

Residential Gas Boilers Regulatory Impact Statement

REGULATORY PROPOSAL

PREPARED BY:
ENERGY EFFICIENCY BRANCH,
B.C. MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES
JULY 2019

COMMENTS MUST BE RECEIVED BY [OCTOBER 4], 2019

Contents:

<i>Scope and Requirements</i>	2
<i>Assessment from an Industry Perspective</i>	3
<i>Assessment from a Consumer Perspective</i>	4
<i>Assessment from a Provincial Government Perspective</i>	5
<i>Notes</i>	6

SCOPE AND REQUIREMENTS

TYPE OF DEVICE	Residential Gas Boiler means a boiler that uses propane or natural gas, is intended for application in a hot water (hydronic) central heating system and has an input rate of less than 88 kW (300,000 Btu/h). A residential gas boiler may or may not service a domestic hot water system in addition to a space heating system.
TEST STANDARD	CSA P.2-13 – Testing method for measuring the annual fuel utilization efficiency of residential gas-fired or oil-fired furnaces and boilers
PROPOSED ENERGY PERFORMANCE STANDARD	Annual fuel utilization efficiency (AFUE) \geq 90%
EFFECTIVE DATE	Products manufactured and sold after January 1, 2022.
CERTIFICATION	Compliance with the proposed regulation is based on adherence of manufactured products with the proposed energy performance standard using the proposed test standard. Testing and verification must be 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.
CURRENT STANDARD	Currently, the B.C. Energy Efficiency Standards Regulation does not have a standard for residential boilers.
HARMONIZATION	<p>The proposed standard harmonizes with the B.C. Building Code. Currently, all residential gas boilers installed in new construction, in alterations or in additions are subject to the B.C. Building Code’s requirement of AFUE \geq 90%.</p> <p>The proposed standard harmonizes with recent amendments to the federal Energy Efficiency Regulations requiring that residential gas boilers manufactured on or after July 1, 2023 must be AFUE \geq 90%. The federal standard requires energy efficiency verification and labeling. This standard applies to all boilers shipped into B.C., but not to boilers manufactured and then purchased within the province.</p>
NEED FOR REGULATION	<p>This standard will:</p> <ul style="list-style-type: none"> • Create a harmonized and enforceable regulation for boilers manufactured in B.C. or shipped into B.C.; • Reduce net heating costs for B.C. residents; and • Achieve CleanBC commitments to reduce greenhouse gas (GHG) emissions through new energy efficiency standards for space heaters, water heaters and residential windows (2.2 Improving Where We Live and Work).

TRANSPARENT REGULATION DEVELOPMENT	<p>Development of the proposed residential gas boiler standard proceeded as follows:</p> <ul style="list-style-type: none"> • Review of provincial climate and energy plans; • Market, economic and technical analysis; and • Development of a regulatory proposal. <p>Public review and stakeholder consultation will be open for [45-days] after the publication of this document. Stakeholder consultation will be followed by regulatory drafting and submission of the regulatory proposal to Cabinet for approval.</p>
ACCEPTANCE	<p>The proposed performance level requires condensing technology and typically incorporates modulating technology and a mechanical draft. While this technology is widely available and well known to most installers, it is a change from single stage, non-condensing natural draft boilers. The two technologies have different venting requirements, materials of construction, and operating schemes.</p> <p>Market acceptance is high as reflected by national shipping data that indicates 67% of residential gas hot water boiler shipments from 2015-2017 were condensing.</p>
MARKET TRANSFORMATION	<p>Market transformation programs for residential gas boilers have been operating since 2008. These include both the ENERGY STAR program and the FortisBC boiler replacement program. Since 2014, both programs have been promoting condensing boilers with an AFUE equal to or greater than 90%.</p>
AVAILABILITY	<p>The high-efficiency residential gas boiler market is well established with most manufacturers providing models with performance ranging from 90% to 97% AFUE. Currently, 52% of product models available in Canada meet the proposed standard.</p>

