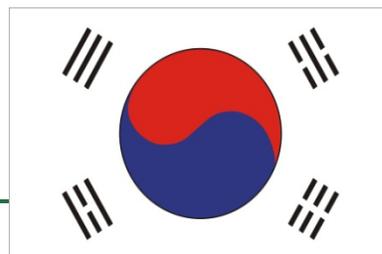


# 28 Republic of Korea



## 28.1 Summary of Coal Industry

### 28.1.1 THE ROLE OF COAL IN KOREA

The Republic of Korea (Korea) relies on imports for 97 percent of its energy needs because of its severely limited domestic resources (EIA, 2014a). Coal supplies about 28 percent of the country's total energy, amounting to an estimated coal consumption of 125 million tonnes (Mmt) in 2012 (EIA, 2014a). However, only about 2.1 Mmt of anthracite coal was produced domestically in 2012, as shown in Table 28-1 (EIA, 2014b; USGS, 2013). Rising coal consumption and a negligible production level have caused the country to rely heavily on imports over the past several years, making Korea the fourth-largest importer of coal in the world, mainly from Australia, Indonesia, and Russia (EIA, 2014a). Indigenous coal reserves were estimated at 126 Mmt in 2011 (EIA, 2014b).

**Table 28-1. Korea's Coal Reserves and Production**

Indicator	Anthracite & Bituminous (million tonnes)	Sub-bituminous & Lignite (million tonnes)	Total (million tonnes)	Global Rank (# and %)
Estimated Proved Coal Reserves (2011)	0	126	126	57 (0.01%)
Annual Coal Production (2012)	2.1	0	2.1	42 (0.03%)

Source: EIA (2014b)

Figure 28-1 illustrates the locations of coal basins and mines in Korea. As seen, Korea's coal is concentrated in four of its nine provinces: North and South Chungcheong, Gangwon (location of Samcheok, the largest coalfield in Korea), and to a small extent in South Jeolla (NationMaster, nd).

Figure 28-1. Korea's Coal Fields and Major Coal Terminals



Source: IEA (2002)

## 28.1.2 STAKEHOLDERS

Table 28-2 lists potential stakeholders in the development of Korea's coal mine methane (CMM) industry.

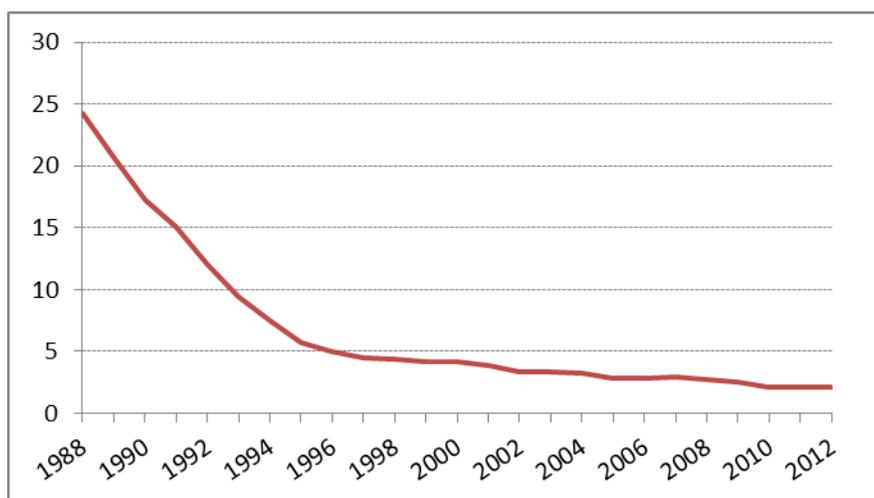
**Table 28-2. Key Stakeholders in the Republic of Korea's CMM Industry**

Stakeholder Category	Stakeholder	Role
Engineering, Consultancy, and Related Services	<ul style="list-style-type: none"> <li>▪ See <a href="http://www.epa.gov/coalbed/networkcontacts.html">http://www.epa.gov/coalbed/networkcontacts.html</a></li> </ul>	Technical assistance
Mining Companies and CBM Developers	<ul style="list-style-type: none"> <li>▪ Korea Resources Corporation</li> <li>▪ Korean Coal Corporation</li> <li>▪ See <a href="http://www.epa.gov/coalbed/networkcontacts.html">http://www.epa.gov/coalbed/networkcontacts.html</a></li> </ul>	Project hosts/promoters
Universities, Research Establishments	<ul style="list-style-type: none"> <li>▪ Korea Institute of Energy Research</li> <li>▪ Korea Electrotechnology Research Institute</li> <li>▪ Korea Institute of Science and Technology</li> <li>▪ Korea Institute of Geoscience and Mineral Resources</li> <li>▪ Korea Electric Power Research Institute</li> </ul>	Technical assistance
Government Groups	<ul style="list-style-type: none"> <li>▪ Ministry of Education, Science, and Technology</li> <li>▪ Ministry of Knowledge Economy</li> <li>▪ Global Green Growth Institute</li> </ul>	Licensing, Monitoring and Control
Other	<ul style="list-style-type: none"> <li>▪ Korea Energy Management Corporation</li> <li>▪ Korea Energy Economics Institute</li> </ul>	Policy

