

Latest developments in the Iranian gas industry

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Abstract

In this report, the author first outlines the structure of the National Iranian Gas Company (NIGC) before reviewing the history of gas usage and development in Iran. He then assesses the policies and objectives up until 2025 and reviews Iran's position in the global context. He concludes by looking at how Iran's share of the global gas trade could be enhanced and considers various capacity enhancement projects.

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Introduction to NIGC

Using natural gas as a heating fuel is just one of the various usages of this precious fuel. With respect to natural gas, the significant value added to the national economy plus its capability for being converted into thousands of valuable commodities in the petroleum and petrochemicals industry means one can easily realize its real and major importance. The growing need for gas to provide energy and fuel, and the foreign currency resulted from sales and export for investment and launching infrastructural industries in the country, reinforced the idea of bundling the gas industry related activities. Therefore, and in line with this, and based on the legal statute, the National Iranian Gas Company (NIGC) as one of the four major subsidiaries of Iran Petroleum Ministry was established. The initial capital of the company amounted to RLS 25 billion, in 1965.

Since its establishment, NIGC has gradually achieved capabilities and has 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 country economic and social development trend. NIGC has also benefited from gas, which is one of the major fuels used for energy production and providing a part of the required currency of the country. At present, NIGC is carrying out its tasks in compliance with international valid standards on its own.

Right now, NIGC is one of the top ten gas companies in the gas industry in the Middle East, and one of the four major subsidiaries of the Petroleum Ministry. Being responsible for providing over 61 percent of the country-required fuel, it has over 45 years experience. The company, in terms of providing gas, has an important position both inside the country and abroad. In line with this, and proportionate with its needs and expansion of its activities in the country and abroad, NIGC has taken measures to revise its structure. While maintaining and reinforcing its potential in terms of hard ware and soft ware, NIGC has recruited experts and/or trained staff, and has updated its experienced staff knowledge.

At present, the number of NIGC permanent staff amounts to 18,000 persons, meanwhile, over 18,000 contractor staff works with NIGC.

Overview of NIGC's administration and organization staffs

- a) National Iranian Gas Company is comprised of six directorates as follows:
 - Finance
 - Planning
 - Research and Technology
 - Human Resources Development
 - Gas Distribution Coordination
 - Production Coordination and Supervision (Dispatching)

- b) In addition to the above- mentioned directorates, there are twelve affairs, which directly report to the Managing Director as follows:
 - Public Relations
 - Legal Affairs
 - Inspection and Complaints Consideration
 - Internal Affairs
 - International Affairs

- Security
 - Assemblies Affairs
 - Executive Affairs of Violations' Investigations
 - Technical Inspection
 - Health, Safety and Environment (HSE)
 - Information Technology
 - Commerce
- c) Among the previously mentioned directorates, Gas Distribution Coordination is comprised of 30 provincial gas companies, which are responsible for delivering gas to cities, villages, power plants, industries and commercial centers.
- d) National Iranian Gas Company is comprised of 6 affiliated companies active in various activities such as gas treatment and dehydration, gas transmission, gas engineering and development, and commerce. The affiliated companies supervise the activities of some independent directorates. The above-mentioned companies are as follows:
- Iranian Gas Engineering & Development Company
 - Iranian Gas Transmission Company
 - Iranian Gas Industrial processing Services
 - Iranian Underground Gas Storage Company
 - Iranian Gas Commerce Company
- e) Iranian Gas Engineering & Development Company is one of the subsidiaries of NIGC. Based on the executive system of oil industry projects, the company is responsible for implementation of NIGC master plans. In terms of the volume of under implementation projects, the company is the biggest company in NIGC and is responsible for over 70% of the total planned investments. The company is in charge of carrying out 12 major projects including gas transfer pipeline design and construction, compressor stations, development of gas processing plants and infrastructure facilities as follows. The value of the under implementation projects amounts to over RLS 200000 billion, and the entire approved credit of the company has amounted to RLS 40000 billion in the current year.

Based on article 5 of the company statute, NIGC is authorized to deal with the following:

- Carrying out economic and feasibility studies of the projects left to the company.
- Carrying out basic and detailed engineering affairs and implementing all the projects left to the company.
- Design, supervision and implementation of all engineering and construction operations such as construction and development of oil and gas production, collection and transfer systems, wellhead facilities, gas processing plants and dehydration facilities, underground gas storage, transfer pipelines, gas supply and distribution, natural gas , CNG and CGS, telecommunication systems, pump stations, construction and infrastructure works, various offshore structures and the relevant facilities in Iran and abroad.
- Carrying out all scientific, technical, financial, commercial and service activities essential for expansion of the company's operation.

- f) Gas Processing Company, which is among the 5 companies established in NIGC, is comprised of seven independent gas processing companies that are responsible for natural gas treatment operation. Through implementation of development projects by 1404, the number of the gas processing companies is expected to be doubled.

Based on the prediction, in case all processing development projects are realized by 2025, the total gas processing capacity of NIGC will amount to over 1200MMCM /d.

