

Country:	European Union 14 [*]
Technology:	Domestic refrigerated appliances
Sub Category:	Refrigerators, refrigerator-freezers and freezers

* Austria, Belgium, Czech Republic, France, Germany, Hungary, Italy, Netherlands, Poland, Portugal, Slovakia, Spain, Sweden, and United Kingdom

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. 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:

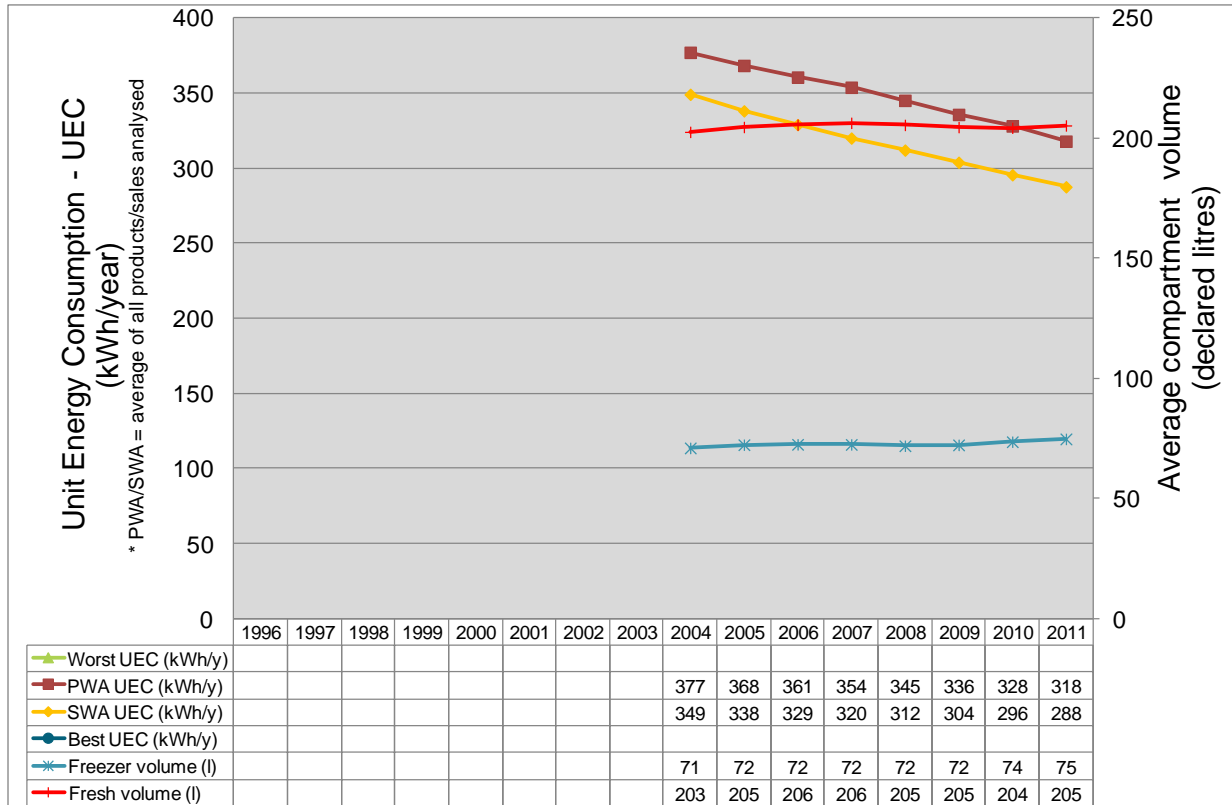
M&B Category	Description
Refrigerator only and refrigerators with freezer compartments	The primary compartment is for fresh storage in the temperature range $5^{\circ}\text{C} \geq T > 0^{\circ}\text{C}$ and <ul style="list-style-type: none"> • The unit has no freezer compartment, or • The unit has a freezer compartment of any temperature rating but a volume of less than 14 litres, or • The unit has a frozen food compartment of any volume that is rated as $0^{\circ}\text{C} \geq T > -15^{\circ}\text{C}$
Refrigerator/Freezer	The primary compartment for fresh storage in the temperature range $5^{\circ}\text{C} \geq T > 0^{\circ}\text{C}$ and the primary frozen food compartment is greater than 14 litres and has a rated temperature $T \leq -15^{\circ}\text{C}$
Freezer only	A unit where <i>all</i> compartments have a temperature rating $T \leq -15^{\circ}\text{C}$

The detailed product definition can be found at the Annex website:

