexible, site-specific approach, which is more readily provided by point of installation standards.

## ENGAGEMENT

The Province is consulting on the point of sale standards, with the stakeholder consultation period ending February 15<sup>th</sup>, 2024. The point of sale policy is described below and detailed in the appendices. The Province will hold two stakeholder webinars and two Indigenous Engagement sessions at the following times:

- Indigenous Engagement Session #1: 10:30 am to 12:00 pm January 23<sup>rd</sup>, 2024
- General Information Session #1: 2:00 pm to 3:30 pm January 25<sup>th</sup>, 2024
- General Information Session #2: 10:30 am to 12:00 pm February 6<sup>th</sup>, 2024
- Indigenous Engagement Session #2: 1:30 pm to 3:00 pm February 14<sup>th</sup>, 2024

Stakeholder representative organizations may register for a webinar using this form: [HEES Engagement Registration](#).

Written feedback will be accepted until the end of the stakeholder consultation period (February 15<sup>th</sup>, 2024). Please contact [HEES@gov.bc.ca](mailto:HEES@gov.bc.ca) to register for a webinar or engagement session and to provide feedback.

## POINT OF SALE STANDARDS

EMLI is proposing prescriptive point of sale standards for common, mass-produced heating equipment in the EESR, to be effective January 1<sup>st</sup>, 2030. The prescriptive EESR standards will prohibit the sale of new and replacement conventional gas- and oil-fired equipment for the following space and water heating equipment:

- Residential forced air systems (i.e., furnaces)
- Residential hydronic heating systems (i.e., boilers)
- Domestic water heaters (i.e., storage and instantaneous water heaters)
- Weatherized gas-fired packaged units (i.e., rooftop and makeup air units)

Each standard covers a category of gas- and oil-fired equipment and will set prescriptive performance standards that require heat pump technology to achieve compliance. Hybrid (also known as dual fuel) systems that include an electric heat pump and conventional gas- or oil-fired appliance, and gas-fired heat pumps, will be compliant with new standards. The sale of conventional gas- and oil-fired equipment such as residential furnaces and residential boilers will not be compliant, although replacement parts will continue to be available. Performance standards for electric alternatives, such as air-source heat pumps, electric water heaters or electric baseboards, are not affected by this policy.

Information on energy efficiency standards can be found at: [Energy Efficiency Standards \(gov.bc.ca\)](https://www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/energy-efficiency-conservation/policy-regulations/standards)<sup>2</sup>.

## HOW POINT OF SALE STANDARDS WORK

Point of sale standards put legal requirements on businesses that manufacture, sell, warehouse or distribute products. Provincial enforcement of point of sale standards ensures all products in the market meet the efficiency standard and are sold under a certification program. Certification bodies publish online directories of certified products that can be used by inspectors to check compliance. The Provincial inspectors are authorized to conduct inspections of manufacturers and retailers of regulated products.

Equipment performance standards define testing, efficiency standards and labelling requirements.

Certification bodies test, label and verify compliance of products. Certification bodies are hired by the manufacturer.

Example scenario: In 2030, a homeowner calls a contractor to inspect their malfunctioning gas furnace. The contractor finds the blower motor has failed. The HEES prevents the homeowner (and contractor) from buying a replacement gas furnace. The homeowner may:

- Replace the blower motor and continue using the gas furnace,
- Replace the gas furnace with a centrally ducted electric heat pump,

<sup>2</sup> [www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/energy-efficiency-conservation/policy-regulations/standards](https://www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/energy-efficiency-conservation/policy-regulations/standards)

- Replace the gas furnace with a dual fuel system consisting of a heat pump and new gas furnace,
- Replace the gas furnace with a gas-driven heat pump and hydronic air handler, or
- Replace the gas furnace with an electric furnace.

The homeowner's decision may depend on their need for air conditioning, their need for emergency backup heat, their electrical service capacity, and their desire to reduce energy costs or greenhouse gas emissions. Replacing the blower motor or installing an electric furnace typically will have lower upfront costs but higher lifetime costs. Replacing the furnace with a heat pump or a dual fuel system adds air conditioning and typically will have higher upfront costs but lower lifetime costs.

## INTERACTION WITH OTHER POLICIES

### *Carbon Taxes*

Steadily increasing carbon taxes improves the business case for the highest efficiency space and water heating equipment. Carbon taxes also provide an incentive for building owners who choose dual-fuel equipment to minimize gas and oil usage, further reducing emissions.

### *Building Code*

The CleanBC Roadmap to 2030 committed to “new requirements for all new buildings to be zero carbon” by 2030. After 2030, zero carbon new construction will reinforce similar outcomes to the 2030 highest efficiency equipment standards. The Province recently published the Zero Carbon Step Code which allows local governments to adopt emission requirements earlier. This will also help prepare the market for HEES by improving market adoption of compliant products.

The Province has also committed to Net Zero Energy Ready new construction by 2032, and has published the Energy Step code which allows local governments to adopt energy efficiency requirements earlier. HEES-compliant equipment will help builders achieve these performance standards.

### *Programs*

CleanBC, BC Hydro, FortisBC and Greener Homes incentive and financing programs have developed critical industry capacity to ensure the province is ready for HEES. These programs are increasing the market share of heat pumps, supporting industry training, and advancing the development of supply chains.

### *2030 Emissions Cap on Gas Utilities*

The CleanBC Roadmap committed to a 2030 emissions cap on gas utilities. Utilities can meet the emission cap through investments in energy efficiency (which may include incentives for gas heat pumps and dual-fuel equipment) and the incorporation of renewable natural gas and hydrogen into their systems. These policies are complementary, as the utility emissions cap will help achieve emission reductions prior to 2030, while the HEES only takes effect after 2030. The HEES will also ensure that after 2030, heating equipment is as efficient as possible, maximizing the value of scarce low-carbon energy resources.

## RISKS AND MITIGATION

### *Workforce Readiness*

High demand for construction and trade labour is currently a widespread issue. The HEES will increase demand for qualified heating and ventilation (HVAC) trades (due to the greater complexity and installation time for compliant equipment) and will lead to some shifts in the labour market. The Province is working with industry associations to determine options to support this shift and increase the overall workforce, including a low carbon trades training strategy for commercial and multi-unit residential buildings, and a roadmap for residential HVAC trades. EMLI will work to advance implementation through the Ministry of Advanced Education and Future Skills' Future Ready Skills Plan.

