

## **The Development of Natural Gas Extraction in the Middle East (A case study of Iraq)**

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### **Abstract**

*In this article I try to present the situation of gas international market and also the role played by the Middle East region on this market that has a high potential of production and export. The largest gas reserves are in the Middle East region but they are not developed due to difficult technical conditions, poor transport infrastructure, and lack of needed funds and investments. But the main problem is represented by great political and military tensions existing in the region which has a long negative tradition in maintaining and fueling a conflictual situation mirrored by successive wars and military conflicts. One can see a permanent confrontation between major local powers and between major world powers which create high obstacles to social and economic progress. In my opinion democracy and cooperation are the only viable alternatives based on a new vision upon international political and economic relations. It is extremely important that great powers like USA, EU, China to be more involved in this region in order to provide enough economic, financial and technological support for developing gas projects, which may contribute to regional political stability and to the acceleration of Middle East economic development.*

**Keywords:** *gas; reserve; supply; demand; consumption; pipeline; LNG; investment; project*

**JEL Classification\*:** *D 43, F 43, F 44, L 13, O 13, Q*

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\*The *JEL* Classification; system was developed for use in the *Journal of Economic Literature (JEL)*, and is a standard method of classifying scholarly literature in the field of economics. The system is used to classify articles, dissertations, books, book reviews, and working papers in EconLit, and in many other applications. For descriptions and examples, see the [JEL Codes Guide](#).

### **Introduction; World Gas Reserves, Production and Consumption in 2013**

In the Table 1 I present the situation of gas reserves (proven), production and consumption in 2013 in the main areas and in the main countries. As concerns the level of world production it increased from 2621.3 bcm in 2003 to 3369.9 bcm in 2013 while the level of world consumption increased from 2596.6 bcm in 2003 to 3347.6 bcm in 2013. The main producing countries in the world in 2013 were: USA, Russia, Iran, Qatar, Canada, Norway, Saudi Arabia, China while the major consuming countries were: USA, Russia, Iran, China, Japan, Canada, Saudi Arabia, Germany, Mexico, United Kingdom.

As concerns the international trade with gas (by pipeline) in Europe the major suppliers in 2013 were: Russia(211.3 bcm), Norway (102.4 bcm), Netherlands(53.2 mcm), Algeria (24.7 bcm), in North America were: Canada (78.9 bcm) and USA (44.4 bcm), in the Middle East was Qatar (19.9 bcm), in Asia was Turkmenistan (40.1 bcm). In the same year the major importers of natural gas by pipeline were: European Union (397.1 bcm), North America (123.3 bcm), former Soviet Union countries (84.2 bcm), Asia & Pacific countries (55.9 bcm). Liquefied natural gas

is mainly produced and exported in 2013 by Qatar (105.6 bcm), followed by Nigeria (22.4 bcm), Algeria (14.9 bcm), Australia (30.2 bcm), Malaysia (33.8 bcm), Indonesia (22.4 bcm) while the main importers were: Japan (119 bcm), South Korea (54.2 bcm), China (24.5 bcm), India (17.8 bcm), Taiwan (17.2 bcm), Spain (14.9 bcm), United Kingdom (9.3 bcm), France (8.7 bcm), Mexico (7.8 bcm). The total world gas export by pipeline in 2013 amounted to 710.6 bcm (21.1% of world production) and the total export of LNG amounted to 325.3 bcm (9.65% of world production). (BP Review on World Energy, August 2014)