<http://mappingandbenchmarking.iea-4e.org/matrix?type=product&id=13>

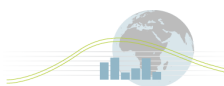


Unit Energy Consumption of new refrigerator freezers in the EU

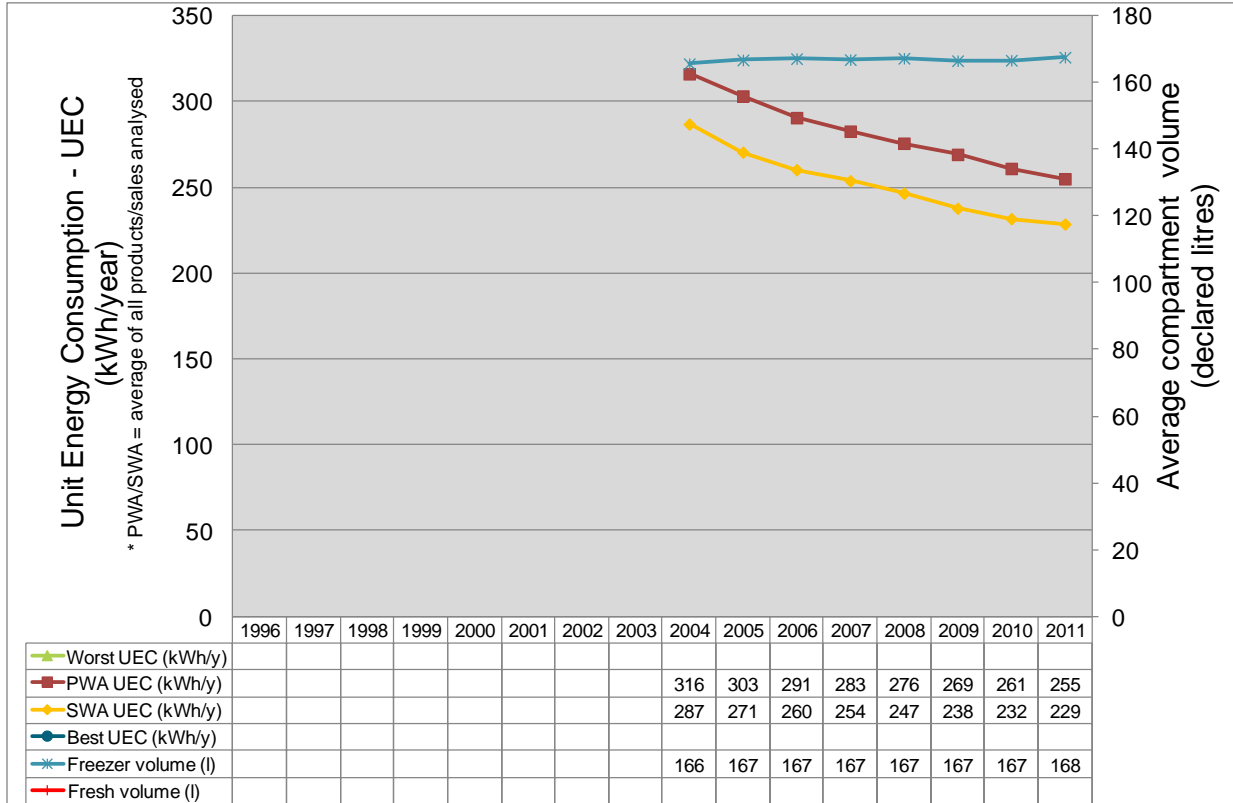


Key notes on Graph (see notes section 1)

- Data was supplied to the Annex as market averages from a dataset that covers approximately 90% of sales in the market.
- No data on Best or Worst performing products was available.
- All volumes shown are sales weighted averages.

