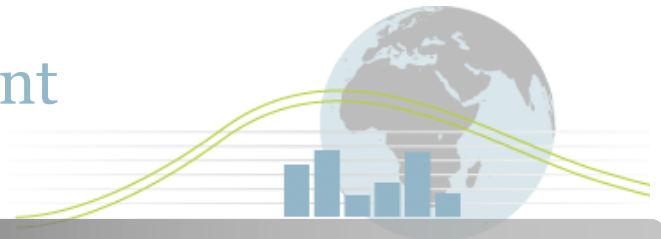


# 4E

## Mapping Document



Country:	The European Union
Technology:	Vending Machines
Sub Category:	Beverage only (can/bottle) and snack machines

### 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)<sup>1</sup>.

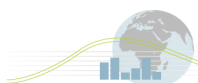
Other characteristics to be noted:

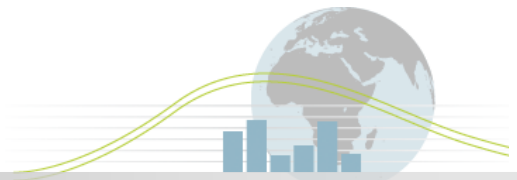
- Capacity - number of cans / bottles / snacks or volume (litres)
- Storage temperature
- Ambient temperature during test
- Whether for indoor or for outdoor use
- Capability of automatically switching into a low power mode
- Presence of usage sensor or timer to enable low power modes
- Refrigerant used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

A full product definition is provided at the annex website<sup>2</sup>.

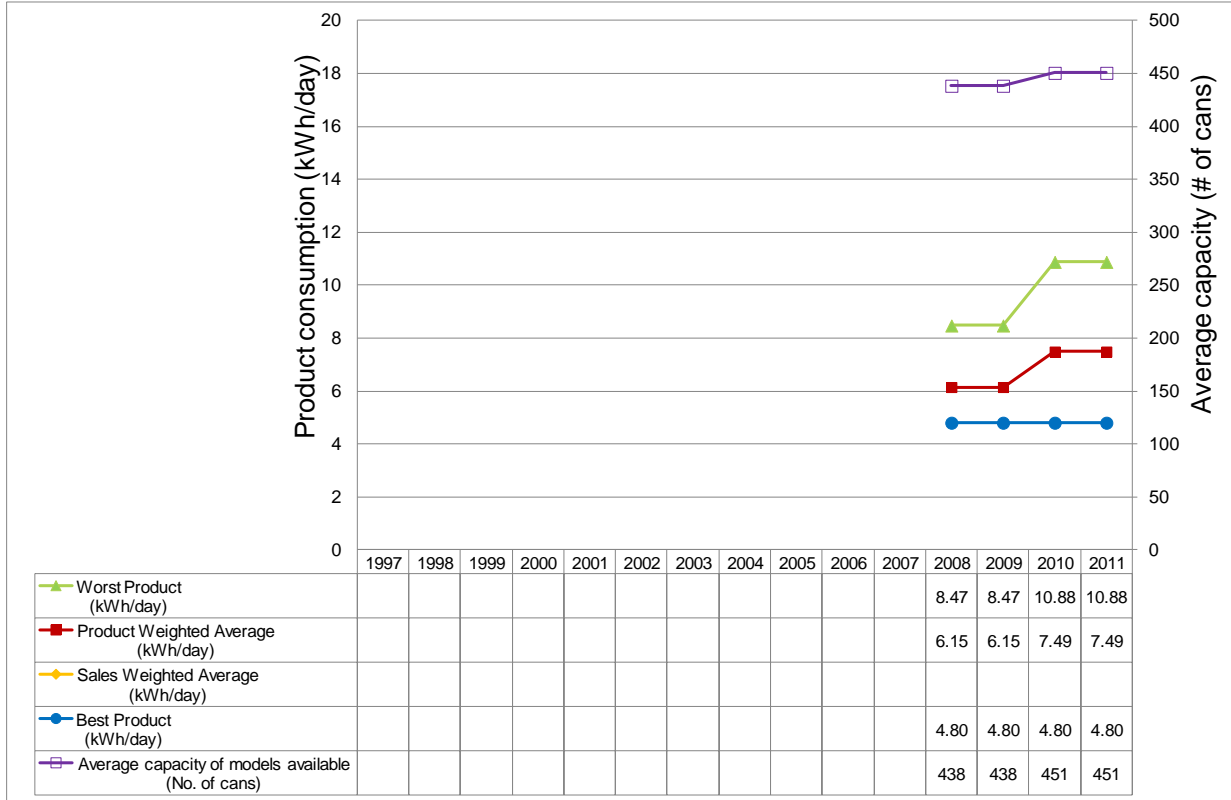
<sup>1</sup> Data on performance of food/snack vending machines were received for the EU, but not for other countries/regions.