Detailed information on workforce training and capacity for each equipment category can be found in the regulatory impact statements that follow in the appendices.

### *Upfront Cost Impacts*

Most equipment types have compliance options that provide lifecycle cost savings but have an incremental capital cost that may be a hardship to those with limited access to capital. Incremental capital costs are highest for heating equipment that does not have a direct replacement, requires extensive retrofits to replace aging infrastructure, or is in northern B.C. Older low-rise multi-unit residential buildings (MURBs) that use hot water radiators with gas boilers and require renewal, will face higher overall capital costs (though comparable incremental costs to other MURBs).

To reduce these impacts, the province is providing supports and incentives through CleanBC Better Homes and Better Buildings programs such as the [Income Qualified Program](#) (IQP), and the [Social Housing Improvement Program](#) (SHIP).

## POLICY IMPACTS

Adoption of the HEES will represent a critical milestone in the decarbonization of the built environment. Once they come into effect in 2030, the HEES will drive the adoption of high-efficiency, low-carbon equipment across BC's building sector. Economic modelling shows the overall HEES will result in a 79% reduction in emissions from buildings by 2050 relative to 2017 levels, generating a reduction of 4.5 million tonnes relative to the 2050 reference case. These totals exclude reductions from zero carbon new construction and renewable natural gas additions to the natural gas distribution system. Analysis for this policy shows that the four proposed point-of-sale standards will account for a significant portion of the overall HEES emission reductions, totaling 3.0 million tonnes per year by 2050.

The HEES policy will impact building owners when their heating equipment reaches end-of-life and requires replacement. The policy will impact about 4%-5% of buildings per year, taking 20-25 years to affect the entire building stock. In addition, the HEES policy will impact building owners when equipment is purchased for or installed in new construction.

The HEES policy will decrease operational costs for building owners. Although building owners will have upfront costs, the overall lifecycle cost will be positive in most cases because of lower energy bills.

The provincial economic and emission impacts of the four proposed HEES point of sale standards are shown in the table below. Detailed analysis can be found in the appendices.

Table 1 Provincial Cost-Benefit Analysis\*

Equipment Category	Capital Costs (\$ billions**)	Operating Cost Benefits (\$ billions)	Net Present Value (\$ billions)	Energy Savings (Petajoules)	GHG Reduction (million tonnes CO <sub>2</sub> e)
Domestic Hot Water	1.1	0.8	-0.4	4	0.4
Residential Hydronic	1.4	3.7	2.3	12	0.5
Residential Forced Air	5.8	9.7	3.8	34	1.9
Weatherized Packaged Units	0.2	1.8	1.7	6	0.2
<b>Total</b>	<b>8.5</b>	<b>16.0</b>	<b>7.5</b>	<b>56</b>	<b>3.0</b>

\* The numbers in the table may not add up due to rounding.

\*\*In 2023 CAD dollars

The cost-benefit analysis is represented by the net present value (NPV) of space heating system replacements that are affected by the proposed standard province-wide between 2030 and 2050. The Provincial cost-benefit assumptions include:

- Installed equipment that is a mix of all-electric air-source heat pumps (ASHP) and hybrid (i.e. dual fuel) systems, with different ratios assumed in each region based on the relative economic case for backup systems.
- The cost of an air conditioner is included in the baseline assumptions for a portion of replacements from each region based on trends of air conditioning installations.
- A forecast of future shipments affected by the standard was based on the replacement rate of B.C.'s installed stock.
- Residential hydronic heating systems are replaced by ASHP. The split between Air-to-Water HP and ductless HP was derived based on today's market trends.
- For weatherized packaged units, the archetype distribution in each region was considered to include a variety of applications.

More details on the analysis for domestic water heating is provided in the appended regulatory impact statement.

## DEVELOPMENT OF POINT OF INSTALLATION STANDARDS

The Province plans to develop point of installation standards which will be incorporated into the BC Building Code by 2030. The Province will work with the national model codes process where feasible, under the umbrella of the Alterations Code to Existing Buildings work.

Although the Province welcomes general feedback on the HEES, this consultation is not intended to gather feedback on the specifics of point-of-installation standards, as these have not yet been developed.

## PROVIDING COMMENTS

We invite you to provide feedback on the HEES. Comments and submissions regarding this consultation paper should be emailed to the following address: [HEES@gov.bc.ca](mailto:HEES@gov.bc.ca). If electronic submission is not possible, please send your feedback addressed to:

Energy Efficiency Branch (c/o Sean LeRoy)  
B.C. Ministry of Energy, Mines and Low-Carbon Innovation  
P.O. Box 9314 Stn Prov Govt  
Victoria, B.C. V8W 9N1

We value your input. The feedback period will be open until February 15<sup>th</sup>, 2024. All comments will be considered.

## Appendices

1. Residential forced air systems (page 8)
2. Residential hydronic heating systems (page 14)
3. Domestic water heaters (page 21)
4. Weatherized gas-fired packaged units (page 26)

