

Country: Republic of Korea

Technology: Domestic refrigerated appliances

Sub Category: Refrigerators, refrigerator-freezers and freezers

Note: the data in this mapping report is not included in the benchmarking report for refrigerated appliances. **The data herein should not be directly compared with the data presented in the benchmarking report as they are based on different test methodologies and the results are therefore not comparable.**

Introduction

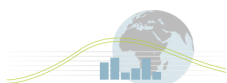
The first stage in the Mapping and Benchmarking process is the definition of the products, i.e. clearly setting the boundaries that define the products for use in data collection and analysis. This ensures that comparison between the participating countries is done against a specific and consistent set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

The summary definition for this product is:

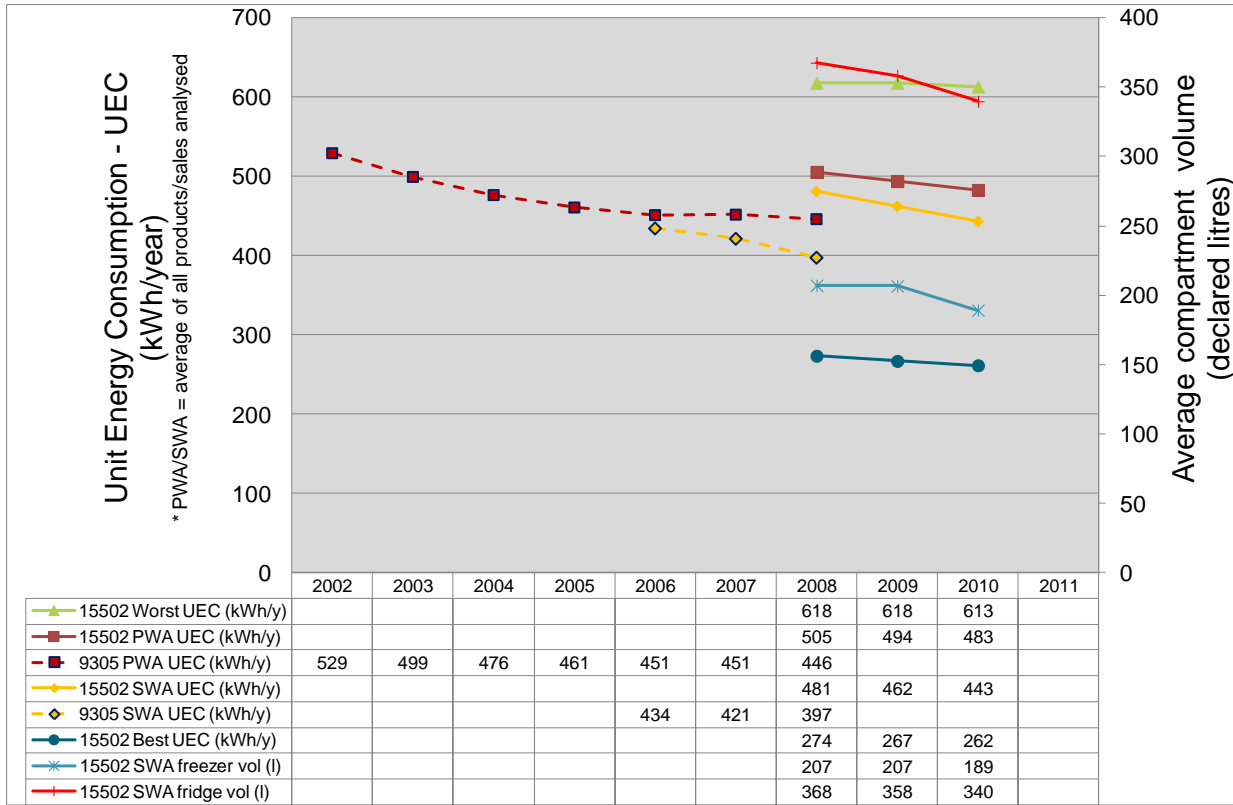
M&B Category	Description
Refrigerator only and refrigerators with freezer compartments	The primary compartment is for fresh storage in the temperature range $5^{\circ}\text{C} \geq T > 0^{\circ}\text{C}$ and <ul style="list-style-type: none"> • The unit has no freezer compartment, or • The unit has a 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>



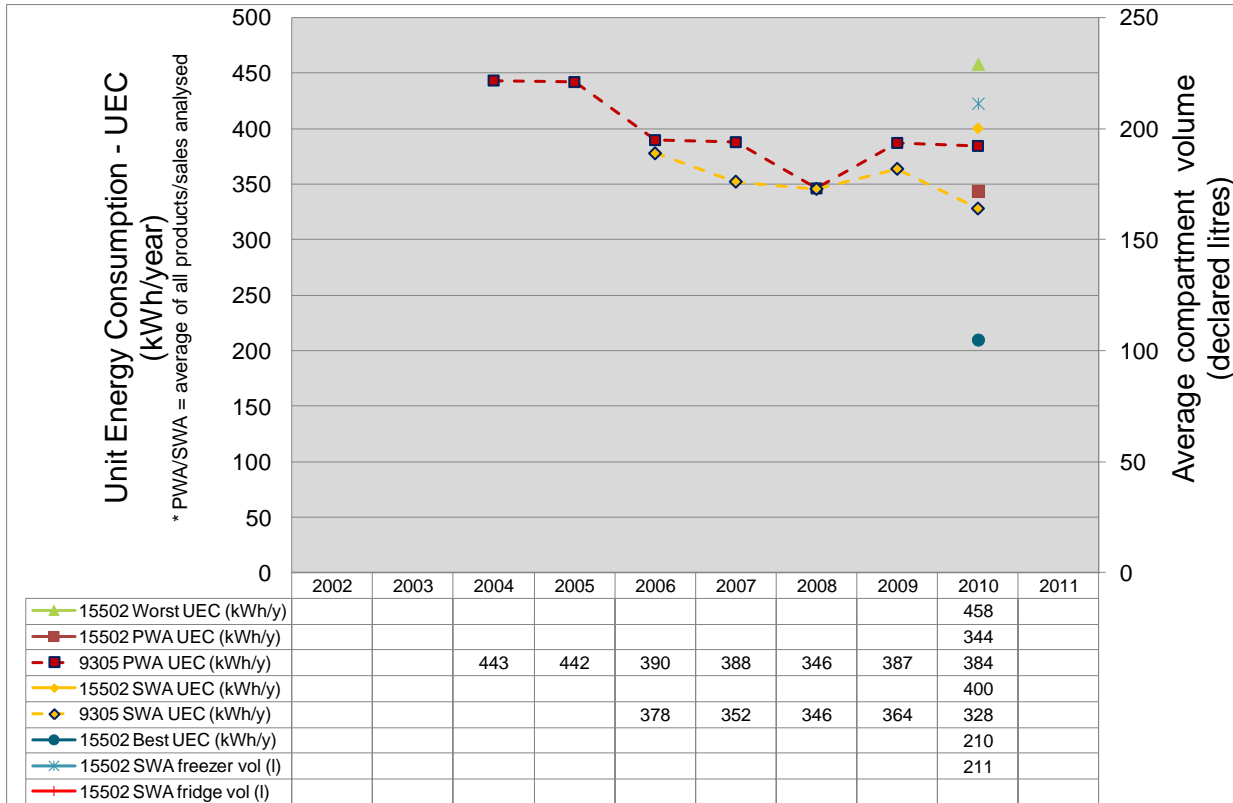
Unit Energy Consumption of new refrigerator freezers in the Republic of Korea