**Table 1. Natural gas reserves, production and consumption in 2013( in billion cubic meters)**

| Area/country              | Reserves<br>(bcm) | %     | Production<br>(bcm) | %     | Consumption<br>(bcm) | %     |
|---------------------------|-------------------|-------|---------------------|-------|----------------------|-------|
| Total World               | 185,700           | 100   | 3369.9              | 100   | 3347.6               | 100   |
| - North America           | 11,700            | 6.3   | 899.1               | 26.9  | 923.5                | 27.8  |
| • USA                     | 9,300             | 5.0   | 687.6               | 20.6  | 737.2                | 22.2  |
| • Canada                  | 2,000             | 1.1   | 154.8               | 4.6   | 103.5                | 3.1   |
| • Mexico                  | 300               | 0.2   | 56.6                | 1.7   | 82.7                 | 2.5   |
| - South & Central America | 7,700             | 4.1   | 176.4               | 5.2   | 168.6                | 5.0   |
| • Venezuela               | 5,600             | 3.0   | 28.4                | 0.8   | 30.5                 | 0.9   |
| • Argentina               | 300               | 0.2   | 35.5                | 1.1   | 48.0                 | 1.4   |
| • Brazil                  | 500               | 0.2   | 21.3                | 0.6   | 37.6                 | 1.1   |
| - Europe & Eurasia        | 50,600            | 30.5  | 1032.9              | 30.6  | 1064.7               | 31.7  |
| • Russia                  | 31,300            | 16.8  | 604.8               | 17.9  | 413.5                | 12.3  |
| • Turkmenistan            | 17,500            | 9.4   | 62.3                | 1.8   | 22.3                 | 0.7   |
| • Kazakhstan              | 1,500             | 0.8   | 18.5                | 0.5   | 11.4                 | 0.3   |
| • Norway                  | 2,000             | 1.1   | 108.7               | 3.2   | 4.4                  | 0.1   |
| • Germany                 | .....             | ..... | 8.2                 | 0.2   | 83.6                 | 2.5   |
| • Italy                   | .....             | ..... | 7.1                 | 0.2   | 64.2                 | 1.9   |
| • France                  | .....             | ..... | .....               | ..... | 42.8                 | 1.3   |
| • United Kingdom          | 200               | 0.1   | 36.5                | 1.1   | 73.1                 | 2.2   |
| - Middle East             | 80,300            | 43.2  | 568.2               | 16.8  | 428.3                | 12.8  |
| • Iran                    | 33,800            | 18.2  | 166.6               | 4.9   | 162.2                | 4.8   |
| • Qatar                   | 24,700            | 13.3  | 158.5               | 4.7   | 25.9                 | 0.8   |
| • Saudi Arabia            | 8,200             | 4.4   | 103.0               | 3.0   | 103.0                | 3.1   |
| • Iraq                    | 3,600             | 1.9   | 0.6                 | ..... | .....                | ..... |
| - Africa                  | 14,200            | 7.6   | 204.3               | 6.0   | 123.3                | 3.7   |
| • Libya                   | 1,500             | 0.8   | 12.0                | 0.4   | .....                | ..... |
| • Egypt                   | 1,800             | 1.0   | 56.1                | 1.7   | 51.4                 | 1.5   |
| • Nigeria                 | 5,100             | 2.7   | 36.1                | 1.1   | .....                | ..... |
| • Algeria                 | 4,500             | 2.4   | 78.6                | 2.3   | 32.3                 | 1.0   |
| - Asia & Pacific          | 15,200            | 8.2   | 489.0               | 14.5  | 639.2                | 19.0  |
| • Australia               | 3,700             | 2.0   | 42.9                | 1.3   | 17.9                 | 0.5   |
| • China                   | 3,300             | 1.8   | 117.1               | 3.5   | 161.6                | 4.8   |
| • Indonesia               | 2,900             | 1.6   | 70.4                | 2.1   | 38.4                 | 1.1   |
| • Japan                   | .....             | ..... | .....               | ..... | 116.9                | 3.5   |
| • South Korea             | .....             | ..... | .....               | ..... | 52.5                 | 1.6   |

Source: British Petroleum Review on World Energy, August 2014

## **Natural Gas: the Second Energy Resource in the Middle East**

### **Large reserves and low production and consumption**

There are huge reserves of natural gas in the Middle East region but there is only a single major exporter(Qatar) and the region will face shortages of natural gas supply on short and medium term if important development projects will not begin sooner or later based on large investments made by foreign and domestic companies due to the continued increase of the population and urbanization process specific to rapid growing markets. The last two factors may bring an important contribution to a steady increase in energy demand and may stimulate the starting of many projects for covering the increase in electricity generation and consumption based mainly on fossil fuels, especially natural gas, despite the negative impact on environment and also despite the increasing attractiveness of renewable energy which rapidly develops in the advanced countries but also in China.

As one may see from Table 2 the most important gas reserves are in Iran, Qatar, Saudi Arabia, Iraq, United Arab Emirates, Kuwait, Egypt, but one cannot compare gas potential with oil potential in the same region, although many gas fields are associated to oil fields, representing petroleum gas and not methane gas. In the Middle East attention is now focused on oil production and refining and also on oil export while the other classical (fossil) and renewable energy resources are somehow neglected, this traditional approach may explain why there was a slow development of the region's gas industry, despite significant gas deposits. Although one can see an increasing demand for gas on behalf of industry and households the supply response is weak and delayed due to the lack of productive investments, limited

regional cooperation, low market prices. Political decision makers may be responsible for this delay due to their lack of vision on gas potential and this affected the security of energy supply, especially of electricity supply. Some governments in the Middle East region seemed more interested in oil-fired and coal-fired power plants and showed some interest towards developing nuclear and solar power on the long term. The development of nuclear energy is taken into account by Iran and UAE, and the development of solar energy by UAE, Kuwait and other countries. Although there are many gas deposits in the area the extraction of this gas (methane or petroleum) is not enough developed to cover the consumption needs of industry and population and a lot of gas (especially petroleum gas) is burned at flare in many oil producing countries and this not only affects the air quality but also generates a lot of pollution and contributes to greenhouse effect(global warming).

As you may see from Table 3 Middle East is a gas rich region, but only a few countries, like Iran, Qatar, Saudi Arabia have large reserves, other states like UAE, Iraq, Kuwait, Egypt have significant gas reserves while other countries have small reserves. In some small countries, like Oman and Yemen, export is an activity made without considering the domestic needs and the prospects of future domestic demand. Some countries have plenty of sour gas which is quite expensive to extract and process.