**APPENDIX 1**

**Residential Forced Air Heating Systems**

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**SCOPE AND REQUIREMENTS**

TYPE OF DEVICE	Residential gas- and oil-fired forced-air heating system means a system that
	<ul style="list-style-type: none"> <li>• is fired by combustible gas or oil,</li> <li>• is operated by a single system of controls,</li> <li>• contains a blower intended for distribution of heated air through a single forced air heating distribution system,</li> <li>• has an input rate of not more than 65.92 kW (225,000 Btu/h), and</li> <li>• is either               <ul style="list-style-type: none"> <li>○ designed, rated and sold together as a single heating system, or</li> <li>○ combined into a single package and sold together as a single heating system.</li> </ul> </li> </ul> <p>Residential gas- and oil-fired forced-air heating system includes gas furnaces, oil furnaces, residential gas heat pumps, integrated dual-energy forced-air space heating systems (also known as hybrid or dual fuel systems) and integrated hybrid gas-fired heat pump systems with hydronic air handler where the following requirements are met:</p> <ul style="list-style-type: none"> <li>• <b>Gas- or oil-fired furnace</b> means an automatic operating central forced air furnace that uses propane, natural gas, biomethane or oil and has an input rate of not more than 65.92 kW (225,000 Btu/h). It does not include a furnace for a park model trailer or a recreational vehicle;</li> <li>• <b>Residential gas heat pump</b> means a thermally driven heat pump system that:               <ul style="list-style-type: none"> <li>○ is intended for application in a forced air central space heating system, and</li> <li>○ has capacity rate of not more than 65.92 kW (225,000 Btu/h);</li> </ul> </li> <li>• <b>Integrated dual-energy forced-air space heating system</b> means a space heating system consisting of an electric heat pump, and a gas furnace all of which are:               <ul style="list-style-type: none"> <li>○ designed for a single system of controls,</li> <li>○ designed for a single heat distribution system,</li> <li>○ where the heat pump serves as the principal source of heat within the heating system,</li> <li>○ where the gas furnace has an input rating of not more than 65.92 kW (225,000 Btu/h), and</li> <li>○ either</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>▪ designed, rated and sold together as a single heating system, or</li> <li>▪ combined into a single package and sold together as a single heating system;</li> </ul> <ul style="list-style-type: none"> <li>• <b>Integrated hybrid gas-fired heat pump system with hydronic air handler</b> means a space heating system, or a space and domestic water heating system, consisting of a residential gas heat pump, a hydronic air handler and a residential gas boiler all of which are:             <ul style="list-style-type: none"> <li>○ designed for a single system of controls,</li> <li>○ where the heat pump serves as the principal source of heat within the heating system,</li> <li>○ designed for a single forced air heat distribution system, and</li> <li>○ either                 <ul style="list-style-type: none"> <li>▪ designed, rated, and sold together as a single heating system, or</li> <li>▪ combined into a single package and sold as a single heating system.</li> </ul> </li> </ul> </li> </ul> <p>A set of heating components that does not meet the definition of integrated dual-energy forced-air space heating system or integrated hybrid gas-fired heat pump system with hydronic air handler is not considered a system and each component must meet its respective efficiency standard on a stand-alone basis.</p>
<p><b>ENERGY EFFICIENCY VERIFICATION</b></p>	<p>There is currently no standardized performance rating for residential gas- and oil-fired forced air heating systems. Product certification for the proposed energy performance standard is not required under this proposal.</p> <p>Published data from relevant test standards and performance rating will be used to determine compliance with the energy performance standard. Test standards for specific equipment are:</p> <ul style="list-style-type: none"> <li>• CAN/CSA P.2-13 Testing method for measuring the annual fuel utilization efficiency of residential gas-fired or oil-fired furnaces and boilers.</li> <li>• ANSI Z21.40.4 Harmonized Standard for Performance Testing and Rating of Gas-Fired, Air-Conditioning and Heat Pumping Appliances.</li> <li>• AHRI 210/240: Performance Rating of Unitary Air-conditioning &amp; Air-source Heat Pump Equipment.</li> </ul>
<p><b>PROPOSED ENERGY PERFORMANCE STANDARD</b></p>	<p>Residential gas- and oil-fired forced-air heating systems must provide heat from a thermodynamic heat pump cycle to achieve a heating energy output higher than its energy input over the course of a heating season.</p>

<b>EFFECTIVE DATE</b>	Products manufactured and sold after January 1, 2030.
<b>COMPLIANCE</b>	The proposed energy performance standard applies to all products manufactured for sale in the province, sold, offered for sale, leased, or otherwise disposed of which includes to transfer by any method, assign, give, sell, grant, charge, convey, bequeath, devise, lease, divest, release and agree to do any of those things.
<b>COMPLIANCE OPTIONS</b>	<p>To comply with the proposed standard one of the following paths can be considered:</p> <ul style="list-style-type: none"> <li>• Air-source heat pump</li> <li>• Integrated dual-energy forced-air space heating system</li> <li>• Electric furnace</li> <li>• Integrated hybrid gas-fired heat pump system with hydronic air handler</li> <li>• Ground source heat pump with hydronic air handler</li> <li>• Gas heat pump with hydronic air handler</li> </ul>
<b>HARMONIZATION</b>	The proposed regulation references existing Canadian and US performance ratings and does not require additional performance testing or certification.
<b>MARKET TRANSFORMATION</b>	<p>The Province is driving market transformation of highest efficiency equipment through a variety of measures, including CleanBC retrofit incentives and financing, industry training, marketing, and home energy ratings. Data on equipment shipments to B.C. shows strong increases in heat pumps shipments.</p> <p>CleanBC Better Homes is B.C.'s hub for homeowners to access information, rebates and support to reduce energy use and greenhouse gas emissions in new and existing homes. The program has been incenting air-source heat pump and integrated dual-fuel forced-air space heating system retrofits since 2018.</p> <p>FortisBC is supporting market development for integrated dual fuel forced-air heating systems with a pilot program and will be launching an incentive program.</p> <p>Highest efficiency equipment standards will result in an overall increase in employment in heating and ventilation (HVAC) trades (due to the greater complexity and installation time for compliant equipment) and will require some shifts in the labour market. HVAC professionals will require some retraining (i.e. demand for gas-fitters may decline while demand for refrigeration mechanics may increase). The Province is working with industry associations to determine options to support this shift and increase the overall workforce - including a roadmap for residential HVAC trades (by the Home</p>

	Performance Stakeholder Council) and will advance implementation through the Future Ready Skills Plan. Currently, the Province is fully subsidizing HVAC training to upgrade skills to meet residential incentive program requirements.
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### ASSESSMENT FROM INDUSTRY PERSPECTIVE

<b>AVAILABILITY</b>	<p>The air source heat pumps and integrated dual energy systems that meet and exceed the proposed regulation are widely available in the province from all major distributors.</p> <p>Variable speed and cold climate heat pumps are available from most brands, with more product options expected within the next few years.</p>
<b>MANUFACTURER PERSPECTIVE</b>	<p>All major gas furnace manufacturers also manufacture heat pumps and central air conditioners as well as offer integrated dual energy forced air systems (which combine a heat pump with a furnace). Heat pumps are almost identical to air conditioners, with only minor component changes. This standard will shift demand away from central air conditioners towards heat pumps. Demand for furnaces will depend on the relative popularity of heat pumps versus integrated dual fuel systems.</p>
<b>IMPACT ON NEW CONSTRUCTION</b>	<p>The proposed regulation is aligned with the province’s commitment to Zero Carbon new construction by 2030 and Net-Zero Energy Ready new construction by 2032. The proposed regulation will have minimal impact on builders as the heating systems that are in most cases needed to meet Zero Carbon or Net Zero Energy Ready are also compliant with the proposed regulation.</p>