Key notes on Graph (see notes section 1)

- Data has been supplied from two different Korean test methodologies (KS9305 and KS15502) and Unit Energy Consumptions (UECs) are presented as measured in each test. There are significant differences in these test methodologies that make the UEC measurements from each test incomparable. Consequently, while the trends over time are correct for each test method, the *relative* positions of the KS9305 and KS15502 average values should be ignored. Only KS15502 results are shown in the benchmarking report/analysis.
- All volumes shown are sales weighted averages for products tested to the KS15502 test.
- The 'Worst UEC' is the UEC of the product at the 'worst 5%' point of a ranked list of products in the KS15502 dataset.

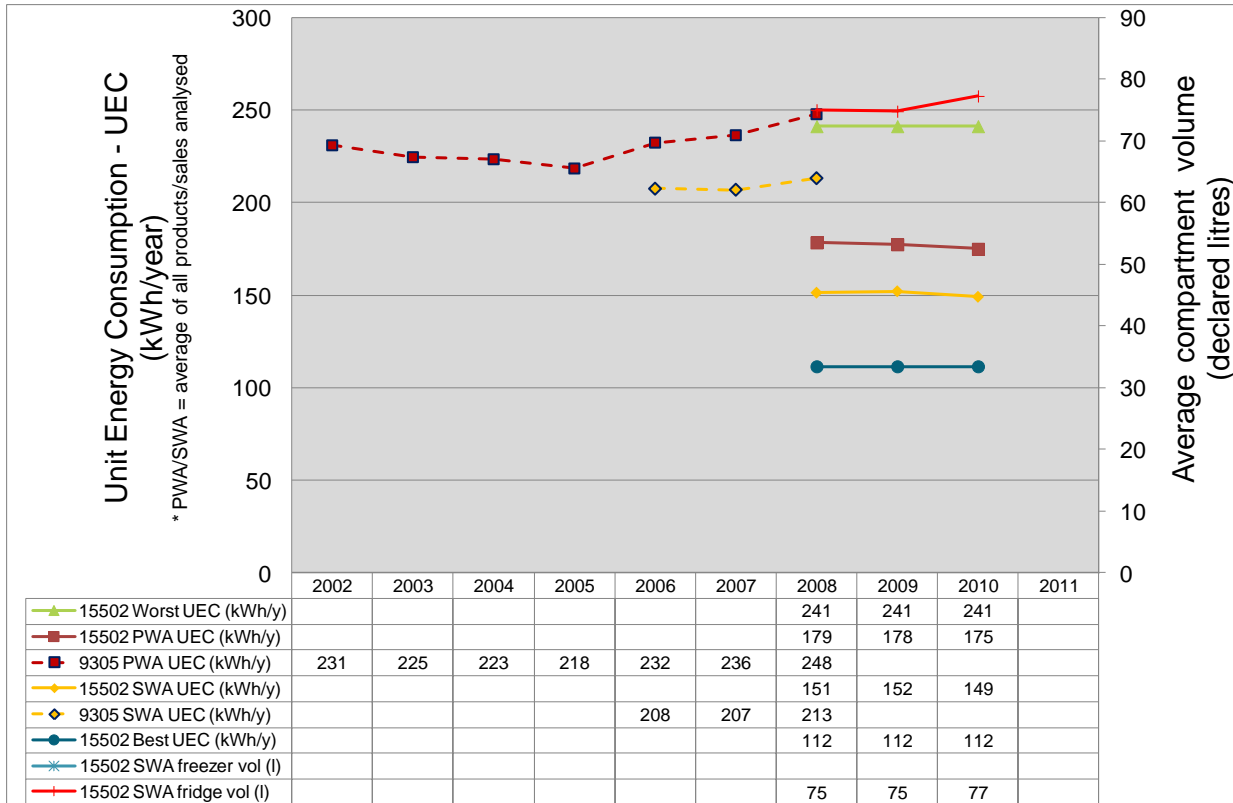
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- All volumes shown are sales weighted averages for products tested to the KS15502 test.
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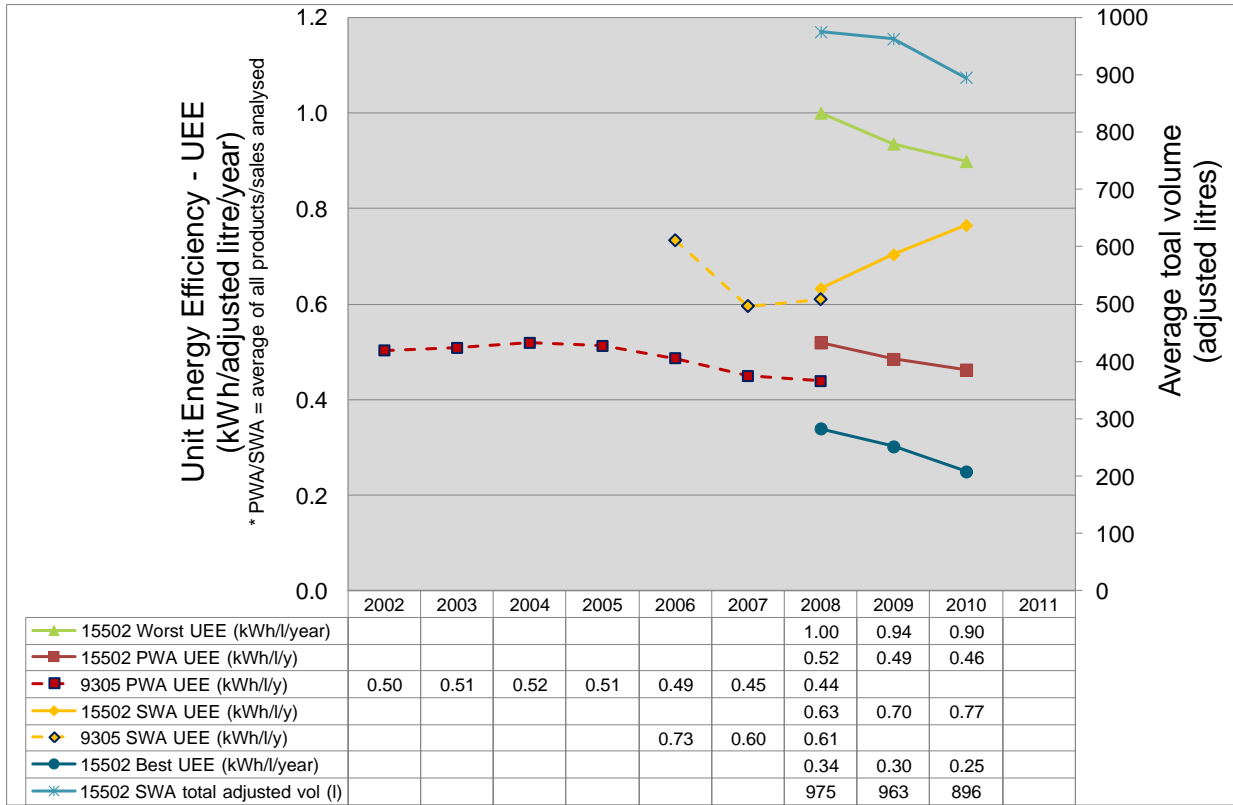
Unit Energy Consumption of new refrigerators and refrigerators with freezer compartments in the Republic of Korea



