

Iran's Strategy for Natural Gas

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Abstract

Natural gas as one of the most significant fossil fuels is playing a crucial role in national energy mix in different countries. Nevertheless, its applications have not been limited to energy providing, and has been used widely as the feed stock in production of different varieties of petrochemicals. So that most of new petrochemical complexes around the country are designed and constructed based on natural gas feed.

Natural gas was produced as one of the byproducts of crude oil and mostly was burned. Gradually along with increasing volumes of extracted natural gas, planning on gathering and using associated gas resulted in more usage of natural gas in different sectors including petrochemical feed and fuel. Following the developments, National Iranian Gas Company (NIGC) was established in 1965 as one of the subsidiaries of the petroleum ministry with initial capital of 25 million Rials.

Since its establishment, NIGC has gradually achieved capabilities and managed to have access to various sources and facilities such as experts and efficient human force equipped with scientific and theoretical vision and knowledge, tools, equipment, machinery and various advanced workshops for implementing its operations proportionate with the economic and social development trend of the country, so that it can independently accomplish all the related tasks complying with the valid international acceptable standards.

Today, NIGC as one of the 4 main subsidiaries of petroleum ministry is supplying more than 70 percent of total energy in the country as well as the feed stock for tens of petrochemical and industrial complexes around the country. The company also is operating one of the biggest high pressure gas transmission and distribution networks of the world facilitating export, import, transit and swap of natural gas in the country. In the point of natural gas treatment and supply, the company has the first position in the Middle East and one of major gas companies around the world.

At the time being, the number of the NIGC permanent staff is more than 19000 official staff and more than 19300 total staff.

A Glance at the NIGC Administration and Organization Staff

The National Iranian Gas Company is comprised of 8 directorates as follows:

1. Natural Gas Production Coordination & Supervision Directorate
2. Financial Affairs
3. Planning
4. Research and Technology
5. Human Resource Development
6. Gas Distribution
7. Natural Gas Distribution Coordination and Supervision (Dispatching)
8. International Affairs

In addition to the mentioned directorates, there are thirteen departments which directly report to the managing director as follows: Public Relations, Legal Affairs, Inspection & Complaint

Consideration Affairs, Internal Auditing, Security, Assemblies' Affairs, Executive Affairs of Violation Investigation, Technical Inspection, Health, Safety and Environment (HSE), Information and Communication Technology, Commercial Expertise Affairs, Recruitment Affairs, and Structural Engineering affairs.

The National Iranian Gas Company is also comprised of 51 subsidiary companies that each of them is active in different fields of natural gas industry with independent directorates. These companies are as follows

a) Provincial Gas Companies

At present, there are 31 provincial gas companies throughout the country which are responsible for gas delivery to the cities, villages, power plants, industries and commercial consumers.

b) Gas treatment Companies

Eight Gas processing companies act under the supervision of Natural Gas Production Coordination and Supervision Directorate. The directorate supervises and utilizes processing plants. It is projected that through implementation of the development projects by 2020, the number of the gas processing companies will increase and based on the existing plans; the total gas processing capacity of NIGC will amount to 1200 Million Cubic Meters (MMC) per day, provided that all processing development projects are realized by 2020. The eight gas processing companies which work under the supervision of the directorate are as follows:

- 1.2 Bidboland I and MasjedSoleyman Gas processing companies with the nominal capacity of 28 MMC per day
3. Shahid Hasheminezhad Gas processing company with the capacity of 58MMC per day.
4. Sarkhun & Qeshm Gas processing company with the capacity of 17 MMC per day.
5. Parsian Gas processing company with the capacity of 84 MMC per day.
6. Ilam Gas processing company with the capacity of 6.8 MMC per day.
7. Fajr Jam gas processing company with the nominal capacity of 125 MMC per day.
8. South Pars Gas Complex Company including 8 processing plants with the capacity of 466 MMC per day.

