Market Transformation Strategies for Energy-using Equipment in the Building Sector: Overview of Aspirational Goals

Residential Windows

Figure 1 lists the short-, medium- and long-term aspirational goals to 2030 for this equipment area. The aspirational goals cover residential windows and sliding glass doors that are factory-built/glazed and used in new construction and existing home retrofits. Unit skylights and hinged doors systems require further discussion to define appropriate performance levels. The goals also include research and development targets to support the development of next-generation technologies.

Figure 1. Aspirational goals to 2030 for residential windows in Canada

Short term: By 2020, residential windows for sale in Canada meet an average U-factor of 1.6 (or an ER of 25).

Medium term: By 2025,

- All residential windows for sale in Canada meet a U-factor of 1.2 (or an ER of 34).
- Residential windows with a U-factor of 0.8 can be manufactured and installed cost effectively.[1]

Long term: By 2030, all residential windows for sale in Canada meet a U-factor of 0.8 (or an ER of 40).[2]

Performance levels for windows have traditionally varied by climate zones. However, only one value was chosen for each aspirational goal since higher performance values reduce the range of efficiency levels possible for different climate zones.

[1] Cost equivalent to a 5% premium over a window with a U-factor of 1.2. This is the estimated cost at which a window with a U-factor 0.8 will become cost-effective versus a window with a U-factor of 1.2. Costs are based on manufacturer and industry estimates collected through Natural Resources Canada's Local Energy Efficiency Partnership Initiative and CanmetENERGY's research programs.
[2] The ER is an approximation.

Space Heating

Figure 2 lists short-, medium- and long-term aspirational goals to 2035 for space heating. The aspirational goals cover commercial and residential technologies that use natural gas and electricity. The goals also include research and development targets to support the development of next-generation technologies.

Figure 2. Aspirational goals to 2035 for space heating in Canada

Short term: By 2025,

- All fuel-burning technologies for primary space heating for sale in Canada meet an energy performance of at least 90% (condensing technology).
- All air-source heat pumps for sale in Canada meet a SCOP greater than 2.5,[3] at least 30% better performance than today.

Medium term: By 2030,

- A residential natural gas heat pump with a SCOP greater than 1.2 can be manufactured and installed cost effectively.[4]
- A residential cold climate air-source heat pump with a SCOP greater than 2.75 can be manufactured and installed cost effectively.[5]
- The deployment of heating systems using renewable technologies and renewable resources are supported.

Long term: By 2035, all space heating technologies for sale in Canada meet an energy performance of more than 100%.

The short-term goals will transition the entire market for gas-fired equipment to condensing technology and electric heat pumps to technology capable of operating efficiently and effectively in cold temperatures. In the medium-term, the goals lay out research and development targets to support the commercialization, deployment and performance improvements of gas heat pump technology, and deployment and performance improvements for air-source heat pumps. The medium-term goals are also focused on ensuring that barriers are not inadvertently created for the use of biomass and other renewable technologies in remote and northern applications. The long-term aspirational goal is to transition the entire market to technologies that have a performance greater than 100% in cold climates.

[3] For ASHRAE Region V, when tested according to the CSA Express document (currently in draft form) regarding variable capacity heat pumps

[4] The research and development target is only for residential applications. Given the absence of data on the commercial building sector, it was not possible to produce a target for this report. Cost equivalent to a 25% premium over a high efficiency gas furnace. This is the estimated cost at which a natural gas heat pump with a SCOP greater than 1.2 will become cost-effective versus a condensing gas furnace with an AFUE of 95%. This cost is based on manufacturer and industry estimates collected through Natural Resources Canada's Local Energy Efficiency Partnership Initiative and CanmetENERGY's research programs.

[5] The research and development target is only for residential applications. Given the absence of data on the commercial building sector, it was not possible to produce a target for this report. Cost equivalent to a 35% premium over a conventional air-source heat pump. This is the estimated cost at which an air-source heat pump with a SCOP greater than 2.75 will become cost-effective versus a conventional air-source heat pump with a SCOP of 1.35-1.45. This cost is based on manufacturer and industry estimates collected through Natural Resources Canada's Local Energy Efficiency Partnership Initiative and CanmetENERGY's research programs.

Water Heating

Figure 3 lists short-, medium- and long-term aspirational goals to 2035 for water heating. The aspirational goals cover commercial and residential water heating technologies that use natural gas and electricity. The goals also include research and development targets to support the development of next-generation technologies.

Figure 3. Aspirational goals to 2035 for water heating in Canada

Short term: By 2025, all fuel-burning water heating technologies for sale in Canada meet an energy performance of at least 90% (condensing technology).

Medium term: By 2030,

- All electric water heaters for sale in Canada meet an energy performance of more than 100% (EF greater than 1).
- A residential gas heat pump with an EF greater than 1.4 can be manufactured and installed cost-effectively.[6]

Long term: By 2035, all water heating technologies for sale in Canada meet an energy performance greater than 100% (EF greater than 1).

The short-term goals will transition the entire market for gas-fired equipment to condensing technology. In the medium-term, electric water heaters would transition to heat pump technology. The medium-term goals also lay out research and development targets to support both the commercialization, deployment and performance improvements of gas heat pump technology. The long-term aspirational goal is to transition the entire market to technologies that have an energy performance greater than 100%. While not directly addressed, it is also expected that the performance and cost of electric heat pumps will also improve between now and 2035.

[6] The research and development target is only for residential applications. Given the absence of data on the commercial building sector, it was not possible to produce a target for this report. Cost equivalent to a 30% premium over a condensing gas-fired storage water heater. This is the estimated cost at which a gas heat pump with an EF greater than 1.4 will become cost effective versus a condensing tank with an EF of 0.82. This cost is based on manufacturer and industry estimates collected through Natural Resources Canada's Local Energy Efficiency Partnership Initiative and CanmetENERGY's research programs.