The gas processing companies, which work under supervision of the directorate, are as follows:

- *Bid Boland Gas Processing plant:* The nominal processing capacity of the company is 27.2 MMCM/d; however, at present it produces 18.3 MMCM /d of the country's required natural gas.
 - *Bid Boland II Gas Processing plant:* The nominal processing capacity of the company is 57 MMCM/d, which will come on stream in 2012.
 - *Parsian Gas Processing plant:* The nominal processing capacity of the company is 83 MMCM /d; however, at present is produces 81.2 MMCM /d of the country's total required gas.
 - *Ilam Gas Processing plant:* The second phase of the gas processing plant (Meymak) which is designed to produce 3.4 MMCM /d is under construction.
 - *Jam Gas Processing plant:* The gas processing plant, at present, provides 102 MMCM/d of the country required gas.
 - *Sarkhoon and Qeshm Gas Processing plant:* The output of the gas processing plant amounts to 15.5 MMCM /d of natural gas.
 - *Shahid Hasheminejad Gas Processing plant:* The gas processing plant, at present, provides 47.2 MMCM /d of the country required gas.
- g) Gas Transmission Company is one of the other subsidiaries of NIGC. Since the establishment of NIGC in 1965, Gas Transmission Company was active under supervision of Gas Processing and Transmission Company. It was in 2005 that in terms of structure transmission directorate was separated from the processing sector and in 2006 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, as well.

Iranian Gas Transmission Company is comprised of 5 managerial districts in headquarters and 10 operational zones. The company, all together, is responsible for protecting about 27000 km gas pipeline all over the country. It is noteworthy that the above-mentioned pipeline of 27000 km, which starts from production points to gas processing plants and continues up to consumption points, is considered to be the main artery of gas transfer all over the country. It is obvious that complexity and sensitivity of the job can not only be sensed through referring to some figures in this regard. However, it is noteworthy that assurance of transfer of 600 MMCM /d of natural gas from the production regions to consumption points and export terminals is not materialized, unless the 7000 thousand hard working personnel of NIGC work day and night to manage the operation of 60 compressor stations. Another important point, which contributes to the success, is benefiting from a modern telecommunication and telemetry network.

- h) Iranian underground Gas Storage Company is one of the other major subsidiary companies of NIGC, which was established in 2008. Whereas, every country should, on average, store 13.7 percent of its consumption rate, and given Iran's annual consumption at the moment is about 140 BCM, Iran ought to store 19 BCM of natural gas annually. In line with this, underground natural gas Storage Company was established aiming at organizing, expanding, developing and speeding up underground gas storage activities in Iran. The company is responsible for continuing the current projects and defining new projects. It started momentum for surveying and studying in various parts of the country to identify and/or find potential underground structures suitable for gas storage; and studied 217 reservoirs over a year. At present, the company is implementing numerous projects namely Sarajeh, Shoorjeh, Yortsha, Nasrabad, Ghezel Tapeh, Mokhtar, etc.
- h) Regardless of NIGC subsidiary companies and their vast range of activities, Gas Distribution Coordination Directorate is one of the most executive and vast directorates within NIGC, so that the range of its activities covers all gas distribution zones in Iran. The 30 gas regions, which cover all the provinces in Iran, are under supervision of the directorate. In fact, in case all the activities of NIGC from gas production to processing, transmission and distribution is considered as a continuous chain, Gas Distribution is located at the end of the chain. It is a pity that Iranians cannot see the complicated chain of work done by NIGC staff to admit the magnitude of the task in this long and complicated chain. They just see some statistics and figures, which lack the required spirit.

However, our fellow citizens are so lucky that, at the end of the chain are exposed to a harmonized executive and collective management in gas industry, which acts like a brilliant mirror in NIGC. It is also a sign of luckiness that the relationship between the components of every system such as what can be seen in NIGC, are considered to be the components of an alive organization which report to each other. In other words, when Gas Distribution Directorate deals with the minor experimental and livelihood affairs of individuals in the society, ebbs and flows is observable in gas distribution operation, which develops a report on all the magnitude and complexity hidden from the public sight. Due to this, since the formation and establishment of NIGC, Gas Distribution Directorate as a component of the company not only provided an account of ebbs and flows in NIGC, but also displayed the complexity of the activities of the company. At present, NIGC has 29 provincial gas companies under its supervision. There are 11,960,000 subscribers and 55,974,000 receiving services from NIGC.

The length of the gas network is 171000 km; however, at the beginning of its activities-1965 to 1968-NIGC was just active in Tehran. Four years later, Khuzestan and Isfahan gas regions commenced their activities. By 2000, Gas Distribution Directorate just took care of ten gas regions where every two or more provinces were supervised by a gas region. Since 2000, based on privatization policies and further to implementation of article 44 of the Iranian constitution, provincial gas companies were established in 24 provinces and during the years 2004 and 2007 four other gas regions including Ilam province, Southern Khorasan, Northern Khorasan and Razavi Khorasan joined provincial divisions of Gas Distribution Directorate.

Nevertheless, it should be kept in mind that Gas Distribution Directorate is not just dealing with various executive activities, but in some headquarters it is active with a technical and strategic outlook and deals with the following:

- Planning Affairs
- Tariffs and Contracts' Affairs
- Expert Affairs
- Gas Distribution to Major Industries and Power Plants Affairs
- Engineering and Technology Affairs
- Management Information System(MIS) and Information Technology (IT) Affairs.

With respect to what was mentioned in explaining about NIGC subsidiaries and Directorates, the general structure of the company is designed and can be seen at a glance as follows:

NIGC Structure

NIGC					
Gas Processing Companies	Iranian Gas Transmission Company	Iranian Gas Engineering and Development Company	Provincial Gas Companies	Iranian Gas Commerce Company	Iranian Gas Services Company
8 Companies	10 Regions	10 Projects	30 Companies		

Iran's gas history

Having a glance at the writings of the ancient historians, one can realize that Iranians were pioneers of using petroleum derivatives and gas. For example, the existence of the ruins of fireplaces and temples like immortal fire near Kirkuk, Known as Bokht-UL-Nasr torch located nears a natural gas reservoir. Zoroastrians' temple near Masjid-Suleyman 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 highland of Iran where dense woods existed, Iranians used some other things apart from wood taken from jungle. In other words, this was fulfilled through benefiting from the underground reserves. In western, southern and southwestern Iran, as today we know, there is a huge amount of oil and gas.

