

Policies to Promote EEC Buildings in Korea

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1. Overview

Since 1993, the Republic of Korea (henceforth, Korea) has developed a Rational Energy Utilization Basic Plan for every 5-year period, with revisions to the plan at the end of each 5-year period. The latest plan, the 5th Basic Plan, was announced in 2014, and it set a target of reducing final energy consumption by 4.1 percent and improving energy intensity by 3.6 percent in 2017 compared with the Business-as-Usual scenario (BAU). The government introduced various measures to achieve this target, which focuses on more innovative energy management policy tools rather than a simple and top-down energy conservation approach.¹ In view of this, the government has been implementing the following policy agenda: 1) energy demand management by energy users in the industrial, transport, buildings, and public sectors; 2) reforming the current energy pricing and market mechanisms; 3) reforming the energy information system; and 4) improvement in energy efficiency.

Key policy agendas include: a) when a business entity builds a new facility and/or expands the existing facilities, it has to prepare an energy demand management facility or energy saving plan; 2) target of fuel economy to be set so that the average fuel economy reaches the level of industrialised countries by 2020 (for example, Japan: 20.3km/L; European Union [EU]: 26.5km/L); 3) in the buildings

¹ The target of the 4th Basic Plan of 2008 was an 11.3 percent improvement in energy intensity compared with the 2012 level.

sector, investment in energy efficient windows can be subsidised with low-interest rates (Green Remodeling Program). The Ministry of Trade, Industry, and Energy (MOTIE) anticipates that, if the 5th Energy Rational Use Basic Plan is successfully implemented, the nation's energy consumption would fall by 4.1 percent, which would translate into a market creation of about 2.8 trillion Korean won for energy efficiency and conservation technologies and a reduction of 88 million tons in carbon dioxide (CO₂) emissions.

In the buildings sector, a couple of new policy tools are introduced. As for the existing buildings, two new programmes are initiated as follows.

- First, a building energy management system (BEMS) is developed and applicable to energy-intensive buildings and commercial/business structures. Its demonstration project is to be implemented for a selected 100 buildings for 5 years, starting from 2015. Fifty percent of the investment is to be subsidised up to 20 million won.
- Second, the Green Remodeling Program is reinforced in connection with the Green Card programme by the Ministry of Environment (MOE).

For newly built buildings, the Zero Energy Buildings 2025 programme will be implemented through a step-by-step reinforcement of 'Designing Criteria for Buildings Energy Savings,' resulting in a 90 percent reduction in heating/cooling energy use by 2020. Another new programme is to mandate the certification of energy efficiency labelling to identify the energy performance of buildings. Currently, this programme is voluntary but will be mandatory for apartment complexes with over 500 households and business facilities with a floor area exceeding 3,000 m².

2. Policy Tools

2.1. Energy Audits

This programme provides energy consumers with technical consulting services by energy auditing agencies that have technical equipment and know-how. By measuring and analysing the actual use of energy in large companies or buildings

that consume significant amounts of energy, loss factors are determined and improvement measures can be proposed. The government offers free energy audits for small and medium-sized companies, and larger companies can purchase the audit service. As a result of the 6,200 audits the government performed between 1980 and 2004, the government estimates that a 10 percent average energy savings rate has been achieved, equivalent to savings of 3.5 Mtoe over the period.

2.2. Energy Service Companies

Energy Service Companies (ESCOs) are companies equipped with required facilities, capital, and technology and registered to the Ministry of Trade, Industry and Energy pursuant to Article 25 of the Energy Use Rationalization Act and Article 30 of the Enforcement Decree of the same Act. The Korean government provides two types of support for ESCOs. It provides money directly to ESCOs to support preliminary work for still unproven efficiency technologies and provides funding directly to industrial companies to pay for ESCO services. The government pays the initial investment cost and then collects repayment based on subsequent energy savings. Once the government's initial investment has been repaid, the remaining benefits flow directly to the customer.

