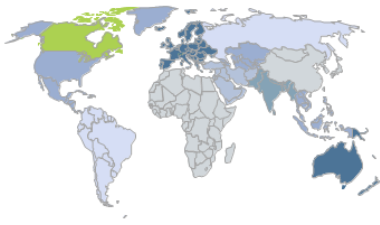
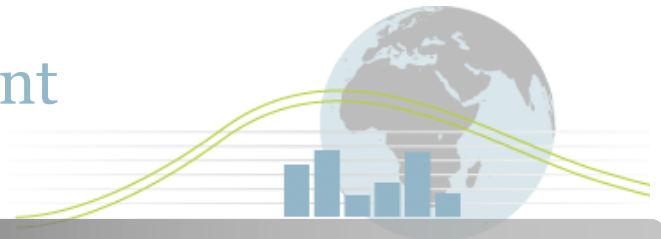


4E

Mapping Document



| | |
|---------------|----------------------------|
| Country: | Canada |
| Technology: | Vending Machines |
| Sub Category: | Beverage only (can/bottle) |

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:

Self-contained refrigerated systems designed to accept consumer payments or tokens to dispense pre-packed beverages (cans/bottles/food packets) at between 3°C and 12°C without on-site labour intervention

Hence data was sought on the energy performance of the following product types:

- Beverage (can/bottle)
- Food/Snack (spiral, carousel or other vend type)¹

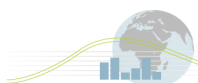
Other characteristics to be noted:

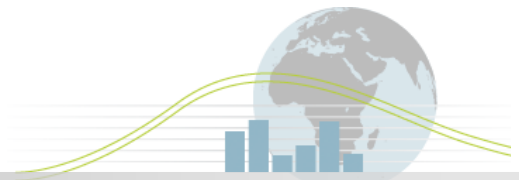
- Capacity - number of cans / bottles / snacks or volume (litres)
- Storage temperature
- Ambient temperature during test
- Whether for indoor or for outdoor use
- Capability of automatically switching into a low power mode
- Presence of usage sensor or timer to enable low power modes
- Refrigerant used
- Glass fronted or solid

A full product definition is provided at the annex website².

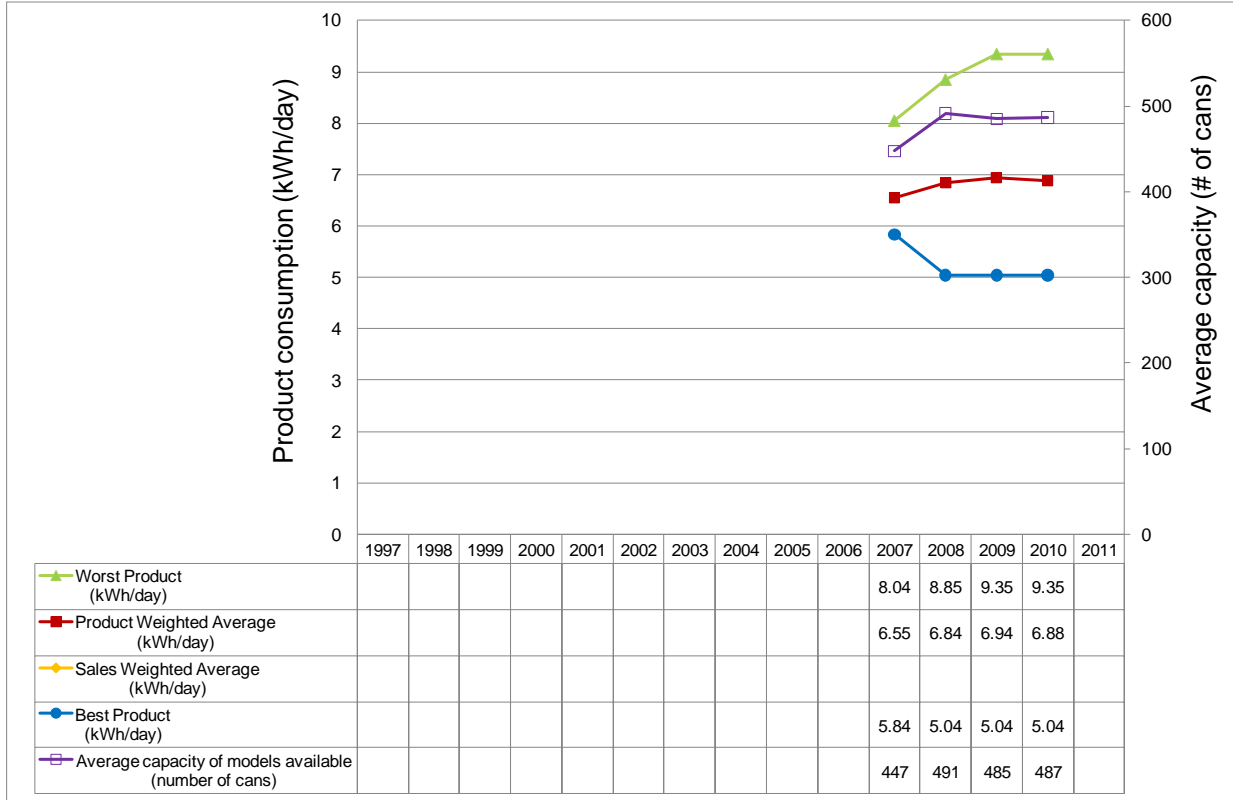
¹ Only one data point was available on this product type, which was disregarded for this analysis.