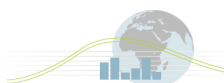


Unit Energy Consumption of new freezers in the EU

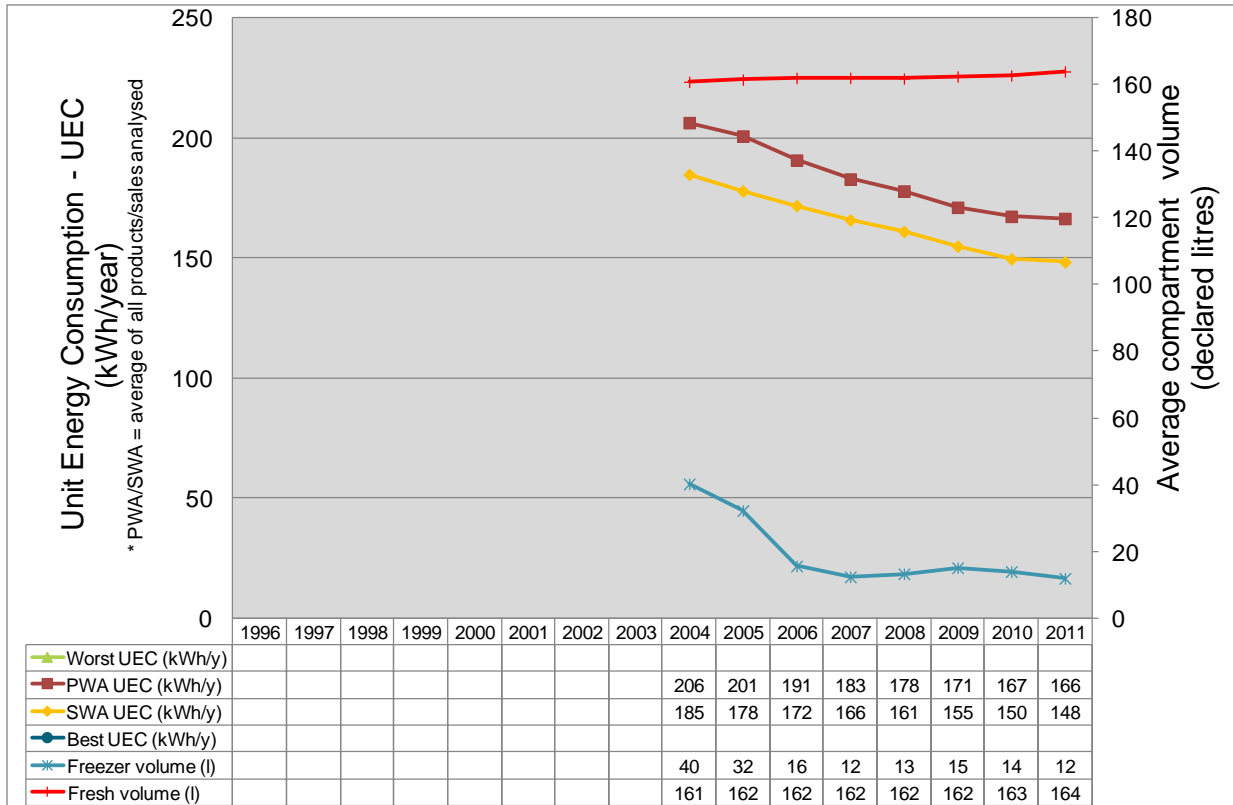


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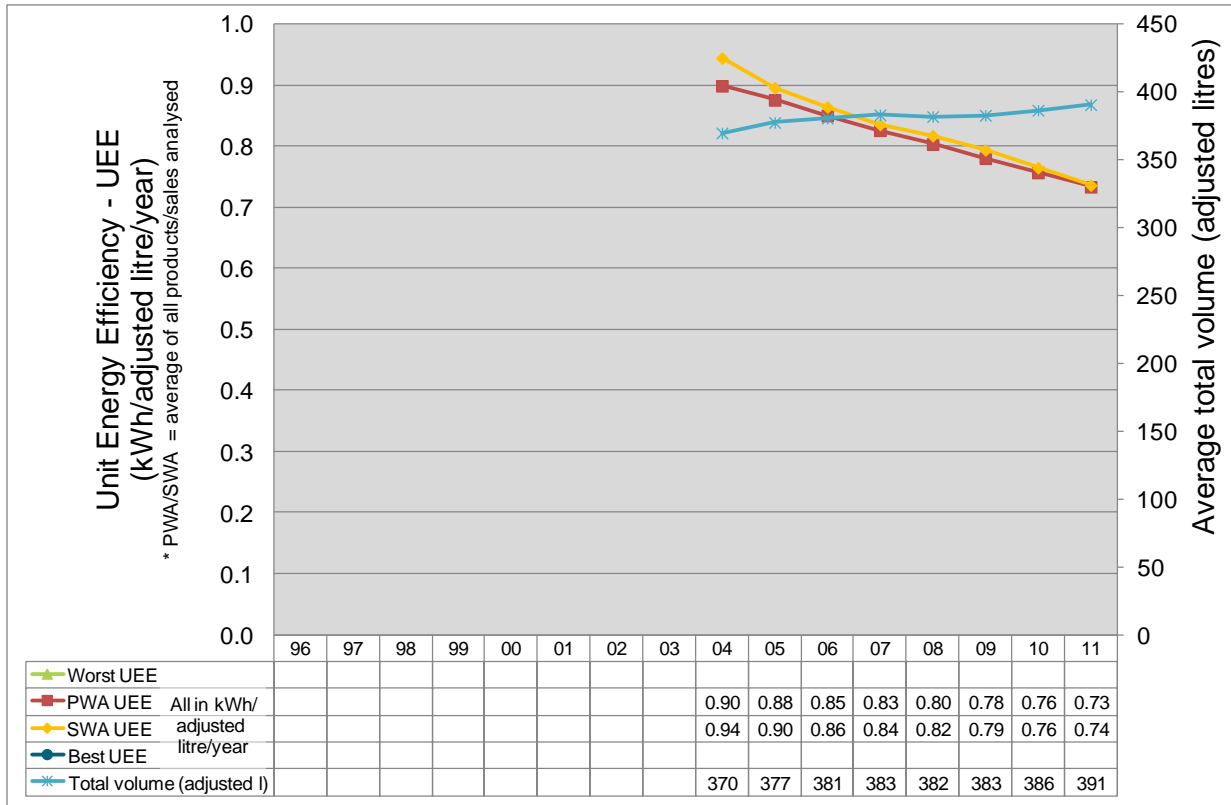
Unit Energy Consumption of new refrigerators and refrigerators with freezer compartments in the EU



Key notes on Graph (see notes section 1)

- Data was supplied to the Annex as market averages from a dataset that covers approximately 90% of sales in the market.
- No data on Best or Worst performing products was available.
- All volumes shown are sales weighted averages.