ASSESSMENT FROM AN INDUSTRY PERSPECTIVE

ACCESSIBILITY	<p>Products meeting the proposed standard are available from approximately 75% of manufacturers serving the Canadian market.</p>
MANUFACTURER PERSPECTIVE	<p>There are three residential gas boiler manufacturers with operations in B.C. All three manufacturers sell products compliant to the proposed standard to provincial and national markets. Two of these manufacturers only sell products that are compliant with the proposed regulation. One company also sells products that are not compliant with the proposed regulation. Manufacturers can continue to produce non-compliant boilers for export.</p>
IMPACT ON BUILDERS	<p>The proposed standard will have minimal impact on builders. The B.C. Building Code, which covers new construction, additions, and alterations, already requires these products. Builders will benefit from harmonization of the standard, as there is less chance of being under-bid by a non-compliant design.</p>
OTHER ISSUES	<p>The more complex technology and the higher initial cost of condensing boilers will result in higher expectations of contractor professionalism and service quality. Un-trained installers may lose market share to more professional companies.</p>

ASSESSMENT FROM A CONSUMER PERSPECTIVE

COST-BENEFIT ASSUMPTIONS	<p>A cost-benefit analysis was completed for representative single-family dwellings in the lower mainland, southern interior, and the north. The cost-benefit analysis weighs the incremental purchase and maintenance costs against the energy cost savings discounted over the equipment lifetime. Net Present Value (NPV) is used to represent the positive or negative economic impact of the proposed standard on each consumer.</p> <p>Cost-benefit assumptions include:</p> <ul style="list-style-type: none"> • A natural gas cost that includes all variable costs including delivery charges, commodity charges, carbon tax, sales tax and the clean energy levy. The total cost of gas supply was estimated at \$9.90/GJ in 2020, with moderate increases in subsequent years. • A consumer discount rate of 6%. • Analysis of various product sizes, efficiency levels, and product types (conventional and combi boilers). • Incremental costs derived from the US Department of Energy (DOE) 2015 Final Rule for Residential Boilers¹ and converted for inflation and currency. • A product lifetime of 26.5 years (derived from the US DOE 2015 Final Rule). • Energy savings modelled in HOT2000 v11.4 for the representative climates of Vancouver, Kamloops and Prince George. <p>The average incremental installed cost for a 90% AFUE boiler compared to a baseline 82% AFUE boiler is \$1,000-\$1,350. Most of this cost is the higher purchase cost of the condensing boiler. The total incremental cost is approximately 14% of total installed costs.</p> <p>The average installation cost includes the average cost to install a new condensate drain. A small subset of homes will require more extensive condensate systems (new electrical connections, long pipe runs, pumps, neutralizers, and wall penetrations, etc.). The additional cost for an extensive condensate drain retrofit is \$500-650.</p> <p>The average installation cost includes the average cost to install new combustion air and fuel gas vents. The incremental cost of installing new vents is offset by a reduction of costs for chimney relining and resizing of natural draft vents.</p>
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¹ EERE-2012-BT-STD-0047 Energy Conservation Program: Energy Conservation Standards for Residential Boilers; Final Rule

