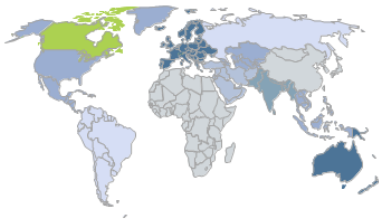
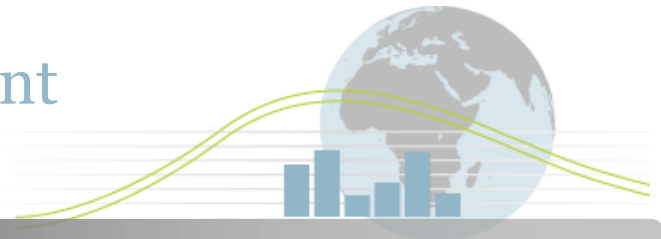


# 4E

## Mapping Document



Country:	Canada
Technology:	Retail display cabinets
Sub Category:	Chilled vertical with glass door and frozen horizontal

### Introduction

The first stage in the Mapping and Benchmarking process is the definition of the products, i.e. clearly setting the boundaries that define the products for use in data collection and analysis. Doing this ensures that comparison between the participating countries is done against a specific and consistent set of products. The summary definition for this product is:

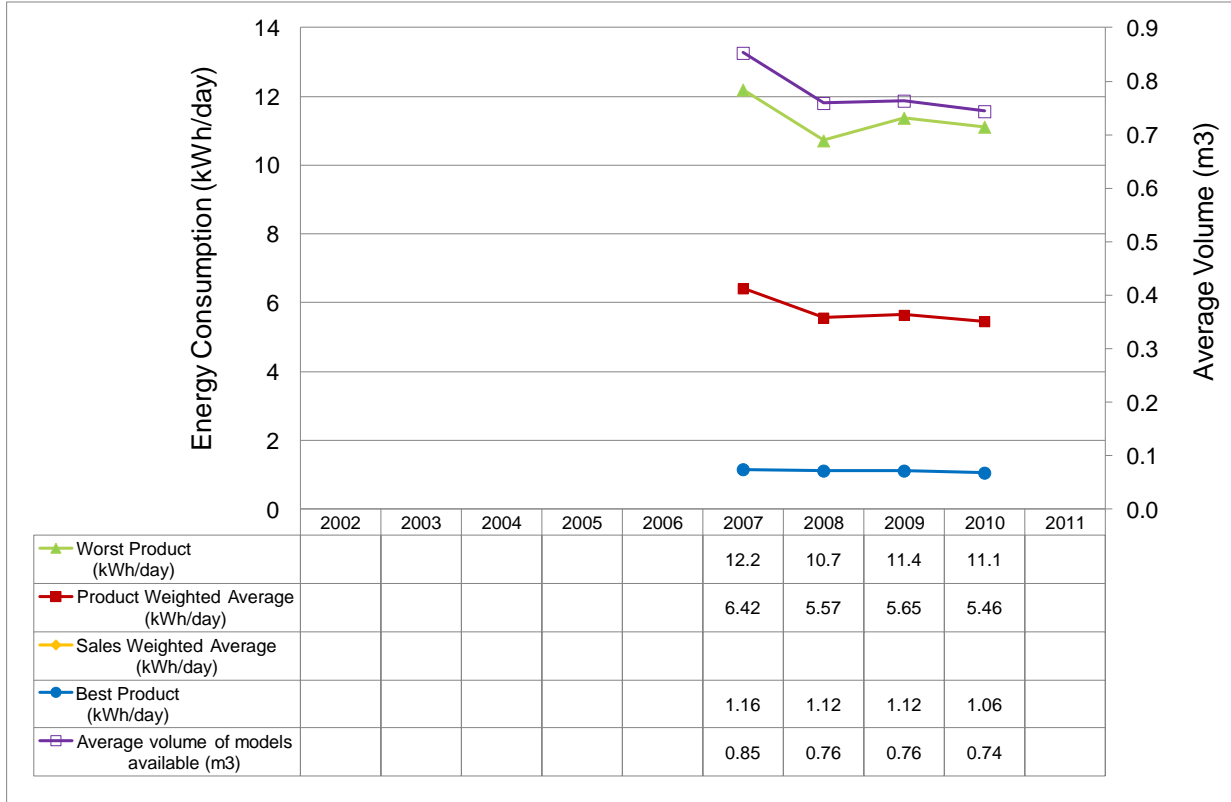
Definition & scope	Scope is limited to: <i>"Refrigerated integral retail display cabinets of types a) vertical chilled with glass door(s) as used for beverages and b) horizontal/semi-horizontal freezers as used for ice cream merchandising. Cabinets must enable customers to view the contents stored in the cabinet even when it is closed either through an opening in the cabinet, or through a transparent door or lid, and also enable customers to self-serve contents. 'Integral' means 'plug in' or self-contained, such that the cabinet incorporates a compressor and condensing unit within its housing."</i>	
Intended purpose / content	Beverage display or similar uses, i.e. vertical chilled cabinets with glass door(s)	Ice cream display or similar, i.e. horizontal/semi vertical freezer cabinets
Temperature class (storage temperature)	Vertical cabinets with glass door for chilled storage at: a) -1 to +10°C ('H1' class, EU) b) 3.3°C ±1.1°C (USA/Canada) c) 'As manufacturer stipulates' (Australia) d) Others TBD	Horizontal and semi-horizontal ice cream cabinets for frozen storage at: a) -15 and below ('L1' class, EU) b) -21°C (USA, prior to 1Jan2010; Canada prior to 12Apr2012 ) c) -26.1°C (USA since 1Jan2010 and Canada since 12Apr2012) d) 'As manufacturer stipulates' (Australia) e) Others TBD
Cabinet orientation and doors / covers (not night covers)	Vertical chilled cabinet with: a) Single door full height b) Double doors full height c) Single under-counter d) Double under-counter	Horizontal frozen cabinet of: a) Small size (TDA and volume definition TBD) b) Standard size (TDA and volume definition TBD)