### 28.1.3 STATUS OF COAL AND THE COAL MINING INDUSTRY

As seen in Figure 28-2, Korean coal production has declined drastically in the last 25 years, with many coal mines closing. Coal production has declined 91 percent from its peak in the late 1980s (EIA, 2014b). Currently, Korea produces only anthracite, importing all its bituminous requirements.

**Figure 28-2. Korea's Coal Production (million tonnes)**



Source: EIA (2014b)

Korea has five anthracite coal mines, three of which are operated by the state-owned Korea Coal Corporation (KCC). The company is also examining production opportunities abroad and developing a mine in the Uvs province of Mongolia. This represents a significant decrease from the 347 mines in operation in 1988, a result of the government's policy of rationalizing domestic coal production. Production of coal in Korea is subsidized by the government and the cost of production is higher than the cost of imports. Nevertheless, the government intends to stabilize supply and demand for anthracite coal, maintaining a minimum annual production volume, given that it is the nation's only natural energy resource (IEA, 2012).

According to the Korean government's green growth policy (see page XX) and the G-20 initiative to abolish fossil fuel subsidies, the government has gradually reduced subsidies in the coal sector. They will come to an end in 2020. The main subsidy was for the production of coal and its use in the form of charcoal briquettes by low-income households. The subsidy covers subsidies for briquette manufacturers, industrial accident insurance premiums, and school expenses for children of mine workers.

Coal consumption in Korea increased by 55 percent between 2005 and 2012, driven primarily by growing demand from the electric power sector, which accounts for 62 percent of the country's coal consumption (EIA, 2014a). Although the share of liquefied natural gas (LNG) in power generation in Korea has increased rapidly, gas is a relatively expensive energy source for power generation. This gives coal a relative cost advantage over gas in the power generation sector. However, expected additions to the coal-fired power plant fleet are modest in the midterm and thus much of the growth in coal imports is expected to come from the industry sector, largely iron and steel production, which consumed approximately 12 percent of coal in 2010 (IEA, 2012).

## 28.2 Overview of CMM Emissions and Development Potential

The Global Methane Initiative (GMI) International CMM Projects Database currently identifies no projects in Korea, in operation or under development (GMI, 2014). Updates on future CMM projects in the Republic of Korea can be found at <https://www.globalmethane.org/coal-mines/cmm/index.aspx>.

### 28.2.1 CMM EMISSIONS FROM OPERATING MINES

Methane emissions in Korea totaled 81.2 million cubic meters (m<sup>3</sup>) in 2000, but are expected to decrease to 61.6 million m<sup>3</sup> by 2015, and then anticipated to increase again to 76.3 million m<sup>3</sup> by 2030 (see Table 28-3).

**Table 28-3. Korea's CMM Emissions (million cubic meters)**

Emissions	2000	2005	2010	2015 (projected)
Total CH <sub>4</sub> Emitted	81.2	55.3	56.7	61.6

Source: USEPA (2012)

### 28.2.2 CMM EMISSIONS FROM ABANDONED COAL MINES

The number of operating coal mines has dwindled from 70 in 1993 to only 5 in 2012 (KEEI, 2009; KEEI, 2013). Although the potential for methane to be found in so many abandoned mines may likely be attractive, no specific data were found.

### 28.2.3 CBM FROM VIRGIN COAL SEAMS

No data were found for virgin coal seams.

## 28.3 Opportunities and Challenges to Greater CMM Recovery and Use

Rapid industrialization, growth in income and the resultant increase in cars on the road have led to serious environmental concerns for Korea, such as acid rain and a rise in greenhouse gas (GHG) emissions. After the Asian financial crisis of 1997-98, Korea began aligning itself with more secure and environmentally sound energy development. It established goals for promoting green development via its *National Vision for Environmental Policies in the 21<sup>st</sup> Century*.