Iranian Gas Engineering and Development Company

Iranian Gas Engineering and Development Company is one of the subsidiaries of the NIGC. Based on the executive system of oil industry projects, the company is responsible for the implementation of National Iranian Gas Company master plans. In terms of the volume of under implementation projects, the company is the biggest one in the NIGC and invests most of the credits. The company is in charge of designing and construction of gas transmission pipelines, gas boosting stations, development of processing plants and infrastructure facilities.

The company is based on the executive system of oil industry projects and is authorized to deal with the following tasks according to the article 5 of the company statute:

1. Carrying out economic and feasibility studies of the projects left to the company.
2. Carrying out fundamental and detailed engineering affairs and implementing all the projects left to the company.
3. Design, supervision and implementation of all the engineering and construction operations such as construction and development of oil and gas production, collection and transfer systems, well head facilities, processing plants and dehydration facilities, underground gas storage, transfer pipelines, gas supply and distribution, gas pressure boosting and reducing stations and C.N.G, telecommunication systems, pumping stations, constructional and infrastructural activities and several marine structures and their related facilities inside and outside the country
4. Performing all the required material procurement activities inside and outside the country
5. Carrying out all the scientific, technical, commercial and service activities required for the development of the company also recently, according to some organizational changes, all underground gas storage projects and activities shifted to the IGEDC.

Iranian Gas Transmission Company

Iranian Gas Transmission Company is one of the other subsidiaries of NIGC. Since the establishment of NIGC in 1965, Gas Transmission Company was active under the supervision of Gas processing and Transmission Company. In 2005, the transmission directorate was organizationally separated from the processing sector and in 2006 the Gas Transmission Company was established. The most important task of the company is receiving natural gas, Ethane, LPG and gas liquids from domestic and foreign production sources and transferring it to domestic production terminals and export terminals.

The Iranian Gas Transmission Company is comprised of seven managerial districts and 10 operational zones. The company is responsible for operation management of about 36000 km gas pipelines all over the country. It is noteworthy that the above-mentioned constructed pipelines which start from production resources to gas processing plants and continue up to the consumption points, are considered to be the main arteries of gas transfer throughout the country. It is obvious that the complexity and sensitivity of the job cannot only be sensed through referring to some figures in this regard.

However, it is noteworthy that having assurance of about 700 MMC of natural gas transmission from the production regions to consumption points and export terminals could not be materialized without the efforts of more than 4000 hardworking personnel and the management of 76 high pressure boosting stations, the existence of 257 compressors and administration of a modern telecommunication and telemetry network.

Underground Gas Storage

Underground Gas Storage is one of the other major sections of the natural gas value chain aiming at building and maintaining balance between the natural gas production and consumption in special circumstances (sudden temperature drop). Activities include continuing the current projects and defining new projects. NIGC started momentum for surveying and studying in various parts of the country to identify potential underground structures suitable for gas storage; and studied 217 reservoirs. At present, Shoorijeh and Sarajeh underground gas storage reservoirs with an annual capacity of 4 BCM are operational and the Yortsha, Nasr Abad, Imam Hasan, Ghezel Tapeh, Baba Ghir and Bankoul reservoirs are under different phases of study and implementation. For the time being, Activities and projects of underground gas storage are being supervised by NIGEDC.

Iranian Gas Distribution Company

In line with the implementation of Article 44 of the Iranian Constitution and line 7 of the National Iranian Gas Company subsidiaries entrusting agenda, a company named Iranian Gas Distribution Company including 31 provincial gas companies was founded responsible for the following activities.

1. Reception, distribution, transaction and commission of natural gas regarding the related rules.
2. Maintenance and administration of the operations related to the secondary lines, gas feeding and distribution networks, pressure-reducing stations, measurement stations, cathodic protection and other installations and building related to the company activities.
3. Offering services to the natural gas applicants and subscribers,

gas sale according to the contract and endeavor to promote the quality of before and after sale services to the customers.

4. Devoting effort to establish the research system and strengthen the relationship with the scientific and research centers in order to reach the scientific and technological innovations and their implementation to answer the company needs.
5. Transportation, warehouse keeping, marketing, distribution and selling of the products and services of other investment-receiving companies and individuals and legal persons who are active in the production and commerce fields.
6. Offering technical, managerial, executive and financial services to the other investment-receiving companies.

