The HVACR Industry and the Transition to a Low Carbon Economy

Presentation to the Standing Senate Committee on Energy, the Environment and Natural Resources

MARCH 29, 2018
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3. The Climate Change Mandate

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The HVACR Industry

- Space heating and cooling of buildings (through various methods)
- Domestic water heating
- Ventilation and indoor air quality
- Refrigeration processes
  - Industry
  - Grocery stores
  - Institutions (hospitals, schools)
  - Ice rinks
  - Various specialty applications
- Building controls tie it all together
- $7 billion in activity per year and tens of thousands of jobs across the country

...yet largely hidden from sight!
About HRAI-Canada

- Established in 1968

- 1,350 member corporations
  - 90 Manufacturers
  - 60 Wholesalers/Distributors
  - 1,000 Contractors
  - 200 Associates (utilities, colleges/trainers, consultants/engineers)
  - 28 staff, 12 instructors, 5 regional managers, 20 chapters

- Services to Members
  - Industry Advocacy and Government Relations
  - Industry Training (technical design, business management)
  - Communications (magazine, e-newsletter, webinars)
  - Trade Show – Canadian Mechanicals and Plumbing Exposition (CMPX)
  - Environmental Stewardship (Refrigerant Management Canada, Thermostat Recovery Program)
  - Conservation/Demand Management Program Administration (almost a million rebates in 10 years)
Under the *Pan-Canadian Framework on Clean Growth and Climate Change*, building-related measures are expected to deliver significant GHG reductions.
According to the International Energy Agency, improved energy efficiency is needed to meet half of the world’s climate goals.

That is 3x what all forms of renewable energy combined will contribute.

The Role of Energy Efficiency

According to CEEA and research commissioned by NRCan*, investing in Energy Efficiency delivers the following benefits for Canadians:

1. **Financial Savings**  Aggressive efficiency programs could generate over $90B in net consumer savings over a 25 year period.

2. **Job Creation**  Energy efficiency creates more jobs (and more *diverse* jobs in all parts of the country) than all other energy options. According to NRCan, efficiency programs could generate 60,000 net new jobs by 2019, and double that after 15 years.

3. **Growth in GDP**  After accounting for any losses elsewhere in the economy (from reduced energy generation and sales), the analysis found that aggressive efficiency programs would boost GDP by $390-580B over the study period (15+13 years).

4. **Fiscal Revenue**  After accounting for lost tax revenue due to reduced spending on energy, NRCan study found that aggressive efficiency programs would boost fiscal revenue by over $3B over the study period.

5. **Other Economic Benefits**  Studies also point to potential for growth in exports and to improved industrial competitiveness arising from gains in energy productivity.

*2014 study commissioned by NRCan, assessing aggressive energy efficiency programs and policies delivered over a 15-year period. Results shown are for "mid" investment level. Several independent studies are currently being finalized that validate the results of the 2014 study.
Federal government consultations are well underway and, as expected, much of the focus is on energy efficiency, and much of the discussion will be on the **heating and cooling of buildings**.
Space heating is an important part of the solution to reduce GHGs in the buildings sector (water heating too)

- Heating, on average, represents between 56-64% of energy use in homes and buildings, the largest source of direct sector emissions
- Improvements in the performance of space heating technology can reduce energy use significantly for a typical residential home
- (According to NRCan) “if all residential heating systems were replaced with heat pump technology by 2040, for example, this could reduce residential energy use by 25% and GHGs by 24M tonnes”
Under the **Pan-Canadian Framework**, building-related measures are expected to deliver significant GHG reductions

...through (among other things):

- Net-zero energy ready building codes by 2030
- Model building retrofit code by 2022
- Labelling/rating requirements as early as 2019
- Standards to the highest level economically and technically feasible for heating equipment and other key technologies
Key Space Heating Technologies in Consideration

- Commercial gas furnaces
- Cold climate air source heat pumps
- Gas-fired heat pumps
- Ground source heat pumps
- Micro combined heat and power (MicroCHP)
- Integrated systems
- Smart controls
The goal is “Market Transformation”

A series of strategic interventions to cause lasting changes in the structure or function of a market, or the behavior of market participants, to accelerate the adoption of energy efficient products, services or practices...
Government plans include “strategic interventions” in the market to accelerate the adoption of high efficiency space heating technologies in Canada between now and 2035

The plan will:

- Set “aspirational goals” (short, medium and long term) e.g. “by 2035 all major space heating technologies for sale in Canada have an energy performance of more than 100%”
- Identify barriers and challenges to achieving those goals
- Implement measures to overcome those barriers that makes use of all available tools (e.g. ENERGY STAR®, regulated standards, building codes, R&D, incentives, etc.)
The Pan-Canadian Framework will create opportunities for the HVACR Sector:

- HVAC unitary products are becoming more and more efficient
- Transition to heat pumps → opportunity for those who adapt!
- Smart building controls present multiple benefits
- Various innovations and technology refinements are in development
- Not just products, but “building systems” → best practices & trades skills
- The HVACR industry has “many tools in its toolkit”

