



Performance Improvements during the First 19 years and a Vision for the Future

KOREA'S ENERGY STANDARDS & LABELING

Market Transformation



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Korea's Energy Standards & Labeling

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Energy and Low Carbon Green Growth

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Energy and Low Carbon Green Growth

On August 15th 2008, the government declared "Low Carbon Green Growth" as a new vision for national development.

Green Growth refers to optimization of synergy created from the virtuous cycle of environmental (Green) and economic (Growth) interactions. In other words, it is a concrete policy solution to establish advanced society by making economic growth patterns more environmental friendly.

As a national development vision, the scope of Green Growth not only covers energy and environmental issues but also extends to creating new jobs and securing new growth engine, building industry competitiveness, efficient land use and revolutionizing our lives. Green Growth is a sustainable development that reduces GHG emissions and pollutions. It is a new national development paradigm that creates new jobs and national growth engines through green technology and clean energy.

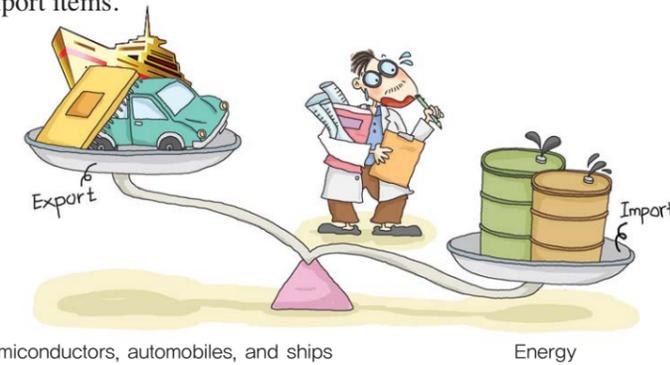
Energy efficiency improvements and the dissemination of new and renewable energy are core contents of Low Carbon Green Growth.



1 - Status of Energy Consumption and Overview of Energy Saving Measures



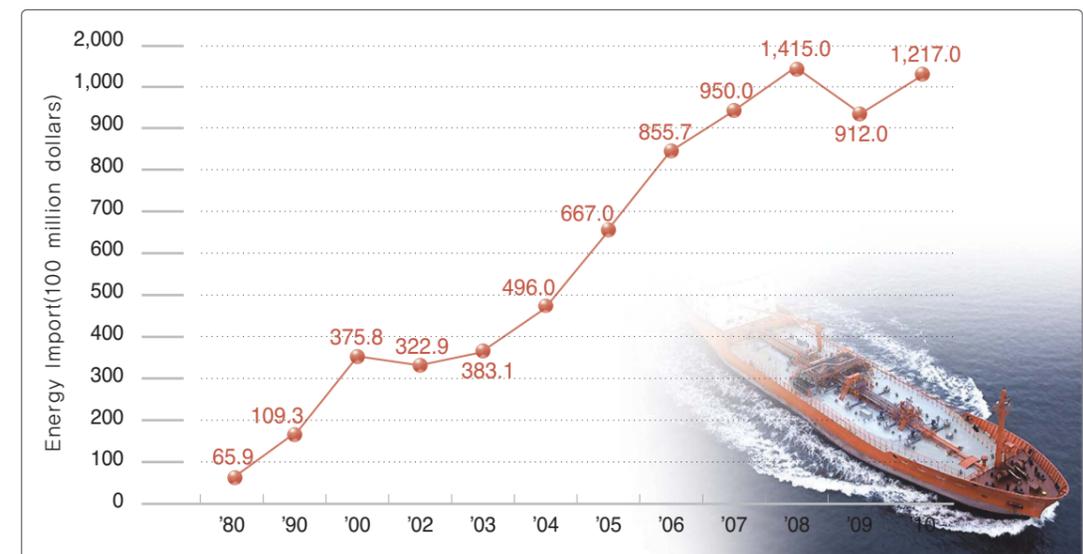
Korea is the 10th largest energy consuming nation in the world. In 2010, Korea spent 121.7 billion dollars on energy imports. This figure accounts for 27% of total imports and is equivalent to the total export of semiconductors, automobiles, ships and steels which are Korea's major export items.



In 2008, oil prices rose well over \$140 per barrel could happen any time in near future and reminds us of the importance of energy saving, especially because Korea imports 96% of its energy needs from overseas. We have already experienced high inflation, stagflation, trade deficits and negative economic growth from the first (1973) and second (1979) oil shocks.

As the price of oil is rising steadily, it is forecasted that Korea will face serious economic hardships due to an economic structure that heavily depends on energy intensive industries. The United Nations Convention on Climate Change, which calls for prevention of climate change by controlling the use of energy, represents another potential burden on our economy.

Rising energy import cost

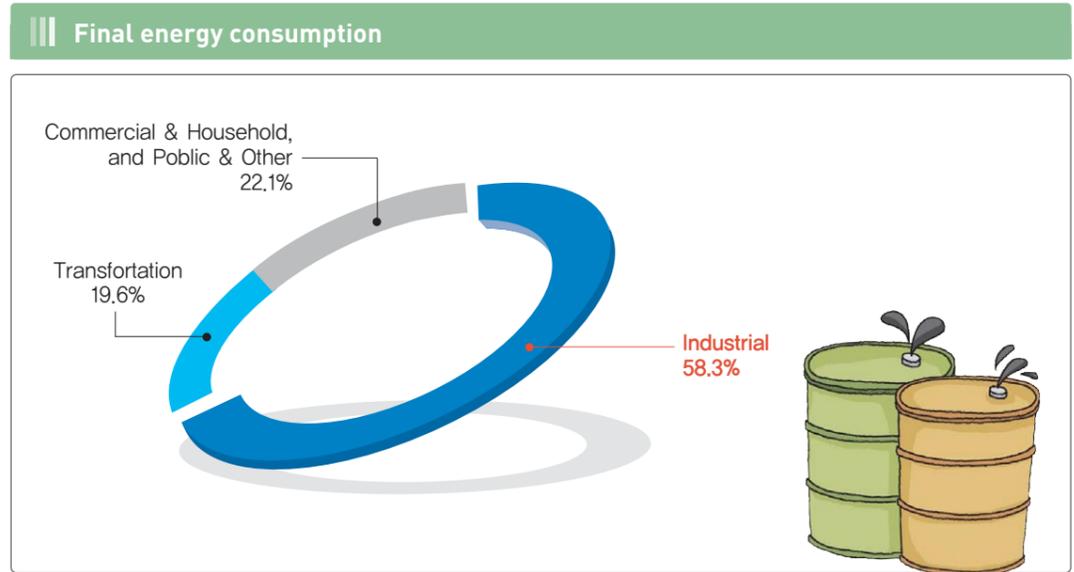


❖ Status of Energy Consumption

Energy cycles in the order of development → importation → supply (primary energy) → conversion/loss → consumption (final energy). Primary and final energy statistics are related to energy efficiency improvements. Final energy consumption status is particularly related to energy efficiency improvements.

Oil (42.1%) was the most consumed source of primary energy, followed in order by bituminous coal (28.2%), nuclear (13.1%), LNG (13.9%) and others (2.3%). As the national income increases, the demand for LNG increases in proportion, whereas dependency on oil is relatively decreasing. The use of nuclear power is increasing due to a rapid increase in power consumption driven by economic growth.

As for final energy consumption, the industrial sector, transportation sector, commercial & household and public & other sectors, account for 58.3%, 19.6%, and 22.1% respectively. Especially, Korea's industrial sector energy consumption rate is relatively high among the OECD countries. This can be attributed to an industrial structure that consists of energy intensive industries such as steel making, petrochemicals, cement and etc.



Source : Energy/Natural resources statistics (MKE)

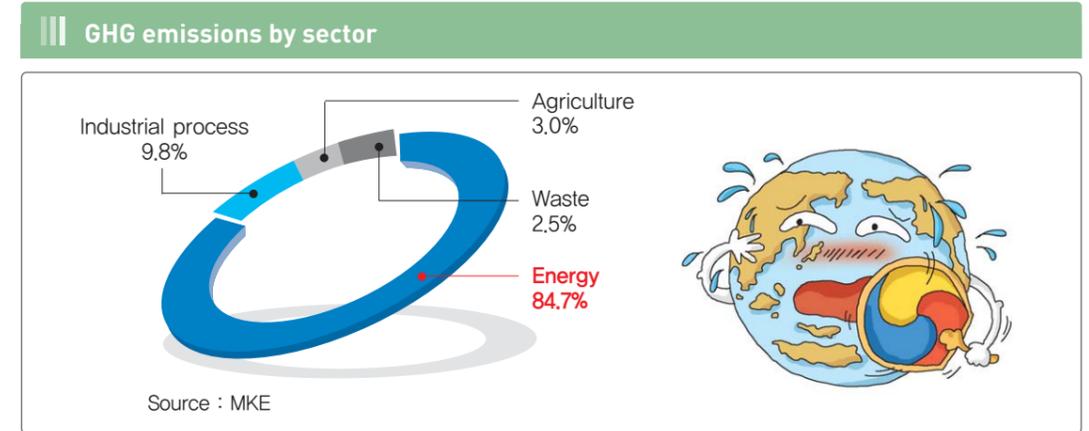
2 Energy and the Kyoto Protocol



Under the Kyoto Protocol, Annex I parties are bound to reducing their GHG emissions. Such obligations would be potential threats to the national economy.

Every year, 5 billion tons of greenhouse gases are emitted into the atmosphere from the use of fossil fuels such as petroleum, coal and gas. These greenhouse gases form a thick layer in the atmosphere and trap infrared radiation which is reflected from the earth's surface to the atmosphere causing a rise in temperature.

84.7% of all GHG emissions that cause global warming can be attributed to the use of energy.



Sector	'90	'95	'00	'05	'06	Change%	'07	Change%	'90~'07
Energy	247.8 (81.1)	372.2 (80.7)	438.8 (82.1)	498.9 (83.6)	505.9 (83.9)	1.4	525.4 (84.7)	3.9	4.5
Industrial process	19.9 (6.5)	47.1 (10.2)	58.3 (10.9)	64.8 (10.9)	63.7 (10.6)	Δ1.8	60.9 (9.8)	Δ4.4	6.8
Agriculture	15.2 (5.0)	22.4 (4.9)	20.6 (3.9)	18.2 (3.1)	17.5 (2.9)	Δ4.2	18.4 (3.0)	5.3	1.1
Waste	22.5 (7.4)	19.5 (4.2)	16.7 (3.1)	14.7 (2.5)	15.6 (2.6)	6.3	15.3 (2.5)	Δ2.2	Δ2.2
Total Emissions	305.4 (100.0)	461.2 (151.0)	534.4 (175.0)	596.7 (195.4)	602.6 (197.3)	1.0	620.0 (203.0)	2.9	4.3
Land Use/Forestry	Δ23.7	Δ21.2	Δ37.2	Δ32.0	Δ32.3	1.1	Δ36.3	12.4	2.5
Net Emissions	281.6 (100.0)	440.0 (156.2)	497.1 (176.5)	564.7 (200.5)	570.3 (202.5)	1.0	583.7 (207.2)	2.3	4.4

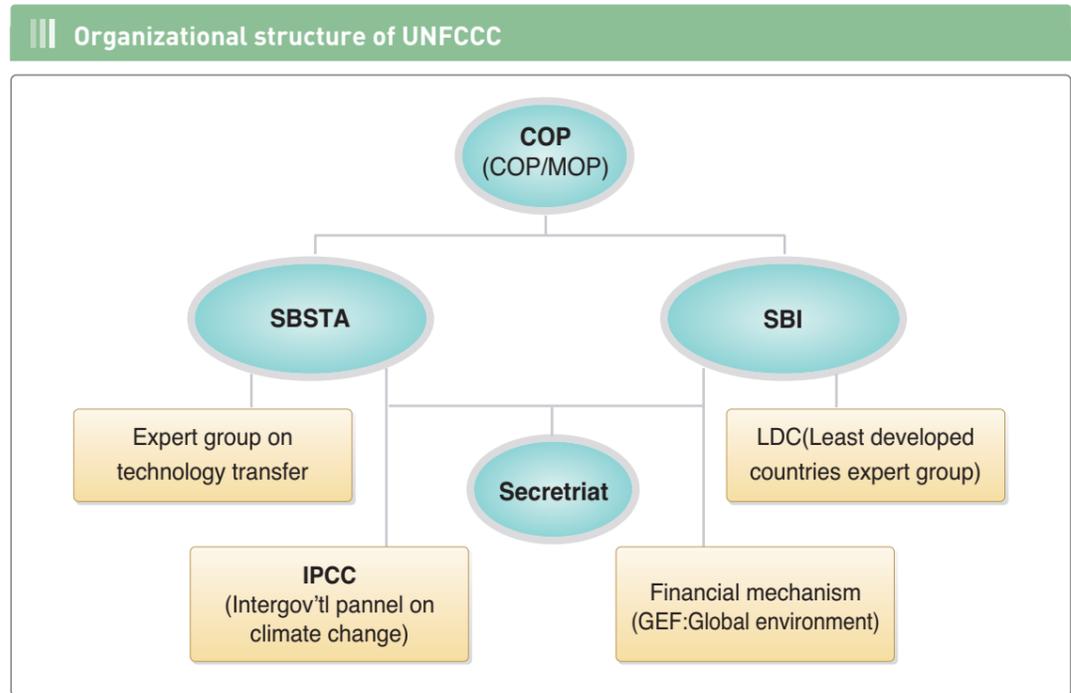
Source : MKE

Kyoto Protocol

In order to initiate GHG reductions, the international community decided to adopt the Kyoto Protocol as a measure to facilitate the United Nations Framework Convention on Climate Change (UNFCCC). Korea, which is world's 10th largest GHG emitter, faces international pressure to accept binding GHG reductions under the Kyoto Protocol. If Korea becomes an Annex I country with mandatory reduction targets, the negative impacts on Korean economy, which has an energy intensive economic structure, will be significant.

Main highlights of the Kyoto protocol

- ▶ Kyoto protocol
 1. **The protocol addresses the six main greenhouse gases.**
 - CO₂, CH₄, N₂O, HFCs, PFCs, SF₆
 2. **Differentiates annex I countries with mandatory Kyoto targets from Non-Annex I countries without mandatory Kyoto targets.**
 - Kyoto reduction targets: During the first commitment period (2008~2012), Annex I parties shall reduce their collective emissions of greenhouse gases by 5.2% compared to the year 1990. National targets range from Δ8%~+10%
 - EU: Δ8%, US: Δ8%, Japan: Δ6%, Russia: 0%, Iceland: +10%
 3. **Recognizes the Kyoto Mechanism as a cost effective way to reduce greenhouse gases**
 - Adds flexibility by adopting market based Kyoto Mechanisms such as JI (Joint Implementation), CDM (Clean Development Mechanism) and Emission Trading.

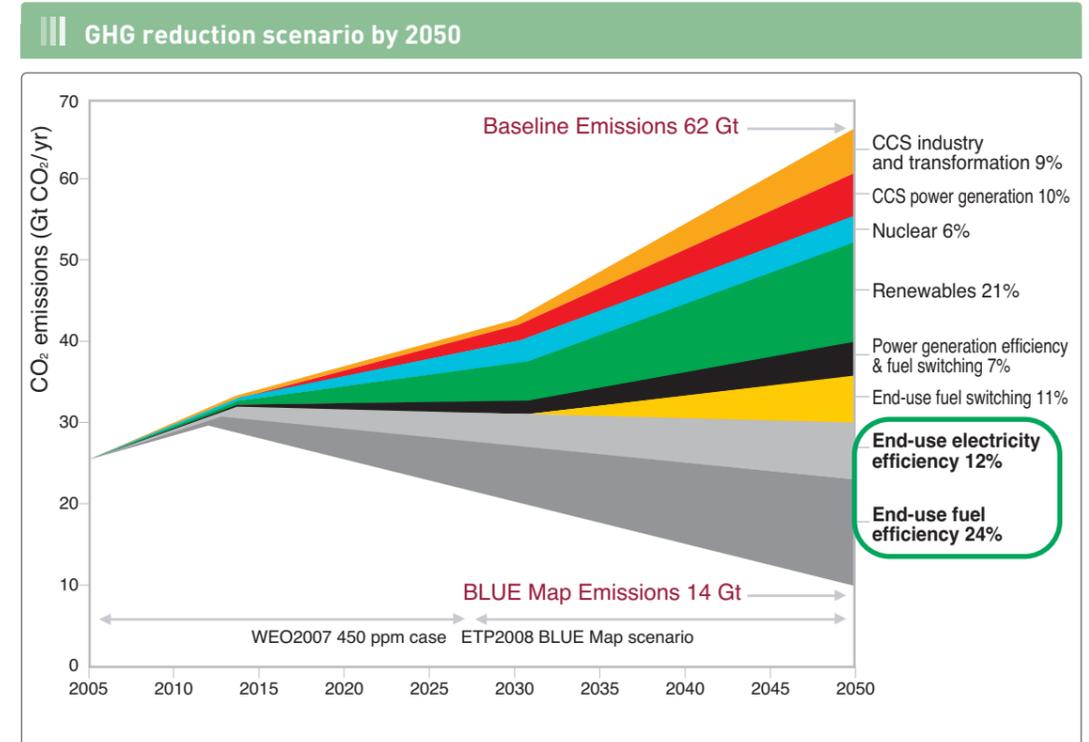


3 The Role of Energy Efficiency in Greenhouse Gas Reduction Efforts



In this age of high oil prices, the high dependency on foreign oil imports as well as international environmental restrictions including UNFCCC, impose heavy burdens on the national economy. To overcome such obstacles, more efforts are needed to promote renewable energy and to improve energy efficiency.

According to recent IEA reports, energy efficiency is the most significant policy tool towards reducing greenhouse gas by 2050, which accounts for 36% of total reductions. Use of new and renewable energy comes second which accounts for 21% of total reductions. The development of renewable energy alternatives should be approached with a long term perspective since it is costly and takes a lot of time. However, energy efficiency can achieve economic gains and prevent global warming at minimal cost.



Source : Energy Technology Perspectives (2008, IEA)

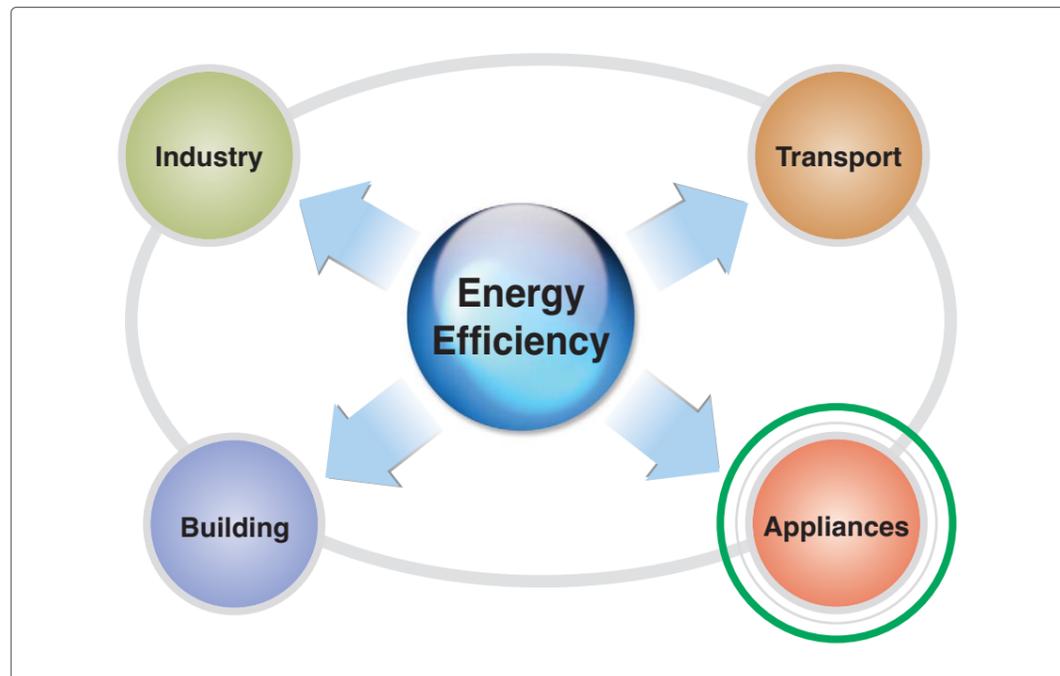
4 Four Major Energy Efficiency Areas



National efforts for energy efficiency improvements in four major sectors, namely industry, transportation, buildings, appliances and equipment, are required to achieve significant energy efficiency. In particular, energy efficiency in the appliances and equipment sector is very important in the sense that it is at the root of the energy efficiency.

Energy efficiency labeling schemes (Energy Efficiency Label and Standard Program, High-efficiency Appliance Certification Program, e-Standby Program) play a key role in carrying out the energy efficiency improvement policy in the appliances and equipment sector in Korea.

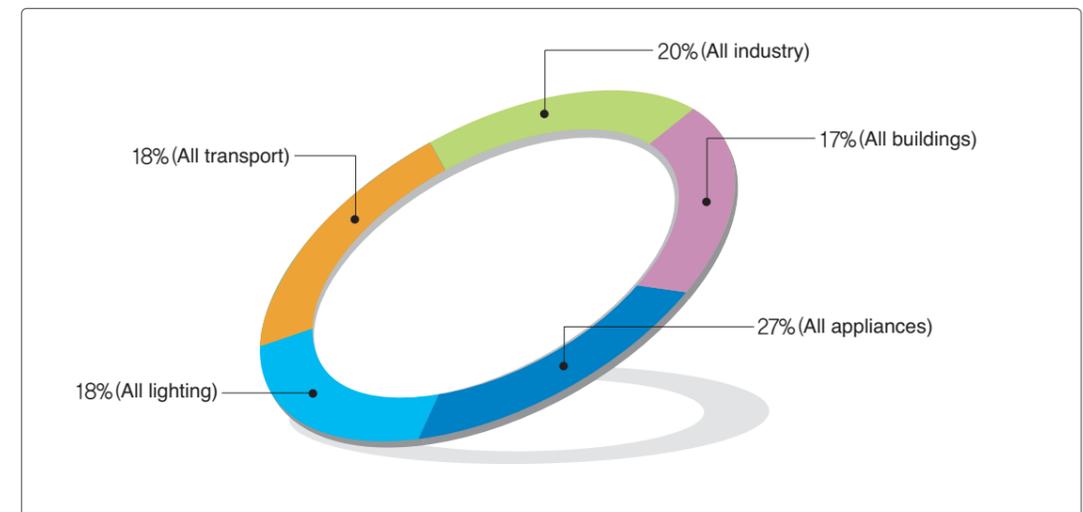
4 Major Energy Efficiency Areas



Energy Improvements of appliances and equipment amount to 45% of GHG reductions

According to the analysis performed by IEA, the estimated reductions of carbon dioxide emissions in appliances and equipments sectors (including lighting) will amount to 45% of the total reductions by 2030. This implies that the implementation of energy efficiency programs on appliances and equipment is the most realistic and effective measure among the available energy saving policies.

Estimated reductions of carbon dioxide emissions by 2030



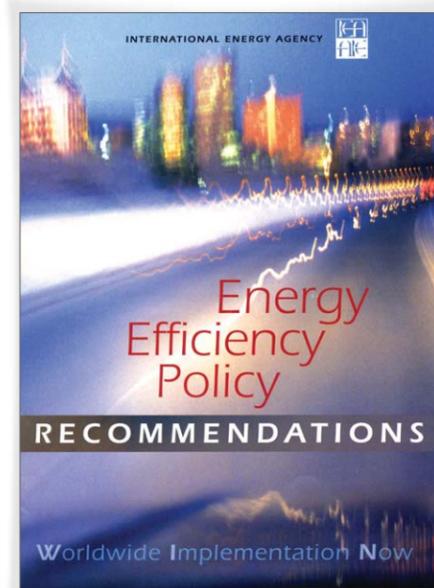
Source : IEA



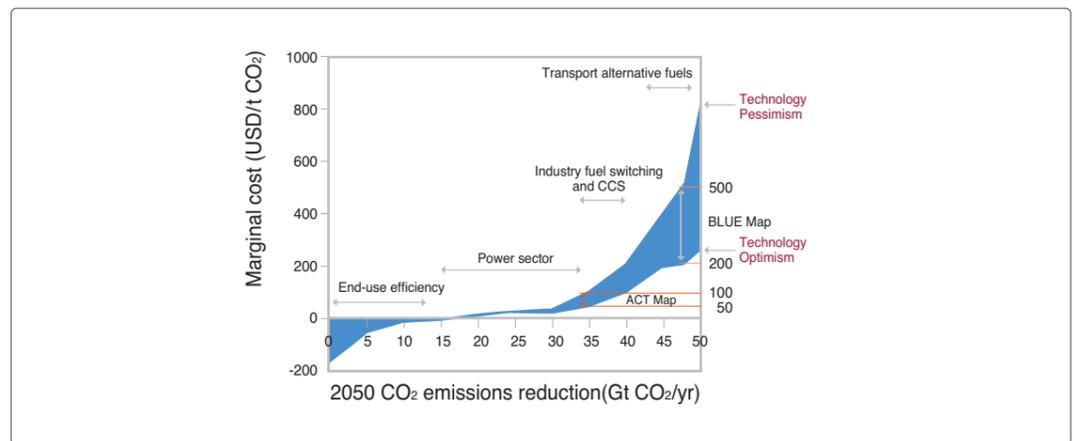
IEA's 25 recommended energy efficiency measures

The IEA also encourages governments to make MEPS and energy efficiency labeling programs their top priorities in enforcing their energy efficiency policies.

At 2006, 2007 and 2008 G8 Summit, IEA recommended G8 leaders adopt 25 energy efficiency measures. Among the recommendations, energy efficiency improvements on appliances and equipment have received the most attention (8 recommendations).



Marginal cost for GHG reduction



Source : Energy Technology Perspectives (2008, IEA)

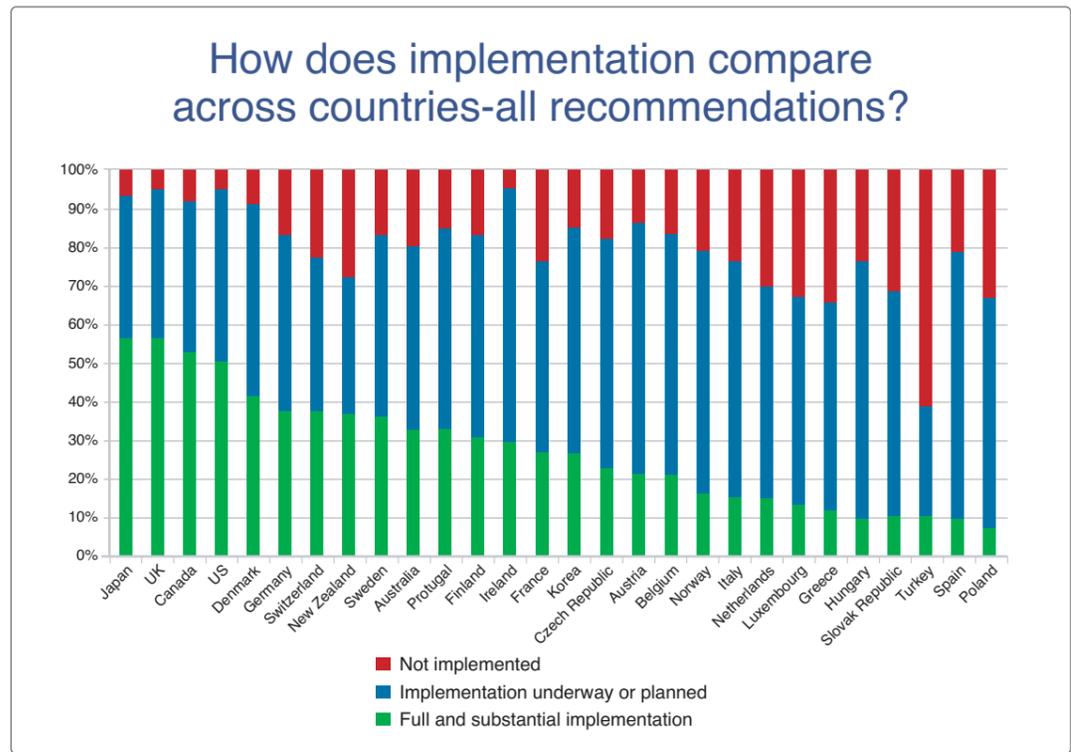
IEA's energy efficiency policy recommendations

Sector	Energy efficiency policy recommendations by IEA
Cross-sectoral	1.1 Measures for increasing investment in energy efficiency 1.2 National energy efficiency strategies and goals 1.3 Compliance, monitoring, enforcement and evaluation of energy efficiency measures 1.4 Energy efficiency indicators 1.5 Monitoring and reporting progress with the IEA energy efficiency recommendation themselves
Building	2.1 Building code for new buildings 2.2 Passive energy houses and zero energy buildings 2.3 Policy packages to promote energy efficiency in existing buildings 2.4 Building certification schemes 2.5 Energy efficiency improvements in windows and other glazed areas
Appliances and equipment	3.1 Mandatory energy performance requirements or labels 3.2 Low-power mode, including standby power, for electronic and networked equipment 3.3 Televisions and set-top boxes 3.4 Energy performance test standards and measurement protocols
Lighting	4.1 Best practice lighting and the phase-out of incandescent bulbs 4.2 Ensuring least-cost of inefficient fuel-based lighting
Transport	5.1 Fuel-efficient tyres 5.2 Mandatory fuel efficiency standards for light-duty vehicles 5.3 Fuel economy of heavy-duty vehicles 5.4 Eco-driving
Industry	6.1 Collection of high-quality energy efficiency data for industry 6.2 Energy performance of electric motors 6.3 Assistance in developing energy management capability 6.4 Policy packages to promote energy efficiency in small and medium-sized enterprises
Energy utilities	7.1 Utilities end-use energy efficiency schemes

▣ The results of implementing IEA's 25 recommended energy efficiency measures across countries

According to the IEA reports (May, 2010) on the implementation of IEA recommended 25 energy efficiency measures by country, Korea ranks 15th among the 28 IEA member countries. IEA ranks Japan, UK, Canada and USA as the top countries with successful implementation of recommended energy efficiency measures.

||| The results of IEA's 25 recommended energy efficiency measures across countries



Korea is actively implementing IEA's 25 recommended energy efficiency measures and currently efforts are being made to apply energy labeling scheme to windows and tyres. Furthermore all incandescent lamps will be phased out of the market. All these measures will boost up the Korea's ranking in the next IEA evaluation.



Korea's Energy Standards & Labeling

Three Major Energy Efficiency Programs



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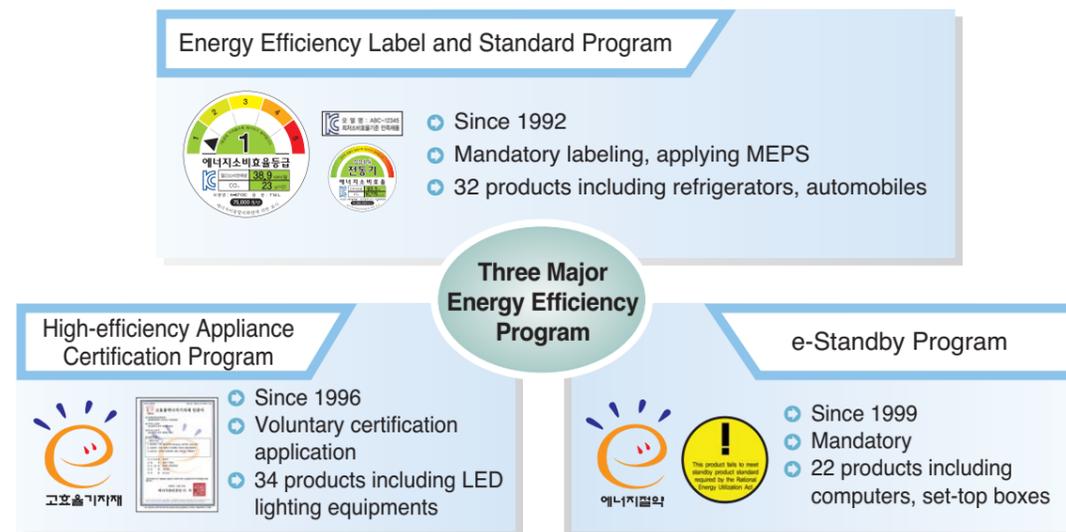
Three Major Energy Efficiency Programs

Korea operates its Energy Efficiency Label and Standard Program, High-efficiency Appliance Certification Program and e-Standby Program in an effort to improve energy efficiency in appliances and equipments.

Initiated in 1992, the Energy Efficiency Label and Standard Program targets products with high energy consumption with mandatory indication of the energy efficiency grade, from the 1st to 5th grade, and prohibits the production and sale of those products that fall below the 5th grade (applying MEPS). The products included in the Energy Efficiency Label and Standard Program fall under 32 categories including household appliances, lighting equipment, and automobiles.

The High-efficiency Appliance Certification Program guarantees the high efficiency of products by certifying products that perform above certain standards. Implemented in 1996, certified products may bear the high-efficiency equipment labels and certificates are also issued. 34 categories of products are included in this program including pumps, boilers and LED lighting equipments.

Since 1999, the e-Standby Program attempts to promote energy efficiency in products by reducing standby power. An Energy Boy label is attached to those consumer electronic appliances and office equipment which have a high potential for reducing standby power, and which satisfy the standby power reduction standards set by the government. Standby warning labels are applied to those products that fall below the standby power reduction standards. 22 categories of products are included in this program including household appliances and office equipment.

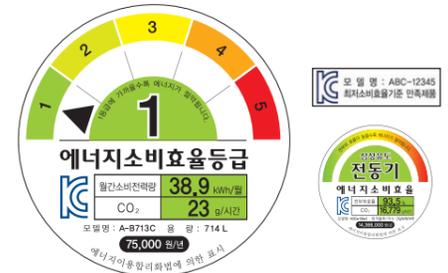


1 Energy Efficiency Label and Standard Program



Overview

Under this program, manufacturers (importers) are mandated to produce and sell energy efficient products from the outset. This program is Korea's core energy efficiency standards & labeling scheme.



Energy Efficiency Label and Standard Program enables consumers to identify energy efficient products easily by ① mandatory indication of energy efficiency grade from 1st to 5th grade ② mandatory reporting, and ③ applying MEPS.

- ① 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
- ② Mandatory reporting of energy efficiency grade by manufacturers or importers
- ③ Production and sales of products that fall below the 5th grade is prohibited (Applying MEPS)

MEPS: Minimum Energy Performance Standard?

Mandatory energy efficiency standard which bans production and sales of low energy efficiency products which fall below the minimum energy performance standard. In case of violation, a fine up to 19 thousand dollars will be charged.