The origins of the natural gas industry

The basis of the gas industry that emerged in the USA and Europe was not natural gas, but it was the gas obtained by heating coal. This gas was used for lighting and transformed the lifestyle of Europeans in early 19th century. Working hours of factories increase and people could use lighting without having to buy and use expensive and hazardous candles; in this way, people could read newspapers and books.

Actually 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 performed a test on the gas resulted from heating sawdust and coal. He registered the method of distillation of the gas.

Nevertheless, the French government refused to accept Philip Lyon's theory and viewpoint for expanding gas lighting system in London streets. Later on, in 1807 for the first time gas was used for lighting some of London's streets. At first, wooden pipes transported the gas; however gradually some pipes such as cannon pipes substituted them. In 1819, there was a pipeline of about 482 km, which supplied the required gas for about 50 thousand subscribers. During those years, various activities commenced for utilizing gas in industry. Although Iranians were the pioneers of using gas and other petroleum derivatives, the first historical documents related to planned using of gas in Iran goes back to the era of Qajar kingdom. In 1873, when king Naser-ul-din visited London, he was surprised when he saw the lights in the streets. Returning home, he ordered the construction and use of a gaslight factory.

Oil and gas evolution in Iran

In 1908, the first oil well drilled in Masjid Suleyman 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 on-stream one by one and Iran thought of using natural gas for supplying the required usages of home sector, especially the houses of NIOC staff in oil-bearing regions such as Masjid Suleyman, Aghajari, Haftgel and Abadan. Even though the major activities of petroleum 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.

From 1910 to 1960s, oil was discovered and 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, but after exporting gas to Russia associated, gas was supplied in Shiraz for the first time. In fact, Shiraz cement factory was the first factory, which received gas as its fuel, later on gas network was expanded to some other cities in Iran. In this way, the gas, which was 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. Nevertheless, after discovery of some independent gas fields such as Kangan and Pars, it was necessary to divide responsibilities regarding gas extraction between NIOC and NIGC. In other words, crude oil production, extraction, sales and export was left to NIOC; and natural gas processing, transmission and distribution was left to NIGC.

Around 40 years ago, the policies adopted by NIOC paved the grounds for 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 abroad, comprehensive studies were made and the project for the overall gas pipeline known as IGAT I carried out 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 the former Soviet Union to expand economic co operations in 1965 which led to inking a protocol in the same year, the issue of gas export was raised, and NIGC was established in March 1966 and started its activities.

At present, NIGC is one of the four major subsidiary companies of the Petroleum Ministry. The chairman of its general assembly is the esteemed president and the chairman of its Board of Directors is the Petroleum Minister.

Gas sector objectives and policies in the 2025 outlook

Based on the outlook documents, in the petroleum industry the funds resulted from oil and natural gas including gas condensates and gas liquids sales after deducting amortization costs is not considered as the government's revenue. In other words, selling these resources is merely considered a national asset and wealth, which should be converted into generating capital to maintain continuous fertility and natural wealth.

One of the other objectives determined in the outlook document is that Iran should have control over 10 percent of the total amount of gas traded all over the world. Based on these objectives, some mechanism created in gas industry should pave grounds to enhance gas production rate to reach 500 BCM per year. It is worth mentioning that the United States of America with gas reserves of one fifth of Iran, produces five times more than Iran. The US gas reserves accounts for about 3 percent of the world's gas reserves, while that of Iran accounts for 15 percent of the world's gas reserves. Even Canada, which has 1.17 of the world's gas reserves, produces two times more than that of Iran.

Based on the outlook document forecasts, through attracting domestic and foreign capital, Iran fulfills this great and important objective.

Removing inefficient bureaucracy is another effort made to materialize Iran's position in the outlook document. According to experts, due to limitation in state investment resources, , efforts should be made to absorb more private domestic and foreign capital rather than merely relying on state resources in the oil and gas industry. Petroleum sector is so attractive to foreign investors are ready to develop energy sector in Iran in desirable conditions.

Therefore, through investment in other sectors, which are not of interest of foreign investors, the government can succeed to promote gas and convert it into a national capital rather than remaining as a natural resource, in compliance with 2025 outlook document.

On the other hand, according to the program defined in the 20-year outlook of the country, oil production is expected to reach one bbl/d and with respect to our gas reserves, which amount to 1000 TCF, gas production is expected to reach 50 BCF/d.

Our current production is over 500 MMCM /d, which is expected to reach 1.4 BCM in the horizon of the 20-year outlook. The current crude oil production capacity is 4.3 mb1/d, and is expected to reach 7 mb1/d including gas condensates according to horizon outlook. The point indicates that our oil and gas industry requires between 400 and 500 billion dollars investment.

At present, desirable measures have been taken to absorb foreign investment in oil and gas fields. For example, in late 2009 and early 2010 Iran has reached agreements with ONGC of India to invest in Farzad gas field with reserves amounting to 12.5 TCF. In the first phase, \$3.5 billion is supposed to invest; and in the next step where the LNG project comes into stream, the investment rate is expected to reach \$7 billion. Kish gas field with reserves amounting to 48 TCF gas requires \$ 10 billion.

Negotiations have been conducted with a European company concerning converting natural gas of Lavan gas field into LNG, which requires between 6 and 7 million dollars investment. Lavan gas field reserves amounts to around eight TCF.

All the earlier mentioned issues indicate that the range of activities of NIGC provides a high potential for capital absorption. There are various big and small fields in the Persian Gulf, which require different levels of investment ranging from between \$200 million and 16 billion with respect to the type of the field.

