



Izumi Tanaka +81-30-5562-5043
izumi.tanaka@growthanalysis.se

Datum
2013-06-17

Skiffergas i South Korea – en underlagsrapport till Näringsdepartementet

Izumi Tanaka, Tillväxtanalys i Tokyo

Contents

1	Overview	2
2	Reserves, production and prices	2
3	Background and political context	3
3.1	Technology and institutional factors/innovations which influence development	3
4	The Future; strategies and trade-offs out going forward	5
4.1	Geopolitical perspective, international relations	5

Myndigheten för tillväxtpolitiska utvärderingar och analyser

Stockholm
Box 574, 101 31 Stockholm
Besöksadress: Regeringsgatan 67, 4 tr
Tel: 010 447 44 00
Fax: 010 447 44 90
info@tillvaxtanalys.se
www.tillvaxtanalys.se
Org. nr 202100-6164

Östersund (säte)
Studentplan 3, 831 40 Östersund
Besöksadress: Studentplan 3
Tel: 010 447 44 00
Fax: 010 447 44 01
Bank: Danske Bank
Kontonummer: 12 810 107 041
Swift: DBBasesX
IBAN: SE6712 0000 000 12 810 107 041

Utlandskontor
Brasilia
New Delhi
Peking
Tokyo
Washington DC

1 Overview

South Korea, the world's thirteenth-largest economy and the seventh-largest exporter, is an energy-intensive nation. It is the world's eleventh highest energy consumer and imports 97 per cent of its energy sources. It is the second largest importer of liquefied natural gas (LNG) and the fifth-largest oil importer; the domestic gas production is negligible and it depends on imported LNG for 99.7 per cent of its demand and has limited domestic oil production and imports 99 per cent of its crude oil requirements¹.

Diversification of source of gas is the major driver for the world's runner-up in consumption of natural gas. The government has announced a master plan in 2012 to expand shale gas imports from North America to 20 percent of its total natural gas imports by 2020 to diversify natural gas suppliers, which are now limited to the Middle East and Southeast Asia. Under the plan, over eight million tons of shale gas will be liquefied and imported to Korea in 2020.² South Korea hopes to take advantage of the low cost of shale gas from North America as the leverage for negotiations with the existing trade partners of LNG, which currently are the 42 per cent from the Middle East, 35 per cent from the Southeast Asia, 8 per cent from the US, 6 per cent from Central and South Americas and 6 per cent from Africa.⁴

2 Reserves, production and prices

There are unexplored areas of continental shelf offshore Korea, including three sedimentary basins: the Ulleung, the Yellow Sea and the Jeju Basins. In 2007, Korea National Oil Corporation (KNOC) successfully drilled for gas hydrates in the Ulleung Basin, which is estimated to hold 600 Mt of gas hydrates, sufficient to meet the country's LNG needs for 30 years. At the time of the discovery, the government announced its intention to begin commercial production from the deposit by 2015. The currently operating sole mine of Donghae-1 gas field is expected to halt commercial production by 2016 and to be converted into underground storage and the domestic production of gas is expected to be more than halved the size in 2015 compared to 2010¹.

Shale gas is expected to replace the LNG consumption in the future, should the price of importing shale gas become lower than that of conventional LNG. Currently, LNG is used 47 per cent for power generation, 23 per cent for residential use, 18 per cent for industrial use, 9 per cent by service sector and 3 per cent by the transportation sector.¹

¹ IEA. (2012). *Energy Policies of IEA Countries- the Republic of Korea 2012 Review*

² MK (2012) *Gov't to increase shale gas imports to 20 pct of natural gas imports by 2020*
<http://news.mk.co.kr/newsRead.php?rss=Y&sc=30800006&year=2012&no=570439&siD=308>

³ MKE (2012) *Preemptive response to Shale gas boom; comprehensive plan (in Korean, tentative translation)*

<http://www.motie.go.kr/motie/news/coverage/bodoView.jsp?seq=76407&pageNo=68&srchType=1&srchWord=&pCtx=1>

