

# CGES Executive Report

## “STEALING IRAQ’S OIL!” IS THE IRAQI PRESS RIGHT?



**CGES**  
CENTRE *for* GLOBAL  
ENERGY STUDIES

# Executive summary

In early February 2008, news headlines in Iraq reported that 'Iran has been stealing Iraqi oil'. This generated a great deal of anxiety among observers of the oil scene in Iraq and the Middle East, as well as concerns about future supplies from the region and the impact of this on the oil market. The Islamic Republic of Iran has denied the allegations.

In this study by the CGES, a case is presented about **a field discovered on the border** between two countries, arguing that the ideal approach would be to have the follow-up operations conducted jointly by the two sides. The appraisal and further drilling, logging and testing, the preparation of development plans, the deals with service companies and contractors, the production operations, mid-life investments (e.g. EOR) and other operations should all be carried out for the whole field. The data collected should then be used to find the optimum development method for the field as a whole, resulting in the least cost and maximum profit. The financing and management of the operations should also be carried out jointly by national and/or international companies.

However, national/political sensitivities, lack of trust and differences in oil policy or in managing the hydrocarbon resources and other factors could hinder such an idealised arrangement and each country might operate its own sector of the border field independently and most probably at different times. If one side develops its sector earlier, part of the oil from the undeveloped sector could migrate into the producing sector. Yet, even for the early producer, the total volume of oil produced and the total revenue earned could be less than if the whole field was developed jointly by the two sides. The same could be said even if both sides develop and produce the field simultaneously, but separately. In practice, however, many border fields have been developed separately, e.g. the Foruzan/Marjan oilfield, located offshore between Iran and Saudi Arabia, has been in production since the 1970s, or the South Pars/North gasfield, also located offshore between Iran and Qatar, has been in production since the early 1990s, and the Naft Shahr/Naft Khaneh oilfield, located onshore between Iran and Iraq, has been producing since the late 1920s!

Similarly, **two fields located across a common border** could be separate accumulations or part of a larger structure with a connected system of pressure and fluids. In such a case, data and tests from the two sides should be analysed together and in detail, and additional tests should be carried out to check the communication between the two. In addition, the area between the two fields and across the border should be surveyed and possibly drilled and tested.

In this CGES study a field-by-field review and analysis is conducted with respect to the oil/gasfields on the borders or on either side of the borders of Iraq with Iran, Kuwait, Jordan and Syria. The fields that might be connected with those across the borders are noted in this document. Schematic maps are prepared that show the location of the fields relative to the border and to each other. A list of the fields is given below.

**IRAN/IRAQ BORDER:** **Naft Shahr/Naft Khaneh** field on the border. Other oilfields on the Iranian side of the border include **Azadegan** (possibly connected with Majnoon in Iraq), **Danan**, **Dehluran** (possibly connected with Abu Ghrab in Iraq), **Yadavaran** and **West Paydar**. On the Iraqi side of the border the fields include **Abu Ghrab**, **Badra** (possibly extending into Iran), **Huwaiza**, **Jabal Fauqi** or Fauqi or Al-Fakkah, **Majnoon**, **Siba** (possibly extending into Iran), **Chah Surkh** and **Jaria Pika** gasfield.

**KUWAIT/IRAQ BORDER:** Oilfields on the Kuwaiti side include **Abdalli** (possibly an extension of Safwan in Iraq), **East Abdalli** (possibly an extension of Umm Qasr in Iraq), **Ratga** (extension of South Rumaila in Iraq), **Raudhatian**, **Sabriyah** and **West Abdalli**. Oilfields on the Iraqi side include **Jraishan**, **Rachi**, **South Rumaila**, **Safwan** and **Umm Qasr**.

In 1990, the Saddam regime protested that Kuwait was stealing oil from Iraq's South Rumaila field by

## Stealing Iraq's oil

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excessive production from the Ratga field. This was one of the reasons used for invading Kuwait. Later again in 2001, Iraq protested to Kuwait for overproducing the Ratga and Abdalli fields and that about 50 million barrels had moved to Kuwait from Iraq's two fields - South Rumaila and Safwan (part of the Zubair field complex).

**SYRIA/IRAQ BORDER:** Fields on the Syrian side are **Al-Hawl** gasfield (could extend into the **Qahtan** structure in Iraq), **Gbeibe**, **Ghouna**, **Hamza**, **Jerribe** (could extend into Jabal Sinjar structure in Iraq), **Karachok** - the first oil discovery in Syria and **Swaidiyah** (extending into Sufaya in Iraq). Fields on the Iraqi side include **Abtakh** - a potential discovery, **Boheira** - an unevaluated discovery, **Mushorah** an unevaluated discovery, **Rabi'a** - a potential discovery, **Sufaya** or Sfaiya, as well as the **Jabal Sinjar** and **Qahtan** structures.