Key notes on Graph (see notes section 1)

- Data has been supplied from two different Korean test methodologies (KS9305 and KS15502) and Unit Energy Consumptions (UECs) are presented as measured in each test. There are significant differences in these test methodologies that make the UEC measurements from each test incomparable. Consequently, while the trends over time are correct for each test method, the *relative* positions of the KS9305 and KS15502 average values should be ignored. Only KS15502 results are shown in the benchmarking report/analysis.
- All volumes shown are sales weighted averages for products tested to the KS15502 test.
- The 'Worst UEC' is the UEC of the product at the 'worst 5%' point of a ranked list of products in the KS15502 dataset.

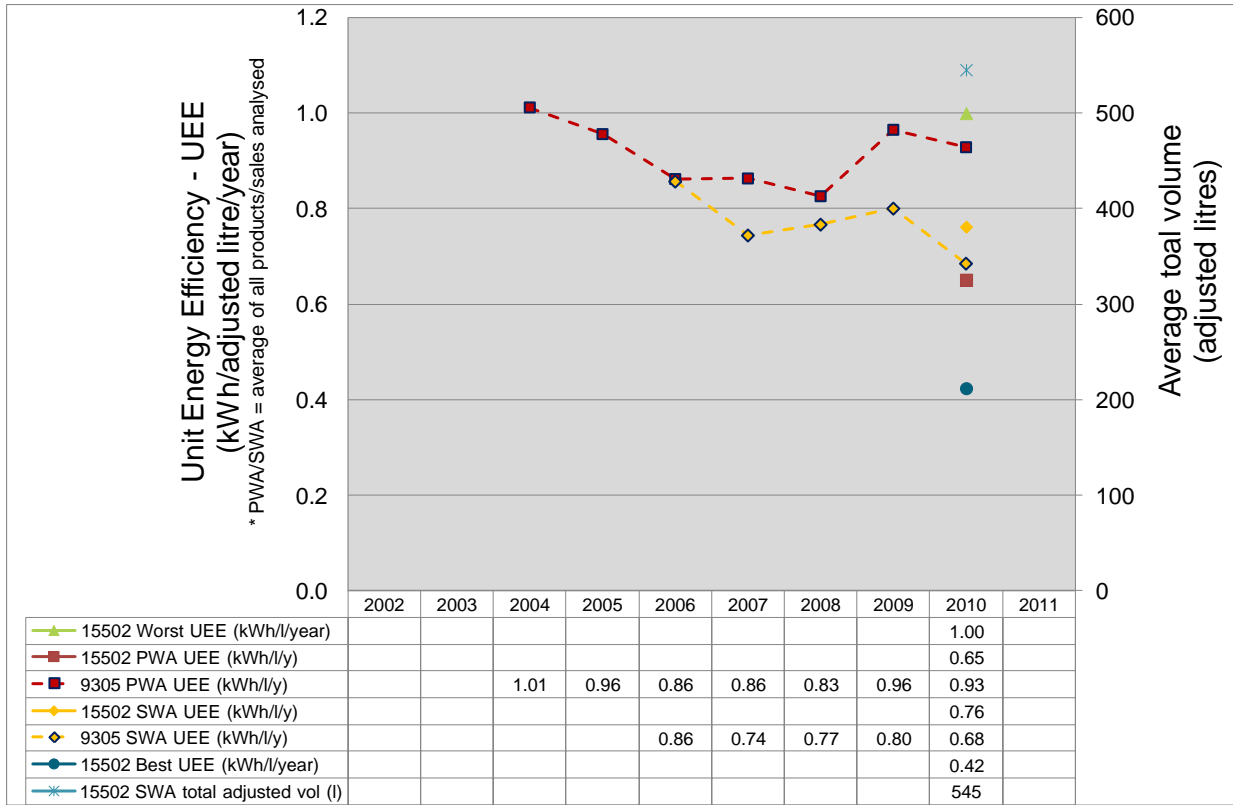
Unit Energy Efficiency of new refrigerator freezers in the Republic of Korea



Key notes on Graph (see notes section 1)

- Data has been supplied from two different Korean test methodologies (KS9305 and KS15502) and Unit Energy Efficiencies (UEEs) are calculated using the Unit Energy Consumptions (UECs) and adjusted volumes as measured in each test.
- There are significant differences in these test methodologies that make the UEE results from each test incomparable. Consequently, while the trends over time are correct for each test method, the *relative* positions of the KS9305 and KS15502 average values should be ignored. Only KS15502 results are shown in the benchmarking report/analysis.
- The average total volumes shown (adjusted litres) are calculated using the temperatures and methods defined in the local test methodology/regulations and are sales weighted averages for products tested to the KS15502 test.
- The 'Worst UEC' is the UEC of the product at the 'worst 5%' point of a ranked list of products in the KS15502 dataset.