² see <http://mappingandbenchmarking.iea-4e.org/matrix?type=product&id=8>



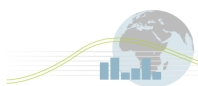


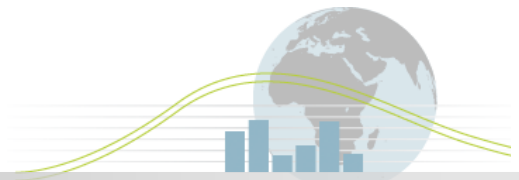
Energy consumption of new beverage vending machines Canada



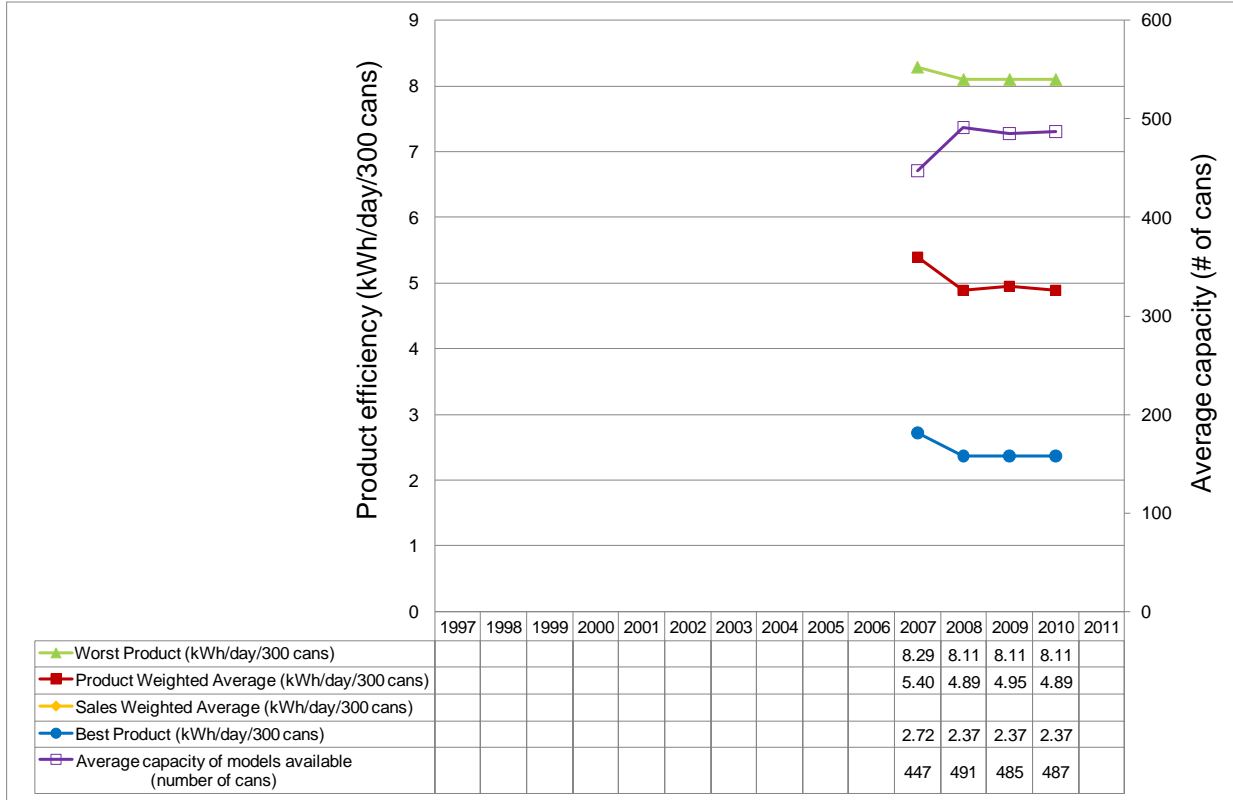
Key notes on Graph (see notes section 1)

- Data were supplied by Natural Resources Canada from the federal database.
- Numbers of products included vary from 12 products (2007) to 39 products (2010). This includes products carried forward from registration in previous years on the assumption that they would remain on the market.