Therefore, benefiting from the capitals of Iranians in the country and abroad is one of the greatest motivations of oil and gas industry.

As mentioned earlier, since 2005 NIGC took measures to establish Gas Engineering and Development Company so that it would absorb domestic and foreign investment to implement projects to make the company approach the outlook objectives. In line with this and based on the executive system of oil industry projects, Iranian Gas Engineering and Development company is responsible for implementation of NIGC master projects. The company is the biggest company in NIGC, in terms of the volume of the under implementation projects; and 70% of the required credit for carrying out projects is provided by Iranian Gas Engineering and Development Company. The company is also responsible for implementation of 12 major projects including design and construction of gas transfer pipelines, pressure boosting stations, development of gas processing plants and infrastructure facilities. The under implementation projects worth over RLS 200,000 billion; and the entire approved credit for the company in 2009 has amounted to RLS 40,000 billion.

NIGC strategic objectives

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

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

In line with this and based on the outlook document, 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 NIGC is ranking the first in the region in terms of gas technology.

- Plans and policies of 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
- Processing about 1050 MMCM /d of natural gas
- Enhancing production capacity while prioritizing joint reservoirs, especially South Pars
- Enhancing natural gas share in the energy basket of the country by 70 percent, through substituting liquid oil products with natural gas
- Making efforts to export natural gas to neighboring countries through pipeline, other countries in the world and far east
- Exporting LNG
- Attracting foreign investment through capital markets and/or joint projects
- Firms running vision and improving structure to maximize profitability and competition in international market

- Maximization of value added through using gas in energy consuming industries and/or establishment of industries like GTL
- Reinforcing private sector in downstream and gas distribution industries
- Cooperation with the countries in the region in production and transmission affairs
- Impressing gas management status in the region
- Benefiting from natural gas adjusting pricing system
- Complete privatization of natural gas in Iran
- Creating the required infrastructures for development of gas industry in its upstream and downstream sectors, especially in the regions.

The company has foreseen plans including interaction with the countries and companies which own advanced technology, establishment of a centre for promotion and improving modern oil, gas and petrochemical industries' technologies in the Persian Gulf and strengthening research and development institutions of domestic research centers.

Iran's gas reserves and world ranking

Economy prosperity 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. And Iran, Russia, Qatar, Saudi Arabia and United Arab Emirates will be the most 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 proven natural gas reserves has tripled over the last three decades. That is to say, the proven gas reserves from about 45 TCM in 1970 has reached over 155 TCM at the end of 2001.

According to the report covering the 2008 data, the world's gas reserves are estimated at around 185 TCM. Russia with 43.3 TCM and 23.4 percent share of the world gas reserves ranks the first and Iran with 29.61 TCM and 16 percent share of the world gas reserves ranks the second after Russia.

According to the earlier mentioned report Qatar with 25 trillion and 460 billion cubic meters and 13.8 percent share, Turkmenistan with 7 trillion and 570 billion cubic meters and 4.1 percent share, United States of America with 6 trillion and 730 billion cubic meters and 3.6 percent share, United Arab Emirates with 6 trillion and 430 billion cubic meters and 3.5 percent share, Nigeria with 5 trillion and 220 billion and 2.8 percent share, and Venezuela with a share of around 2.6 percent and gas reserves of 4 trillion and 840 billion cubic meters rank after Russia and Iran in term of holding gas reserves in the world.

Among operated gas reservoirs in Iran, two reservoirs namely Maroun Khami located in Southeast of Ahwaz and South Pars are of high importance. Development operation of Maroun Khami gas reservoir started on 30 October 2006. Among the discovered reservoirs, the reservoir is unique.

Reservoir pressure of 12500 psi, gas, temperature of 300° F, flow pressure of 6000 psi, and using API 1500 class commodities are the most important characteristics of the reservoir.

Top ten gas reserves in the world, by country

Ranking	Country	Reserves (TCM)	Share of total
1	Russia	43.3	23.4
2	Iran	29.61	16
3	Qatar	25.46	13.8
4	Turkmenistan	7.94	4.3
5	Saudi Arabia	7.57	4.1
6	United States	6.73	3.6
7	United Arab Emirates	6.43	3.5
8	Nigeria	5.22	2.8
9	Venezuela	4.84	2.6
10	Other	47.9	25.9

Iran's position in the world production basket and gas consumption

According to the IEA reports, by 2030 in the 30 countries which will form the greater Europe, natural gas demand among other initial energies will grow significantly and from 450 million tons of oil equivalent in 2003 will reach 760 million tons of oil equivalent in 2030. It is noteworthy that demand for natural gas in the great Europe was just 110 million tons of oil equivalents in 1970.

Studying natural gas production and supply indicates that little by little when demand for natural gas in the earlier-mentioned countries in Europe goes up, dependence on import gas resources will dramatically rise. In line with this and based on the results of the studies conducted by IEA results of the studies conducted by IEA, while Europe was not in need of importing gas by 1973, in the year 2000 a high percentage of the 520 BCM gas supplied to Europe (30 members) was provided through importing gas from non-European countries. In 2030, European will depend on importing natural gas more than ever. In 2030, natural gas production in great Europe is estimated at less than 300 BCM. However, around 600 BCM is imported to Europe from outside European Union.

In this way, European Union's share for importing natural gas, was almost zero in 1970, in 2005; reached around 36% and is forecasted to reach 70% by 2030.

