

NATURAL GAS-FIRED FURNACES

REGULATORY PROPOSAL

PREPARED BY:

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[HTTP://WWW.EMPR.GOV.BC.CA/EEC/STRATEGY/EEA/PAGES/DEFAULT.ASPX](http://www.empr.gov.bc.ca/EEC/STRATEGY/EEA/PAGES/DEFAULT.ASPX)

JANUARY 2014

PLEASE SUBMIT COMMENTS BY MARCH 17, 2014

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SCOPE AND REQUIREMENTS – REGULATORY PROPOSAL¹

TYPE OF DEVICE	<p>Natural gas-fired furnaces (input rate <225,000 BTU/h; <65.9 kW) - a commercially available product designed solely for the purpose of raising the temperature of incoming air.</p> <p>The product uses an input of natural gas and oxygen to initiate combustion, thereby creating heat that is transferred to the forced air by virtue of a heat exchanger. Given the small capacity of furnaces included within this scope, the heated space is usually a single family dwelling (SFD) - either a detached or semi-detached house.</p> <p>Included:</p> <ul style="list-style-type: none"> • Natural gas or propane furnaces <p>Not included:</p> <ul style="list-style-type: none"> • Gas furnaces with an integrated cooling component that <ul style="list-style-type: none"> (a) Are outdoor gas furnaces, and (b) Use single-phase electric current • Gas-fired duct furnaces • Oil-fired furnaces
TEST STANDARD	<p>CAN / CSA-P.2-07 standard used to measure the annual fuel utilization efficiency (AFUE) of residential gas-fired furnaces and boilers.</p>
PROPOSED ENERGY PERFORMANCE STANDARD	<ul style="list-style-type: none"> • Annual Fuel Utilization Efficiency (AFUE) ≥ 92% • This harmonizes with the BC Building Code adopted in April 2013, with an effective date of December 19, 2014.
EFFECTIVE DATE	<p>Products manufactured after December 19, 2014</p>
CERTIFICATION	<p>All manufactured products must be tested and adhere to the proposed energy performance standard using the proposed test standard. Testing and verification must be performed by Certification Organizations accredited by the Standards Council of Canada.</p> <p>No unique British Columbia labeling will be required. Rather, a product listing on the Natural Resources Canada database, showing a compliant performance level, is sufficient.</p>

¹ This Regulatory Proposal is to be considered a “specified proposal” for the purposes of special treatment under section 4(1.4)(b) of the Demand Side Measures Regulation.

NEED FOR REGULATION	<p>The proposed regulation reduces energy bills for consumers, reducing the cost of owning and operating houses and buildings. It also supports the BC's greenhouse gas (GHG) reduction targets as stated in the <i>Greenhouse Gas Reduction Targets Act</i> of 2007:</p> <ul style="list-style-type: none"> • By 2020, 33% less than the level of emissions in 2007 • By 2050, 80% less than the level of emissions in 2007 <p>The regulation is identical to the level adopted in the BC Building Code, which will become effective on December 19, 2014. By removing non-compliant products further up the supply chain, this regulation will assist with enforcement for replacement furnaces, where permit enforcement is a challenge. It will also prevent situations in which a consumer purchases and installs a non-compliant product and is then denied a building permit as a result.</p>
TRANSPARENT REGULATION DEVELOPMENT	<p>Development of the regulation followed the succeeding procedure:</p> <ul style="list-style-type: none"> • Initial market analysis including manufacturer inventory • Economic assessment • Regulatory assessment <p>The regulatory impact statement will be posted for written comment over a 45-day formal public consultation period.</p>
MARKET TRANSFORMATION STRATEGY	<p>The current ENERGY STAR[®] standard as of February 1, 2013 is 95% AFUE for gas-fired furnaces in Canada and the northern United States.</p> <p>Certain incentives offered by various agencies have increased the uptake of high efficiency furnaces:</p> <ul style="list-style-type: none"> • LiveSmart BC offered a \$500-\$600 rebate for ENERGY STAR furnaces until March 31, 2013. • The federal ecoENERGY grant offered a variety of incentives for high efficiency furnaces until March 31, 2012, ranging from \$375 to \$790 depending on the efficiency level. • The BC Hydro Power Smart New Home program offers up to a \$2,000 rebate for houses that achieve EnerGuide 80 or higher, which usually requires a high-efficiency heating system. • The BuiltGreen BC program offers extra points for a high efficiency furnace, which is one of the easiest ways to earn points under the guidelines. • FortisBC has a long standing history of furnace incentive programs, the most recent of which are highlighted: <ul style="list-style-type: none"> ○ \$800 rebate: 2013 Furnace Replacement Pilot Program (ENERGY STAR natural gas furnace at least 95% AFUE) ended July 1, 2013 ○ \$1000 rebate: Switch 'n' Shrink Program (from oil or propane to ENERGY STAR natural gas furnace at least 95% AFUE) ○ \$2000 Vancity mortgage rebate: available to Furnace Replacement Pilot Program participants provided they are new Vancity mortgage clients or re-financing their existing Vancity mortgage with additional funds of at least \$25,000 (program