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





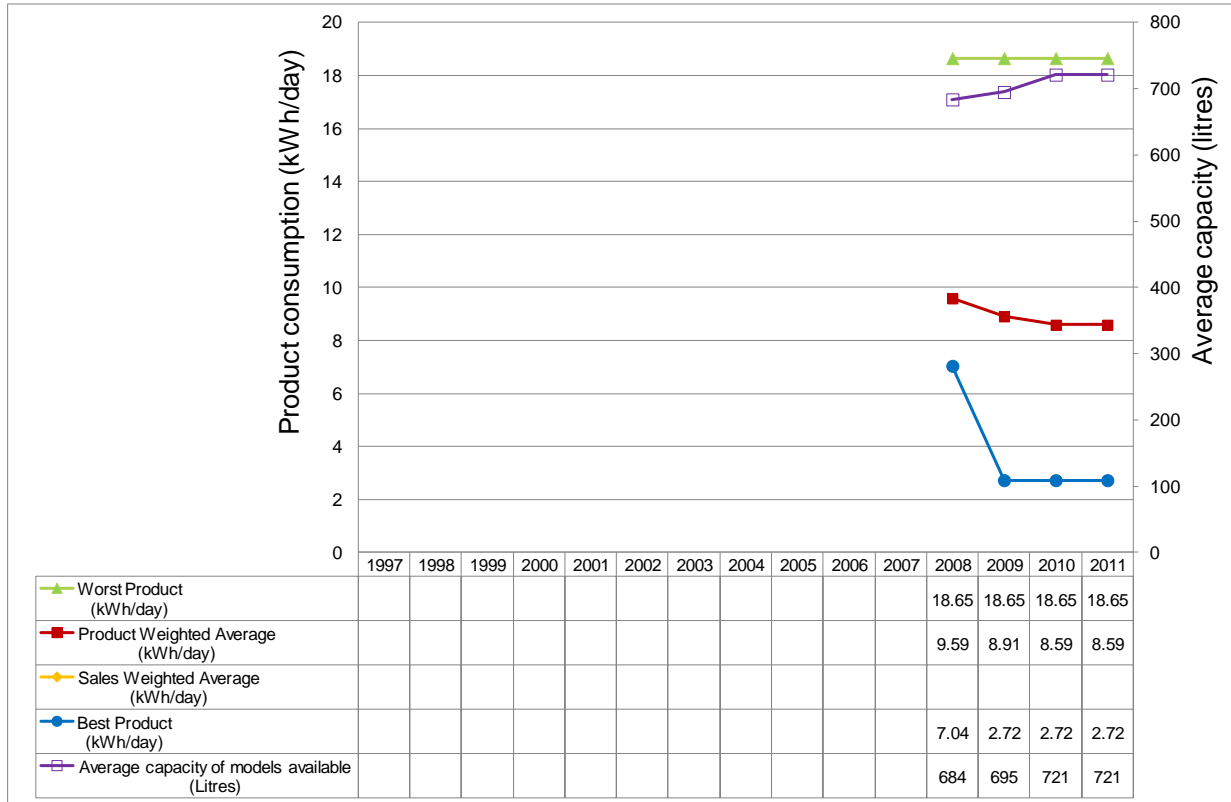
## Energy consumption of new beverage vending machines The European Union



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

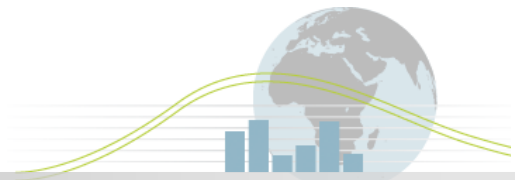
- Data is based on 9 products in 2008 and 2009 and 21 in 2010/2011. Note that the suppliers who submitted data account for over half of the overall EU market, although not all of their products are included.
- Data is derived from products tested to the European Vending Association Energy Measurement Protocol but using different declared temperatures in some cases. All data has been normalised as if tested to the ASHRAE standard 32.1 outdoor test temperature, and internal storage temperature of 4.4°C.
- The best and worst performing machines in 2010 and 2011 are very different in capacity and type: best efficiency is achieved by a large closed front dedicated can/bottle machine, worst efficiency is achieved by a small capacity glass front flexible vending machine configured for cans and bottles.