Based on this, probably, the countries with rapid economic growth rate, will allocate the highest rate of demand to themselves in the next years. Therefore, it can be claimed that India with annual economic growth rate of 6.5%, South Korea with 3.5%, African countries with 5.5%, and Middle East countries with 4.5% will allocate the highest energy demand rate to themselves in the next years.

According to the estimations made, in terms of consumption, the USA with 657.2 BCM of natural gas i.e. 22 % of the worlds total gas consumption in 2008 ranks the first. Russia with 430.2 BCM – 13.9% of the world's total gas consumption ranks the second; and Iran with 132.7 BCM – 4.4% of the world's total gas consumption ranks the third.

The report indicates that Canada with 100 BCM, UK with 93.9 BCM, Japan with 93.7 BCM, Germany with 82 BCM, China with 80.7 BCM and Saudi Arabia with 78.1 BCM, rank respectively after Iran, in terms of natural gas consumption.

World's top ten natural gas consuming countries in 2008

Ranking	Country	Consumption (BCM)	Total Share
1	USA	657.2	22
2	Russia	420.2	13.9
3	Iran	132.7	4.4
4	Canada	100	3.3
5	UK	93.9	3.1
6	Japan	93.7	3.1
7	Germany	82	2.7
8	China	80.7	2.7
9	Saudi Arabia	78.1	2.6
10	Other	1280.25	42.7

World's top ten natural gas producing countries

Ranking	Country	Production (BCM)	Total Share
1	Russia	601.7	19.6
2	America	582.2	19.25
3	Canada	175.2	5.7
4	Iran	144.4	4.7
5	Norway	99.2	3.2
6	Algeria	86.5	2.8
7	Saudi Arabia	78.1	2.5
8	Qatar	76.6	2.49
9	China	76.1	2.47
10	Others	1173.7	38.19

The global net gas trade and Iran's position

The IEA has calculated Europe's net gas import for the year 2030. According to the calculations made by IEA, Europe's gas import from Africa in 2030 based on minimum scenario is estimated at 135 BCM, while based on the maximum scenario it is forecasted to reach 200 BCM. It is worth mentioning that, at present, Europe annually imports around 60 BCM from Europe. Based on this and according to the minimum scenario, Russia will annually export 175 BCM gas to Europe by 2030. Based on the maximum scenario, the previously mentioned amount will be less than 250 BCM. At present, Russia exports 125 BCM gas to Europe. However, in IEA report, the highest volatility in gas supply to Europe, based on different scenarios, is related to Far East. Based on what was earlier mentioned, while according to the minimum scenario, Europe's gas import from the Middle East, in 2030, is just 40 BCM, the continent's import according to the maximum scenario will be over 210 BCM. However, based on the average scenario which may be a more precise scenario, Europe will import over 160 BCM from the Middle East, in 2030. At present, natural gas import from Middle East is less than 15 BCM.

In general, based on IEA calculations, Europe's net gas import from the most important oil bearing regions is estimated to be at least 460 BCM and at most 660 BCM.

Based on the latest estimations, USA with 104.41 BCM gas i.e. 17.78% of the world's total gas produced, ranks the first among gas importing countries.

It is worth mentioning that, at present, USA secures one third of its required energy from natural gas. Natural gas ranks the second, after oil, in the US energy basket. Meanwhile, natural gas provides 14 percent of the feedstock of power plants. In addition, 45 percent of the required amount of energy for households heating system and 31 percent agriculture and industry sectors in the USA is provided by natural gas. Based on the existing statistics and figures, last year, the USA imported 104 BCM of its required gas from Canada. The figure accounts for 20 percent of Canada's total gas consumption. Given the current situation and gas production trend in the USA and Canada, the two countries will run out of gas in 10 and 8 year's time, respectively.

Apart from Iran and Russia, which have huge gas reserves, at present some countries including Qatar, Nigeria, Algeria and Venezuela are the countries, which have reliable gas reserves. Qatar has inked many contracts with American companies for development of its gas fields. Some political analysts are of the opinion that awarding development contracts to American companies is a privilege given to America by Qatar to provide Doha with security umbrella in the Middle East. In addition, lack of political stability in many gas producing countries, leads to lack of confidence in them in long term. For example, Nigeria has been suffering from ethnic and racial chaos and unrests, and its petroleum facilities have been in danger. Due to these unrests, during the recent months, oil and gas production trend faced slump. More or less, the same case is through about Algeria, which is involved with hardliner groups, which disagree with foreign companies' activities in Algeria. The government ruling Venezuela is not interested in having political ties with west, especially the USA that is the biggest gas consuming country.

After the USA, countries namely Germany, Italy, France and Turkey rank the next in terms of gas import. Following them are Belgium, India, Canada, UAE, Hungary, Brazil, Spain, Mexico, Poland, Czech Republic, Thailand, Singapore and Austria. The Islamic Republic of Iran, which imports 7.1 BCM of natural gas, 1.2% of the total natural gas produced in the world, ranks the twentieth among the gas importing countries.

Iran's position from the viewpoint of international organizations and research institutes

Based on the natural gas current trend and its outlook over the next 25 years, growing demand for natural gas in Europe and the increasing need of the continent, international organizations and research institutes have forecasted a position for Iran in meeting the needs and demand, according to these projections, in the near future UK which supplied a part of west Europe required gas, will start importing gas from 2010 on. Norway's export to Europe is predicted to reach 120 BCM per year in 2020. In North Africa, Algeria will be still the most important gas exporter to Europe through pipeline and in the form of CNG. In Central Asia, Kazakhstan, Turkmenistan and Uzbekistan have no way out except exporting their gas to Europe through pipeline passing through Iran or Russia. Based on the result of certain research activities, gas

reserves in the Persian Gulf region is over 50 TCM, which is more than Russia's reserves. Due to abundance of oil resources in the region, natural gas export was not the centre of attention until the year 2000.