Policy characteristics

Mandatory reporting

Legal basis

Based on article 15 (Designation of machinery and materials subject to efficiency management) and article 16 (Post management of machinery and materials subject to efficiency management) of the "Rational Energy Utilization Act"

- "Regulation on energy efficiency labeling and standards" (Ministry of Knowledge Economy notification)
- "Regulation on energy efficiency labeling of automobiles" (Ministry of Knowledge Economy notification)

Target products

Refrigerators, freezers, kimchi refrigerators, air conditioners, washing machines, drum washing machines, dish washers, dish driers, hot and cold water dispensers, rice cookers, vacuum cleaners, electric fans, air cleaners, incandescent lamps, fluorescent lamps, ballasts for fluorescent lamp, compact fluorescent lamps, 3 phase electric motors, domestic gas boilers, external power supplies, electric cooling and heating equipments, commercial refrigerators, gas water heaters, TVs, window sets, electric transformers, electric fan heaters, electric stoves, VRF multi-split heat pumps, dehumidifiers, tyres, and automobiles (32 products).

Program operating organization

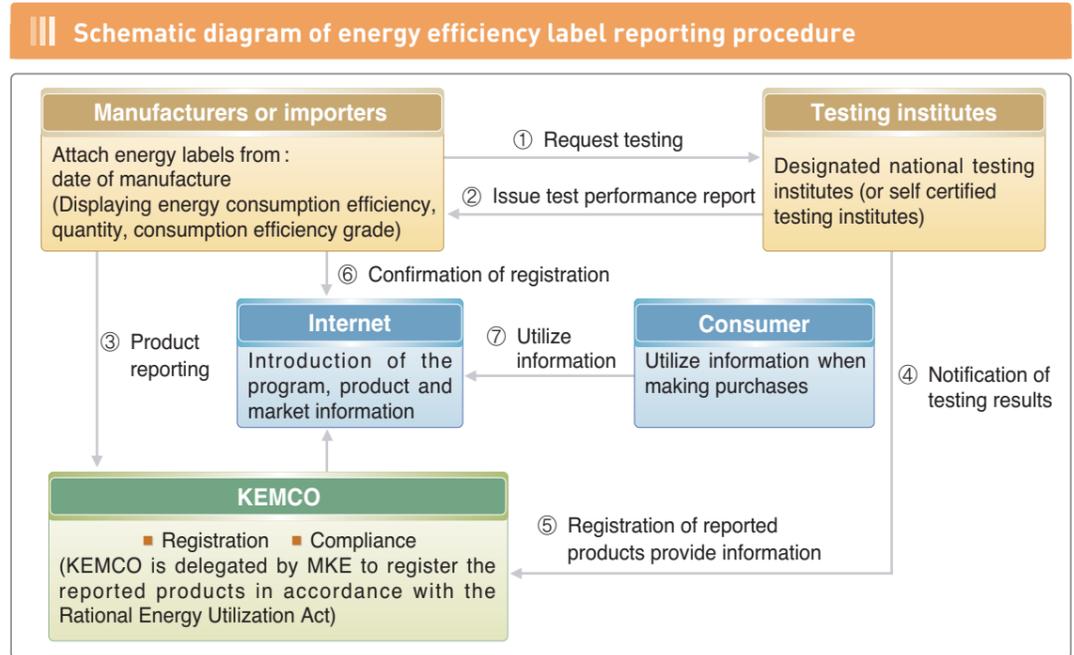
Korea Energy Management Corporation (KEMCO), delegated by the Ministry of Knowledge Economy (MKE), operates the program in partnership with 500 household appliance, lighting equipment, and automobile manufacturers. Currently, 32 products with over 20,000 models are registered.

Energy saving performance

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

Reporting procedure of energy efficiency labeling

Energy efficiency labeling 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 KEMCO and made publicly available on the internet (<http://www.kemco.or.kr>).



The Interpretations of energy efficiency level index “R”

Refrigerators

$$R(\text{Energy efficiency level index}) = \frac{\text{Maximum power consumption of a given model (kWh/month)}}{\text{Monthly power consumption of a given model (kWh/month)}}$$

- Maximum power consumption: The lower limit of the Minimum Energy Performance Standard (5th grade) and the values are obtained from the reference equation.
- Monthly power consumption: Actual measurements obtained by applying KS C IEC 62552 measurement methods
- Increasing numbers of “R” corresponds to getting close to 1st grade and the decreasing numbers of “R” corresponds to getting close to 5th grade



Freezers

$$R(\text{Energy efficiency level index}) = \frac{\text{Maximum power consumption of a given model (kWh/month)}}{\text{Monthly power consumption of a given model (kWh/month)}}$$

- Maximum power consumption: The lower limit of the Minimum Energy Performance Standard (5th grade) and the values are obtained from the reference equation.
- Monthly power consumption: Actual measurements obtained by applying KS C IEC 62552 measurement methods
- Increasing numbers of “R” corresponds to getting close to 1st grade and the decreasing numbers of “R” corresponds to getting close to 5th grade

Kimchi refrigerators

$$R(\text{Energy efficiency level index}) = \frac{\text{Maximum power consumption of a given model (kWh/month)}}{\text{Monthly power consumption of a given model (kWh/month)}}$$

- Maximum power consumption: The lower limit of the Minimum Energy Performance Standard (5th grade) and the values are obtained from the reference equation.
- Monthly power consumption: Actual measurements obtained by applying KS C 9321 measurement methods
- Increasing numbers of “R” corresponds to getting close to 1st grade and the decreasing numbers of “R” corresponds to getting close to 5th grade



Air conditioners

$$R(\text{Energy efficiency level index}) = \frac{\text{Maximum power consumption of a given model (kWh/month)}}{\text{Monthly power consumption of a given model (kWh/month)}}$$

- Cooling capacity, cooling power consumption: Actual measurements obtained by applying KS C 9306 measurement methods
- Increasing numbers of “R” corresponds to getting close to 1st grade and the decreasing numbers of “R” corresponds to getting close to 5th grade



Washing machines

$$R(\text{Energy efficiency level index}) = \frac{\text{Power consumption for one full cycle of washing (Wh)}}{\text{Rated washing capacity (kg)}}$$

1. Power consumption for one full cycle of washing: Actual measurements obtained by applying measurement methods specified in the "Operational regulation on machinery and materials subject to efficiency management"
2. Standard washing load: Maximum weight of washing load (dried, in kg) for one full cycle program (standard program) specified by the manufacturer
3. Decreasing numbers of "R" corresponds to getting close to 1st grade and the increasing numbers of "R" corresponds to getting close to 5th grade

Drum washing machines

$$R(\text{Energy efficiency level index}) = \frac{\text{Power consumption for one full cycle of washing (Wh)}}{\text{Rated washing capacity (kg)}}$$

1. Power consumption for one full cycle of washing: Actual measurements obtained by applying measurement methods specified in the "Operational regulation on machinery and materials subject to efficiency management"
2. Standard washing load: Maximum weight of washing load (dried, in kg) for one full cycle program (standard program) specified by the manufacturer
3. Decreasing numbers of "R" corresponds to getting close to 1st grade and the increasing numbers of "R" corresponds to getting close to 5th grade



Dish washers

$$R(\text{Energy efficiency level index}) = \text{Electric energy efficiency ratio (EER}_e\text{)} \times \text{Water energy efficiency ratio (EER}_w\text{)}$$

1. Electrical energy efficiency ratio, water energy efficiency ratio: Actual measurements obtained by applying measurement methods specified in the "Operational regulation on machinery and materials subject to efficiency management"
2. Increasing numbers of "R" corresponds to getting close to 1st grade and the decreasing numbers of "R" corresponds to getting close to 5th grade

Dish driers

$$R(\text{Energy efficiency level index}) = \frac{\text{Power consumption of a given model (Wh/20 minutes)}}{\text{Standard power consumption of a given model (Wh/20 minutes)}}$$

1. Power consumption: Actual measurements obtained by applying measurement methods specified in the "Operational regulation on machinery and materials subject to efficiency management"
2. Standard power consumption: Values obtained from the reference equation determined by the "Operational regulation on machinery and materials subject to efficiency management"
3. Decreasing numbers of "R" corresponds to getting close to 1st grade and the increasing numbers of "R" corresponds to getting close to 5th grade

Hot and cold water dispensers

$$R(\text{Energy efficiency level index}) = \frac{24 \text{ hours power consumption P1(kWh)}}{\text{Power consumption of the expected insulation capacity P3(kWh)}}$$

1. 24 hours power consumption: Actual measurements obtained by applying measurement methods specified in the "Operational regulation on machinery and materials subject to efficiency management"
2. Power consumption of the expected insulation capacity: Values obtained from the reference equation determined by the "Operational regulation on machinery and materials subject to efficiency management"
3. Decreasing numbers of "R" corresponds to getting close to 1st grade and the increasing numbers of "R" corresponds to getting close to 5th grade

Rice cookers

$$R(\text{Energy efficiency level index}) = \frac{\text{Power consumption of a given model for one person serving (Wh/ person serving)}}{\text{Standard power consumption of a given model (Wh/person serving)}}$$



1. Power consumption for one person serving: Actual measurements obtained by applying measurement methods specified in the "Operational regulation on machinery and materials subject to efficiency management"
2. Standard power consumption: Values obtained from the reference equation determined by the "Operational regulation on machinery and materials subject to efficiency management"
3. Decreasing numbers of "R" corresponds to getting close to 1st grade and the increasing numbers of "R" corresponds to getting close to 5th grade

Vacuum cleaners

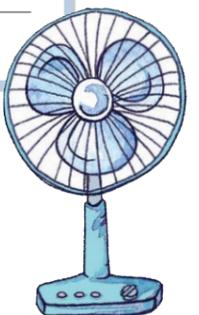
$$R(\text{Energy efficiency level index}) = \frac{\text{Maximum cleaning capacity of a given model}}{\text{Standard power consumption of a given model}}$$

1. Maximum cleaning capacity: Actual measurements obtained by applying measurement methods specified in KS C IEC 60312
2. Standard power consumption: Values determined by the "Operational regulation on machinery and materials subject to efficiency management"
3. Increasing numbers of "R" corresponds to getting close to 1st grade and the decreasing numbers of "R" corresponds to getting close to 5th grade

Electric fans

$$R(\text{Energy efficiency level index}) = \frac{\text{Standard power consumption of a given model}}{\text{Wind volume efficiency of a given model}}$$

1. Standard power consumption: Values determined by the "Operational regulation on machinery and materials subject to efficiency management"
2. Wind volume efficiency: Standard wind volume ÷ power consumption. Values of standard wind volume are determined by reference equation specified in the "Operational regulation on machinery and materials subject to efficiency management". Power consumption values are actually measured values.
3. Decreasing numbers of "R" corresponds to getting close to 1st grade and the increasing numbers of "R" corresponds to getting close to 5th grade



Air cleaners

$$R(\text{Energy efficiency level index}) = \frac{\text{Measured power consumption (W)}}{\text{Standard usable area (m}^2\text{)}}$$

1. Measured power consumption: Actual measurements obtained by applying measurement methods specified in the "Operational regulation on machinery and materials subject to efficiency management"
2. Standard usable area: Values determined by the "Operational regulation on machinery and materials subject to efficiency management"
3. Decreasing numbers of "R" corresponds to getting close to 1st grade and the increasing numbers of "R" corresponds to getting close to 5th grade

Incandescent lamps

$$R(\text{Energy efficiency level index}) = \frac{\text{Standard consumption efficiency (lm/W)}}{\text{Luminance efficiency of a given model (lm/W)}}$$

1. Standard consumption efficiency: Values determined by the "Operational regulation on machinery and materials subject to efficiency management"
2. Luminance efficiency: Actual measurements obtained by applying measurement methods specified in KS C 7501
3. Decreasing numbers of "R" corresponds to getting close to 1st grade and the increasing numbers of "R" corresponds to getting close to 5th grade

Fluorescent lamps

$$R(\text{Energy efficiency level index}) = \frac{\text{Standard consumption efficiency (lm/W)}}{\text{Luminance efficiency of a given model (lm/W)}}$$

1. Standard consumption efficiency: Values determined by the "Operational regulation on machinery and materials subject to efficiency management"
2. Luminance efficiency: Actual measurements obtained by applying measurement methods specified in KS C 7601 and "Regulation on stabilization certification"
3. Decreasing numbers of "R" corresponds to getting close to 1st grade and the increasing numbers of "R" corresponds to getting close to 5th grade

Ballasts for fluorescent lamps

Apply MEPS without assigning energy efficiency level index(R)

MEPS is relative efficiency and they are obtained by applying measurement methods specified in KS C 81021 and "Regulation on stabilization certification"

Compact fluorescent lamps

$$R(\text{Energy efficiency level index}) = \frac{\text{Standard consumption efficiency (lm/W)}}{\text{Luminance efficiency of a given model (lm/W)}}$$

1. Standard consumption efficiency: Values determined by the "Operational regulation on machinery and materials subject to efficiency management"
2. Luminance efficiency: Actual measurements obtained by applying measurement methods specified in KS C 7621
3. Decreasing numbers of "R" corresponds to getting close to 1st grade and the increasing numbers of "R" corresponds to getting close to 5th grade

3 phase electric motors

Apply MEPS without assigning energy efficiency level index (R)

MEPS is full load efficiency and they are obtained by applying measurement methods specified in KS C IEC 60034-2-1

Domestic gas boilers

$$R(\text{Energy efficiency level index}) = \text{Rated heating efficiency of a given model (\%)}$$

1. Heating efficiency : Actual measurement obtained by applying KS B 8109 and KS B 8127 measurement method
2. Increasing numbers of "R" corresponds to getting close to 1st grade and the decreasing numbers of "R" corresponds to getting close to 5th grade

External power supplies

Apply MEPS without assigning energy efficiency level index(R)

MEPS is operational efficiency and they are obtained by applying measurement methods specified by the "Operational regulation on machinery and materials subject to efficiency management"

Electric cooling and heating equipments

$$R(\text{Energy efficiency level index}) = \frac{\text{Cooling period energy efficiency} + \text{Heating period energy efficiency}}{2}$$

1. Cooling period energy efficiency, heating period energy efficiency: Actual measurements obtained by applying measurement methods specified in KS C 9306
2. Increasing numbers of "R" corresponds to getting close to 1st grade and the decreasing numbers of "R" corresponds to getting close to 5th grade

Commercial refrigerators

$$R(\text{Energy efficiency level index}) = \frac{\text{Maximum power consumption of a given model (kWh/month)}}{\text{Monthly power consumption of a given model (kWh/month)}}$$

1. Maximum power consumption: The lower limit of the Minimum Energy Performance Standard (5th grade) and the values are obtained from the reference equation.
2. Monthly power consumption: Actual measurements obtained by applying KS C IEC 62552 measurement methods
3. Increasing numbers of "R" corresponds to getting close to 1st grade and the decreasing numbers of "R" corresponds to getting close to 5th grade

Gas water heaters

$$R(\text{Energy efficiency level index}) = \text{Rated hot water efficiency (\%)}$$

1. Hot water efficiency: Actual measurements obtained by applying KS B 8116 measurement methods
2. Increasing numbers of "R" corresponds to getting close to 1st grade and the decreasing numbers of "R" corresponds to getting close to 5th grade

Transformers

Apply MEPS without assigning energy efficiency level index (R)

MEPS is efficiency and they are obtained by applying measurement methods specified in KS C 4306, KS C 4311, KS C 4316, KS C 4317



Window sets

$$R(\text{Energy efficiency level index}) = \text{Heat transmission coefficient (W/(m}^2 \cdot \text{K))}$$

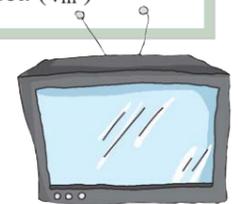
1. Heat transmission coefficient: Actual measurements obtained by applying KS F 2278. This indicates the level of insulation performance. The lower value indicates better insulation performance.
2. Decreasing numbers of "R" corresponds to getting close to 1st grade and the increasing numbers of "R" corresponds to getting close to 5th grade



TVs

$$R(\text{Energy efficiency level index}) = \frac{\text{Power consumption at operational mode (W)}}{\text{The square root of display area (\sqrt{m}^2)}}$$

1. Power consumption: Actual measurements obtained by applying measuring methods specified in KS C IEC 62087.
2. Decreasing numbers of "R" corresponds to getting close to 1st grade and the increasing numbers of "R" corresponds to getting close to 5th grade



2 High-efficiency Appliance Certification Program



Overview

The program certifies products for industry and buildings as high-efficiency appliances, where the energy efficiency and quality test results are above the certification standards set by the government. KEMCO issues a high-efficiency appliance certificate. Financial supports are provided for high-efficiency LED lighting equipments and few other high-efficiency appliances.



What are high-efficiency appliances?

High-efficiency and high energy efficiency products are certified by KEMCO where they satisfy the energy efficiency and quality certification standards of the designated testing institutes.

Policy characteristics

Voluntary certification scheme

Target products

Sensor lighting equipments, heat recovery ventilators, pumps, centrifugal screw chillers, uninterruptible power systems, industrial gas boilers, electronic ballasts for metal halide lamps, electronic ballasts for natrium lamps, inverters, auto thermostatic valves for heating, LED traffic lights, multi-function type switch gear systems, direct-fired absorption chiller-heaters, single phase motors, ventilation fans, centrifugal blowers, submersible aerators, metal-halide lamps, reflectors for HID lamps, oil burning water boilers, industrial oil boilers, LED guide lights, regenerative burners, turbo blowers, thermo-hygrostats, LED lamps(internal converter), LED Lamps(external converter), recessed and fixed LED light fixtures, LED security light fixtures, LED sensor light fixtures, LED converters, PLS light fixtures, high air tight insulated doors, fixtures for ultra constant discharge lamps (34 products).

Legal basis

“Regulation on promotion and dissemination of high energy efficiency appliances” (Ministry of Knowledge Economy) based on Article 21(Certification of high-efficiency equipment) and Article 22(Post management of high-efficiency equipment) of the Rational Energy Utilization Act.

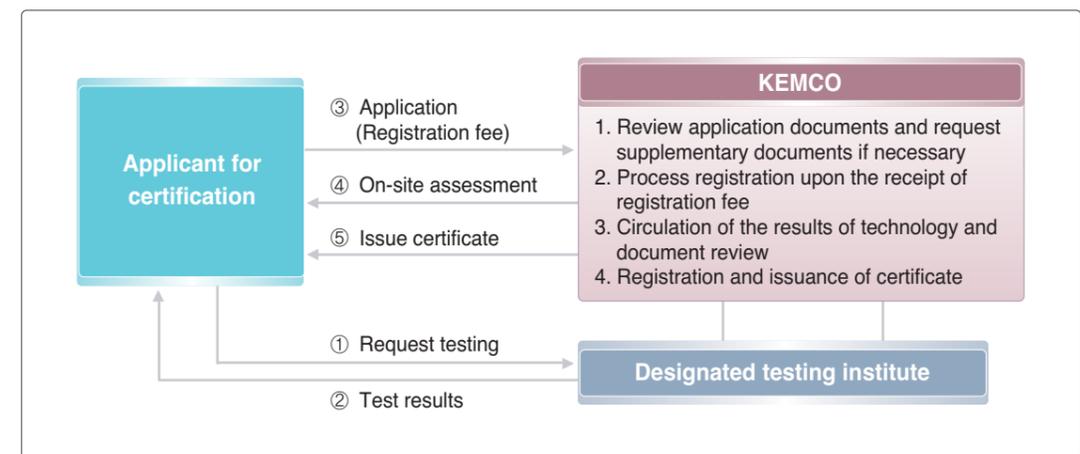
Program operating organization

Korea Energy Management Corporation (KEMCO), delegated by Ministry of Knowledge Economy (MKE), operates the program in partnership with 300 lighting equipments, heavy electric equipments, boiler and other manufacturers. Currently, 34 products with over 5,000 models are certified.

Application procedure for high-efficiency energy appliances certification

Manufacturers interested in receiving high-efficiency appliance certification shall apply for certification to KEMCO by submitting ①the certification application, ②documents on maintenance of certified efficiency, and ③a performance testing report issued by designated testing institutes.

Schematic diagram of application procedure for high-efficiency appliances certification



3 e-Standby Program



Overview

The program encourages the adoption of energy saving modes while the appliances are idle and the minimization of standby power. An Energy Boy label is attached to those products that meet the standards for standby power. Standby warning label is attached to those products that do not meet the specified standby power standards. It is the core program to reduce standby power below 1W by 2010.

In particular, all e-Standby Program target products should ①be subject to mandatory reporting of standby power ②and mandatory indication of standby warning label on appliances that fall below the standby power standards (a fine of below 5 thousand dollars in case of violation).



Standby power?

Computers, set-top boxes and other electronic appliances consume a significant amount of energy while awaiting instructions to provide full services. Standby power includes power consumption in off mode, no load mode, passive standby mode where the remote control is turned off, active standby mode during network communication and sleep mode during operation.

Policy characteristics

Mandatory reporting scheme

Target products

Computers, monitors, printers, fax machines, copiers, scanners, multi-function devices, energy saving & controlling devices, televisions, video cassette recorders, home audio products, DVD players, microwave ovens, set-top boxes, door phones, cord/cordless phones, radios, bidets, modems, home gateways, servers, hand dryers (22 products)

Legal basis

“e-Standby Program application regulation” (Ministry of Knowledge Economy notification) based on Article 18(Designation of standby power reduction target products) and Article 19(Designation of standby warning label target products), Article 20 (Indication of high standby power reduction products) and Article 21 (Post management of target standby power reduction products) of the Rational Energy Utilization Act.

Program operating organization

Korea Energy Management Corporation (KEMCO), delegated by Ministry of Knowledge Economy (MKE), operates the program in partnership with 150 electronic manufacturers. Currently, 22 products with over 9,000 models are registered.

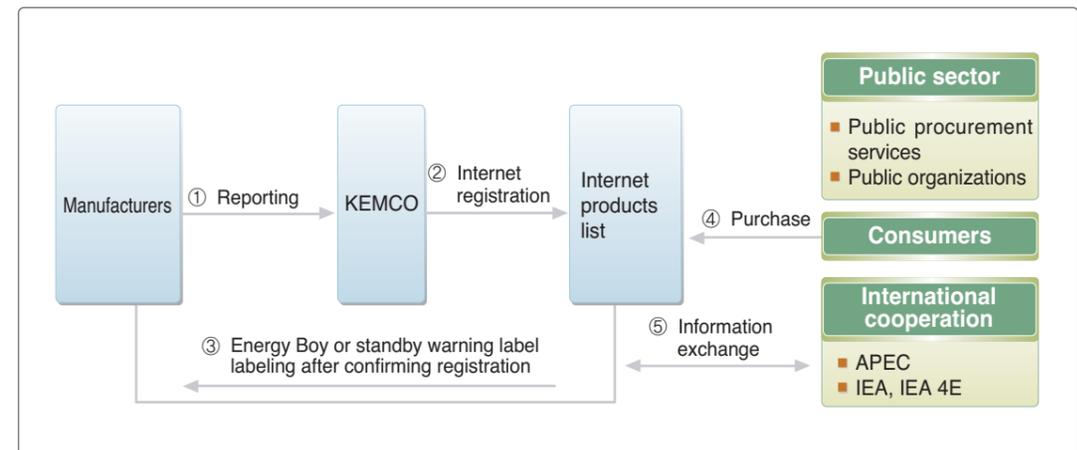
Energy saving performance

Products with the Energy Boy label save 30~50% more energy than ordinary products.

Product reporting procedure

Manufacturers or importers can have their products classified as either products with high standby reduction potentials or standby warning label target products. Applications are submitted for each product model and application documents include ①the reporting form, ② the performance test report, and ③a picture of the product or a brochure. The performance test report can be issued by a designated testing institute or the corporation itself if it is designated as a self-certified testing institute. The application can be confirmed by checking the list of standby power products on the internet (<http://www.kemco.or.kr>).

Schematic diagram of e-Standby Program reporting procedure



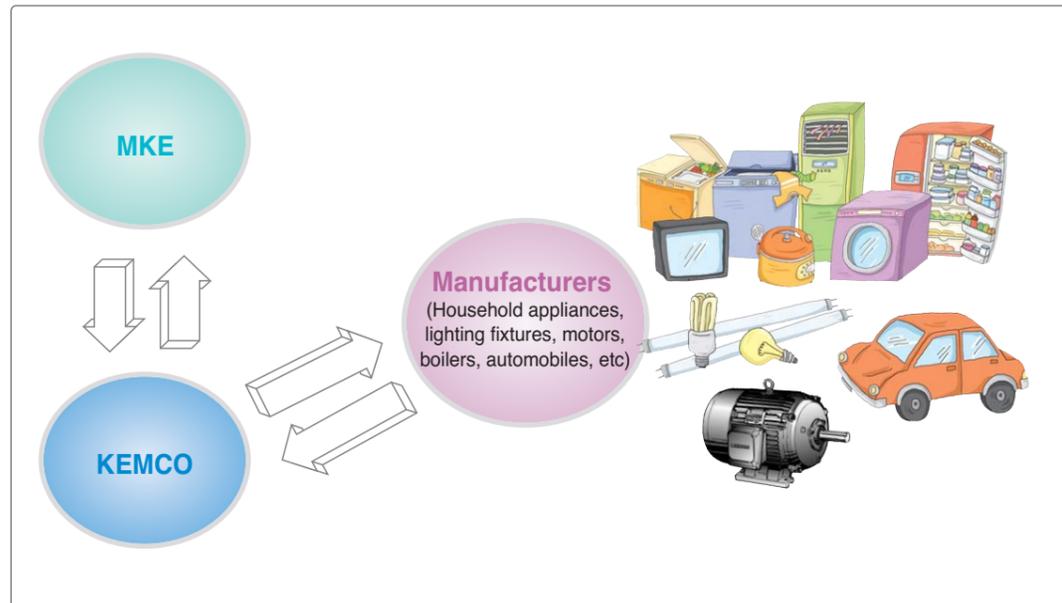
4 Policy Implementation Organizations

Ministry of Knowledge Economy(MKE) and Korea Energy Management Corporation (KEMCO) are the key organizations in implementing energy efficiency standards and labeling.

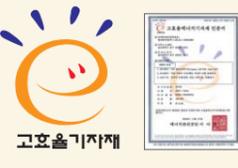
MKE drafts policy and regulations on energy efficiency standards and labeling and KEMCO implements and operates them. As an example, Korea's three major energy efficiency standards & labeling programs (Energy Efficiency Label and Standard Program, High-efficiency Appliance Certification Program, e-Standby Program) were drafted by MKE notification based on the Rational Energy Utilization Act. However, the government (MKE) has delegated its power to KEMCO to operate the three major energy efficiency programs.

KEMCO reports to MKE on the progress of the implementation of the three major energy efficiency programs. In summary, MKE makes policies on national energy efficiency and KEMCO executes the policies.

Organizations involved in implementing three major energy standards & labeling programs



5 Overview of 3 Major Energy Standards & Labeling Programs

Program	Overview	Target products
Energy Efficiency Label and Standard Program (32 products)	 <ul style="list-style-type: none"> Increasing energy efficiency - controlling efficiency when in operation Mandatory reporting Mandatory indication of energy efficiency label MEPS - Prohibits production and sales of products that fall below the standard 	<ul style="list-style-type: none"> Refrigerators (MEPS+Label) Freezers (MEPS+Label) Kimchi refrigerators (MEPS+Label) Air conditioners (MEPS+Label) Washing machines (MEPS+Label) Drum washing machines (MEPS+Label) Dish washers (MEPS+Label) Dish dryers (MEPS+Label) Hot and cold water dispensers (MEPS+Label) Rice cookers (MEPS+Label) Vacuum cleaners (MEPS+Label) Electric fans (MEPS+Label) Air cleaners (MEPS+Label) Incandescent lamps (MEPS+Label) Fluorescent lamps (MEPS+Label) Ballasts for fluorescent lamps (MEPS) Compact fluorescent lamps (MEPS+Label) 3 phase electric motors (MEPS) Domestic gas boilers (MEPS+Label) External power supplies (MEPS) Electric cooling and heating equipment (MEPS+Label) Industrial electric refrigerators (MEPS+Label) Gas water heaters (MEPS+Label) TVs (MEPS+Label) Window sets (MEPS+Label) Transformers (MEPS) Electric fan heaters (MEPS) Electric stoves (MEPS) VRF multi-split heat pumps (MEPS+Label) Dehumidifiers (MEPS+Label) Tyres (Label) Automobiles (Label)
High-Efficiency Appliance Certification Program (34 products)	 <ul style="list-style-type: none"> High-efficiency equipment for industry and buildings Voluntary participation - Financial incentives High efficiency equipment label - Indication and issuance of certificate 	<ul style="list-style-type: none"> Single phase motors Sensor lighting equipment Heat recovery ventilators Ventilation fans Centrifugal blowers Metal-halide lamps Reflectors for HID lamps Oil burning water boilers Industrial oil boilers Pumps Uninterruptible power systems Industrial gas boilers Electronic ballasts for metal halide lamps Electronic ballasts for sodium lamps Inverters Auto thermostatic valves for heating LED traffic lights Multi-function type switchgear systems Direct-fired absorption Chiller-heaters Thermo hygostat LED lamps (internal converter) LED lamps (external converter) LED security light fixtures LED sensor light fixtures LED converters PLS light fixtures High air tight insulated doors Fixtures for ultra constant discharge lamps Regenerative burners Turbo blowers LED guide lights Centrifugal screw chillers Submersible arators Recessed and fixed LED light fixtures
e-Standby Program (22 products)	 <ul style="list-style-type: none"> Controlling energy consumption in standby power mode Mandatory reporting - Standby warning label target products Mandatory indication of standby warning label product Voluntary indication of Energy Boy label 	<ul style="list-style-type: none"> Computers (Standby warning label target) Monitors (Standby warning label target) Printers (Standby warning label target) Fax machines (Standby warning label target) Copiers (Standby warning label target) Scanners (Standby warning label target) Multi-function devices (Standby warning label target) Energy saving & controlling devices Servers Hand dryers Televisions(Standby warning label target) Video cassette recorders (Standby warning label target) Home audio products (Standby warning label target) DVD players (Standby warning label target) Microwave ovens (Standby warning label target) Set-top boxes(warning label target) Door phones (Standby warning label target) Cord/cordless phones (Standby warning label target) Radios(Standby warning label target) Bidets(Standby warning label target) Modems(Standby warning label target) Home gateway (Standby warning label target)

6 Energy Standards & Labeling in Other Countries



Comparison of MEPS applied products by country

Products	Korea	United States	EU	Japan	China	Canada	Australia
Refrigerators	•	•	•	•	•	•	•
Freezers	•	•		•	•	•	•
Kimchi refrigerators	•						
Air conditioners	•	•		•	•	•	•
Washing machines	•	•	•		•	•	
Drum washing machines	•	•	•		•	•	
Dish washers	•	•	•			•	
Dish dryers	•						
Hot and cold water dispensers	•						
Rice cookers	•			•	•		
Vacuum cleaners	•						
Electric fans	•				•		
Incandescent lamps	•	•			•	•	•
Compact fluorescent lamps	•				•	•	•
Fluorescent lamps	•	•	•	•	•	•	•
Ballasts for fluorescent lamps	•	•			•	•	•
Gas boilers	•	•			•		
Air cleaners	•						
TVs	•		•	•	•		•
Copiers				•			
Computers				•			
Magnetic disk devices				•			
VCRs				•			
Automobiles (passenger)				•			
Automobiles (cargo)				•			
Gas cookers				•		•	
Gas hot water dispensers	•	•		•		•	
Oil hot water dispensers				•		•	
Toilet seats				•			
Vending machines		•		•		•	
Transformers	•	•		•	•		•
Microwave ovens				•			
DVD players				•			
3 phase electric motors	•	•	•		•		•
Industrial refrigerators	•	•				•	•
Single unit air vonditioners		•			•		•
Commercial washing machines		•					
Clothes dryers		•				•	
Heat pumps	•	•					•
Full heater		•					
Furnaces & boilers		•				•	
Electric hot water dispensers		•				•	•
Cooking devices		•					

Products	Korea	United States	EU	Japan	China	Canada	Australia
External power supplies	•	•	•		•		•
Dehumidifiers	•	•				•	
Pipeline products		•					
Floor lamps		•				•	
HID lamps		•			•		
Ceiling fan		•				•	
Direct heating equipment		•					
Small sized duct		•					
Metal halide lamps-ballast		•					
Coolers & chillers		•				•	•
Industrial heating, air conditioners, hot water dispensers		•					•
Set top boxes			•				•
Routers				•			
Switches				•			
Circulators			•				
Street lighting			•				
Converters for halogan lamp							•
Standby power			•				
Window sets	•						
VRF multi-split heat pumps	•	•		•		•	
Ground or water-sources heat pumps						•	
Internal water-loop heat pumps						•	
Electric range						•	
Automatic ice-makers		•				•	
Exit signs						•	
Traffic signals						•	
Gas furnaces						•	
Gas fireplaces						•	
Gas-fired unit heaters						•	
Packaged terminal air conditioners and heat pumps		•				•	
Fan, blowers pumps		•	•			•	
Transformas and electronic step-down converters for ELV lamps							•
Electronic fan heaters	•						
Electronic stoves	•			•			
Lighting systems		•					
Meatal halide lamp fixtures		•					

EU is Ecodesign directive, Japan is Top Runner Program



Energy standards & labeling in other countries

Korea	Characteristics	Country	Organization	Label	Operation status
Energy Efficiency Label and Standard Program (32 products) 	Minimum Energy Performance Standard	United States	DOE	-	<ul style="list-style-type: none"> MEPS Motors, refrigerators etc. (40 products)
		EU (27 members)	EU Commission	-	<ul style="list-style-type: none"> Eco-design (12 products) MEPS Refrigerators, freezers, etc (4 products)
		Japan	METI	-	<ul style="list-style-type: none"> Top Runner Program Refrigerators, transformers etc. (23 products)
		China	CNIS	-	<ul style="list-style-type: none"> MEPS Refrigerators, air conditioners etc.(14 products)
		Canada	NRCAN	-	<ul style="list-style-type: none"> MEPS Clothes dryers, washing machines etc.(45 products)
		Australia	DCCEE	-	<ul style="list-style-type: none"> MEPS Motors, refrigerators etc. (18 products)
	Mandatory energy labeling	United States	FTC		<ul style="list-style-type: none"> Energy Guide Label Refrigerators, air conditioners, boilers etc. (11 products)
		EU (27 members)	EU Commission		<ul style="list-style-type: none"> Energy Guide Label Refrigerators, air conditioners, boilers etc. (11 products)
		China	CNIS		<ul style="list-style-type: none"> Energy Label Refrigerators, air conditioners, TVs (10 products)
		Canada	NRCAN		<ul style="list-style-type: none"> EnerGuide Label Refrigerators, air conditioners, TVs (9 products)
Australia		DCCEE		<ul style="list-style-type: none"> Energy Rating Label Refrigerators, air conditioners, TVs (7 products) 	
e-Standby Program (22 products) 	Voluntary energy saving labeling	United States	EPA & DOE		<ul style="list-style-type: none"> ENERGY STAR Label TVs, computers, etc. (40 products)
	Mandatory standby warning labeling	EU (27 members)	EU Commission	-	<ul style="list-style-type: none"> GEEA TVs, computers, etc. (15 products)
		Australia	DCCEE		<ul style="list-style-type: none"> Products exceeding standby power of 1W (under review)

III

Korea's Energy Standards & Labeling

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Promotion of High-efficiency Appliances



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Promotion of High-efficiency Appliances

The Korean government is implementing various policies to induce market transformation by promoting energy efficient appliances. Despite slight differences among target products, measures such as the following are generally available: financial rebates, priority purchase from the public procurement service, mandatory use of energy efficient appliances for new buildings, mandatory or recommended consideration of building codes, tax breaks on energy efficiency investments, rational utilization energy subsidies and financial supports for testing fees.