## Energy consumption of new snack and drink vending machines - The European Union

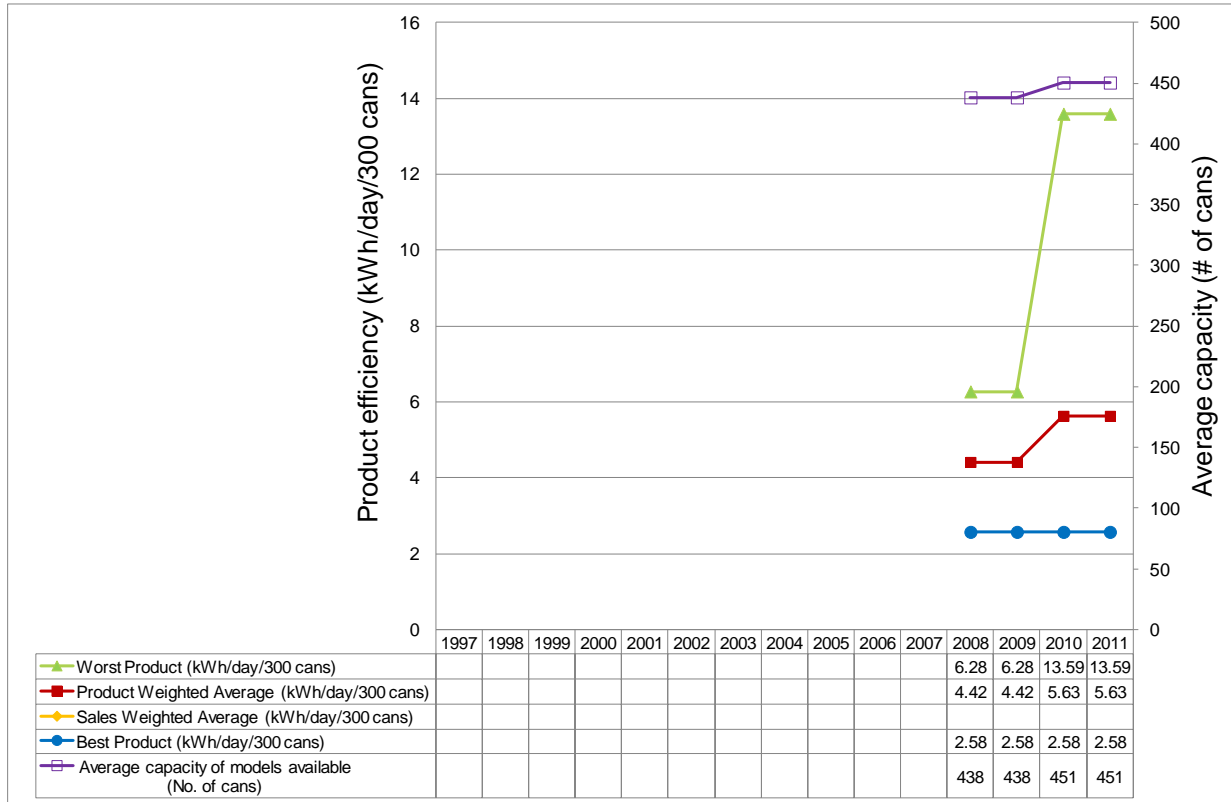


### Key notes on Graph (see notes section 1)

- Data for 2008 is based on 20 products; 2009 on 23 and 2010/2011 on 24 products. Note that the suppliers who submitted data account for over half of the overall EU market, although not all of their products are included.
- The specific products with the highest and lowest consumption (worst and best) did not declare details of capacity. However, products with very similar consumption figures to these two are of very different capacities: the higher consumption for a machine of almost double the capacity of that with the lower consumption.
- Data is derived from products tested to the European Vending Association Energy Measurement Protocol but using different declared temperatures in some cases. All data has been normalised as if tested to the ASHRAE standard 32.1 outdoor test temperature, and internal storage temperature of 4.4°C.



