Iran and Global Natural Gas Markets

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Abstract

At the outset of the third millennium, natural gas is considered the fuel of choice due to its unique features and lingering concerns about environment. Projections are indicative of a better outlook for this clean fuel in coming years.

IEA projections show that natural gas with its market share growing from 21% in 2002 to 25% in 2030 will be the second dominant fuel after oil by the third decade of the 21st century. Nevertheless, there are concerns about the stability of natural gas prices and markets and whether such natural gas projects as GTL, LNG, and natural gas pipelines are economical. Undoubtedly natural gas industry, particularly in natural gas producing countries will face serious challenges if natural gas markets are not managed in a decent way. Therefore, cooperation between natural gas producing and consuming countries seems to be inevitable and necessary. Islamic Republic of Iran as the world's second biggest country in terms of natural gas reserves cannot ignore international energy markets' potentials for Iranian surplus natural gas exports. Thus Iran has multiplied its efforts to develop natural gas exports since the huge South Pars natural gas field was explored and consequently Iran's proven natural gas reserves increased dramatically.

European Union and South Asian countries such as India and Pakistan with negligible natural gas reserves and high gas demand are among potential profitable markets for Iran's natural gas.

It is projected that natural gas demand in India as the second most populated country in the world will encounter a dramatic growth rate. New power plant, petrochemicals, and other industrial projects contribute in large measure to natural gas demand growth in India. Therefore the most reasonable and cost-effective solution for India will be the import of natural gas by means of an interstate pipeline to meet its increasing domestic demand. As a result, a proposal for transmission of Iran's natural gas through Pakistan to India was put forward.

European Union is projected to face a considerable shortfall in its domestic natural gas production which can be a good opportunity for Iran to find a niche in this big market. The PersianGulf states are also considered prospective markets for Iran's natural gas.

Natural gas prices have recently grown considerably in international markets. The US markets is believed to play a leading role in recent developments. European markets are also predicted to follow the example of the US market experiencing a rapid growth of natural gas prices. However, Asian markets will be affected by the developments with a time lag.

Islamic Republic of Iran, located on a land separating two hydrocarbon-rich regions of the Caspian Sea and the Persian Gulf is of much importance from geopolitical point of view.

More than 70% of the world's proven natural gas reserves are located in the Persian Gulf and FSU region. Such countries as Russia, Iran, and Qatar hold more 55% of the world's natural gas reserves. In 2004, total recoverable natural gas reserves in the region was estimated at 130 TCM which is indicative of the crucial role of the region in providing energy for the world due to the outlook for the share of natural gas in global energy mix at present and future.

Although in many regions, especially in the North Sea, natural gas reservoirs are mature, most of the gas fields in the region are at the beginning stages of production and the R/P ratio in the region is 130 years which is much higher than global standard of 67 years.

There are comprehensive plans pursued by Iran to develop domestic consumption of natural gas considering such factors as Iran's geographical and climate diversity, the government's policies regarding natural gas replacement, a need to gas injection into oil fields, necessity of developing petrochemicals industries, and increasing need to development of power plants. However, Iran with the second larges gas reserves in world cannot ignore global natural gas markets.

Natural Gas Demand Outlook

Natural gas demand will experience an annual growth rate of 2.3% by 2030. The major portion of this demand growth is contributed by power plants. Therefore, the share of natural gas in global energy mix will rise from 21% in 2002 to 25% in 2030.

Natural gas demand growth in India and China will be more than 5% by 2030 due to the replacement of natural gas for coal in power plants. Therefore, share of developing Asian countries in global demand for natural gas will rise to 14% in 2002 from 8% in 2002.