2.3. Building Codes and Efficiency Audits

To improve Korea's building energy codes, which are currently at a relatively low level compared with other International Energy Agency (IEA) countries, the Korea Institute of Construction Technology was tasked with investigating building energy efficiency assessment standards and strengthening current codes and policies in July 2005. On the basis of its results, the government prepared action plans and implemented them in 2007. Moreover, the existing programme, which requires a building energy savings plan for new buildings over a certain size, was strengthened and expanded to other building types. In addition, a performance-based energy code, which limits total energy use per unit area, has been implemented in these buildings.

The government is currently working on more stringent building insulation standards that will become tighter over time. Insulation standards, which are currently mandatory for all new buildings, will also be expanded to apply to significant renovations of existing buildings. To improve energy efficiency for windows, the Korean government plans to introduce more stringent standards. Korea is also studying whether to mandate that all real estate transactions for large buildings include an energy efficiency certification, with the associated document attached to all sale and purchase transactions. In 2007, the government mandated that energy audits be conducted every 5 years for buildings with energy consumption of more than 2,000 toe/year. Buildings that achieve outstanding energy performance can be exempted from this requirement.

2.4. Appliance Labelling and Standards

In 2004, Korea set a goal that the standby power of all electronic products be reduced to 1 watt by 2010, a goal that was later codified into e-Standby Korea 2010. The e-Standby programme aims to promote the widespread use of energy saving products that reduce standby power consumption. Standby power is electricity consumed by appliances that are plugged in but not in use. The products that meet the 1-Watt (W) standard are entitled to bear the 'Energy Saving Label.' When they fail to meet the standard, the 'Standby Warning Label' is displayed on the front of the product.

The programme was implemented in three stages according to the 'Standby Korea 2010' roadmap. The programme's ultimate goal is to reduce standby power of each electrical device below one watt by 2010. The first stage is the 'Voluntary 1 W Policy' that ran from 2005 to 2007. The second stage is the 'Preparation for Transition to a Mandatory 1 W Policy' from 2008 to 2009. From 2010, the 'Mandatory 1W Policy,' which is the ultimate goal of the roadmap, will be implemented as the final stage. At this stage, appliances sold in Korea will be subject to compliance with a 1-watt usage of power or less when in standby mode.

Korea is actively working to promote energy efficiency standards and labelling for appliances. The energy efficiency standards and labelling programme, launched in 1992 and subsequently reviewed in 2004, requires companies to label the energy efficiency of products in 18 categories, including refrigerators, air-conditioners, and cars. The comparative energy labels range from 5 (least efficient) to 1 (most efficient or 'target' level) and no product with a rating less than 5 may be sold after the effective date. The programme currently covers 21 products.

The government also has a programme to certify and label high-efficiency products, which was introduced in 1996. The programme covers 34 items including inductor motors, boilers, pumps, and lighting equipment. In 1999, the government started the standby power saving programme, a voluntary system that initially labelled products in 14 categories, including computers, printers, copying machines, televisions, and video-cassette recorders (VCRs).

3. Buildings

3.1. Buildings Energy & GHG Target Management Scheme (BGHG)

The Buildings Energy & GHG Target Management Scheme (BGHG) was implemented as a core measure to meet the mid-term reduction target in GHG (by 2020) prescribed in Article 42 of the Basic Law of Low-Carbon and Green Growth and Articles 26–32 of the Enforcement Decree of the same law. Companies with a high level of GHG emissions and energy consumption are designated as companies under surveillance. Targets of GHG emissions and fossil fuel energy are imposed on them and they are required to evaluate their performance. The targets are set following a discussion between the government and the respective companies. Incentives (support for implementation) and penalties (improvement order and penalty) are given based on the fulfilment of the target. Targeted subjects of the programme are categorised as corporates and business premises. The scope of the target is slated to be expanded pursuant to Article 29 of the Enforcement Decree of the Basic Law of Low-Carbon and Green Growth.

The Ministry of Environment oversees the programme implementation and runs the Greenhouse Gas Inventory & Research Center of Korea, which was established to develop a comprehensive GHG information management system. Supervising institutes in each section serves as a single window to oversee tasks of target setting, implementation, and giving support to those targeted companies.