Iran's position among the world's gas exporting countries in 2008

Ranking	Country	Export (BCM)	Total share
1	Russia	154.41	19
2	Canada	103.2	12.68
3	Norway	94.97	11.67
4	Algeria	59.37	7.3
5	Qatar	56.78	7
6	Holland	55	6.75
7	Indonesia	33.5	4.11
8	Malaysia	29.4	3.61
9	USA	27.15	3.33
10	Nigeria	20.54	2.52
11	Australia	20.24	2.5
12	Trinidad & Tobago	17.36	2.13
13	Germany	15.14	1.9
14	Egypt	14.06	1.72
15	Bolivia	11.29	1.4
16	Oman	10.9	1.3
17	UK	10.5	1.29
18	Libya	10.4	1.27
19	Iran	4.7	0.58

Iran is the most liable country in the region for exporting gas to Europe. Iran's huge reserves and its strategic situation have created a suitable opportunity for Iran in this regard. In line with this, the volume of Iran's potential export to Europe in three periods i.e. years 2000, 2010 and 2020 have been studied. The study shows that Iran did not export gas to Europe in 2000. Based on the study, Iran's gas export to Europe will amount to 10 BCM. Indeed, the figure is the one considered for gas export to Turkey. In 2020, about 30 BCM of the required gas of the EU will be supplied by Iran.

The results of the studies on the report of the European Union Energy Commission indicates that Iran is one of the potential suppliers of natural gas: "The considerable growth of demand for gas in Europe, creates a situation wherein European Union's attention to the new gas suppliers is inevitable". That is to say, in countries such as Iran, Iraq, Qatar and Turkmenistan where import cost transfer and transit are sometimes two times higher than that of Algeria and Libya should be paid attention to. On the other hand, Iran as of the world's second gas reserves owner cannot be indifferent to gas export markets, Iran has been the centre of attention. European companies have paid special attention to the existing options for transferring Iran's gas through pipeline via various routes such as Turkey and Armenia. Some multinational and European companies such as Shell, Repsol, Total and some companies from East Asia have negotiated with Iran regarding Iran's LNG export projects, and they have reached some agreements in this regard. All the arrangements have been forecasted on the basis of the development of Iran's gigantic South Pars Gas field. Ms Florence Fee, based in London, says South Pars gas field is a piece of jewelry on the crown of Iran's gas Kingdom. Ms. Fee: "what is meant by jewelry?" South Pars Gas Field with 13 TCM gas reserves, on its own,

holds half of Iran's proven gas reserves. Ms. Fee believes that with respect to growing demand for gas in the USA, and not having access to new sources of gas, the situation in the USA is so worrisome. USA believes that South Pars gas field could be a source of LNG supply to the USA. Qatar, at present, exports the LNG produced from the gas field to the USA. Ms. Fee believes that with respect to Iran's pertinacious rivals in the LNG market in short term, South Pars gas field will be one of the most important sources of supplying LNG to the global markets.

In summation, the strategic situation and the advantages of Iran's gas market, at a glance and based on consumers' view, are as follows:

- The shortest route to global markets
- Having the huge infrastructures for transferring gas abroad
- The minimum required investment
- Possibility of transit to Turkey, European and Persian Gulf region countries
- Possibility of Swap to the adjacent countries
- Existence of potential major consumers
- Owning 29 TCM proven gas reserves and ranking the second among gas owning countries with the current trend by the next hundred years
- Ranking the fourth among producers, however it will rank the third in twenty years' time
- Having reliable infrastructures for gas export and swap and transit to Europe, east Asia Persian Gulf region countries

Iran and Europe gas export routes: Natural Gas, LNG and GTL developments

Enjoying huge natural gas reserves can provide valuable opportunities for development and improvement of the country. In addition to being a clean fuel, natural gas can meet domestic needs and can be considered for export.

Since the first oil shock in 1973, international energy markets have paid the most attention to petroleum industry development; and other energy sources were not the first priority because it was stated that oil would still be the dominant fuel. Among initial energies in the global market, natural gas has had the most rapid growth rate during the recent years. Therefore, the level of natural gas reserves has reached 170 TCM from 83 TCM within the last two decades.

In case, gas policy issue is considered based on the current level of gas supply; we might conclude that there is not much gas available for export. In such circumstances, the Islamic Republic of Iran does not have enough space to be active in the international scene; however, in case we consider Iran as the second biggest gas reserve holder country after Russia, and we take it for granted that finally gas should be extracted and produced, it can be concluded that in a long term horizon and with a strategic vision, Iran's gas industry will be definitely in a premium and unique position.

Nowadays, "oil diplomacy" is very common and known to the public; however in future "gas diplomacy" will be raised. Perhaps, it would not be surprising to say that in future instead of petroleum ministry with a subsidiary gas company, we would have gas ministry and a subsidiary oil company. World's gas export is made through pipeline. Of course, exporting gas as LNG is preferred to export through pipeline. In fact, gas export is, to a high extent, a subordinate of the laws and frameworks of crude oil export, which can be exported to remote points. It is noteworthy that gas by

itself is a fuel, which is difficult to export, and during the recent decades, it highly depended on development of pipe industry. As far as Islamic Republic of Iran is concerned, export starts with the neighboring countries whose balance in the gas sector is negative. There are two major markets for Iran's gas; Europe market and Asian pipeline. In the former, export is through Turkey. The latter is exporting gas to Pakistan and India. These two markets severely need Iran's gas. Turkey and European countries concern about gas supply security and reliance on Russia as a supplier.