Iraq is an example of how a relatively rich country in oil and gas reserves was not able to develop and to turn to good account its natural resources: delay of developing the legal framework, lack of domestic and foreign gas investments, concentration on oil extraction and infrastructure due to budget constraints, negative impact of terrorist and military activities. The development of gas extraction in the Middle East was hindered by a factor specific to the region: a large part gas supply is represented by

associated gas rather than non-associated gas. Thus is very difficult to extract gas reserves in order to supply it to domestic markets or to export as re-injection is critical for keeping constant the levels of crude oil production (Philip Weems & Farida Midani, 2009).

From Table 2 and 3 one can see that the main gas producers and exporters in the Middle East are Iran and Qatar. Iran is a major producer and exporter but it was not able to supply enough gas to the neighboring countries by pipeline due to its insufficient production, price disputes and maybe to some divergent religious and political matters. Qatar is a major gas supplier (exporter) in the region, by pipeline for countries like UAE and Kuwait, but also for LNG, as it has built the largest LNG capacities in the world. Many projects in the field of petrochemical industry were cancelled or postponed in the Middle East, but also projects in other industrial fields due to the lack of gas resources. Huge investments are needed in gas extraction but in the past they were discouraged by the lack of funds and by artificially low prices, which may be considered a kind of subsidies given to consuming industries. Another explanation is that until recently, foreign investments made by international oil and gas companies were restricted in many Middle East countries.

In the 1990-2006 period the level of international oil and gas prices was quite low and the global financial and economic crisis had a negative impact on productive investments, after the crisis the price of oil increased very much and also the price of gas but one could see a slow economic recovery in some major consuming areas, like EU and Japan. The lack of funds led to a decrease of government financing everywhere and there was an overall credit squeeze, which affected private and public investments in gas extraction and this created some uncertainties over gas supply shortages in the future. Gas deficit in the Middle East and also in the major importing areas,

like EU, may significantly worsen as a result of investment gap, uncertain military and political situation in the Middle East and also due to deterioration of political and economic relations between Western world and Russia. It is hard to believe that key infrastructure investments (like gas pipelines) will be carried out when there is a lot of tension and even small wars in the Middle East region, which may thus lose the opportunity to become a major gas supplier in the world.

**Table 2. Natural Gas Reserves in Middle East (in b.c.m.)**

| <b>Country</b>       | <b>Date/Year</b> | <b>Quantity(Wikipedia)</b> | <b>BP(2013)</b> |
|----------------------|------------------|----------------------------|-----------------|
| Iran                 | 12.06.2013       | 33600                      | 33800           |
| Qatar                | 12.06.2013       | 21000                      | 24700           |
| Saudi Arabia         | 1.01.2012        | 8200                       | 8200            |
| Iraq                 | 1.01.2012        | 3600                       | 3600            |
| United Arab Emirates | 1.01.2010        | 2250                       | 6100            |
| Kuwait               | 1.01.2010        | 1798                       | 1800            |
| Egypt                | 1.01.2010        | 1656                       | 1800            |
| Oman                 | 1.01.2010        | 849.5                      | 900             |
| Lebanon              | 1.01. 2010       | 750.4                      | ....            |
| Yemen                | 1.01.2010        | 478.5                      | 500             |
| Israel               | 1.01.2013        | 271.0                      | ....            |
| Syria                | 1.01.2010        | 240.7                      | 300             |
| Bahrain              | 1.01.2010        | 92.0                       | 200             |
| Jordan               | 1.01.2010        | 6.0                        | ....            |
| Turkey               | 1.01.2010        | 6.1                        | ....            |

Source: Wikipedia, 2013; British Petroleum Review on World Energy, August 2014

**Table 3. Natural Gas Production/Consumption in the Middle East (in b.c.m.)**

| Country/Quantity     | Production |                 |          | Consumption            |
|----------------------|------------|-----------------|----------|------------------------|
|                      | Year       | Quantity        |          | Quantity<br>(BP, 2013) |
|                      |            | Wikipedia, 2012 | BP, 2013 |                        |
| Iran                 | 2011       | 151.8           | 166.6    | 162.2                  |
| Qatar                | 2011       | 133.2           | 158.5    | 25.9                   |
| Saudi Arabia         | 2012       | 103.2           | 103.0    | 103.0                  |
| Iraq                 | 2013       | 23.2*           | 0.6      | ....                   |
| United Arab Emirates | 2011       | 52.31           | 56.0     | 68.3                   |
| Kuwait               | 2011       | 13.53           | 15.6     | 17.2                   |
| Oman                 | 2012       | 35.94           | 30.9     | ....                   |
| Lebanon              | 2011       | .....           | ...      | .....                  |
| Yemen                | 2011       | 9.62            | 10.3     | .....                  |
| Israel               | 2011       | 2.6             | .....    | 6.9                    |
| Syria                | 2011       | 7.87            | 4.5      | .....                  |
| Bahrain              | 2011       | 12.62           | 15.8     | .....                  |
| Jordan               | 2011       | 0.23            | ....     | .....                  |
| Turkey               | 2012       | 0.63            | ....     | 46.3                   |
| Egypt                | 2011       | 61.26           | 56.1     | 52.6                   |

