



Building Advisory B23-004

June 17, 2024

Subject: District Energy and NECB Compliance

Background:

The City of Calgary is exploring opportunities to reduce the use of carbon intensive fuels in buildings. The downtown core of the city contains a district energy (DE) facility which is currently underutilized. Based on considerations, The City of Calgary is encouraging the use of district energy (DE) wherever possible as an alternative to individual heating systems, a key component of its carbon reduction strategy.

The National Energy Code of Canada for Buildings (NECB) treats DE as purchased energy (A.8.4.3.5). When using purchased energy in an energy model, the NECB requires the utilization of the same equipment in both the reference and proposed models, which eliminates the ability to derive any benefits from the actual performance of the DE equipment. This places a proposal using DE at a disadvantage compared to a proposal which can choose a heating system to optimize other factors of the design.

With the East Village District Energy Plant a combined heat and power generation (COGEN) unit utilizes multiple natural gas modulating boilers to produce heat. The network distributes this heat to buildings that have chosen to connect to the system. The system captures the waste heat from this process and reuses it to generate electricity, which is then sent back to the grid. This process does not increase the measured efficiency of the base equipment, but it does use that energy conversion twice, albeit at a reduced efficiency, producing both heat and power from the same volume of natural gas.

We have received a request to consider if a building connected to this DE facility can use a higher efficiency gas-fired boiler for the proposed model to gain the same benefits as a building not connected to DE. This will remove any detriment to a building that chooses a DE connection over an independent heating system and contributes to a reduction in overall carbon production from the building.

An engineer report has been produced and submitted documenting the actual measured efficiencies of the DE facility in use, demonstrating the actual production of heat and power over a period. It's anticipated that these numbers will improve as the plant approaches optimum utilization.

As the COGEN facility is not unique to a single building it is not possible to quantify the amount of electricity generation that is attributable to each building connected to the system, it would therefore be unreasonable to assign the full benefit obtained to each individual building connecting to the facility. There is, however, sufficient benefit demonstrated that it is reasonable to consider a building connected to this facility as equivalent to the best boilers available. Allowing the building energy model to utilize a boiler efficiency of 95% would be comparable to the best boilers available in the market currently, thus putting DE on an equal footing with individual systems.

The principal reason for limiting the advisory to 95% is that if a building owner no longer retains a connection to the DE facility, they can install a boiler that matches the efficiency used in the energy model at the time of construction. This would significantly reduce or eliminate the risk of significant upgrades to the envelope or building systems being required to remain compliant.



Advisory:

Under NECB Division B Purchased Energy is regulated under 8.4.3.5 and 8.4.4.6.

8.4.3.5 provides the conditions for using purchased energy in the Proposed model and requires that it be modelled as a gas fired modulating boiler in accordance with the prescriptive requirements of 5.2.

8.4.4.6 provides the conditions for purchased energy in the Reference model and requires the system be modelled as a gas fired modulating boiler in accordance with the prescriptive requirements of 5.2.

Below are the excerpted efficiency requirements for a single modulating gas boiler referenced in 5.2.

Extracted from NECB 2020 Division B table 5.2.12.1.-N

Type of Equipment	Cooling or Heating Capacity, kW	Performance Testing Standard	Rating Conditions	Minimum Performance ⁽¹⁾
Gas-fired ⁽⁴⁾	< 88	CAN/CSA-P2	See standard	AFUE = 90% (water) ⁽³⁾ AFUE = 82% (steam) ⁽³⁾
	≥ 88 and < 733	DOE 10 CFR, Part 431, Subpart E, Appendix A	See standard	E _t ≥ 90% (water) E _t ≥ 81% (steam)
	≥ 733 and < 2 930		See standard	E _c ≥ 90% (water) E _t ≥ 82% (steam)

Notes to Table 5.2.12.1.-N:

- ⁽¹⁾ The symbols and abbreviations that appear in this column have the following meanings:
 AFUE = annual fuel utilization efficiency
 E_c = combustion efficiency
 E_t = thermal efficiency
- ⁽²⁾ No standards address the heating performance efficiency of electric boilers; however, their thermal efficiency is typically normalized at 97% in the testing standards.
- ⁽³⁾ Components or equipment regulated in the "Energy Efficiency Regulations" at the time of publication of the Code (see Article 1.1.1.3. of Division A).
- ⁽⁴⁾ Includes propane.

Due to the measured performance of the East Village DE plant, it is considered reasonable to allow the proposed model to use a maximum AFUE, E_T or E_c of 95%. For applications which are proposing a connection to the system.

The NECB Compliance report and the drawings shall highlight the connection to the DE system. Evidence of agreement to connect to the DE system shall be submitted to the file manager prior to Building Permit issuance.

If a proposal is accepted under this advisory and later changes its heating system to something other than DE a building permit will be required and a new energy model shall be submitted to show that the building will continue to meet the energy efficiencies demonstrated at time of approval.

This interpretation was accepted by the Codes and Standards Technical Interpretation Committee (CSTIC – June 17, 2024).

Chief Building Official
The City of Calgary

This Advisory is issued by The City of Calgary. Advisories have no legal status and cannot be used as an official interpretation of the various bylaws, codes, and regulations currently in effect. The City of Calgary accepts no responsibility to persons relying solely on this information.