Unit Energy Efficiency of new refrigerator freezers in the EU

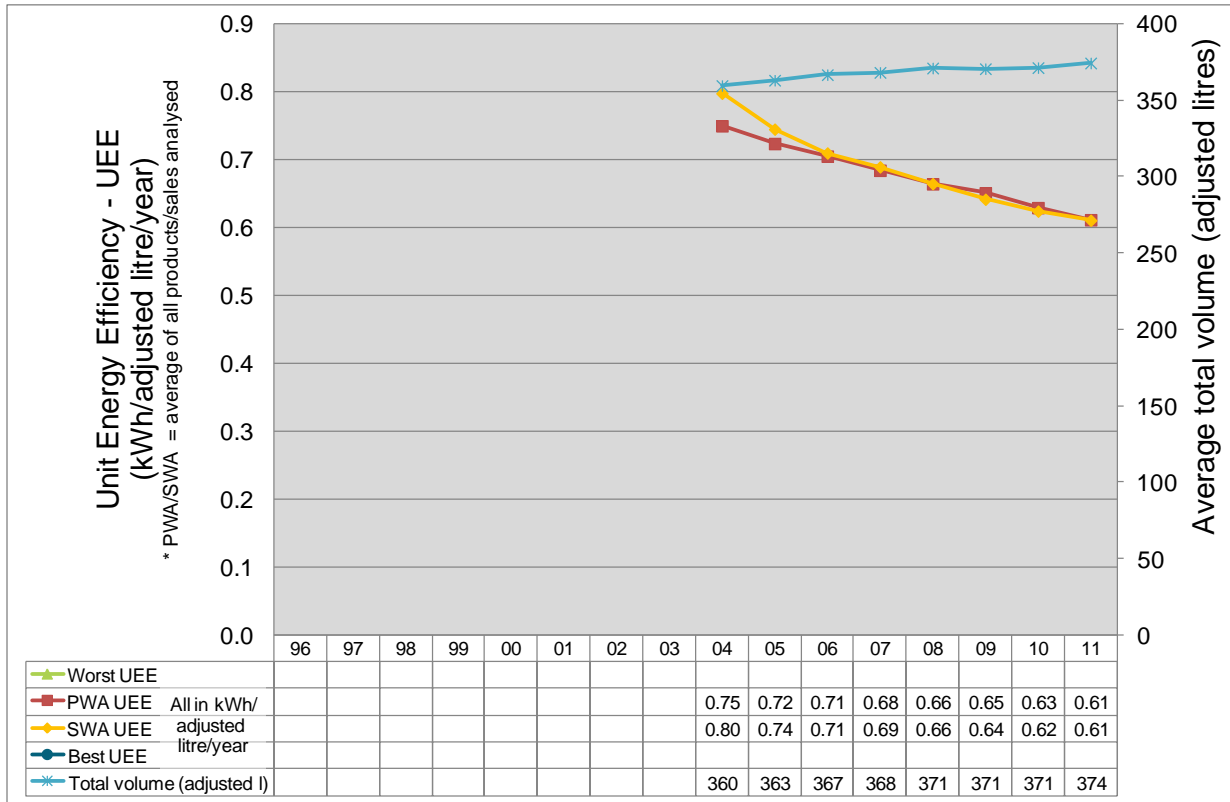


Key notes on Graph (see notes section 1)

- Data was supplied to the Annex as market averages from a dataset that covers approximately 90% of sales in the market.
- No data on Best or Worst performing products was available.
- The average total volumes shown (adjusted litres) are sales weighted and calculated using the temperatures and a slightly modified version of the volume adjustment method defined in EU/regulations. The sales weighted average unit energy efficiency (UEE) is then calculated by using the sales weighted unit energy consumption (UEC) and sales weighted - adjusted volumes. Product weighted UEE is calculated in the same way but using product weighted UECs and product weighted total adjusted volumes¹.
- All values and associated calculations are based on market average values for consumption, compartment volume and the percentage of sales with auto-defrost functionality. While the use of these market averages (rather than product level data) to calculate UEE will generally give reliable results, the approach introduces a level of uncertainty that cannot be quantified.

¹ Note, the average model purchased (the sales weighted value) is slightly smaller than the average unit on sale (the product weighted value). This difference in volumes is reflected in product weighted units having slightly higher UEC values. However, when UEE is calculated here, the addition energy consumption of product weighted units is offset by the slightly greater volumes. Hence while UEC values differ between sales weighted and product weighted results, UEE values are similar)