Other characteristics to be noted: Refrigerant type; Presence of lighting; Presence of circulation fan; Defrost type; Outer dimensions; Ambient test conditions class.

A full product definition is provided at the annex website<sup>1</sup>.

<sup>1</sup> see <http://mappingandbenchmarking.iea-4e.org/matrix?type=product&id=10>

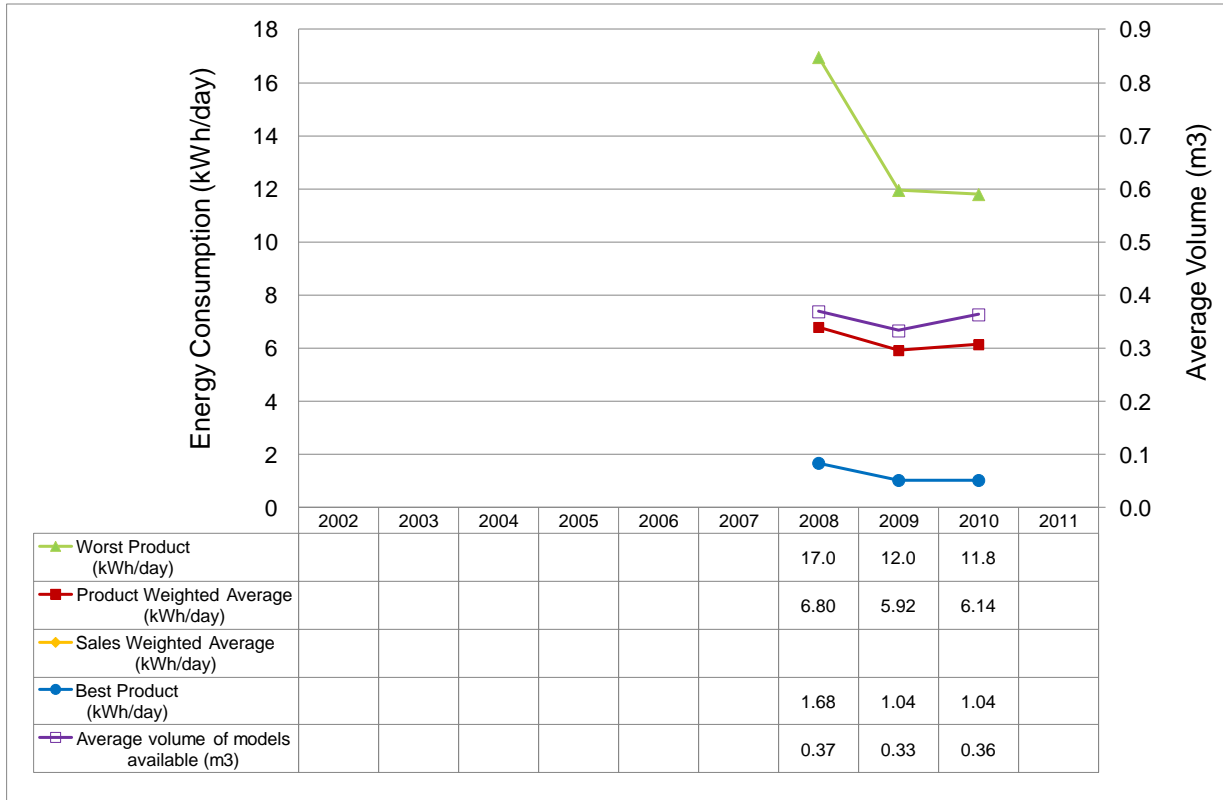
## Energy consumption of new chilled retail display cabinets Canada