MARKET TRANSFORMATION STRATEGY	<p style="text-align: center;">ended Aug 15, 2013).</p> <p>Availability: NRCan reports 3,188 different models of furnaces from 85 manufacturers that achieve $\geq 90\%$ AFUE (the current EESR standard), which represents approximately 60% of the entire database. Over 91% of these models would meet the proposed regulation of 92% AFUE which suggests that the market is saturated with these products, and that only the least efficient 9% of products would be eliminated from the BC market. The vast majority of manufacturers (94%) have at least one model that meets the proposed regulation.</p> <p>Awareness: Gas furnaces are approaching very high efficiencies, in some cases up to 98% AFUE. Retailers stock and promote ENERGY STAR furnaces.</p> <p>Accessibility: Product lines are typically featured on manufacturer’s websites, along with product brochures outlining key benefits and specifications. Pamphlets are usually available at distribution outlets and retailers.</p> <p>Affordability: Preliminary analysis from the NRCan consultation process in 2006 suggests that the incremental cost (installed) of a 92% AFUE furnace over a 90% AFUE furnace is approximately \$100. DOE data from 2005 estimates this figure to be closer to \$55.</p> <p>Acceptability: Aggregated shipment data across Canada indicates that approximately 95% of furnaces shipped in 2012 were greater than or equal to 92% AFUE (Heating, Refrigeration and Air Conditioning Institute of Canada, 2012). Furthermore, 70% of furnaces met or exceeded the 95% AFUE threshold. These statistics are clear evidence that the high-efficiency furnace market is well established, and that consumers are willing to pay a premium for energy efficiency.</p> <p>Demand Side Management (DSM) programs to increase market share: This proposed regulation can be promoted by energy utilities through their Demand-Side Management (DSM) programs², leading to increased market share of compliant products prior to the effective date.</p>
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ASSESSMENT FROM AN INDUSTRY PERSPECTIVE

RANGE OF PRODUCTS AFFECTED	<p>The 92% AFUE standard applies to all small capacity natural gas-fired furnaces (input <225,000 BTU/h; <65.9 kW). Outdoor furnaces with single-phase electric current are beyond the scope of this proposed regulation.</p>
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² This Regulatory Proposal is to be considered a “specified proposal” for the purposes of special treatment under section 4(1.4)(b) of the Demand Side Measures Regulation.

COST IMPACT	<p>As of December 31st, 2009, the minimum energy performance standard (MEPS) for gas furnaces in the Energy Efficiency Standards Regulation (EESR) is 90% AFUE, which can only be achieved with condensing technology; since the components and construction of the 90% AFUE furnace is largely identical to that with 92% AFUE, the incremental cost is expected to be marginal. There are no additional cost considerations during the installation of either furnace.</p> <p>Data provided to NRCan's furnace consultation in 2006 indicates that the incremental cost is approximately \$100 installed. A more recent study by the DOE found that the price difference was approximately \$55.</p>
COMPETITIVE ANALYSIS AND HARMONIZATION	<p>There are no BC-based manufacturers of natural gas-fired furnaces. Marketing and distribution of gas furnaces is done on a continental basis and as such, several other manufacturers' products are available in British Columbia.</p> <p>The BC Building Code was adopted in April 2013 and includes the 92% AFUE furnace standard as published in the model National Building Code (NBC) of Canada.</p> <p>The Province of Manitoba has regulated furnaces to a minimum of 92% AFUE since December 30, 2009.</p>
MARKET SHARE	<p>Data from 2012 shows that approximately 95% of furnaces shipped in Canada met or exceeded 92% AFUE.</p>