It is projected that power generating sector in

World Natural Gas Primary Demand (bcm)

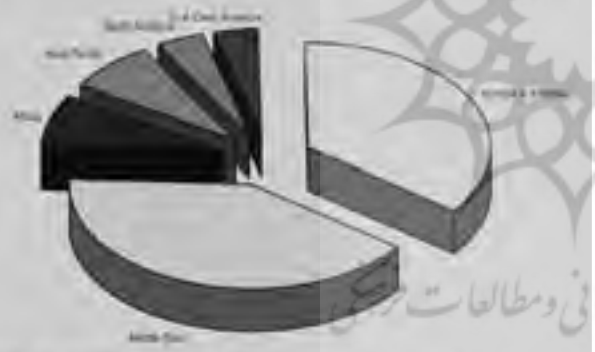
	2002	2010	2020	2030	2002-2030%
OECD North America	750	866	1002	1100	1.3
OECD Europe	491	585	705	807	1.8
OECD Pacific	139	173	216	246	2.3
OECD	1380	1624	1924	2154	1.6
Russia	415	473	552	624	1.5
Other Transition economics	220	254	311	360	1.8
Transition economics	635	728	863	984	1.6
China	36	59	107	137	5.4
Indonesia	36	53	75	93	3.5
India	28	45	78	110	5.0
Other Asia	109	166	242	313	3.8
Brazil	13	20	38	64	5.8
Other Latin America	89	130	191	272	4.1
Africa	69	102	171	276	5.1
Middle East	219	290	405	470	2.8
Developing Countries	597	864	1307	1753	3.9
World	2622	3225	4104	4900	2.3
European Union	471	576	684	786	1.8

developed countries will play a key role in the growth of natural gas demand. Power generating sector is predicted to contribute 59% of natural gas growth by 2030 so the share of this sector will grow from 36% in 2002 to 40% in 2030. It is worth mentioning that the annual growth rate of global demand for natural gas averaged 2.5% in 1990-2002.

World's Conventional Natural Gas Reserves

Conventional natural gas reserves in the world were estimated at some 180 TCM by 2004 which has doubled for last 20 years. This volume of reserves will provide the global demand for next 66 years. If the growth rate of global demand for natural gas is supposed to be 2.3% per year, these reserves are able to meet the global demand for natural gas at most for next 40 years. Russia, Iran, and Qatar hold some 55% of conventional proven natural gas reserves in the world.

Figure 1-World's Natural Gas Reserves (2004)



Source: Bp Statistical Yearbook 2005

Figure 2-The Middle East Natural Gas Reserves (2004)

Source: Bp Statistical Yearbook 2005

Unexplored natural gas reserves in the world are estimated at 147 TCM, some 75% of which are non-associated gas reserves and remaining 25% of which includes associated gas reserves.

Natural Gas Production Global Outlook

The future of regional production of natural gas depends to a great extent on the capacity of the reserves in the region and production costs. A majority of huge natural gas reserves are located in areas far from major natural gas markets.

It is projected that natural gas production by such Russia, CIS, and the Middle East countries grow more than the production in other countries. However natural gas production in Africa and South America will face a higher growth rate.

In some areas, production costs are very low. For example in Iran's South Pars gas field; the revenues from the sale of condensates will cover a major part of production costs.

Annual production capacity growth in the third decade will reach 320 BCM. One fourth of this growth will occur in North America where most of the fields are mature and natural decline in higher than other regions. Major portion of the growth in production capacity will be materialized in the Middle East countries and Russia.

Natural Gas Trade

Regional trade of natural gas will grow more than three fold by 2030, that is, it will be hiked to 1265 BCM in 2030 from 417 BCM in 2002. In 2030, European Union will rely on natural gas imports to provide 80% of its consumption. North America and OECD Asian members will rank the second and third respectively in terms of domestic demand for natural gas in the corresponding period.