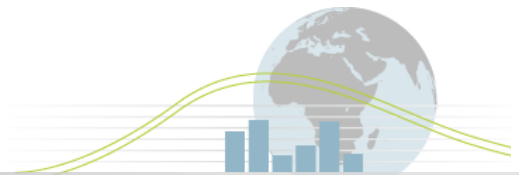


Energy efficiency of new beverage vending machines Canada



Key notes on Graph (see notes section 2)

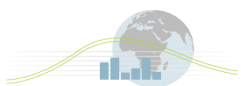
- Data were supplied by Natural Resources Canada from the federal database.
- Numbers of products included vary from 12 products (2007) to 39 products (2010). This includes products carried forward from registration in previous years on the assumption that they would remain on the market.



Total energy consumption in the existing beverage vending machine stock - Canada

Key notes on Graph (See Notes Section 3)

- No substantive data on the installed stock of vending machines in Canada were available to the Annex at the time of publication.
- However, a Canadian study in 2004 concluded that there are an estimated 200,000 vending machines in operation in Canada, requiring an average of about 2 million kWh of electricity every day (which implies an annual consumption of around 730 GWh per year).



Major Policy Interventions (See notes Section 4)

Canada has MEPS for vending machines and also uses the ENERGY STAR label for rebuilt machines only.

MEPS

Canada's Energy Efficiency Regulations were amended November 2, 2006 and published in the Canada Gazette, Part II on November 15, 2006 to require dealers of refrigerated vending machines imported or shipped inter-provincially for sale or lease in Canada to comply with minimum energy performance standards.

The regulations apply to both beverage (can/bottle) and to food/snack machines³. The first MEPS came into force in January 2007 and are identical to the ENERGY STAR Tier 1 requirements (which came into force under ENERGY STAR in April 2004). This imposes a maximum consumption figure related to the vendible capacity of the machine, plus a requirement that machines must be capable of automatically operating in low power mode during a period of extended inactivity, in one or more power states described below, as applicable:

1. Refrigeration low power state: in which the average temperature of the refrigerated beverages is allowed to rise to 4.4°C,
2. Lighting low power state: in which the lights are turned off, and
3. Refrigeration and lighting power state: in which requirements (1) and (2) are both in operation at the same time.

Subsequently, a more stringent consumption MEPS level was introduced for refrigerated beverage vending machines vending less than 20 discrete types of beverages. This came into effect in January 2008 and corresponds with ENERGY STAR Tier 2 requirements (which came into force under ENERGY STAR in July 2007).

ENERGY STAR voluntary label

As of January 2008, ENERGY STAR in Canada has discontinued the specification for new beverage vending machines because regulated minimum energy performance standards now match the ENERGY STAR performance levels. The ENERGY STAR specification is now only applicable in Canada to rebuilt units.

³ See <http://oee.nrcan.gc.ca/regulations/product/beveragevendmachine.cfm?attr=0>

Cultural Issues (See Notes Section 5)

A Canadian study in 2004 concluded that:

- There are an estimated 200,000 vending machines in operation in Canada, requiring an average of about 2 million kWh of electricity every day
- Shipment data for the years 1998 through 2003 indicated a very strong downward trend in beverage vending machine sales
- About 90% of all “beverage-vending machines” are for vending packaged beverages (as opposed to drinks served in cups).
- Two common customer demands are increased vending capacity and the use of glass fronts for product advertisement. Both of these can adversely affect energy efficiency: the increase in capacity diminishes the volume of insulation in the machine and the need for transparency replaces insulation from the front of the machine with (double-)glazing. Additionally, glass front machines require heating of the outer glass pane to prevent condensation.
- Beverage vending machines operated in cold outdoor climates are installed with accessory heaters to prevent the beverages from freezing.
Note: in this analysis it was assumed that such heaters do not factor in energy consumption calculations and presence of such heaters was not recorded.
- Premature replacement is not common, and therefore inefficient vending machines tend to remain in service until the end of their useful life. Generally, the life of vending machines ranges from 7 to 13 years, with 2 or 3 refurbishments during the life.
- The market for new packaged beverage machines shrank between 1998 and 2004, with sales in 2004 about 25% of what they were in 1998-1999, at least in part due to a trend towards refurbishment and away from purchasing new equipment. The market is, however, cyclical and it was expected that the sale of new equipment would increase when a large portion of the equipment stock reached the average life expectancy.