### Key notes on Graph (see notes section 1)

- Products covered are self-contained (integral) vertical chilled cabinets with glass door(s). Volume is the refrigerated internal storage volume.
- Data were supplied by Natural Resources Canada from the federal regulatory product register. No sales data were available.
- Data sets represent products available for sale in each year and contain between 166 (2007) and 445 (2010) products.

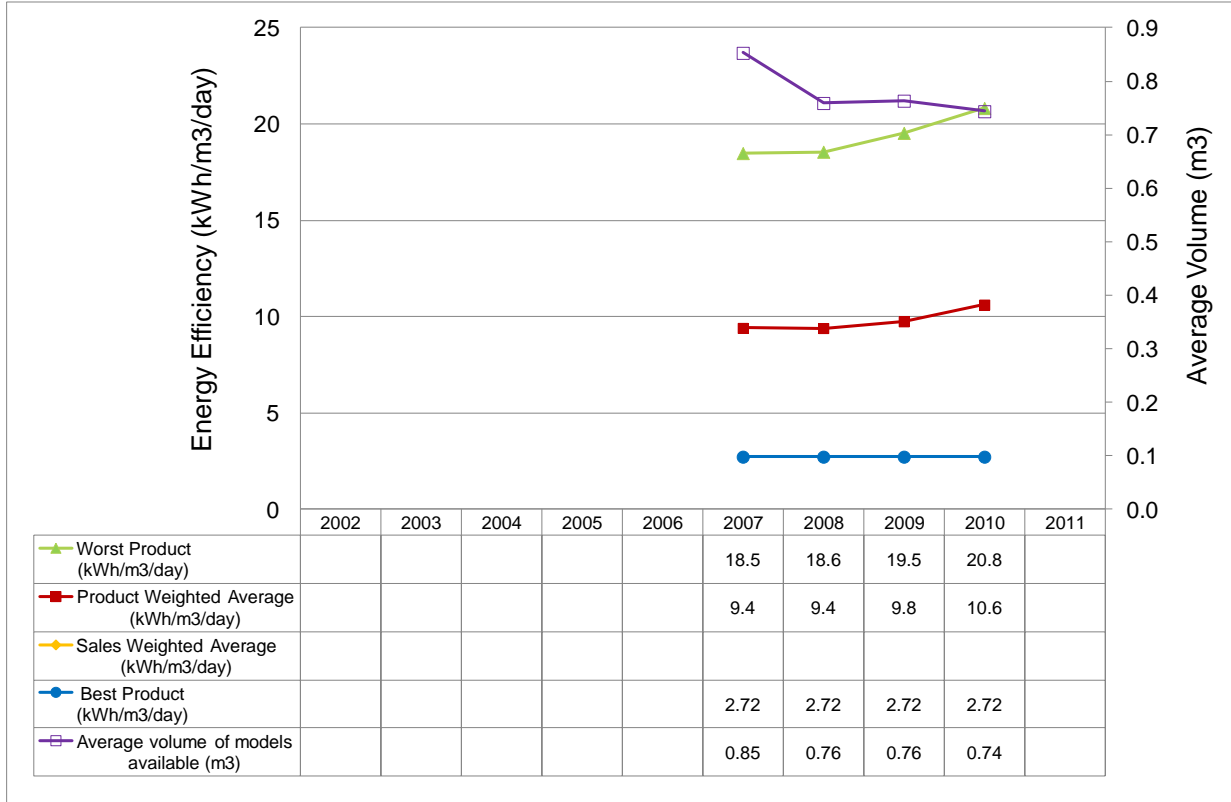
## Energy consumption of new frozen retail display cabinets Canada