Table 1. Criteria for Eligible Management Companies

Category	Before 31 December 2011		From 1 January 2012		From 1 January 2014	
	Corporate	Business Premise	Corporate	Business Premise	Corporate	Business Premise
GHG (tCO ₂)	125,000	25,000	87,500	20,000	50,000	15,000
Energy (TJ)	500	100	350	90	200	80

* Relevant law: The article 29 of the Enforcement Decree of the Basic Law of Low-carbon and Green Growth.

* 1TJ = 23.88 toe

Source: Ministry of Education, Science and Technology, 2016.

3.2. Buildings Energy Efficiency Certification

The Korean government assesses and certifies energy efficiency of buildings in terms of energy consumption and GHG emissions to improve energy efficiency. Starting with a certification programme for apartment buildings in 2001, it was mandated that new apartments in the public sector should obtain certification higher than level 2 pursuant to the Prime Minister Guideline (June 2008), which was again strengthened up to level 1 in 2011. The scope of this regulation was expanded to include non-residential buildings (The Green Building Promotion Act, 2013). The government estimates CO₂ emissions and energy consumption for heating, cooling, and hot water supply of buildings based on their design specifications and issues certificates ranging from level 7 to level 1 +++ (total 10 levels).

3.3. Building Energy Code Compliance

This programme sets obligatory requirements on energy saving design including preventing heat loss and installing energy saving facilities and develops energy efficiency indexes for effective management of building energy. This regulatory history is as follows:

- In 2003, the Korea Energy Agency (KEA) reviewed energy-saving worksheets pursuant to the local government ordinance.
- In 2008, the KEA was designated as a review and advisory institution by law (Article 22 of the Rule on Construction Standards of Buildings, order of the Ministry of Land, Transportation and Maritime Affairs).
- In 2010, the Insulation Standard was raised to 20 percent.
- In 2011, the Total Annual Energy Consumption programme was implemented for office buildings with areas greater than 10,000m².
- In 2013, the Green Building Promotion Act was implemented. The heat transmission coefficient standard was raised to 30 percent and the scope of applicable buildings was broadened.

Proprietors of buildings should submit a Building Energy Code Compliance application for construction permits of new buildings with a gross area greater than 500 m² pursuant to the Building Design Standards for Energy Saving (the Notification of the Ministry of Land, Infrastructure and Transportation) and the Green Building Promotion Act. The KEA reviews the worksheet to check if the property satisfies all of the standards and gets at least 65 points on the Energy Performance Index (EPI) (minimum 75 points for public buildings) and decides on the issuance of the building permit. The main content of the Building Energy Code Compliance is as follows:

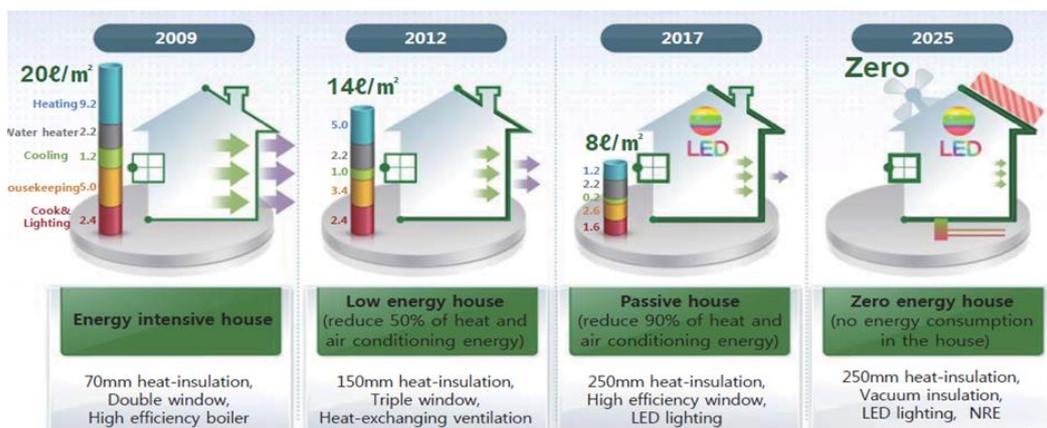
Construction: 1) energy-saving design criteria including average heat transmission coefficient, air-tightness of window, and rooftop landscape; 2) machinery and electric facilities: installing high-efficiency-certified products and adopting energy-saving control techniques; 3) new and renewable energy:

utilising new and renewable energy for the electric load and capacity for cooling, heating, and supplying hot water.