Iranian Gas Commerce Company

Iranian Gas Commerce Company as one of the other NIGC subsidiary companies was established in 2008 in line with the strategic objectives and policies to fulfill the following detailed tasks:

1. Commerce activities including marketing, purchase, sales, import, export, goods and equipment commissioning and some hydrocarbon derivatives including natural gas, Liquid Petroleum Gas (LPG), Liquefied Natural Gas (LNG), gas liquids, gas condensates, sulfur and other processing byproducts.
2. Carrying out goods-related tasks including warehouse keeping, customs formalities, and other relevant activities.
3. Rendering technical and expertise services, goods technical inspection, updating and classifying goods, developing vendor lists and some other relevant activities.

An Acquaintance with the Iranian Gas Industry Iran Gas Industry

Having a glance at the writings of the ancient historians, one can realize that Iranians were the pioneers of using natural gas and oil derivatives. For example, the existence of the ruins of fireplaces and temples like the immortal fire near Kirkuk, known as Bokht-Ul-Nasr torch was located near a natural gas reservoir. Zoroastrians' temple near Masjid Soleyman and historical narrations regarding Azargoshasb fireplace, all together is proof for this very claim. Ancient Iranians, based on the norms of their own religion, esteemed fire, and tried to keep it alive. In central and southern plateaus of Iran and the regions where dense woods existed, Iranians used some other things apart from wood taken from jungle to keep the holy fire alive and the nature of these regions with the abundant underground reserves made this effort easy.

Natural Gas Industry's Birth

The basis of gas industry emerged in the USA and Europe was not natural gas, it was the gas produced from heating coal. The gas produced from heating coal, which was being used for lighting transformed the lifestyle of the people in the early 18th century. Working hours of factories increased and people could use lighting without having to buy and use expensive and hazardous candles; in this way, people could read newspapers and books.

Finally, a Scottish inventor called William Mordak was the first person who found out that using gas as a source of energy was easier than using coal, because it could be transferred by ship and was easy to control, as well. In 1792, William Mordak managed to use gas in order to provide his own house lighting. Later on, in 1799 someone called Philip Lyon accomplished a test on the gas resulted from heating sawdust and coal. He registered the gas distillation method resulted from wood.

Nevertheless, the French government refused to accept Philip Lyon's theory and viewpoint for expanding gas lighting system not until 1807 when for the first time Winsor used gas for lighting of London streets. At first, wooden pipes were used for transferring gas; however gradually some pipes such as cannon pipes related to the British Navy substituted for them.

In 1819, there was a pipeline of about 482 km, which supplied the required gas for about 50 thousand gas consumers. During those years, various activities commenced for utilizing gas in industry.

Although, Iranians were the pioneers of using gas and other oil derivatives, the first historical documents related to planned using of gas in Iran goes back to the era of Qajar and the kingdom of Naser-Al-Din Shah. In 1873, when king Naser-Al-Din Shah had a visit from London, he was surprised when he saw lights in the streets of London. Returning home, he ordered to construct and use gaslight factory.

In 1908, the first oil well drilled in Masjid Soleyman reached oil; and a huge amount of associated gas was flared due to the long distance between production sources and consumption origins on one hand and high cost of investment and low consumption rate in the south of Iran, on the other. But gradually oil reservoirs came into stream one by one and Iran thought of using natural gas for supplying the required uses of home sector, especially the houses of the National Iranian Oil Company (NIOC) staff in oil-bearing regions such as Masjid Soleyman, Aghajari, Haftgel and Abadan. Even though the major activities of oil industry in those days included crude oil production, transmission and processing in southern Iran, agent companies carried out some limited activities for production and process of natural gas.