\* for Iraq an estimation based on January daily production

Source: Wikipedia, 2013, British Petroleum Review on World Energy, August 2014

## New gas discoveries in Levant Basin

Quite recently in the Eastern Mediterranean sea (in the offshore zone) there were made important natural gas discoveries belonging to Cyprus, Turkey, Israel, Syria, Lebanon and Palestinian Territories. The natural gas reserves discovered in Levant Basin may alter the energy outlook in the Middle East, may contribute to economic development of countries involved and may bring some prosperity for them. The gas deposits discovered after the year 2000 off the coast of Israel and Cyprus are estimated at 1100 bcm but further new discoveries depend on the fate of Syrian conflict, territorial disputes between some countries, tensions between Cyprus and Turkey and between other countries, military, political and economic factors affecting the economies of the countries in the region, which may also influence the level of exploration and extraction activities. According to the data presented in the Table 4 almost all important discoveries made in the Levant Basin

were located in the sea areas belonging to Cyprus and in Israel's territorial waters while exploration activities in Lebanon territorial waters will continue due to initial poor results.

**Table 4.** Gas reserves, production and consumption of Levant Basin countries  
(b.c.m.)

| Country                       | Offshore gas reserves |             |        | Production<br>2012 | Consumption<br>2012 |
|-------------------------------|-----------------------|-------------|--------|--------------------|---------------------|
|                               | Possible              | Potential * | Proven |                    |                     |
| Cyprus                        | 200                   | 1400        | ....   | -                  | -                   |
| Israel                        | 492                   | 940         | 270    | -                  | 6.9 (2013)          |
| Syria                         | ....                  | ....        | 243    | 7.6                | 8.2 (2011)          |
| Lebanon                       | ....                  | 700         | ....   | -                  | ....                |
| Jordan                        | ....                  | ....        | 6      | -                  | 1.07 (2011)         |
| Palestina<br>n<br>Territories | 28.57                 | ....        | ....   | -                  | ....                |

\* estimates made by companies involved in exploration activities.

Source: EIA estimates, IHS, Oxford Institute for Energy Studies, Oil & Gas Journal, company reports, trade press; British Petroleum Review on World Energy, June 2013 and August 2014

It was Israel that started the offshore gas production with Tamar field in 2013, while Lebanon is in the early stages of licensing with the exploration activities, and Syria postponed the explorations indefinitely due to the civil war. There was some progress in exploration activities in Cyprus and Israel, and to a lesser degree in the Palestinian Territories which may lead to race for investments in exploration and exploitation of Levant Basin gas resources. The high potential of this basin is important for all countries in the region especially for those that had to import gas in the past as it was the case with Israel who imported natural gas through the Arish-Ashkelon pipeline from Egypt, but the notable discoveries of the Tamar and Leviathan fields (among several others) will allow it to increase the consumption and even to export some natural gas in the next decade. The most important gas field was found in Cypriot waters (Aphrodite field discovered by Noble Energy in 2011. Another important gas field is Aphrodite-2 which is situated both in Israeli waters and also in Cypriot waters and

the two countries will have to share this field by concluding an agreement before production begins. Some significant resources may be found in Gaza Marine field and although Israel government and Palestinian Authority discussed on developing this field in September 2012, no agreement was concluded up to now and no good prospects are for it, maybe due to last year military intervention of Israel in Gaza. In April 2013 the government of Lebanon completed a pre-qualification bid in order to start the gas exploration in its territorial waters and a number of 46 foreign and local companies were accepted with their applications.

Authors like Friedbert Pflüger (2013) see as the best option for exploiting and exporting the new gas reserves from Levant Basin the project to build a pipeline from Israel's Leviathan field via Cyprus, where it would take additional gas, to Turkey, but not to Europe. Implementing such a project for a twin pipeline with a capacity of 16 bcm/year would amount to 2.5 billion dollars, and starting from Israeli Leviathan field it will have a length of 470 km through the Mediterranean sea but this is a better option (less costly) than any LNG terminal in Cyprus or Israel and it may contribute to improving political relations between (Greek) Cyprus and Turkey. Turkey's gas consumption is supposed to raise from 45.6 bcm in 2013 to 62 bcm in 2020 and there is the assumption that Mediterranean will be cheaper than that imported from Russia or Iran. Israel and Cyprus announced their intention to build LNG terminals for gas export, but these are very costly (a single LNG terminal for about 7 bcm of gas per year costs more than 6 billion dollars) and such projects are very difficult to finance, due to relatively limited financial reserves as well as due to regional risks. Another factor that could deter any investment in gas industry is the recent collapse of oil prices, in two and half months (from November 2014 to mid-January 2015) international oil prices decreased by 50%.

## **Iraqi Natural Gas Industry**

I used different sources of information to analyze Iraq natural gas reserves and production. I may mention a study made by Harvard University's Belfer Center and Rice University's Baker Institute Center for Energy Studies (Luay J. al-Khatteeb & others, 2013), information, statistics, outlooks, reviews published by International Energy Agency, US Energy Information Administration, [CIA World Fact book](#), Oil & Gas Journal, Wikipedia, British Petroleum, Oxford Institute for Energy Studies. I also used domestic sources of information, like those provided by Iraqi Oil Ministry, Ministry of Planning, Iraqi News Network, different Iraqi and Arabic energy specialists.

