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Procedia Environmental Sciences 11 (2011) 1359 – 1364

Procedia

Environmental Sciences

Conference Title

Low Carbon Energy Policy Research

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Abstract

Case study of Korea, Low carbon 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. Korea operates these Programs in an effort to improve energy efficiency in appliances and equipments. Mandatory energy efficiency standard which bans production and sales of low energy efficiency products which fall below the minimum energy performance standard. Ministry of Knowledge of Economy (MKE) and Korea Energy Management Corporation (KEMCO) is the key organizations in implementing energy efficiency standards and labeling. National energy efficiency efforts can be realized through energy efficiency improvements with the successful implementation of an energy efficient appliances dissemination policy and the phase out of low efficiency appliances. 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, and 1.37 billion USD worth of energy savings.

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Keywords: energy efficiency; Label and Standard; Certification; e-Standby; MEPS

1. Introduction

Korea is the 10th largest energy consuming nation in the world. In 2009, Korea spent 91.2 billion dollars on energy imports. This figure accounts for 28% of total imports and is equivalent to the total export of semiconductors, automobiles, ships and steels which are Korea's major export items. 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 Korea economy.

Generally, 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.

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. 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 tires. 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.

2. 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 24 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. 41 categories of products are included in this program including pumps, boilers and LED lighting equipment.

Since 1999, the e-Standby Program attempts to promote energy efficiency in products by reducing standby power based on manufacturers' voluntary participation. 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. 20 categories of products are included in this program including household appliances and office equipment.

2.1 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 .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. Mandatory reporting of energy efficiency grade by manufacturers or importers

- 3) applying MEPS. 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 17 thousand dollars will be charged.

- Policy characteristics

Mandatory reporting

- Target products

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, air cleaners, incandescent lamps, fluorescent lamps, ballasts for fluorescent lamps, compact fluorescent lamps, 3 phase electric motors, domestic gas boilers, external power supplies, electric cooling and heating equipments, commercial refrigerators, gas water heaters and automobiles (24 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, 24 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>).

2.2 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.

- Policy characteristics

Voluntary certification scheme

- Target products

Reflectors for fluorescent lamps, sensor lighting equipments, heat recovery ventilators, windows, pumps, centrifugal screw chillers, uninterruptible power systems, industrial gas boilers, transformers, T-5 fluorescent lamps, ballasts for metal halide lamp, ballasts for sodium lamps, inverters, auto thermostatic valves for heating, LED traffic lights, multi-function type switchgear systems, direct-fired absorption chiller-heaters, single phase motors, ventilation fans, centrifugal blowers, submersible aerators, ballasts for 16mm fluorescent lamps, metal- halide lamps, reflectors for HID lamps, ballasts for FPL 32W compact fluorescent lamps, FPL 32W compact fluorescent lamps, oil burning water boilers, industrial oil boilers, LED guide light, regenerative burners, turbo blower, thermo-hygrostat, multi-air conditioners, LED lamps(internal converter), LED Lamps(external converter), general LED lighting equipments, LED guard lighting equipments, LED sensor lighting equipments, converters for LED lighting modules, PLS equipments, high air tight insulated doors (41 products).

- Program operating organization

Korea Energy Management Corporation (KEMCO), delegated by Ministry of Knowledge Economy (MKE), operates the program in partnership with 100 lighting equipment, heavy electric equipment, boiler and other manufacturers. Currently, 41 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

1)The certification application,

2)Documents on maintenance of certified efficiency, and

3)A performance testing report issued by designated testing institutes.

2.3 e-Standby Program

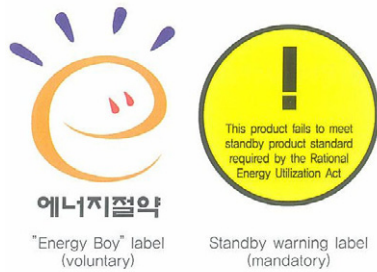


Figure 1. “Energy Boy”label.

- 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

- 1) Be subject to mandatory reporting of standby power
- 2) And 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).