The government of South Korea has analyzed when US gas price is USD 4 to 7 and oil price is USD 100 to 120, the introduction price of shale gas deprived LNG is USD 11 to 15 and is approximately 25 per cent more competitive than the current contract. However, if the oil price drops below USD 80, US produced shale gas loses its competitiveness. The Canadian production still calls for investment in infrastructure for liquefaction but is more competitive than US in logistics and less likely to face export restrictions. In any case, if only power generations costs are considered, thermal power generation by gas (including shale gas) will not replace nuclear at USD 3.5 per MMBtu or thermal power generation by coal at USD 6 per MMBtu as the primary source of energy, however, in the interest of environmental cost and the need for decentralization of energy sources, ratio of gas may increase in the future.²

3 Background and political context

In September 2012, then Ministry of Knowledge Economy released "Preemptive response to Shale gas boom; comprehensive plan (tentative translation, hereafter the Strategy)," which summarized the government's strategy on shale gas based on the recent international trends of shale gas development. The strategy focuses on the strategy for the involvement of Korea in exploration and development of shale gas mines internationally and sector-specific measures to meet the increasing supply of shale gas.

Korea National Oil Corporation, a public corporation responsible for exploration, development and production of natural gas, has announced their strategy to focus on the US and Canada as the field of shale gas development based on vertical drilling in the first phase and in the second phase, adding other target areas and horizontal drilling will be tested. Finally in the third step, plan for increase in investment to expand excavation, including purchase of land. The aim of the three-phased plan is to first focus on the entrance to the North American fields to establish the platform and accumulate the technology and experience and then to construct the value chain enabling entrance to other markets such as China and Europe.³

3.1 Technology and institutional factors/innovations which influence on development

The size of capital in the public corporation is small compared to the international competitors. For example, compared to Japanese and Chinese counter-parts, the capital and annual investment is one third to one seventeenth and one half to one eighteenth in size.² To expand investment in shale gas, the Export-Import Bank of Korea (Korea EXIMbank) will expand its credit limit to the private sector, targeting to expand the limit to KRW 21 trillion in 2020 from KRW 2.8 trillion in 2012. Trade Insurance Corporation will expand the guarantee for investment risk to support funds and overseas resource development loaning project will be

³ Gim (2013) Korean shale gas development model is needed (in Korean, tentative translation) <http://www.sciencetimes.co.kr/article.do?atidx=0000068012>

restructured. Korea Gas Corporation, Korea Oil Corporation, Overseas Resource Development Association and Plant Industries Association signed an MOU to cooperate in developing and supplying Shale gas and to strengthen cooperation between public and private organizations.³

The government sees the “shale gas boom” as a golden opportunity to strengthen the capability of resources development of Korea’s public and private sectors. Currently, the shale gas development and production level of South Korean companies are 20 to 30 per cent of and to have three to eight years of disparity in technology levels from technologically advanced countries such as the United States.⁴ A master plan to map out development of shale gas technology is expected to be established, expecting to include evaluation of feasibility study on large-scale R&D projects and human resource development through dispatching personnel to excavating sites abroad.²

The Strategy also states measures to meet the global increase in utilization of shale gas for the Korea’s major industries. For the petrochemical industry, since US utilizes shale gas based ethane, increase in facilities to crack ethane is expected from 22 million ton in 2010 to 32 million tons in 2020. The effect on Korea’s domestic market is expected to be limited, due to trade-off effect of increased competition in ethylene products and improved profitability of non-ethylene products. The measure for the petrochemical industry is to converge to production of non-ethylene products, to increase value-added of ethylene products and to diversify sources such as switching from naphtha to LPG.³

For the steel industry, increased production of shale gas will increase need of specialized steel facilities and equipment as a whole, but competition from American and eventually Chinese counterparts will increase. To meet the international competition, steel industry is to continue and expand investment in state-of-the-art equipment for shale gas production in addition to the development of steel production method using LNG.³