The targets of the programme are buildings with gross areas greater than 500 m² that apply for a building permit, as prescribed in Article 10 of Enforcement Decree of the Green Building Promotion Act (Buildings required to submit Building Energy Code Compliance).

Through this programme, the heat-insulation standard for windows and walls, starting with a 15 percent reduction in 2012 to a 30 percent reduction in 2017, a 60 percent reduction in 2020, and a 100 percent reduction (obligatory zero energy) in 2025, as shown in Figure 1.

Figure 1. Heat-insulation Standard for Windows and Walls to Be Strengthened



Source: Ministry of Education, Science and Technology, 2016.

3.4. Performance Evaluation of Eco-friendly House

This programme was designed to develop standards for the construction of energy-saving and eco-friendly housing and construct 2 million of such buildings by 2020 to meet the challenges of climate change and achieve low-carbon green growth. A landlord of an apartment complex with more than 30 households should submit a green home performance evaluation statement and related materials to the local autonomies when applying for business operation approval. The local governments decide on the approval based on the review of energy agencies including the KEA.

The programme consists mainly of two items: performance standards and construction standards. As for performance standards, total energy consumption (CO₂ emission) should be lowered by over 30 percent for households with living areas greater than 60 m² and by over 25 percent for households with living areas of less than 60 m² in terms of heating, hot water supply, heat source, and electricity energy.² Construction standards strengthen the heat insulation standard prescribed in the Regulation on the Designing Energy Saving Buildings.³ It also specifies installation of high-efficiency condensing.⁴ In addition, it mandates installation of high-efficiency appliances (highly air-tight windows, high-efficiency equipment and materials, standby power cut-off devices, network switches, high-efficiency lighting, automatic switching systems for public restrooms, and individual temperature controlling systems).

The buildings must satisfy standards in one of three categories: performance evaluation of eco-friendly homes, design standards of eco-friendly homes, and building energy efficiency certification.

3.5. Rational Energy Use in the Public Sector

This programme aims to raise awareness of energy efficiency improvement and conservation in response to the United Nations Framework Convention on Climate Change (UNFCCC) by encouraging the public sector to reduce energy consumption, to improve energy efficiency, and to increase the use of new and renewable energy. In this context, this programme is designed to implement energy consumption rationalisation measures of the central and local governments pursuant to Article 8 of the Energy Use Rationalisation Act.

² There are a total of 14 evaluation criteria: exterior walls, side-walls, windows, exterior doors, floors, roofs, boilers, integrated energy use, new and renewable energy use (solar PV, solar thermal, geothermal, wind).

³ The standard is more than 43 percent higher for windows and more than 31 percent for walls.

⁴ Boilers (houses using district heating systems or integrated heating systems are not applicable).

Table 2. Criteria of Construction & Performance Evaluation of Eco-friendly House

Category	Performance Evaluation		Design Standards		Energy Efficiency	
Evaluation	<ul style="list-style-type: none"> • Compliance of mandatory features • Reduction rate of total energy consumption or CO₂ emission per household 		<ul style="list-style-type: none"> • Compliance of design standards for windows, walls, exterior gates, etc. 		<ul style="list-style-type: none"> • Primary energy supply per unit area per year 	
Criteria	Exclusive living area		Exclusive living area		Exclusive living area	
	Over 60m ²	Below 60m ²	Over 60m ²	Below 60m ²	Over 60m ²	Below 60m ²
	Reduction by more than 30 percent	Reduction by more than 25 percent	Meet the standards for windows, walls, energy source systems, etc.		<u>Level 1</u> Compliance of standards for windows, walls, etc.	<u>Level 2</u> Compliance of standards for windows and walls etc.