In Iran at first, just the oil was extracted while a plentiful amount of associated gas was also produced. From 1910 to 1960s, the associated gases were mainly flared. In early 1960s based on a contract signed with Russia, associated gases were gathered and transferred to Russia in lieu of constructing a steel mill in Iran. In fact, for 50 years the associated gases were flared without any use, but after gas export to Russia, the associated gases were supplied in Shiraz for the first time. In fact, Shiraz cement factory was the first factory which became gas-fueled and later on the gas network was expanded to some other cities in Iran. In this way, the gas which was uselessly flared for 50 years entered the gas distribution network and was used at home sector. Until no independent gas fields were discovered in Iran, it was natural to process and use associated gas in this way. Nevertheless, after discovery of some independent gas fields such as Kangan and South Pars, it was necessary to divide responsibilities regarding gas extraction between the NIOC and the NIGC. In other words, crude oil production, extraction, sales and export was left to the NIOC; and natural gas processing, transmission and distribution to the NIGC.

Around 50 years ago, the policies adopted by the NIOC paved the grounds for the NIOC to have access to technical and economic requirements to handle and restrain associated gases and consequently gather process, transfer and sell them. Due to raising the issue of exporting gas to the foreign countries, comprehensive studies were completed and the project for the trans-Iranian gas pipeline known as IGAT I was implemented and came into stream. Due to the essentiality of leaving all the gas affairs to a single organization

responsible for the determined responsibilities and objectives in future, and because of the general agreements between Iran and Former Soviet Union to expand economic cooperation in 1965 which led to inking a protocol in January, the same year, the issue of gas export was raised and the NIGC was established in March 1966 and started its activities. At present, the NIGC is one of the four major subsidiary companies of the Oil Ministry. The chairman of its general assembly is the esteemed president and the chairman of its Board of Directors is the Oil Minister.

The NIGC's Strategic Objectives

The NIGC major objectives can be surveyed in two different sections: national and international.

In both sectors, the main principle is customer satisfaction and maximum productivity achievement.

In line with this and based on the outlook document (2020 horizon), the NIGC aims at ranking the third among natural gas producers in the world to achieve 8 to 10 percent of the global gas trade share. The second objective of the NIGC is ranking the first in the region in terms of gas technology.

Plans and policies of the NIGC in international level and ranking the third in the world and achieving a share of 10 percent of natural gas trade in the world are as follows:

1. Processing about 1200MCM per day of natural gas
2. Enhancing natural gas share in the energy basket of the country by 70 percent, through substituting liquid oil products for natural gas
3. Increasing natural gas export to regional and international markets through pipelines and other methods
4. Attracting foreign investment through capital markets and/or joint projects
5. Moving towards economic and commercial based vision and improving structures to maximize profitability and competition in international markets
6. Maximization of the added value through using gas in energy consuming industries and/or establishment of industries like GTL and CNG
7. Improving private sector's position in downstream and gas distribution sections
8. Cooperation with the neighboring countries in the region in production, transmission and diversification of gas trade opportunities.
9. Improving natural gas infrastructures' management in the region
10. Adjusting natural gas pricing system

Top Five Gas Reserve Holder countries in the World by the End of 2015

Unit: Trillion Cubic Meters

Iran	34
Russia	32.3
Qatar	24.5
Turkmenistan	17.5
USA	10.4

Iran's ranking in the World's Gas Reserves

Economy prosperity in the world requires rich sources of energy. Various survey indicate that by 2050 hydrocarbon resources will be still the most major sources of supplying energy. Examining the trend of these resources and their geographical distribution indicates that only the five countries in the Persian Gulf region -the Islamic Republic of Iran, Saudi Arabia, Kuwait, Iraq and United Arab Emirates- will be the major oil producing countries. In addition, Iran, Russia, Qatar, Saudi Arabia and United Arab Emirates will be the major gas producing countries by 2025.

Gas reserves, like oil reserves, are categorized in three groups: proven reserves, probable reserves and possible reserves. The volume of the proven natural gas reserves has tripled over the last three decades. That is to say, the proven gas reserves from about 72 Trillion Cubic Meters (TCM) in 1970 has reached over 187 TCM at the beginning of 2016 and Iran with 34 TCM (18.2 percent of the total) of the world gas reserves ranks the first among the reservoir holders.