Natural Gas Import Dependence

	2002		2010		2030	
	Bc	%	Bc	%	Bc	%
OECD North America	0	0	33	4	197	18
OECD Europe	163	36	267	46	525	63
OECD Asia	99	98	130	97	153	94
China	0	0	0	15	42	27
India	0	0	16	23	44	40
European Union	233	49	342	60	639	81

The Middle East is projected to become the biggest natural gas exporter in the world by 2030. Natural gas exports from this region will increase to 304 BCM in 2030 from 30 BCM in 2002. In the meantime, LNG regional trade will grow to 250 BCM in 2010 and 680 BCM in 2030 from 150 BCM in 2002. In 2030, more

than 50% of natural gas traded regionally will be in the form of LNG.

Investment Outlook

A total investment of $2.7 trillion should be made by 2030 in order to achieve desired balance of natural gas supply and demand. In other words, some $100 billion should be spent annually on the global natural gas industries by 2030.

OECD countries will absorb half of the projected investments in natural gas industries by 2030. North America will spend one forth of the investments by 2030. In the second rank, Russia, the Caspian region, the Middle East, and African countries will absorb the investments in natural gas industries.

The Middle East will require the biggest portion of the investments in natural gas industries while CIS countries (including Russia) will absorb the greatest portion of the investments in natural gas transmission grids.

A Summary of Iran's Gas Export Projects

Four contracts regarding the export of 17 BCM per year via pipeline have been finalized and signed so far. Natural gas export to Turkey started in 2001. Gas exports to Nakhjavan and the UAE will start this year. The fourth contract is on the export of natural gas to Armenia which will be operational by winter 2007. Other contracts under negotiations are as follows:

• South: Oriental Oil Co, DUSUP, Mobadele, Raas-alKheimeh (natural gas exports to the UAE), Kuwait and Oman

• East: Pakistan-India land pipeline project

• North and North West: Austria (natural gas export to Europe), Switzerland,

Ukraine, France, Greece, and Italy.

It is notable that the contract of natural gas export to Turkey was signed in 1996 with Botas (Turkey). Under this contract, gas exports to Turkey starts from 3 BCM and reaches the maximum amount of 10 BCM. Natural gas exports from Iran to Turkey was a turning point in commercial ties between Iran and international energy markets which is of high importance from economic, political, and long-term international relations point of view.

Studies show that Europe's demand for natural gas will outstrip the domestic supply in next two decades and natural gas imports will double. This indicates that European countries are trying to diversify their natural gas resources with the aim of maintaining the security of supply.

The Middle East countries, particularly Iran, are the most promising potential suppliers of natural gas to global markets, so they are able to play a decisive role in this most important economic region through preparing the ground for their own presence.

The South Pars gas field, which is a common field between Iran and Qatar, is the biggest non-associated gas field in the world located 100 kilometers off Iran's southern coasts. The area of this field is 9700 square kilometers. The capacity of the Iranian side of this field is estimated at some 14.2 TCM which is equal to 7% of world's total natural gas reserves and 38.6% Iran's total natural gas reserves. The amount of condensates in this field is also estimated at 18 billion beo.

South Pars, phases 11, 12, and 13 are specialized for LNG projects. To this end, NIOC has defined four separate LNG projects. Three of these projects are under way as follows:

1. Pars LNG: NIOC (50%), Total (30%), and Petronas (20%). This project includes 2 trains with nominal capacity of 5 million tons per year for each train which is able to consume 1.8 BCF of natural gas per day. At present a Japanese company, JGC, and a French company, Technip, are dealing with the design of the project. The share of Petronas has been recently decreased to 10% and 12% of the project was commissioned to CNPC, China.

2. Persian LNG: NIOC (50%), Shell (25%), Repsol (25%). This project includes two trains with nominal capacity of 8 million tons per year for each train. The natural gas feedstock of the project is equal to 2.8 BCF per day.