Korea signed the Kyoto Protocol in September 1998 (see Table 28-4). Although Korea has no formal Kyoto commitment to cap its GHG emissions, it announced in 2009 to unilaterally cut its emissions 4 percent below 2005 levels by 2020, which is a 30 percent cut in emissions under a business as usual scenario.

**Table 28-4. Korea's Climate Change Mitigation Commitment**

Agreement	Signature	Ratification
UNFCCC	June 13, 1992	December 14, 1993
Kyoto Protocol	September 25, 1998	November 8, 2002

Source: UNFCCC (2014)

In 2010, Korea established the National Climate Change Adaptation Master Plan (Master Plan) based on the Framework Act on Low Carbon, Green Growth (Green Law) and set up a committee comprised of representatives from 13 ministries to implement the Master Plan successfully. Adaptation of Industry/Energy is one of the ten sectors outlined in the Master Plan, striving to create new business for adaptation, minimize damages in industry, and provide energy stability (KACCC, 2014). Korea's Ministry of Environment (MOE) has conducted a national GHG inventory in accordance with the Green Law since 2010. More than 450 Korean companies agreed upon the GHGs and energy reduction goal for 2012 in October 2011, and submitted the implementation plan using the National Greenhouse Gas Reporting System in December 2011 (MOE, 2014).

### 28.3.1 MARKET AND INFRASTRUCTURE FACTORS

Alternative energy sources are still not commercially competitive with conventional fossil fuel energy in Korea. The Korean government plays a central role in setting prices for the energy market. With the country's push toward sustainable development, the government is taking significant steps to improve market penetration of renewable energy (see "Regulatory Information"). The Ministry of Knowledge Economy (MKE) is also concerned with regulating economic policy, particularly in the industrial and energy sectors, and is involved in encouraging foreign investment in Korea.

Several organizations are vested in energy-related research and development (R&D) besides MKE, such as the Ministry of Education, Science and Technology. The Korea Institute of Energy Research and the Korea Electrotechnology Research Institute are two more major public institutes for energy technology research and are government funded. Other government-supported research institutes include the Korea Institute of Science and Technology (KIST) and the Korea Institute of Geoscience and Mineral Resources (KIGAM). KIST is the leading Korean institute for research in fundamental and applied science, which plays an essential role in developing energy-efficient industrial technologies. KIGAM seeks to boost sustainable development through advancement of science and technology by conducting geological surveys and disseminating research outcomes in fields such as mineral resources, geohazards, and climate change.

The Korea Energy Economics Institute (KEEI) is Korea's main energy policy research organization. KEEI conducts basic research on energy policy options. It provides energy information and statistics and produces energy balances; formulates policies for the government on reforms in the electricity and gas supply industries, energy efficiency, and demand management; produces energy supply and consumption forecasts; and is also involved in climate change studies. The Korea Energy Management Corporation (KEMCO) plays a key role in implementing R&D policy objectives for energy efficiency, energy conservation, and clean energy technologies.

No data are available on CMM operations in Korea. However, projects utilizing methane from landfills are well under way and may help in drawing parallel to CMM projects (NREL, 2006). The

MKE has partnered with the U.S. Environmental Protection Agency to form the Climate Change Technology Program to assist with implementing methane recovery and energy-efficient technologies in Korea. The plan involves government-supported project development and technology implementation through private sector collaboration between Korean and international firms. Korea has also been at the forefront of green growth initiatives, issuing *The National Strategy for Green Growth (2009-2050)* and the *Five-Year Plan (2009-2013)* to provide a comprehensive policy framework for green growth (OECD, 2014). In the long term, the National Strategy aims to promote eco-friendly new growth engines, enhance peoples' quality of life, and contribute to international efforts to fight climate change. The Five-Year Plan outlines government actions for National Strategy implementation and provides detailed tasks for ministries and local governments. Under the plan, the government will spend approximately 2 percent of annual GDP on green growth programs and projects, with initial investments geared towards infrastructure systems (OECD, 2014).

### 28.3.2 REGULATORY INFORMATION

Although Korea initiated privatization of the natural gas companies, the Korea Gas Corporation (KOGAS) and several other state-owned enterprises in 1999, the State still retains a 27 percent direct equity share (EIA, 2014a). KOGAS was to be split into three competitive retail gas suppliers; however, the government decided to revise its plans.

Under Korea's constitution, the land and natural resources are protected by the state and the government plans for the best development and utilization of its resources. The State may grant licenses for temporary periods to private companies for tapping into the natural wealth (Constitution, nd).

The Korea Occupational Safety and Health Agency (KOSHA), which oversees the country's Industrial Safety and Health Act that provides occupational safety measures for both employers and employees, focuses on preventing workplace accidents, improving working environments, and preventing occupational diseases such as pneumoconiosis, common in workers engaged in "dust work" (KOSHA, 2014).