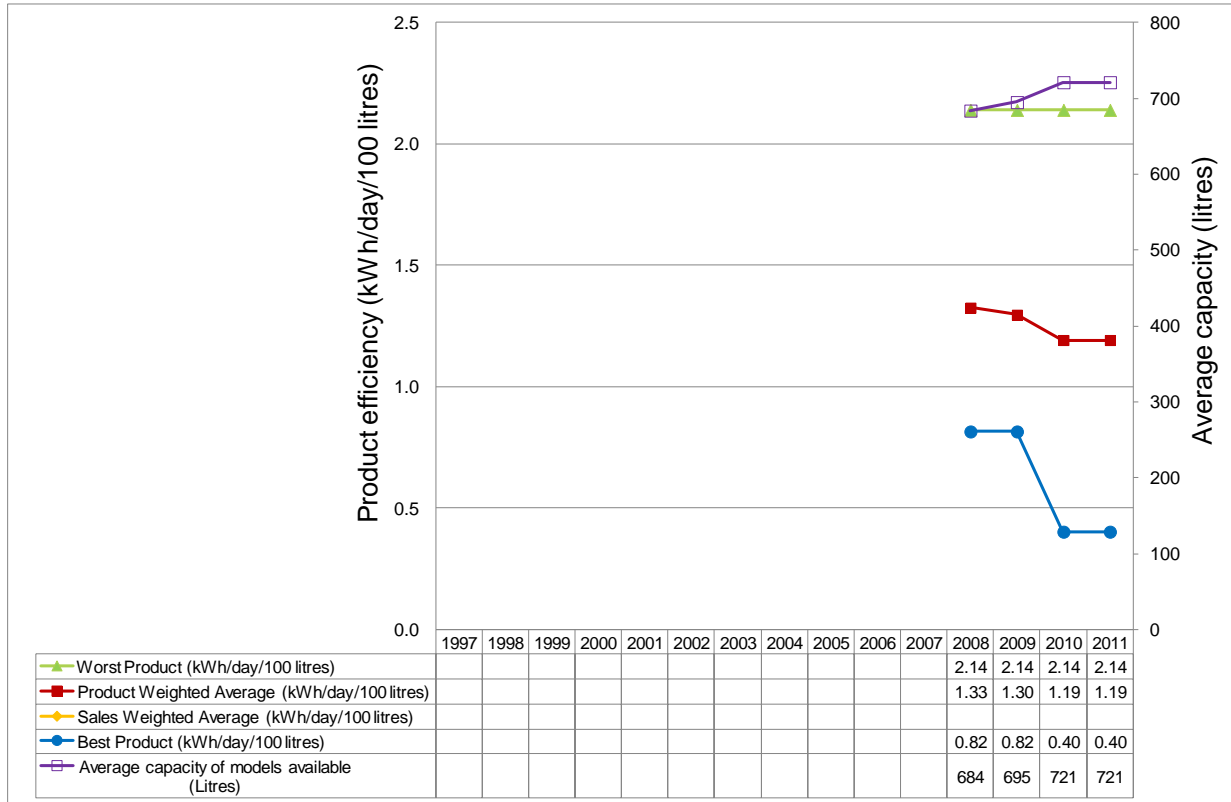
## Energy efficiency of new beverage vending machines The European Union



### Key notes on Graph (see notes section 2)

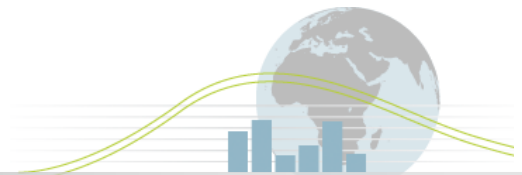
- Data for 2008 and 2009 is based on 9 products; 2009 is based on 15 and 2010/2011 on 21 products. Note that the suppliers who submitted data account for over half of the overall EU market, although not all of their products are included.
- The marked changes between 2009 and 2010 arise from a change in the mix of suppliers whose products are present in the datasets and should not be seen as indicative of any trend.
- The best and worst performing machines in 2010 and 2011 are very different in capacity and type: best efficiency is achieved by a large closed front dedicated can/bottle machine, worst efficiency is achieved by a small capacity glass front flexible vending machine configured for cans and bottles.
- Data is derived from products tested to the European Vending Association Energy Measurement Protocol but using different declared temperatures in some cases. All data has been normalised as if tested to the ASHRAE standard 32.1 outdoor test temperature, and internal storage temperature of 4.4°C.