**JORDAN/IRAQ BORDER:** **Risha** gasfield is on the Jordanian side that apparently extends into Iraq and **Akkas** gasfield inside Iraq.

In the **concluding remarks** it is argued that in general when one side of the border is explored and brought into production, there is always a tendency for the country on the other side to suspect it is losing its hydrocarbons to the producing side. This will happen even if no well has been drilled close to the border and no directional or horizontal well has crossed the border in the subsurface.

Technical and political expediency requires the cooperation of both parties and the coordination of the development and production operations for the fields located on the border of the two countries. Even for the fields on either side but near the border, cooperation and joint operation will be extremely beneficial for both sides, facilitating the exploration and evaluation of the border area, and confirming if the two fields are part of a larger structure or separate and independent fields. In the former case, the two should be developed jointly, while in the latter they could be developed independently of each other.

It is encouraging that the Iraqi oil minister has denied the story, saying that the location of the Iran/Iraq border had been agreed both at sea and on land, but not all of it had been marked on the ground. It is also good to hear that the Iranian petroleum minister had apparently decided to cancel the inauguration ceremony marking the commencement of production at the Azadegan oilfield. Both actions reduce tensions and promote cooperation, which ultimately might lead to joint development of the fields on or near the border of the two countries. Deciding on such an approach would indeed be a courageous and beneficial policy for both sides.

Lastly, although a number of border fields (e.g. Naft Shahr/Naft Khaneh on the Iran/Iraq border or the Ratga/South Rumaila or Abdalli/Safwan/Zubair on the Kuwait/Iraq border) have been developed separately and produced oil for years or even decades, technical and economic arguments supporting a joint operation for the rest of the life of those fields would still be valid.

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### INTRODUCTION

In early February 2008, news head lines in Iraq reported that 'Iran has been stealing Iraqi oil'. This generated a great deal of anxiety among observers of the oil scene in Iraq and the Middle East, as well as concerns about future supplies from the region and the impact of this on the oil market. The Islamic Republic of Iran has denied the allegations.

This type of news about the Iranian border was unexpected for the observers of the Iraqi oil scene. Such disputes, and on a serious level, have existed between Iraq and Kuwait, but had not arisen with Iran. The media reported that Iraq's Foreign Affairs Ministry had delivered a letter of warning to Iranian authorities regarding the accusations that Iran was illegally pumping Iraqi oil and demanding the cessation of all such activities. The Iraqi undersecretary of Foreign Affairs had said that Baghdad planned to discuss the matter with Tehran and an Iraqi delegation was to visit Iran for discussing the oilfields and the Iran/Iraq border issue. Some media reports said that Iran had seized fifteen oil wells in southern Iraq, as well as using "diagonal" wells from the Iranian side. Iran has denied the allegations.

Some observers of the Iraqi oil scene have taken the issue quite seriously and have been discussing its implications. Others have played down the story and questioned its validity. Some observers have reminded us of similar protests by the Saddam regime in 1990 that Kuwait was stealing oil from Iraq's South Rumaila field. It was taken as additional justification for invading Kuwait. Some observers jokingly ask if a similar plan is at hand for Iran! The actual Iraqi oilfields in the recent news are not very clear in the media coverage. Some imply the Majnoon field, others refer to Abu Ghrab and Jabal Fauqi fields.

It is not intended to comment on the media and/or political repercussions of these head lines. However, it is useful to remember some technical and practical aspects and industry practices for an oilfield located on the border

between two sovereign states. It will also be a valuable contribution to examine and summarise the available information on the oil and gasfields located at or near the border of Iraq with Iran and with its other neighbours. Schematic locations of these fields are shown in three sketch maps, the locations of which are illustrated as insets in Figure 1. The concluding remarks of the study are given following the field-by-field review.