**Reserves.** In 2014 British Petroleum estimated Iraq's proven gas reserves at 3600 bcm, which represents 1.4% of total global gas reserves (conventional ones). In Iraq natural gas deposits are found especially in an associated form with oil, and they represent 81% percent of the total reserves, a small share is detained by cap gas-2% and non-associated gas has a share of 17%. That is why gas production is linked to the oil production, due to the large percentage of associated gas. Some experts are pretending that gas reserves in Iraq could be much higher (at least double) than the estimates made by British Petroleum. Iraq's gas reserves are mainly situated in the South, mostly of them are large associated reserves in the giant fields of Rumaila, West Qurna, Majnoon, Nahr Umr and Zubair and they are richer in natural gas liquids (NGL) and is less contaminated with sulfur, compared to the reserves situated in the Northern part of the country. The less contaminated reserves may find a good market in the petrochemical sector, which Iraq may develop in the next years in order to better capitalize its natural resources and the increase of national revenues and to reduce the its high dependence on oil revenues. Another major consuming sector will be that of power stations because there is a chronic shortage of electricity

supply in the country and gas may represent an available and efficient fuel for generating electricity.

As concerns the gas resources from Kurdistan in the Northern part of Iraq, Ministry of Natural Resources of the Kurdistan Regional Government (MNR-KRG) is responsible for the development of gas resources. We have two kinds of estimates, ones made by under the care of federal government, by the Ministry of Oil (MOO) of Iraq which appraised that the most promising gas deposits in the north were those of Khor Mor (51 bcm) and those of Chemchamal (58.6 bcm) and other estimates made by MNR-KRG which considered that these fields were almost ten times higher in gas deposits than the figures issued by the Iraqi Ministry of Oil, that were higher than the estimates made by international organizations and companies.

The gas deposits value in Iraq is no less important than the oil deposits value, despite its smaller contribution to the revenue of the Iraqi government's budget and the lack of the proper exploitation of this wealth yet. In case proper investments are made for gas, Iraq will be able to run all the power stations and thus the country will not need to import diesel fuel to power these stations any more, and instead it will be able to export the gas surplus to Middle East region and also to European countries. In its turn this means increasing the national income and diversity of the revenue sources.

Iraqi specialists estimated that Iraq's losses of the revenue due to non-exploitation of the gas is worthy of billions of dollars annually, as a result of burning out about 700 million cubic meters of the associated gas during the extraction of crude oil, which in its turn causes significant negative effect on the environment due to the emission of the CO<sub>2</sub> from burning flames.

According to many experts, Iraq sits on huge gas reserves, which are as important as the oil reserves. "Ekaz" gas field in the Anbar province may be described as a huge project, which is expected to

provide a lot of gas to the European markets. Also the Asian companies operating in Qatar, which are exporting gas through pipelines or in a liquified form to Asia, may play an important role by delivering Iraqi gas surplus to the Asian markets.

The future pipelines projects for gas transportation in Iraq are directed to the neighboring countries, by which there will be completed the connection of Iraq's pipelines to the Arabic countries and to the international pipelines network for exporting the natural gas, thus opening up Iraqi gas industry to the global market and achieving solid financial resources for the country. Because of the great importance given to the gas export and the need to diversify the natural resources of Iraq's economy, the potentials of the Iraqi gas export looks promising for several reasons:

1. The availability of the natural gas reserves in the gas fields that may provide a sustainable production without the need to depend on the production of the crude oil.
2. Turkey is the largest consuming country in the region for the natural gas and can easily take advantage of this market by establishing a pipeline network along the Turkish-Iraqi border.
3. The importance of the strategical geographical location of Iraq, which is very suitable in relation to the gas consuming neighboring countries.
4. The Gulf region is the center of the supply of the natural gas, especially to the Middle East area, however the Iraqi facilities for gas exporting need to be improved and to carry out such an operation.

**Production.** One year ago I estimated Iraq production at 23 bcm for the year 2013, based on January production, an optimistic estimation but also a very low level compared to Iraq reserves, but anyhow much higher than the figure for the whole year published by British Petroleum in August 2014 (0.6 bcm). The evolution of Iraq natural gas production and consumption between and 1989 and 2009 is shown in the Table 5 based on official Iraq

statistical data. Because there are huge differences between Iraq official data and those published by British Petroleum and Wikipedia a logical question arises: why British Petroleum and Wikipedia did not take official Iraq government figures? Unfortunately a large quantity of (petroleum) gas is not recovered and is flared in the atmosphere due to some technical difficulties and due to the lack of infrastructure. The maximum level of gas production was attained in 1979 with 20 billion cubic meters, which is equivalent to about 1950 million cubic meter per day, but less than 20% of it was invested and used, due to non-availability of manufacturing facilities. In 1989 the production rate was about 16 billion cubic meter and more than 90% of it invested and used, due to the availability of the manufacturing facilities at that time, while the production rate in 2009 was 17.521 billion cubic meter.