High-efficiency appliances refer to 1st grade energy efficiency appliances, high-efficiency certified products and products with high standby reduction potential (Energy Boy labeled products).

• Policies available in promoting energy efficient appliances

Types	Target recipient (or complying party)	Target products
Financial supports	Installation parties	<ul style="list-style-type: none"> 5 products from the High-efficiency Appliance Certification Program
Priority purchase from the public procurement service	Public procurement services	<ul style="list-style-type: none"> 1st grade energy efficiency appliances High-efficiency certified products Products with high standby reduction potentials
Designation of best procured products	Public procurement services	<ul style="list-style-type: none"> High-efficiency certified products
Mandatory use by public organizations	Public organizations	<ul style="list-style-type: none"> High-efficiency certified products e-Standby registered products (Energy Boy labeled products) 1st grade energy efficiency appliances
Mandatory or recommended consideration of energy saving design standards in building code	Residential housing complexes and educational facilities	<ul style="list-style-type: none"> 1st grade energy efficiency appliances High-efficiency certified products Energy Boy labeled products
Mandatory use of eco-friendly housing standards and performance data	Residential housing complexes	<ul style="list-style-type: none"> 1st grade energy efficiency High-efficiency certified products Products with high standby reduction potentials
Tax breaks on energy efficiency investments	Installation parties	<ul style="list-style-type: none"> 7 products from the High-efficiency Appliance Certification Program
Rational energy utilization subsidies	Installation parties small & medium sized manufacturers	<ul style="list-style-type: none"> High-efficiency certified products Products with high standby reduction potentials 1st grade energy efficiency appliances
Financial supports for testing fees	Small & medium sized manufacturers	<ul style="list-style-type: none"> High-efficiency certified products

1- Rebates



Overview

In order to promote the market transformation through high efficiency appliances, insallation subsidies are provided to 5 appliances and equipments (including LED guide lights) approved as high efficiency appliances.

Target products

Target products include, inverters, freezers, LED guide lights (emergency, hallway), LED lamps (internal converter), LED lamps (external converter) of which are approved as high efficiency appliances.

• The amount of subsidy and respective targets for support by products

Products	Target products	Amount
Inverters	Certified as high efficiency energy appliance	Unit subsidy amount per capacity number of installed equipments
Freezers	Certified as high efficiency energy appliance	Unit subsidy amount per capacity number of installed equipments
LED guide lights (emergency, hallway)	Certified as high efficiency energy appliance	Unit subsidy amount per capacity number of installed equipments
LED lamps (internal converter)	Certified as high efficiency energy appliance	Unit subsidy amount per capacity number of installed equipments
LED Lamps (external converter)	Certified as high efficiency energy appliance	Unit subsidy amount per capacity number of installed equipments

Legal basis

“Directive on the management of power efficiency improvement”
(Ministry of Knowledge Economy)



2- Priority Purchase through the Public Procurement Service



Overview

When making purchases through the public procurement service, high-efficiency certified products, Energy Boy labeled products, and 1st grade energy efficiency labeled products get first priority for purchase. In addition, the public procurement service is operating a high efficiency appliance internet shopping mall (www.g2b.go.kr)



Legal basis

“Energy consuming products purchase operation standards” (Public procurement service official order)

3- Designation of Best Procured Products



Overview

When making purchases through the public procurement service, high-efficiency certified products are designated as best procured products.

Legal basis

“Regulation on the designation of best procured products” (Public procurement service official order)

4- Mandatory Use of Energy Efficiency Appliances by Public Organizations



Overview

Mandatory use of high-efficiency appliances

In accordance with the provisions of “Regulation on promotion and dissemination of high energy efficiency appliances” (Ministry of Knowledge Economy notification) all public organizations, if there are no compelling reasons to do otherwise, shall use high efficiency certified appliances when making new purchases or replacing existing appliances. All public organizations must replace more than 30% of their lighting equipments with LED products until 2012. However public organizations with plans of relocation under the government policy are exempt from this mandatory rule.

Mandatory use of Energy Boy labeled products

In accordance with the provisions of the “e-Standby Program application regulation” (Ministry of Knowledge Economy notification), it is mandatory for all public organizations to select office equipment such as computers and other electronic appliances with Energy Boy labels when making new purchases or replacing the existing appliances. Appliances with standby power usage below 1W will get first priority when making purchase decisions. In addition, devices for blocking standby power (automatic energy saving multiple tap, automatic standby power blocking power outlet, automatic standby power blocking switch) should be installed in public organizations. Public organizations must install softwares that automatically save power when they are not in operation

Mandatory use of 1st grade energy efficiency appliances

In accordance with the provisions of the “Operational regulation on machinery and materials subject to efficiency management” (Ministry of Knowledge Economy notification), it is mandatory for all public organizations to select office equipment such as refrigerators or fluorescent lamps and other electronic appliances with 1st grade energy consumption efficiency label. If there are no products that qualify for 1st grade energy efficiency appliances criteria, then products with next higher level of efficiency should be purchased.

Legal basis

“Directive on rational energy utilization Implementation for public organizations” (MKE notification)



5 Building Codes



Overview

For specific types of buildings, which need to submit energy efficiency plans, it is either mandatory or recommended that they use energy efficient appliances when newly constructed. Particularly, it is mandatory for energy efficient electric transformers, lighting equipment (high efficiency certified appliances, 1st grade energy efficiency products) and automatic standby power blocking outlet or switch.

Target buildings

Apartments, townhouses and educational facilities with floor space of 3000m² or more

Legal basis

“Energy saving design standards for buildings” (Ministry of Land, Transport and Maritime Affairs notification)



Mandatory or recommended consideration of building codes

Type	Energy efficiency appliances
Mandatory (Should apply when designing buildings)	<ul style="list-style-type: none"> Transformers(High-efficiency certified product or Above standard energy consumption efficiency) Compact fluorescent lamps(1st grade energy efficiency appliance) Fluorescent lamps(1st grade energy efficiency appliance) Ballasts for fluorescent lamps(Above standard energy consumption efficiency) LED Sensor Lights(High-efficiency certified product) Automatic standby power blocking outlet, automatic standby power blocking switch (high standby power reduction equipment, energy saving & controlling devices)
Recommended (Selectively applied when designing buildings)	<ul style="list-style-type: none"> LED guide light(High-efficiency certified product) Domestic gas boilers(1st grade energy efficiency appliance) Industrial gas boilers(High-efficiency certified product) Centrifugal freezers(High-efficiency certified product) Heat recovery ventilators(High-efficiency certified product) Three phase electric motors(MEPS or high-efficiency certified product) Door phone(Products with high standby reduction potentials) Home gateway(Products with high standby reduction potentials)

6 Standards and Performance of Eco-Friendly Houses



Overview

This is a mandatory regulation for the construction of eco-friendly houses

Target products

Residential housing complex with more than 20 households

Legal basis

Standards and performance of eco-friendly houses (Ministry of Land, Transport and Maritime Affairs notification)

Mandatory requirements of standards and performance of eco-friendly houses

Type	Energy efficiency appliances
Mandatory (Should apply when designing houses)	<ul style="list-style-type: none"> Transformers(Above standard energy consumption efficiency) Compact fluorescent lamps(1st grade energy efficiency appliance) Fluorescent lamps(1st grade energy efficiency appliance) Ballasts for fluorescent lamps(Above standard energy consumption efficiency) Automatic standby power blocking outlet, automatic standby power blocking switch (high standby power reduction equipment, energy saving & controlling devices)

7 Tax Breaks on Energy Saving Investments



Overview

Domestic residents seeking to invest in energy saving facilities, as designated by the president's executive order excluding investments on second hand or leased equipments, can apply for a tax waiver (10% of total investment cost) from income or corporate tax until December 31st 2011.

Target products

LED lights(lamps, light fixtures), lighting equipment with automatic luminous intensity, heat recovery ventilators

Legal basis

Article 25 paragraph 2 of the Tax Incentive Limitation Law

8 Financing Rational Energy Utilization Fund



Overview

Financial supports are available for installing high efficiency certified appliances and production facilities for the manufacturing of high efficiency products.

Installation support

Type	Maximum financing for a given year	Loan period	Interest rate	Remark (Target recipient)
Installing high efficiency appliances	Up to 10 million USD	3 years and redemption by installments for 5 years	In accordance with guidance on the management of energy and resources project special account	Installation user
Installing high efficiency appliances production system	Up to 5 million USD	3 years and redemption by installments for 5 years		Manufacturers (Small and medium sized companies)

* The same type of assistance can not be given twice to a single installation

Legal basis

“Directive on financial support for rational energy utilization” (MKE notification)

9 Testing Fee Waiver



Overview

KEMCO provides financial support to small and medium sized manufacturers for costs incurred in testing the efficiency of appliances in the laboratory.

IV

Korea's Energy Standards & Labeling

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Accomplishments over the 19 years of Implementing Energy Efficiency Management Policies



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Accomplishments over the 19 years of Implementing Energy Efficiency Management Policies

Through the implementation of the Energy Efficiency Label and Standard Program (1992), High-efficiency Appliance Certification Program (1996) and e-Standby Program (1999), significant energy efficiency improvements have been achieved. In particular, energy efficiency in the appliances sector is one of the best in the world. The energy efficiency improvements in refrigerators, air conditioners, and washing machines are considered especially successful cases.

According to the report submitted by IEA to G8 summit, "Energy efficiency policy recommendations prepared by the IEA for the G8 under the gleaneagles plan of action (2008.3.21)", the success of Korea's mandatory energy efficiency standards and warning labeling programs was recognized at the summit as follows: "Korea recently developed a mandatory programme over a relatively short period of time, incorporating the better elements from the more established national programmes and adding new initiatives, such as the threat of using mandatory warning labels for products that fail to meet standby power targets."

Recommendation : Mandatory performance requirement or labels

"Korea recently developed a mandatory programme over a relatively short period of time, incorporating the better elements from the more established national programmes and adding new initiatives, such as the threat of using mandatory warning labels for products that fail to meet standby power targets."



Source : Energy efficiency policy recommendations prepared by the IEA for the G8 under the gleaneagles plan of action (21 March 2008)

1- Refrigerators

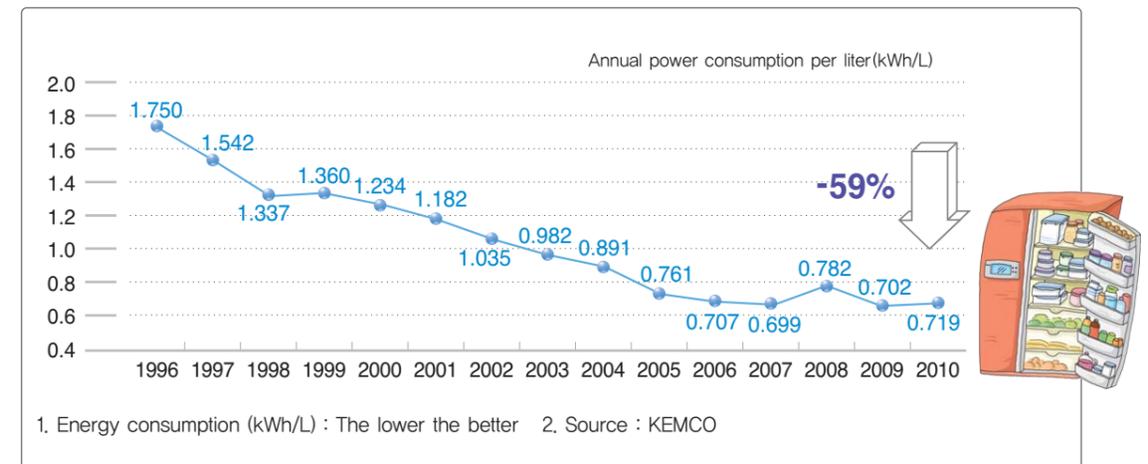


The Energy efficiency improvement of refrigerators is a success story. As shown in the table below, refrigerators' annual energy consumption decreased from 1.750 kWh/L (1996) to 0.719 kWh/L (2010), over 59% in 14 years.

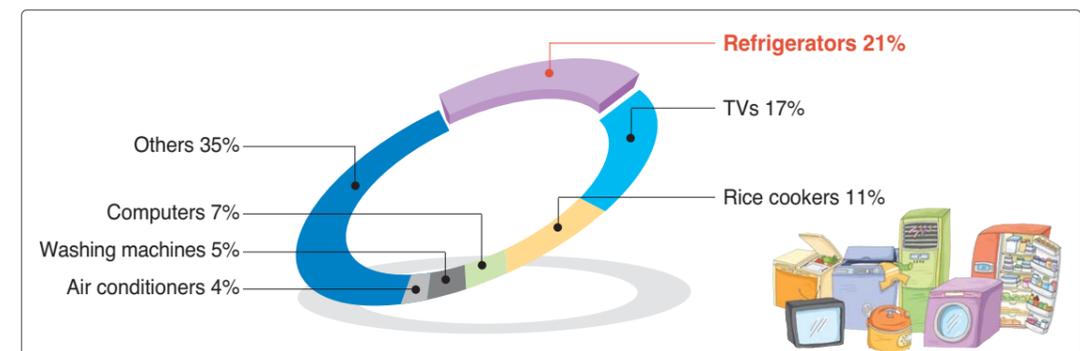
For example, 530L class refrigerator's monthly power consumption decreased from 71 kWh/month (1996) to 35 kWh/month (2010), over 50%, through energy efficiency improvements.

Refrigerators account for 21% of household power consumption and they are the most energy intensive appliances among the household appliances.

Trend of energy consumption of refrigerators (annual kWh/L)



Refrigerators' portion in household power consumption



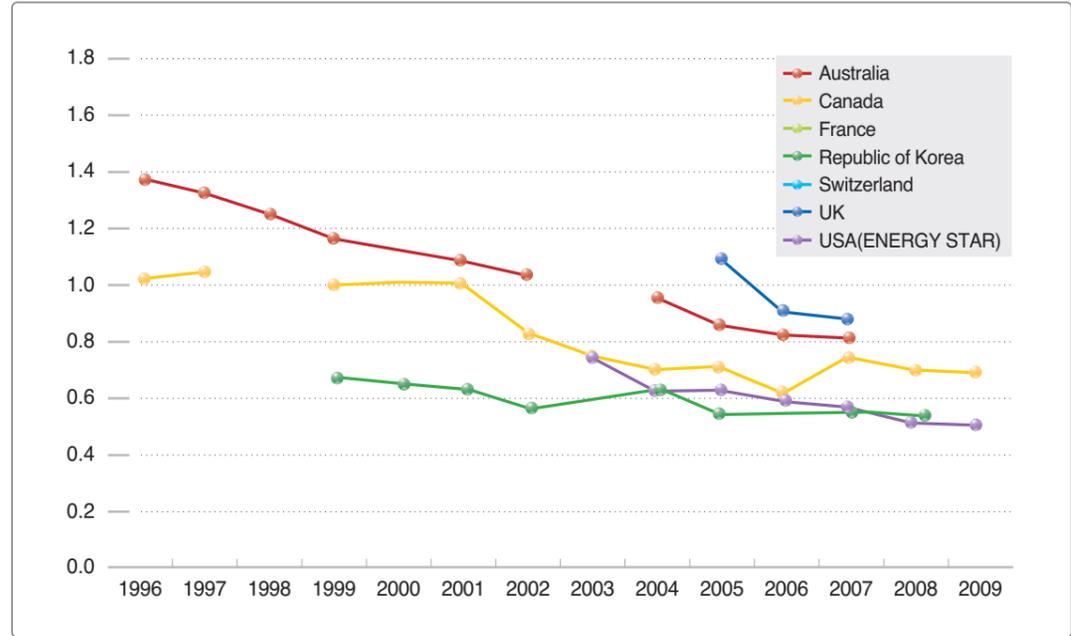
Comparison results of IEA 4E energy efficiencies of refrigerators

For the first time in the world, the 7 IEA member countries (USA, Canada, UK, France, Switzerland, Australia, Korea) participating in the IEA 4E Mapping & Benchmarking Annex (leading country: UK, international energy efficiency comparison project) conducted an international comparison on the energy efficiency of refrigerators.

This international project is conducted by adjusting measuring differences of energy efficiencies between countries so that a harmonized measuring standard can be applied.

The results of annual power consumption per adjusted volume showed USA(ENERGY STAR) as the leading country with the least power consumption of refrigerators, followed by Korea, Canada, Australia and the European countries. However, unlike other countries, USA provided only ENERGY STAR refrigerator data which are within the top 25% energy efficiency range. Considering the fact that Korea's data covers refrigerator efficiency grade from 1st to 5th, it is reasonable to conclude that energy efficiency of Korea's refrigerator is the highest in the world.

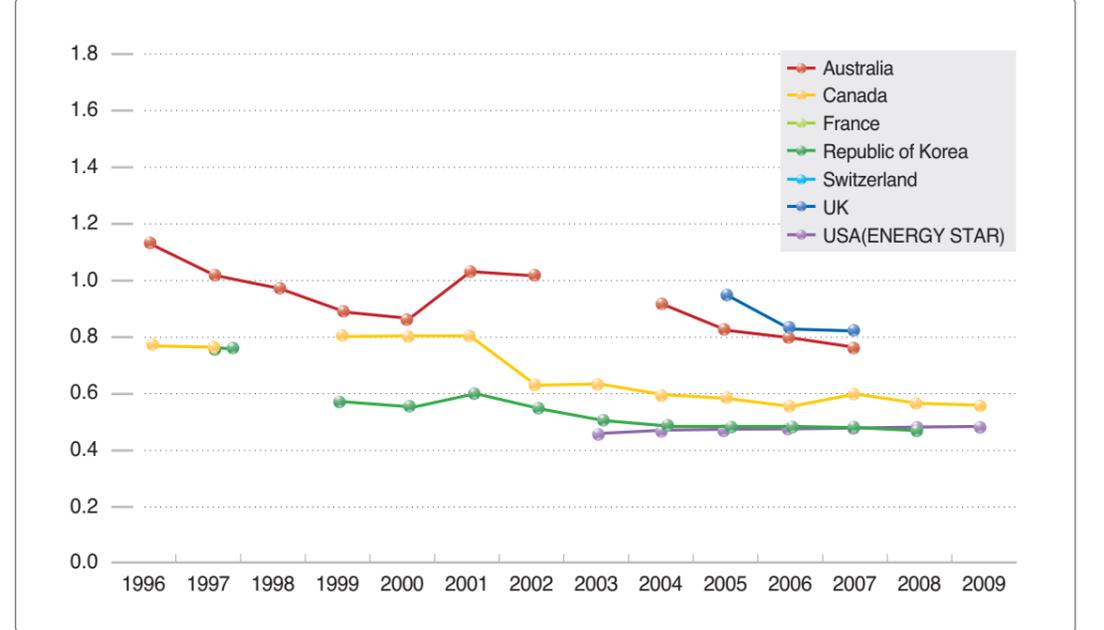
Annual power consumption per adjusted volume



1. Source : IEA 4E Mapping & Benchmarking Annex
2. The lower the number the better the energy efficiency

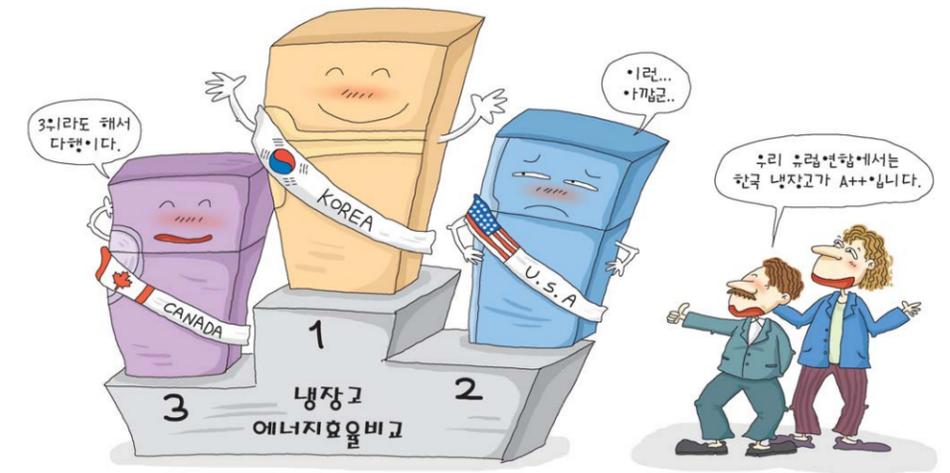
In the comparison of power consumption per liter, Korea's refrigerators' energy efficiency topped the list, followed by USA(ENERGY STAR), Canada, Australia and the European countries.

Annual energy consumption per 1 liter



1. Source: IEA 4E Mapping & Benchmarking Annex
2. The lower the number the better the energy efficiency

Currently Korean refrigerators of 1st grade energy efficiency level are equivalent to EU's A++ level which is a very high energy efficiency level.



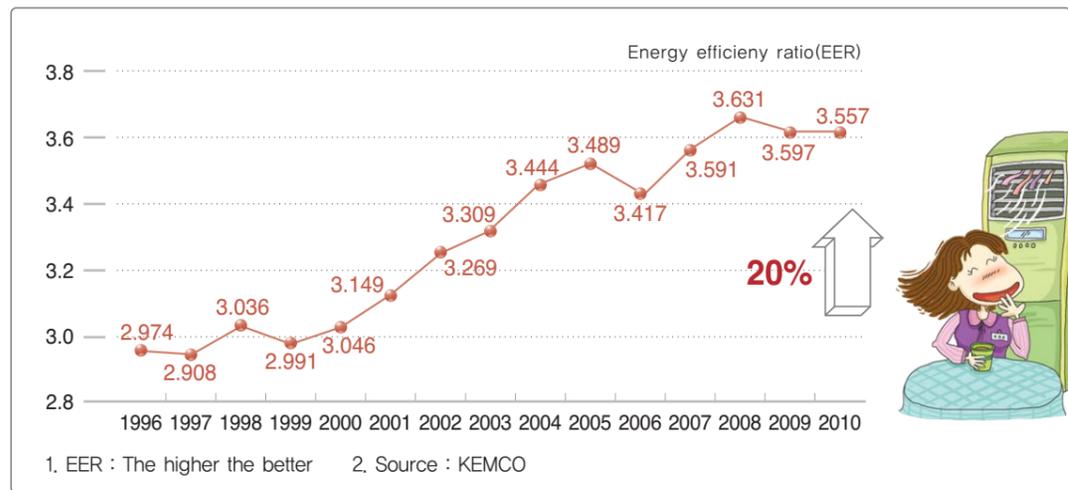
Energy and Low Carbon Green Growth
Three Major Energy Efficiency Programs
Promotion of High-efficiency Appliances
Accomplishments over the 19 years of Implementing Energy Efficiency Management Policies
Market Transformation Through Energy Efficient Appliances
International Cooperation and Current Overview of Energy Efficiency
International Energy Efficiency Standards and Labeling

2 Air Conditioners



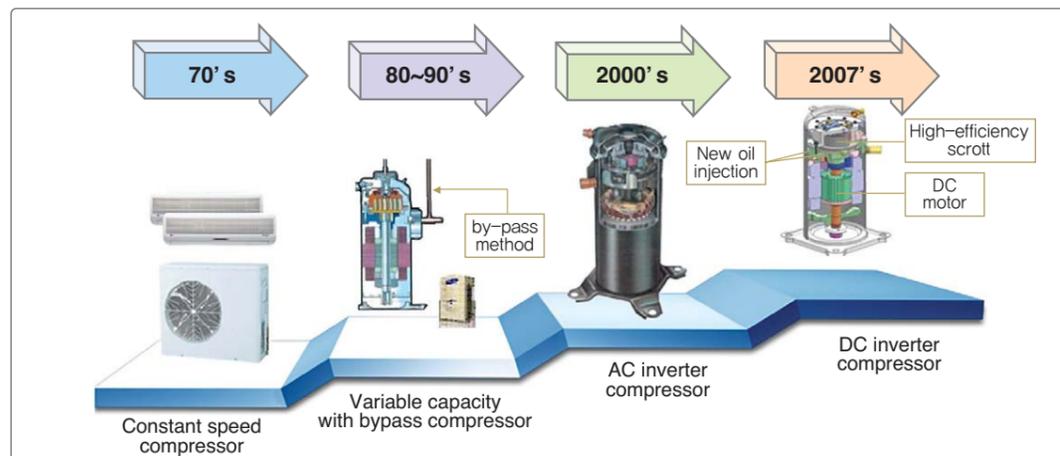
Along with refrigerators, air conditioners also boast world class energy efficiency. The energy efficiency ratio of air conditioners increased from 2.974 (1996) to 3.557 (2010), 20% over 14 years.

Trend of air conditioners EER



Air conditioners' high energy efficiency is closely linked to rapid technology developments of compressor which is a core component of air conditioners. In particular, the emergence of inverter technology in 2000s significantly improved the energy efficiency of air conditioners.

The evolution of air conditioner compressor technology

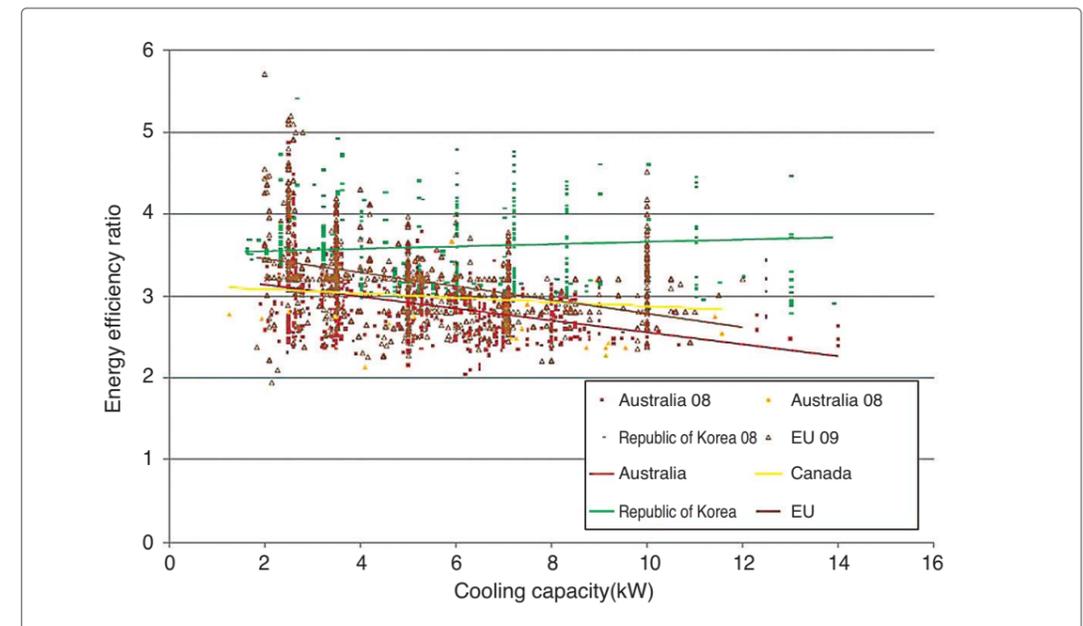


Comparison results of IEA 4E energy efficiencies of air conditioners

The 10 IEA member countries (USA, Canada, UK, France, Switzerland, Austria, Denmark, Netherlands, Australia, Korea) participating in the IEA 4E Mapping & Benchmarking Annex (leading country: UK, international energy efficiency comparison project) conducted an international comparison on the energy efficiency of air conditioners.

The results showed Korea as the leading country with the best energy efficiency (EER) followed by Canada, EU, and Australia .

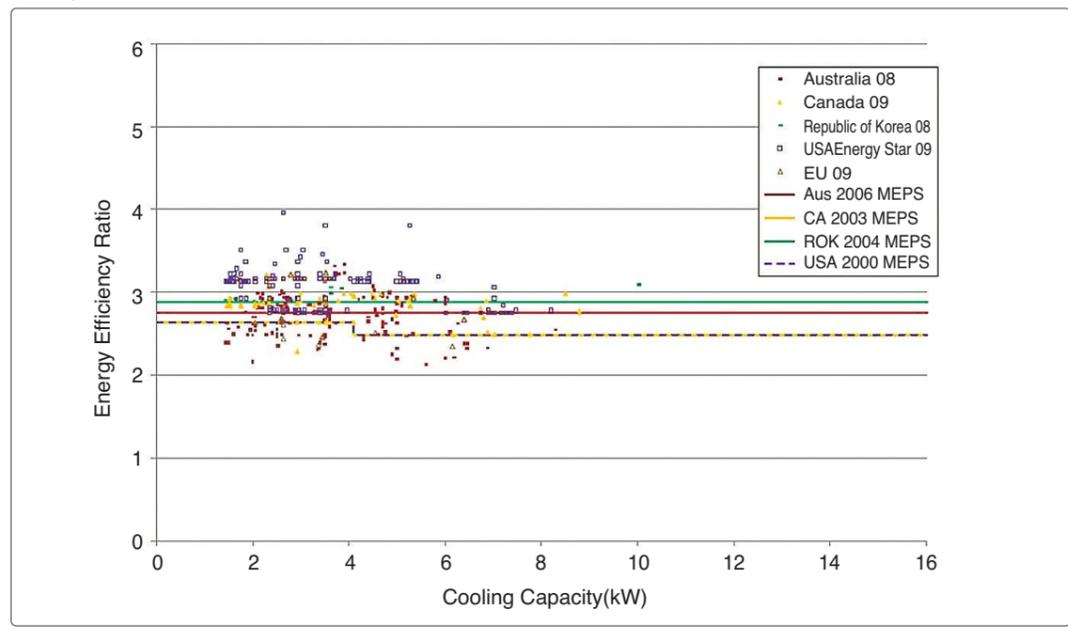
IEA 4E report, comparison of energy efficiency of air conditioners (EER)



1. Source : IEA 4E Mapping & Benchmarking Annex
2. The higher the number the better the energy efficiency

The comparison results of MEPS among countries showed Korea as the leading country with the best MEPS followed by Australia, USA and Canada.

III IEA 4E report, Comparison of MEPS of air conditioners

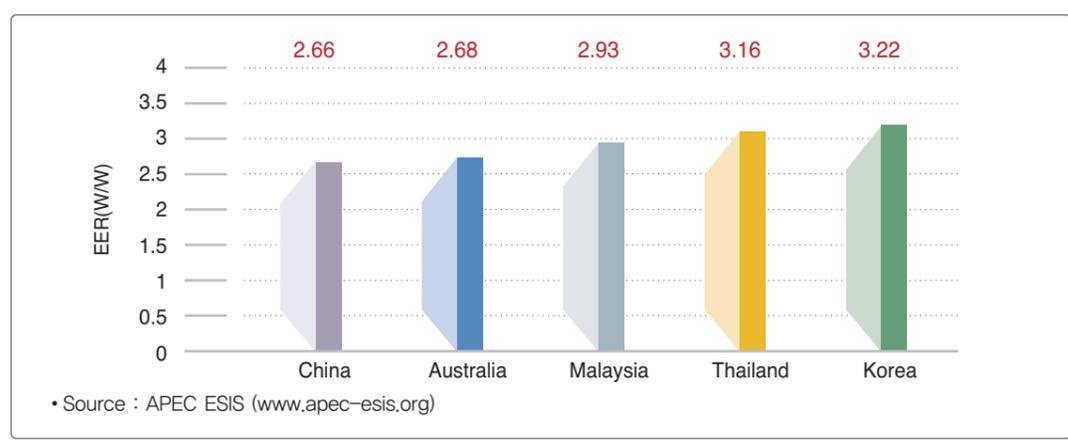


1. Source : IEA 4E Mapping & Benchmarking Annex
 2. The higher the number the better the energy efficiency

IV Comparison of air conditioners energy efficiency

In June 2004, Australian government commissioned DEM (Danish Energy Management), to conduct a survey of EER in 5 APEC countries (Korea, Australia, China, Thailand, Malaysia). The survey, which was sponsored by APEC, showed that Korea's air conditioners to have the highest energy efficiency.

III Comparison of air conditioners energy efficiency



• Source : APEC ESIS (www.apec-esis.org)

3 Washing Machines

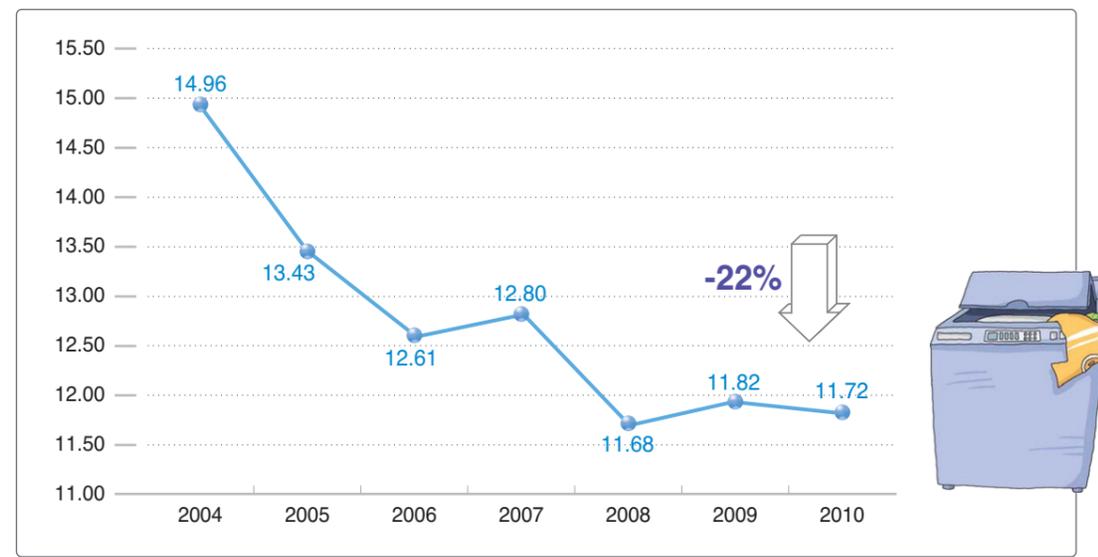


There are two kinds of washing machines (general and drum types). In general, drum washing machines consumes more power than general washing machines (4 to 5 times)

IV General washing machines

General washing machines' power consumption decreased from 14.96 Wh/kg (2004) to 11.72 Wh/kg (2010), over 22% in just 6 years since the implementation of Energy Efficiency Label and Standard Program.