- 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, toilet seats, modems, home gateways (20 products)

- Program operating organization

Korea Energy Management Corporation (KEMCO), delegated by Ministry of Knowledge Economy (MKE), operates the program in partnership with 100 electronic manufacturers. Currently, 20 products with over 7,000 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

- 1) The reporting form,
- 2) The performance test report, and
- 3) A 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>)

3. Organizations Involved in Implementing Three Energy Standards & Labeling Programs

Ministry of Knowledge of 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.

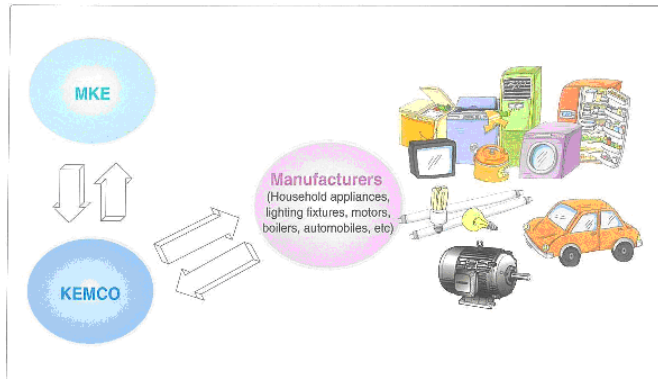


Figure 2. Organizations involved in implementing energy programs.

4. Implementation of Energy Efficiency Management Policy

4.1 Analysis of policy impacts on market transformation

National energy efficiency efforts can be realized through energy efficiency improvements with the successful implementation of an 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.

4.2 Accomplishments 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 Gleneagles 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 program over a relatively short period of time, incorporating the better elements from the more established national programs and adding new initiatives, such as the threat of using mandatory warning labels for products that fail to meet standby power targets."

1.37 billion USD worth of energy savings

The application of MEPS to 3 phase electric motors from 1 July 2008 will make the production and sale (import) of high efficiency motors mandatory. This is considered the most innovative energy efficiency policy among the rational energy utilization policies implemented in the past 30 years.

Under this program, 70% of 3 phase electric motors are to be replaced by high efficiency motors, and 1.37 billion USD worth of energy savings is expected. Due to the application of MEPS, production costs are estimated to rise by 409 million USD. However, the national benefit from the implementation of the program is estimated to be 957.2 million USD. Moreover, the promotion of premium motor technology development will advance the domestic motor industry and will contribute significantly to national energy efficiency improvement efforts.

Acknowledgment

My deepest gratitude goes first and foremost to Professor CUI Xi-Ming, my PHD supervisor, for her constant encouragement and guidance. He has walked me through all the stages of the writing of this thesis. Without his consistent and illuminating instruction, this thesis could not have reached its present form.

At the same time, I also owe my sincere gratitude to my friends and my fellow classmates who gave me their help and time in listening to me and helping me work out my problems during the difficult course of the thesis. Last my thanks would go to my beloved family for their loving considerations and great confidence in me all through these years.

I sincerely appreciate experts and professors to the review this paper to spend their time and hard work.

References

- [1]Hwa-Young Sin,Eunnyeong Heo,Sul-Ki Yi,Jihyo Kim, "South Korean citizen's preferences on renewable energy support and cooperation policy for North Korea,"Renewable & sustainable energy reviews,2010,14(5)
- [2]Whan-Sam Chung,Susumu Tohno, "A time-series energy input-output analysis for building an infrastructure for the energy and environment policy in south Korea," Energy & environment, 2009,20(6)
- [3]Hoesung Lee and Ji-Chul Ryu, "Energy and CO2 emissions in Korea: Long-term scenarios and related policies", Energy Policy Volume 19, Issue 10, December 1991, P926-933
- [4]Sang-Hyeon Jin, "The effectiveness of energy efficiency improvement in a developing country: Rebound effect of residential electricity use in South Korea", www.elsevier.com/locate/enpol, Energy Policy 35 ,2007, P5622–5629
- [5]Ku, Se-Ju Yoo, Seung-Hoon, "Willingness to pay for renewable energy investment in Korea: A choice experiment study",Renewable and Sustainable Energy Reviews, v 14, n 7, P2196-2201, 2010