3. NIOC LNG: This project is financed by NIOC. This project includes two trains with nominal capacity of 5 million tons per year for each train. The natural gas needed for this project is 1.8 BCF per day. The design of the project has been completed. For more convenience, the project has been divided into three sections:

• First: Natural gas process and liquefaction units, utilities and loading ouflets

• Second: LNG and LPG storage tanks

• Sulphur, LPG, LNG, and NGLs Loading docks which is in bids phase

NIOC LNG project is of greater importance since it is implemented totally by Iranian financers and expertise.

Iran's LNG Contracts

Project		Customer	Latest Status	Size (mt/y)	Target market	Start of Delivery	Notes
NIOC LNG	1	ISERIBORA	MOU signed	2.4	Spain & Mexico	2009	Sales Contract finalized
	2	IOC & GAIL PARAKAT & PET	In June 2005 finalized and signed	5	India	2009	25 Yrs and extendable by 7.5 Yrs
	3	MITSUBISHI	CA draft signed & Term sheet submitted by Mitsubishi	0.7-2.2	Japan	10/2009	In negotiations Term sheet
	4	GUNDONG (China)	MOU & Agreement signed	2.5-5	China	2008	30 Yrs
	5	SINOPEC (China)	MOU signed & Terms Sheet in negotiations	10	China	10/2009	250 million ton LNG in 30 Yrs
PARS LNG	1	TOTAL & PETRONAS	Term Sheet signed & Sales contract in final stages	5	England, Mediterranean and Atlantic region, and India	2008	25 Yrs extendable to 30 Yrs
	2	PETROCHINA	MOU & CA signed	3-4	China	2008	25 Yrs
	3	EDISON	Preliminary negotiations	-	-	-	-
	4	GAZPROM (EXPORT)	Term Sheet prepared and CA signed	2	India & Europe	2008	Term Sheet in final stages
Persian LNG	1	SHELL & REPSOL	Agreement signed and Sales contract in negotiations	8	Mediterranean and Atlantic region, and India	11/2009	20 Yrs extendable to 30 Yrs

Iran's Natural Gas Exports via Pipeline

Region		Project	Target Market	Latest Status	Sales (MCM/d)	Contract Period (Yrs)	Project	Target Market
East	1	Dorood	Sharjah & Dubai	Contract signed	11	25	2007	Operational contract finalized
	2	Dorood-III	General	Contract signed	8	5	2008	Pending guaranty submission
	3	IOC-UAE	Dubai	Term Sheet pending signing & sales contract finalized	20	25	2007	Prices in negotiation
	4	MUBARAKE	UAE	Terms Sheet being finalized	20	25	2007	Prices in negotiation
	5	Ras-al-Khaimah	Ras-al-Khaimah	MOU signed	10	25	2007	Terms Sheet in negotiation
	6	Kuwait	Kuwait	Terms Sheet signed	5	25	2008	Terms Sheet in negotiation
	7	Oman	Oman	MOU signed	-	25	2008	Terms Sheet in negotiation
East (Export)	1	Pakistan-India Pipeline	Pakistan & India	Terms Sheet prepared	360	25	2010	Negotiations on finalizing the framework and principles of contract
	2	Azerbaijan	Nakhjavan	Contract signed	20	20	2007	Operational agreement being finalized
	3	Armenia	Armenia	Contract signed	1.2-2.2 BCM	10	2007	Operational agreement being prepared & operation started
	4	Serbia	Europe	Terms Sheet at final stages	13.3 BCM/y	25	2009	GSPA in negotiations Implementation pending NABUCO project

Natural Gas Global Developments

International trade of natural gas started in 1964 when Algeria exported its first natural gas cargo. Today, natural gas trade has grown rapidly. Such countries as Indonesia, Algeria, Malaysia, Qatar, Australia, Brunei, Nigeria, Oman, Abu-Dhabi, Trinidad, the United States, Libya, and Egypt are among the exporters liquefied natural gas in the world. Japan with more than 50% share in total global natural gas consumption is the biggest consumer of natural gas in the world. After Japan, South Korea, France, Spain, the United States are the biggest consumers of natural gas in the order mentioned. By 2010-2020, Canada, Mexico, and especially the United States will become the biggest consumers of LNG in the world since demand for natural gas is increasing in North America and these countries are not able to meet the increasing domestic demand.