ASSESSMENT FROM A CONSUMER PERSPECTIVE

INCREMENTAL PURCHASE COSTS	<p>The incremental cost of a 92% AFUE furnace over a 90% AFUE furnace is in the range of \$55-\$100 installed.</p>																								
COST-BENEFIT ANALYSIS ENERGY SAVINGS FOR EACH CONSUMER	<p><i>Table 1: Annual Summary for Each Consumer:</i></p> <table border="1" data-bbox="431 1182 1328 1528"> <thead> <tr> <th></th> <th><i>Detached</i></th> <th><i>Semi Detached</i></th> </tr> </thead> <tbody> <tr> <td>Heat Requirement (GJ/yr)</td> <td>51</td> <td>32</td> </tr> <tr> <td>NG Savings (GJ/yr)</td> <td>1.2</td> <td>0.7</td> </tr> <tr> <td>Cost Savings - First Year</td> <td>\$13</td> <td>\$8</td> </tr> <tr> <td>GHG Savings (kg CO₂e/yr)</td> <td>59</td> <td>37</td> </tr> <tr> <td>Incremental Installed Cost, Furnace</td> <td>\$55</td> <td>\$55</td> </tr> <tr> <td>Simple Payback Period (yrs)</td> <td>4.2</td> <td>6.8</td> </tr> <tr> <td>NPV (15 yrs, 6% discount rate)</td> <td>\$90</td> <td>\$36</td> </tr> </tbody> </table> <p>In summary, detached single family dwellings will benefit from \$13 lower energy bills per year for an incremental capital cost of \$55, resulting in a net benefit (profit) of \$90 over the life of the product.</p>		<i>Detached</i>	<i>Semi Detached</i>	Heat Requirement (GJ/yr)	51	32	NG Savings (GJ/yr)	1.2	0.7	Cost Savings - First Year	\$13	\$8	GHG Savings (kg CO₂e/yr)	59	37	Incremental Installed Cost, Furnace	\$55	\$55	Simple Payback Period (yrs)	4.2	6.8	NPV (15 yrs, 6% discount rate)	\$90	\$36
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**COST-BENEFIT
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A sensitivity analysis was performed on varying natural gas prices and incremental capital costs. Barring a substantial drop in natural gas prices, the 15-year NPV remains positive in the majority of cases (Figures 1-4).

Figure 1: Varying Natural Gas Prices and Discount Rates – Single Family Dwelling

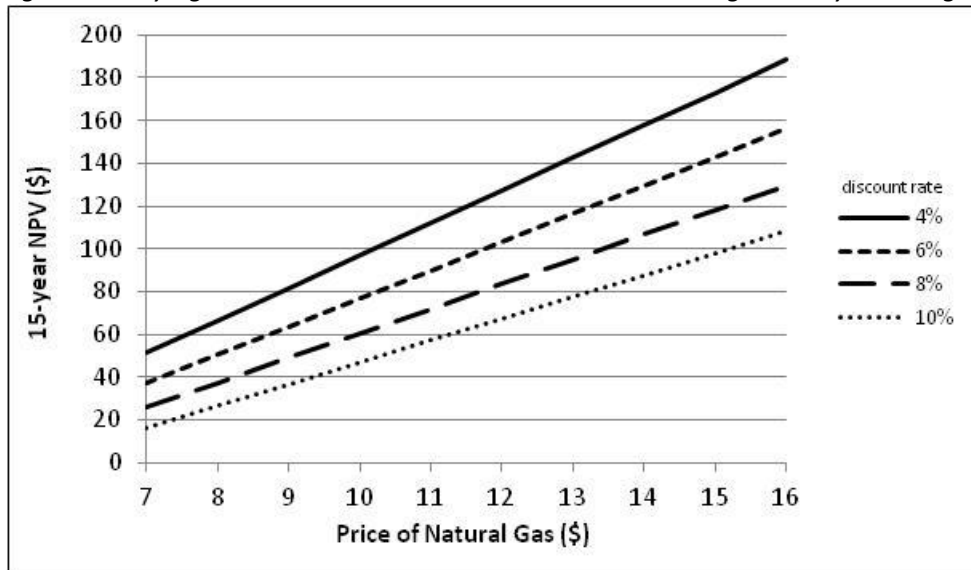
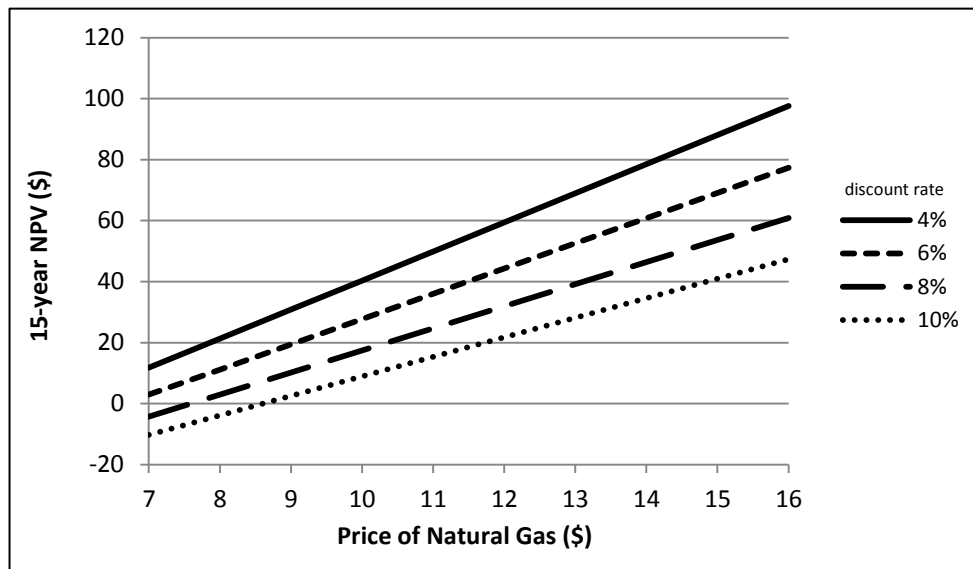