...for example...
Heat Pump Cycle

2. Vapour
Vapour is channelled into an electric compressor, increasing the pressure and temperature of the vapour.

3. Warm vapour
Warm, high-pressure vapour enters the heat exchanger producing heat for water or heating system.

1. Fan
A fan passes ambient air over the evaporator. The refrigerant boils and evaporates at low temperatures.

4. Condensed vapour
Condensed vapour returns to liquid, passes through the expansion valve, reducing pressure and temperature. The cycle repeats.
Electronically Commutated Motors (ECMs)
Variable Refrigerant Flow (VRF)

Variable refrigerant flow systems can deliver cooling to some zones and heating to others, with no reheat needed (an air-source system is shown here).
Smart Controls

5 AM
Manager arrives for a global call (So early!)

5 AM
Sensor detects car and exterior lights go on

5 AM
Security system grants access

5 AM
Lights on

5 AM
HVAC system adjusts airflow + temperature

OVERNIGHT
When nobody is in the building,

OVERNIGHT
HVAC, lights + security all setback

10 AM
Meeting in the conference room

10 AM
Lights on when people arrive

10 AM
Temperature adjusts, depending on the number of people

6 PM
Most of the building is empty

6 PM
Following a schedule, lights off, except where occupancy is detected (Don’t work too late!)

1 PM
Sun pours in through south-facing windows

1 PM
Daylight harvesting dims lighting
HVACR Industry Challenges

The Pan-Canadian Framework will present challenges for the HVACR Sector:

- Industry needs time and resources to adapt
  - Product innovation to accommodate fuel switching
  - Product innovation to accommodate increasing efficiency standards
  - Growing sophistication of codes and building systems
  - Growing need for skilled labour, and possibly in different areas of technical focus – retraining

- Transition to heat pumps... disrupting the industry

- New refrigerants: CFCs → HCFCs → HFCs → hydrocarbons = emerging issues

- Smart building controls and need for standardization of protocols

- Marketing issues for the industry (not sexy like solar) – need to educate market
The HVACR industry is prepared to engage with government at all levels to assist in meeting the challenges of the Paris Agreement.
1. Manufacturers & distributors need a “runway” for implementation of legislation, regulations and programs affecting products
   ◦ Long-term to plan for product development in relation to standards and regulations
   ◦ Short-term to ensure for product availability to the market

2. Regulatory harmonization among countries (Can/US) and Provinces is critical
   ◦ Timely adoption of national building code by provinces
   ◦ Consistent minimum efficiency performance standards (MEPS) for products
   ◦ No duplicate testing or certification procedures
   ◦ Regulatory inconsistency adds costs to industry and end users
   ◦ HRAI supports the efforts of the Regulatory Cooperation Council (RCC) and applauds the principles embodied in the Canada Free Trade Agreement (CFTA)
3. Clear and consistent signals needed from government for industry to invest in product adaptation and employee development

4. Level playing field: programs should foster, not hamper competition

5. Industry consultation is paramount to good program design
   ◦ Industry has knowledge of products (and can balance competing claims)
   ◦ Knowledge of customer base (including price points and how to “sell”)
   ◦ Facilitates advance preparation – product and skills development
Industry Recommendations

1. Government should lead by example
   - Require benchmarking and disclosure of public building performance
   - Impose similar expectations on private investors who benefit from government largesse
   - Require new publicly-owned buildings to be built to nearly zero energy
   - Upgrade public buildings through deep energy retrofits (30% energy reduction or more) at a rate that reduces total federal building emissions by more than 30% by 2030

2. Act on key elements of the Pan-Canadian Framework
   - Support provincial programs with accessible information on energy use and reporting (e.g. EnerGuide Rating System for homes; Portfolio Manager for commercial buildings)
   - Protect consumers and provide industry with certainty through timely application of codes and standards towards net-zero
   - Facilitate private investment in energy efficiency and carbon reduction through strategic use of public funds, including infrastructure bank
Industry Recommendations

3. Communicate benefits of energy efficiency investment to end users
   ◦ Importance of public education on a broad scale
   ◦ Collaborate with industry on marketing of benefits

4. Support for R&D
   ◦ Support product innovation through research (e.g. CanMet ENERGY laboratories)
   ◦ Support building science research leading to new and innovative building practices (e.g. residential commissioning)

5. Commit to bilateral and inter-provincial harmonization of standards codes and regulations
   ◦ Support US-Canada collaboration and harmonization through the Regulatory Cooperation Council
   ◦ Ensure harmonization of codes, standards and regulations among provinces through Canada Free Trade Agreement
Industry Recommendations

6. Strive for consistency and continuity in policies and regulations

7. Support the development of financing tools that will unlock private investment for the long term

8. Provide support for transitioning labour markets as product mix and practices shift to meet needs of new low-carbon economy

9. Explore tax credits for businesses investing in energy efficient building upgrades

10. Consult early and often with industries that have a direct stake in these matters!
Thank You

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