### ASSESSMENT FROM CONSUMER PERSPECTIVE

<b>ACCEPTANCE</b>	<p>Market acceptance of heat pumps is steadily growing. All electric heat pumps have moderate acceptability with some concerns noted about higher upfront costs, a perception of high operating costs, and limitations due to ducting and electrical capacity. Integrated dual energy systems have good acceptance as the backup gas furnace has broad appeal.</p> <p>Aside from electric furnaces, compliant options require knowledge of heat pump technology. Contractors who are experienced with heat pumps are more likely to accept them as a solution or recommend them to homeowners. Training supports are expected to improve acceptability leading up to 2030.</p>
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<p><b>ACCESSIBILITY</b></p>	<p>Accessibility of all-electric heat pumps is already high in urban communities in Southern B.C. and moderate-to-low in rural Northern B.C. While cold climate heat pumps can provide heat down to -30°C and come with electric furnace backup, the additional costs to increase electrical or generator capacity can be significant.</p> <p>Integrated dual energy systems already have high accessibility across all regions and climate zones in B.C. as the gas furnace can provide emergency backup for extreme cold or power outages (when connected to a generator).</p>
<p><b>CONSUMER COST-BENEFIT ANALYSIS</b></p>	<p>A cost-benefit analysis was completed for representative single-family dwellings in the lower mainland, Vancouver Island, southern interior, and the north. The cost-benefit analysis weighs the incremental cost of compliant equipment purchased in 2030, against the energy cost savings discounted over the equipment's lifetime. The cost-benefit analysis assumes a natural gas cost that includes carbon taxes and a cost premium representing a higher proportion of renewable natural gas.</p> <p>A forced air furnace will typically be replaced with an electric heat pump with electric resistance supplemental heating, or hybrid (i.e. dual energy) system consisting of an electric heat pump and a gas furnace. The analysis found that when replacing a gas furnace with a central air conditioner there is a lifetime cost savings in all regions of the Province.</p> <p>A typical home in the Lower Mainland or on Vancouver Island would see an incremental capital cost of \$4,100 to \$7,300 but an overall lifetime savings (adding up capital and operational costs) of \$5,700 to \$9,000.</p> <p>A typical home in the Southern Interior would see an incremental capital cost of \$4,900 to \$9,000 but an overall lifetime savings of \$9,000 to \$12,000. A typical home in Northern B.C. would see an incremental capital cost of \$7,000 to \$15,000 but an overall lifetime savings of \$13,000 to \$21,000. Lifetime cost savings occur in the Southern Interior and Northern B.C. because the higher energy use that is typical in those regions results in higher operational savings, relative to the equipment cost.</p>
<p><b>NON-ENERGY IMPACTS</b></p>	<p>The proposed standard will reduce GHG emissions and air pollution associated with residential space heating, helping consumers reduce their environmental footprint.</p> <p>Retrofitting a gas- and oil-fired furnace with a heat pump will add air conditioning to the home. Given the recent strong market penetration of central air conditioning systems, air conditioning is a valued benefit. It will help improve climate resiliency by helping British Columbians better cope with extreme heat events, and wildfire smoke.</p>

**APPENDIX 2**

**Residential Hydronic Heating Systems**

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**SCOPE AND REQUIREMENTS**

TYPE OF DEVICE	<p><b>Residential gas- and oil-fired hydronic heating systems</b> means systems that</p> <ul style="list-style-type: none"> <li>○ are fired by combustible gas<sup>3</sup> or oil,</li> <li>○ are operated by a single system of controls,</li> <li>○ are connected to a single hot water central space heating distribution system,</li> <li>○ may service a potable hot water system,</li> <li>○ have an input rating of less than 87.92 kW (300 000 BTU/h), and</li> <li>○ are either <ul style="list-style-type: none"> <li>▪ designed, rated and sold together as a single heating system, or</li> <li>▪ combined into a single package and sold together as a single heating system.</li> </ul> </li> </ul> <p>Residential gas- and oil-fired hydronic heating systems include residential gas- and oil-fired boilers, residential gas heat pumps, integrated dual-energy hydronic space heating systems and integrated hybrid gas heat pump systems where</p> <ul style="list-style-type: none"> <li>• <b>Residential gas- or oil-fired boiler</b> mean a boiler that <ul style="list-style-type: none"> <li>○ is intended for application in a hot water central space heating system,</li> <li>○ may service a potable hot water system, and</li> <li>○ has an input rating of less than 87.92 kW (300 000 BTU/h);</li> </ul> </li> <li>• <b>Residential gas heat pump</b> means a thermally driven heat pump system that <ul style="list-style-type: none"> <li>○ is intended for application in a hot water central space heating system,</li> <li>○ may service a potable hot water system, and</li> <li>○ has a nominal heating capacity of less than 87.92 kW (300 000 BTU/h);</li> </ul> </li> <li>• <b>Integrated dual-energy hydronic space heating system</b>, means a space heating system, or a space and domestic hot water heating system, consisting of an electric heat pump, and a gas boiler all of which are</li> </ul>
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<sup>3</sup> Natural gas, biomethane, or propane.