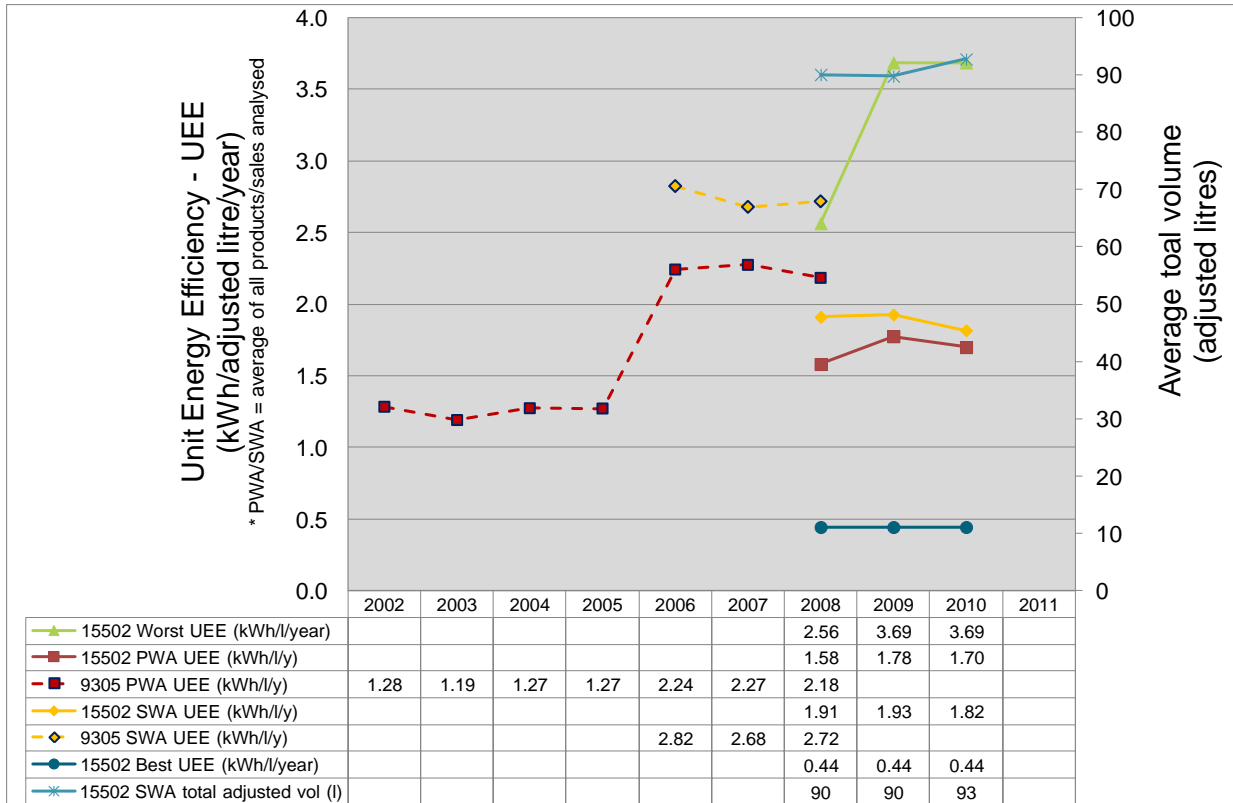
Unit Energy Efficiency of new freezers in the Republic of Korea



Key notes on Graph (see notes section 1)

- Data has been supplied from two different Korean test methodologies (KS9305 and KS15502) and Unit Energy Efficiencies (UEEs) are calculated using the Unit Energy Consumptions (UECs) and adjusted volumes as measured in each test.
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- The 'Worst UEC' is the UEC of the product at the 'worst 5%' point of a ranked list of products in the KS15502 dataset.

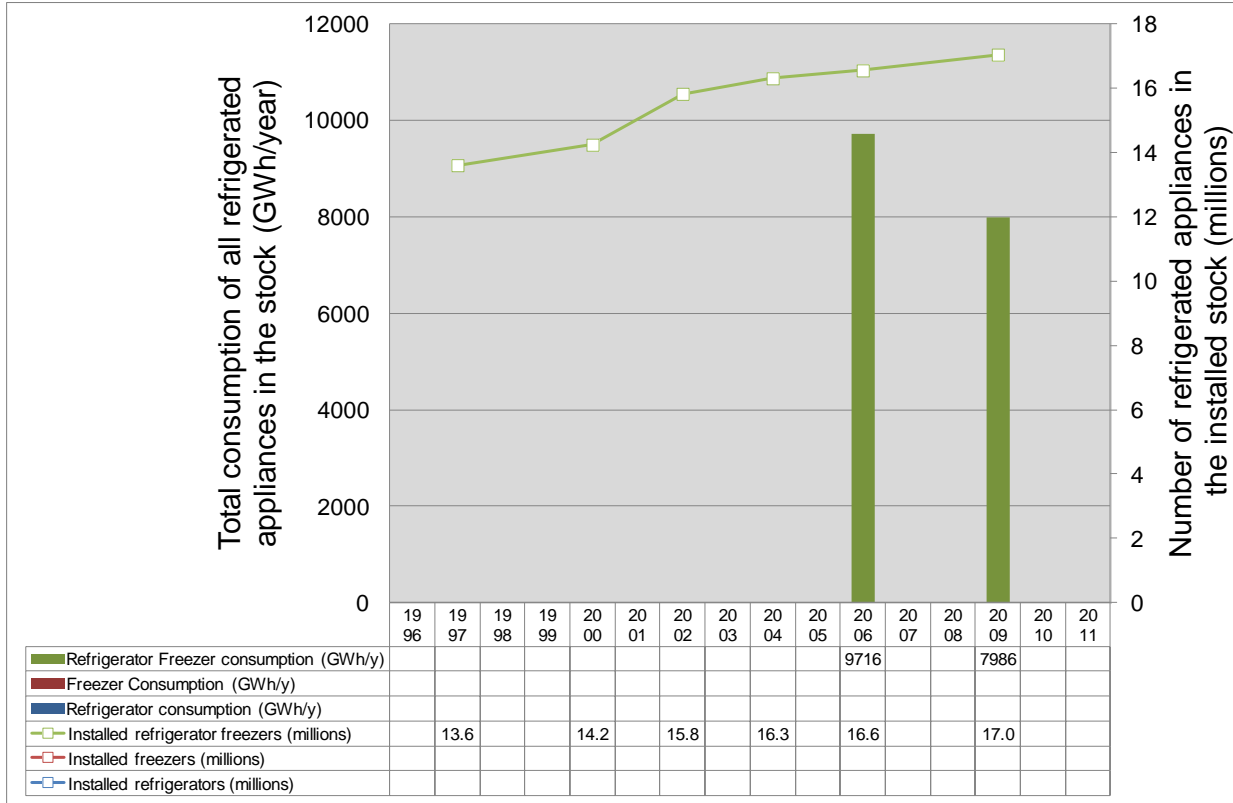
Unit Energy Efficiency of new refrigerators and refrigerators with freezer compartments in the Republic of Korea



Key notes on Graph (see notes section 1)

- Data has been supplied from two different Korean test methodologies (KS9305 and KS15502) and Unit Energy Efficiencies (UEEs) are calculated using the Unit Energy Consumptions (UECs) and adjusted volumes as measured in each test.
- There are significant differences in these test methodologies that make the UEE results from each test incomparable. Consequently, while the trends over time are correct for each test method, the *relative* positions of the KS9305 and KS15502 average values should be ignored. Only KS15502 results are shown in the benchmarking report/analysis.
- The average total volumes shown (adjusted litres) are calculated using the temperatures and methods defined in the local test methodology/regulations and are sales weighted averages for products tested to the KS15502 test.
- The 'Worst UEC' is the UEC of the product at the 'worst 5%' point of a ranked list of products in the KS15502 dataset.