III Trend of energy consumption of general washing machines per 1kg washing load (Wh/kg)



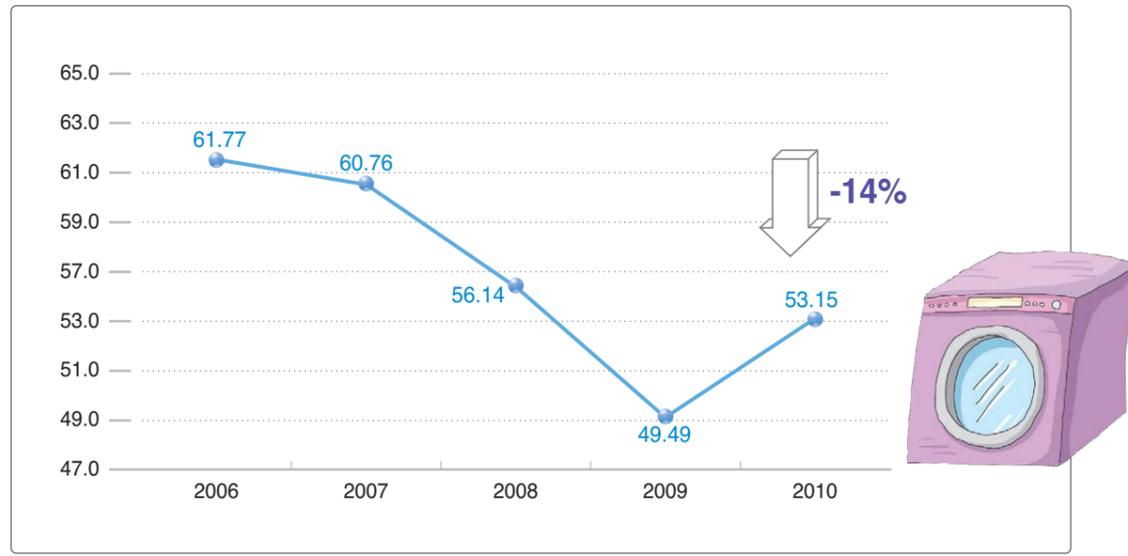
1. Power consumption (Wh/kg) : The lower the better
 2. Date of program implementation : January 1st 2004
 3. Source : KEMCO

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Drum washing machines

Drum washing machines' power consumption decreased from 61.77 Wh/kg (2006) to 53.15 Wh/kg (2010), over 14% in just 4 years since the implementation of Energy Efficiency Label and Standard Program.

Trend of energy consumption of drum washing machines per 1kg washing load (Wh/kg)



1. Power consumption (Wh/kg) : The lower the better
2. Date of program implementation : January 1st 2006
3. Source : KEMCO

Since 2011 the efficiency standards of drum washing machines have significantly strengthened. In particular, in addition to power consumption per 1kg washing load, drum washing machines should simultaneously satisfy water efficiency (L/kg), washing performance, and standby power requirements in order to qualify for 1st grade efficiency level.



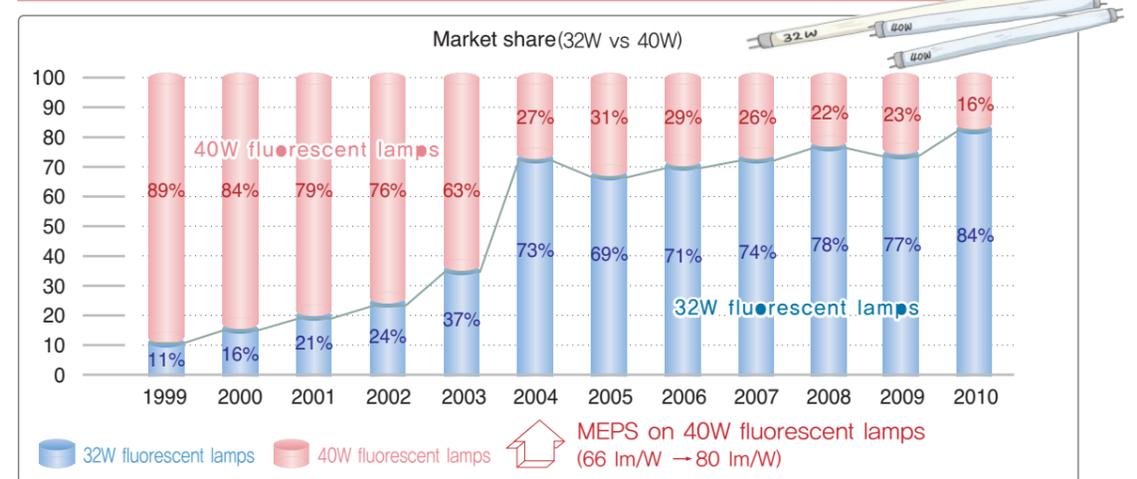
4- 32W Fluorescent Lamps (Replacing 40W Fluorescent Lamps)



Replacement of 40W fluorescent lamps with 32W fluorescent lamps, which have 20% more energy saving potential, is a successful example of transforming the lighting equipment market.

The increase of the MEPS standard (66 lm/W → 80 lm/W) for 40W fluorescent lamps in January 2004 accelerated the replacement of 40W fluorescent lamps with 32W fluorescent lamps. As shown in the table below, the market share of 32W fluorescent lamps (10~30%) drastically increased to 70% in 2004. Except for compact fluorescent lamps, the stricter MEPS standards virtually ended the production and sales (import) of 40W fluorescent lamps, thereby transforming the market.

Status of replacement of 40W fluorescent lamps with 32W fluorescent lamps



	32W fluorescent lamps	40W fluorescent lamps	Total
1999	4,522,305 (10.9%)	37,099,560 (89.1%)	41,621,865 (100.0%)
2000	8,028,112 (15.8%)	42,693,783 (84.2%)	50,721,895 (100.0%)
2001	9,558,929 (21.3%)	35,261,495 (78.7%)	44,820,424 (100.0%)
2002	10,748,654 (24.3%)	33,541,005 (75.7%)	44,289,659 (100.0%)
2003	12,046,821 (36.8%)	20,671,395 (63.2%)	32,718,216 (100.0%)
2004	18,720,707 (73.3%)	6,828,404 (26.7%)	25,549,111 (100.0%)
2005	19,661,914 (69.2%)	8,770,696 (30.8%)	28,432,610 (100.0%)
2006	22,012,995 (70.6%)	9,178,902 (29.4%)	31,191,897 (100.0%)
2007	21,651,593 (74.0%)	7,616,113 (26.0%)	29,267,706 (100.0%)
2008	19,589,649 (78.3%)	5,438,960 (21.7%)	25,028,609 (100.0%)
2009	14,538,201 (77.1%)	4,318,360 (22.9%)	18,856,561 (100.0%)
2010	19,090,833 (83.9%)	3,648,878 (16.1%)	22,739,711 (100.0%)

Source : KEMCO

5- LED Guide Lights



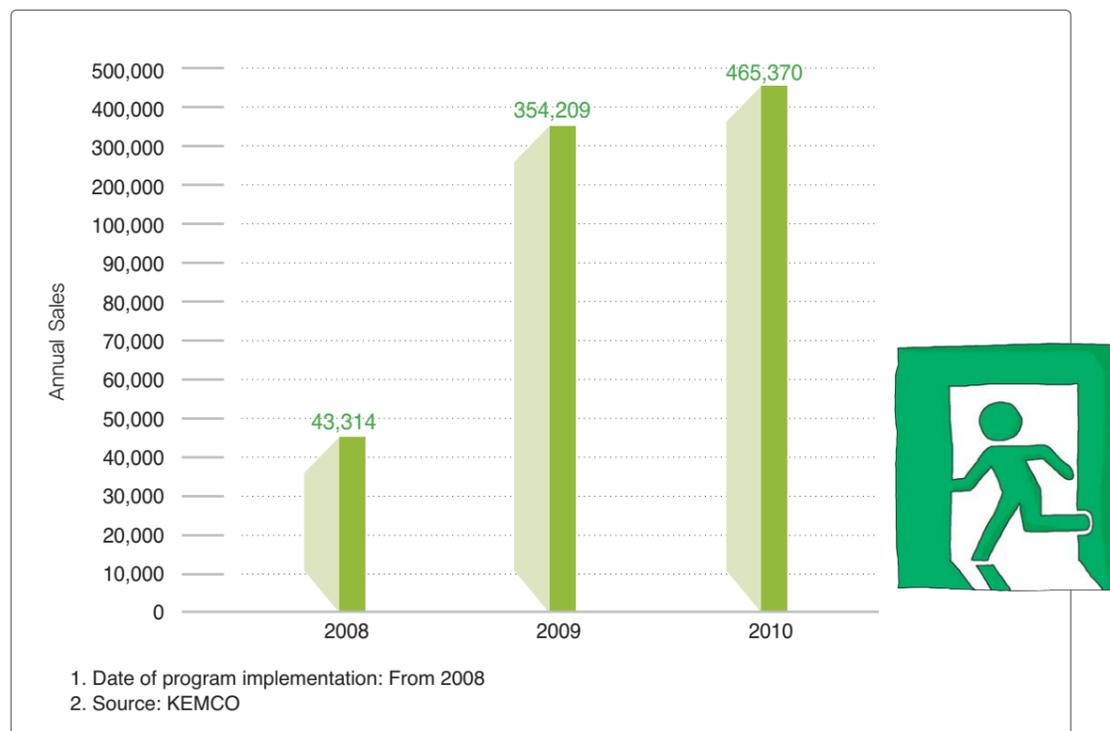
6- Heat Recovery Ventilators



The dissemination of LED guide lights is the most active among LED lights. The number of high-efficiency certified LED guide lights increased rapidly from 40,000 in 2008 to 470,000 in 2010.

Such rapid dissemination of LED lights can be attributed to tax exemptions, subsidies and other various incentives. In particular, prescribing the recommended use of high-efficiency certified LED guide lights in the building codes helped the active dissemination of LED guide lights.

III Status of the promotion of LED guide lights

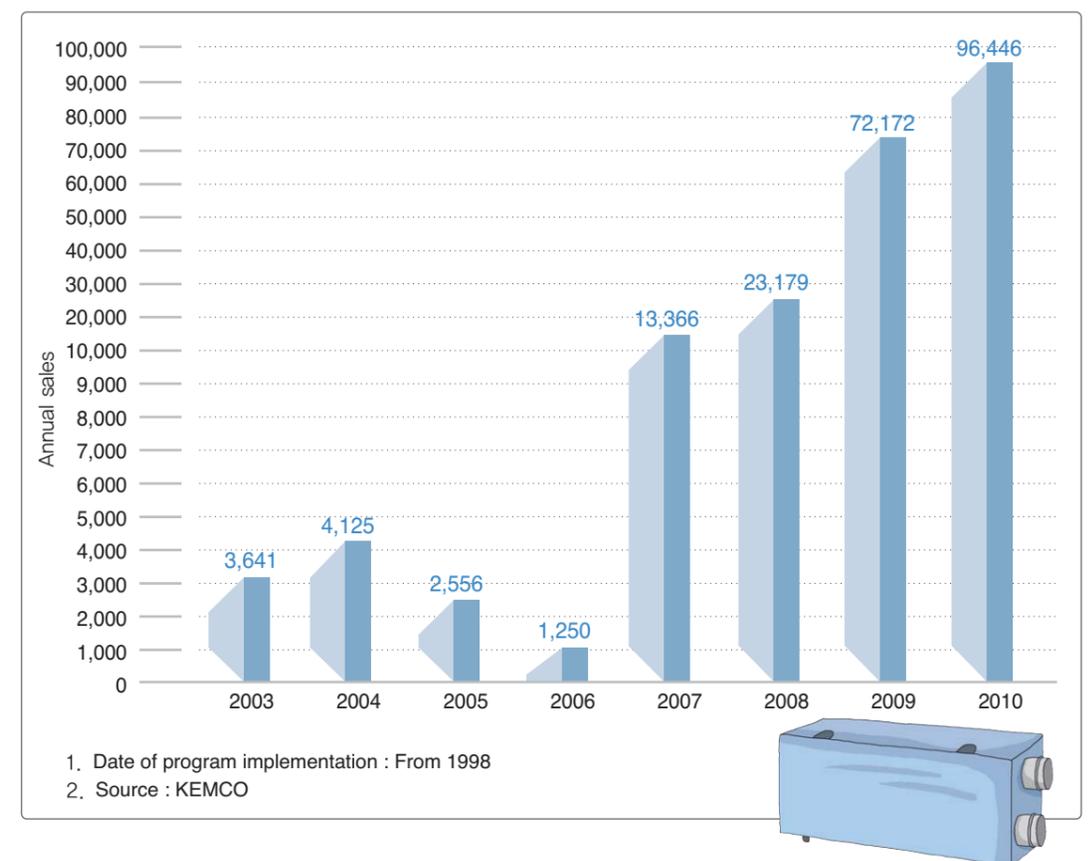


While opening a window does provide ventilation, the building's heat and energy will be lost inevitably. Heat recovery ventilators employ a system that recovers these energy and provides fresh air. By installing a heat recovery ventilation system, heat loss due to ventilation can be recovered from 75% to 93%. At the same time, the capacity of cooling a heating requirements of coolers and boilers can be reduced significantly.

Since 1998, the dissemination of heat recovery ventilators have been encouraged through high efficiency energy appliance certification. The establishment of recommendation on the adoption of building codes sparked the sharp increase of heat recovery ventilators dissemination.

As a consequence, the number of heat recovery ventilators increased from 4,000 in 2003 to 96,000 in 2010 which is a 26 fold increase.

III Status of the promotion of heat recovery ventilators



7 External Power Supplies



Over 50 million external power supplies are manufactured annually and they are core target products of standby power 1W policy. About one third of all standby power consuming appliances can be attributed to external power supplies. External power supplies are managed under the e-Standby Program which is voluntary until 2008.

The implementation of MEPS on January 2009 acted as a major stimulus to transform the external power supplies market to energy efficient product market. The same standards and existing "Regulation on e-Standby Program" are transferred to the "Regulation on machinery and materials subject to efficiency management". As a consequence, the low reporting number for registration under a voluntary reporting basis increased dramatically to over 1000 different models of external power supplies by March 2009. This is ten fold increase from the period when it was implemented on a voluntary basis.

Accordingly from 2009, all external power supplies with energy wasting linear types are no longer available in the market. Energy efficient SMPS type external power supplies are being circulated into the market.



Linear Adapter



Switching Adapter

MEPS for external power supplies

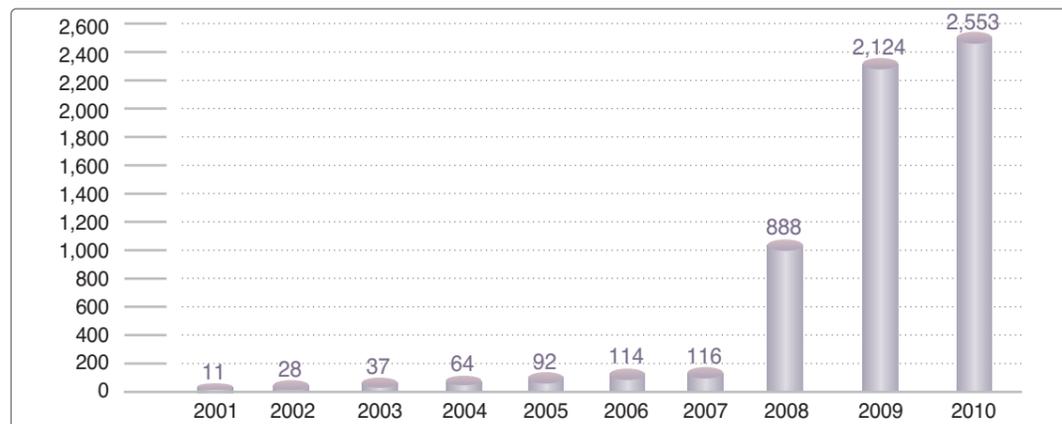
Adaptors (No charging function)

Nameplate output power(Pno)	Active mode energy efficiency	Nameplate output power(Pno)	Standby power(No load)
0 < Pno ≤ 1W	≥ 0.49 × Pno	0 < Pno ≤ 10W	≤ 0.5W
1W < Pno ≤ 49W	≥ [0.09 × Pn] + 0.49	10W < Pno ≤ 150W	≤ 0.75W
49W < Pno ≤ 150W	≥ 0.84		

Chargers (For lithium-ion battery)

Input Power(Pin)	Standby Power(No load)
0W < Pin ≤ 10W	≤ 0.5W
10W < Pin ≤ 20W	≤ 0.75W

Models of external power supplies



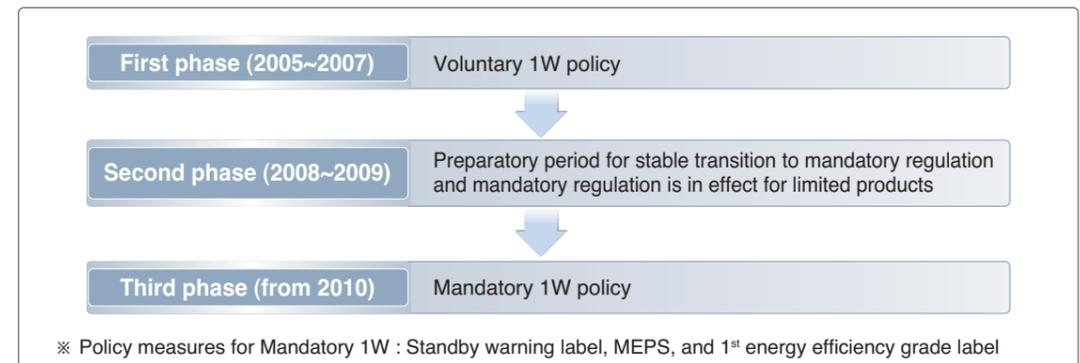
Source : KEMCO

8 Accomplishments of the Standby Power 1W policy



In July 2005, Ministry of Knowledge Economy and KEMCO established "Standby Korea 2010" which is a national roadmap to limit standby power to below 1W by 2010. The roadmap is composed of 3 phases. In the first phase (2005~2007), 1W policy is established on a voluntary basis. The second phase (2008~2009) is a preparatory period for stable transition to mandatory regulation of the "Standby Korea 2010". Starting from the third phase (from 2010), all electronic goods traded in Korea are subject to mandatory standby power 1W policy.

Standby power 1W national roadmap "Standby Korea 2010"



Applying standby power ≤ 1W standard

Policy tools for ≤ 1W		Standby	Enforcement of date	Target products
e-Standby Program	Standby warning label 	≤ 1W (Off or passive standby)	28 Aug 2008	TVs
			1 Jul 2009	Computers, monitors, printers, multifunction devices, sep top boxes, microwave ovens
			1 Jul 2010 (draft)	VCRs, audios, DVD players, radios, toilet seats, cord/cordless phones, door phones, modems, fax machines, copiers, scanners, home gateways
Energy Efficiency Label and Standard Program	MEPS 1 st energy efficiency grade label 	≤ 0.5W (No load) ≤ 1W (Off or passive standby) ≤ 3W (Sleep or active standby)	1 Jan 2009	External power supplies
			1 Jan 2007	Washing machines, dish washers
			1 Jan 2008	Rice cookers
			1 Jul 2008	Air cleaners
			1 Jan 2009	Drum washing machines, electric fans
			1 Jan 2010	Air conditioners, household gas boilers
1 Jan 2011	Dish dryers, gas water heaters			

Implementation of world's first standby warning label scheme

In accordance to Standby Korea 2010, Korea became the first country in the world to implement the standby warning label scheme in 2008. Through the revision of Rational Utilization of Energy Act in 2008, standby warning label scheme was applied to TV for the first time among the 20 products covered by the e-Standby Program (August 28th 2008) and the remaining 19 products are designated as standby warning label target products (July 1st 2010).

Once designated as standby warning label target product, relevant manufacturers or importers of such designated products must ① report the standby power and ② display warning label to those products that do not meet the required standards of standby power reductions. In the case of violating these mandatory requirements, a fine of 5 thousand dollars will be charged.



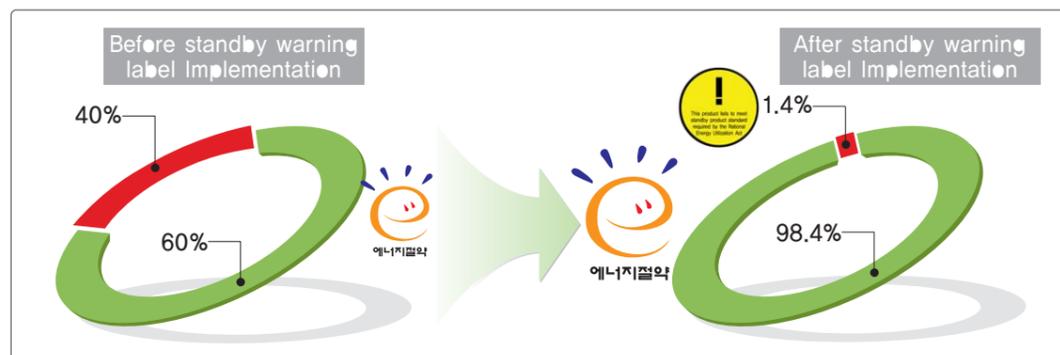
Relevant legal basis

Article 19 Rational Utilization of Energy Act, e-Standby Program application regulation based on Article 14 enforcement regulations of Rational Utilization of Energy Act (Ministry of Knowledge Economy notification)

Standby warning label target products

Implementation date	Standby warning label target products
From 8. 28. 2008	TVs (1 product)
From 7. 1. 2009	Computers, monitors, printers, multi-function devices, set-top boxes, microwave ovens (6 products)
From 7. 1. 2010	Fax machines, copiers, scanners, video cassette recorders, home audio products, DVD players, Radios, door phones, cord/cordless phones, bidets, modems, home gateways (12 products)

The implementation of standby warning label scheme has been successful. According to the analysis of production and sales data of 19 products designated as the standby warning label target products, conducted at the end of year 2010, the market share of high standby power reduction products was 60% in 2008(TV in 2007). That same figure increased to 98.6% in 2010. On the other hand, the market share of these 19 products designated as the standby warning label target products was only 1.4%.



The effects of implementing standby power warning label scheme by products

ITEM	2010		2010		Date of Implementation on standby warning label
	Energy Boy labeled products	Standby warning labeled products	sales	Market share	
Computers	4,288,599	99.7%	11,790	0.3%	2009. 7. 1
Monitors	5,667,093	99.97%	1,462	0.03%	2009. 7. 1
Printers	653,969	99.9%	587	0.1%	2009. 7. 1
Fax machines	89,875	100%	-	-	2010. 7. 1
Copiers	2,985	100%	-	-	2010. 7. 1
Scanners	34,108	99.5%	182	0.5%	2010. 7. 1
Multi-function devices	955,449	99.9%	1,361	0.1%	2009. 7. 1
TVs	2,958,525	100%	6	-	2008. 8. 28
VCRs	24,391	100%	-	-	2010. 7. 1
Home audio	921,780	96.6%	32,595	3.4%	2010. 7. 1
DVD players	308,459	99.0%	3,200	1.0%	2010. 7. 1
Radio cassette players	90,619	85.5%	15,360	14.5%	2010. 7. 1
Microwave ovens	940,650	100%	-	-	2009. 7. 1
Set top boxes	2,244,063	99.6%	8,085	0.4%	2009. 7. 1
Door phones	831,492	100%	-	-	2010. 7. 1
Cord/cordless phones	699,813	97.5%	17,792	2.5%	2010. 7. 1
Bidets	882,681	100%	70	-	2010. 7. 1
Modems	152,914	41.4%	216,845	58.6%	2010. 7. 1
Home gateways	541,315	100%	-	-	2010. 7. 1
Total	22,288,780	98.6%	309,335	1.4%	

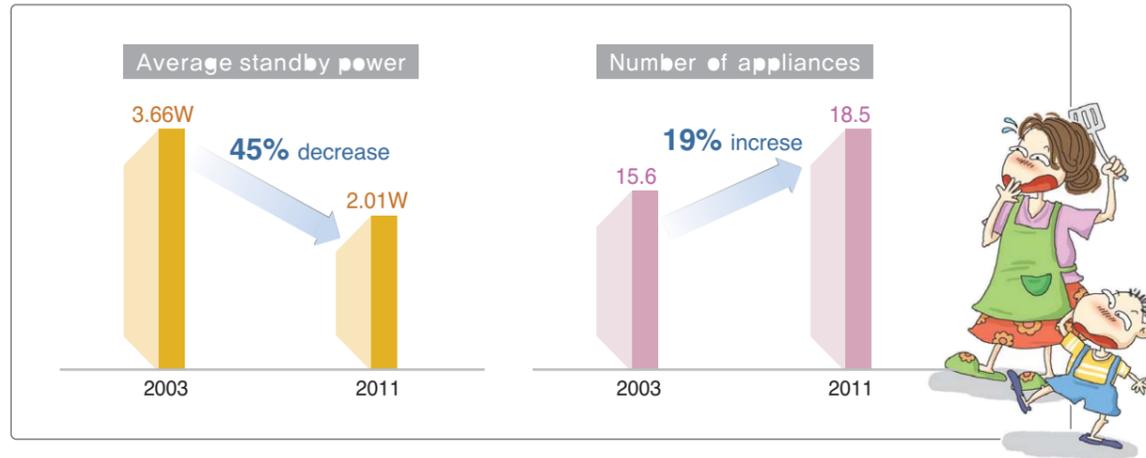
Standby power of an appliance in the household decreased 45%

According to the measurements taken from the households, the standby power of an appliance in the household decreased 45 % in comparison to 2003(3.66W per appliance in 2003 to 2.01W in 2011).

Considering the fact that many of the household appliances in the market already have achieved standby power below 1W and the rapid supply of high efficiency household appliances in the market, the average standby power of appliances in the household are expected to be below 1W within next 2 years. This success is deemed to be an outcome of combined efforts of government's 1W policy since 2005 and the electronic industry to reduce standby power.



III The change in standby power after the implementation of standby power 1W policy



The total annual standby power decreased 25% (1,130GWh/year). The total standby power decreased from 4,600GWh/year in 2003 to 3,470GWh/year in 2011. When converted to in monetary terms, such a decrease is equivalent to annual saving of \$US136 million KRW in 2011. Annual standby power consumption per household decreased 32% from 306kWh(2003) to 209kWh(2011).

• Performance of 'Standby Korea 2010'

Category	2005	2010	
		Objectives	Performance
Annual standby power consumption	4,600GWh (\$US550 million)	3,500GWh	3,470GWh (\$US416 million)
Annual standby power consumption per household	306kWh	-	209kWh
Number of target equipments	18	30	31
Average standby power in household	3.66W	2.5W	2.01W
Standby power 0.5W diffusion rate	22%	40%	53%
Annual standby power reduction effect	-	1,100GWh	1,130GWh (\$US136 million)

• Comparison of standby power consumption

Category	2003	2011	Remark
Annual standby power consumption	4,600GWh	3,470GWh	-25%
* Annual savings	(\$US550 million)	(\$US416 million)	(\$US-136 million)
Annual standby consumption per household	306kWh	209kWh	-97kWh
* Rate	(11.0%)	(6.1%)	(-32%)
Average standby power per product	3.66W	2.01W	-45%
Number of appliances in household	15.6	18.5	19%

* Source : KERI

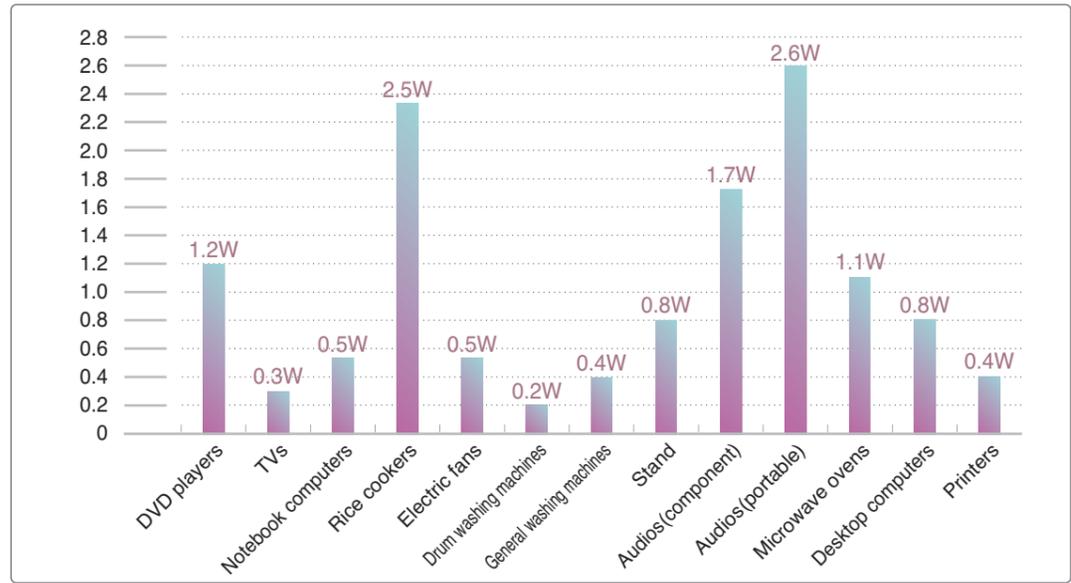
IV Comparison of standby power of household appliance

The comparison result of standby power of household appliances after the implementation of standby power 1W policy is as follows:





Standby power of appliances in the market in 2011



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Market Transformation through Energy Efficient Appliances

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Market Transformation through Energy Efficient Appliances

Ministry of Knowledge Economy (MKE) and Korea Energy Management Corporation (KEMCO) plan to transform the market by a policy of introducing energy efficient appliances.

As for 3 phase electric motors, which account for 40% of national power supply, general motors will be phased out of market and they will be replaced by premium motors. Domestic gas boilers, which account for 50~60% of city gas consumption, will be replaced by energy efficient gas condensing boilers. As for lighting equipments, incandescent lamps and ordinary lamps will be phased out of market and they will be replaced by compact fluorescent lamps and LED lights.

Energy efficiency management plans for peak power inducing electric heating equipments will be established. Energy intensive equipments will be designated as efficiency management target products. Standards of energy frontier scheme will be adopted and the plans for Standby Korea 2015 will be established. Furthermore power measuring methodologies will be harmonized with respect to the international standards and the carbon dioxide emissions will be displayed in the energy efficiency labels.

Market transformation through energy efficient appliances

	Market transformation policy	Current	Future
3 phase electric motors	Minimum Energy Performance Standard for premium motors(IE3)	High efficiency motors(IE2) 	Premium motors(IE3) 
Domestic gas boilers	Unifying the efficiency grade standards	Regular gas boilers 	Condensing gas boilers 
Lighting equipments	Phase out of incandescent lamps	Incandescent lamps 	Compact fluorescent lamps 
	Promoting LED lights	General lights 	LED lights 
Household appliances	Adopting energy frontier scheme	Regular household appliance 	Ultra high efficiency household appliance 
Standby power	Standby power $\leq 1/2W$ policy	$>1W$ 	$\leq 0.5W$ 

Analysis of policy impacts on market transformation

National energy efficiency efforts can be realized through energy efficiency improvements with the successful implementation of a energy efficient appliances dissemination policy and the phase out of low efficiency appliances.

MKE and KEMCO are operating three major energy efficiency management programs (Energy Efficiency Label and Standard Program, High-efficiency Appliance Certification Program, e-Standby Program) and diverse supporting programs to transform the market by switching to energy efficient appliances.

As for the energy efficient appliance dissemination policy, there is the 1st grade energy efficiency product dissemination program, the high-efficiency appliances certification program and the e-Standby Program (Energy Boy label). Also, financial rebates are available for promoting high efficiency appliances to the market.

Allowing excessive energy consumption from low efficiency appliances worsens the leakage of energy. The application of MEPS, energy labels (1-5 grade), and standby warning labels are examples of policies intended to phase out low efficiency appliances. In reality however, the implementation of a mandatory phase out policy for low efficiency appliances has a more significant impact on the market than the energy efficient appliance dissemination policy. In particular, MEPS is the most effective among the policies outlined in the Rational Energy Utilization Act.

Market transformation policy measures of three major efficiency programs

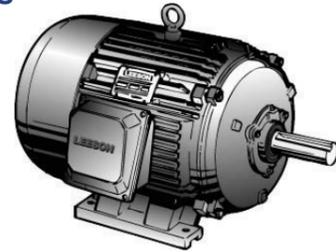
Types	Phase out of low efficiency appliances	Dissemination of energy efficient appliances
Energy Efficiency Label and Standard Program (Mandatory)	Applying MEPS	-
	Energy efficiency grade label (5 th grade) 	Energy efficiency grade label (1 st grade) 
High-efficiency Appliance Certification Program (Voluntary)	-	High-efficiency appliance certification 
e-Standby Program (Standby warning label : mandatory, Energy Boy label : voluntary)	Standby warning label 	Energy Boy label 
Promotion of high-efficiency appliances	-	Rabates

1 - 3 Phase Electric Motors, Mandatory Transition to Premium Motors (IE3)

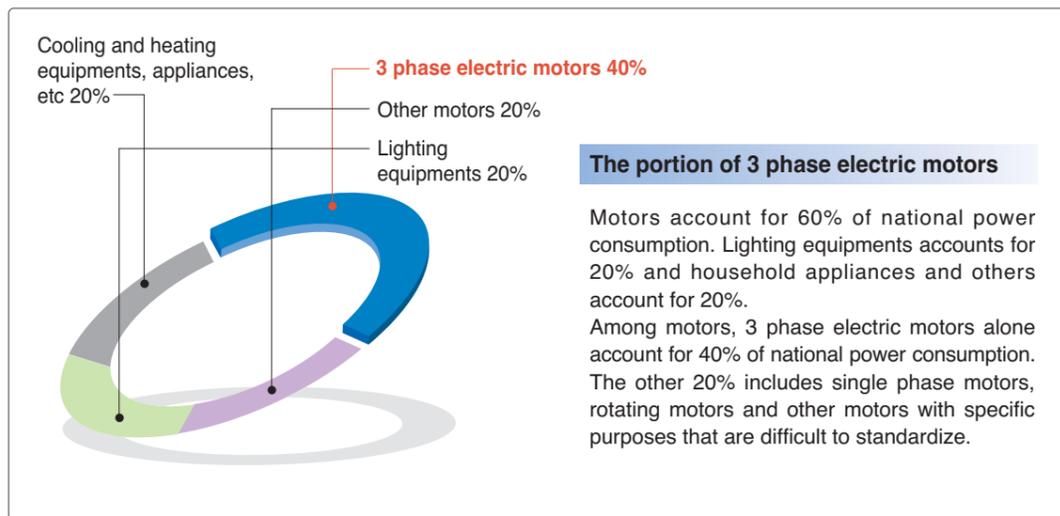


The importance of 3 phase electric motors

As a single unit of machinery, 3 phase electric motors account for 40% of national power consumption. Therefore, it is crucial to promote high efficiency motors in the 3 phase electric motor market.