	<ul style="list-style-type: none"> <li>○ designed for a single system of controls,</li> <li>○ designed to be connected to a single heat distribution system,</li> <li>○ where the heat pump serves as the principal source of heat within the heating system,</li> <li>○ where the gas boiler has an input rating of less than 87.92 kW (300,000 BTU/h), and</li> <li>○ either             <ul style="list-style-type: none"> <li>▪ designed, rated and sold together as a single heating system, or</li> <li>▪ combined into a single package and sold together as a single heating system;</li> </ul> </li> <li>● <b>Integrated hybrid gas-fired heat pump system</b> means a space heating system, or a space and domestic water heating system, consisting of a residential gas heat pump, and a residential gas boiler all of which are             <ul style="list-style-type: none"> <li>○ designed for a single system of controls,</li> <li>○ designed to be connected to a single space heat distribution system, and</li> <li>○ where the heat pump serves as the principal source of heat within the heating system,</li> <li>○ either                 <ul style="list-style-type: none"> <li>▪ designed, rated, and sold together as a single heating system, or</li> <li>▪ combined into a single package and sold as a single heating system.</li> </ul> </li> </ul> </li> </ul> <p>A set of heating components that does not meet the definition of integrated dual-energy hydronic space heating system or integrated hybrid gas-fired heat pump system is not considered a system and each component must meet its respective efficiency standard on a stand-alone basis.</p>
<p><b>ENERGY EFFICIENCY VERIFICATION</b></p>	<p>There is currently no standardized performance rating for residential gas- and oil-fired hydronic heating systems. Product certification for the proposed energy performance standard is not required under this proposal.</p> <p>Published data from relevant test standards and performance rating will be used to determine compliance with the energy performance standard. Test standards for specific equipment are:</p> <ul style="list-style-type: none"> <li>● CAN/CSA P.2-13 Testing method for measuring the annual fuel utilization efficiency of residential gas-fired or oil-fired furnaces and boilers.</li> </ul>



	<ul style="list-style-type: none"> <li>• ANSI Z21.40.4 Harmonized Standard for Performance Testing and Rating of Gas-Fired, Air-Conditioning and Heat Pumping Appliances.</li> <li>• ANSI/AHRI Standard 551/591-2023 Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle.</li> <li>• EN 14825:2022 - Air conditioners, liquid chilling packages and heat pumps, with electrically driven compressors, for space heating and cooling, commercial and process cooling - Testing and rating at part load conditions and calculation of seasonal performance.</li> <li>• AHRI 210/240: Performance Rating of Unitary Air-conditioning &amp; Air-source Heat Pump Equipment.</li> </ul>
<b>PROPOSED ENERGY PERFORMANCE STANDARD</b>	Residential gas- and oil-fired hydronic heating systems must provide heat from a thermodynamic heat pump cycle to achieve a heating energy output higher than their energy input over the course of a heating season.
<b>EFFECTIVE DATE</b>	Products manufactured after January 1, 2030.
<b>COMPLIANCE</b>	The proposed energy performance standard applies to all products manufactured for sale in the province, sold, offered for sale, leased, or otherwise disposed of which includes to transfer by any method, assign, give, sell, grant, charge, convey, bequeath, devise, lease, divest, release and agree to do any of those things.
<b>COMPLIANCE OPTIONS</b>	<p>To comply with the proposed standard one of the following paths can be considered:</p> <ul style="list-style-type: none"> <li>• Air-to-water heat pump</li> <li>• Multi-split air-source heat pump</li> <li>• Ground source heat pump</li> <li>• Gas heat pump</li> <li>• Integrated dual-energy hydronic space heating system</li> <li>• Integrated hybrid gas-fired heat pump system</li> <li>• Electric boiler</li> </ul>
<b>HARMONIZATION</b>	The proposed regulation references existing Canadian and US performance ratings and does not require additional performance testing or certification.
<b>MARKET TRANSFORMATION</b>	<p>The Province is driving market transformation of highest efficiency equipment through a variety of measures, including CleanBC retrofit incentives and financing, industry training, marketing, and home energy ratings.</p> <p>CleanBC Better Homes is B.C.'s hub for homeowners to access information, rebates and support to reduce energy use and greenhouse gas emissions in</p>

	<p>new and existing homes. The program has been incenting heat pump retrofits of residential gas- and oil-fired hydronic systems since 2018.</p> <p>FortisBC is supporting market development for residential gas heat pumps by completing a pilot program and working with manufacturers to test products in B.C.</p> <p>Highest efficiency equipment standards will result in an overall increase in employment in heating and ventilation (HVAC) trades (due to the greater complexity and installation time for compliant equipment) and will require some shifts in the labour market. HVAC professionals will require some retraining (i.e., demand for gas-fitters may decline while demand for refrigeration mechanics may increase). The Province is working with industry associations to determine options to support this shift and increase the overall workforce - including a roadmap for residential HVAC trades (by the Home Performance Stakeholder Council) and will advance implementation through the Future Ready Skills Plan. Currently the Province is fully subsidizing HVAC training to upgrade skills to meet residential incentive program requirements.</p>
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**ASSESSMENT FROM INDUSTRY PERSPECTIVE**

<p><b>AVAILABILITY</b></p>	<p>Electric air-to-water (A2W) heat pumps are a compliant option that are a direct replacement for residential gas- or oil-fired hydronic heating systems. Electric A2W heat pumps have moderate availability today, with 17 product lines listed on the Better Homes Qualified Product List. Given the large number of products available internationally, widescale product availability is expected by 2030. Integrated dual fuel hydronic systems incorporating an electric A2W heat pump and a gas boiler are also expected to be widely available by 2030.</p> <p>Multi-split air source heat pumps (ASHP) are widely available products that are often chosen as a retrofit replacement for residential gas- and oil-fired boilers. Multi-split ASHPs are available from the majority of heating, ventilation, and air conditioning manufacturers.</p> <p>Residential gas heat pumps and integrated hybrid gas heat pump systems are newer to the market and currently have limited availability. A few products have been piloted in BC and are expected to be commercially available in 2023.</p>
<p><b>MANUFACTURER PERSPECTIVE</b></p>	<p>There are two residential gas boiler manufacturers with operations in B.C. Residential gas boiler manufacturers may continue to</p>

	<p>manufacture gas boilers for export out of the province. For in-province sales, they may partner with heat pump manufacturers to sell integrated dual-energy hydronic space heating systems or integrated hybrid gas heat pump systems.</p>
<b>IMPACT ON NEW CONSTRUCTION</b>	<p>The proposed regulation is aligned with the province’s commitment to Zero Carbon new construction by 2030 and Net-Zero Energy Ready new construction by 2032. The proposed regulation will have minimal impact on builders as the heating systems that are in most cases needed to meet Zero Carbon or Net Zero Energy Ready are also compliant with the proposed regulation.</p>