### Key notes on Graph (see notes section 1)

- Products covered are self-contained (integral) horizontal frozen ice cream merchandiser cabinets. Volume is the refrigerated internal storage volume.
- Data were supplied by Natural Resources Canada from the federal regulatory product register. No sales data were available.
- Data sets represent products available for sale in each year and contain between 77 (2008) and 127 (2010) products. 2007 data not shown as it contained only 7 products.

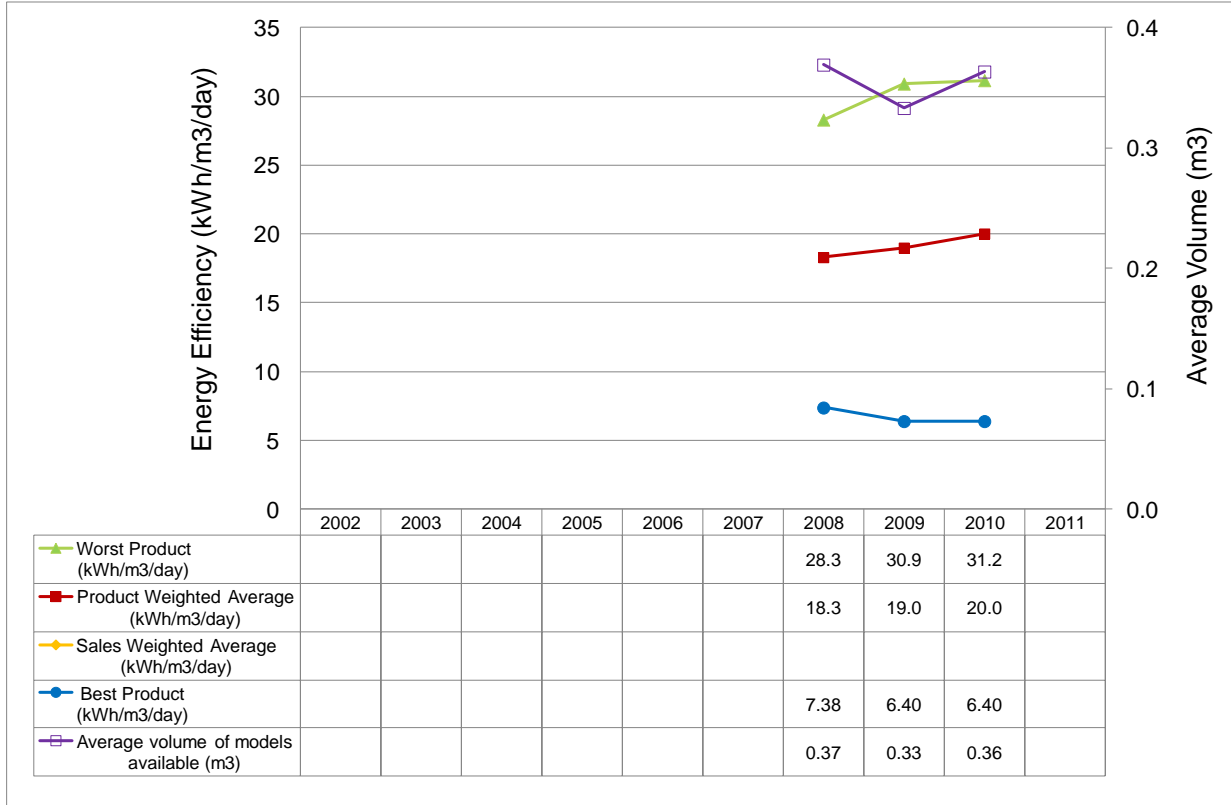
## Energy efficiency of new chilled retail display cabinets Canada