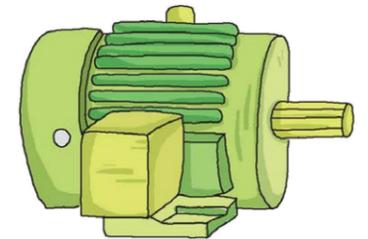
The importance of 3 phase electric motors in energy efficiency



Development stages of three phase electric motors

Depending on the level of energy efficiency, 3 phase electric motors are categorized in the order of standard efficiency motors (IE1) → high efficiency motors (IE2) → premium efficiency motors (IE3) → super premium efficiency motors (IE4)

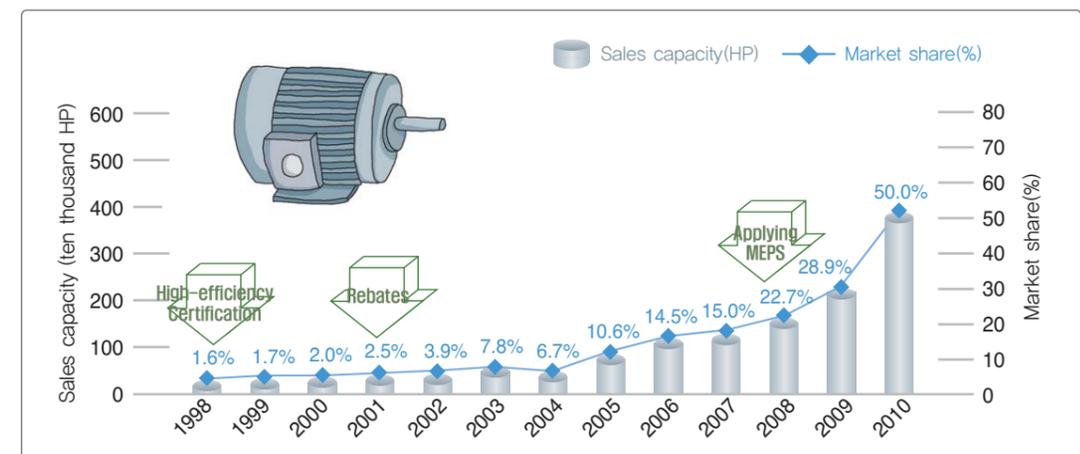
The standard efficiency motors (IE1) in the market are KS C 4202 standard motors or non-standard motors. High efficiency motors (IE2) have higher efficiency than standard efficiency motors (4~5%), and premium efficiency motors (IE3) have higher efficiency than high efficiency motors (2~3%). Super premium efficiency motors (IE4) have 1~2% higher efficiency than premium motors.



Generation shift of 3 phase electric motors

Types	Types of 3 phase electric motors	Efficiency standard	Domestic market share	Remarks
1 st generation	Standard efficiency motors (IE1)	-	50%	-
2 nd generation	High efficiency motors (IE2)	4~5% higher efficiency than standard efficiency motors	50%	<ul style="list-style-type: none"> Korea implements MEPS (since 2008) EU implements mandatory policy through EcoDesign (from 2011) China implements MEPS (from 2011)
3 rd generation	Premium efficiency motors (IE3)	Higher efficiency than high efficiency motors (2~3%)	0%	<ul style="list-style-type: none"> USA and Canada has already implemented MEPS for premium motors (since 2011) EU plans to implement mandatory policy through EcoDesign (2015~2017)
4 th generation	Super premium efficiency motors (IE4)	1~2% higher efficiency than premium efficiency motors	0%	<ul style="list-style-type: none"> No domestic technology development case available

High efficiency motor(IE2) dissemination scenario under MEPS



Source : KEMCO

Plans for mandatory transition to premium efficiency motors (IE3)

MKE and KEMCO has drafted and implemented efficiency standards of premium efficiency motors (IE3) to 3 phase electric motors, which account for 40% of national power consumption, since April 1st 2012. Starting from 2015, all motors manufactured and sold in the market, gradually in several phases, should satisfy the standards for premium efficiency motors (IE3).

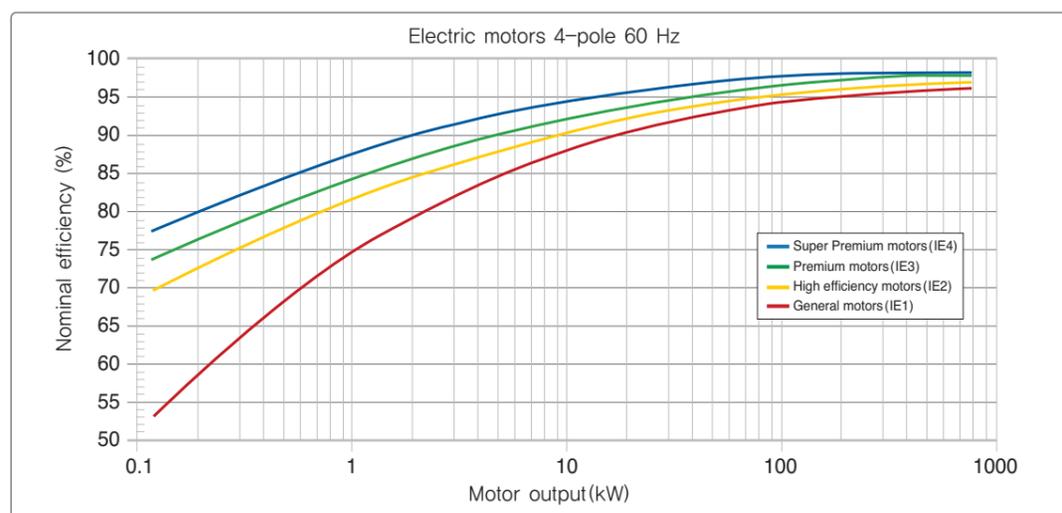
Starting from 2012 for 3 years, premium efficiency motors are supplied in the market as a pilot project. motor challenge program, which aims to promote manufacture, sales and technology development of premium efficiency motors through financial supports, will be established and implemented. In particular, technology support plans are being considered for the commercialization of premium efficiency motors under 37 kW produced mainly by small and medium sized companies.

Mandatory MEPS for premium efficiency motors (IE3) will be applied to large capacity motors (37kW~200kW), medium capacity motors (15kW~37kW) and small capacity motors (0.75kW~15kW) starting from 2015, 2016 and 2017 respectively.

3 phase electric motors, plans for transition to premium efficiency motors(IE3)

Policy	'12.4.1~'14.12.31	'15.1.1	'16.1.1	'17.1.1
Premium efficiency (Trial)	Promotion of premium efficiency motors (Financial and technology development support)	-	-	-
MEPS (Mandatory)	-	Large capacity (37kW~200kW)	Medium capacity (15kW~37kW)	Small capacity (0.75kW~15kW)
Manufacturers		Manufactured by large sized company		Manufactured by small and medium sized company

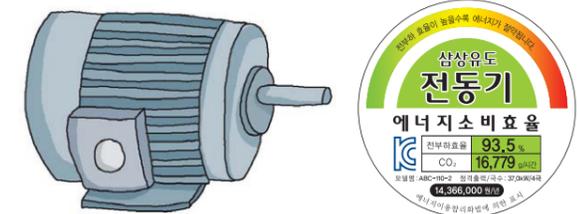
Efficiency standard of 3 phase electric motors



3 phase electric motors, standards for premium efficiency (IE3)

Related regulation and implementation period

“Operational regulation on machinery and materials subject to efficiency management” (Notification of Ministry of Knowledge Economy).



Scope

3 phase squirrel cage electric motors with power usage below 60Hz frequency and below 600V, under a refrigerant temperature of 50°C plus the following specifications:

- Classification: Protective or Closed
- Nameplate Output: 0.75kW ~ 200kW
- Poles: 2, 4, 6, 8
- Purpose & frame: Multipurpose frame
- Speed : Nameplate operation
- Type: Foot mount or flange
- Torque characteristics: Design A or B

Standards for premium efficiency (IE3)

Nameplate output (kW)	Protective type (%)				Closed type (%)			
	2 poles	4 poles	6 poles	8 poles	2 poles	4 poles	6 poles	8 poles
0.75	77.0	85.5	82.5	-	77.0	85.5	82.5	75.5
1.5	85.5	86.5	87.5	-	85.5	86.5	88.5	84.0
2.2	85.5	89.5	88.5	-	86.5	89.5	89.5	85.5
3.7	86.5	89.5	89.5	-	88.5	89.5	89.5	86.5
5.5	88.5	91.0	90.2	-	89.5	91.7	91.0	86.5
7.5	89.5	91.7	91.7	-	90.2	91.7	91.0	89.5
11	90.2	93.0	91.7	-	91.0	92.4	91.7	89.5
15	91.0	93.0	92.4	-	91.0	93.0	91.7	90.2
18.5	91.7	93.6	93.0	-	91.7	93.6	93.0	90.2
22	91.7	94.1	93.6	-	91.7	93.6	93.0	91.7
30	92.4	94.1	94.1	-	92.4	94.1	94.1	91.7
37	93.0	94.5	94.1	-	93.0	94.5	94.1	92.4
45	93.6	95.0	94.5	-	93.6	95.0	94.5	92.4
55	93.6	95.0	94.5	-	93.6	95.4	94.5	93.6
75	93.0	95.4	95.0	-	94.1	95.4	95.0	93.6
90	94.1	95.4	95.0	-	95.0	95.4	95.0	94.1
110	94.1	95.8	95.4	-	95.0	95.8	95.8	94.1
132	94.5	95.8	95.4	-	95.4	95.8	95.8	94.5
160	95.0	95.8	95.4	-	95.4	96.2	95.8	94.5
200	95.0	95.8	95.4	-	95.8	96.2	95.8	94.5

Measurement method

The measurement method follows the determination of loss and efficiency of the 3 phase electric motors in accordance with KS C IEC 60034-2-1.

Mandatory high efficiency motor policy in developed countries

Periods for mandatory implementation of high efficiency motors(selected countries)

Efficiency Levels 3-phase electric motors	Efficiency Classes	Testing Standard	Performance Standard
		IEC 60034-30 Global 2008 :rev.2012	IEC 60034-2-1 incl. stray load losses 2007/rev.2012
Super premium efficiency	IE4		
Premium efficiency	IE3		Canada Mexico USA Europe 2015 (2017<7.5kW)
High efficiency	IE2		Australia Brazil 2009 China 2011 Europe 2011 (2015+VSD) Korea 2008 New Zealand Switzerland 2012
Standard efficiency	IE1		Costa Rica Israel Taiwan

USA

The MEPS policy has been implemented under the “Energy Policy Act of 1992”, which limits the production and sale of only premium efficiency motors(IE3) from 2011. All electric motors are required to display their load efficiency and compliance certification number, issued by DOE, on the nameplate.

- Imposing \$110 fine for each violation of MEPS



EU

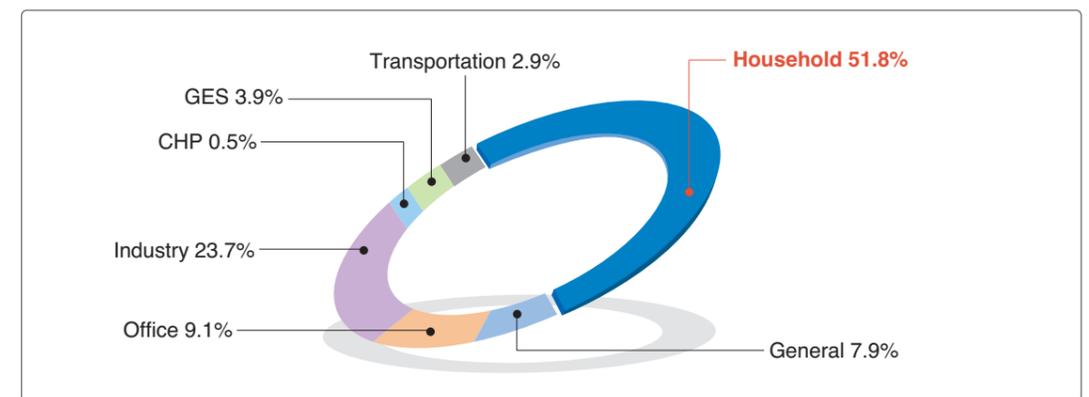
On March 2009, the EU's Ecodesign committee made a decision to implement mandatory high efficiency motors (IE2) from 2011. Starting from 2015, all 3 phase electric motors over 7.5kW will be replaced by premium efficiency motors (IE3). Starting from 2017 all 3 phase electric motors will be replaced by premium efficiency motors (IE3).

2 Promotion of Condensing Gas Boilers



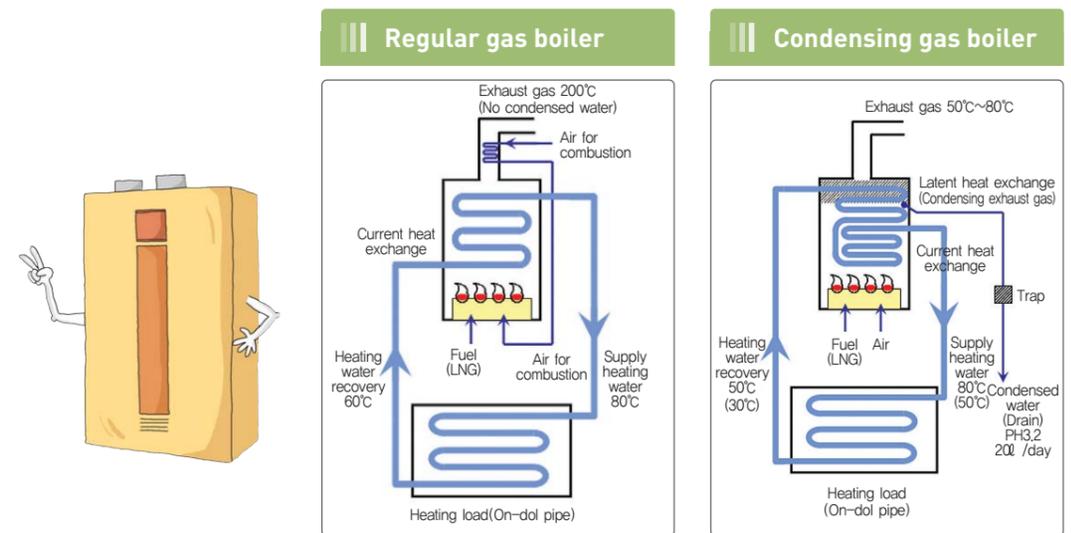
The importance of domestic gas boilers

Domestic gas boilers are energy intensive equipments which account for 50~60% of city gas consumption.



Source : Korea City Gas Corporation

In general, condensing gas boilers' heating efficiency is 6~9% higher than regular gas boilers in testing lab conditions. While the regular gas boilers freely emit heat in the water vapor, condensing gas boilers recover the heat in the water vapor and use them to heat up the water that passes through the heat exchanger.



❖ Condensing gas boilers save energy 10~28%

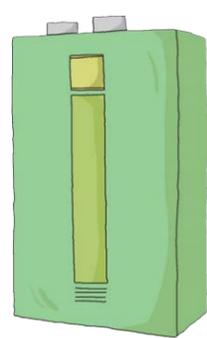
There has been a controversy whether condensing gas boilers save significant amount of energy in real residential environmental setting rather than in testing lab conditions. To resolve this problem, KEMCO requested Korea Gas Safety Corporation to see if there is a difference in gas consumption between regular and condensing gas boilers in real residential environmental setting rather than in testing lab conditions.

For one month (January ~ February 2008), Korea Gas Safety Corporation created a environment that is identical to a typical household. Then, a regular boilers and a condensing gas boilers were activated at temperature settings of 19°C, 23°C, and 26°C. Then the gas consumption of the two kind of boilers were measured. As a result, the condensing gas boiler's fuel efficiency was 9.7~28.4% higher than the regular gas boiler. The general theory tested in the lab that the heating efficiency of condensing gas boiler is higher than the regular gas boiler is confirmed once again through this experiment. Furthermore, the result shows that test conducted in the real environment has wide gap in heating efficiency between regular and condensing gas boilers than tests conducted in lab conditions.

❖ Unifying the efficiency grade standards

It is obvious that the condensing gas boilers deserve to get the highest energy efficiency grade since its' superior heating efficiency over regular gas boilers has been proven both in real and testing lab conditions.

Consequently, starting from 2010, both regular and gas condensing boilers have adopted heating efficiency without differentiating the two. To put it more precisely, efficiency grade standards is unified so that only gas condensing boilers receive 1st grade energy efficiency. With a successful implementation, it is expected that the market share of gas condensing boiler will increase from 10% (2010) to 30% in the future.



Only
Condensing
Gas boilers
for
1st grade

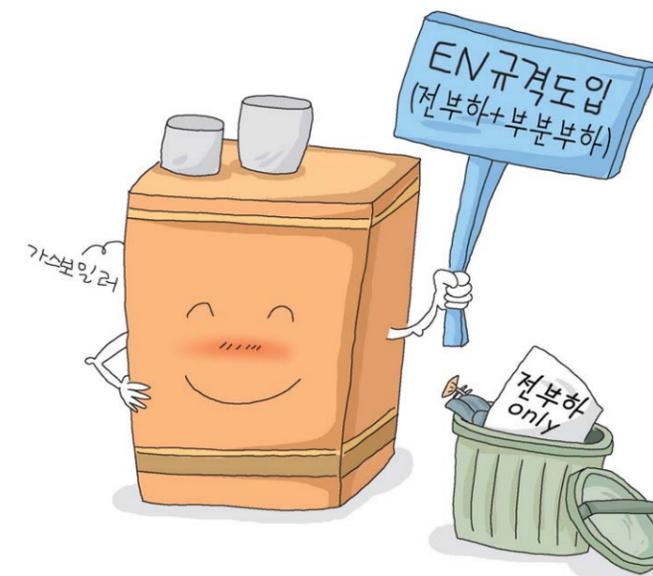


❖ Plans for improving the measuring methods of gas boilers

The efficiency gap between ordinary boilers and condensing gas boilers ranges between 6~9% under laboratory test conditions whereas the actual efficiency gap ranges between 9.7~28.4%. This suggests that the current measuring methods are not properly reflecting the actual environment of consumers. One of the reasons might be that the current KS measuring methods, which is referred by the Energy Efficiency Label and Standard Program, measures the energy efficiency at full load. In real environment, partial load is more common than the full load.

Unlike Korea, the EU's EN standards measures both full load and partial load (30%) to grade its energy labels. From 2013, KS including partial load standards will be adopted to measure the energy efficiency of household gas boilers to better reflect the real environment conditions.

After the improvement of the measuring methods, carbon dioxide emissions and annual energy consumptions will be displayed on household gas boilers.

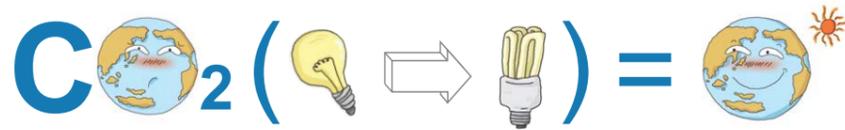


3 Phase Out of Incandescent Lamps



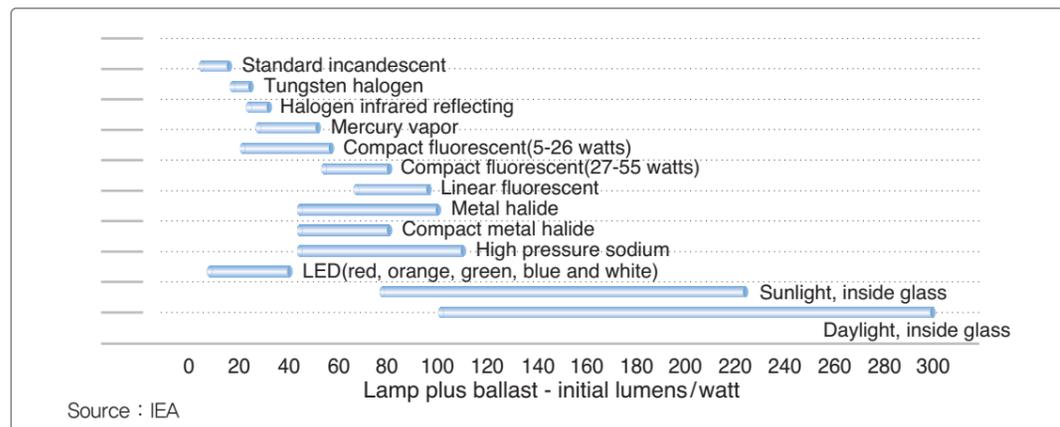
The trend of energy efficiency improvement in lighting equipment

Lighting equipment accounts for 20% of total national power consumption. Altogether, over 30 million incandescent lamps and compact fluorescent lamps are supplied to the market each year.

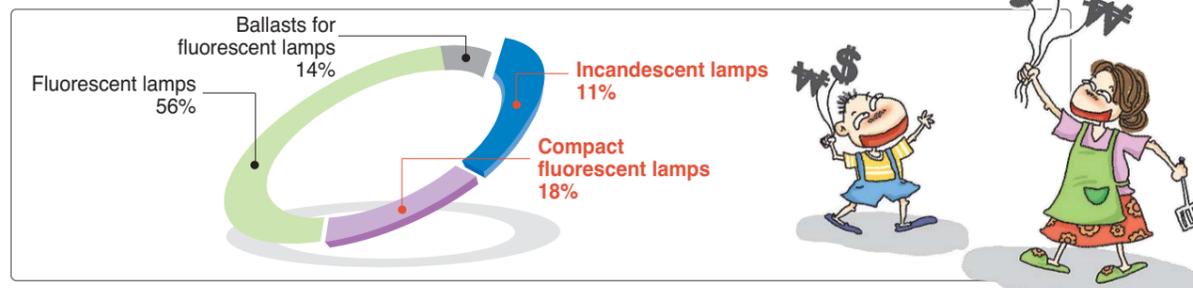


According to KEMCO's analysis report on the "production and sales performance record of Energy Efficiency Label and Standard Program", incandescent lamps and compact fluorescent lamps combined together account for 29% of total lighting equipment. Therefore, energy efficiency improvement in incandescent lamps and compact fluorescent lamps is a key energy efficiency strategy.

Comparison of initial lumens/watt (IEA)

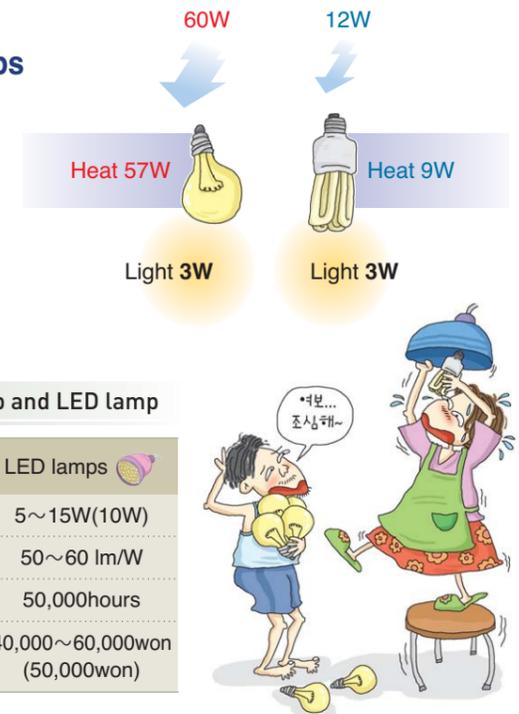


The portion of incandescent lamps and compact fluorescent lamps among lighting equipments



Comparison of incandescent lamps, compact fluorescent lamps and LED lamps

The incandescent lamps are the classic example of low efficiency lighting equipment that emits 95% of its energy through heat and only utilizes 5% of its energy in producing light. Incandescent lamps consume 30-100W, whereas the compact fluorescent lamps only consume 12-20W. LED lamps only consume 5-15W.



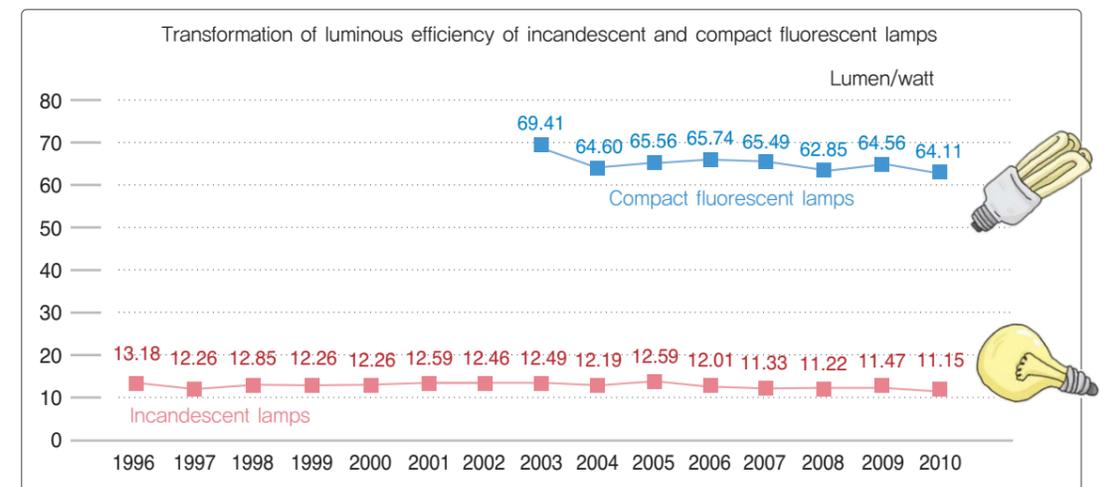
Comparison of incandescent, compact fluorescent lamp and LED lamp

Types	Incandescent lamps	Compact fluorescent lamps	LED lamps
Power consumption	30~100W(60W)	12~20W(15W)	5~15W(10W)
Luminous efficiency	10~15 lm/W	45~80 lm/W	50~60 lm/W
Lifetime	1,000hours	6,000hours	50,000hours
Price (60W as reference)	500~800won (700won)	2,200~6,600won (6,000won)	40,000~60,000won (50,000won)

Transformation of luminous efficiency of incandescent and compact fluorescent lamps

According to an analysis conducted by KEMCO on the energy efficiency of new products registered in the Energy Efficiency Label and Standard Program, the luminous efficiency (lm/W) of incandescent and compact fluorescent lamps has not improved substantially. However, the energy efficiency in this sector is improving steadily by replacing low efficiency lighting equipment such as incandescent lamps (10-15 lm/W) with high efficiency lighting equipment such as compact fluorescent lamps (45-80 lm/W).

Transformation of luminous efficiency of incandescent and compact fluorescent lamps

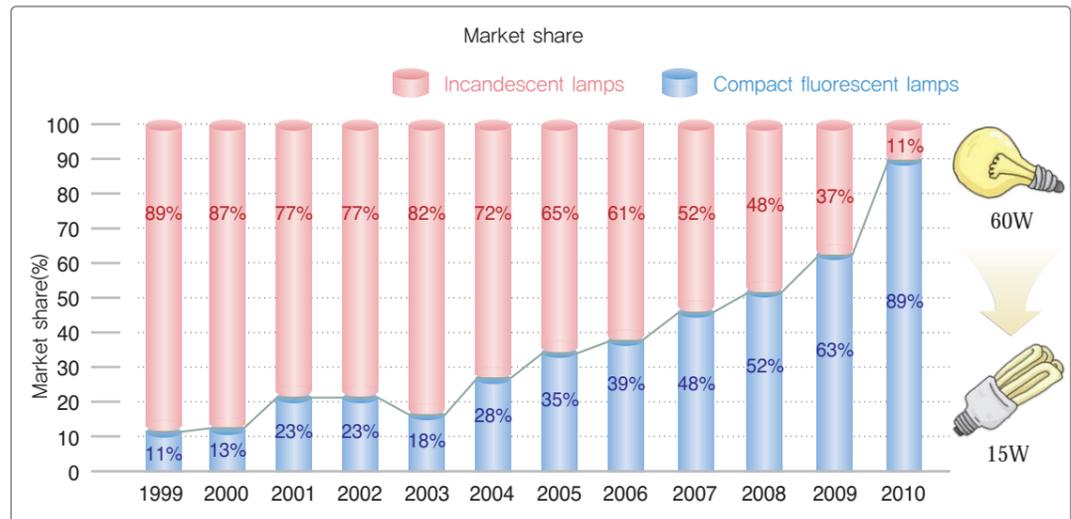


❑ Promotion of compact fluorescent lamps

The government has been making efforts to transform the market by replacing the low efficiency lighting equipment such as incandescent lamps with high efficiency lighting equipment such as compact fluorescent lamps. The public campaigns on the use of compact fluorescent lamps and the financial subsidy program are two examples.

As a consequence, the market share of compact fluorescent lamps rose from 11% in 1999 to 89% in 2010. However, despite their high efficiency, compact fluorescent lamps are not able to completely replace incandescent lamps.

Replacement of incandescent lamps by compact fluorescent lamps



Types	Incandescent lamps	Compact fluorescent lamps	Total
1999	53,319,833 (88.8%)	6,750,172 (11.2%)	60,070,005 (100.0%)
2000	56,315,505 (87.1%)	8,310,236 (12.9%)	64,625,741 (100.0%)
2001	49,973,991 (76.8%)	15,122,098 (23.2%)	65,096,089 (100.0%)
2002	39,391,626 (76.8%)	11,886,869 (23.2%)	51,278,495 (100.0%)
2003	49,357,065 (82.1%)	10,778,326 (17.9%)	60,135,391 (100.0%)
2004	35,719,694 (72.0%)	13,887,391 (28.0%)	49,607,085 (100.0%)
2005	29,417,507 (65.2%)	15,700,844 (34.8%)	45,118,351 (100.0%)
2006	27,143,119 (61.4%)	17,046,637 (38.6%)	44,189,756 (100.0%)
2007	20,874,884 (51.7%)	19,474,544 (48.3%)	40,349,428 (100.0%)
2008	18,584,249 (47.6%)	20,421,782 (52.4%)	39,006,031 (100.0%)
2009	10,683,484 (37.1%)	18,103,592 (62.9%)	28,787,076 (100.0%)
2010	2,400,069 (11.5%)	18,841,981 (88.5%)	21,282,050 (100.0%)

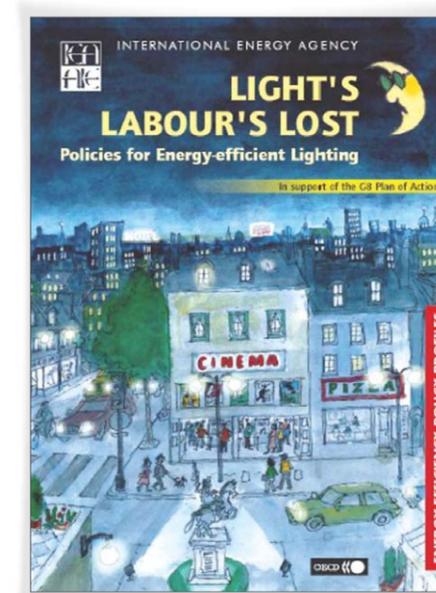
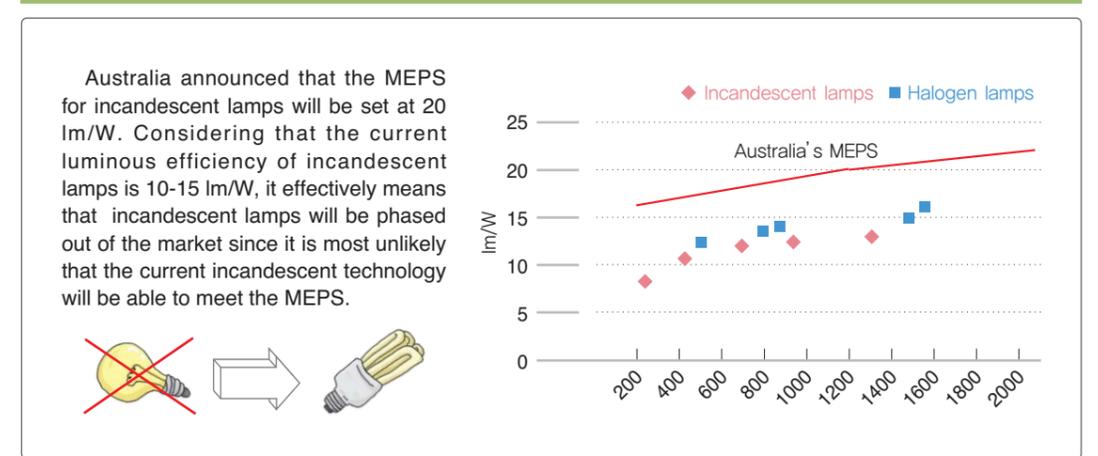
Source: KEMCO

❑ International movement to phase out incandescent lamps from the market

There is a strong international consensus on phasing out incandescent lamps from the market in order to promote transformation to compact fluorescent lamps.

Australian federal government (DCCEE : Department of Climate Change and Energy Efficiency) has already declared its plan to phase out all incandescent lamps from the Australian market by 2010. IEA is also encouraging the phasing out of all incandescent lamps from the market. IEA recommends that governments phase out incandescent lamps with consideration for each country's commercial and economic situation.

DCCEE's phase out policy on incandescent lamps



Phase out of incandescent lamps from the market by 2013

In spite of government efforts to promote compact fluorescent lamps and LED lamps (a voluntary program with financial incentives), incandescent lamps still exceed compact fluorescent lamps in sales. The existing government policies are not able to overcome the barriers to market transformation because of the relatively cheap price of incandescent lamps compare to compact fluorescent lamps. This shows that there is a limit on market transformation with the implementation of a voluntary policy.

On December 15th 2008, the National Energy Saving Implementation Committee(Chair: Prime Minister) decided to phase out low efficiency incandescent lamps from the market. MEPS is employed as a policy tool to phase out incandescent lamps. In other words, incandescent lamps are phased out by raising the standards of MEPS to a level(20 lm/W) so that the incandescent lamps (10~15 lm/W) are no longer able to be manufactured or sold in the market.

For the first phase, incandescent lamps of 70W~150W (mainly 100W which accounts for 26% of all incandescent lamps) will be phased out of the market from January 1st 2012. For the second phase, incandescent lamps of 25W~70W (mainly 60W and 30W which account for 74% of all incandescent lamps) will be phased out of the market from January 1st 2014.

MEPS of incandescent lamps (standards for phase out, 20 lm/W)

Type	MEPS		
	By 31 December 2011	From 1 January 2012	From 1 January 2014
25W ~ 40W	8.3	8.3	20.0(phase out)
40W ~ 70W	11.4	11.4	20.0(phase out)
70W ~ 150W	13.2	20.0(phase out)	20.0(phase out)



4 Promoting LED Lights



Importance of expansion/ dissemination of LED lights

LED lights can save up to 90% of the energy consumed by ordinary lighting equipment. LED lights are also drawing attention as new sources of lights for their environmental friendliness and stability.

LEDs are luminous diodes which are a type of semiconductor that emit light when sent electric signals. They are used in traffic lights, general lighting, automobiles, medical lighting equipments, small LCDs, and back lights etc. LED lights are more environmentally friendly and safer than ordinary lights since they do not use gas filaments or mercury.