**ASSESSMENT FROM CONSUMER PERSPECTIVE**

<b>ACCEPTANCE</b>	<p>A2W heat pumps are relatively new to the B.C. market and currently have limited acceptance. Based on successful market adoption in Europe, with European sales increasing by 61% year over year, the province expects market acceptance will improve to acceptable levels with continued incentives, contractor training and more product availability.</p> <p>Multi-split ASHPs have high market acceptance and are commonly chosen as a retrofit replacement for residential gas boilers despite not being a direct replacement. Retrofitting a hydronic system to a ductless ASHP adds air conditioning to the home, which significantly improves acceptance of the solution. Other factors that support the high level of acceptance for ductless ASHPs is their better availability and longer time in the B.C. market.</p> <p>Electric boilers are available with the same fit, form and functionality as their gas counterparts and are seen as an acceptable replacement.</p> <p>Residential gas heat pump and integrated hybrid gas heat pump systems are newer to the market and currently have limited acceptability. A few products have been piloted in BC and are expected to be commercially available in 2023.</p> <p>Aside from electric boilers, compliant options require knowledge of heat pump technology. Contractors who are experienced with heat pumps are more likely accept them as a solution or recommend them to homeowners. Training supports are expected to improve acceptability leading up to 2030.</p>
<b>ACCESSIBILITY</b>	<p>Residential hydronic heating systems are predominantly found in newer homes in the Lower Mainland and have relatively low market penetration in older homes and outside of the Lower Mainland. Newer homes typically have low temperature distribution systems that are applicable to a wide</p>

	<p>range of A2W heat pumps while old homes have higher temperature distribution systems that a narrower range of A2W heat pump options. Because of the nature of this market, compliant A2W options currently have moderate accessibility in newer homes in the Lower Mainland and low accessibility in older homes and outside of the lower mainland.</p>
<p><b>COST-BENEFIT ANALYSIS</b></p>	<p>A cost-benefit analysis was completed for representative single-family dwellings in the Lower Mainland, Vancouver Island, Southern Interior, and the North. The cost-benefit analysis weighs the incremental cost of compliant equipment purchased in 2030, against the energy cost savings discounted over the equipment lifetime. The cost-benefit analysis assumes a natural gas cost that includes carbon taxes and a cost premium representing a higher proportion of renewable natural gas.</p> <p>Three scenarios were modeled for the replacement of a gas boiler in a residential hydronic heating system. The first scenario is a retrofit of the hydronic system and installation of ductless heat pumps with electric backup. Retrofitting ductless heat pumps is currently the most popular choice as it is the most cost-effective. The other two scenarios involve the replacement of the natural gas-fired boiler with an air-to-water (A2W) heat pump; with one scenario using electric supplemental heating and one using gas backup. The gas back up system represents homes that have limited electrical capacity including but not limited to colder climates.</p> <p>The analysis found that retrofitting to a mini-split heat pump system results in strong lifetime cost savings (adding up capital and operating costs) of \$22,000 to \$32,000.</p> <p>The analysis found that replacement with an A2W heat pump has an overall lifetime cost premium of \$4,000 to \$7,000 in the Lower Mainland and Vancouver Island, but an overall lifetime cost <i>savings</i> of up to \$17,000 elsewhere. Lifetime cost savings occur in the Southern Interior and Northern B.C. because the higher energy use that is typical in those regions results in higher operational savings, relative to the equipment cost.</p>
<p><b>NON-ENERGY IMPACTS</b></p>	<p>The proposed standard will reduce GHG emissions and air pollution associated with residential space heating, helping consumers reduce their environmental footprint.</p> <p>Retrofitting with a mini-split heat pump will add air conditioning to the home. Given the recent strong market penetration of central air conditioning systems, air conditioning is a valued benefit. It will help improve climate resiliency by helping British Columbians better cope with extreme heat events, and wildfire smoke.</p>

## APPENDIX 3

# Domestic Water Heaters

PREPARED BY:  
ENERGY EFFICIENCY BRANCH,  
B.C. MINISTRY OF ENERGY, MINES AND LOW CARBON INNOVATION

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**SCOPE AND REQUIREMENTS**

TYPE OF DEVICE	<p><b>Gas- and oil-fired domestic water heater</b> means a water heater that</p> <ul style="list-style-type: none"> <li>• is fired by combustible gas<sup>4</sup> or oil,</li> <li>• is designed to be operated by a single system of controls,</li> <li>• is primarily intended for providing potable hot water.</li> </ul> <p>Gas- and oil-fired domestic water heater includes:</p> <ul style="list-style-type: none"> <li>• gas- and oil-fired storage water heaters               <ul style="list-style-type: none"> <li>○ with rated storage capacity up to and including 454 L (120 US gal);</li> <li>○ having rated inputs up to and including 30.77 kW (105 000 Btu/h); and</li> <li>○ designed to provide outlet hot water at a controlled temperature up to and including 82 °C (180°F);</li> </ul> </li> <li>• gas-fired instantaneous water heaters               <ul style="list-style-type: none"> <li>○ with a storage volume no greater than 7.6 L (2 US gallons),</li> <li>○ an input rate equal to or less than 58.56 kW (200,000 Btu/h), and</li> <li>○ designed to provide outlet hot water at a controlled temperature up to and including 82 °C (180°F); and</li> </ul> </li> <li>• gas-fired heat pump storage water heaters that               <ul style="list-style-type: none"> <li>○ use gas as the main energy source,</li> <li>○ have a nameplate input rating of 20,000 Btu/h (26.4 MJ/h) or less,</li> <li>○ have a maximum current rating of 24 amp (including all auxiliary equipment, such as fans, pumps, controls, and, if on the same circuit, any resistive elements) at an input voltage of no greater than 250 V,</li> <li>○ have a rated storage volume not more than 120 gal (450 L), and</li> <li>○ are designed to transfer thermal energy from one temperature level to a higher temperature level to provide outlet hot water at a controlled temperature up to and including 82 °C (180°F).</li> </ul> </li> </ul>
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<sup>4</sup> Natural gas, biomethane, or propane.