The European market is a reliable and transparent one ruled by a series of international laws and regulations. In the market supply and demand security is a basic principle and Energy Charter principles are observed in all EU members. Although there is a rather demand for gas and proper growth, and despite its political and strategic aspects, Asia market is an unknown market. Both India and Pakistan have a high potential for consuming gas, in addition they do not have access to better alternatives. Anyway, with respect to Iran's high capacity for gas development, apart from Europe, Iran may export gas to Asian markets, as well. It is almost twenty years that Iran has been planning to export gas to Europe; however, the possibility of exporting gas through pipeline is another option. The outlook of gas trade in global aspects is to a considerable extent depending on LNG and GTL projects' development; and Iran has had some plans under survey and implementation. Both LNG and GTL process are costly and require advanced technologies; nevertheless accessing them is not impossible. By the next few decades, gas will be transmitted through pipeline, which creates independence and long-term common responsibilities on the part of countries and neighbors. Major players in the gas market can speed up facilitate development of gas trade policy with Pakistan and India.

In order to export gas to its target global markets, Russia has to transit its gas through at least seven countries. This is an indication of the number countries contributing to gas export from Russia. Therefore, security should be established in different transit countries, this is what Europe is seeking. In other words, gas pipeline and international trade make the necessity of mutual security in the transit countries a severe issue.

Enhancement of Iran's 8 per cent share in global gas trade

It is the policy of NIGC to enhance Iran's current share in the total global gas trade to reach 8 percent. At present, Iran's gas processing plants capacity is about 540 MMCM /d; however, based on the Fifth Development Plan is to reach 900 MMCM /d. 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 late 2025.

At present, NIGC meets around 62 percent of the country needs and provides 5.1 million vehicles with their required CNG in 900 CNG stations in 700 cities. The objective is having access to 1300 MMCM /d gas, 70 thousand km pipeline and achieving 8 to 10 percent of gas global trade in the next 15 years. In line with implementation of article 44 of the Iranian Constitution, one of the priorities of NIGC is privatization of the company. On this basis, all the logistics, technical, maintenance, procurement services of 7 compressor stations, power generators, pipelines and taking care of the access roads to them are supposed to be left to the private sector. With respect to the fact that Iranian companies can meet almost all the needs of the industry, they are to construct high-pressure stations, observing the world's latest standards such API.

Therefore, in order to access gas production of 1300 MMCM/d; in addition to new financial sources, private sector is necessary to promote its capabilities.

Achieving a higher global trade balance

A Glance at NIGC Production and Processing Facilities Indicates Achievement of a Higher Rank in the Global Trade Balance

With respect to the natural gas share in the fossil energy carriers basket and the 40 year valuable experiences in the gas industry activities in terms of hardware and software, 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; natural gas production, processing and dehydration capacity has had a growing trend to meet the new requirements. In addition, the growing trend is recommended to be continued proportionate with development projects.

The estimates indicate that in 2012, Iran's gas processing capacity will stand at 274 BCM per year, in other words it will be equal to the 55 percent growth rate during the next years. Without operating its development projects, NIGC is capable of processing 500 MMCM /d of gas.

As it was mentioned earlier, at present, NIGC is responsible for management and operation of seven independent and private processing companies. According to the estimations, by 2025, the number of gas processing companies is supposed to be doubled 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 NIGC will amount to over 1200 MMCM /d.

Natural gas transfer

Natural gas transfer from production origins and gas 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 pipeline in Iran is around 32 thousand km. The pipeline's transfer capacity is estimated at 500 MMCM /d based on decisions adopted in the framework of the twenty-year outlook, the length of pipeline from 32 thousand km should reach 65 thousand km. Hence, Iranian Gas Transmission Company as one of the subsidiaries of NIGC benefits from all vast executive- logistic facilities and various machinery to implement general projects in the realm of engineering, basic 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.

Processing capacity enhancement projects

NIGC has many gas processing plants under construction such as Bidboland 2 with daily production capacity of 57 MMCM /d. Chief among the measures taken to enhance processing capacity, one can refer to operating Bidboland 2 gas processing plant in 2011, development of Ilam gas processing plant at aiming at enhancing daily production capacity by 3.4 MMCM /d by 2010, operating gas projects of phases 6,7

and 8 of South Pars with production capacity of 100 MMCM /d by 2010, operating phases 9 and 10 of South Pars with production capacity of 50 MMCM /d of gas by 2008, operating phases 15,16, 17 and 18 of South Pars with production capacity of 100 MMCM /d of gas by 2012, operating phases 19,20 and 21 of South Pars with production capacity of 40 MMCM /d of gas by 2014.

Natural gas high pressure transmission pipelines

One of the major development projects of high-pressure gas transmission pipeline under construction is Assaluyeh, Bidboland, Ahwaz sixth pipeline, with 625 km length and 56 inch in diameter. The objective of constructing the pipeline is increasing transmission capacity by 95 MMCM/d and 5 pressure increase stations. The capital allocated \$ 101 billion.

Another under construction project is Assaluyeh, Sarkhoun, Iranshahr seventh pipeline with 902 km length and 56 inch in diameter with the transfer capacity of 110 MCM /d with at most 10 gas compressor stations and the capital allocated \$ 2.2 billion.

The other under construction project is Assaluyeh, Naein, Tehran eighth pipeline with 1050 km length and 56 inch in diameter with the transfer capacity of 100 MCM /d with 10 gas pressure-boosting stations and the capital allocated is \$ 3.3 billion. Assaluyeh, Ahwaz, Dehgolan, Bazargan is the ninth pipeline with estimated length of 1860 km and with 56 inch in diameter, and transfer capacity of 110 MMCM /d with 17 gas pressure boosting stations is another under construction pipeline to which around \$ billion is allocated. The project, which is in design phase, is expected to come to stream in 2014.