**Table 5. Iraqi Natural Gas Production and Consumption in 1989-2009 period**  
(mil.c.m.)

| Year  | Production | Consumption | Flared  |
|-------|------------|-------------|---------|
| 1989  | 16309.81   | 9329.55     | 6980.13 |
| 1995  | 7794.56    | 6755.23     | 1039.33 |
| 2000  | 14539.64   | 10020.73    | 4518.91 |
| 2005  | 13723.00   | 7077.00     | 6611.00 |
| 2009  | 17521.00   | 10139.00    | 7381.00 |
| 2013* | 23000.0    | 23000.0     | ....    |

\* estimations made by the author based on January 2013 production

Source: Annual Statistical Abstract 2010-2011, Ministry of Planning- Central Statistical Organization, Republic of Iraq.

As concerns Iraqi natural gas exploitation contracts concluded in the last years one can mention that on December 20th, 2010 Iraq offered development contracts of three gas field to some international companies based on an international auction, as Iraq

seeks to enter the top energy producers club by exploiting the huge resources and opening it's vital energy sector to foreign investments and the results of the gas exploitation of the first three gas fields together with the associated gas from these fields in Basra region within six years will be 700 million cubic meters per day.

The contracts for these three fields with companies are as follows:

- 1- "KO gas" company of South Korea and "Qaz Monagas" for exploitation and production, the second largest oil company in Kazakhstan, won the first deal to develop the "Ekaz" field in the western Anbar province, which contain a reserve of about 158 billion cubic meters (5.6 trillion cubic feet)
- 2- "TPAO" a Turkish company, "Kuwait Energy Group (KEG)" and "KO gas" won the contract to develop Al Mansuriyah field, which is located near the Iranian border in Diyala province. This has an estimated reserve of about 127 billion cubic meter (4.5 trillion cubic feet).
- 3- The "KEG" got the contract to develop the "Ciba" gas field in Basra, the oil hub in the southern part of Iraq, with an estimated reserve of about 1.5 trillion cubic feet.

The total gas reserve of these three fields is estimated at 11.23 trillion cubic feet (301 billion cubic meters), which is equivalent to 10% of the total Iraqi reserves of 112 trillion cubic feet (3000 billion cubic meters), which is the tenth largest reserve in the world.

Under my information from official sources a share of 85% from total production of 23 bcm was achieved by Ministry of Oil, the difference of 15% was free gas (non-associated gas) produced by MNR-KRG that controls Northern field of Khor Mor. There are optimistic projections made by MOO for gas production because they are linked to the oil production and according to them Iraq gas production

is expected to reach 87.5 bcm by 2020 (both associated gas and free gas). Initial plans set by MOO are very ambitious or very optimistic as concerns the level of oil production. During 2013 MOO revised the plans for oil production and in 2015 a new revision is required due to severe drop of oil prices in the second part of 2014 and due to recent military events in the Northern part of the country. These downward revisions for oil extraction will affect the initial forecast for gas production, the level of initial forecast being higher than the level shown by scenario forecasts made by the International Energy Agency in Iraq Outlook 2012 and the INES (Integrated National Energy Strategy) scenario of gas projection, under which the total gas production may reach only 72 bcm in 2020 depending on the development of infrastructure needed for local consumption and export. Realistically speaking, this level may be considered now too high to be achieved under the current unfavorable circumstances and under future conditions of major political uncertainty.

Another difficult problem is represented by the situation of gas processing capacity, which stood at 21.4 bcm of associated gas, 16 bcm of dry gas, and 5.5 MT annually of LPG before 2003, which had fallen in 2004 to 13 bcm and to 5.15 bcm (production). The increase of Iraq gas production is mainly based on Basra Gas Company projects and also having in mind the end to flaring by 2015. The Kurdistan Regional Government intended to fully exploit the gas reserves and to export natural gas to Turkey by 2016 but now the main priority seems the oil export to Ceyhan by pipeline, while for gas there is no transport infrastructure to move it from Iraqi Kurdistan to Turkey. I do not know how much interest has Turkey in importing gas from Kurdistan because now Turkey is involved in projects that will bring natural gas from Caspian Sea region and maybe from Levant Basin.

**Pipelines.** There is a gas pipeline network in Iraq, the first one from Basra in the South to Mosul in the North, that is 1775 km long, which provides the connection of several power plants and industrial plants along the way and there is a LPG pipeline extending over 1400 km, the two networks being operated by the state-owned Pipeline Company but they are not operational and some parts are already damaged. There are two projects for two main gas pipelines, one project is for a new 24-inch pipeline running parallel to the damaged 18-inch pipeline from PS-1 in Basra to Haditha with a nameplate shipping gas capacity of 3.8bcm/year and the other project is a new 42-inch pipeline from PS-1 in Basra to Baghdad, with a gas transport capacity of 8.75 bcm/year.