Source: Ministry of Education, Science and Technology, 2016.

The government develops obligatory requirements for energy use rationalisation in public buildings and supervises the compliance pursuant to the Regulations on Energy Use Rationalization of Public Buildings. The programme is targeted at: 1) Central administrative agencies and local government agencies, 2) Agencies prescribed in Article 4 of the Act on the Management of the Public Institutions, 3) Local public corporations prescribed in Article 49 and Article 76 of the Local Public Enterprises act, 4) National and public schools and universities, 5) Municipal and provincial offices of education, 6) National University Hospitals, and 7) Seoul National University.

3.6. Buildings Energy Auditor

This programme is a national qualification system to train building energy auditors. The assessors would be engaged in building energy management efforts such as the building energy efficiency certification programme. The KEA trains building energy assessors in anticipation of the expansion of the scope of

buildings subject to efficiency certification and mandatory implementation of the certification system.

- Building energy efficiency certification: The scope of the certification was limited to apartments and office buildings. But in future individual housings and buildings for all purposes with gross areas greater than 500 m² will also be subject to the certification.
- Energy saving worksheet: The scope of the certification was limited to buildings with limited purpose and size such as office buildings with gross areas greater than 3,000 m² and accommodation buildings with gross areas greater than 2,000 m². All types of buildings with gross areas greater than 500 m² will also be subject to the certification.

4. Way Forward

Up until now, the Korean government has made great efforts to improve the energy efficiency of buildings. Under the Basic Plan for Rational Energy Use, which has been renewed five times since 1992, many programmes and regulations on energy-efficient buildings have been developed and implemented. As a result, policy outcomes are seen to be successful in terms of institutional arrangements and performance of the building energy management system (BEMS). However, there remains much to be done on the path to a successful implementation of BEMS. Let us take a look at a couple of issues and the policy options to address them.

First, energy demand management in Korea is being implemented in the form of cooperative governance between relevant ministries. Under these circumstances, structural reform of energy policy is required to conduct an integrated demand management, including 1) a collaborative administration manual under the Government 3.0;⁵ 2) establishing a channel between the central government and the local autonomies in which a roadmap developed by the central government

⁵ Government 3.0 is a new paradigm for government operation to deliver customised public services and generate new jobs in a creative manner by opening and sharing government-owned data with the public and encouraging communication and collaboration between government departments.

guides the development of specific and detailed programmes by local autonomies; and 3) creation of local communities to collectively and voluntarily participate in BEMS.

Second, a database for a building energy management system (BEMS) should be established. As relevant ministries have arrived at a consensus on the necessity of a database, it is high time that relevant ministries get together and develop an integrated portal for building energy management, which would send the right signal to the government and the public. The government could then use this portal to develop feasible and attainable mid- and long-term targets and policies for building an energy management system, and the public might respond with valuable feedback and voluntary participation in the government programmes.

Third, guideline development and incentive provision are necessary to promote the development and adoption of building technologies. The 2nd Energy Basic Plan states that energy consumption is to be reduced by 15 percent by 2020 through a variety of regulations and incentives for building energy management programmes. However, a limited government budget and civil society's poor awareness of building energy management make it difficult for policies to take effect. In an effort to overcome these barriers, the Korean government should design a phased incentive system and raise the existing subsidies for building energy management along with providing construction and design guidelines for re-modelling, renovation of existing buildings, and construction of new buildings.

Last but not least, buildings are designed by architects according to requirements of owners so they have diverse structures and functions. Building energy management has to be approached from different perspectives, therefore. It is recommended that the contents of BEMS have different elements. In this regard, design of BEMS calls for participation of experts with a lot of experience in this field: 'BEMS Coordinators.' Since there are only few BEMS coordinators domestically available, the Korean government has to establish a training and education system to cultivate an appropriate number of BEMS coordinators to promote BEMS activities.