<b>ENERGY EFFICIENCY VERIFICATION</b>	<p>Compliance with the proposed regulation is based on adherence of manufactured products with the proposed energy performance standard based on CAN/CSA-P.3-15 <i>Testing method for measuring energy consumption and determining efficiencies of gas-fired and fuel oil-fired water heaters</i>. Testing and verification must be completed by a Standards Council of Canada-accredited Certification Organization. Products must be labelled with an energy efficiency verification mark showing the trademark or logo of the certification body.</p>
<b>PROPOSED ENERGY PERFORMANCE STANDARD</b>	<p>Gas- and oil-fired domestic water heaters must have a Uniform Energy Factor (UEF) that is equal or greater than 1.00.</p>
<b>EFFECTIVE DATE</b>	<p>Products manufactured and sold after January 1, 2030.</p>
<b>COMPLIANCE</b>	<p>The proposed energy performance standard applies to all products manufactured for sale in the province, sold, offered for sale, leased, or otherwise dispose of which includes to transfer by any method, assign, give, sell, grant, charge, convey, bequeath, devise, lease, divest, release and agree to do any of those things.</p>
<b>HARMONIZATION</b>	<p>The proposed regulation references existing Canadian and US performance ratings and does not require additional performance testing or certification.</p>
<b>COMPLIANCE OPTIONS</b>	<p>To comply with the proposed standard one of the following paths can be considered:</p> <ul style="list-style-type: none"> <li>• Electric storage water heater</li> <li>• Heat pump water heater</li> <li>• Gas-fired heat pump storage water heater</li> </ul>
<b>MARKET TRANSFORMATION</b>	<p>The Province is driving the market transformation of highest efficiency equipment through a variety of measures, including CleanBC retrofit incentives and financing, industry training, marketing, and home energy ratings.</p> <p>CleanBC Better Homes is B.C.'s hub for homeowners to access information, rebates and support to reduce energy use and greenhouse gas emissions in new and existing homes. The program has been incenting heat pump water heaters since 2018.</p>

## ASSESSMENT FROM INDUSTRY PERSPECTIVE

<b>AVAILABILITY</b>	Household electric resistance storage-type water heaters and heat pump water heaters are available from all major suppliers through the province.
<b>MANUFACTURER PERSPECTIVE</b>	All major water heater manufacturers of gas- and oil-fired water heaters also manufacture electric storage water heaters and heat pump water heaters. The proposed standard would require that manufacturers focus their product lines on electric storage and heat pump water heaters.
<b>IMPACT ON NEW CONSTRUCTION</b>	The proposed regulation is aligned with the province’s commitment to Zero Carbon new construction by 2030 and Net-Zero Energy Ready new construction by 2032. The proposed regulation will have minimal impact on builders as the heating systems that are in most cases needed to meet Zero Carbon or Net Zero Energy Ready are also compliant with the proposed regulation.

## ASSESSMENT FROM CONSUMER PERSPECTIVE

<b>ACCEPTANCE</b>	<p>Electric storage water heaters are a common and acceptable product in the market and account for about half of the storage-type water heaters in the Province. Electric storage water heaters provide the same functionality as gas- and oil-fired storage water heaters.</p> <p>Heat pump water heaters are a new product that is gaining acceptability as the technology evolves. Heat pump water heaters cool the air in the room they are installed in (unless vented to the outside) and create more noise than gas- and oil-fired water heaters. Heat pump water heaters are an acceptable solution for homes with mechanical rooms, and unfinished or semi-finished basements.</p>
<b>ACCESSIBILITY</b>	<p>Electric storage water heaters can be installed in the same locations as gas- and oil-fired storage water heaters but will need a new electrical connection and in some cases may require an electrical service upgrade.</p> <p>Heat pump water heaters are intended for partial or unconditioned spaces such as basements and mechanical rooms. Heat pump water heaters require a condensate drain, adequate air flow and an electrical connection. Plug-in heat pump water heaters are designed to directly replace gas- and oil-fired storage water heaters and only require a common 120 V connection.</p>



<p><b>CONSUMER COST-BENEFIT ANALYSIS</b></p>	<p>A cost-benefit analysis was completed for representative single-family dwellings in the Lower Mainland, Vancouver Island, Southern Interior, and the North. The cost-benefit analysis weighs the incremental cost of compliant equipment purchased in 2030, against the energy cost savings discounted over the equipment's lifetime. The cost-benefit analysis assumes a natural gas cost that includes a carbon tax and a cost premium representing a higher percentage of renewable natural gas.</p> <p>The analysis found that when replacing a typical gas water heater, a heat pump water heater installation has a lifetime cost premium of \$400 and an electric storage tank water heater installation has a lifetime cost premium of \$700.</p>
<p><b>NON-ENERGY IMPACTS</b></p>	<p>The proposed standard will reduce operational GHG emissions associated with water heating, helping consumers reduce their environmental footprint.</p>

## APPENDIX 4

# Weatherized Packaged Units

PREPARED BY:  
ENERGY EFFICIENCY BRANCH,  
B.C. MINISTRY OF ENERGY, MINES AND LOW CARBON INNOVATION

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**SCOPE AND REQUIREMENTS**

<p><b>TYPE OF DEVICE</b></p>	<p><b>Gas- and oil-fired weatherized packaged units</b> means space heating or ventilation systems, which may include air conditioning, dehumidification, cleaning and heat/energy recovery, that;</p> <ul style="list-style-type: none"> <li>• are fired by combustible gas<sup>5</sup> or oil,</li> <li>• is designed for outdoor installation,</li> <li>• is designed to be operated by a single system of controls,</li> <li>• contain a blower intended for distribution of heated air through a single forced air distribution system,</li> <li>• have an input rate of not more than 105 kW (360 kBtu/hr), and</li> <li>• are combined into a single package and sold together as a single heating or ventilation system.</li> </ul> <p><b>Gas- and oil-fired weatherized packaged units</b> include fired heaters, packaged rooftop units, make-up air units and dedicated outdoor air systems with heaters, but exclude fired heaters designed for industrial applications. This can include integrated dual fuel, gas heating only or gas heating electric cooling systems.</p>
<p><b>ENERGY EFFICIENCY VERIFICATION</b></p>	<p>There is currently no standardized performance rating for gas- and oil-fired weatherized packaged systems. Product certification for the proposed energy performance standard is not required under this proposal.</p> <p>Published data from relevant test standards and performance rating will be used to determine compliance with the energy performance standard. Test standards for specific equipment are:</p> <ul style="list-style-type: none"> <li>• ANSI Z21.47:21/CSA 2.3:21 Gas-fired central furnaces.</li> <li>• CAN/CSA P.2-13 Testing method for measuring the annual fuel utilization efficiency of residential gas-fired or oil-fired furnaces and boilers.</li> <li>• AHRI Standard 340/360-2022 Standard for Performance Rating of Commercial and Industrial Unitary Air-conditioning and Heat Pump Equipment.</li> <li>• ANSI Z21.40.4 Harmonized Standard for Performance Testing and Rating of Gas-Fired, Air-Conditioning and Heat Pumping Appliances.</li> <li>• AHRI 210/240: Performance Rating of Unitary Air-conditioning &amp; Air-source Heat Pump Equipment.</li> </ul>