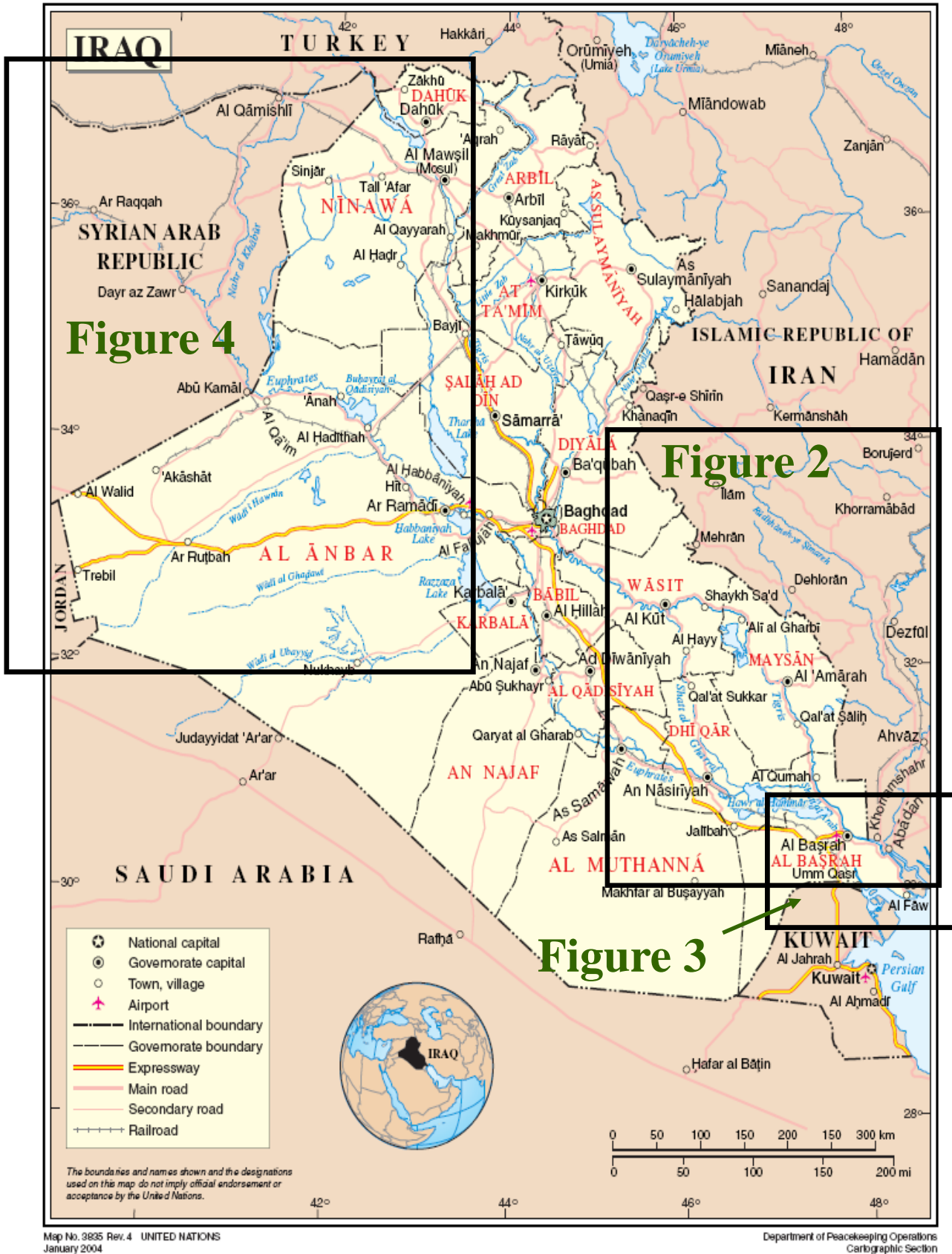
#### **Fields located on the border between two countries**

##### ***An ideal approach:***

Following the discovery of a field on the border, the ideal approach would be to have the follow-up operations conducted jointly, such as appraisal surveys, drilling, logging and testing, and preparing an optimum development plan for the whole field and employing service companies and contractors to actually develop the field and bring it on stream. Production operations during the life of the field, possible application of enhanced/improved recovery methods and other field operations would also be undertaken jointly by the two sides. These joint activities could be financed and managed/ conducted by the two governments or national oil companies through a joint committee, by setting up a joint operating company, or by international oil companies that have made agreements with the governments of the two countries. Different oil companies could be involved on each side or the same company or group of companies could undertake the work based on agreements with both governments.

For evaluating the share of hydrocarbons for each side, technical teams compute the volume of oil in place and the volume that is recoverable on each side of the border, thus 'unitising' the field and determining the share of each side for providing the investments and for receiving the revenues from the produced oil and/or natural gas throughout the development phase and the production life of the oil/gasfield.

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**Figure 1: Map of Iraq and the locations of insets—Figures 2, 3 & 4**  
 (From: “Hydrocarbon exploration and field development in Iraq”, Fig I.1.A Governorates of Iraq, CGES - Uqaili et al, 2007)



### ***Practical constraints and policy differences:***

However, such an idealised arrangement is not easily achievable. In practice the determination of the shares might not be a simple exercise. Even if agreed at the beginning, most probably it would be revised later during the life of the field. This is because the reservoir becomes better defined and its drive mechanisms will be better understood during the producing life of the field. Nevertheless, it could happen that in spite of the goodwill from both sides, they might not be able to reach an agreement on the share and on the investment and operation plans. Arbitration, studies by an independent team of experts and even court cases are not uncommon in oil industry operations around the world.