Notes on data

Section 1: Notes on Product Efficiency

1.1 Test methodologies, Performance Standards and Labelling Requirements

In Canada energy performance of refrigerated beverage vending machines is measured according to ASHRAE Standard 32.1-2004, Methods of Testing for Rating Vending Machines for Bottled, Canned, and Other Sealed Beverages (as used by ENERGY STAR) except relating to the ambient temperatures to be used during test, as in the tables below.

MEPS apply to all refrigerated beverage and refrigerated food/snack vending machines (see Policy section).

Labelling is not mandatory although suppliers may use the ENERGY STAR label for compliant and registered rebuilt machines (the scheme does not apply to new machines).

1.2 Product Efficiency Graphic

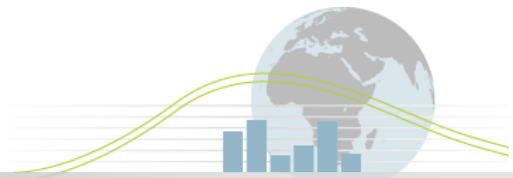
Data were supplied by Natural Resources Canada from the federal database. Registration on the database is mandatory for products that fall within the scope of the MEPS regulations.

The database distinguishes products by the "number of discrete types of beverages displayed and dispensed", whether less than 20, or equal/more than 20 in line with the scope of MEPS requirements. This field was used to determine which ambient temperature category the product is assumed to be tested in (ASHRAE 32.1 'outdoor' or 'indoor' conditions). Categories determined in that way were used as the basis of normalisation steps described below.

Data were available for products on the market in 2007 to 2010 inclusive and varied between 12 products (2007) and 39 products (2010). This included products carried forward from registration in previous years on the assumption that they would remain on the market. Historical databases were provided (snapshots in each year from that time) and so modifications subsequent to original registration have not distorted the data from that time.

All data related to new products (no rebuilt products were included).

Data were almost exclusively for can/bottle type vending machines. The single food/snack vending machine data point was disregarded.



Summary of test method requirements for ambient temperature and storage temperature, for ASHRAE 32.1 and according to the Canadian energy efficiency regulations for vending machines.

| Test method | ‘Indoor’ type product | | ‘Outdoor’ type product | |
|--|----------------------------|------------------------|----------------------------|------------------------|
| | Ambient temperature (DegC) | Ambient humidity (%RH) | Ambient temperature (DegC) | Ambient humidity (%RH) |
| ASHRAE 32.1 (USA, Canada, Australia) and AS/NZ 4864.1:2008 | 23.9°C±1°C | 45%±5% | 32.2°C±1°C | 65%±5% |

| Test method | Machine vending >=20 discrete types of product and food/snack machines | | Machine vending <20 discrete types of product | |
|--|--|------------------------|---|------------------------|
| | Ambient temperature (DegC) | Ambient humidity (%RH) | Ambient temperature (DegC) | Ambient humidity (%RH) |
| Canadian regulations test requirements | 23.9°C±1°C | 45%±5% | 32.2°C±1°C | 65%±5% |

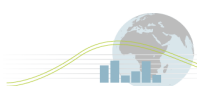
Ambient temperature during test affects the energy consumption of the machine – consumption rises (or falls) by around 3% for each additional (or reduced) degree Celcius of ambient temperature above the internal storage temperature of the machine.

To make data comparable, all were normalised for internal storage temperature and for ambient temperature during test (carried out for both consumption and efficiency results):

- i. Storage temperature: as if tested with a storage temperature of 4.4°C (where this was made possible by any declared storage temperature). This was done assuming 3% change in consumption for every degree Celcius difference.
- ii. Ambient temperature: as if tested at the ASHRAE outdoor requirement as per the table above. This was also done assuming 3% change in consumption for every degree Celcius difference.

The internal product temperature during test was assumed to be 4.4°C in all cases (standard requirement for soft drinks).

As noted in the tables above, the Canadian regulations implicitly assume that machines vending less than 20 types of product would typically have an opaque front and be mostly used outdoors. Hence these are required to be tested according to ASHRAE 32.1 outdoor conditions. Machines vending equal to or more than 20 types of product must be tested according to ASHRAE 32.1 indoor conditions. The test conditions assumed for products in the Canadian database were in line with this requirement since the database included a field for the number of discrete beverage types vended. Hence products vending 20 or less types



were assumed outdoor and results were not normalised; machines vending over 20 types were normalised from 23.9°C to 32.2°C.

Section 2: Notes on Product Consumption

2.1 Test methodologies, Performance Standards and Labelling Requirements

Test methodology used for consumption is exactly as above for efficiency.

2.2 Product Consumption Graphic

Data sources for this graphic are exactly as for efficiency above.

Section 3: Notes on Consumption of Stock

No data were available on consumption of stock.

Section 4: Notes on Policy Interventions

No further information available.

Section 5: Notes on Cultural Issues

No further information available.