Characteristics of LED lights

- Due to high efficiency in producing light, they have low power consumption (save energy up to 90%)
- Life time of LED lights is up to 100,000 hours (100 times more than incandescent lamps)
- The speed of turning on and off is much quicker than ordinary lights
- Stable and safe to external shocks since they do not have filaments
- They are environmentally friendly since they do not need mercury (incandescent and fluorescent lamps use mercury)

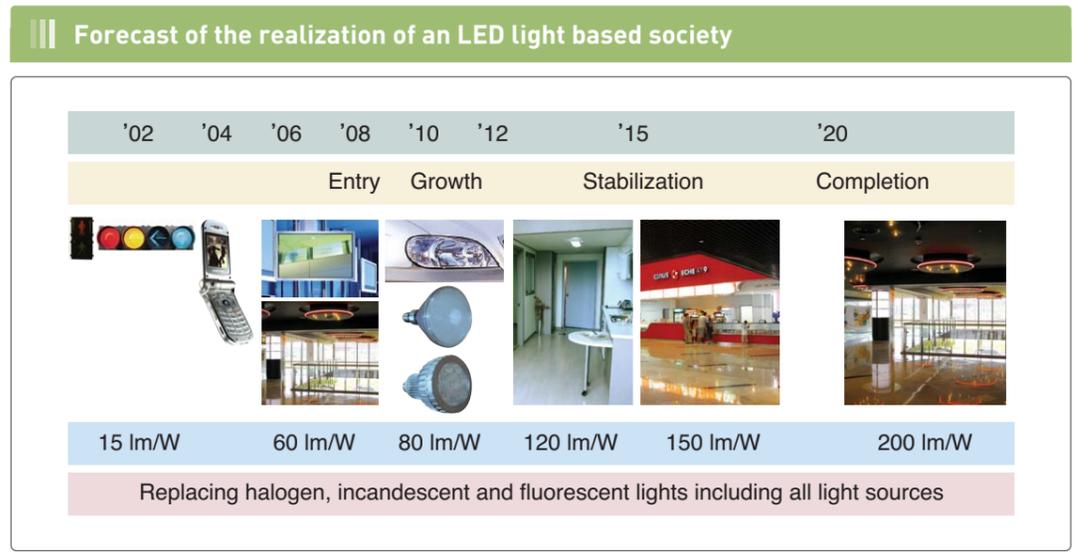
Many countries are strategically fostering the LED industry which is recognized as an advanced IT industry for reducing power consumption significantly. Japan is implementing its "21st century light project" that proposes to reduce 20% of lighting energy by 2010. The USA's "Vision 2020" plans to replace 50% of lighting equipment with LEDs by 2020.

Cases of LED lights promotion



Forecast of the realization of an LED light based society

The LED light industry is very important in the sense that it has high energy-saving potential and is an environmentally friendly source of light. It is also a 21st century economic growth engine that will become a future lighting industry expected to expand to tremendous size (2012: \$42.2 billion). LED lights are expected to replace lighting equipment in homes and offices in five years. A semiconductor lighting society is expected to be realized by 2015.



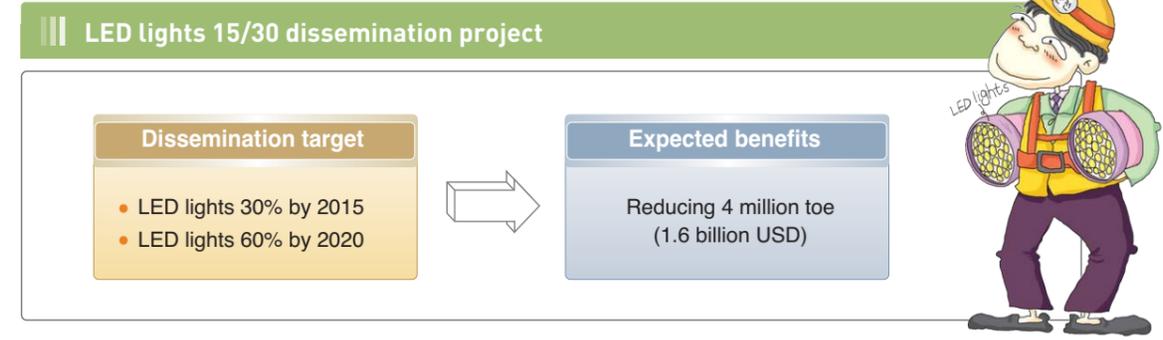
Current white LED lights' luminous intensity is low and their usage is limited to certain applications. However, in the future they will not only replace incandescent and fluorescent lamps, but will also be used for street lights, and automobile lights.

Use of LED lights

Now	Traffic lights, exit signs, various indication displays, LED displays, automobile dashboards, stop signal lamps, direction guiding lamps, small LCD back lights.
Future	General lightings, street lights, headlights for automobiles, lights for medical equipment, lights for growing plants, lights for catalysts, large LCD back lights, camera flashes, various light sources for ultra violet rays, light sources for projection.

Targeting share of LED lights up to 30% by 2015, 60% by 2020

MKE announced the "LED lights 15/30 dissemination project". The project aims to increase the share of LED lights to 30% and is thereby expected to save 4 million toe (1,600 billion KRW). And targeting share of LED lights planned up to 60% by 2020.



Plans for disseminating LED lights

Dissemination of LED lights will be implemented by item in accordance with the level of technological development. LED lights will be immediately supplied for traffic lights, guiding lights, and LED lights that replace halogen. For general lights, LED replacements will be used after 2010.

An LED dissemination scenario is shown in the table below which considers the market circumstances and technology development level for each kind of LED lighting equipment.

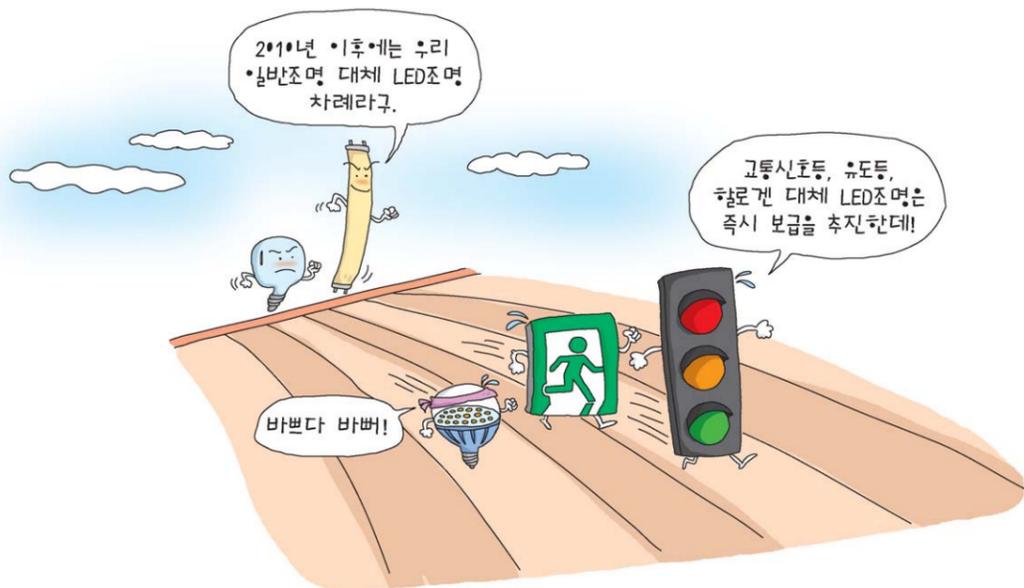
LED lighting equipment dissemination scenario

Types	'07	'08	'09	'10	'11	'12	'13	'14	'15
Traffic lights	Certification('01) Regional energy project support				MEPS				
Guiding lights	Certification	Pilot dissemination project and financial rebate						MEPS	
Halogen and incandescent lamps		Certification	Pilot dissemination project and financial rebate					MEPS	
Fluorescent lamps, LED sensor lights and convertors			Certification	Pilot dissemination project	Financial rebate				
Street lights				Certification	Pilot dissemination project	Financial rebate			

Support measures to promote LED lights

Support measures to promote LED lights

Type	High efficiency appliance certification	Rebates	Mandatory or recommended in building codes	Tax breaks for investments on energy efficiency facility installations
LED traffic lights	○			
LED guide lights	○	○	○ (Recommended)	
LED lamps (internal converter)	○	○		○
LED lamps (external converter)	○	○		○
Recessed and fixed LED light fixtures	○			○
LED safety light fixtures	○			○
LED sensor light fixtures	○		○ (Mandatory)	○
Power supplied converter for LED modules	○			

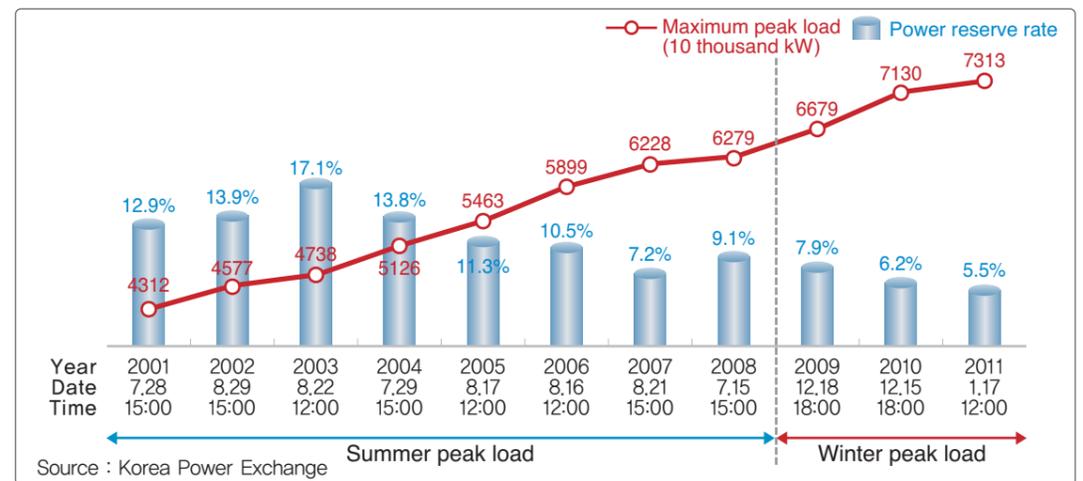


5 Energy Efficiency Management of Peak Power Inducing Electric Heating Equipments



Since 2009, an unusual phenomenon has been observed which has never been observed before. In general, peak power always occurs during the summer season. However this happened also during the winter season in 2009-2011.

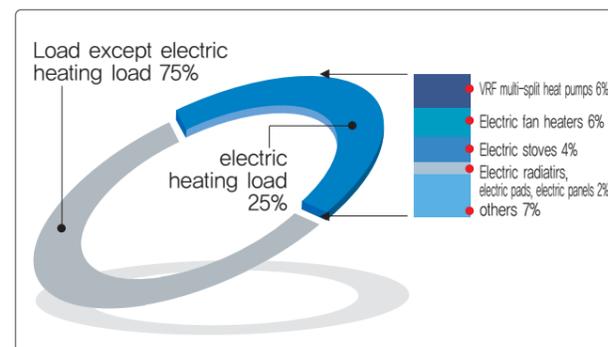
Maximum peak load and power reserve rate



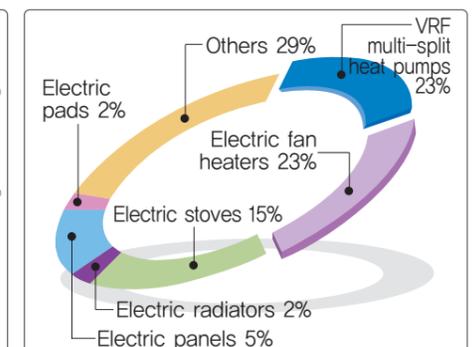
Causes for observing peak power during the winter season

KEMCO commissioned a survey project to Korea Testing Laboratory to find the causes for inducing peak power during the winter season. According to the survey results, electric fan heaters, Variable refrigerant flow (VRF) multi-split heat pumps (EHP, System air conditioners) account for 16% (61% of all electric heating appliances) of maximum peak power.

Contributing factors to maximum peak power during winter season



Electric heating load (18.57 million kW, 25% of total peak power) by products



Implementing electric rates displaying scheme

Increasing block rates are applied to electric fan heaters and electric stoves which are popular appliances used among low income households. However, some advertisements mislead consumers as if these appliances are not subject to increasing block rating system.



MKE and KEMCO plans to implement mandatory displaying of electric rates on the energy efficiency label from December 2011. In particular, electric rates (subject to increasing block rating system) for heaters under 3kW must be displayed in order to remind consumers that excessive use of heaters could result into high electricity bill.



Label for electric fan heaters



Labels for electric stoves

Maximum power (kW) estimates by electric heating products

Products	Total	%	Commercial	Industrial	Other
VRF multi-split heat pumps (EHP, System air conditioners)	4,343,127	6.0%	4,142,772	200,354	-
Electric fan heaters	4,341,588	6.0%	3,439,969	873,797	27,823
Electric stoves	2,987,148	4.1%	2,553,634	226,009	207,505
Electric radiators	317,612	0.4%	296,843	20,769	-
Electric panels	905,852	1.2%	880,152	25,700	-
Electric pads	309,145	0.4%	-	-	309,145
Others	5,365,424	7.3%	91,878	1,464	5,272,082
Total	18,569,896	25.4%	11,405,247	1,348,094	5,816,555

1. Total national peak power: 73.13 million kW (100%)

2. Source : KEMCO(Results from survey conducted by Korea Testing Laboratory which is commissioned by KEMCO)

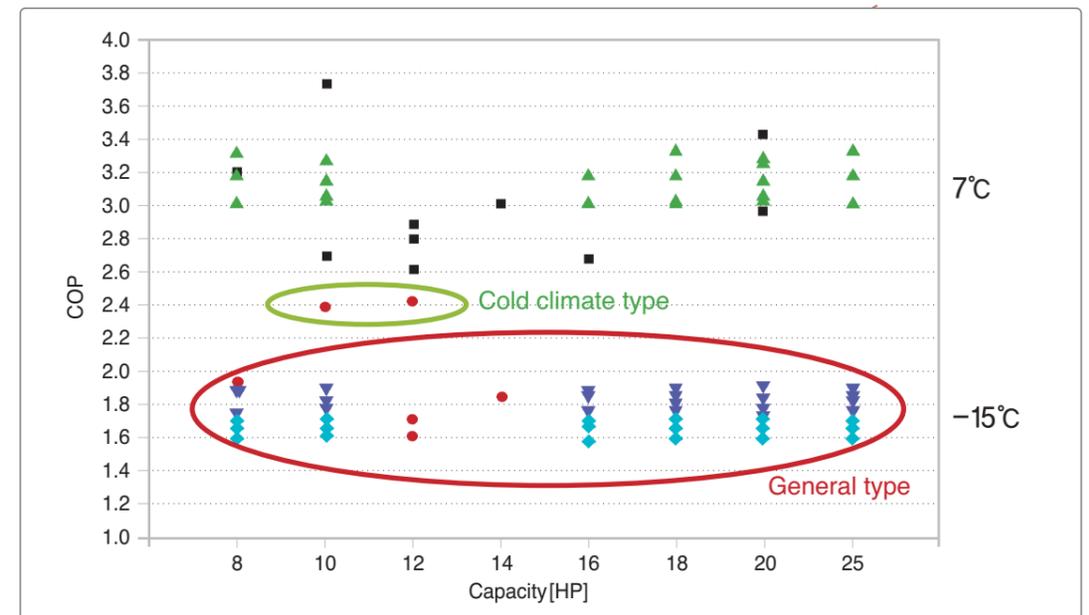
Switching to Energy Efficiency Label and Standard Program for VRF multi-split heat pumps

VRF multi-split heat pumps (EHP, System air conditioners) are comprised of outdoor unit, indoor unit and pipes. They are used to cool and heat buildings. VRF multi-split heat pumps are known as energy efficiency equipments using heat pump technology. The government has designated it as high efficiency equipment and has provided supports to create initial market.

However, the number of VRF multi-split heat pumps rapidly increased to 1.4 million (indoor units as the reference) and they account for 6% (the highest among contributing appliances) of peak power during the winter season. In addition, there are concerns over the measuring methods of efficiency that it does not reflect the real conditions of consumers using the appliances. To resolve such deficiencies, KEMCO has commissioned a testing laboratory to perform comparative testing.

The comparative testing results show that the energy efficiency drops when the length of pipe gets longer. In fact when the length of the pipe exceeds 50 meters (similar to the length used in actual consumers' settings) the energy efficiency drops to 20~30%. Furthermore, the most of VRF multi-split heat pumps energy efficiency dropped under -15°C (the actual winter temperature of Seoul). At 7°C the heating efficiency(COP) was relatively high (3~3.8). But at -15°C, the efficiency of general type models(heating efficiency is relatively high until -10°C) dropped to similar levels of the worst heating appliances (electric stoves and electric fan heaters). The efficiency of cold climate type models (heating efficiency is relatively high until -15°C) relatively showed high efficiency levels.

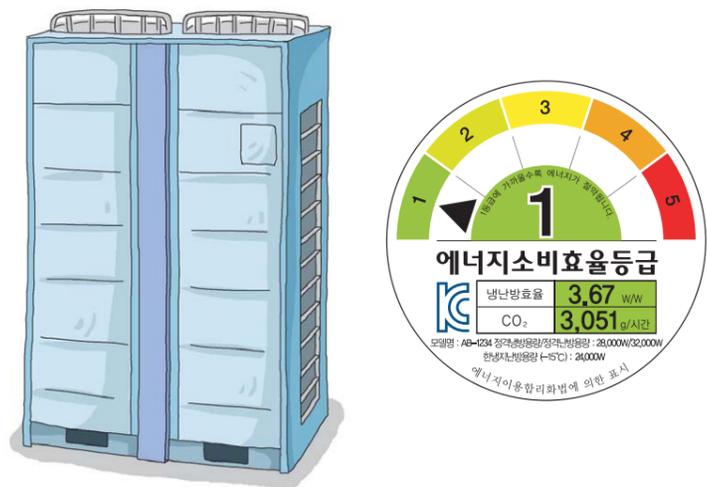
The heating efficiency of VRF multi-split heat pumps



1. Cold climate type COP : 2.4 (Average of 2 models)
2. General type COP : 1.7 (Average of 8 models)
3. Heaters (electric stoves and electric heaters) COP : 1

Based on the results, MKE and KEMCO have plans to exclude VRF multi-split heat pumps from High-efficiency Appliance Certification Program and place it under the Energy Efficiency Label and Standard Program from 2012. The measurement conditions under the efficiency rating system will adopt conditions of actual consumers' settings (50m length pipes, cold climate heating temperature of -15°C and non ducted type(indoor unit))

With the improved measurement methods, when the efficiency rating system is implemented the cold climate type VRF multi-split heat pumps are expected to increase their share in the market. This will also help mitigate the negative effects of peak power in the winter season and will contribute in saving energy at the national level.



• The pipe length of electric heat pump system pipe at Seoul National University (SNU) and other sites

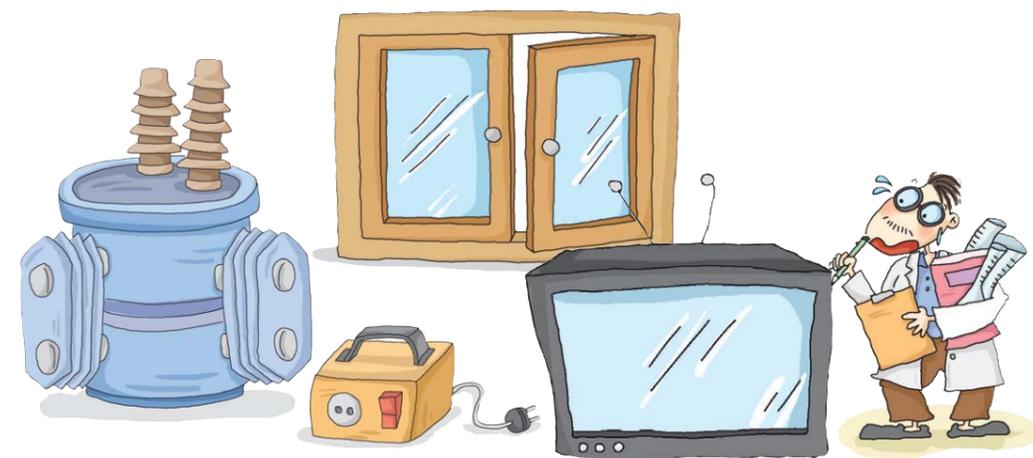
Sites	Location	Total Capacity	# of outdoor units	Average length of pipe
Site 1	SNU-#36 5 floors	750kW	11	40~56m
Site 2	SNU-#19 5 floors	640kW	9	35~51m
Site 3	Soon Chun Hyang Univ- Engineering school Hall #1-A 3 floors	329kW	6	45~57m
Site 4	Soon Chun Hyang Univ- Engineering school Hall #2 3 floors	416kW	8	36~48m
Site 5	Soon Chun Hyang Univ- Engineering school Hall #1-C 2 floors	77kW	2	41~53m
Site 6	Engineering school Hall #5 5 floors	714kW	10	60~76m
Site 7	Engineering school Hall #6 4 floors	726kW	8	66~78m
Site 8	Park	73kW	2	45m
Site 9	Government complex	107kW	3	38~53m
Site 10	Experience Hall	325kW	5	28~46m

6 Designation of Energy Intensive Equipments as Efficiency Management Target Products



Energy saving effects can be attained by designating energy intensive equipments and appliances as efficiency management target products. When a product is designated as an efficiency management target product then the mandatory MEPS or the energy efficiency grade (1 to 5) must be displayed. This leads to the production and sales of energy efficient products to the market.

MKE and KEMCO have plans to designate energy intensive equipments as efficiency management target products through the establishment of “The 4th basic plan for rational utilization of energy” (2008-2012). transformers, window sets, and TVs are also expected to be designated from July 2012.



Transformers

Transformers are core elements in the electricity transmission system which supplies necessary power to the consumers. Without transformers the electricity transmission system will not function properly. In the process of electricity transmission to the consumers, a certain amount of power loss occurs in the transformer.

To reduce such power loss, MEPS and standard consumption efficiency (High efficiency) will be applied to transformers from July 2012. 50% load will be applied to measurement data obtained in accordance with KS C 4306, KS C 4311, KS C 4316, KS C 4317 to obtain the final efficiency (%).

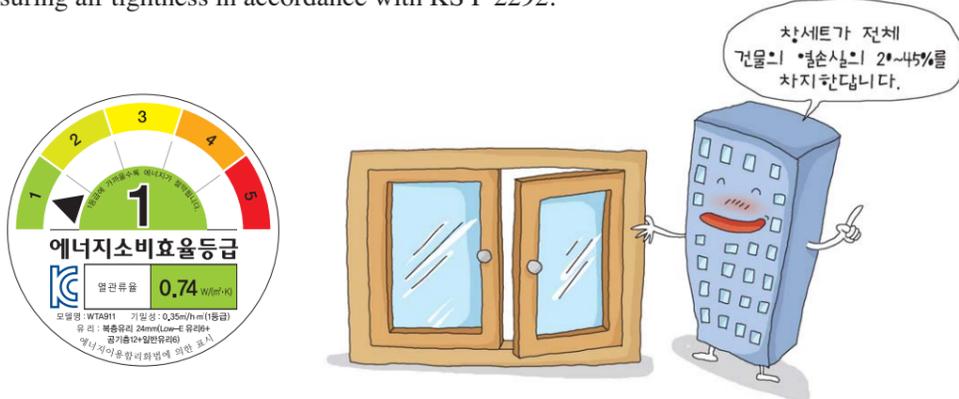


Window Sets

Window sets occupy almost 1/2 of apartment and building's total surface area of walls. Window sets' insulation performance is 7 times lower than the performance of walls. The heat loss due to window sets account for 20~45% of total heat loss of buildings.

Mandatory application of MEPS and the indication of energy efficiency grade (1 to 5) will be applied to window sets starting from July 2012. Window sets only refer to products where frames and glass are integrated in a single unit.

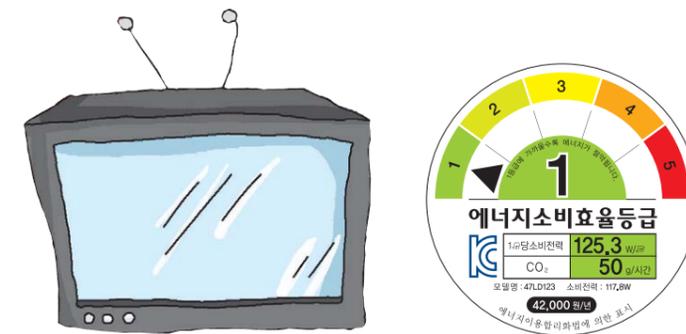
The efficiency of window sets are obtained and appropriate energy efficiency grade is determined by measuring overall heat transfer coefficient in accordance with KS F 2278 and measuring air tightness in accordance with KS F 2292.



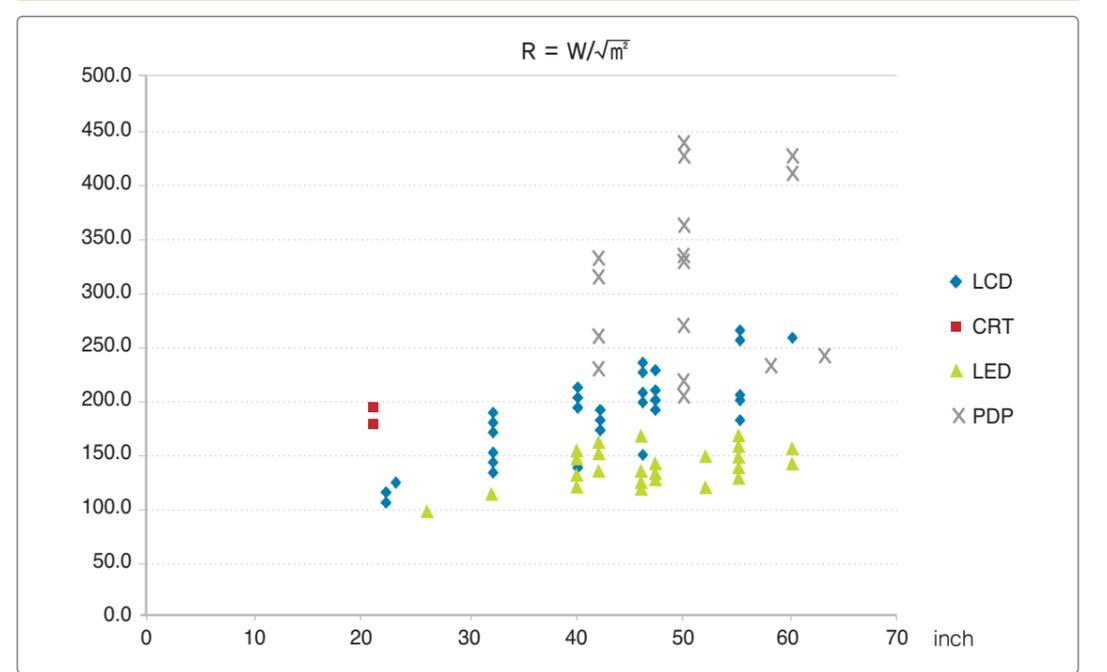
TVs

TV was the only exception to mandatory indication of energy efficiency grade (1 to 5) among the 4 major appliances (refrigerators, air conditioners, washing machines, TVs). Korea is the number one TV manufacturing country in the world and TV is country's major export item.

Mandatory application of MEPS and the indication of energy efficiency grade (1 to 5) will be applied to TV starting from July 2012 where there are several different kinds of display types (CRT, PDP, LCD, LED). International standards (KS C IEC 62087) will be used to measure the efficiency. When the Energy Efficiency Label and Standard Program is implemented, rapid dissemination of LED TV is expected since it consumes less power in comparison to other TVs.



Power consumption per $\sqrt{m^2}$ in TVs



1. Source : Telecommunication Technology Association
2. $\sqrt{m^2}$: Square root of screen area

7 Adopting the Standards of Energy Frontier Scheme



What is energy frontier?

Energy frontier scheme sets medium & long term energy efficiency goals and provides incentives to those who have achieved target goals within the specified periods.

Energy frontier scheme sets efficiency targets which is 30~50% higher than current 1st grade efficiency in every 3 years in order to motivate the industry to achieve efficiency targets. Products satisfying energy frontier standards are deemed to be ultra high efficiency products.

From 2012, energy frontier scheme is applied to TV, refrigerators, air conditioners and drum washing machines where their technology and efficiency levels are world class.



Incentives will be given to energy frontier products to promote technology developments.

Standards for energy frontier

Target consumption efficiency or target energy use standards for ultra high efficiency products where the energy efficiency is 30~50% higher than current 1st grade efficiency. The standards for energy frontier are upgraded in every 3 years.



8 Efficiency Improvements of Data Center



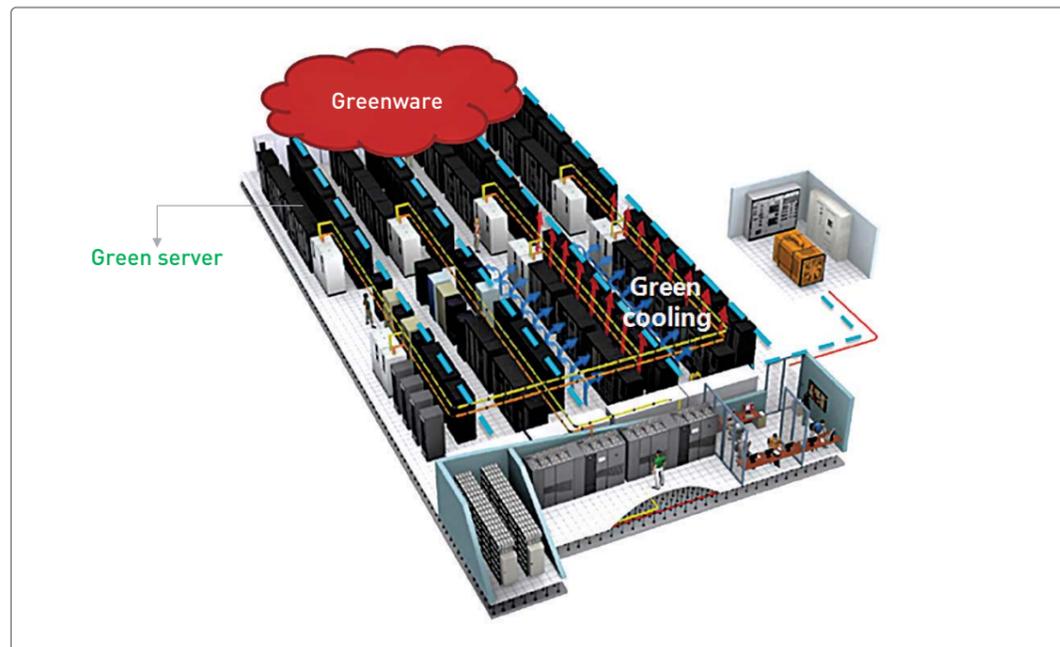
The recent flourishing of the cloud computing market is expected to trigger a demand for energy intensive data center. The value of the world market is estimated to increase from 3,100 billion KRW in 2011 to 6,000 billion KRW in 2014. The value of the domestic market is also forecasted to increase from 160.4 billion KRW in 2011 to 498.5 billion KRW in 2014.

Cloud computing

Services that borrow various IT resources (hardware, software, etc) by connecting to the internet on a fee basis.

- Killer service that contributes to saving energy, expanding IT industry, reducing IT cost, concentrating core capability and improving productivity through outsourcing.
- When cloud computing is implemented, it is expected to increase the energy efficiency of energy intensive personal PCs.

Conceptual diagram of green IDC

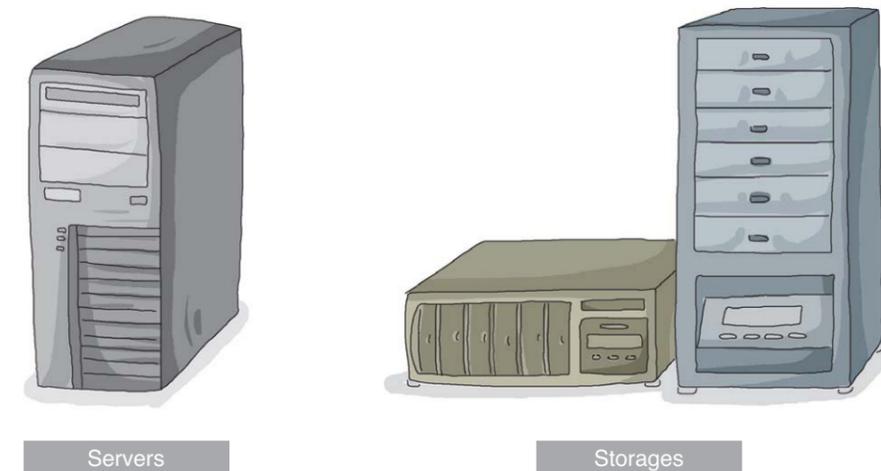


Implementing energy efficiency rating system for servers and storages

MKE and KEMCO plans to adopt efficiency management standards for major equipments and systems of data center to achieve energy saving effects of more than 30%. Especially, Energy Efficiency Label and Standard Program will be applied to core equipments of data center such as servers and storages. In addition, green IDC center certification scheme will be adopted.

In the United States, SPEC (Standard Performance Evaluation Corporation) is developing SERT (Server efficiency rating tool), by the end of 2011, to measure the efficiency at operational mode. The EPA, who runs the ENERGY STAR program, is in the process of preparing energy efficiency standards for servers and storages.

In conjunction with the US efficiency standards for servers and storages, Korea also has plans to adopt efficiency standards for servers and storages at operational modes (preparation period: first half of 2012, adoption: second half of 2012). In parallel with implementing energy efficiency rating system to individual equipments, the green data center certification scheme will also be implemented in 2012. Technology development supports will be provided to improve major power supply system, power storage facilities, green servers and storages, power use monitoring, storage management system, remote power management system, load forecasting system and software.



9 - Establishing Plans for Standby Korea 2015



“Standby Korea 2015” is a national roadmap, based on the “Standby Korea 2010”, to reduce standby power by 2015. Standby Korea 2010 provided a basis for adopting standby power 1W policy and standby warning label target products scheme. “Standby Korea 2010” aims to reduce the standby power mainly at off mode to below 0.5W and network standby power at active standby mode to below 2~3W.