LNG spot trade which started from 1992 currently accounts for some 4% of LNG market. Expansion of spot sales, particularly LNG cargoes to distant markets which started from 1993 will lead to a change in LNG trade.

There were only three LNG trade markets in the world before, namely, Asia-Pacific, the United States, and Europe with totally independent pricing mechanisms however at present. LNG trade is developed dramatically particularly trading LNG batches over long distances.

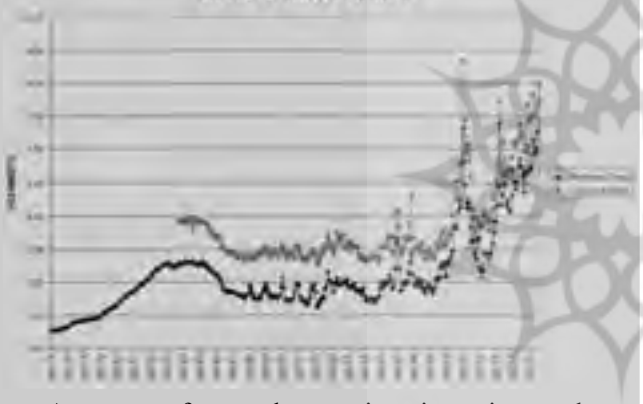
Liberalizing policies in EU markets of natural gas will result in the improved economy of short-term plans of supplying LNG to this region. Although in 1999, some 12% of total imported natural gas and 6% of total natural gas demand in Europe was provided by LNG, the LNG will play a stronger role considering EU plans to move to open markets. LNG prices in European markets should competitive. In any open market, they are competitive prices and

relative advantages which determine the position and share of energy carriers. Therefore, if LNG is willing to increase its own share in the market, its commercial advantages should compete with those of pipeline natural gas.

In Atlantic region, the outlook for LNG is better. There is a good capacity in the United States for the development of LNG trade due to increasing demand for natural gas in this country. LNG markets are acting more freely so that some analysts believe that an LNG factory should not supply for a specific terminal as it was usual in 1970's, but it should adopt a more flexible outlook. It seems that huge markets will welcome LNG since previous long term contracts are to expire and new terminals become operational in India and China.

Development of Natural Gas Prices

Figure 3-Development of Natural Gas Prices In the United States



A survey of natural gas prices in major markets, particularly in the US market which is one the most liberalized markets in the world indicates that well head prices of natural gas in the United States rose from 53 cents per million Btu in 1976 to $7.48/mBtu in August 2005 which is indicative of a growth rate of 1300% in less than three decades. A review of the prices in major US markets shows that in some cases due to natural disasters or rapid temperature changes natural gas prices in some markets rose to $30/mBtu. Or for example, London market spot prices of natural gas have recently reached some $20/mBtu which is a red alert for these markets. If these countries do not take serious actions to build and optimize natural gas transmission, distribution, and storage infra-structures, major natural gas markets will encounter serious crises.

Considering the low prices of natural gas in the past, consumers tried to replace oil with natural gas. But with the rising natural gas prices this trend may be reversed. Recent fuel oil prices might be a harbinger of this reversed trend.

Conclusions

At the outset of the third millennium, natural gas is considered the fuel of choice due to its unique features and lingering concerns about environment. Projections are indicative of a better out look for this clean fuel in coming years.

IEA projections show that natural gas with its market share growing from 21% in 2002 to 25% in 2030 will be the second dominant fuel after oil by the third decade of the 21 century. Nevertheless, there are concerns about the stability of natural gas prices and markets and whether such natural gas projects as GTL, LNG, and natural gas pipelines are economical. Undoubtedly natural gas industry, particularly in natural gas producing countries will face serious challenges if natural gas markets are not managed in a decent way. Therefore, cooperation between natural gas producing and consuming countries seems to be inevitable and necessary.