Unit Energy Efficiency of new freezers in the EU

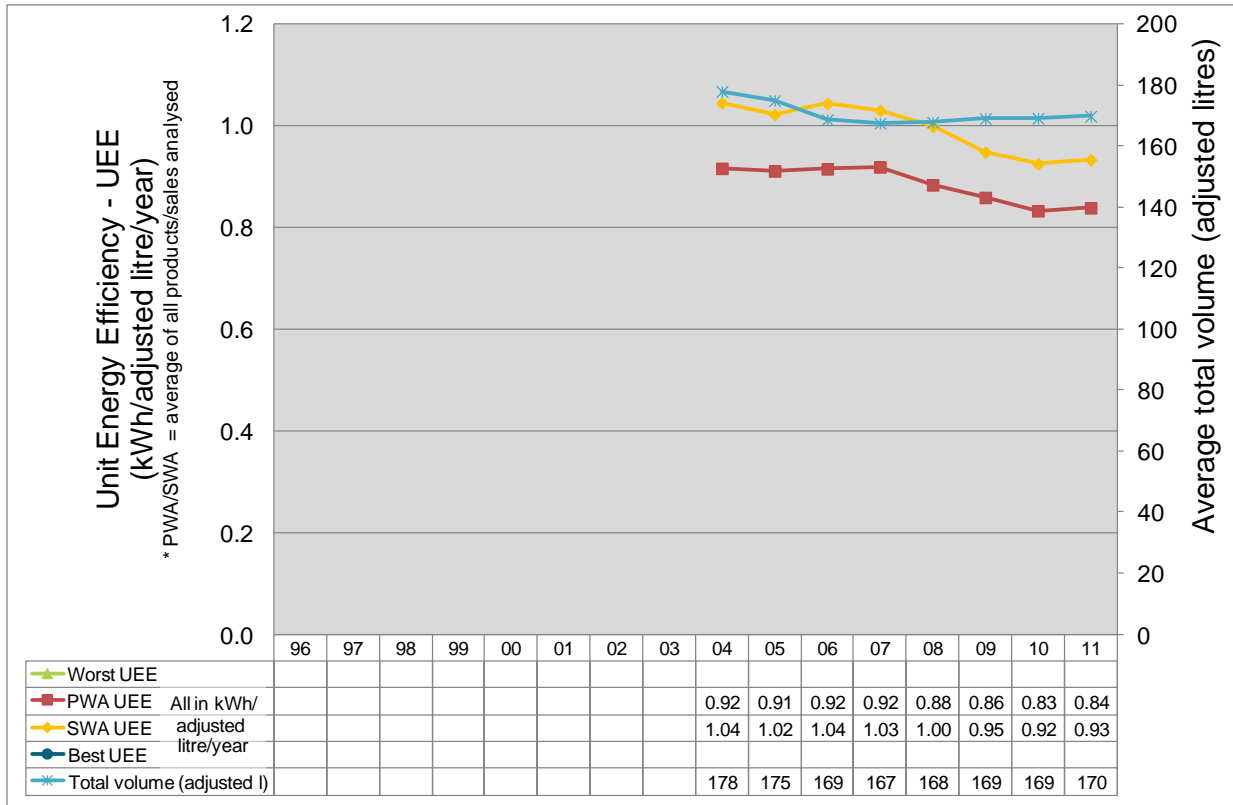


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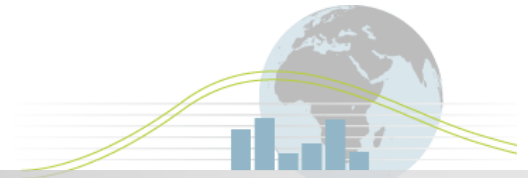
Unit Energy Efficiency of new refrigerators and refrigerators with freezer compartments in The EU



Key notes on Graph (see notes section 1)

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- No data on Best or Worst performing products was available.
- The average total volumes shown (adjusted litres) are sales weighted and calculated using the temperatures and a slightly modified version of the volume adjustment method defined in EU/regulations. The sales weighted average unit energy efficiency (UEE) is then calculated by using the sales weighted unit energy consumption (UEC) and sales weighted - adjusted volumes. Product weighted UEE is calculated in the same way but using product weighted UECs and product weighted total adjusted volumes³.
- All values and associated calculations are based on market average values for consumption, compartment volume and the percentage of sales with auto-defrost functionality. While the use of these market averages (rather than product level data) to calculate UEE will generally give reliable results, the approach introduces a level of uncertainty that cannot be quantified.

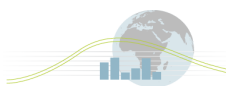
³ Note, the average model purchased (the sales weighted value) is slightly smaller than the average unit on sale (the product weighted value). This difference in volumes is reflected in product weighted units having slightly higher UEC values. However, when UEE is calculated here, the addition energy consumption of product weighted units is offset by the slightly greater volumes. Hence while UEC values differ between sales weighted and product weighted results, UEE values are similar)



Energy Consumption of the installed stock of refrigerated appliances in the EU

Key notes on Graph (see notes section 2)

- No data on the installed stock of refrigerated appliances was available to the annex at the time of publication.



Major Policy Interventions (see notes section 3)

EU Wide Regulations:

Policy name	Period in force	Description	Impact <i>Relative impact of policy</i>
EC Energy Label ⁴	1995 – 2010	Defines A to G efficiency classes	All domestic refrigeration appliances to be labelled – improvement in the average efficiency over time
EC MEPS (EuP) ⁵	1999 – (July) 2010	Limit sales to A, B, C class, plus D & E for chest freezers	All domestic refrigeration - improvement in the average efficiency over time
Industry Commitment ⁶	2002 - 2010	CECED commitment: only B or better (except chest freezers) on market by end 2004	Improvement in the average efficiency over time
EC Energy Label ⁷	2004-2010	Defines A+ and A++ classes	All domestic refrigeration - improvement in the average efficiency over time
EC MEPS (EuP) ⁸	July 2010 July 2012	Limits sales to products to those reaching at least A class. Limits sales to products attaining at least A+ class. (note that the maximum EEI requirement for A+ is lowered in 2014)	All domestic refrigeration - improvement in the average efficiency over time
EC Energy Label ⁹	2011-	Introduces new labelling format and the introduction of A+++. Also slightly revises EEI definition of A+.	All domestic refrigeration - improvement in the average efficiency over time

⁴ www.legislation.hmso.gov.uk/si/si1994/Uksi_19943076_en_1.htm.