In addition, various other factors could impede initiating a joint operation in the first place. These include national/political sensitivities, lack of trust and differences in oil policy or in managing the hydrocarbon resources. One side might prefer to develop a field as soon as possible while the other side has greater priority for its other oilfields (e.g. due to their location, size, available infrastructure, regional and other priorities in the national economic and development plans, etc.). One side might prefer to develop its oilfields relatively slowly, provide its own investment and do it by the country's national oil company. The other side, while using its own financial resources, might prefer to engage major contractors and implement the project as soon as possible. Furthermore, one of the two countries might prefer to have an oil company (or a consortium of companies) provide the investment and conduct the whole oilfield development project as fast as technically and economically feasible.

### ***Separate developments:***

As it happens there are many cases that the above reasons or simply the inertia for negotiating or deciding on a joint development approach, could result in each country operating independently in its own sector of the border field.

Such an outcome is not ideal for the conservation of resources and from technical/economic

considerations. If only one side develops the field, it is possible that part of the oil from the undeveloped sector would migrate into the producing sector. The other side would gain less oil if it decides to develop and produce the field later. Yet, even for the early producer, the total volume of oil produced could be less than if the whole field was developed jointly.

Even if the two countries develop the field more or less simultaneously and no oil moves from one side to the other, still the sum of the initial investments and the operating costs could be greater and the total recoverable oil could be smaller than the case of a joint development. Usually in such a case a race occurs between the two and each side tries to produce at the highest possible rate. The high rate of production could result in bypassing the less permeable segments of the reservoir, thus less oil recovery on each side. This could happen even for the side that had an earlier start and a higher rate of production and benefiting from a pressure gradient directing the flow of the oil in the reservoir towards itself.

However, in practice the capital requirements and the realities of field operations might not allow a high rate of production and the above long-term damages might not be as severe. In fact in spite of acting independently, the two sides might make commitments not to drill too close to the border or utilise directional or horizontal wells and might even cooperate by exchanging technical information and sharing some services and facilities. Though this is not an ideal arrangement, many examples exist in the region with many years of production, e.g., the Foruzan/Marjan oilfield, located offshore between Iran and Saudi Arabia, has been in production since the 1970s, or the South Pars/North gasfield, also located offshore between Iran and Qatar, has been in production since the early 1990s, and the Naft Shahr/Naft Khaneh oilfield located onshore between Iran and Iraq, has been producing since the late 1920s!

### **Fields located near the border of two countries**

Two fields located across a common border between two countries could be separate

accumulations of hydrocarbons with independent reservoir hydrodynamic systems and pressure regimes. They could also be part of a larger structure having different culminations but acting as a connected system of pressure and fluids in communication with each other. In this case, data and tests from the two sides should be analysed together and in detail. Additional pressure and production tests could also be carried out to check the communication between the two. The area between the two fields and across the border might have to be surveyed in more detail, followed by drilling and testing in order to clarify the situation.

Most of the fields near the borders between Iraq and its neighbours are structurally controlled anticlinal traps in the form of dome-shaped or elongated whale back structures. Some of these fields (mostly near the Iranian and Syrian borders) are visible at the surface and others (mostly near

the Kuwaiti and Jordanian borders) have been defined by seismic surveys that have delineated their structural closures. Seismic surveys have to be conducted in the border area in order to map the saddle (synclinal or down warped) areas between the two dome-shaped or whale-backed structures on the two sides of the border.

If seismic surveys indicate interesting prospects in the border area, further drilling and testing will be needed to evaluate them and to delineate the gas/oil and oil/water contacts, the 'spill points' and the thickness of the oil columns, as well as helping to understand the pressure regimes, whether they are in communication with the nearby fields and how they perform in response to draw-down or build-up tests and other evaluation techniques. It is possible that some reservoir layers in the two fields are in communication across the border while other layers are independent systems.

### IRAN AND IRAQ

The more important Iranian and Iraqi fields located near the border between the two countries are shown in the sketch map of Figure 2. In general all the older oilfields located near and on both sides of the border were shut-in after the start of the war when Saddam attacked Iran in 1980. The fields' surface installations were severely damaged during the unfortunate and tragic war that lasted until 1988. In the years after the cease fire, the surface facilities in most of these fields were repaired and the fields were brought on stream.

Brief comments on the individual fields are given below.