For the automobile industry, introduction of shale gas will contribute to the stabilization of gas prices and with the financial incentives by the governments, number of CNG vehicles for commercial use is expected to increase, especially in the US. The roll-out is expected to be limited for business-use vehicles as the charging infrastructure, performance of vehicles and economic benefit is unpredictable to be popularized to conventional vehicles. The automobile industry is instructed to increase performance of core parts in preparation of increased CNG vehicles.³

For ship building industry, increase in transportation of shale gas will lead to new contracts, however increase in China’s ability to self-supply its energy sources may decrease sea-bound transportation. South Korea has the competitive edge in LNG-fuelled vessels and the business opportunities are expected to increase. The industry is asked to develop LNG propulsion system for large-sized container ships

and promote the localization of transport equipment to meet the increase in global consumption of shale gas.³

For plant construction industry, there are much expectations for increased business in the liquefaction and petrochemical plants in the North America. And the industry is asked to expand its development effort of LNG pumps, gas compressors, including LNG liquefaction plants,³

4 The Future; strategies and trade-offs out going forward

The Strategy states to project for ratio of shale gas to be seven and 20 per cent in 2017 and 2020, respectively. It also announces the target of self-development ratio to increase to 20 per cent in 2020, from 3.4 per cent in 2011. In the Strategy, the key challenges for South Korea to utilize shale gas is identified as establishment of public-private partnership in development scheme to increase ratio of self-development abroad and to establish a “Korean Development Model” which promotes to incorporate gas development, construction, operation of gas liquefaction plants and transportation.² Strengthening international cooperation and the expansion of financial support to promote private investment are key aspects to ensure sufficient funding for the future. South Korea has the ambition to establish a framework to become hub for LNG exchange in northeast Asia and expansion and fortifying the domestic storage infrastructure for LNG remains to be a challenge.

Human resource development plays an important role in further utilization of shale gas in the future. In order to nurture the needed personnel, approximately 200 experts are to be trained by 2020 by dispatching to existing mines and research institutes and by conducting merger and acquisition of entities with competence. The 200 are expected to be coming from employees of energy-related companies, in addition to providing education opportunities at advanced-university course level. Two or three specialized graduate schools on oil and gas development is planned to be established.³

4.1 Geopolitical perspective, international relations

Some of the business endeavors are already being pursued, such as Korea Gas Corporation signing an agreement with a US firm in March 2012 to annually import 3.5 million tons of natural gas, including shale gas produced from an area near the Sabine Pass River on the border of Texas and Louisiana, for the next 20 years and Korea National Oil Corporation purchasing 23.67 per cent stake in an oil field in Texas producing shale gas, along with more expensive natural gas liquids and condensate.⁵ Partnership with Canada is already being pursued by (then) Ministry of Knowledge Economy with the Energy Ministry of British Columbia by signing a memorandum of understanding (MoU) to allow Korea Gas Corp (KOGAS) to join shale gas projects there and export more natural gas to South

⁵ *The Korean Herald (2012) Seoul eyes overseas shale gas*
<http://tm.koreaherald.com/view.php?ud=20120906000659>

Datum
2013-04-25

Korea by building an LNG terminal there, jointly with Royal Dutch Shell (40%), Mitsubishi (20%) and PetroChina (20%).⁶ In addition, Korean government will come up with channels and programs to establish cooperative relations between domestic companies and energy companies in North America. For example, the first Korea-Canada Natural Gas Forum will be held at the end of this year.³

Northeast Asia trades 53 per cent of the world's LNG short-term contracts, with the yearly volume of 32 million tons in 2011. It is the largest spot-price market and South Korea hopes to take the advantage of the largest market by increasing domestic capacity in storage and by establishing framework and regulations for allowing for resale. Korea Gas Corporation's operation will prioritize domestic introduction, however the option will be available for the Corporation to resale the gas abroad. Five LNG storage facilities are under construction and measures such as improving the regulations on storage facilities owned by private companies to be able to take advantage of storage capacity owned by private entities.²

⁶ *Gas to Power (2012) South Korea to develop 'shale gas master plan' before year-end;*
<http://gastopowerjournal.com/markets/item/882-south-korea-to-develop-shale-gas-master-plan-before-year-end-official#axzz2Vz7MOws6>