### Key notes on Graph (see notes section 1)

- Products covered are self-contained (integral) vertical chilled cabinets with glass door(s). Efficiency is measured in kWh per day per cubic metre of refrigerated internal storage volume.
- Data were supplied by Natural Resources Canada from the federal regulatory product register. No sales data were available.
- Data sets represent products available for sale in each year and contain between 166 (2007) and 468 (2010) products.

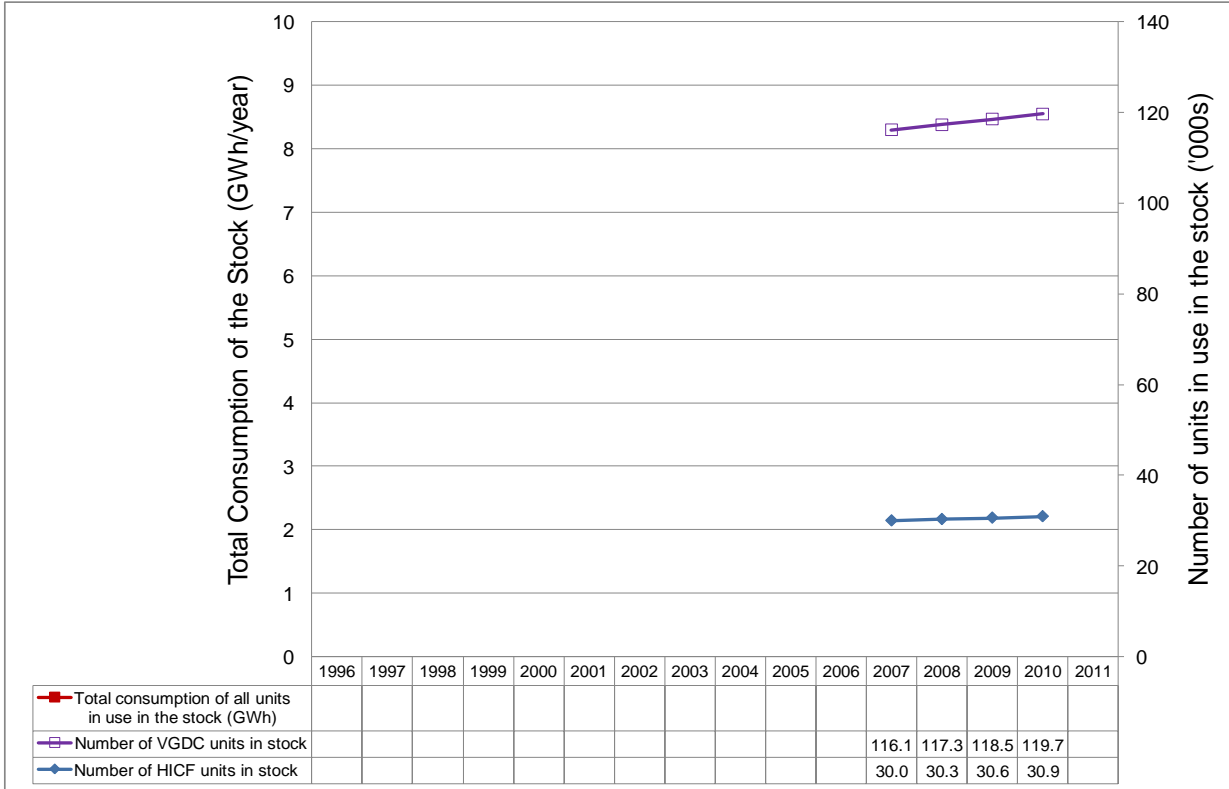
## Energy efficiency of new frozen retail display cabinets Canada