⁵ www.opsi.gov.uk/si/si1997/19971941.htm

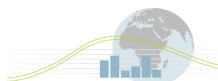
⁶ "Voluntary commitment of reducing energy consumption of household refrigerators, freezers and their combinations (2002-2010)" 31st October 2002.

<http://www.cecce.eu/ICECED/easnet.dll/ExecReq/Redirection?eas:oldfilename=/community/files/296/phpXly1ow/UICCOLD2002.pdf>

⁷ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:170:0010:0014:EN:PDF>

⁸ Directive 96/57/EC repealed and replaced by Regulation 2009/643/EC <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:191:0053:0068:EN:PDF>

⁹ Directive 94/2/EC repealed and replaced by Regulation 1060/2010 <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:314:0017:0046:EN:PDF>



Cultural Issues (see notes section 4)

Due to the extremely diverse range of cultures within countries the EU (eg household sizes, building types and sizes, national and local income levels, etc), it is impossible to provide any meaningful cultural information other than large scale observations:

- Household numbers are rising in almost all member states, but the number of individuals within households is falling
- Average buying power of households rose in all member states between 1996 and 2008
- Average cold appliance sizes are increasing in almost all areas, with a gradual migration to combination fridge/freezer units taking place

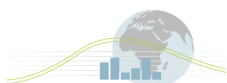
Section 1. Unit Energy Consumption and Unit Energy Efficiency Graphics

1.1 Test methodologies, Performance Standards and Labelling Requirements

Energy consumption is claimed according to the requirements of the EC energy label and the appropriate energy efficiency class allocated according to the calculations given in the energy label directives.

The test standard for EC energy labelling is EN 153 which calls upon the EN ISO 15502.

Test Standard name	Date in force	Description	Comments
EN 153:2005 Methods of measuring the energy consumption of electric mains operated household refrigerators, frozen food storage cabinets, food freezers and their combinations, together with associated characteristics.	2005	Energy, temperature and volume of all types of domestic cold appliances are measured in accordance with test standard (BS) EN 153 and used for energy label declarations. EN 153 refers to EN ISO 15502:2005	Supersedes EN 153:1995 (withdrawn 30 June 2008). Although there is some debate as to which test standard is currently valid under UK law.
EN ISO 15502: 2005 Household refrigerating appliances, refrigerator freezers – characteristics and test methods.	2005	Defines characteristics and test methods	Prior to this standard there were four test standards for each of the main refrigerating appliance types



Specific information:

External/ambient test temperature

25 ± 0.5°C (Deviations from 25°C within ± 0.5°C are corrected in accordance with EN 153:2006 Clause 15.2.1.)

Internal temperatures for the appliances

- | | |
|---|--|
| • Fridge compartment | Mean temp of +5°C (no tolerance because in general, the energy consumption at this temp is obtained by interpolation.) |
| • Freezers (0-2 Star) | Various classifications incorporating temperature ranges from +3 to -18°C |
| • Freezer compartment (3 or 4 star compartment) | -18°C or colder |

1.2 Product Classifications

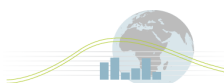
(Source: COMMISSION REGULATION (EC) No 643/2009¹⁰)

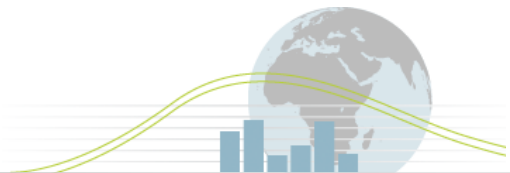
Group	Description
1	Refrigerator with one or more fresh-food storage compartments
	Refrigerator-cellar, cellar and wine storage appliance
3	Refrigerator-chiller and refrigerator with a 0-star compartment
4	Refrigerator with a 1-star compartment
5	Refrigerator with a 2-star compartment
6	Refrigerator with a 3-star compartment
7	Refrigerator-freezer
8	Upright freezer
9	Chest freezer
10	Multi-use and other appliances

1.3 Data sources and limitations

Sources: New product data is GfK data split by refrigerators with a 0*, 1* or 2* rated freezer compartment, refrigerators with a 3* or 4* freezer compartment split by volumes either less or more than 14 litres and Freezers. Data was supplied as market averages in the form:

¹⁰ Directive 96/57/EC repealed and replaced by Regulation 2009/643/EC <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:191:0053:0068:EN:PDF>





Metric	Year
Product Weighted Energy Consumption [kWh]	
Sales Weighted Energy Consumption [kWh]	
Product Weighted Freezer Volume [Litres]	
Product Weighted Fridge Volume [Litres]	
Sales Weighted Freezer Volume [Litres]	
Sales Weighted Fridge Volume [Litres]	
Sales Units With auto defrost %	
Sales Units Without auto defrost %	
Sales Units Built in/under %	
Sales Units With ice-cube dispenser %	
Coverage %	
Number of products	
Sales [Thousand Units]	

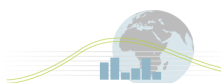
The datasets submitted are reported to cover between 85%-90% of sales in the EU market. The number of models and sales analysed by product category are presented in the tables below.

