
Iran's Aggressive Natural Gas Expansion Plans

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As global energy demand rises, natural gas increasingly plays a strategic role. The sector is poised for tremendous growth over the next two decades and some believe that it may overtake oil as the prime fuel between 2020 and 2030. Iran's huge proven reserves - some 28 trillion cubic meters (about 995 trillion cubic feet) - should make it a key player in the emerging global gas business.

These impressive reserves figures - second only to the Russian Federation's - underscore Iran's enormous potential. The National Iranian Gas Company (NIGC) plans the steady expansion of transmission and processing infrastructure in a program aimed at increasing imports and exports of natural gas, which will take natural gas to parts of the Islamic Republic not yet reached by distribution systems and boost exports by pipeline and in the form of LNG.

More than 60 percent of Iran's gas reserves are located in non-associated undeveloped or partially developed fields. The major non-associated gas fields include South Pars (280-500 tcf of gas reserves), North Pars (50 tcf), Kangan (29 tcf), Nar (13 tcf), and Khangiran (11 tcf). There are also several other large gas fields with multi-tcf reserves. However, most of the gas will come from the offshore South Pars gas field, which is being developed in stages.

Supplementing that supply will be imports from Turkmenistan and, soon, from Azerbaijan.

South Pars was first identified in 1988 and was originally thought to contain just 128 tcf. Current estimates show it to contain at least 280 tcf (with some estimates going as high as 500 tcf) as well as over 17 billion barrels of condensate.

By 2010, more than 500,000 barrels per day of condensates could be produced at South Pars, mainly for domestic consumption. Designed in 28 phases, so far only 18 phases have been activated. By 2015, condensate production from South Pars phases 1-14 is expected to reach 628,000 bpd. Besides condensate production and enhanced oil recovery, South Pars natural gas is intended for both domestic consumption and exports. South Pars can produce more than 400 million cubic meters per day (14.2 billion cubic feet/day). Considering internal demand, half of this production can be assigned to exports.

Internal consumption represents a rapidly growing demand on Iranian gas supply. The NIGC expects internal consumption to rise to 156.2 bcm per year in 2009 (13.2 bcf/day). (Editor's Note: The National Iranian Oil Company is purported to raise oil production to about 5.4 million barrels per day by 2009.)

Market Expansion

By 2009, NIGC expects to have 29,400 kilometers of gas transmission pipeline in place and a distribution network of 125,000 km. Domestic gas consumption that year will represent 69 percent of the Iranian energy market, and 54 million Iranians will have access to natural gas - about 80 percent of the population.

NIGC plans to invest about \$18 billion through 2009 in high-pressure gas pipelines, compressor stations, gas-processing plants, underground storage, distribution networks, and maintenance.

Pipeline Projects

Many of the pipeline projects planned by NIGC will be attached to the Iranian Gas Transmission (IGAT) system. Transmission pipelines with a length of 20,000 km take gas from various sources to destinations across the whole country. Lines with diameters of 56, 48, and 42 inches have been employed to carry more than 500 million cubic meters per day (17.7 bcf/day) of natural gas.

The IGAT IV pipeline will carry 110 (mcm/day) of gas from South Pars and the Parsian gas plants to consumption areas. The project includes 1,030 km of 56-inch pipe in two sections and two compressor stations. Parts of IGAT IV have begun service. The main part of the pipeline was connected with the Pol Kaleh compressor station in Isfahan in 2004; a 351-km section to Fars Province became operational in 2004.

A second stage of IGAT IV will include a 42-inch spur line to Kerman, a 24-inch line to serve a Fars petrochemical plant, a second 40-inch line to Yazd, and a 40-inch Isfahan-Mobarakeh pipeline.

The 56-inch IGAT V trunkline will carry 75 mcm/day of sour gas from South Pars Phases 6-8 to Khoozestan oil fields for injection. It will connect Assaluye and Agha Jari, a distance of 504 km, and will have five compressor stations.

The IGAT VI pipeline will generally parallel IGAT V to serve gas needs of Bushehr and Khoozestan provinces, including oil field injection. With a length of 492 km and a diameter of 56 inches, it will have a capacity of 90 mcm/day. Two compressor stations are planned.