Figure 2: Varying Natural Gas Rates and Discount Rates – Semi Detached



**COST-BENEFIT
ANALYSIS**
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Figure 3: Varying Incremental Capital Cost and Discount Rates – Single Family Dwelling

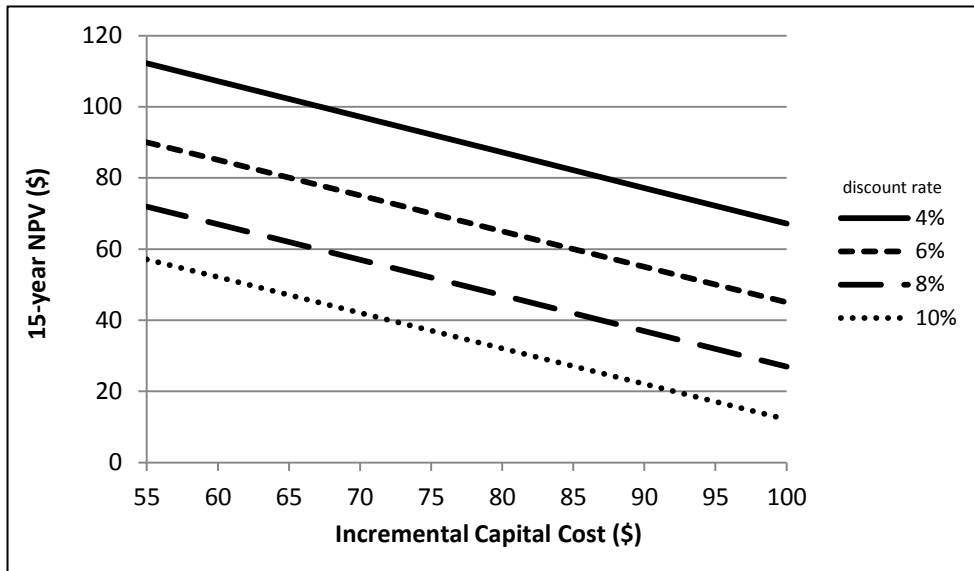
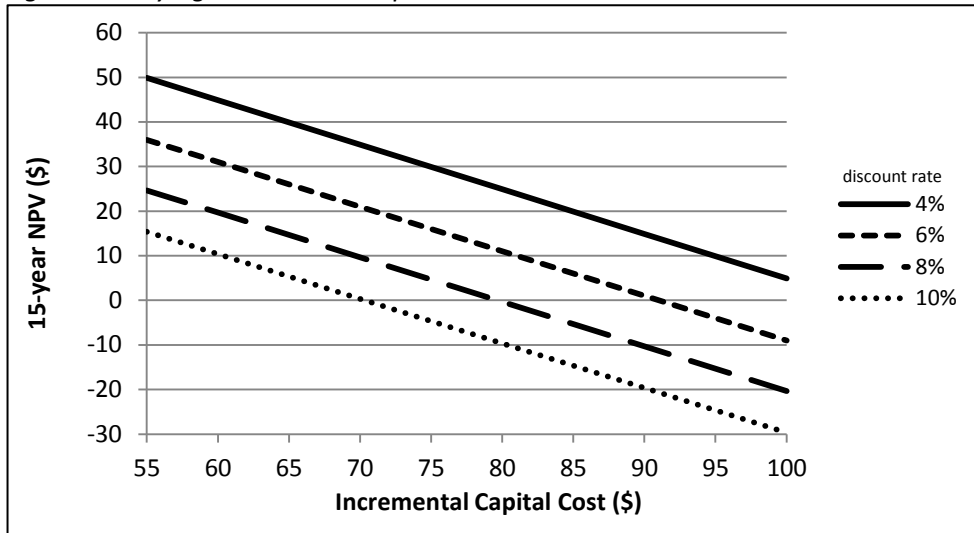