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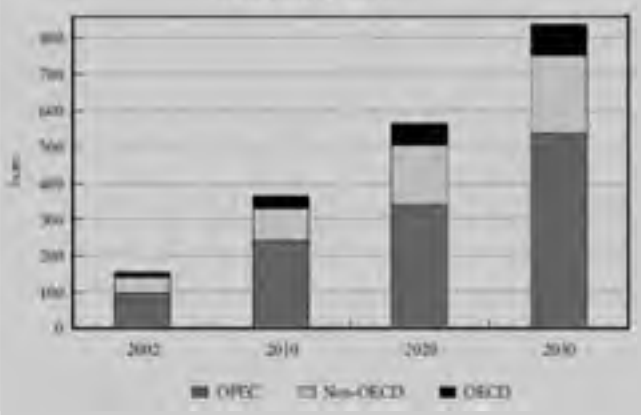
European Union and South Asian countries such as India and Pakistan with negligible natural gas reserves and high natural gas demand are among potential markets for Iran's natural gas. European Union is projected to face a considerable shortfall in its domestic natural gas production which can be a good opportunity for Iran to find a niche in this big market. The Persian Gulf states are also considered prospective markets for Iran's natural gas. Based on Iran's 2015 outlook, the country should become the third biggest natural gas producer in the world with 10% share of global natural gas trade, therefore the production should increase to 900 MCM per day.

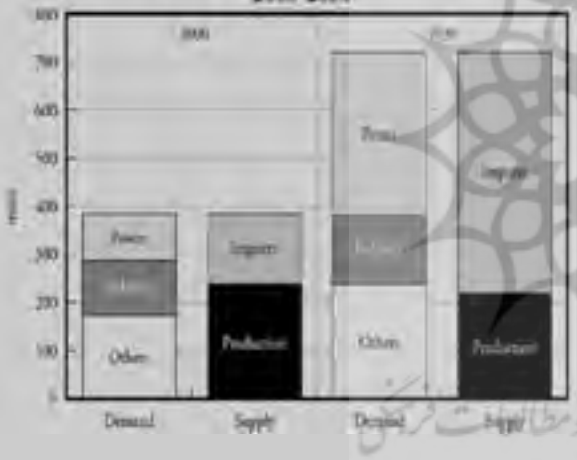
Natural gas prices have recently grown considerably in international markets. The US markets is believed to play a leading role in recent developments. European markets are also predicted to follow the example of the US market experiencing a rapid growth of natural gas prices. However, Asian markets will be affected by the developments with a time lag.

Sourcing of LNG

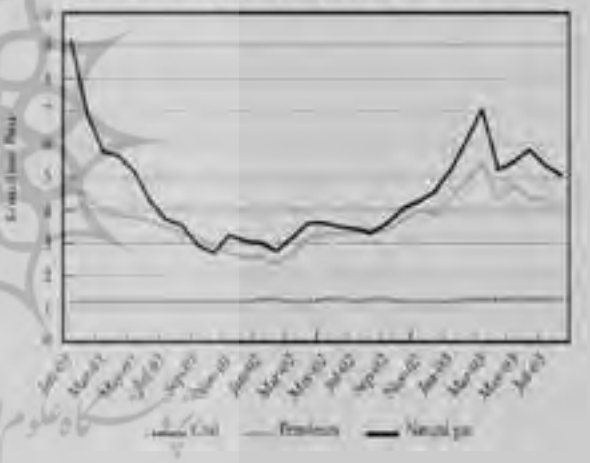


Evolution of US gas production and consumption

OECD European gas demand vs. Production/imports 2000-2030



US spot fuel price for power generation



Development Trend of Oil and Gas Price in US and UK Markets

Development Trend of Crude Oil and Gas Price in US Market