#### **Naft Shahr/Naft Khaneh - an oilfield on the border**

This is the best known oilfield that is actually located across the border with approximately half on each side. **Naft Shahr** (formerly known as Naft-e Shah) is the name on the Iranian side and **Naft Khaneh** is the name on the Iraqi side. This field has been producing since the late 1920s and is mostly depleted, though is still producing few thousand barrels per day. The field was developed and produced for more than two decades as a joint operation by the Khanaqin Oil Company and the Anglo Persian Oil Co. However, after nationalisation (1950s and 1960s), the segments of the field on the two sides of the border have been operated independently. Nevertheless, even so late in the life of this field, it could still be argued that initiating a joint operation would improve the recovery factor and the production of the 'tail ends'. For example, by coordinating the transport and refining of the produced crude oil from the field, the least cost and most profitable option might be to transport the production from both sides to a refinery in one country. This could improve the economics of the field as a whole, lengthening its producing life and increasing the total recovered oil and the revenues to be earned.

The other fields located on the two sides, though near the border, are listed below together with brief comments for each.

#### **Oilfields on the Iranian side:**

**Azadegan** was discovered in 1999. Its recoverable reserves are estimated to be up to 9 billion barrels (bn bbls). It is expected to be developed in different phases with a production reaching 150 thousand barrels per day (tbpd), 260 tbpd and ultimately several hundred thousand barrels per day. Oil production commenced at low rates in early 2008. Further discussions on this field are given later in this study.

**Danan** is a 1971 discovery. The initial reserves were estimated at 100-150 million barrels (mn bbls) and it has been producing.

**Dehluran** was discovered in 1972 and brought on stream in 1978. The field has been in production since the 1990s. Its initial reserves were estimated at 500-600 mn bbls. Its production was less than 10 tbpd and plans were to increase this to 20 tbpd. Lateral reservoir communication was reported to be weak due to decreasing porosities towards the border with Iraq. Thick shale layers also do not allow vertical communication between the reservoir layers.

**Yadavaran** consists of two fields (Kooshk, a 2000 discovery and Hosseinyeh, a 2002 discovery) that were found to be joined together at the deeper Cretaceous level. Yadavaran is estimated to have reserves of about 3 bn bbls and is expected to produce at a rate of 300 tbpd.

**West Paydar** is a 1978 discovery. The oil in place in two reservoirs in this field is estimated at 1.4-1.9 bn bbls in place. The recoverable reserves are estimated at about 250 mn bbls. Production has been at a low rate

#### **Oilfields on the Iraqi side:**

**Abu Ghrab** was discovered in the early 1970s and brought on stream in 1976 at few thousand barrels per day. It was closed during the Iran/Iraq war, was

partially developed later and has been producing. Its reserves are estimated at few hundred thousand barrels but could be as high as 2 bn bbls. The field is believed to extend into Iran's Dehluran field.

**Badra** is a small field that was discovered in 1979 and is also believed to extend into Iran. Its production potential is not greater than 10 tbpd.

**Huwaiza** is a 1980 discovery in swampy areas. Its reserves could be about 500 mn bbls. The field has not been brought on stream, though production plans have been prepared.

**Jabal Fauqi** (Fauqi or Al-Fakkah) was discovered in 1973. Its oil in place could be about 2 bn bbls. It was brought on stream in 1979, closed during the war and later partially developed and has been producing.

**Majnoon** was discovered in 1977. Its recoverable reserves are estimated at about 12 bn bbls in many (>10) reservoirs. Recent production has been about 50 tbpd but the expectations are for 300 tbpd from one reservoir, followed by additional production levels of 100 tbpd and 200 tbpd from other reservoirs. Ultimate production could reach 2