IGAT VII, 860 km of 42 to 56-inch line, will carry gas produced in South Pars Phases 9 and 10 for use in Sistan and Baluchestan provinces in southern Iran, and possibly for export to the U.A.E., Pakistan, and India.

IGAT VIII, a 1,050-km, 56-inch line, will carry South Pars gas to the Parsian gas plant and north to a line serving Tehran. It will have 10 compressor stations with a total of 1.8 million hp.

To meet growth in gas demand in the northern and eastern provinces of Semnan, Khorasan, Golestan, and Mazandaran, NIGC plans a second pipeline between Parchin and Sangbast, 790 km long with a diameter of 48 inches, and a 110-km, 40-inch segment between Miami and Jajarm. The system will have four compressor stations and will handle South Pars gas delivered through IGAT VIII.

To serve the western and northern provinces of Hamadan, Kordestan, Zanzan, as well as East and West Azerbaijan, NIGC plans to lay 280 km of 48-inch pipeline between a compressor station at Saveh and the city of Bijar, and 192 km of 40-inch pipeline between Bijar and Miandoab. Other segments with diameters of at least 30 inches will boost pipeline lengths planned for this region to 950 km.

Gas Processing Projects

Seven gas processing plants have recently been completed or are planned and under construction in Iran. The Parsian plant began treatment operations in 2003, dehydrating 20 mcm/day of gas from Tabnak field and stabilizing 12,000 bpd of condensates.

Construction of the new processing facilities will proceed in two phases, one with an inlet capacity of 48 mcm/day and the other, 28 mcm/day. The complex is designed for annual yields of 85,000 tons of ethane, 11 million barrels of pentanes-plus, 310,000 tons of butane, and 450,000 tons of propane.

The Bidboland II plant will sweeten and process 57 mcm/day of gas at facilities that will be built about 14 km southeast of the existing Bidboland plant. Fed by gas from the Pazanan, Gachsaran, and Bibi Hakimeh fields, the new plant has design output capacities of 15 bcm of sweet gas, 1.48 million tons of ethane, 1.51 million tons of propane and butane, and 860,000 tons of natural gasoline.

About 6 bcm per year from the plant are targeted for oil-field injection, the rest for delivery into the gas grid. Ethane will go to a petrochemical plant at Arvand. The other products will be exported through Bandar Mahshahr.

In a separate project, NIGC plans a gas processing plant 25 km northwest of the city of Ilam and 12 km west of Chavar in western Iran. The Ilam plant will process gas from Tange Bijar and Kamankooch fields.

Built in two phases, it will have an inlet capacity of 10 mcm/day and will supply dry gas to cities in Ilam Province and the transmission network and liquids to a petrochemical plant at Ilam.

NIGC also plans a small processing plant at Masjed Soleiman with inlet capacity of 1 mcm/day and is studying a plant able to process 14 mcm/day at South Gesho sour gas field in Hormuzgan Province. The South Gesho facility, near an existing plant at Sarkhon, would have two trains with identical inlet capacities.

After removal of 600 tons/day of sulfur and 9,000 bpd of condensate, sweet gas would move to markets in the southeastern part of the country, including some to a power plant at Bandar Abbas.

Storage Projects

To overcome seasonal fluctuations in consumption, installation of underground gas storage has been recognized as the best choice. Three underground storages are under study, with some degree of progress, to ensure natural gas supply to internal users and export destinations.

NIGC has also identified several reservoirs that might be converted for underground gas storage. One of them is Sarajeh gas and condensate field, about 40 km east of Qom, whose production rates have been restricted by surface equipment for about 45 years. NIGC believes that by working over old wells and drilling new ones it can deplete the reservoir in two years and convert it to storage. Another prospect for gas storage is the Yortsha Dome saltwater reservoir 25 km south of Varamin. NIGC has acquired 2D and 3D seismic data over the reservoir and plans to drill vertical and horizontal wells to prepare it for storage. Another saltwater reservoir under study for use as gas storage is the Talkheh Dome in central Iran, which also contains negligible amounts of light and heavy hydrocarbons. A single well drilled in 1960 found the structure. NIGC has 2D seismic data from the area and plans a 3D survey.