■ An overview of “Standby Korea 2015”

The standby power consumption of all electronic appliances on the market will be reduced to below 0.5W by 2015. Three major target is networked standby, products of big consuming standby power, and products of high reducing standby power.

||| National roadmap for Standby Korea 2015

The standby power consumption of all electronic appliances on the market will be reduced to below 0.5W by 2015

Objectives at each phase

Category	2011	Objectives	
		2013	2015
Number of target equipments	31	35	40
Average standby power of equipments	2.01W	1.8W	1.5W
Standby power 0.5W diffusion rate	33%	41%	57%
Annual standby reduction effect	1,100GWh	1,300GWh	1,600GWh

3 major target

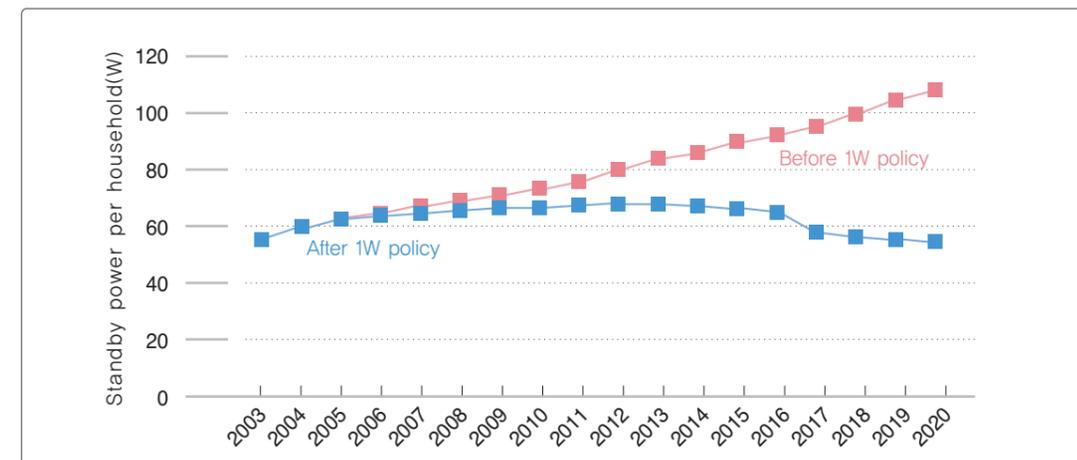
- 1 **Networked standby**
 - Establishment of energy saving measures to address home networked products
- 2 **Products of big consuming standby power**
 - Establishment of energy saving measures to address big consuming standby power
- 3 **Products of high reducing standby power**
 - Promotion of high reducing standby power product

The national roadmap for Standby Korea 2015 also proposes integrated management of consumption efficiency and standby power. In general, energy saving policies measures separately implemented into two parts: efficiency policy (standards used when the appliances are in operation) and standby power (when the appliances are not in operation). Making standby power 1W requirement as the prerequisites for obtaining 1st grade energy efficiency of appliances (washing machines, rice cookers and etc) is an exemplary case of initiating integrated management. This suggests that an integrated policy, which combines operational (efficiency) and non operational (standby power) aspects, should be implemented in the future (TEC: Typical energy consumption and 80+ energy efficiency scheme should be reviewed)

Furthermore, the roadmap proposes support plans for R&D developments to maintain the status of advanced country in managing standby power. Major support areas of R&D technology include standby power reduction technology in smart household and network appliances (near zero standby power reduction technology; reducing the standby power of household appliances to near 0 using high efficiency nano power supply devices), technology for 80+ energy efficiency of power supply devices of household appliances (high efficiency power supply devices for all levels of load; 100% load, medium load, no load) and additional technology development supports to boilers and other products that deserve attention.

Plans for reducing standby power of built in appliances will also be implemented. For built in appliances, standards and performance of eco-friendly houses, building codes, managed by Ministry of Land, Transport and Maritime Affairs, or energy efficiency of 1st grade requirements will be mandatorily applied.

||| The impact of standby power 1W



1. The portion of products achieving 1W is set at 22% (2003), 30% (2007), 40% (2010), 80% (2020)
2. Average standby power of participating appliance is set at 0.8W (those with standby power below 1W) and 4.5W (those with standby power above 1W, mostly network devices)

Standby power and power factor

In general standby power 1W policy has been a tremendous success. However, there are still rooms for improvements. Currently, e-Standby Program's standby warning label scheme and the Energy Efficiency Label and Standard Program's 1st grade energy efficiency requirements both aim to apply standby power 1W standards to reduce significant amount of standby power. In this regard, the policy objective of reducing the standby power has been met with satisfaction.

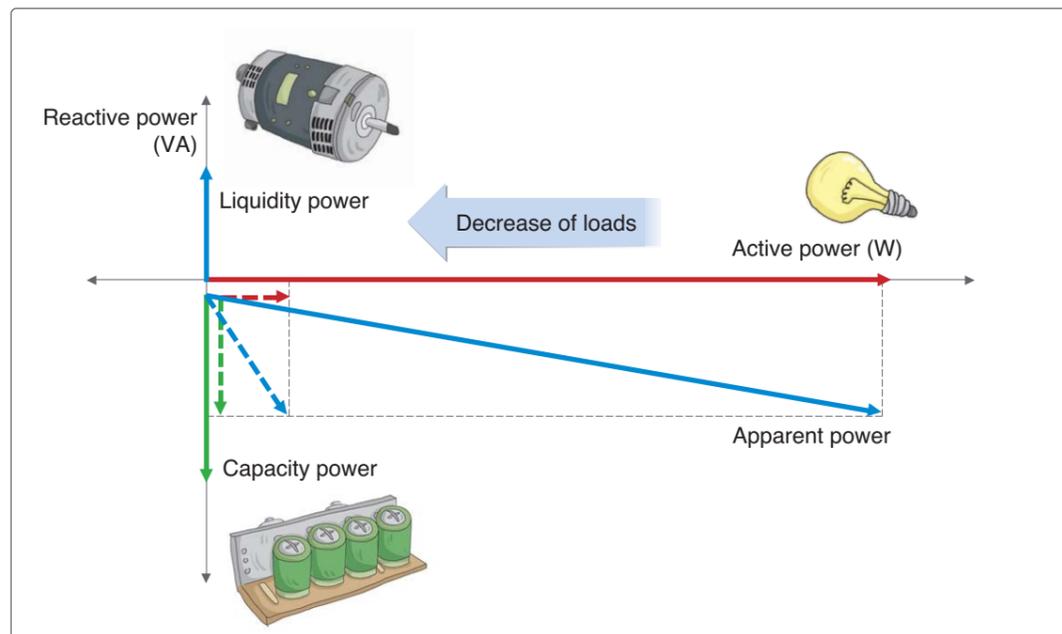
$$\text{Power factor} = \text{active power} \div (\sqrt{\text{active power}^2 + \text{reactive power}^2})$$

However, there are cases where significant number of standby power related appliances' power factor is low because power factor is not considered in applying standby power reduction standards.

During the standby mode, it might appear that power factor decreases since reactive power relatively gets larger than active power. This does not necessarily mean that reactive power increases. Therefore even if the power factor decreases due to reduction in standby power, it will not pose extra burden on power facilities or result into energy waste. Eventually, standby power reduction enables energy savings which can be enjoyed at national and individual level.

Therefore, no specific provisions on power factor in relation to standby power will be included in the "Standby Korea 2015".

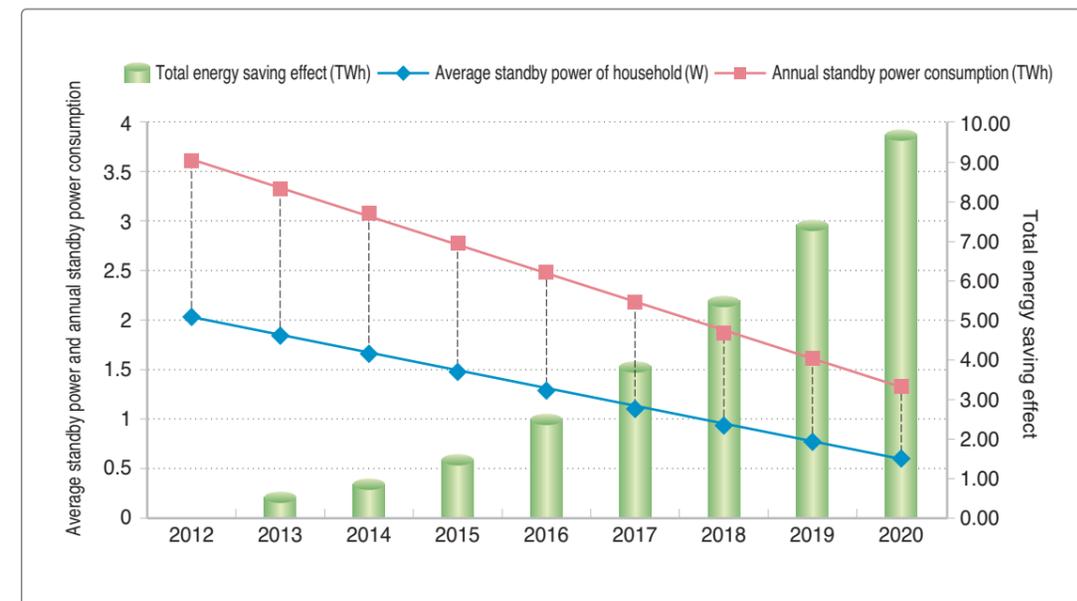
Power relations through change in loads



Expected performance outcome of "Standby Korea 2015"

Assuming the successful implementation of "Standby Korea 2015", the expected performance outcome of "Standby Korea 2015" is as follows. With the successful implementation of the standby power 0.5W policy, power reduction will amount to 1,420GWh(2015).

Energy saving effects of "Standby Korea 2015"



10 Harmonizing Measurement Methodologies with International Standards



The importance of international standards

The energy standards & labeling can be divided into three components: the scope of application, energy efficiency standards and measurement techniques. In particular, measurement techniques are drawing international attention.

So far, Korea's Energy Efficiency Label and Standard Program's measurement technique employed KS standards. If KS standards are not available, the MKE notification was used alternatively. Strictly speaking, KS and other government regulations are Korean standards and can not be treated as global standards.

Korea has an export driven economic structure. All products manufactured in Korea are basically exportable. It is also an international trend to directly adopt IEC or ISO as domestic standards.



Global Standard



Compatibility of energy efficiency measurement methods with international standards for selected products

Type	International standards (IEC/ISO)	USA (Energy Guide Label/ MEPS/ ENERGY STAR Program)	EU (Energy Label/ Ecodesign directive)	Japan (Top Runner Program)	Korea (Energy Efficiency Label and Standard Program /e-Standby Program)	Remarks (Compatibility of Korean standards with international standards)
Automobiles	NA	FTP+HFET	ECE15-EUDC	Japan10-15	CVS-75	Korean standard (Similar to USA)
Refrigerators	IEC 62552	ANSI/AHAM HRF-1	EN 153 (=IEC 62552)	JIS C 9801	KS I IEC 62552	Compatible to international standards.
Air conditioners	ISO 5151 ISO 13253 ISO-FDIS 15042	ANSI / ASHRAE 16 (RA99) 10 CFR Part 430 Subpart B App M 10 CFR Part 430 Subpart B App F	ISO 5151 ISO 13253 ISO-FDIS 15042	JIS B 8615-1 JIS B 8615-2	KS C 9306	Korean standard
Drum washing machines	IEC 60456	10.CFR 430. Appendix. j1	EN 60456 (=IEC 60456)	NA	Operational regulation on machinery and materials subject to efficiency management	Korean standard
TVs	IEC 62087	10 CFR Part 430 Subpart B App H	IEC 62087	Top Runner Program JIS C 6101	KS C IEC 62087	Compatible to international standards
Three phase electric motors	IEC 60034-2-1	IEEE Std. 112 Method B	IEC 60034-2-1	NA	KS C IEC 60034-2-1	Compatible to international standards
Domestic gas boilers	EN 483 EN 677	AFUE: BSR/ASHRAE Standard 103-1993R	EN 483/EN 677 BED (92/42/EEC)	NA	KS B 8109 /KS B 8127	Korean standard
Fluorescent lamps	IEC 60081 IEC 60901	ANSI	EN 60081 (=IEC 60081) EN 60901 (=IEC 60901)	JIS C 7601 JIS C 8105	KS C 7601	Korean standard
Standby power	IEC 62031	IEC 62301	IEC 62301	Top Runner program	KS C IEC 62301	Compatible to international standards

Plans for improving measurement techniques

Korea initiated the international standardization of domestic standards by adopting IEC 62301 (Standby power measurement techniques for household appliances) as Korean standards. After making them Korean standards, they are referenced by the Energy Efficiency Label and Standard Program and e-Standby Program.



In the near future, further international standardization will continue by combining measurement techniques for domestic (KS) efficiency standards and energy efficiency labels with appropriate IEC or ISO standards (ie: Standby power measurement techniques will follow KS C IEC 62301).

Plan for international standardization

Standard	Description	Programs	Target products	Remarks
IEC 62301	Measurement of standby power household electrical appliances	- e-Standby Program - Energy Efficiency Label and Standard Program	Computers, monitors, printers, copiers, TVs, video cassette recorders, home audio products, DVD Players, set-top boxes, toilet seats, modems, radios, multifunction devices, scanners, washing machines, dish washers, drum washing machines, rice cookers, air cleaners, electric fans	Completed
IEC 62552	Household refrigerating appliances-characteristics and test methods	- Energy Efficiency Label and Standard Program	Refrigerators, freezers, commercial refrigerators	Completed
IEC 62087	Methods of measurement for the power consumption of audio, video and related equipment	- e-Standby Program - Energy Efficiency Label and standard Program	TVs, video cassette recorders, home audio products, DVD players, set-top boxes	Expected
IEC 60034-2-1	Methods for determining losses and efficiency of 3 phase cage induction motors	- Energy Efficiency Label and Standard Program	3 phase electric motors	Completed

11 Displaying CO₂ emissions and Energy Cost in Energy Efficiency Grade Label



World's first CO₂ energy label for electric products

Starting from July 1st 2009, all new models of electricity using products including refrigerators, air conditioners, washing machines, lighting equipment, and 3 phase electric motors should display energy efficiency grades(1st ~ 5th) and CO₂ emissions. 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 equipments subject to efficiency management (24 products) will be annually disseminated into the market with carbon dioxide emissions information.

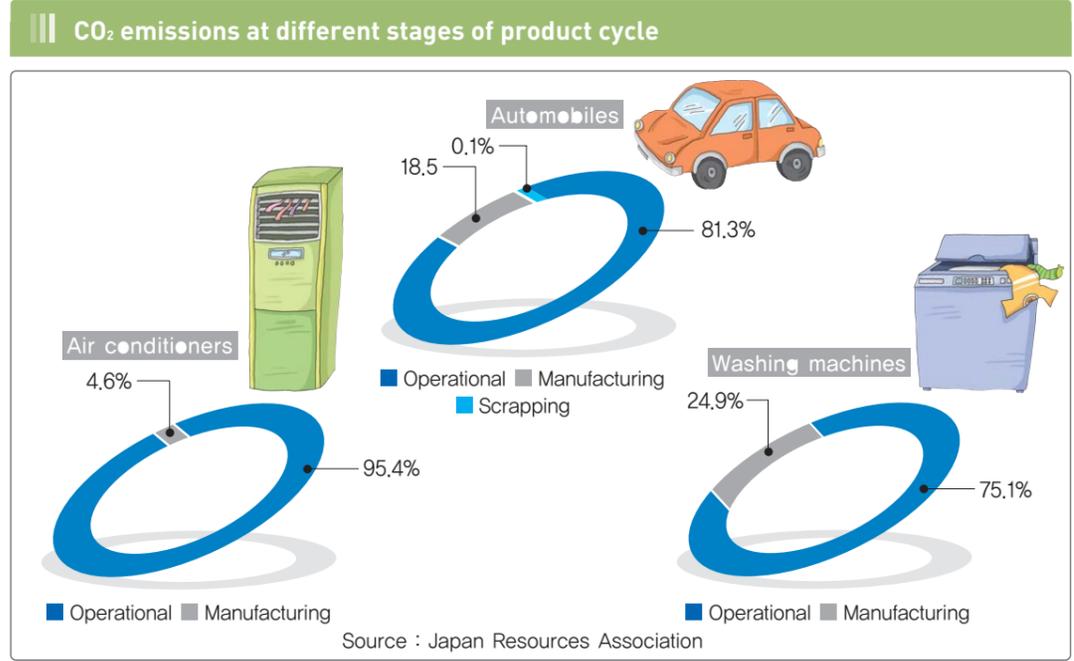
Marking method (example : refrigerators)



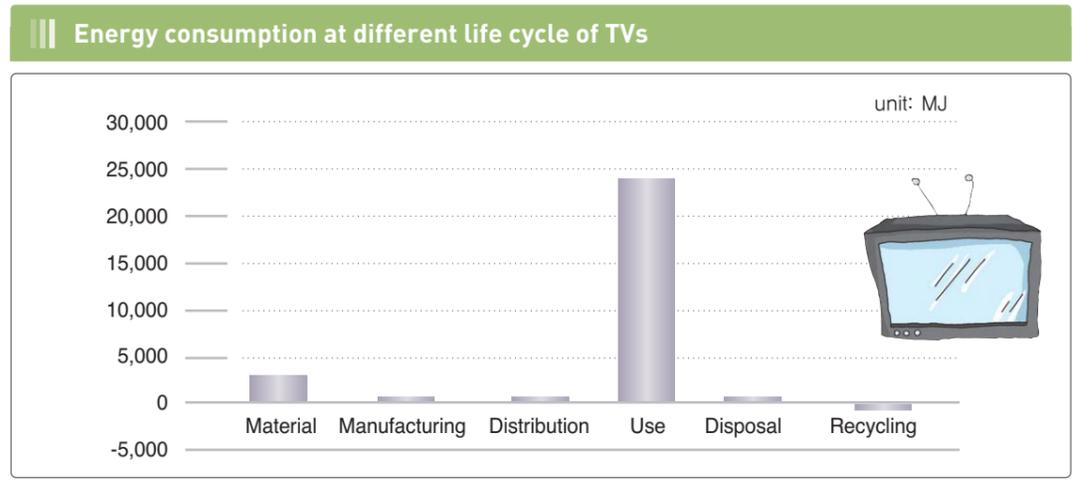
Starting from July 1st 2010, it is mandatory to display the annual energy cost of household appliances (refrigerator, air conditioner etc.) on the energy label to induce consumers' voluntary selection of energy efficiency products through the sharing of energy cost information.

75~95% of CO₂ emissions occur during the operational stage

Equipments that use energy emit 75~95% of CO₂ at their operational stage. The CO₂ emissions at manufacturing or scrapping stage are negligible. According to Japan Resources Association, automobiles emit 81.3%, 18.5% and 0.1% of CO₂ emissions at operational, manufacturing and scrapping stage respectively. Air conditioners emit 95.4%, and 4.6% of CO₂ emissions at operational and manufacturing stage respectively. Washing machines emit 75.1% and 24.9% of CO₂ emissions at operational and manufacturing stage respectively.



EU's pilot study on the application of Ecodesign Directive to TV also shows that CO₂ emissions reach its peaks at operational stage as shown on the graph below:

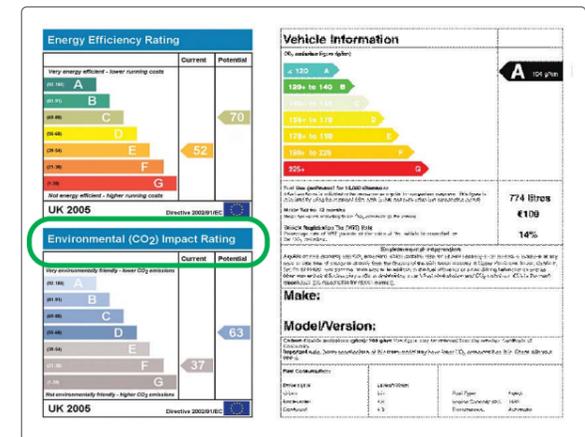


International trends towards incorporating CO₂ emissions on energy label

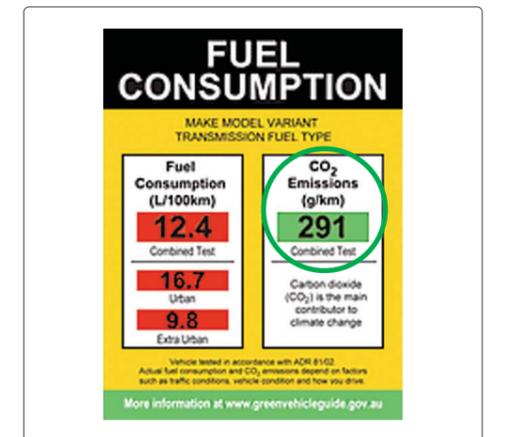
The CO₂ emissions at manufacturing or scrapping stage are small and they are hard to quantify thus yielding low reliability. For example, more than 20,000 parts are needed to manufacture a car and in case of electronic products and lighting equipments, many of the parts are imported from a third country to be assembled in Korea. For these reasons, it is realistically very difficult to track them down to quantify the CO₂ emissions during the manufacturing stage.

Therefore, it seems sufficient to indicate the CO₂ emissions during its actual operational stage for customers to make a choice whether the product they are buying qualify as a low carbon product. As it can be inferred from the automobile example, 27 EU member countries, Australia and others have already added CO₂ emissions to their energy consumption efficiency labels compatible with manufacturers' and consumers' interests.

EU's automobile energy label



Australia's automobile energy label



Standards for displaying CO₂ emissions

CO₂ emissions of automobiles are taken by actual measurement of CO₂ emissions during the measurement of fuel mileage. The standard for displaying CO₂ emissions of automobiles is CO₂ emissions per distance traveled (km).

CO₂ emissions of electronic appliances are calculated by obtaining “power consumption per hour” and converting it to “CO₂ emissions per hour”. But CO₂ emissions of washing machines, drum washing machines, dishwashers are calculated by obtaining “power consumption per a complete cycle” and converting it to “CO₂ emissions per complete cycle.” The conversion factor from “power consumption per hour or complete cycle” to “CO₂ emissions per hour or complete cycle” is “1Wh = 0.425g (CO₂ emissions)”. This conversion factor is the average of greenhouse gas emission factor of power sector in last 5 years.

GHG emission factor of domestic power sector

Type	2003	2004	2005	2006	2007	Average
CO ₂ emissions (tCO ₂)	126,007,512	138,132,150	143,526,713	149,731,814	166,411,460	
Power Generation(MWh)	303,629,477	322,832,473	345,228,062	353,669,157	374,948,253	
Emission (tCO ₂ /MWh)	0.4150	0.4279	0.4157	0.4234	0.4438	0.42516

Source : Based on documents prepared by Korea Power Exchange and reported to Ministry of Knowledge Economy



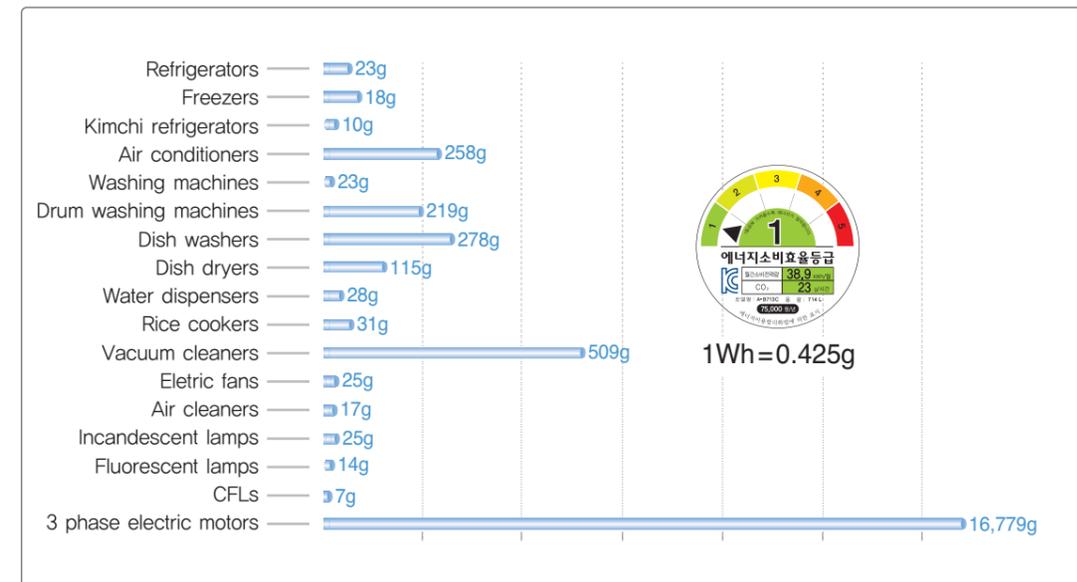
The significance of displaying CO₂ emissions and its impact

By displaying CO₂ emissions in energy efficiency grade label and the promotion of low carbon and energy efficiency products, Korea is better prepared against the United Nations Framework Convention on Climate Change.

It is foreseeable that the promotion of light vehicles with high fuel mileage and hybrid cars will be accelerated due to low CO₂ emissions.

It is also significant to show “CO₂ emissions per hour or complete cycle” based on the “power consumption per hour or complete cycle” as an indicator for customers to make a purchase decision, in addition to energy efficient rating from 1 to 5. By clearly showing that drum washing machines emit CO₂ more than 5~10 times than regular washing machines, air conditioners emit 30 times more than electric fans and incandescent lamps emit 4~5 times more than compact fluorescent lamps, customers are better informed which products are low carbon and energy efficient products.

Comparison of CO₂ emissions by products



Source: KEMCO

Future plans for displaying CO₂ emissions

As the CO₂ emissions for each product become an important criterion for consumers to make a purchase decision, the management of CO₂ emissions displayed on the energy efficiency label needs to be strengthened so that the consumers can safely purchase low carbon and energy efficient products. To facilitate this goal, regulation on machinery and materials subject to efficiency management (MKE) will be amended to include CO₂ emissions as items to be managed in addition to energy efficiency grades (1 to 5).

Furthermore, all new products participating in the energy efficiency grade labeling programs should also indicate CO₂ emissions.

By displaying CO₂ emissions in energy efficiency grade label, not only it provides a basis for identifying energy consuming behavior and energy efficiency but it will also contribute to raising the energy efficiency of household and industrial equipments. In particular, it will provide objective evidences for governments to establish a policy guideline and strategies to participate in the international setting such as GHG emission trading.

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

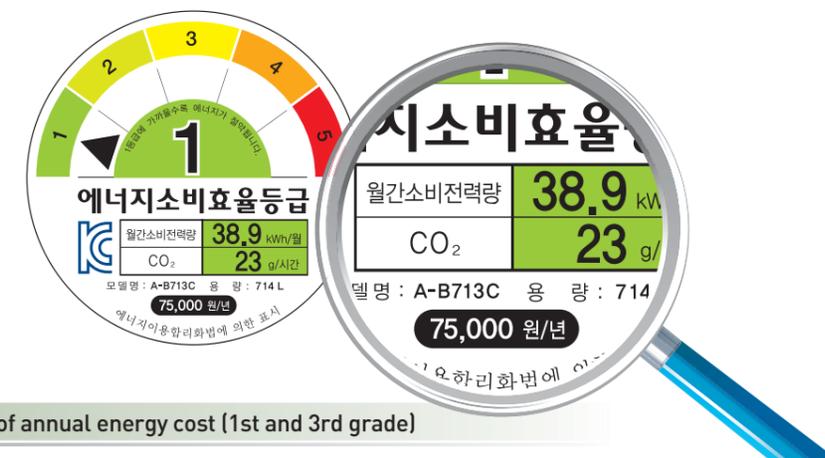
Displaying annual energy cost information

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.

Efficiency grade indicator

Energy efficiency ratio(air-conditioners), power consumption per 1kg(drum washing machines), light efficiency(fluorescent lamps), heat efficiency(gas boilers)

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.



Comparison of annual energy cost (1st and 3rd grade)

Products	Average energy efficiency 1st grade		Average energy efficiency 3rd grade		Effects of energy savings (3rd grade -1st grade)		Remark
	Annual power consumption (kWh/year)	Annual energy cost (KRW)	Annual power consumption (kWh/year)	Annual energy cost (KRW)	Annual power consumption (kWh/year)	Annual energy cost (KRW)	
Refrigerators	474.6	75,936.0	615.0	98,400.0	140.4	22,464.0	700L class
Air conditioners	431.6	69,062.4	497.8	79,644.8	66.1	10,582.4	Cooling capacity 6kW class (15pyong)
Electric rice cookers	220.5	35,278.3	242.3	38,765.5	21.8	3,487.2	10 people serving size

There are concrete plans for displaying annual energy cost information on newly manufactured TV and other new products that consume energy. The scope will be gradually expanded.

• Basis for annual power consumption by products

Products	Capacity (Main model)	Basis for annual power consumption (kWh)	Annual energy cost (Korean Won)
Refrigerators	700L	Monthly power consumption(kWh) × 12 months = 467	75,000
Electric freezers	200L	Monthly power consumption(kWh) × 12 months = 361	58,000
Kimchi refrigerators	200L	Monthly power consumption(kWh) × 12 months = 209	33,000
Air-conditioners	36.3m ²	Monthly power consumption(kWh) × 2 months = 444	71,000
Washing machines	10kg	Power consumption for one cycle (Wh) × 210 cycles = 44	7,000
Drum washing machines	10kg	Power consumption for one cycle (Wh) × 210 cycles = 200	32,000
Dish washers	12 persons	Power consumption for one cycle (Wh) × 365 cycles = 344	55,000
Dish dryers	7 persons	Power consumption for 20 minutes (Wh) × 438 cycles = 38	6,000
Electric rice cookers	10 persons	Power consumption for one cooking cycle(Wh) × 438 cycles = 206	33,000
Vacuum cleaners	1200W	Power consumption(W) × 21.6(cycle) × 0.333(h) × 12 months × 0.75 = 75	12,000
Electric fans	35cm	Measured power consumption(W) × 655(h) = 31	5,000
Air cleaners	26.4m ²	Measured power consumption (W) × 8,760(h) × 0.3 = 138	22,000
Industrial refrigerators	1400L	Monthly power consumption (kWh) × 12 months = 944	151,000

1kWh(power consumption) = 160 Korean Won (energy cost)



VI

Korea's Energy Standards & Labeling www.kemco.or.kr

International Cooperation and Current Overview of Energy Efficiency

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4. International Partnership for Energy Efficiency Cooperation (IPEEC) 116
3. Asia-Pacific Economic Cooperation (APEC) 118

International Cooperation and Current Overview of Energy Efficiency

Among the four major energy efficiency sectors (industry, transport, buildings, appliances and equipment), international cooperation is most active in the appliances and equipment sector. Energy standards & labeling accounts for 50~60% of international cooperation since the majority of international cooperation is centered around appliances such as motors, lighting equipment and appliances that consume standby power.

There are a number of international conferences on energy efficiency, including IEA meetings, International Partnership for Energy Efficiency Cooperation (IPEEC), Asia-Pacific Economic Cooperation (APEC) and other international organizations are also active in endorsing energy efficiency.



1 - International Energy Agency (IEA)



Overview of IEA

The International Energy Agency is an international organization that promotes and supports energy policies of the OECD. IEA implements comprehensive energy cooperation programs including energy efficiency among 27 OECD member countries.

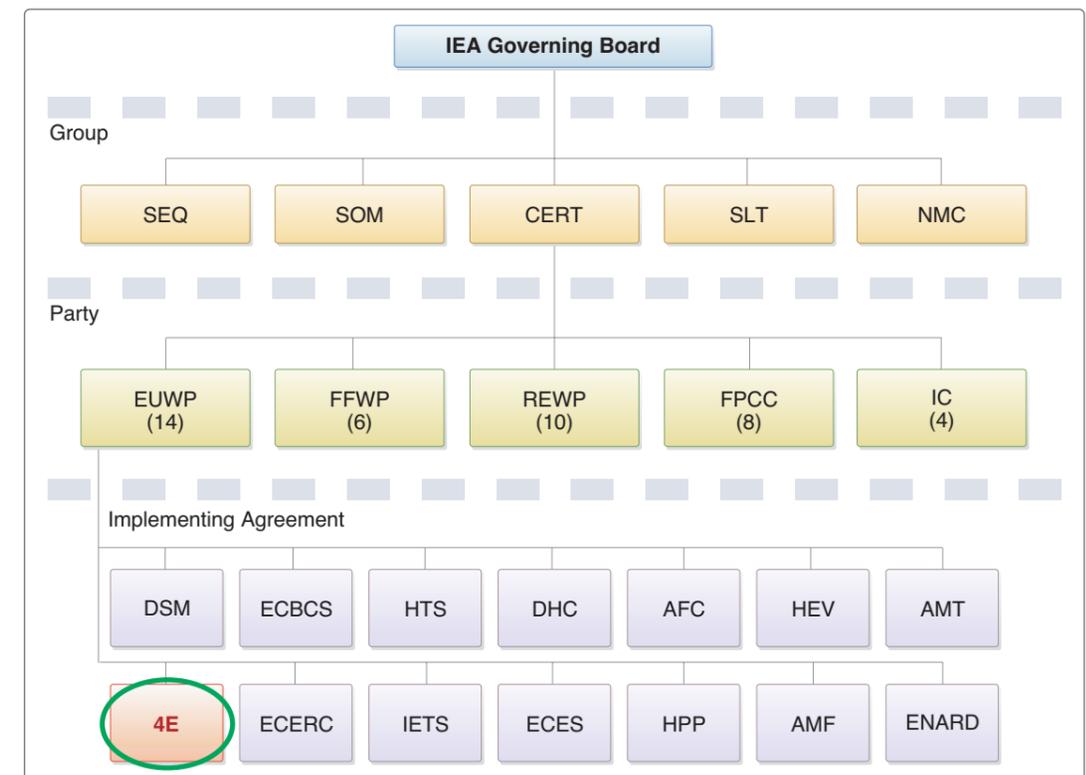


IEA makes recommendations to national governments, and promotes energy efficiency improvement as the most fundamental and appropriate energy policy. IEA encourages national governments to take firm actions in promoting energy efficient appliances and phasing out low efficiency appliances from the market.



Web site: www.iea.org

Organization of IEA Implementing Agreement chart



IEA 4E

IEA 4E(Efficient Electrical End-Use Equipment) is an implementing agreement drafted in 2008 to facilitate the operation of international projects such as energy efficiency projects in appliances and equipment and labeling schemes, etc.

Website: www.iea-4e.org

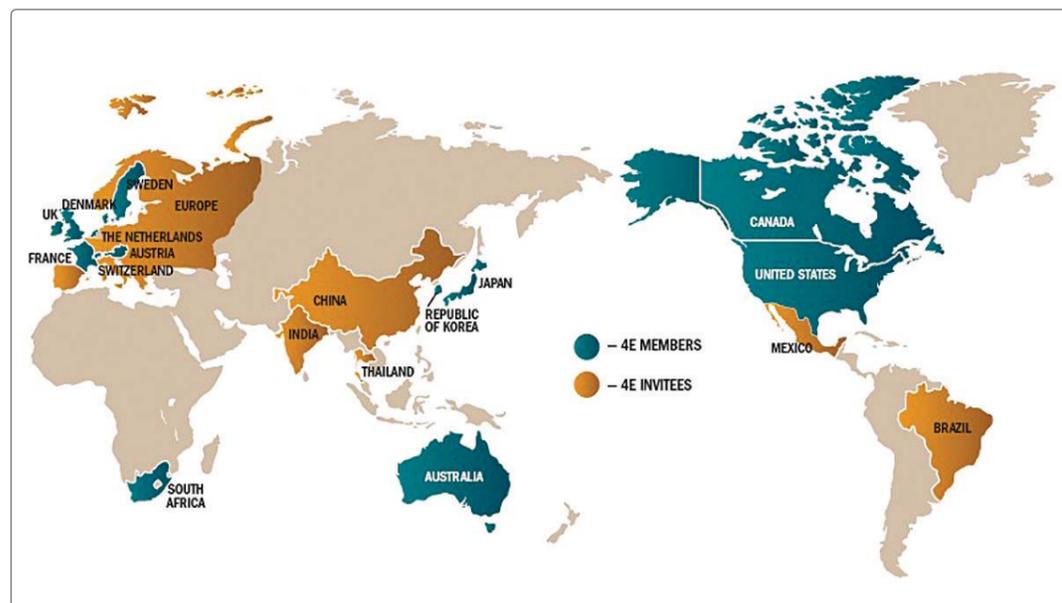
IEA's existing 40 implementing agreement focused around technology. IEA 4E is noteworthy in the sense that it is the first implementing agreement focused on policy to address climate change issue by involving OECD governments.



USA, Canada, Australia, UK, France, Netherlands, Denmark, Switzerland, Austria, South Africa, Korea, Sweden Japan (13 OECD countries) are involved in international projects related to mapping & benchmarking, standby power, motor systems, LED lights(SSL).