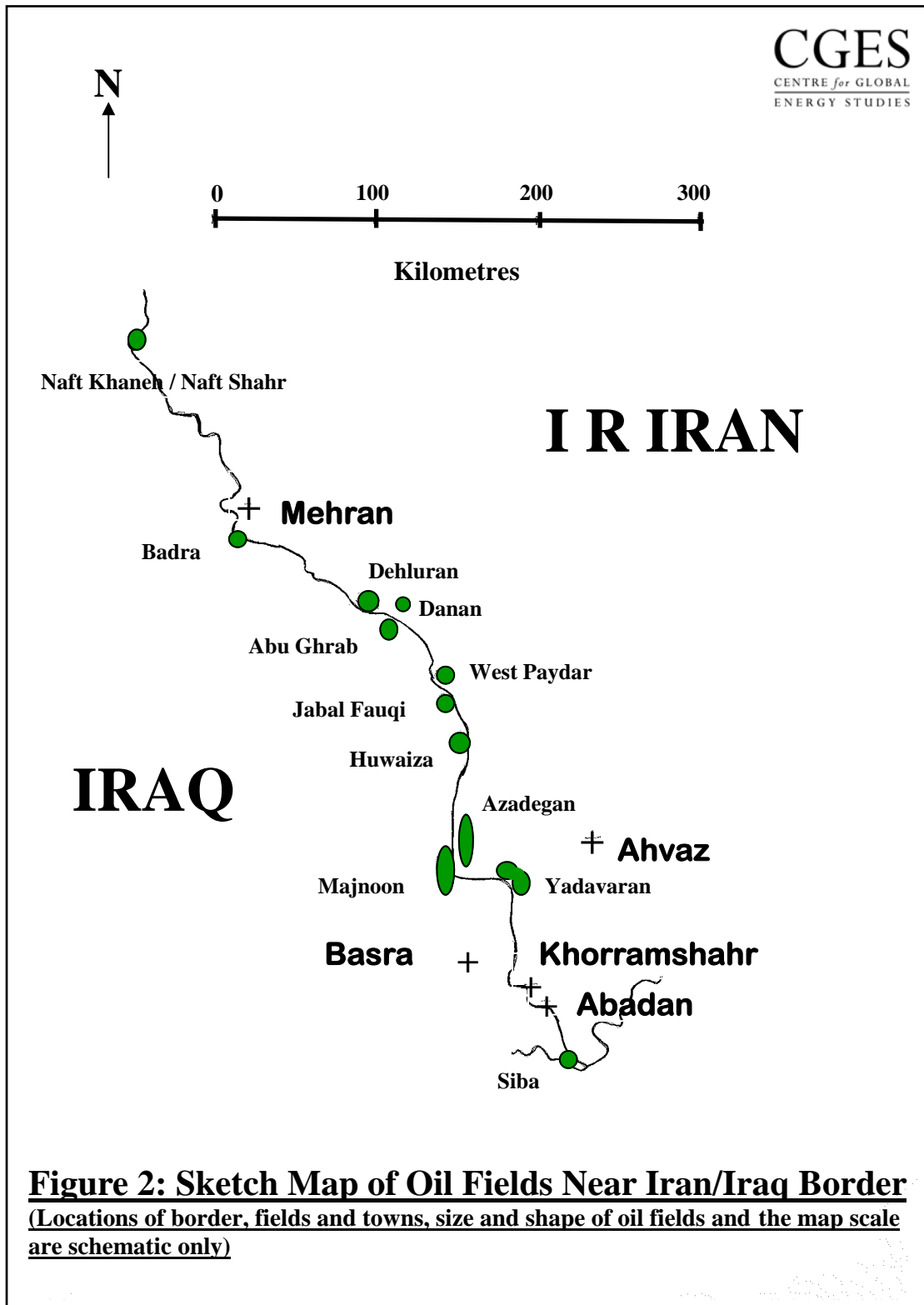
mbpd. The field has been partially developed and has been producing. The field could be connected to the Azadegan field in Iran. Further discussions on this field are given later.

**Siba** is a 1968 discovery and apparently is not yet developed. Two domes have been defined by seismic surveys. It could hold about 100 mn bbls oil and 1-3 trillion cubic feet (tcf) of gas. Part of the field extends into Iran.

For the sake of completeness, one could also mention Chia (Chah) Surkh oilfield and Jaria Pika gasfield. Both are near the Iranian border, but are located further to the north beyond the sketch map of Figure 2.

**Chah Surkh** was originally located on the Persian (now Iranian) side of the border with the Ottomans. It was drilled in 1905 by W K D'Arcy on a concession agreement with the Persian government. The field was considered non-commercial. Later border demarcations put the field on the Iraqi side.

**Jaria Pika** was discovered in the late 1970s. Its gas reserves have been estimated to be about 1 tcf.



### KUWAIT AND IRAQ

There are also a number of oilfields at or near the Kuwaiti border (Figure 3), some with significant reserves. These fields were severely damaged on both sides during the Iraqi invasion of Kuwait in 1990 and the military operations to free Kuwait in 1991. The Iraqi fields also suffered, though to a lesser extent, from the military operations in 2003 and the poor security conditions that existed later. The oilfields near the Kuwait/Iraq border have been the subject of major political disputes between the two states for few decades. The issue will be discussed later, but brief comments on the fields are given below.