## Energy efficiency of new snack and drink vending machines - The European Union



### Key notes on Graph (see notes section 2)

- Data is based on 15 products in 2008; 16 in 2009 and 17 in 2010/2011. Note that the suppliers who submitted data account for over half of the overall EU market, although not all of their products are included.
- The best performing product of 2010 and 2011 is significantly larger and so inherently more efficient per litre than the worst performing product.
- Data is derived from products tested to the European Vending Association Energy Measurement Protocol but using different declared temperatures in some cases. All data has been normalised as if tested to the ASHRAE standard 32.1 outdoor test temperature, and internal storage temperature of 4.4°C.



## Total energy consumption in the existing vending machine stock - The European Union

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

- No official data on the total energy consumption of vending machines in the installed stock was available to the Annex at the time of publication.
- However, the European Ecodesign study<sup>3</sup> estimated that there were 1.16 million refrigerated vending machines in the EU-25 in 2004.

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<sup>3</sup> European Commission DG TREN Preparatory Studies for Eco-design Requirements of EuPs [TREN/D1/40-2005/LOT12/S07.56644], Lot 12 Commercial refrigerators and freezers, Final Report December 2007, Bio Intelligence Service S.A.S.

## Major Policy Interventions (See notes Section 4)

There are no EU-wide policies specifically relating to vending machines in force at July 2011.

An EU Ecodesign preparatory study<sup>4</sup> covering vending machines (amongst other commercial refrigeration products) was published in December 2007 that laid out evidence on which future EU minimum standards and/or labelling measures could be based. No draft measure had been published at July 2011. An indicative regulation development plan published by the European Commission in early 2011 suggested that measures for commercial refrigeration equipment would be progressed in the 4<sup>th</sup> quarter of 2011.

In parallel to this, the European Vending Association (EU trade body covering vending machines) has developed a voluntary methodology for the energy labelling of vending machines according to an A to G label scale similar in nature to EU regulatory energy labels. This is as an extension to their Energy Measurement Protocol (EMP, test methodology) for energy consumption<sup>5</sup>. To date few products on the EU market have an associated 'energy label' in their product data, although many quote energy consumption measured in accordance with the EMP. The label scale is set such that a product achieving an energy label D would meet the requirements of ENERGY STAR.

Vending machines are covered by the USA ENERGY STAR programme, but not by the EU ENERGY STAR programme.

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<sup>4</sup> European Commission DG TREN Preparatory Studies for Eco-design Requirements of EuPs [TREN/D1/40-2005/LOT12/S07.56644], Lot 12 Commercial refrigerators and freezers, Final Report December 2007, Bio Intelligence Service S.A.S.

<sup>5</sup> See <http://www.vending-europe.eu/standards/EVA-EMP.html>

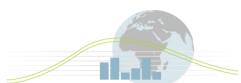
## Cultural Issues (See Notes Section 5)

Information provided by the European Vending Association suggests that the market for vending machines in Europe is fundamentally different to that of USA, Canada and Australia in the following ways:

- EU (refrigerated) vending machines are predominantly of the glass-fronted food/snack type which can also be configured to vend cans/drinks; whereas US/Canadian/Australian markets are dominated by can/bottle dedicated machines with relatively few of the food/snack machines. This is also implied in the data received as no data on food/snack machines were submitted outside of the EU.
- Italy, France, The United Kingdom, Germany, Spain and The Netherlands account for more than 80 % of the European market by themselves<sup>6</sup>.
- Anecdotal evidence from the European trade association indicates that EU 'indoor' machines are generally designed to operate in a wider range of ambient temperatures than typical US machines since they typically have to operate without air-conditioning in summer<sup>7</sup>.
- Similarly, anecdotal evidence from the European trade association indicates that a significant proportion of EU machines are designed to store fresh food and so subject to food safety regulations. To ensure compliance, the machines are designed with a higher refrigeration capacity than would be necessary for non-perishable goods. This could result in a higher consumption per unit capacity than, for example, beverage machines that are typical in the US market.

<sup>6</sup> View of the European Vending Association in 2007, quoted in the EU ecodesign study (BioIS).

<sup>7</sup> It was suggested that US specifications typically achieve a consistent 7°C temperature drop below ambient, rather than being able to achieve the target temperature regardless of ambient (which in summer requires more than 7°C temperature drop, and so a higher refrigerating capacity).