Among the operated gas reservoirs in Iran, two reservoirs namely Maroun Khami located in Southeast of Ahwaz and South Pars are of extreme importance. Especially, South Pars as the second and most important gas reservoir of Iran owns 50 percent of the country's whole gas reserves and more than 8 percent of the world's.

Top Ten Gas Reserve Holder Countries in the World in the beginning of 2016

Item	Country Name	Proved Reserves by the beginning of 2016 (Trillion Cubic Meters)	Share (Percent)
1	Iran	34	18.2
2	Russia	32.3	17.3
3	Qatar	24.5	13.1
4	Turkmenistan	17.5	9.4
5	United States of America	10.4	5.6
6	Saudi Arabia	8.3	4.5
7	United Arab Emirates	6.1	3.3
8	Venezuela	5.6	3
9	Nigeria	5.1	2.7
10	Algeria	4.5	2.4

Iran's Position in the World's Natural Gas Production and Consumption

According to the International Energy reference organizations, natural gas demand by 2035 will grow faster than other fossil fuels especially crude oil and coal. The demand growth is projected to be 1.6 percent per annum within the study's period. In supply side, gas production from conventional resources will increase 0.7 percent per year, while the Middle East, Russia and Italy will be the main suppliers of gas from conventional sources. In unconventional sector, shale gas comprises two thirds of increase in total natural gas production within the study period. After North America, as the main source of unconventional gas, China will be the second main supplier of the shale gas by 2035.

Industrial consumers shape the main increase in natural gas demand within the projection years. The sector will comprise 45 percent of total demand growth by 2035. Power plants also will have a 36 percent of share in total growth of natural gas demand.

In demand side, China, some Middle Eastern countries and the US will consist the main sources of consumption growth up to 2035. The main demand increase in China arises from growth in industrial and electricity generation demands. In the US, main growth in natural gas demand belongs to the electricity sector.

Iran's position among the world's top ten natural gas consuming countries in the world in 2016

Item	Country Name	Consumption (Billion Cubic meters) in 2016	Partial Percent
1	United States of America	778	22.8
2	Russia	391.5	11.2
3	China	197.3	5.7
4	Iran	191.2	5.5
5	Japan	113.4	3.3
6	Saudi Arabia	106.4	3.1
7	Canada	102.5	2.9
8	Mexico	83.2	2.4
9	Germany	74.6	2.1
10	United Arab Emirates	69.1	2.0

Iran's position among the world's top ten natural gas producing countries in the world in 2016

Item	Country Name	Consumption (Billion Cubic meters) in 2016	Partial Percent
1	United States of America	767.3	22
2	Russia	573.3	16.1
3	Iran	192.5	5.4
4	Qatar	181.4	5.1
5	Canada	163.5	4.6
6	China	138	3.9
7	Norway	117.2	3.3
8	Saudi Arabia	106.4	3
9	Algeria	83	2.3
10	Indonesia	75	2.1

Iranian Gas Market privileges and advantages

1. The shortest route to the main global markets.
2. Having the huge infrastructures for treatment and transmission of natural gas to domestic and foreign destinations.
3. The minimum required investment.
4. Possibility of natural gas transit to Turkey, the Europe and Persian Gulf region countries.
5. Possibility of gas swaps to the adjacent countries.
6. Existence of potential major consumers.
7. Owning 34 TCM proven gas reserves and ranking the first among big gas owners now and with the current trend by the

next hundred years.

8. Ranking the third among producers that will rank the second in coming years.
9. Having necessary infrastructures for gas export and swap and transit to Europe, East Asia and Persian Gulf region countries.
10. The privilege of existing enough talented professionals and experts in all sections of gas operations including treatment, transmission, distribution, contracts and trading options.