The production of oil from the oilfields on the Kuwaiti side of the border has been causing tension between Iraq and Kuwait. It was part of the excuse for the Saddam regime's attack on Kuwait in 1990. He protested that Kuwait was stealing oil from Iraq's South Rumaila field. Again in 2001, Iraq protested about Kuwait's "excessive and unilateral" production that had resulted in fifty million barrels of oil having moved from the Iraqi sector of the fields to the Kuwaiti side. The excessive production was said to have been in Ratga field (23 wells drilled by Kuwait) and in Abdalli field (17 wells). Abdalli is an extension of Iraq's Safwan field, itself the fourth culmination of the Zubair field.

#### **Oilfields on the Kuwaiti side:**

**Abdalli** was passed to Kuwait with the frontier settlement between Kuwait and Iraq in 1993. Exploration by Kuwait since then has shown that the field extends much further southwards into Kuwait than had been previously believed. Its reserves are significant though no official figure is available. It was reported to be producing about 30 tbpd early in this decade. This field appears to be an extension of Safwan field in southern Iraq. As noted above, oil production in Abdalli has caused tension between Kuwait and Iraq.

**East Abdalli** is an oil prospect in the Jurassic and Cretaceous horizons and is located close to the border with Iraq. It could be an extension of the Umm Qasr field in Iraq.

**Ratga** was discovered in 1977 and its early reserves estimate was about 1 billion barrels. It has been producing since the late 1970s or early 1980s. Additional segments of the field were passed to Kuwait following the realignment of the border in 1993. Ratga's oil production was reported at 30-45 tbpd early this decade. Recent maps show this field covering a large area southwards, reported as Ratga field by one source or as Fars by another. The large area could probably be as a complex of fields. The north side of Ratga is an extension of South Rumaila field in Iraq. In the late 1980s, the reported pressure drop in South Rumaila was said to be due to production in Ratga field. As noted above, the Saddam regime had protested about Kuwait stealing oil from South Rumaila field and it was one of the excuses for invading Kuwait.

**Raudhatain** is a 1955 discovery that has been producing since 1960. The ultimate recoverable reserves were estimated to be nearly 9 bn bbls in the 1980s and the remaining reserves were about 7.5 bn bbls in recent years. Its production capacity was reported at 225 tbpd early this decade and plans were for an increase to 515 tbpd.

**Sabriyah** was discovered in 1956/7 and has been producing since the 1960s. Its ultimate recoverable reserves were estimated to be 4-5 bn bbls in the 1980s and the remaining reserves were about 4 bn bbls in recent years. Its production capacity was reported at 95 tbpd early this decade with plans for an increase to 250 bpd.

**West Abdalli** is an oil prospect in the Jurassic and Cretaceous horizons and is located close to the border with Iraq.

The five fields (Abdalli, Ratga, Raudhatain, Sabriyah and Bahrah – south of Sabriyah and not

shown in the sketch of Figure 3) are part of '**Project Kuwait**' under discussion since 1998. They are expected to be developed by foreign companies with a target production of more than 900,000 bpd (from the recent production of about 400,000 bpd). However, the disagreements between Kuwait's government and parliament (National Assembly) have so far delayed the implementation of the project.

Of the oil discoveries near the Iraqi border one could note the **Kraa el-Merou** field in northwestern Kuwait discovered in 1995 and new horizons (e.g. **Marat Formation**) in Sabriyah in 2000 and in 2002/03. From the information of the first well, Kraa el-Merou field was said to have 350 mn bbls of reserves. Additional drilling must have increased this estimate, though it will not be comparable to Burgan, as had been mentioned in the early comments by the authorities.

### **Oilfields on the Iraqi side:**

**Jraishan** was discovered in the late 1970s but not much information is available on the field.

**Rachi** is a 1957 discovery and its possible reserves were estimated as high as 1 bn bbl. However, the planned 1990 production from this field together with Safwan, was only 30,000 bpd. Later studies of Rachi give estimated reserves about 200 mn bbls, expecting a production of 30-40,000 bpd.