Energy Consumption of the installed stock of refrigerated appliances in the Republic of Korea



Key notes on Graph (see notes section 2)

- Graph is based on a 2006 Survey on Electricity Consumption Characters of Home Appliances (KPX(Korea Power Exchange)).
- Stock consumption data only available in 2006 and 2009.
- The refrigerator freezer data shown includes refrigerators and refrigerators with freezer compartments as it was supplied in combination. Refrigerator freezers are the most common products in the stock.

Major Policy Interventions (see notes section 3)

Korea has two primary policies targeting refrigerators and freezers:

- **Mandatory Energy Labelling:** Required since 1992, the label requires an indication of efficiency on a 1-5 grade scale, where grade 1 is typically 30-40% more efficient than grade 5.

The labelling requirement was defined by a special standard "Regulation on Energy Efficiency Labeling and Standards" and applies to refrigerators, freezers and combination fridge/freezers only. This standard was strengthened several times and test method was revised for refrigerators in April 2008 and for freezers in January 2010. The further revised standard came into effect on 21st November 2011¹.

- **Mandatory Energy Performance Standards (MEPS):** For refrigerators and combination fridge/freezers introduced in 1992 and for freezer introduced in 2004, and prohibits the sale of appliances below the 5th grade on the labelling scale.

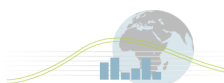
Both these policies sit within an overall framework of the Korean Energy Efficiency Program that targetted over 30 products in 2011, and 35 products in 2012². In this program, every manufacturer and importer of target product must report their products with test results, and they have to attach efficiency grade label on their products.

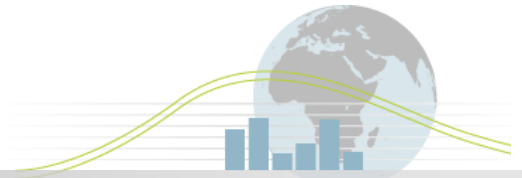
In addition, Korea has a range of policies that affect the energy consumption of appliances either directly or indirectly. In particular:

- Korea has standards for energy frontier. Energy frontier is designed to highlight products that achieve energy consumption/efficiency levels that are 30-50% better than the current 1* grade thresholds.
- Korea has recently introduced a carbon pricing and annual energy cost information program (requiring display of this information on many products).

¹ Note that results presented in this document only apply to products registered under the standards in force between April 2008 and November 2011 for refrigerator/freezers, and January 2010 and November 2011 for freezers.

² See presentation "Korea's SL and Market Intervention (LeeKiHyun).ppt"

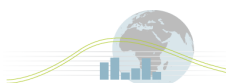




Cultural Issues (see notes section 4)

- Average product lifetime is unusually short compared with many countries. Average refrigerator lifetime is 7.0 years in 2011³ (increasing from 6.8 years in 2006 and 6.89 years in 2009). This results in the potential to increase the overall efficiency of the stock much more quickly than in countries where lifetime is considerably longer (typically twice this period).

³ 2011 Survey on Electricity Consumption Characters of Home Appliances (KPX(Korea Power Exchange))



Section 1. Unit Energy Consumption and Unit Energy Efficiency Graphics

1.1 Test methodologies and Product Definitions

1.1.1 Test Methodology

Refrigerator (including combination refrigerator/freezers):

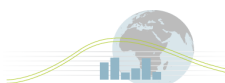
- Prior to 29th April 2008: National test methodology was KS C 9305 (Household electric refrigerators, refrigerator—freezers and freezers : IEC 60335-2-24:1999, MOD) and was implemented on Dec. 28th 1970.
- Following 30th April 2008: National test methodology is KS C ISO 15502 (Household refrigerating appliances—Characteristics and test methods: ISO 15502:2005, MOD. The change in methodology was formally announced on 31 October 2007.
- From 21st November 2011: National test methodology is KS C IEC 62552 (Household refrigerating appliances - Characteristics and test methods : ISO 62552:2007, IDT). The change in methodology was formally announced on Dec. 31th 2010.

Freezers:

- Prior to 31 December 2009: National test methodology was KS C 9305 (Household electric refrigerators, refrigerator—freezers and freezers : IEC 60335-2-24:1999, MOD) and was implemented on Dec. 28th 1970
- Following 1 January 2010: National test methodology is KS C ISO 15502 (Household refrigerating appliances—Characteristics and test methods: ISO 15502:2005, MOD. The change in methodology was formally announced on 31 October 2007.
- From 21st November 2011: National test methodology is KS C IEC 62552 (Household refrigerating appliances - Characteristics and test methods : ISO 62552:2007, IDT). The change in methodology was formally announced on Dec. 31th 2010.

1.1.2 Testing Method Temperatures

- KS C 9305 (Refrigerator)
Ambient external test temperature 30°C, +/-1°C
Internal Refrigerator Compartment: 3°C, +/-0.5°C
Internal Freezer Compartment: one-star -6°C, +/-0.5°C, two-star -12°C, +/-0.5°C, three-star and four-star -18°C, +/-0.5°C
- KS C 9305 (Freezer)
Ambient external test temperature 30°C, +/-1°C
Internal Freezer Compartment: one-star -18°C, +/-0.5°C
- KS C ISO 15502 (Refrigerator) and KS C IEC 62552



Ambient external test temperature 25°C , +/-0.5°C

Internal Refrigerator Compartment: ≤5°C

Internal Freezer Compartment: one-star ≤-6°C, two-star ≤-12°C, three or four-stars ≤ -18°C

- KS C ISO 15502 (Freezer) and KS C IEC 62552
Ambient external test temperature 25°C , +/-0.5°C
Internal Freezer Compartment: one-star ≤-6°C, two-star ≤-12°C, three or four-stars ≤ -18°C

1.2 Data sources and limitations

Sources: Korea Energy Management Corporation.

The data provided is drawn directly from the National Registrations System (all products are required to be registered prior to sale).

Note that on 30th April 2008, the National Test Methodology changed (from KS C 9305 to KS C 15502) and the absence of certain data from the 15502 data set makes it impossible to normalise between the two test methodologies. Datasets are therefore presented separately.

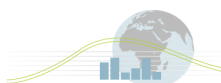
The number of models and sales analysed by product category are presented in the tables below.