**Agreements with foreign entities.** Starting with the year 2005, Iraqi Government has signed a number of agreements for developing some gas projects for the production, export and import, but none of these agreements has become operational. Iraq needs to be connected to other countries from the Middle East region in a gas network and also to EU and maybe to other important importing areas, but in the second case a pipeline passing through Turkey has to be built and in the third case it will have to develop liquefying facilities which are very expensive. In both cases there is a need for a strong involvement of large oil companies and only one, Shell, expressed its interest for Iraqi gas extraction and under Iraq Gas Master Plan, MOO commissioned Shell in 2005 to develop a blueprint plan and a strategy. This plan was an independent strategic plan for Iraqi gas, after which Shell entered into direct negotiations with Iraq government in 2008 to sign an exclusive heads of agreement (HOA) with the state-owned South Gas Company for developing associated gas from the southern fields. In 2011 this HOA became a 25 year contract for extracting and using the associated gas from three southern fields (Rumaila, West Qurna-1 and Zubair) not only for meeting the local demand but also for exporting LNG to Asia. Basra Gas Company

is a joint venture located in Basra and controlled by other 3 companies: Shell, with a 44% stake, the state-owned South Gas Co. with 51%, and Japan's Mitsubishi Corp. with the remaining 5%. This gas project of \$17 bcm which is run by Royal Dutch Shell could bring an important contribution to Iraq post-war recovery.

This project, which was planned to continue for about 25 years, with investments of about 17.2 billion dollars, will contribute to the establishment of the "Basra Gas Company" in Baghdad. There will be a spending of 12.8 billion dollars for the construction of the infrastructure and 4.4 billion dollars to build a natural gas facility according to the document, which was distributed by the Iraqi parliament. This contract is considered to be the most important contract which was signed by Iraq in the field of gas with a mentioned value of more than 17 billion dollars and the contract stipulates that the involved companies in this joint venture will be in charge with the extraction, processing and marketing of the gas from three oil fields in the oil rich region of Basra, where the gas is still burned without any mentioned benefit, because of the lack of the infrastructure for taking advantage of this national wealth. This contract is also considered an important point to revive the electric power plants despite the millions of dollars which were spent on electric power projects. This contract with Shell company is the third one since spring of 2003 that will involve the presence of this company in Iraq through signing a memorandum of understanding, in 2008, between Shell company and Iraq which has a huge reserve of crude oil and gas, but the project has stalled since then, after Iraqi lawmakers has vetoed it, due to the fact that it should be approved and ratified by the Iraqi Parliament, in addition to the demands of the officials in the province of Basra for larger quotas for the province. As it is stipulated in the agreement, the objective is to meet the domestic demand and to export the surplus of gas beyond the needs for the power stations. The

joint venture will sell processed gas to the South Gas Company - SGC. It is noteworthy that Iraq will gain about 100 billion dollars from this project, because the gas would be an alternative to the currently oil used as fuel in the production of electric power in Iraq. It is also noteworthy that Iraq will receive a profit tax of 35% on behalf of Shell and Mitsubishi companies which will have a net profit of 7%.

After year 2010 Iraq signed some framework agreements with the aim to connect to neighboring countries through various energy trades. In January 2010, Iraq government signed an MOU for a Strategic Partnership with the European Union for promoting Iraqi gas export to Europe based on an Energy Policy Action Plan adopted by the European Council in March 2007. The focus of the MOU was put on the Euro-Arab Mashreq Gas Market Project and on the development of the Arab Gas Pipeline in order to make Iraq a gas supplier to European Union. Due to tense relations between EU and Russia as a result of the conflict in Ukraine, Iraqi gas and Iranian gas could become an alternative to Russian gas for European Union if important investments will be made in production and transport infrastructure.

In 2011 Iraq signed a contract with the Iranian company ACG for extending the pipeline that brings gas from Iran to keep in operation Iraqi power stations. Iraq government authorized in February 2013 the MOU for a pipeline contract bringing gas from Iran to European Union, through Iraq and Syria but this plan could be hindered by various geopolitical challenges and numerous local conflicts in the Middle East and practically it almost impossible to predict a final term for it. In principle two sets of projections have to be taken into account by policymakers: the Integrated National Energy Strategy issued by the Iraqi government in June 2013, and the World Energy Outlook 2012 of International Energy Agency, with a special section for Iraq gas resources. The two projections differ in the matter of the timing and volume of potential gas exports, for instance the

INES outlook expects gas flaring to stop by 2015, resulting in surplus capacity and this capacity will be sustained by additional gas production of 26-39 bcm from new gas fields so the surplus gas may be exported or used as a feedstock for petrochemical projects aiming at generating high revenues. Under the IEA's scenario, the gas exports will rise from 4.63 bcm in 2020 to 20 bcm by 2035, provided new discoveries will be made which may also lead the domestic demand to a level of 70 bcm, if total production reached 90 bcm. The viability of this forecast depends on the available investment funds for developing the domestic transport infrastructure, and also how non-associated gas fields will be developed across Iraq, mainly in the Iraqi Kurdistan, as most part of the associated gas in the Southern part of the country will be used to meet the local increasing demand.