### Key notes on Graph (see notes section 1)

- Products covered are self-contained (integral) horizontal frozen ice cream merchandiser cabinets. Efficiency is measured in kWh per day per cubic metre of refrigerated internal storage volume.
- Data were supplied by Natural Resources Canada from the federal regulatory product register. No sales data were available.
- Data sets represent products available for sale in each year and contain between 77 (2008) and 127 (2010) products. 2007 data not shown as it contained only 7 products.

## Total energy consumption in the existing retail display cabinets stock - Canada



### Key notes on Graph (See Notes Section 3)

- Data were supplied by Natural Resources Canada, from a 2008 market study. The study separately estimated stock of 'upright transparent door refrigerators' (assumed equivalent to vertical chilled glass door refrigerators) and 'transparent door ice cream chest freezers' (assumed equivalent to horizontal frozen ice cream cabinets).

## Major Policy Interventions (See notes Section 4)

Canada has the voluntary ENERGY STAR label and mandatory MEPS in force. The MEPS were updated in October 2011.

### ENERGY STAR voluntary label

The first Canadian ENERGY STAR criteria for Commercial solid door, self-contained refrigerators and freezers came into effect in Canada in September 2006 and aims to endorse the most energy efficient products. A requirement for third party verification for these products was introduced in Canada in April 2007. The original criteria were superseded at 31 December 2009 by version 2<sup>2</sup> which had an expanded scope to cover all commercial food grade refrigerators and freezers with solid door(s), glass door(s) and mixed solid/glass door(s)<sup>3</sup>.

The energy requirement is that daily energy consumption must be below a value calculated from formulae involving the internal refrigerated volume of the cabinet. Different formulae are stipulated according to whether the cabinet is refrigerated or frozen, and whether of vertical or horizontal configuration. If vertical, formulae are different whether with solid door or glass door. For example Maximum Daily Energy Consumption (MDEC) for a refrigerated solid door cabinet of volume between 850 and 1415 litres must be less than or equal to  $(0.00198V + 1.635)$  kWh/day, where V is internal refrigerated volume in litres.

### MEPS

Canadian minimum energy efficiency requirements were first introduced in January 2007 applicable to self-contained commercial refrigerators, freezers and combination refrigerator-freezers with opaque or transparent doors. The requirements were introduced with two tiers: Tier 1 from 1 April to 31 December 2007, and Tier 2 from 1 January 2008. The Tiers coincided with the mandatory requirements previously imposed by the Californian Energy Commission in 2003 and 2004<sup>4</sup>.

In addition to the appliances covered by MEPS, manufacturers of self-contained refrigerators and freezers without doors have to report energy used but these products do not have to meet any stipulated efficiency level.

The amendment to the Regulations were published in October 12, 2011<sup>5</sup> and comes into force six months after publication, on April 12, 2012 for closed door unit MEPS to be made

<sup>2</sup> See <http://oee.nrcan.gc.ca/residential/business/manufacturers/specifications/sd-refrig.cfm?attr=12>

<sup>3</sup> Eligible products include reach-in, roll-in, or pass-through units; merchandisers; under-counter units; milk coolers; back bar coolers; bottle coolers; glass frosters; deep well units; beer-dispensing or direct draw units; and bunker freezers. Cabinets NOT eligible include drawer cabinets, prep tables, deli cases, and open air units. Version 2 criteria allowed glass door cabinets to begin qualifying from 1 April 2009.

<sup>4</sup> Note that CEC has since introduced revised requirements for commercial refrigerated cabinets effective 1 January 2010 – see Appliance Efficiency Regulations, (California Code of Regulations, Title 20, Sections 1601 through 1608), dated September 2010, document reference CEC-400-2010-012.