Refrigerator freezers:

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Products in dataset	165	435	899	1181	1248	1180	1040	1308	989	1269
KS 15502 Products analysed	0	0	0	0	0	0	0	490	850	1127
KS 9305 Products analysed	165	435	899	1181	1248	1180	1040	818	0	0
% products included	100%	100%	100%	100%	100%	100%	100%	100%	86%	89%
Sales in dataset	-	-	-	-	-	1,576,009	1,506,036	1,524,012	1,693,233	1,952,862
KS 15502 Sales analysed	-	-	-	-	-	-	-	1,006,256	1,692,575	1,949,778
KS 9305 Sales analysed	-	-	-	-	-	1,576,009	1,506,036	517,756	-	-
% Sales included	-	-	-	-	-	100%	100%	100%	99.96%	99.8%

Freezers:

	2004	2005	2006	2007	2008	2009	2010
Products in dataset	10	37	63	58	43	18	33
KS 15502 Products analysed	0	0	0	0	0	0	13
KS 9305 Products analysed	10	37	63	58	43	18	20
% products included	100%	100%	100%	100%	100%	100%	100%
Sales in dataset	-	-	39,679	42,648	61,939	53,253	95,745
KS 15502 Sales analysed	-	-	-	-	-	-	66,003
KS 9305 Products analysed	-	-	39,679	42,648	61,939	53,253	29,742
% Sales included	-	-	100%	100%	100%	100%	100%



Refrigerators and refrigerators with freezer compartments:

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Products in dataset	284	466	825	670	486	87	59	86	57	66
KS 15502 Products analysed	0	0	0	0	0	0	0	30	46	54
KS 9305 Products analysed	284	466	825	670	486	87	59	56	0	0
% products included	100%	100%	100%	100%	100%	100%	100%	100%	81%	82%
Sales in dataset	-	-	-	-	-	201,226	93,281	162,817	122,859	157,630
KS 15502 Sales analysed	-	-	-	-	-	-	-	94,498	115,162	153,421
KS 9305 Sales analysed	-	-	-	-	-	201,226	93,281	68,319	-	-
% Sales included	-	-	-	-	-	100%	100%	100%	94%	97%

1.3 Data manipulations and specific limitations

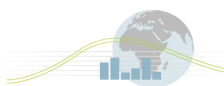
1.3.1 Overview of the mapping and benchmarking process

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. A separate “actions and assumptions” report has been created for each of the datasets used in this Republic of Korea mapping document.



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 *Republic of Korea* and *Domestic refrigerated appliances 2012*.

1.3.2 Specific cautions for this data

Please refer to the actions and assumptions document described in Section 1.3.1.

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

2.1 Data sources and limitations

Sources: (Source: Survey on Electricity Consumption Characters of Home Appliances (KPX(Korea Power Exchange), 2009)

Survey provides data on all refrigerators for years 1995, 1997, 2000, 2002, 2004, 2006, 2009:

1. Number of products in stock
2. Proportion of volume in stock (%) by bands <199L, 200~299L, 300~399L, 400~499L, 500~599L, > 600L including actual average total volume for 2006
3. Power consumption of products in stock (W) by bands <199L, 200~299L, 300~399L, 400~499L, 500~599L, > 600L and overall average volume for 2006
4. Annual operation time (hour/year)
5. Annual power consumption (wh/year) for 2006 and 2009

Section 3. Major Policy Interventions

3.1 Energy Efficiency Standards and Labels Programme

Under the program, manufacturers (and importers) are mandated to produce and sell energy efficiency products. This program is Korea’s core energy efficiency management scheme. The Energy Efficiency Label and Standard Program enable consumers to identify high efficiency energy efficiency products easily by:

- Mandatory indication of energy efficiency grade from 1st to 5th grade: According to the energy efficiency and consumption of the product, the product is required to indicate an energy efficiency grade from 1st to 5th grade
- Mandatory reporting: Mandatory reporting of energy efficiency grade by manufacturers (and importers)
- Applying minimum energy performance standard (MEPS): Production and sales of products that fall below the 5th grade is prohibited

In case of violation MEPS, a fine up to 20 thousand dollars will be charged. In case of violation of other regulations, a fine or penalty of up to 5 thousand dollars will be charged.

3.2 Mandatory Energy Efficiency Standards (MEPS)

The labelling and MEPS requirements specify the rated power consumption are below 500W and the available content capacities are below 1,000 litres (ie defining domestic units).

Minimum Energy Performance Standards calculated according to the following regulations:

- First introduced in 1992 to prohibit the sale of poor performing products.
- Requirements were revised in from 1 January 2004 (1 October 2004 for freezers) with details as follows⁴ (noting requirements for Kimchi refrigerators vary slightly):

Items	MEPS
Refrigerator only	$P \leq 0.037AV + 16.75$
Refrigerator-freezer whose compensated cubic volume is less than 500 L	$P \leq 0.025AV + 29.45$
Refrigerator-freezer whose compensated cubic volume is no less than 500 L	$P \leq 0.043AV + 16.19$

Remark)

1. AV = compensated cubic volume = cubic volume of the freezing compartment \times K + cubic volume of the fresh compartment

1) K value in the refrigerator only is 0

2) K value in refrigerator-freezer is 1.78

$$K \text{ (compensation coefficient)} = \frac{T_1 - T_3}{T_1 - T_2}$$

Where

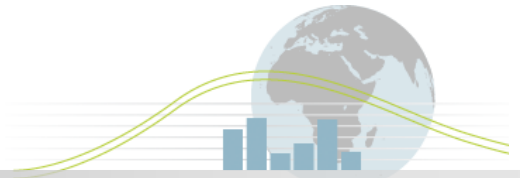
T_1 =ambient temperature in testing(30°C)

T_2 =averaging indoor temperature of the fresh compartment(3°C)

T_3 =averaging indoor temperature of the freezer compartment(-18°C)

2. P = Maximum power consumption (kWh/month)

⁴ Page 41 of Notice 2007-70 (Refrigerator KS C 9305) (from 1 October 2004 onward only for freezers)



Item	MEPS
	From 1 st of October, 2004
Freezer	$P \leq 0.072AV + 39.73$

Remark) 1. AV = compensated cubic volume = cubic volume of the freezing compartment × K
 1) K=1.60
 2. P = Maximum power consumption

- Following 30th April 2008 (1 January 2010 onward for freezers) the requirements were raised to the following⁵:

Items	MEPS From 30 April 2008
Refrigerator only	$P \leq 0.037AV + 16.75$
Refrigerator-freezer whose compensated cubic volume is less than 500 L	$P \leq 0.025AV + 29.45$
Refrigerator-freezer whose compensated cubic volume is no less than 500 L without ice-dispenser or homebar door	$P \leq 0.043AV + 16.19$
Refrigerator-freezer whose compensated cubic volume is no less than 500 L with ice-dispenser or homebar door	$P \leq 0.043AV + 16.19$ +4.4 (through-the-door ice dispenser) +0.044 (the length of the actual sealing perimeter of the homebar door of fresh compartment, cm) +0.073 (the length of the actual sealing perimeter of the homebar door of freezer compartment, cm)

Remark)
 1. AV = compensated cubic volume = $\sum \{(\text{cubic volume of the each compartment}) \times K \times F\}$
 1) K value in the refrigerator only is 1
 2) K value in refrigerator-freezer is

$$K (\text{compensation coefficient}) = \frac{T_1 - T_c}{T_1 - T_2}$$

Where
 T_1 =ambient temperature in testing(25℃)
 T_2 =averaging indoor temperature of the fresh compartment(5℃)