### **Conclusions**

- a) Middle East region has large natural gas reserves that have a share of 43.2% in the total proven world gas reserves (without shale gas), there are enough gas resources for meeting the fast growing domestic demand and also for exports to other areas. While some analysts believe that potential gas reserves could be higher than the estimates made by British Petroleum in 2014 (the situation being similar also for crude oil) other specialists and institutions consider that estimates of the proven reserves of Middle East region are exaggerated. Any pessimistic prediction made in the last 50 years referring to the rapid depletion of oil and gas reserves proved to be wrong, because there are huge shale and bitumen sands reserves, also huge reserves in the oceans, seas and other areas still undiscovered or untapped and new technologies and extraction processes were developed for exploiting these immense resources.
- b) Iran is the main natural gas producer in the Middle East with the largest gas reserves, followed closely by Qatar with which shares the largest field in the world

and which is the biggest LNG producer in the world. Saudi Arabia, United Arab Emirates and Egypt are also important producers while Iraq that has important gas reserves is a small producer. The major gas consumers are: Iran, Saudi Arabia, United Arab Emirates and Egypt. The offshore gas production in the Levant Basin started with Tamar field of Israel in 2013, which intends to build a LNG terminal. Iranian Minister of Industry, Mohammad Reza Nematzadeh has appreciated in April 2014 in an interview with German newspaper Handelsblatt that Iran can be a reliable, safe and long term gas supplier for European Union. Iran wants to play an important role on the world gas market not in competition with Russia (with which has friendly relations) but taking into account Europe's needs on medium and long term and thus intends to become a long term partner of EU due to its huge gas reserves and its existing plans for such a cooperation. Unfortunately there has been some rising political and military tension in some countries and also between the major political actors involved in the Middle East region. This tension has increased in the last year and harms a lot the economic development, productive investments and trade relations of Middle East countries.

- c) Middle East region is the largest exporter of crude oil in the world but not a major gas exporter due to the lack of productive investments, proper infrastructure, and due to the fact that a large part of natural gas deposits are found in an associated form with oil deposits. Gas exports are deterred by strong domestic demand growth in the last decade and also by the many obstacles encountered by foreign strategic investors.
- d) There are no precise official data concerning Iraq gas reserves and production but only some estimates made by British Petroleum and some international organizations. I know very well that Iraq has important gas reserves in the Southern part (in Basra

region), in the form of associated gas, and also in the Northern part (in Kurdistan) in the form of non-associated gas. Kurdistan government wants to export a part of this gas to Turkey, although there are no pipelines for transporting the natural gas. In the past Iraq gas production was very low due to the difficulties encountered in the extraction of associated gas and also due to the fact that a large quantity of gas was not recovered and was flared in the atmosphere, causing a lot of waste and pollution. There were two main projects for gas pipelines regarding the meeting of domestic needs but not for gas export. The Basra Gas Company is a joint venture where Shell plays a major role and if this joint venture will be able to implement some gas projects this will be a good example of a large oil company's involvement in developing Iraq natural resources and in supporting its economic and social development.

- e) Currently the pipeline transport sector in Iraq requires great efforts made by the State and other institutions in order to prepare comprehensive studies of economic feasibility and cost/ benefit analysis for the pipeline projects meant to improve and upgrade this sector. The interest for developing this sector is still under the required levels. The studies suggest that Iraq needs a new network of pipelines of estimated length of 10,000 km, in addition to the existing network for linking all regions of Iraq with the neighboring countries and to start a new phase for building direct pipelines for natural gas export to the world market. In this way Iraq will gain significant economic revenues for supporting the growth of national economy and thus for prosperity of all people from all regions.
- f) The importance of attracting foreign investments and investors to develop and improve the natural gas fields in Iraq, is decisive for shaping the future of the gas industry in Iraq and for making it one of the most important sources of welfare at the local and regional level, and also for providing enough gas to the

European markets and strengthening bilateral economic and political relations with EU.

## References

1. Al-Dabbagh A. (2011). The official spokesman for the former Iraqi government, *Interview for the Independent Iraqi News* November, 18, <http://www.ina-iraq.com>
2. Al-Khatteeb, L.J. et al. (2013). *The Geopolitics of Natural Gas, Natural Gas in the Republic of Iraq*, Harvard University's Belfer Center and Rice University's Baker Institute Center for Energy Studies, November
3. British Petroleum, (2013). *Review on World Energy*, June.
4. British Petroleum, (2014). *Review on World Energy*, August.
5. Al-Chalabi, I. (2005). *Read on Iraq's oil industry and oil policy*. A seminar on "Future of Iraq" 25-28 July, Beirut, Lebanon.
6. Committee on NGO Coordination for Iraq, <http://www.nccirap.org>
7. International Energy Agency (2012). *Iraq Energy Outlook* (released on 9 October 2012).
8. International Gas Union (2013). *World LNG Report - 2013 Edition*.
9. Iraqi News Network <http://www.aliraqnews.com>
10. Iraqi Oil Ministry (2014). <http://www.oil.gov.iq>
11. Ministry of Planning-Central Statistical Organization, Republic of Iraq, 2013, *Annual Statistical Abstract 2010-2011*.
12. Pflüger, F. (2013). *Eastern Mediterranean Gas – Plea for a peace pipeline!*, 19 June, Energy Post
13. US Energy Information Administration (2013). *International Energy Outlook*.
14. Wikipedia, 2013, *Natural gas reserves, production and consumption*.

15. Weems, P. , Midani, F. (2009). *A Surprising Reality: Middle East Natural Gas Crunch*, January, [www.whoswholegal.com](http://www.whoswholegal.com)