<sup>5</sup> Natural gas, biomethane, or propane.

<b>PROPOSED ENERGY PERFORMANCE STANDARD</b>	Gas- and oil-fired weatherized packaged units must provide heat from a thermodynamic heat pump cycle to achieve a heating energy output higher than its energy input over the course of a heating season.
<b>EFFECTIVE DATE</b>	Products manufactured and sold after January 1, 2030.
<b>COMPLIANCE</b>	The proposed energy performance standard applies to all products manufactured for sale in the province, sold, offered for sale, leased, or otherwise disposed of which includes to transfer by any method, assign, give, sell, grant, charge, convey, bequeath, devise, lease, divest, release and agree to do any of those things.
<b>HARMONIZATION</b>	The proposed regulation references existing Canadian and US performance ratings and does not require additional performance testing or certification.
<b>COMPLIANCE OPTIONS</b>	To comply with the proposed standard one of the following paths can be considered: <ul style="list-style-type: none"> <li>• Heat pump rooftop unit</li> <li>• Integrated dual-energy rooftop unit</li> <li>• Electric rooftop unit</li> <li>• Rooftop unit with hydronic or refrigerant coils (including VRF LEV Kits)</li> <li>• Very high efficiency dedicated outdoor air system</li> </ul>
<b>MARKET TRANSFORMATION</b>	<p>The Province is driving the market transformation of highest efficiency equipment through a variety of measures, including CleanBC retrofit incentives and financing, industry training, and marketing.</p> <p>CleanBC Better Buildings is B.C.'s hub for building owners to access information, rebates and support to reduce energy use and greenhouse gas emissions in new and existing buildings. The program has been incenting heat pump and integrated dual-energy rooftop unit retrofits since 2018.</p>

## ASSESSMENT FROM INDUSTRY PERSPECTIVE

<b>AVAILABILITY</b>	Compliant options have high availability and are available from most manufacturers and distributors. Many manufacturers recently introduced new product lines to meet the US DOE's latest energy efficiency standard. Smaller tonnage (t) units (up to 5 t) are the most common product and have the most options, while larger packaged systems (up to 30 t) are the least common type of installation and have relatively fewer options.
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<b>MANUFACTURER PERSPECTIVE</b>	Major gas- and oil-fired weatherized packaged unit manufacturers also manufacture heat pumps and integrated dual-energy rooftop units (which combine a heat pump with a gas-fired heater). This standard will shift demand away from conventional gas- and oil-fired heaters towards heat pumps and dual-energy units.
<b>IMPACT ON NEW CONSTRUCTION</b>	The proposed regulation is aligned with the province’s commitment to Zero Carbon new construction by 2030 and Net-Zero Energy Ready new construction by 2032. The proposed regulation will have minimal impact on builders as the heating systems that are in most cases needed to meet Zero Carbon or Net Zero Energy Ready are also compliant with the proposed regulation.

**ASSESSMENT FROM BUILDING OWNER PERSPECTIVE**

<b>ACCEPTANCE</b>	Compliant options are widely available and commonly used across the industry.
<b>ACCESSIBILITY</b>	<p>All compliance options are suitable in urban communities in Southern B.C and in buildings with sufficient electrical capacity.</p> <p>In Northern B.C. and in buildings with limited electrical capacity, integrated dual-energy rooftop units are suitable, as are rooftop units with refrigerant coils and VRF LEV Kits.</p>
<b>BUILDING OWNER COST-BENEFIT ANALYSIS</b>	<p>A cost-benefit analysis was completed for gas-fired weatherized packaged systems in the Lower Mainland, Vancouver Island, Southern Interior, and the North. The cost-benefit analysis weighs the incremental cost of compliant equipment purchased in 2030, against the energy cost savings discounted over the equipment's lifetime. The cost-benefit analysis assumes a natural gas cost that includes a carbon tax and a cost premium representing a higher proportion of renewable natural gas.</p> <p>A gas- or oil-fired weatherized packaged system will typically be replaced with a packaged air source heat pump with electric or gas backup. The gas backup system represents buildings that have limited electrical capacity or need redundancy for emergency heat including but not limited to colder climates. A typical strip mall or light commercial building that uses a rooftop unit for heating, cooling and ventilation in the lower mainland or Vancouver Island will see an overall lifetime savings (including capital and operational costs) of \$38,200 to \$47,400. This is the most common application for weatherized packaged units.</p>

	<p>A large low rise multi-unit residential building that uses the make-up air unit for ventilation in the lower mainland or Vancouver Island will see an overall lifetime savings of \$169,000 to \$171,000.</p> <p>An office in the lower mainland that uses a dedicated outdoor air system for ventilation and has a chiller water system for cooling will see an overall lifetime cost premium of \$2,200 to \$19,500. Alternatively, if the building has sufficient electrical capacity, an electric resistance unit will have a lower lifetime cost premium of \$80 to \$1,600.</p>
<p><b>NON-ENERGY IMPACTS</b></p>	<p>In some cases, the retrofit of a gas- or oil-fired make-up air unit with a heat pump make-up air unit will add partial air conditioning to a multi-unit residential building. Building owners can choose whether to use the air conditioning, but it is expected to provide an additional benefit for buildings that experience overheating.</p> <p>The proposed standard will reduce operational GHG emissions from building heating helping businesses and consumers reduce their environmental footprint.</p>