3) F = 1.2 if it is auto defrost, otherwise F=1.0
 2. P = Maximum power consumption (kWh/month)

Item	MEPS
	From 1 st of January, 2010
Freezer	$P \leq 0.028AV + 32.40$

Remark)
 1. AV = compensated cubic volume = $\sum \{(\text{cubic volume of the each compartment}) \times K \times F\}$

$$K (\text{compensation coefficient}) = \frac{T_1 - T_c}{T_1 - T_2}$$

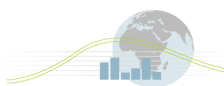
Where
 T_1 =ambient temperature in testing(25℃)
 T_2 =averaging indoor temperature of the fresh compartment(5℃)

F = 1.2 if it is auto defrost, otherwise F=1.0
 2. P = Maximum power consumption (kWh/month)

- Requirements were further revised for compliance on 1st January 2011 as follows⁶ (Noting that data contained in this mapping was collected prior to this date and does not include products registered to this standard. Also note MEPS for freezers remains unchanged, and there are alternative requirements for Kimchi refrigerators):

⁵ Page 125 of Notice 2009-158 (Refrigerator KS C ISO 15502)

⁶ Page 129 onward, MKE's Notification 2010-124, Regulation on Energy Efficiency Labelling and Standards, 16 June 2010



Items	MEPS From 1 st of January 2011
Refrigerator only	$P \leq 0.037AV + 16.75$
Refrigerator-freezer whose compensated cubic volume is less than 500 L	$P \leq 0.025AV + 29.45$
Refrigerator-freezer whose compensated cubic volume is no less than 500 L, less than 1000L without ice-dispenser or homebar door	$P \leq 0.043AV + 16.19$
Refrigerator-freezer whose compensated cubic volume is no less than 500 L, less than 1000L with ice-dispenser or homebar door	$P \leq 0.043AV + 16.19$ +2.6 (through-the-door ice dispenser) +0.022 (the length of the actual sealing perimeter of the homebar door of fresh compartment, cm) +0.036 (the length of the actual sealing perimeter of the homebar door of freezer compartment, cm)

Remark:

1. $AV = \text{compensated cubic volume} = \sum\{\{\text{cubic volume of the each compartment}\} \times K \times F\}$
 - 1) K value in the refrigerator only is 1
 - 2) K value in refrigerator-freezer is

$$K \text{ (compensation coefficient)} = \frac{T_1 - T_C}{T_1 - T_2}$$

Where

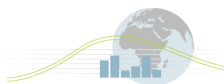
T_1 =ambient temperature in testing(25°C)

T_2 =averaging indoor temperature of the fresh compartment(5°C)

3) $F = 1.2$ if it is auto defrost, otherwise $F=1.0$

2. $P = \text{Maximum power consumption (kWh/month)}$
 3. 220V is priority if both voltages, 110V and 220V can be applied
 4. To determine MEPS it shall round off the 2nd place of decimal of the value in accordance with KS Q 5002.
- Requirements were further revised for refrigerator-freezers with adjusted volumes of 1000 litres or above for compliance on 1st December 2012⁷. The requirements for freezer-refrigerators with adjusted volumes below 1000 litres and for freezers are also included in this revised regulation, but remain the same as the requirements as of 1st January 2011.
(Again noting that data contained in this mapping was collected prior to this date and does not include products registered to this standard. Also note there are alternative requirements for Kimchi refrigerators):

⁷ MKE's Notification 2011-241, Regulation on Energy Efficiency Labelling and Standards, 21 November 2011

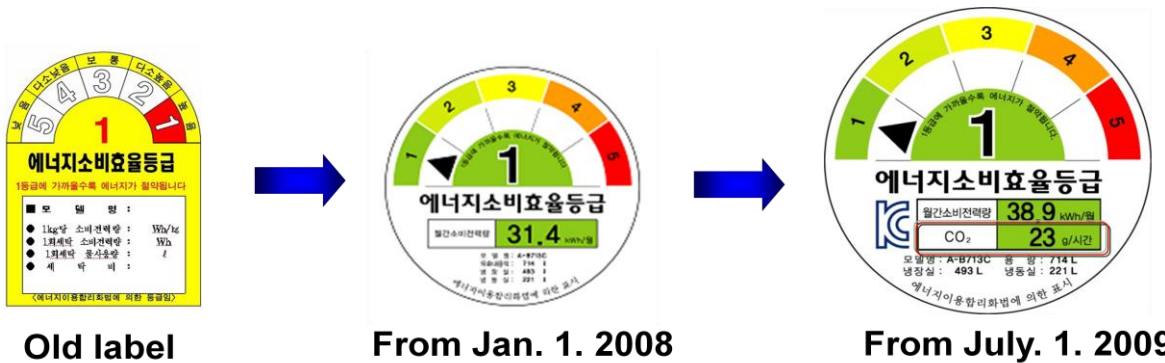


Items	MEPS From 1st of December 2012 (Requirements for products below 1000 litres are also included in this revised regulation, but remain the same as the requirements as of 1st January 2011)
Refrigerator-freezer whose compensated cubic volume is no less than 1000L, without ice-dispenser or homebar door	$P \leq 0.021AV + 33.25$
Refrigerator-freezer whose compensated cubic volume is no less than 1000L, with ice-dispenser or homebar door	$P \leq 0.021AV + 33.25$ +2.6 (through-the-door ice dispenser) +0.022 (the length of the actual sealing perimeter of the homebar door of fresh compartment, cm) +0.036 (the length of the actual sealing perimeter of the homebar door of freezer compartment, cm)

Remarks remain unchanged from those shown in the 1 January 2011 MEPS requirements.

3.3 Mandatory Energy Labelling

The Energy Labelling of Refrigerators has been mandatory in Korea since 1992. Over time the label has evolved in appearance with the most recent including a CO₂ emissions value.



3.3.1 World's first CO₂ energy label for electronic products

Starting from July 1st 2009, all new models of electricity using products including refrigerators, air conditioners, washing machines, lighting equipment, and 3 phase induction motors must display energy efficiency grades (1st ~ 5th) and CO₂ emissions (please refer to the table in section 3.2 for a table giving full implementation dates). This is a measure to establish a sustainable production and consumption culture (so-called "Green Growth"). Since August of 2008 indication of fuel mileage and CO₂ emissions of automobiles has become mandatory. The extent of this policy has expanded to electronic goods and Korea became the first country to implement CO₂ energy label for electronic products. Over 160 million appliances and equipment subject to efficiency management (24 products) will be annually disseminated into the market with carbon dioxide emissions information.



Starting from July 1st 2010, it is mandatory to display the annual energy cost of household appliances (refrigerator, air conditioner etc.) on the energy label to induce consumers' voluntary selection of energy saving products through the sharing of energy cost information.