COST-BENEFIT ANALYSIS ENERGY SAVINGS FOR EACH CONSUMER	<p>The average impact on consumers is shown below.</p> <table border="1" data-bbox="451 252 1481 619"> <thead> <tr> <th colspan="2">Average Consumer Cost-Benefit Analysis</th> </tr> </thead> <tbody> <tr> <td>Incremental installed cost</td> <td>\$1,050</td> </tr> <tr> <td>Annual energy savings</td> <td>15 GJ</td> </tr> <tr> <td>Annual GHG reductions</td> <td>770 kg CO₂e</td> </tr> <tr> <td>Simple payback per unit</td> <td>7 years</td> </tr> <tr> <td>NPV</td> <td>\$1,060</td> </tr> </tbody> </table> <p>The cost-benefit results vary for each climate region, depending on the capacity of the boiler required and the length of the heating season. The NPV for a mid-size home in Vancouver is \$900 whereas the NPV for the same sized home in Prince George is almost \$3,000. Likewise, the cost-benefit is different when comparing the proposed standard to an 82% boiler (the federal minimum efficiency) or 85% boiler (a commonly purchased efficiency level). When using an 85% boiler as the baseline, the NPV for a mid-sized Vancouver home is \$600. The NPV was positive for all modelled scenarios.</p>	Average Consumer Cost-Benefit Analysis		Incremental installed cost	\$1,050	Annual energy savings	15 GJ	Annual GHG reductions	770 kg CO ₂ e	Simple payback per unit	7 years	NPV	\$1,060
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NON-ENERGY IMPACTS	<p>The proposed standard will reduce GHG emissions associated with residential space heating, helping consumers reduce their environmental footprint.</p> <p>Condensing boilers also reduce air pollution associated with the combustion of fossil fuels and minimize the risk of indoor combustion spillage. Condensing boilers that use modulating technology improve household comfort by creating more consistent indoor temperatures.</p> <p>The proposed standard will require some occupants to change their thermostat control habits. While it may seem counter-intuitive, some occupants will need to minimize the depth of their nighttime thermostat setback to achieve optimal efficiency and comfort.</p>												

ASSESSMENT FROM A PROVINCIAL GOVERNMENT PERSPECTIVE

ECONOMIC ASSESSMENT FROM A PROVINCIAL PERSPECTIVE <i>(Aggregate energy, emission, and net cost savings)</i>	<p>A cost-benefit analysis was completed to determine the impact of the proposed standard on the Province. The cost-benefit analysis is represented by the NPV of boiler installations that are affected by the proposed standard between 2022 and 2030. The Provincial cost-benefit assumptions include:</p> <ul style="list-style-type: none"> All assumptions made in the consumer cost-benefit analysis. The percent of shipments that already meet the proposed standard were excluded from the cost-benefit analysis. The average cost and efficiency of non-compliant products was derived from shipment data and based on two benchmarks: (1) the federal minimum energy performance standard (82% AFUE); and (2) the average efficiency benchmark (85% AFUE).
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	<ul style="list-style-type: none"> A forecast of future shipments affected by the standard was based on the replacement rate of B.C.'s installed stock. The estimate of B.C.'s installed stock is based on historical percentages of gas equipment and hot water space heating systems in B.C. homes and the equipment's life expectancy, as well as the projected population growth. The installed stock estimated was cross-referenced against Canadian boiler shipment data. <p>The Province-wide cost-benefit results are shown below.</p> <table border="1" data-bbox="431 474 1399 716"> <thead> <tr> <th colspan="2">Provincial Cost-Benefit Analysis²</th> </tr> </thead> <tbody> <tr> <td>Aggregated Annual Energy Savings</td> <td>133,000 GJ in 2030</td> </tr> <tr> <td>Aggregated Annual GHG Reductions</td> <td>6,600 tonnes CO₂e in 2030</td> </tr> <tr> <td>Provincial NPV</td> <td>\$7 Million by 2030</td> </tr> </tbody> </table>	Provincial Cost-Benefit Analysis ²		Aggregated Annual Energy Savings	133,000 GJ in 2030	Aggregated Annual GHG Reductions	6,600 tonnes CO ₂ e in 2030	Provincial NPV	\$7 Million by 2030
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ADMINISTRATIVE FEASIBILITY FOR COMPLIANCE AND ENFORCEMENT	<p>The compliance and enforcement approach under the <i>Energy Efficiency Act</i> is based on random inspections and response to compliance complaints.</p> <p>Enforcement will be based on provincially and federally regulated labelling and the certified product directories of designated testers.</p> <p>Harmonization with new construction standards will be mutually beneficial as enforcement will occur at both the point of sale and at the construction site.</p>								

NOTES

REGULATORY ASSESSMENT COMPLETED BY	Cameron Shook, P.Eng Energy Efficiency Standards Engineer, Energy Efficiency Branch Tel: (778) 698-8306 E-mail: cameron.shook@gov.bc.ca
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² The aggregated annual values account for the savings and GHG reductions that occur in the year specified from all units installed since the implementation of the standard up to the year specified.