Moving towards daily production of 1.2 BCM of natural gas and penetration into new target markets

It is the policy of the NIGC to enhance Iran's current share in the total global gas trade to reach 8-10 percent. At present, processing and dehydration capacity of the Iran's gas processing plants is about 840 MCM per day; however, based on the Sixth Development Plan it is to reach 1200 MCM per day within the first years of the plan. At present, Iran's share in gas trade including export, import, swap, transit, and bartering gas for electricity is around 2 percent. However, Iran's share in natural gas global trade is to reach 10% by 2025. Currently, the NIGC supplies more than 70 percent of the country's energy needs. The objective is having access to 1200 MCM per day of gas production, 70 thousand km of high pressure pipelines and achieving 8 to 10 percent of gas global trade in the next 15 years. In line with the implementation of Article 44 of the Iranian Constitution, one of the priorities of the NIGC is privatization of the some sections of the value chain. On this basis, it is supposed to increase the share of private sector in all the logistics, technical, maintenance and procurement services, power generators, pipelines and access roads. NIGC, relying on abilities of Iranian companies in engineering, procurement, manufacturing and construction of pipeline and compressor stations projects, will materialize its strategies in development of natural gas infrastructures to enhance gas supply to both domestic and foreign destinations and diversify gas trade options.

A Glance at the NIGC Production and Processing Facilities in Line with Achieving a Premium Rank in the Global Trade Balance

Natural Gas Processing

With respect to the natural gas share in the fossil energy mix and the 50 years of valuable experience in the gas industry activities in terms of hardware and software, the NIGC has a high potential and is considered to be among the major gas companies in Iran and the Middle East. As much as consumption rate has gone up, and based on the horizons developed in the development outlook document, natural gas production, processing and dehydration capacity has had a growing trend to meet the new requirements. Without operating its development projects, the NIGC is capable of processing about 770 MCM per day of gas. As mentioned earlier, at present, the NIGC is responsible for the management and operation of seven independent and private processing companies. According to the estimations, by 2020, the number of gas processing companies is supposed to increase through carrying out development projects. Predictions indicate that in case all the gas processing development projects are materialized, by the end of 2025, the total processing capacity of the NIGC will amount to over 1200 MCM per day.

Natural Gas transmission

Natural gas transmission from production origins and processing plants to various consumption points in various sectors of gas

industry is of high sensitivity and importance. The total length of high-pressure gas transfer pipelines in Iran is around 37 thousand km. The pipeline's transfer capacity is estimated to be 600MCM per day based on the decisions adopted in the framework of the twenty-year outlook document, the length of pipeline from 37 thousand km should reach 70 thousand km. Hence, the Iranian Gas Transmission Company as one of the subsidiaries of the NIGC benefits from all vast executive- logistic facilities and various machinery to implement general projects in the realm of engineering, fundamental and detailed designing gas especially in relation with designing gas transfer pipelines, supply and distribution networks, pressure reduction stations all over the country while observing international standards.

Iranian Gas Transmission Company, which enjoys 78 active gas pressure-boosting stations, has taken measures to boost gas transmission capacity to meet the requirements of both domestic and export sectors through planning for construction of new stations. In case the above- mentioned projects 36,200 km of pipeline by 2025 are materialized, our pipelines will benefit from 140 active stations. The status of Iran's strategic gas reserves in south coast of Iran and the existence of common gigantic South Pars gas field shared with Qatar has made the Pars Special Energy Zone so important.

Iran's share from gas reserves in South Pars is estimated to stand at around 14.2 TCM (around 8 percent of the world's total gas reserves and 50 percent of Iran's gas reserves). Taking into consideration all the above - mentioned points, the Pars Special Energy Zone's position and role in development of the economy of the country is undeniable.

Natural Gas Distribution and Consumption

Besides Iran's integrated and vast gas distribution network in home and business sector which consumes the lion's share of the produced and processed natural gas, there are some other sectors including power plants, major industries and petrochemicals that consume a significant amount of the processed gas. The share of gas in the country's oil and gas product basket has reached 72percent so far and is expected to continue to grow in the near future.

Until the present time, the total length of over 310thousand km of urban gas distribution network has been constructed which is responsible for providing gas to 1082 cities and 23000 villages. At present, around 25millionhouseholds enjoy natural gas.

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