A renewable portfolio standard (RPS) for Korea became effective in 2012, with an anticipated increase in renewable power generation to 10 percent of total power generation by 2022, up from two percent in 2012 (EIA, 2014a). The RPS replaces previous feed-in tariff subsidies for power generated from alternative sources. Korea's ongoing R&D tax credit program still applies to renewable energy technologies, and import duties are reduced by 50 percent for components and/or equipment procured for renewable energy facilities (KPMG, 2014).

CMM recovery is justifiably a key element of energy conservancy and is environmentally crucial. Therefore, although CMM projects have yet to develop in Korea and the government is pursuing other clean technologies (e.g., green growth), it is possible that the Korean government would contribute by providing incentives and tax breaks to encourage CMM use and ease its entry into the energy market.

## 28.4 Profiles of Individual Mines

Information on active mines in Korea is currently unavailable.

## 28.5 References

- Constitution (nd): South Korean Constitution – Chapter IX, The Economy, Article 120, not dated.
- EIA (2014a): Country Analysis Brief – South Korea, U.S. Energy Information Administration, Washington, DC, last updated 1 April 2014. <http://www.eia.gov/countries/cab.cfm?fips=KS>
- EIA (2014b): International Energy Statistics, U.S. Energy Information Administration, Washington, DC, accessed July 2014. <http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm>
- GMI (2014): International Coal Mine Methane Projects Database, Global Methane Initiative, accessed in July 2014. <https://www.globalmethane.org/coal-mines/cmm/index.aspx>
- IEA (2002): International Energy Agency, 2002.
- IEA (2012): *Energy Policies of IEA Countries: The Republic of Korea 2012 Review*, International Energy Agency, 2012. [http://www.iea.org/publications/freepublications/publication/Korea2012\\_free.pdf](http://www.iea.org/publications/freepublications/publication/Korea2012_free.pdf)
- KACCC (2014): The National Climate Change Adaptation Plan of Korea, Korea Adaptation Center for Climate Change, accessed July 2014. <http://www.oecd.org/env/cc/50426677.pdf>
- KEEI (2009): Yearbook of Energy Statistics 2009, Korea Energy Economics Institute, December 2009. <http://www.keei.re.kr/keei/download/YES2009.pdf>
- KEEI (2013): Yearbook of Energy Statistics 2013, Korea Energy Economics Institute, December 2013. <http://www.keei.re.kr/keei/download/YES2013.pdf>
- KOSHA (2014): About KOSHA – History, Korea Occupational Safety and Health Agency, accessed November 2014. <http://english.kosha.or.kr/english/content.do?menuId=1201>
- KPMG (2014): Taxes and Incentives for renewable energy - South Korea, KPMG International Cooperative, accessed November 2014. <http://www.kpmg.com/Global/en/IssuesAndInsights/ArticlesPublications/taxes-and-incentives-for-renewable-energy/Pages/south-korea.aspx>
- MOE (2014): Climate Change Policy Overview – Private and Public Sectors, Ministry of Environment, accessed July 2014. <http://eng.me.go.kr/eng/web/index.do?menuId=109&findDepth=1>
- NationMaster (nd): Online compilation of data on countries from CIA World Factbook, United Nations, World Bank, World Health Organization, and other sources, not dated.
- NREL (2006): Case Studies from the Climate Technology Partnership: Landfill Gas Projects in South Korea and Lessons Learned, U.S. National Renewable Energy Laboratory, Colorado, December 2006. <http://www.nrel.gov/docs/fy07osti/40428.pdf>
- OECD (2014): Green growth in action: Korea, Organisation for Economic Co-operation and Development, accessed November 2014. <http://www.oecd.org/korea/greengrowthinactionkorea.htm>
- UNFCCC (2014): Ratification Status – Republic of Korea, United Nations Framework Convention on Climate Change, accessed July 2014. <http://maindb.unfccc.int/public/country.pl?country=KR>
- USEPA (2012): *Global Anthropogenic Non-CO<sub>2</sub> Greenhouse Gas Emissions: 1990 - 2030*, U.S. Environmental Protection Agency, Office of Atmospheric Programs, Climate Change Division, December 2012. <http://www.epa.gov/climatechange/EPAactivities/economics/nonco2projections.html>
- USGS (2013): 2011 Minerals Yearbook – Republic of Korea, United States Geological Survey, May 2013. <http://minerals.usgs.gov/minerals/pubs/country/2011/myb3-2011-ks.pdf>