3.3.2 Displaying annual energy cost information

The current Energy Efficiency Grade Label's core indicator is energy efficiency and this could misguide consumers' selection of small sized appliance with less energy consumptions. The motivation for displaying energy cost information in Energy Efficiency Grade Label is to provide more information to consumers so that products with less energy consumptions can be promoted.

Annual energy cost information is based on energy consumptions in absolute scale so that it hopes to complement the energy efficiency grade indicators. The energy cost information sends a clear message to the consumers that products with less energy consumption are also economical where such information is not conveyed in the energy efficiency indicators.



• Products with indication of CO₂ emissions and energy cost

Type	Target products	Date
Displaying CO ₂ emissions (24 products)	Automobiles	From 1 August 2008
	Refrigerators, kimchi refrigerators, washing machines, drum washing machines, dish dryers, vacuum cleaners, electric fans, air cleaners, incandescent lamps, compact fluorescent lamps	From 1 July 2009
	Electric freezers, electric cooling equipments, dish washers, electric hot and cold water dispensers, electric rice cookers, fluorescent lamps, 3 phase electric motors, industrial refrigerators	From 1 January 2010
	Electric fan heaters, electric stoves	From 1 December 2011
	VRF multi-split heat pumps	From 1 April 2012
	TVs, dehumidifiers	From 1 July 2012
Displaying energy cost (19 products)	Refrigerators, electric freezers, kimchi refrigerators, electric cooling equipments, washing machines, drum washing machines, dish washers, dish dryers, electric rice cookers, vacuum cleaners, electric fans, air cleaners, industrial refrigerators	From 1 July 2010
	Electric fan heaters, electric stoves	From 1 December 2011
	Electric hot and cold water dispensers, 3 phase induction motors	From 1 January 2012
	TVs, dehumidifiers	From 1 July 2012

3.3.2.1 Label banding

- Refrigerators (from 30 April 2008) :

A. Energy Efficiency Level Index

$$R(\text{Energy Efficiency Level Index}) = \frac{\text{MEPS [kWh/month]}}{\text{Measured monthly power consumption [kWh/month]}}$$

B. Energy Efficiency Level

R	Level
$1.60 \leq R$	1
$1.45 \leq R < 1.60$	2
$1.30 \leq R < 1.45$	3
$1.15 \leq R < 1.30$	4
$1.00 \leq R < 1.15$	5

- Freezers (from January 2010):

A. Energy Efficiency Level Index

$$R(\text{Energy Efficiency Level Index}) = \frac{\text{MEPS [kWh/month]}}{\text{Measured monthly power consumption [kWh/month]}}$$

B. Energy Efficiency Level

R	Level
$2.20 \leq R$	1
$1.90 \leq R < 2.20$	2
$1.60 \leq R < 1.90$	3
$1.30 \leq R < 1.60$	4
$1.00 \leq R < 1.30$	5



- Requirements for refrigerators and refrigerator-freezers were further revised for compliance on 1st January 2011 as follows⁸ (Noting that data contained in this mapping was collected prior to this date and does not include products registered to this standard. Also note the requirements for freezers remains unchanged and there are alternative requirements for Kimchi refrigerators):

A. Energy Efficiency Level Index

$R(\text{Energy Efficiency Level Index}) = \frac{\text{MEPS [kWh/month]}}{\text{Measured monthly power consumption [kWh/month]}}$

B. Energy Efficiency Level

Refrigerator and Freezer-refrigerator with adjusted Volume less than 500 L

R	Level
$1.60 \leq R$	1
$1.45 \leq R < 1.60$	2
$1.30 \leq R < 1.45$	3
$1.15 \leq R < 1.30$	4
$1.00 \leq R < 1.15$	5

Freezer-refrigerator with adjusted Volume no less than 500 L, less than 1000L

R	Level
$1.90 \leq R$	1
$1.75 \leq R < 1.90$	2
$1.60 \leq R < 1.75$	3
$1.45 \leq R < 1.60$	4
$1.00 \leq R < 1.45$	5

- Requirements were further revised for refrigerator-freezers with adjusted volumes of 1000 litres or above for compliance on 1st December 2012 as follows⁹. The requirements for freezer-refrigerators with adjusted volumes below 1000 litres and for freezers are also included in this revised regulation, but remain the same as the requirements as of 1st January 2011. (Again noting that data contained in this mapping was collected prior to this date and does not include products registered to this standard. Also note there are alternative requirements for Kimchi refrigerators):

⁸ Page 129 onward, MKE's Notification 2010-124, Regulation on Energy Efficiency Labelling and Standards, 16 June 2010 and notification 2011-263, 23 Dec 2011.

⁹ MKE's Notification 2011-241, Regulation on Energy Efficiency Labelling and Standards, 21 November 2011.

Freezer-refrigerator with adjusted Volume no less than 1000 L ((Requirements for products below 1000 litres are also included in this revised regulation, but remain the same as the requirements as of 1st January 2011)

R	Level
$2.20 \leq R$	1
$1.95 \leq R < 2.20$	2
$1.70 \leq R < 1.95$	3
$1.45 \leq R < 1.70$	4
$1.00 \leq R < 1.45$	5

1st grade products save 30~40% more energy than 5th grade products.

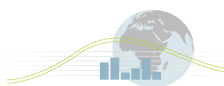
The 2012 regulations¹⁰ also introduced the Energy Frontier Standard to identify the premium efficiency products as follows:

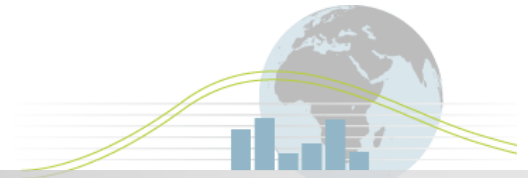
Classification	R	Monthly power consumption
Refrigerator and Freezer-refrigerator with adjusted Volume less than 500 L	$2.10 \leq R$	Below 25.0kWh
Freezer-refrigerator with adjusted Volume no less than 500L, less than 1000L	$2.50 \leq R$	Below 25.0kWh
Freezer-refrigerator with adjusted Volume no less than 1000L	$2.90 \leq R$	Below 25.0kWh

3.3.1 Reporting Procedure of Energy Efficiency Labelling:

Energy efficiency labelling tests are conducted on request at designated national testing institutes (or self certified testing institutes) to determining the energy efficiency grades of products (imported goods included). Manufacturers or importers receive the test performance report from the designated testing institutes. The reports are sent to Korea Energy Management Corporation (KEMCO) and made publicly available on the internet (<http://www.kemco.or.kr>). Reporting of sales figures for the preceding 12 months is required in January of the following year.

¹⁰ MKE's Notification 2011-241, Regulation on Energy Efficiency Labelling and Standards, 21 November 2011.





Section 4. Cultural Issues

No additional notes.