<sup>5</sup> See <http://oee.nrcan.gc.ca/regulations/amendment11/commercial-refrigeration-oct2011.cfm?attr=24>

more stringent (based upon the internal volume of the unit) and the test methodology to be updated requiring ice-cream freezers to be tested at  $-26.1^{\circ}\text{C}$ .

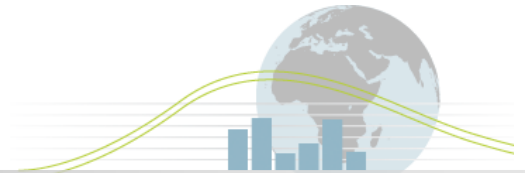
An update proposal was also published in May 2010<sup>6</sup> that expands the scope of MEPS. This proposal also provides that for all cabinets which are open or have transparent doors that the energy consumption requirements change from being based on the cabinet's internal volume to being based on total display area (TDA). Those with solid doors remain based upon internal volume. These draft requirements are proposed to be enacted from 1 January 2012 but this requires publication of the necessary final regulation (not yet published at April 2012). The revised scope sets MEPS for: self-contained equipment without doors (was a reporting only requirement); equipment with remote condensing unit (previously no MEPS); more stringent MEPS for self-contained ice cream freezers with closed doors and new MEPS for ice cream freezers without doors (was reporting only requirement) and ice cream freezers with remote condensing units. These updated draft requirements are designed to harmonise with the USA Final Rule published by the US DOE on January 9, 2009 (which is also mainly based on TDA calculations).

Testing for these proposed regulations is based around AHRI standard 1200:2008 *Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets* with several specific additional requirements<sup>7</sup>. Both proposals require a product temperature of  $-26.1^{\circ}\text{C}$  ( $-15^{\circ}\text{F}$ ) for ice cream freezers in line with a 2008 update to the AHRI requirement (previously  $-20^{\circ}\text{C}$ ).

<sup>6</sup> See <http://oee.nrcan.gc.ca/regulations/bulletin/refrigerator-freezers-may-2010.cfm?attr=24>

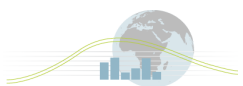
<sup>7</sup> Additional requirements cover product temperature levels during test; stipulation that all additional manually controlled electrical accessories must be on during test; stipulated methodology for calculation of internal volume; power management systems are allowed if certain conditions are met. These requirements are laid out in the Canadian Regulation.





## Cultural Issues (See Notes Section 5)

No information was available.



## Notes on data

### **Section 1: Notes on Product Consumption**

#### *1.1 Test methodologies, Performance Standards and Labelling Requirements*

Canadian regulations and performance data were based around ASHRAE standard 117 for closed refrigerators and ASHRAE standard 72 for open refrigerators. The new regulatory requirements (due to take effect 12 April 2012) are based upon AHRI 1200:2008 *Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets* (which in turn references tests to ASHRAE standard 72). All of this data is considered mutually comparable.

MEPS have been in place since January 2007. Revised requirements to extend the scope of regulated products are proposed to come into force 1 January 2012.

There are no mandatory labelling requirements, although compliant products with third party certified performance results can register with Natural Resources Canada and so gain entitlement to carry the ENERGY STAR label.

See also section *Major Policy Interventions*.

#### *1.2 Product Consumption Graphic*

The chosen metric for consumption for both frozen and chilled cabinets is kWh per day.

##### *Data sources and data cleaning*

The analysis is based upon data provided by Natural Resources Canada from their mandatory federal product database. Three sets of data were submitted that provided data for cabinets registered in 2007, 2008, 2009 and 2010. The three sets were:

- Products compliant with tiers 1 and tier 2 (of the Canadian 2006 regulation)
- Products compliant with only tier 1 (and so became non-compliant 1 January, 2008)
- Products exempted from the regulations (those regulated but tested at -9°C or -10°C)

These three data sets were combined (retaining the relevant year of registration) and subject to the cleaning/filtering as described below. The product data were confirmed by NRCAN as showing the data associated with the products at the stated year (some products had updates to their data over successive years and so were registered as more efficient in later years).