Figure 4: Varying Incremental Capital Cost and Discount Rates – Semi Detached



**NON-ENERGY
BENEFITS**

Aligning the proposed 92% AFUE standard with the BC Building Code would mean a uniform minimum energy performance standard across the province for manufacturing, distribution, sale (retail) and installation of residential gas-fired furnaces. Collectively it would reduce confusion for the public and would facilitate easier enforcement by the province.

ASSESSMENT FROM A PROVINCIAL GOVERNMENT PERSPECTIVE

<p>ECONOMIC ASSESSMENT FROM A PROVINCIAL PERSPECTIVE</p> <p><i>(Aggregate energy, emission and net cost savings)</i></p>	<p>The following three metrics illustrate the benefit of the regulation from an energy, emissions, and cost perspective:</p> <table border="1" data-bbox="431 359 1422 877"> <tr> <td data-bbox="431 359 1062 537"> <p>Annual Natural Gas Savings (GJ/yr) in 2020</p> </td> <td data-bbox="1062 359 1422 537"> <p>3,000 (with a provincial NPV of \$6,000)</p> </td> </tr> <tr> <td data-bbox="431 537 1062 711"> <p>Annual GHG Savings (tCO₂e/yr) in 2020</p> </td> <td data-bbox="1062 537 1422 711"> <p>200</p> </td> </tr> <tr> <td data-bbox="431 711 1062 877"> <p>Provincial NPV (\$) over the lifetime of products installed between 2015-2025</p> </td> <td data-bbox="1062 711 1422 877"> <p>\$ 300,000</p> </td> </tr> </table> <p>In summary, British Columbians as a whole will see 3,000 gigajoules of natural gas savings in 2020 and will save \$300,000 over and above incremental capital costs. In addition, greenhouse gas reductions of 200 tonnes will be achieved in 2020.</p> <p>The reduction in SO_x and NO_x gases is a side benefit that improves local air quality, especially in urban areas where furnace density is high.</p> <p>Modelling Assumptions:</p> <ul style="list-style-type: none"> • National statistics from 2012 show approximately 16,000 furnaces with less than 92% AFUE were shipped. • Data shows that consumers prefer to purchase equipment that exceeds the minimum national or provincial standards. This analysis assumes that historical furnace purchases below 95% AFUE increase by 2% AFUE on average as a result of the proposed regulation. • Product lifetime of 15 years • 6% discount rate 	<p>Annual Natural Gas Savings (GJ/yr) in 2020</p>	<p>3,000 (with a provincial NPV of \$6,000)</p>	<p>Annual GHG Savings (tCO₂e/yr) in 2020</p>	<p>200</p>	<p>Provincial NPV (\$) over the lifetime of products installed between 2015-2025</p>	<p>\$ 300,000</p>
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<p>ADMINISTRATIVE FEASIBILITY FOR COMPLIANCE AND ENFORCEMENT</p>	<p>Compliance and enforcement approach under the <i>Energy Efficiency Act</i> is based on random inspections and response to compliance complaints, primarily at the retail level. The updated Canadian Standards Association test standard was finalized in 2008 (P.2-07) which will support compliance with the stated regulation.</p> <p>No unique labelling of BC products will be required. As such, enforcement will be based on product listings on the NRCAN online database showing compliant performance levels.</p>						

NOTES

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DATE	January 29 th , 2014