Other areas that NIGC thinks might have reservoirs amenable to gas storage are in the provinces of Abardejno, Siahkooch, Marehtapeh, Prandak, and East Azerbaijan.

Expansion of Iran's gas industry follows a strategy in place since the early 1990s to displace oil with gas in domestic consumption. In 2002, gas moved

ahead of oil in Iran's total energy consumption. Gas now claims 70 percent and oil, 30 percent of Iran's overall primary energy use.

Export Markets

The strategic role of the Persian Gulf and the huge amount of gas reserves in this area have provided a good opportunity for Iran to export gas to consuming countries through pipeline or in the form of LNG. NIGC believes pipeline exports can reach 44 bcm/year in 2009 and 110 bcm/year by 2020. Besides Turkey, potential customers for Iranian gas include Ukraine, Europe, India, Pakistan, Armenia, Azerbaijan, Georgia, and China. NIGC is targeting LNG exports from three planned liquefaction projects to China, Thailand, and India of 35 mcm/day in 2009 and 180 mcm/day in 2020.

Assalouyeh and Kish Island have been named as possible LNG export terminals.

Oman and Iran have signed an agreement to develop offshore gas fields in Iran and take the gas to Oman.

The gas from the joint Bukha-Hengam and other fields would be converted into LNG at Oman's Qalhat LNG plant and marketed as exports by a joint company. The agreement also calls for joint petrochemical projects.

Bahrain has started discussions with Iran over importing natural gas through a new pipeline by 2015.

As part of its plans to meet the Kingdom's future electric power needs, Bahrain has implemented a twin-pronged strategy to boost gas supply. This involves both increasing domestic output and negotiating import agreements with its gas-rich neighbors.

The project for transferring gas to Europe is also economically attractive and will benefit all parties involved. Turkey and Ukraine have been considered as alternative routes, but the former is less expensive.

By the end of 2007, Iran expects to be exporting about 300 bcf/year of gas to Europe via Turkey.

Since the discovery of natural gas reserves in Iran's South Pars fields, the Iranian government has increased efforts to promote higher gas exports abroad. The prospects for profit are especially good in south Asian countries like India and Pakistan, where natural gas reserves are low and energy demand exceeds supply. Pakistan and Iran signed a preliminary agreement for the construction of a natural gas pipeline linking the Iranian South Pars natural gas field in the Persian Gulf with Karachi, Pakistan's main industrial port. Iran later proposed an extension of the pipeline from Pakistan into India. Although India and Iran signed a memorandum of understanding in 1993 for a land-based natural gas pipeline, regional political and security concerns continue to block the completion of a feasibility study.

Import Markets

Apart from natural gas exports, Iran has also discussed importing natural gas from Azerbaijan and already imports it from Turkmenistan. This is basically for use in Iran's northern areas, far from the country's main natural gas reserves in the south.

In December 1997, Turkmenistan launched the \$190 million Korpedze-Kordkoy pipeline to Iran, the first natural gas export pipeline in central Asia to bypass Russia. According to the 25-year contract's terms, Iran will take between 5 and 6 bcm of natural gas from Turkmenistan annually, with 35 percent of Turkmen supplies allocated as payment for Iran's contribution to

building the pipeline. Iran's gas imports from Turkmenistan will peak at 8 bcm per year.

Armenia and Iran have agreed to a long-term deal under which Iran will supply an annual 1.3 tcf of natural gas to Armenia over 20 years (starting in 2007) in exchange for electricity supplies from Armenia. The two countries will also build an 85-mile gas pipeline at a cost of more than \$200 million (construction on the pipeline began in late November 2004). Armenia is also reportedly keen to receive credit from Iran for building hydroelectric plants on the Aras River in exchange for electricity supplies to Iran. These deals are expected to boost regional trade and cooperation between Iran and central Asian states.

Iran's gas industry now contributes the lion's share to the country's fossil fuel basket and it has entered an intense stage of development. For more than 40 years, gas has played a secondary role to oil. But the growing demand for natural gas in the residential and industrial sectors, along with surging export demand, have launched a new era. To respond adequately, Iran's gas sector needs investments, especially in upstream development, technology transfer, and export and import facilitation. With or without foreign investment, Iran will be a key gas exporter for decades to come.

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