## Notes on data

### Section 1: Notes on Product Efficiency

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

Two test methodologies are in common use around the world:

- a. ASHRAE Standard 32.1-2004, Methods of Testing for Rating Vending Machines for Bottled, Canned, and Other Sealed Beverages (as used by ENERGY STAR and US DOE MEPS )
- b. Test Protocol for the Measurement of Energy Consumption in Vending & Dispensing Machines, Version 2.0 – June 2008<sup>8</sup>, published by the European Vending Association (EVA) as their 'Energy Measurement Protocol' (EMP).

Both of these are applicable to can/bottle machines and to food/snack machines. Test procedures are similar but involve slightly different ambient test temperatures (see below). Once the test temperatures are normalised, results are assumed comparable.

The EVA EMP methodology is promoted by this manufacturers' association for use in presenting performance data to customers. It also forms the basis of the EVA voluntary energy labelling scheme in Europe although few manufacturers publish these energy labels in their literature. All of the available data from European suppliers for which a methodology is declared (74% of all products) was tested using the EVA EMP.

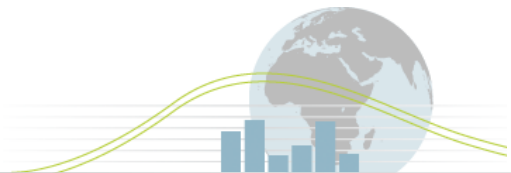
The ASHRAE test methodology has been adopted by the USA EPA for ENERGY STAR, and by California Energy Commission, Canada and Australia for MEPS.

The following metrics for efficiency were adopted:

- Energy efficiency of beverage (can/bottle) vending machines in kWh per 300 cans per day (measured in idle mode).
- Energy efficiency of food/snack machines in kWh per 100 litres of refrigerated volume per day (measured in idle mode).

An important distinction of product type that also defines the ambient temperature in which it is tested is whether it is designed to be placed outside and fully weatherproof or only indoors. Ambient temperature (defined by usage location) affects the energy consumption of the machine – consumption rises (or falls) by around 3% for each additional (or reducing) degree Celcius of ambient temperature above the internal storage temperature of the machine. The ASHRAE test standard (and so ENERGY STAR criteria) and EVA EMP require a different test temperature and humidity depending on whether the product is intended for indoor or outdoor use (see table below). However, some products were tested and data declared at different ambient temperatures than these.

<sup>8</sup> European Vending Association (EVA), Brussels, <http://www.vending-europe.eu>.



## Summary of test method requirements for ambient temperature and storage temperature.

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)	23.9°C±1°C	45%±5%	32.2°C±1°C	65%±5%
European Vending Association Energy Measurement Protocol	25°C	60%	32°C	65%

Data for some products declared the internal product temperature during test – this was used as the basis of analysis where available. Where no specific temperature was declared, it was assumed to be 4.4°C (standard requirement for soft drinks).

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):

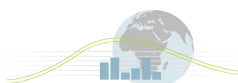
- i. Storage temperature: as if tested with a storage temperature of 4.4°C (where this was made possible by any declared storage temperature). This was done assuming 3% change in consumption for every degree Celcius difference.
- ii. Ambient temperature: as if tested at the ASHRAE outdoor requirement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

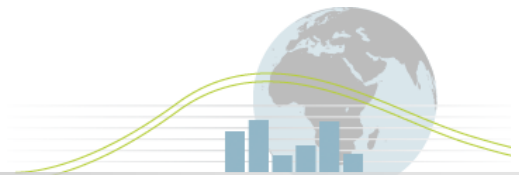
### 1.2 Product Efficiency Graphic

Data were invited from the major EU equipment manufacturers/suppliers via the UK and EU trade associations as no central database exists in the EU. Data were provided by four suppliers and covered a total of 69 products. Just under half of the products were food/snack based, and the balance configured for cans/bottles. 35% of the machines configured or dedicated for cans/bottles were of the glass fronted (spiral vend) type. The EU trade association technical committee confirmed that these suppliers and products represent over 50% of the EU market.

Data on consumption were provided for all products, but some did not provide capacity data and so efficiency could not be calculated.

Efficiency data were normalised as per consumption data above.





## **Section 2: Notes on Product Consumption**

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

The same test methodologies apply as above. The consumption metric for both can/bottle and for food/snack machines is kWh per day (24 hours), measured in idle mode.

### **2.2 Product Consumption Graphic**

The data set is the same as that for efficiency above.

As above, data were normalised for storage temperature and for ambient temperature during test as 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.