The data sets covered Canadian refrigerated display cabinets of wider scope than that covered in this analysis and so a significant proportion of the products had to be filtered out. For example the data sets included refrigerated equipment designed for wine or flower storage, solid door cabinets and open cabinets.

As part of the data cleaning process, the following product types were deleted from the data set, and the table below shows quantities of data and proportions deemed out of scope:

- Products with opaque doors and drawer units
- Refrigerated (chilled) products without doors
- All chest Refrigerated (chilled) products ('drinks wells')
- All delicatessen cabinets
- All freezer units higher than 1m (cannot be horizontal units)
- All cabinets noted with configuration as upright/vertical freezer units (cannot be horizontal ice cream units)

In order to have data sets that represent products available on the market (as opposed to the more limited set of products registered with the Government in that year), it was assumed that products would continue to be available for four years after first registration. i.e. products would be carried forward to four successive years after first registration, except of course if the product falls foul of new MEPS.

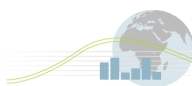
Since only 7 HICF products were deemed within scope for 2007, the data for 2007 was not used on graphs (not statistically robust enough to merit display).

No sales data were available for any products and so data are only product-weighted.

**Table showing size of Canadian data sets as submitted and count of products deemed within scope of the analysis<sup>8</sup>.**

Year for data validity	Total number of products in data set	Number of products deemed in scope	Percentage of year's data set deemed in scope
<b>2007</b>	191	185	97%
<b>2008</b>	1,113	274	25%
<b>2009</b>	279	92	33%
<b>2010</b>	103	50	49%
<b>2011</b>	0	0	0
<b>All years</b>	1,686	601	36%

<sup>8</sup> Note that some of the products deemed within scope were later removed due to missing or dubious data, and also products registered in any given year were carried forward to each of the successive 4 years (unless they fell foul of MEPS). Hence these numbers reflect the source data but not the final numbers of products analysed for each year.



**Table of final number of products analysed in each year (including products carried forward from previous 4 years; excluding products deemed out of scope and with partial or dubious data).**

	Frozen horizontal (ice cream) cabinets	Chilled vertical glass door cabinets	Total products analysed (including carried-over)
<b>2007</b>	7	166	173
<b>2008</b>	77	364	441
<b>2009</b>	117	414	531
<b>2010</b>	127	445	572
<b>All years</b>	328	1,389	1,717

In addition, Canadian data provided on lighting were edited to add a field to state whether the product has lighting or not: if a lighting wattage or lighting type was provided, the field was set to 'yes'; if the products stated 'no lighting', or 'not applicable' in the lighting type field, combined with no claimed wattage then the field was set to 'no'. Lighting types that stated T8, T12 or T5 were assumed to be 'fluorescent' type lighting.

*No normalisation of data for mapping*

No adjustments were necessary to Canadian data to ensure internal comparability. This is because the conditions used during test measurements for energy consumption were consistent for all of the data (for internal storage temperature, ambient air temperature/humidity and lighting regime during test).

**Section 2: Notes on Product Efficiency**

*2.1 Test methodologies, Performance Standards and Labelling Requirements*

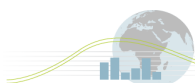
Test methodologies, standards and labelling apply to efficiency exactly as for product consumption above.

*2.2 Product Efficiency Graphic*

All data were provided in terms of the products' internal volumes and so the chosen metric for efficiency of Canadian products is kWh/cubic metre per day.

No analysis was carried out for efficiency in terms of total display area (TDA) as no TDA data were provided although future data sets from Canada will include TDA as this is likely to be the basis of regulatory performance from January 2012. Analysis of this data set efficiency by TDA would have involved making significant assumptions to estimate TDA from available external dimensions, product type and volume.

The data sets used for efficiency analysis were exactly the same as for product consumption above.



***Section 3: Notes on Consumption of Stock***

No further information available.

***Section 4: Notes on Policy Interventions***

No further information available.

***Section 5: Notes on Cultural Issues***

No further information available.