Refrigerator freezers:

	2004	2005	2006	2007	2008	2009	2010	2011
Products in dataset	15,971	16,220	16,036	15,205	14,751	14,723	14,103	14,583
Products analysed	15,971	16,220	16,036	15,205	14,751	14,723	14,103	14,583
% products included	100%	100%	100%	100%	100%	100%	100%	100%
Sales in dataset ('000s)	9,250	9,426	10,283	10,266	10,050	9,652	9,883	9,949
Sales analysed ('000s)	9,250	9,426	10,283	10,266	10,050	9,652	9,883	9,949
% Sales included	100%	100%	100%	100%	100%	100%	100%	100%

Freezers:

	2004	2005	2006	2007	2008	2009	2010	2011
Products in dataset	6,662	6,342	5,832	5,494	5,186	5,069	4,859	5,060
Products analysed	6,662	6,342	5,832	5,494	5,186	5,069	4,859	5,060
% products included	100%	100%	100%	100%	100%	100%	100%	100%
Sales in dataset ('000s)	4,018	3,874	3,950	3,848	3,729	3,631	3,585	3,550
Sales analysed ('000s)	4,018	3,874	3,950	3,848	3,729	3,631	3,585	3,550
% Sales included	100%	100%	100%	100%	100%	100%	100%	100%



Refrigerators and refrigerators with freezer compartments:

	2004	2005	2006	2007	2008	2009	2010	2011
Products in dataset	5,644	5,512	5,229	4,870	4,687	4,677	4,555	4,755
Products analysed	5,644	5,512	5,229	4,870	4,687	4,677	4,555	4,755
% products included	100%	100%	100%	100%	100%	100%	100%	100%
Sales in dataset ('000s)	3,514	3,496	3,623	3,506	3,332	3,117	3,161	3,140
Sales analysed ('000s)	3,514	3,496	3,623	3,506	3,332	3,117	3,161	3,140
% Sales included	100%	100%	100%	100%	100%	100%	100%	100%

1.4 Data manipulations and specific limitations

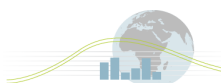
1.4.1 Overview of the mapping and benchmarking process

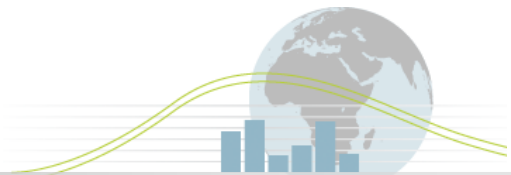
There are essentially 4 stages to the mapping and benchmarking process for domestic refrigerated appliances as detailed below:

Stage:	Description
1. Data Cleaning and Pre-processing	<ul style="list-style-type: none"> • Removal of duplicate entries • Pre-processing to align all terminology and reported test values to be consistent between countries • Assigning of local, mapping and benchmarking and EU categories • Etc
2. Production of mapping outputs	<ul style="list-style-type: none"> • Production of mapping outputs based on local test methodologies
3. Normalisation of test data	<ul style="list-style-type: none"> • Calculation of adjusted volumes • Assignment Unit Energy Consumption to individual compartments • Normalisation for test temperature differentials
4. Production of Benchmarking outputs	<ul style="list-style-type: none"> • Post processing of benchmarking results • Production of benchmarking report

The details of this process are described in three supporting documents that accompany this mapping report:

1. The **product definition** describes the exact characteristics of the product being analysed; the energy metrics that will be calculated; the technological, usage and other characteristics that will be considered; and any other policy or cultural information that will be collected
2. The **summary of approach** provides an overview of the mapping and benchmarking process for analyzing domestic refrigerated appliances for all countries and regions.
3. The **actions and assumptions** report details the specific steps that were necessary to allow the data submitted from a specific country or region to be included in the mapping and benchmarking process as described in the product definition and summary of approach.





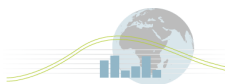
All these documents can be found at the annex website:

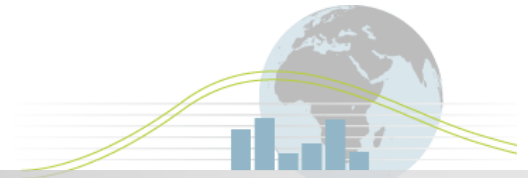
<http://mappingandbenchmarking.iea-4e.org/matrix>

by clicking on the "X" in the matrix table that aligns with *EU* and *Domestic refrigerated appliances 2012*.

1.4.2 Specific cautions for this data

Please refer to the actions and assumptions document described in Section 1.4.1.