According to the report, Kangan, Panaveh, Tiran tenth pipeline with 590 km length and 56 in diameter, and transfer capacity of 65 MMCM /d and with for pressure boosting stations and \$ 635 million capital allocated to it is under construction. The 56 inch Assaluyeh, Naein, Miami eleventh pipeline with 1320 km length and with transfer capacity of 110 MMCM /d and with 12 pressure-boosting stations is on the agenda to be constructed. The 42 and 48 inch North second pipeline (Northeast of Parchin, Miami, Sangbast) with approximate length of 900 km and with six pressure boosting stations with a capital of \$ 1.5 billion is in operation phase. The 40 and 48 inch Azarbaijan, Saveh, Hamadan, Bijar, Miyandoab third pipeline with 430 km length and with three pressure-boosting stations, and a capital estimated at \$ 800 million is in operation. All the earlier – mentioned projects are among major development projects of natural gas high-pressure pipelines.

Iranian Gas Transmission Company which enjoys 63 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 35,200 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 existence of common gigantic South Pars gas field shared with Qatar has made the Pars Especial Energy Zone so important.

Iran's share from gas reserves in South Pars is estimated to stand at around 14.2 TCM (around 7 percent of the world's total gas reserves and 50 percent of Iran's gas

reserves). Taking into consideration all the above – mentioned points, PEEZ'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 a lion share of the produced and processing natural gas, there are some other sectors including power plants, major industries and petrochemicals that consume a significant amount of the processing gas. The total consumption of the earlier – mentioned sectors, at present, has led the share of gas in the country fossil fuel consumption basket to reach 62 percent, and is expected to continue to grow.

At present, the total length of urban gas distribution network is over 162,000 km, which is responsible for providing gas to 790 cities, 7500 villages and 22,975 industrial plants. At present, 56 million persons in the form of 14.5 million households enjoy natural gas.

Over the last year 133 BCM of natural gas was delivered to the domestic consumers. Of the entire amount, 42.9 BCM is allocated to the power plant sector, 32.9 BCM to the industry sector, and 57 BCM is consumed in home and business sector. Meanwhile, 56 power plants were provided with natural gas in 2009.

According to estimations and forecasts, the volume of gas consumed in 2010, 2011, 2012, 2013, and 2013 in the home and business sector is estimated at 385, 396, 407, 418, and 429 MMCM/d, respectively.

The amount of gas estimated to be consumed by industries in 2010, 2011, 2012 and 2013 and 2014 stands at 142, 175, 195, 207 and 218 MMCM/d, respectively.

According to estimations and forecasts, in 2010, 2011, 2012 and 2013, petrochemical industries will consume 57, 91, 123, 145 and 157 MMCM/d, respectively.

According to estimations, in 2010, 2011, 2012, 2013 and 2014, power plants will consume 182, 214, 525 and 267 MMCM/d, respectively.

According to the previously mentioned forecasts, over the last years, on average, Iran will export around 34 BCM of gas to Turkey and Armenia through transfer pipelines.

CNG estimated volume to be consumed in transportation sector will stand at 14, 17, 20, 24 and 28 MMCM/d in 2010, 2011, 2012, 2013 and 2014, respectively.

Changing the gas consumption/production balance

In case, we want to introduce an index for level of development and underdevelopment on one hand it is necessary to pay attention to the balance or ratio of consumption to production, on the hand it is essential to evaluate energy intensity regardless of production. In this respect, communities are categorized as producers and consumers. During the postwar period (second world war) due to global recession and based on consumption encouraging economic theories such as

Keynes' theory, and in some periods, if economic prosperity in 1960s and 1970s, development economists and theoreticians generally believed that more consumptions is equal more development. Nevertheless, after a while, studying the lifespan of mineral and energy resources in the world and importance of the world's nutrition on one hand and environmental threats on the other, many researcher even politicians recommended limiting consumption rather than developing it. Therefore, a developed community is not the one, which enhances its consumption level, but it is a community, which measures its consumption balance by production.

On the other hand, it should be noticed that production or consumption orientation is an index for the level of development and underdevelopment both for communities and individuals. In other words, every individual can measure its own consumption intensity compared with his real needs. In addition, he can measure its consumption intensity compared with his role in production trend of the community to achieve a scale for his own development or underdevelopment. In other words, it through benefiting from these scales that one can realize whether he is in development or under development level.

Unfortunately, despite its developed moral and cultural background our community is not in a desirable status in terms of consumption.

It is said that among all countries in the world Iran's gas consumption intensity is the highest. The studies indicate that Iran's gas consumption is 17 times higher than Japan, 8 times higher than Europe, 2 times higher than China, and 2.8 times higher than East Asia countries.

However, efforts are being made to adjust consumption trend, especially in the gas sector. In line with this, in 2001 a directorate called "Energy Consumption Optimization" established to take care of energy saving issues. Surveys in the year 2000 indicated that home sector which consumes over 40% of the entire energy consumed in the country, has allocated the highest share to itself compared with other sectors. Home sector has consumed the highest amount of natural gas while kerosene has allocated the highest value of the energy consumed. The amount of energy consumed in the buildings in Iran with that of developed countries indicates the huge difference between the two figures, which makes it essential to revise energy consumption policies fundamentally in the building sector. However, due to energy low price in Iran, consumers do not care about how much they consume. Taking into consideration the fact that the government pays a lot of subsidy in energy, it can be simply realized that energy saving can be of benefit of all the members of the society.