IEA 4E participating countries



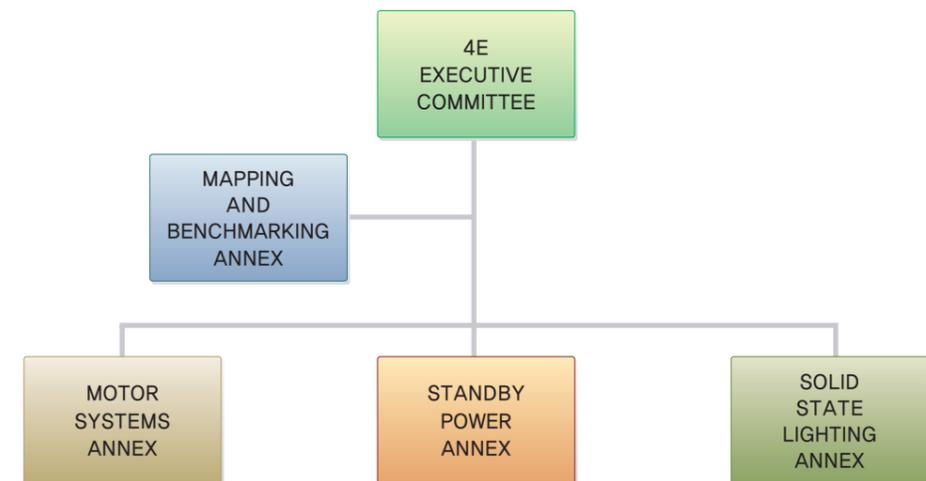
IEA 4E participating countries and organizations

Participating countries	Participating organizations	Type
USA	Department of Energy	Government
Canada	Natural Resource Canada	Government
Australia	Department of Climate Change and Energy Efficiency	Government
UK	defra	Government
France	ADEME	Public organization
Netherlands	NL Agency	Government
Denmark	Danish Energy Agency	Government
Switzerland	Swiss Federal Office of Energy	Government
Austria	Austrian Federal Ministry of Transport, Innovation and Technology	Government
Sweden	The Swedish Energy Agency	Government
Japan	New Energy and Industrial Technology Development Organization	Public organization
South Africa	National Energy Efficiency Agency	Government
Korea	MKE, KEMCO	Government, Public organization

IEA 4E is conducting 4 international projects that include mapping & benchmarking, standby power, motor systems, and LED lighting (SSL). All member countries of IEA 4E should participate in the mapping & benchmarking Annex.

IEA 4E Annex

Annex	Leader	Participant Countries
Mapping & Benchmarking	UK	USA, Canada, Australia, France, Netherlands, Denmark, Switzerland, Austria, Japan, Sweden, South Africa, Korea
Standby Power	Australia	UK, Canada, Sweden, Netherlands, Denmark, Switzerland, Austria, Korea
Motor System	Switzerland	Denmark, Australia, Netherlands, Austria, USA
LED Lighting(Solid State Lighting)	Sweden	UK, Netherlands, France, Denmark, Australia, USA, Japan



2- International Partnership for Energy Efficiency (IPEEC)



IPEEC (International Partnership for Energy Efficiency Cooperation) is an international partnership for energy efficiency cooperation among G8 (USA, UK, France, Germany, Italy, Canada, Japan, Russia) + 6 (China, India, Brazil, South Africa, Mexico, Korea) countries.

Under IPEEC TASK, 6 international projects including SEAD are currently being carried out.



• IPEEC task

Task	Leading country
Super-efficient Equipment and Appliance Deployment (SEAD)	USA
Energy Management Action Network (EMAK)	Japan
Sustainable Buildings Network (SBN)	Germany
Measuring & Verifying EE Improvements	France
Global EE Action Initiative (GEEAI)	Italy
Assessment of EE Financing Mechanisms	India



IPEEC SEAD

SEAD (Super-efficient Equipment and Appliance Deployment System) is a government-led global market transformation initiative which was proposed as a Task under IPEEC by the United States.

Web site : www.superefficient.org



USA, Australia, Canada, EU commission, France, Germany, India, Japan, Mexico, South Africa, Sweden, UK, Republic of Korea are member countries of SEAD. Work programs include harmonization of testing procedures, drafting of global energy efficiency policy, provision of incentives, government procurement, and technical analysis. Products considered in the program include commercial refrigerators, computers, transformers, LED lightings, motors, network standby power and TVs. Lawrence Berkeley National Laboratory (LBNL) and CLASP are supporting US DOE and they are acting as the secretariat of SEAD.

The first global energy efficiency project target product will be TVs starting from 2012.

3 - Asia-Pacific Economic Cooperation (APEC)



Overview of APEC

APEC, comprised of 21 member countries, is an international economic cooperation community. APEC has an Energy Working Group (EWG) to facilitate APEC energy activities. APEC also has funds to support energy related projects. Under the EWG, there are four expert groups. The APEC EGEE&C (Expert Group on Energy Efficiency and Conservation) is responsible for energy efficiency activities.



APEC EGEE&C

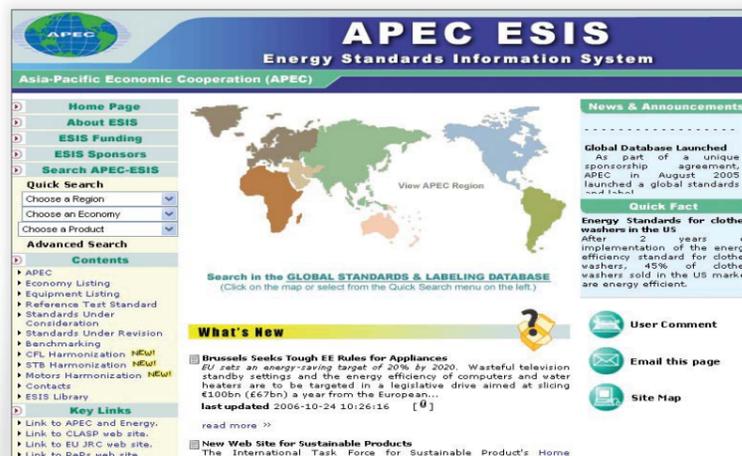
APEC EGEE&C (Expert Group on Energy Efficiency and Conservation) is an energy efficiency expert group. About 70% of EGEE&C's current international energy efficiency projects are focused on improvements of energy efficiency of appliances and equipment.



Web site : www.egeec.apec.org

APEC EGEE&C's well known project is APEC ESIS (Energy Standard Information System). APEC ESIS provides information on member countries' MEPS, energy labels, policy regulators, and international harmonization efforts.

Web site : www.apec-esis.org (maintained by CLASP)



VII

Korea's Energy Standards & Labeling

www.kemco.or.kr

International Energy Efficiency Standards and Labeling

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International Energy Efficiency Standards and Labeling

Countries around the world are operating energy labels and standards to promote energy efficiency and to protect the environment. Energy efficiency promotion policies can be classified into mandatory (energy labels and MEPS) and voluntary programs.

The USA and Australia are countries that are phasing out low efficiency appliances from the market by implementing MEPS and EU's Ecodesign directive also falls in this category. The USA's Energy Guide, Europe's Energy Label and Australia's Energy Rating Label are examples of mandatory labeling programs. In addition, Japan's Top Runner Program is also a mandatory program.

Numerous incentive programs are available that induce the manufacturing of energy efficient products. The ENERGY STAR Program jointly implemented by US EPA and DOE and falls in this category.

International energy labels & standards

Category	Label	Characteristics	International energy labels & standards
Energy label	Mandatory labeling	Mandatory	
	Voluntary labeling	Voluntary	
MEPS	NA	Mandatory	Korea, USA, Australia, California, EU's Ecodesign
Target efficiency Level	NA	Mandatory	Top Runner Program (Japan)
Voluntary agreement	NA	Voluntary	Code of Conduct (EU Commission)
Promotion program	NA	Voluntary	Market Transformation Program (UK)
Government procurement	NA	Voluntary	FEMP(USA), green purchase(Japan), China

1 - The United States



A brief introduction to the US federal government's Energy Guide Label, MEPS, ENERGY STAR Program, Federal Energy Management Program and procurement system is given here. In addition, California's efficiency standard, which has a significant impact on US energy efficiency standards, is presented in this section.



1 Federal Government MEPS

Overview

The program bans production and sales of products below MEPS. In the case of motors, a fine of \$110 is charged for each violation.

Web site: www.eere.energy.gov/buildings/appliance_standards

Characteristics

Mandatory

Target products

Motors, refrigerators, air conditioners, boilers, fluorescent lamps, external power supplies etc. (40 products)

Implementing organization

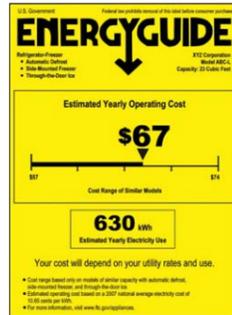
DOE



2 Energy Guide Label

Overview

Energy Guide label on energy cost and efficiency
 Web site: www.ftc.gov/bcp/online/edcams/eande



Characteristics

Mandatory

Target products

Refrigerators, air conditioners, washing machines, furnaces, boilers etc (11 products)

Implementing organization

The Federal Trade Commission

3 ENERGY STAR Program

Overview

The program aims to involve manufacturers on a voluntary basis to promote energy efficient appliances and environmental protection. Especially, the ENERGY STAR Program standards for office equipment and household electronics have emerged as quasi-world standards.

Website: www.energystar.gov



Characteristics

Voluntary

Target products

Computers, monitors, printers, fax machines, copiers, scanners, multi-function devices, televisions, home audio products, refrigerators, washing machines, boilers, furnaces, air conditioners, lighting fixtures, windows, external power supplies

Implementing organization

US EPA & DOE

4 Federal Energy Management Program

Overview

At the Federal level, energy efficient procurement is managed by the Department of Energy's Federal Energy Management Program (FEMP). Federal buyers are now required by the Energy Policy Act of 2005 to purchase products that are ENERGY STAR-qualified or FEMP-designated (in the upper 25% of energy efficiency in their class), unless they are unavailable or demonstrably not cost-effective (onus is on procurer to make this case). FEMP helps federal purchasers identify these types of highly efficient products.

Website: www1.eere.energy.gov/femp

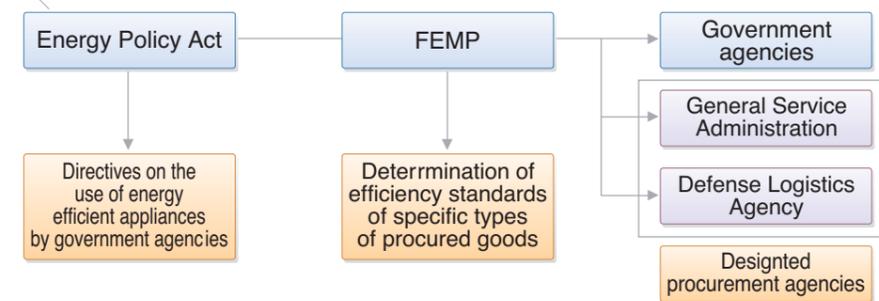


Characteristics

Mandatory

Implementing organization

DOE



5 California MEPS

Overview

Since 1970, the state of California has established standards for energy efficiency and standby power, and frequently they have been adopted as the federal standards.

Web site : www.energy.ca.gov/appliances



Characteristics

Mandatory

Target products

External power supplies, televisions, computers, copiers, gas boilers, refrigerators, etc. (40 products)

Implementing organization

California Energy Commission

2 European Union (EU)



The EU, comprised of 27 member countries, is a unified economic community. Each member state applies the Energy Label, Ecodesign and MEPS in accordance with the directive or regulation from the EU Commission. In addition, each member state operates its own energy efficiency programs.



Along with the regulation or EU directives (Ecodesign of energy-using products, Energy Label, MEPS, Eco-Label) which is implemented across the EU, independent labeling schemes worked out between some member state and industry are being implemented. Among the schemes in operation, Eco-design of energy-using products and Energy Labels and MEPS based on EU directives impose responsibilities on manufacturers.



EU directives have legal effects on EU member state. However, each member state needs to incorporate the directives into its domestic law in order to have full enforceability.

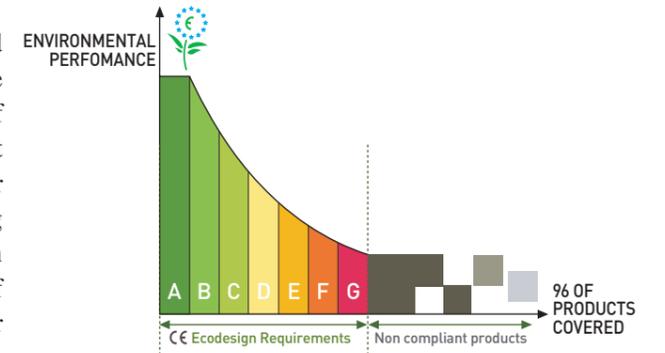
EU legislation

Types of legislation	Target	Enforceability
Regulation	All member states, legal entities, individuals	It has the strongest enforceability. It supersedes the domestic law and imposes responsibilities on Member States. Nowadays, many states adopt regulation only if the states already have common policy between them.
Directive	All member states	It mandates the Member States to incorporate the provisions of the directive into their domestic law in accordance with Member States' own circumstances. The full incorporation of a directive can take several years.
Decision	Individual member states or legal entities	EU renders orders to individual Member States or legal entities.
Recommendation opinion	All member states	It has no mandatory enforceability. It is the opinion of EU parliament.

1 Ecodesign

Overview

EuP (energy using products) and ERP (energy related products) provide rules for the energy efficient design of energy using products. From August 2008, all energy using products or energy related products being exported to the EU should be in compliance with the provisions of Ecodesign. Energy using products or energy related products that satisfy the requirements of Ecodesign will be indicated with a CE label and only products with the CE label will be allowed to enter the EU market.



Web site: ec.europa.eu/enterprise/eco_design/index_en.htm

The Ecodesign stipulated can be interpreted as mandatory compliance of energy efficiency standards which is similar to concept of Korea's MEPS based on Rational Energy Utilization Act. Standby power sector became mandatory first which means products that meet the 1W requirement can only be sold in the EU market. Furthermore, the application of Ecodesign on street & office lighting, simple set-top boxes, external power supplies, domestic lighting, electric motors, circulators, refrigerators, TVs, dish washers, washing machines, fans will become mandatory from 2010.

Characteristics Mandatory

Target products

Standby power, street & office lighting, simple set-top boxes, external power supplies, domestic lighting, electric motors, circulators, refrigerators, TVs, dish washers, washing machines, fans (12 products)

Implementing organization EU Commission

Steps involved in drafting Ecodesign Directive



- 1 A preparatory study
- 2 A consultation forum (consultation of all interested stakeholders)
- 3 An impact assessment
- 4 A regulatory committee
- 5 A scrutiny by the European Parliament

Products under Ecodesign directive

- Standby and off-mode
- Tertiary lighting
- Simple set-top boxes
- External power supplies
- Boilers and combi-boilers (gas/oil/electric)
- Water heaters (gas/oil/electric)
- Personal computers, desktops & laptops, computer monitors
- Imaging equipment (copiers, faxes, printers, scanners, multifunctional devices)
- Residential room conditioning appliances (air conditioners and ventilation, domestic fans)
- Electric motors 1-150 kW, water pumps, circulators, industrial fans
- Commercial refrigerators and freezers, including chillers, display cabinets and vending machines
- Domestic refrigerators and freezers
- Domestic dishwashers and washing machines
- Solid fuel small combustion installations
- Laundry dryers
- Vacuum cleaners
- Complex set top boxes
- Domestic lighting products II (reflector lamps and luminaires)
- Local room heating products
- Central heating products using hot air to distribute heat (other than CHP)
- Domestic and commercial ovens (electric, gas, microwave), including when incorporated in cookers
- Domestic and commercial hobs and grills, including when incorporated in cooker
- Professional washing machines, dryers and dishwashers
- Non-tertiary coffee machines
- Networked standby losses of EuPs
- Domestic uninterruptible power supplies : UPS

Standby power reduction standard by Ecodesign directive

Mode	1 year	4 years
Off mode	≤1.0W	≤0.5W
Standby mode without display	≤1.0W	≤0.5W
Standby mode with display	≤2.0W	≤1.0W

2 EU MEPS

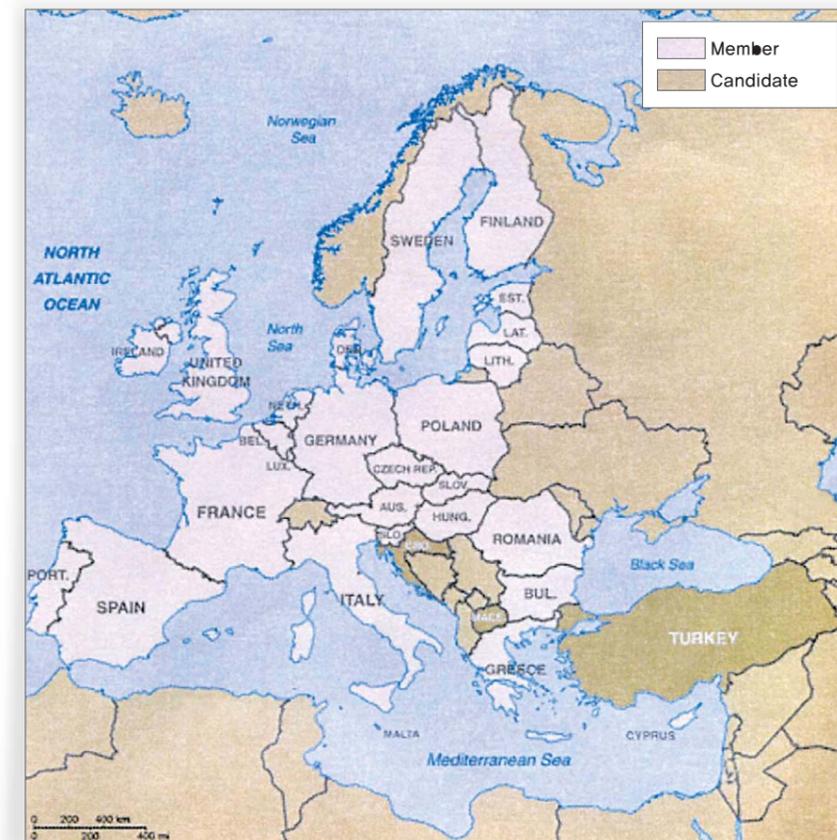
Overview

In accordance to the Directive of EU Commission, member countries implement MEPS standards.

Web site: ec.europa.eu/enterprise/eco_design/directives.htm

Characteristics Mandatory

Target products Boilers, refrigerators, freezers, ballasts, etc (4 products)



3 Energy Label

Overview

The Energy Label shows the level (A~G) of energy efficiency. Member states are incorporating the EU Commission's directive into their domestic law by mandating the indication of energy labels.

Web site : europa.eu/legislation_summaries/consumers/product_labelling_and_packaging/132004_en.htm

Characteristics Mandatory

Target products Refrigerators, freezers, washing machines, dish washers, lighting fixtures (10 products)

Implementing organization EU Commission

Energie		Washing Machine
Hersteller	ABC	123
Modell		
Niedriger Energieverbrauch		
A		
B		
C		
D		
E		
F		
G		
Hoher Energieverbrauch		
Energieverbrauch kWh/Waschprogramm	0.95	
Washing Machine		
Auslass	Abcdefg	
Schleudereffizienz	Abcdefg	
Füllmenge (Baumwolle) kg	5.0	
Wasserverbrauch l	49	
Geräusch		
Wärmepumpe		
Schleudern		

4 Eco Label

Overview

In addition to the Energy Label, environmentally friendly products with an a grade can be indicated with the Eco-label. It is a voluntary scheme where the Eco-label is allowed only when the manufacturer expresses interest and the product satisfies the requirements of the Eco-label.

Web site: ec.europa.eu/enterprise/eco_design/index_en.htm



Characteristics Voluntary

Target products Refrigerators, washing machines, lighting fixtures, computers (9 products)

Implementing organization EU Commission

5 Code of Conduct

Overview

The EU Commission and the manufacturers concluded a voluntary agreement to reduce standby power, and drafted the EU Code of Conduct

Web site: re.jrc.ec.europa.eu/energyefficiency/html/standby_initiative.htm

Characteristics Voluntary

Target products External power supplies, set-top boxes, modems, broad bandwidth equipments, data centers, etc.

Implementing organization EU Commission



6 GEEA (Group for Energy Efficient Appliances)

Overview

This is a program that promotes the development of energy efficient products to reduce standby power (Switzerland, Germany and other European countries (eight countries) are participants in this program). The program utilizes the energy label. GEEA is terminated and developed into IEA 4E.

Web site: www.gealabel.org/home.htm



Characteristics Voluntary

Target products TVs, set-top boxes, computers, monitors, multifunctional devices, etc. (15 products)

Implementing organization

SFOE (Switzerland), DEA (Denmark), EVA (Austria), Dena/GED (Germany), SenterNovem (Netherlands), STEM (Sweden), Motiva (Finland), ADEME (France)

7 Market Transformation Program

Overview

This is the UK's energy efficiency promotion program and covers cooling & heating equipments, lighting fixtures, household appliances and so on. The program does not have labels and focuses on market transformation through energy efficient appliances.

Web site: www.mtprog.com

Characteristics Voluntary

Target products Household appliances, lighting fixtures, office equipments, cooling and heating equipments

Implementing organization defra

MARKET TRANSFORMATION PROGRAMME
Supporting UK Government policy on sustainable products

8 Energy Saving Recommended products

Overview

Energy Saving Recommended (ESR) label is attached to products with top 20% efficiency level. UK's Energy Saving Trust operates this program and ESR label is given after a strict review. ESR label is well known among consumers in the UK.

Web site: www.energysavingtrust.org.uk/Energy-saving-products/About-Energy-Saving-Recommended-products



Characteristics Voluntary

Implementing organization Energy Saving Trust

9 Blue Angel

Overview

Blue Angel is a German environmental label. Along with other environmental standards, it is also applied to standby power.

Web site: www.blauer-engel.de/en/index.php



Characteristics Voluntary

Target products Monitors, computers, copiers, fax machines, printers, etc. (10 products)

10 Nordic Swan

Overview

Environmental label of Norway, Sweden, Finland, Iceland, Denmark, etc.

Web site: www.svanen.nu



Characteristics Voluntary

Target products Refrigerators, washing machines, TVs, computers, heat pumps, boilers, etc (13 products)

11 TCO

Overview

TCO is an international specification on radiation and energy efficiency. TCO certification has a significant impact on monitors.

Web site: www.tcodevelopment.com



Characteristics Voluntary

Target products Monitors, cellular phones, computers, printers, etc (9 products)

Implementing organization Swedish Union of Professional Employees

3 Japan



Japan's energy labels & standards are unique and set apart from the general trends of the world. Especially, the Top Runner Program is one of Japan's most successful energy programs and is recognized as one of the most powerful such government programs in the world.

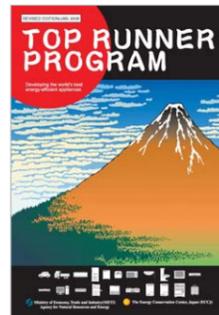
1 Top Runner Program

Overview

The program establishes the current highest energy efficiency levels as the target efficiency standards and implements various measures to obtain the efficiency target within a specified time period. For those manufacturers that fail to achieve the target objectives, the following measures will be applied:

- 1st step: Advisory measures
- 2nd step: Public announcement of violation
- 3rd step: Fine imposed

Web site: www.eccj.or.jp/top_runner



Characteristics Mandatory

Target products

Automobiles, air conditioners, fluorescent lamps, TVs, refrigerators, toilet seats, transformers, vending machines, gas equipments, etc. (23 products)

Implementing organization METI



2 Uniform Energy Saving Label

Overview

The energy saving level is displayed from one to five stars. More stars indicates higher energy efficient products. The labeling standards are connected to Top Runner Program.

Web site: www.eccj.or.jp/labeling_program



Characteristics Voluntary

Target products Refrigerators, air conditioners, TVs (3 products)

Implementing organization METI

3 Energy Saving Label

Overview

General products are labeled in orange and energy efficient products are labeled in green. The JIS standard is employed.

Web site: www.eccj.or.jp/labeling



Characteristics Voluntary

Target products Refrigerators, air conditioners, TVs, gas equipment, etc. (16 products)

Implementing organization JIS

4 - China



China, one of the world's most industrious countries, is rapidly implementing energy labels & standards. In particular, China has an important role to play in the lighting fixtures sector since it supplies most of world's lighting equipment.



1 Minimum Energy Performance Standard

Overview

The program aims to ban production and sales of low efficiency products with the objective of phasing low efficiency products out of the market.

Web site: www.cnis.gov.cn

Characteristics Mandatory

Target products Refrigerators, air conditioners, fluorescent lamps, 3 phase electric motors, etc. (14 products)

Implementing organization CNIS



2 Energy Label

Overview

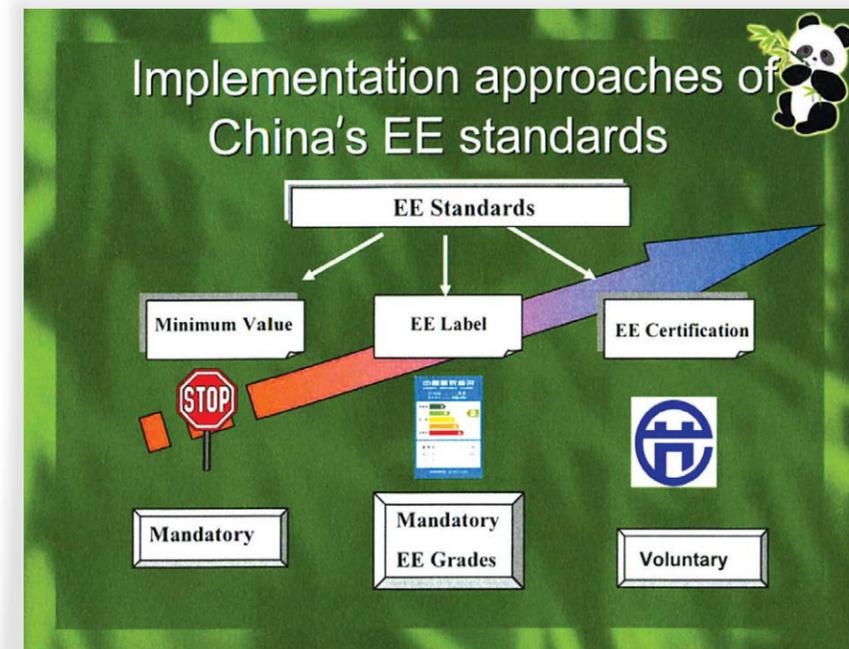
The energy efficiency level is displayed from grade 1 to grade 5. Number 1 indicates the highest energy efficient products.

Web site: www.cnis.gov.cn

Characteristics Mandatory

Target products Refrigerators, air conditioners, fluorescent lamps, etc. (10 products)

Implementing organization CNIS



5 - Canada



Canada's efficiency standards and energy labeling schemes are one of the best in the world. Considering its cold climate, Canada's efficiency management of heating appliances is well recognized around the world. In many cases, Canada's energy labeling schemes are similar, in terms of measurement methods and standards, to the standards of USA, the neighboring country.



1 MEPS

Overview

The program aims to ban production and sales of low efficiency products with the objective of phasing low efficiency products out of the market.

Web site: oee.nrcan.gc.ca/english

Characteristics

Mandatory

Target products

Clothes dryers, clothes washers, dehumidifiers, dishwashers, electric ovens, freezers, gas ranges, integrated washer-dryers, refrigerators, electric water heaters, gas water heaters, oil-fired water heaters, gas fireplaces, gas furnaces, gas boilers, gas-fired unit heaters, water-cooled heat pumps, heat pumps for commercial buildings, oil-fired boilers, oil-fired furnaces, packaged terminal air conditioners, room air conditioners, single-package central air conditioners and heat pumps, split-system central air conditioners and heat pumps, ceiling fans and ceiling fan light kits, compact fluorescent lamps, exit signs, fluorescent lamp ballasts, general service fluorescent lamps, general service incandescent reflector lamps ER and BR lamps, general service lamps, torchiere lamps, traffic and pedestrian signal modules, ice makers, chillers, dry-type transformers, three phase induction motors, vending machines, self-contained commercial refrigerators (45 products)

Implementing organization

Natural Resources Canada

2 EnerGuide Label

Overview

Mandatory display of energy use

Web site: oee.nrcan.gc.ca/residential/business/manufacturers/energguide-label.cfm

Characteristics

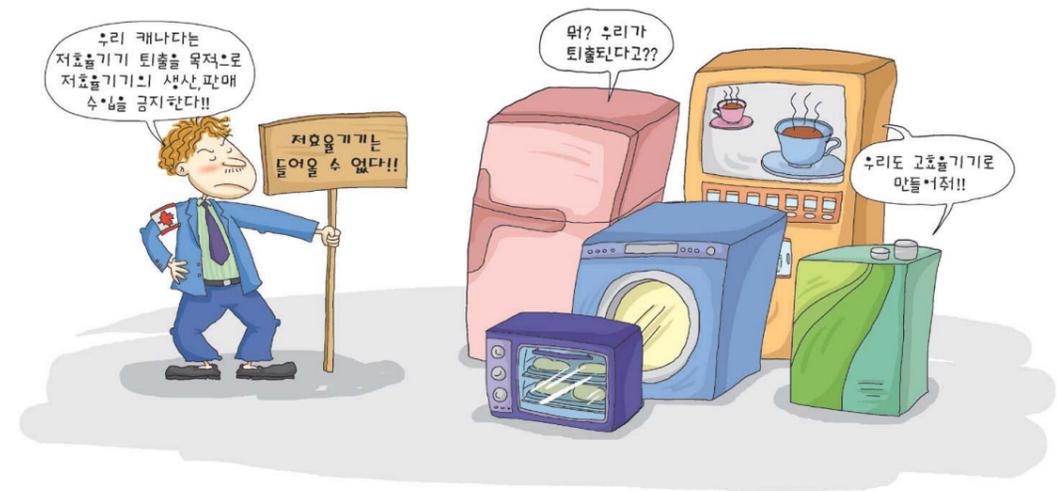
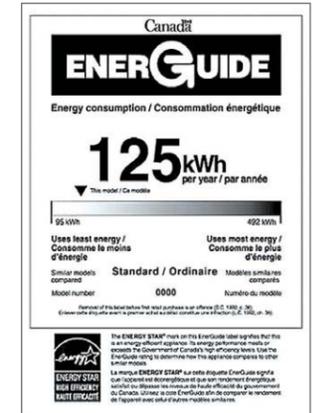
Mandatory

Target products

Refrigerators, air conditioners, clothes washers, clothes dryers, automobiles, etc (9 products)

Implementing organization

Natural Resources Canada



6 Australia



Australia imports many of its manufactured products. Consequently, it operates one of the strictest and most effective energy labels & standards programs. Australia's energy labels & standards program is regarded one of the best programs in the world.



Australia's standby power 1W policy was the world's first mandatory standby power policy at a national level. Furthermore, Australia became the first country in the world to announce its intention to phase out the low efficiency incandescent lamps.

1 Minimum Energy Performance Standard

Overview

The program aims to ban the production and sales of low efficiency products, with the objective of phasing low efficiency products out of the market.

Website: www.energyrating.gov.au

Target products Refrigerators, air conditioners, fluorescent lamps, 3 phase electric motors, etc. (18 products)

Implementing organization DCCEE

2 Energy Rating Label

Overview

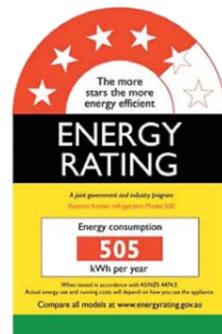
The Energy Rating Label indicates the energy efficiency of products. More stars indicates the higher energy efficiency.

Web site: www.energyrating.gov.au

Characteristics Mandatory

Target products Refrigerators, air conditioners, dryers, etc. (7 products)

Implementing organization DCCEE



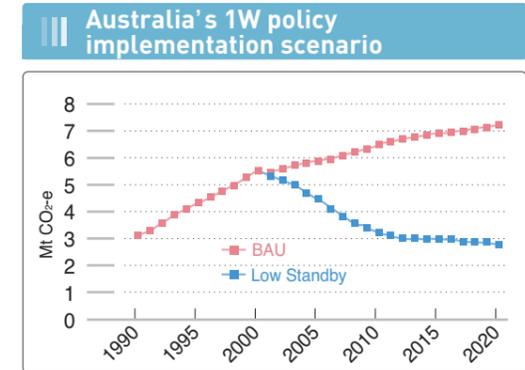
3 National Standby Power 1W Policy

Overview

In 2002, Australia announced that it would limit its standby power below 1W by 2012. MEPS will be the main policy tool to reduce the standby power of electronic goods to below 1W. The use of a mandatory standby warning label is also being considered.

- 1st phase: Voluntary 1W (2007)
- 2nd phase: Mandatory 1W(2012)

Web site: www.energyrating.gov.au/standby.html



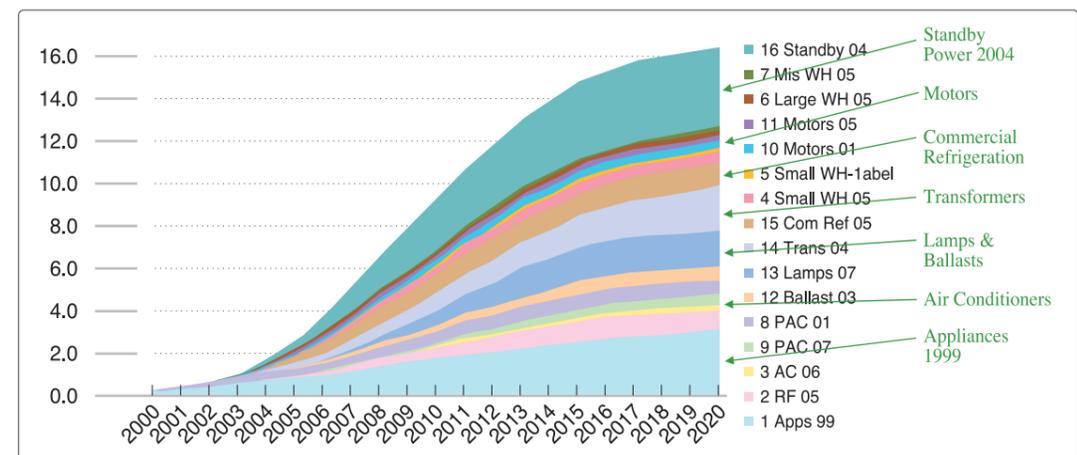
Characteristics Mandatory

Target products

DVD players, video cassette recorders, home audio products, multi-function devices, copiers, printers, washing machines, dryers, dish washers, kitchen ranges, clothes dryers, scanners, bread makers, coffee makers, modems, sensors, speakers, etc.

Implementing organization DCCEE

Australian Government's GHG reductions



DCCEE expects that, by 2020, GHG reductions from standby power will be the highest among the available GHG reduction measures.

International Energy Labels & Standards