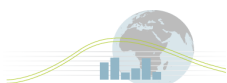




Section 2. Energy Consumption of the installed stock of refrigerated appliances graphic

2.1 Data sources and limitations

No additional information.



Section 3. Major Policy Interventions

3.1 Pan-European Policy

3.1.1 Mandatory Legislation:

COMMISSION REGULATION (EC) No 1060/2010¹¹

Program Type: Mandatory Label

Year Published: 28/09/2010

Year Effective: 30/11/2011¹²

Economy: EU Member Countries

Implementing Agency: National bodies of EU member Countries

Description:

Revises energy labelling scale for domestic refrigeration appliances through the introduction of a new high efficiency class (A+++ where unit EEI<22) from 30 November 2011. The regulations also revises the maximum EEI value for A+ declarations from EEI<44 to EEI<42 from 1 July 2014.

This deregulated regulation repeals and replaces by Directive 96/57/EC.

COMMISSION REGULATION (EC) No 643/2009 (implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for household refrigerating appliances)¹³

Program Type: Mandatory Minimum Performance Standards

Year Published: 22/07/2009

Year Effective: 1 July 2010 and 1 July 2014

Economy Affected: EU Member Countries

Implementing Agency: National bodies of EU member Countries

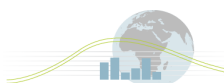
Description:

Technically this regulation repeals Directive 96/57/EC and places a requirement on national governments to enact appropriate legislation to restrict the sales of domestic refrigerated

¹¹Directive 94/2/EC repealed and replaced by Regulation 1060/2010 <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:314:0017:0046:EN:PDF>

¹² Implementation of some requirements delayed to 30/3/2012

¹³ Directive 96/57/EC repealed and replaced by Regulation 2009/643/EC <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:191:0053:0068:EN:PDF>



products to those where the performance exceeds a specified energy efficiency index (EEI) as follows:

Application date	EEI	Equivalent EU Label
01 July 2010	EEI < 55	A
01 July 2014	EEI < 42	A+

In general, other requirements laid out in the preceding directives detailed below remain the same

Commission Directive 2003/66/EC¹⁴

Program Type: Mandatory Label

Year Published: 03/07/2003

Year Effective: 2004

Economy: EU Member Countries

Implementing Agency: National bodies of EU member Countries

Description:

Revises and extends the existing A-G energy labelling scale for domestic refrigeration appliances through the introduction of 2 new high efficiency classes (A+ and A++) from 1 July 2004.

This directive is the amendment of the framework directive 94/2/EC implementing Council Directive 92/75/EEC for mandatory labeling scheme, which was agreed in 1992 and cancelled the framework directive 79/530/EEC.

Directive 96/57/EC¹⁵

Program Type: Minimum Energy Performance Standard - Mandatory

Product: Refrigerator-freezers

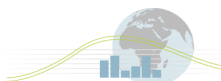
Economy: EU Member Countries

Year Published: 03/09/1996

Year Effective: 03/09/1999

¹⁴ www.opsi.gov.uk/si/si2007/uksi_20072037_en_1

¹⁵ www.opsi.gov.uk/si/si1997/19971941.htm



Implementing Agency: National bodies of EU member Countries

Description:

Introduces Minimum Energy Performance Standards for all domestic refrigeration types. In effect removes all products below European Label C from the market (labels D and E allowed for chest freezers).

Commission Directive 94/2/EC¹⁶

Program Type: Mandatory Label

Year Published: 22/09/1992

Year Effective: 21/01/1994

Economy: EU Member Countries

Implementing Agency: National bodies of EU member Countries

Description:

Introduces the EU's A-G energy label for refrigerated domestic appliances.

3.1.2 Voluntary Initiatives

Voluntary Commitment on Reducing Energy Consumption of Household Refrigerators, Freezers and their Combinations¹⁷

Program Type: Minimum Energy Performance Standard - Voluntary

Product: Refrigerator-freezers

Economy: EU Member Countries

Description: The European Commission has pursued voluntary agreement with the European Federation of Domestic Appliance Manufacturers (CECED) to improve the energy efficiency of household refrigerating appliances.

Year Published: 31/10/2002

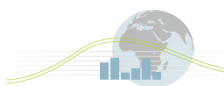
Year Effective: Applicable from 2002-2010

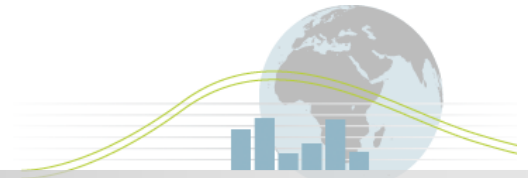
Implementing Agency: European Federation of Domestic Appliance Manufacturers - <http://www.cecед.org/>

¹⁶ www.legislation.hmso.gov.uk/si/si1994/Uksi_19943076_en_1.htm.

¹⁷ "Voluntary commitment of reducing energy consumption of household refrigerators, freezers and their combinations (2002-2010)" 31st October 2002.

<http://www.cecед.eu/ICECED/easnet.dll/ExecReq/Redirection?eas:oldfilename=/community/files/296/phpXLy1ow/UICCOLD2002.pdf>





Section 4. Cultural Issues

No additional information.