**Safwan** was discovered in the late 1970s with early reserve estimates up to 500 mn bbls. Its reservoir

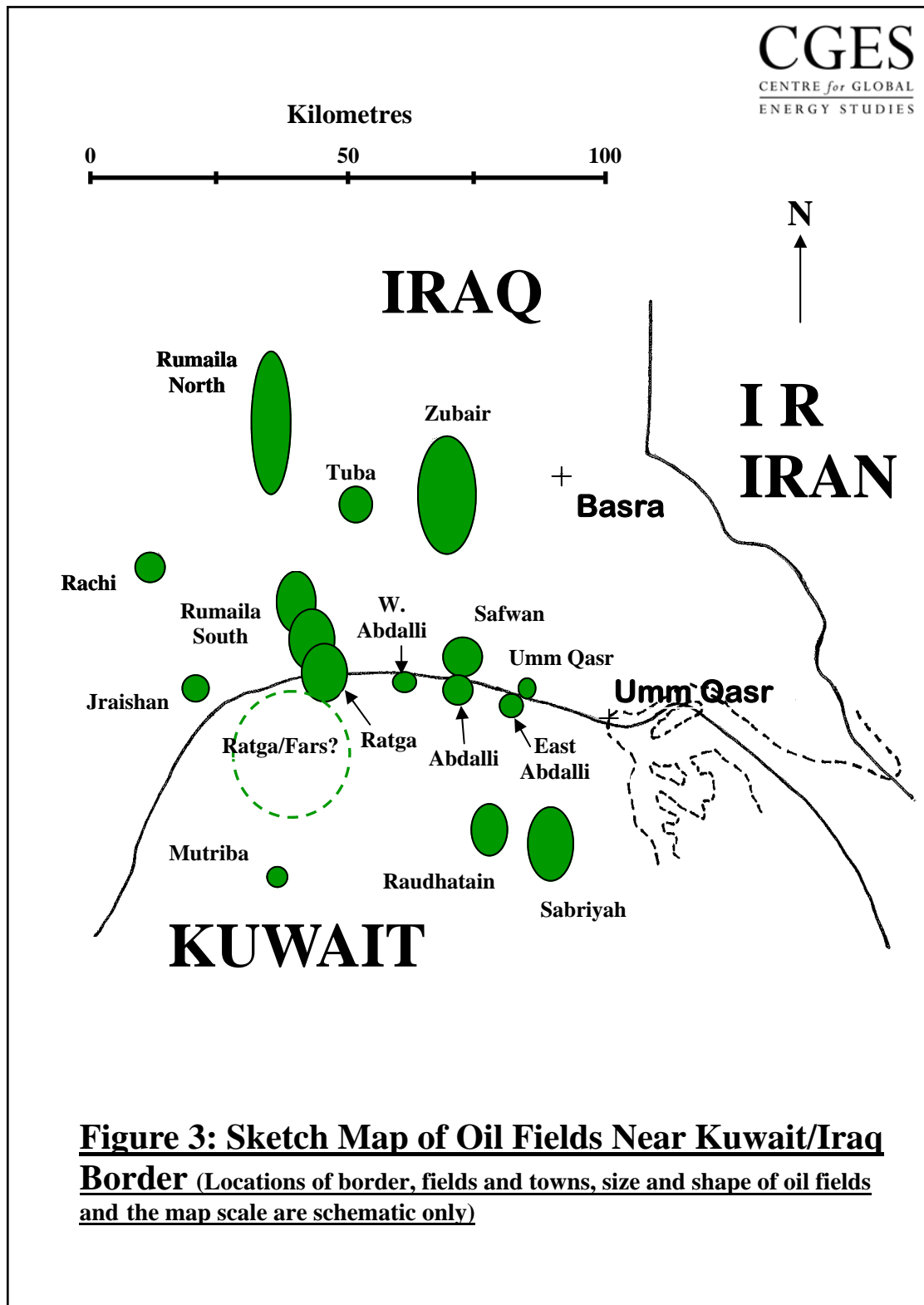
properties are believed to be similar to the Zubair field and could be considered the fourth dome of that field. Safwan began production in 1989. The field was planned to reach a production of 30,000 bpd (together with Rachi) by 1990. Its production has been less than 10 ttpd but could rise to about 15,000 bpd.

Safwan is believed to extend into Kuwait where it is known as the Abdalli field. As noted above, oil production in Abdalli field has caused tension between the two states in the past.

**South Rumaila** was discovered in 1953 and put on stream few years later. Its ultimate reserves (estimated in the late 1980s) were 14-21 bn bbls. Its production was about 1 mbpd in the second half of the 1970s with an annual peak of 1.3 mbpd in 1979. The field is connected to North Rumaila. The latter is not as large, though still with huge ultimate reserves - estimated in the late 1980s as 5-8 bn bbls. It was put on stream in the early 1970s with an annual peak production of 190,000 bpd in 1979. In fact, the two Rumaila fields and West Qurna (another super giant field not shown on the sketch map) are said to be three culminations of the same structure.

As note above, South Rumail extends into Kuwait, known as Ratga field. Oil production in the latter field has generated tension between the two states. It was one of the factors used by Saddam regime to invade Kuwait in 1990.

**Umm Qasr** is a small field discovered in 1979, with about 50 mn bbls of reserves. It could be an extension of East Abdalli field in Kuwait.





### SYRIA AND IRAQ

There are also a number of oil and gasfields at or near the Syria/Iraq border (Figure 4). Those in production have been developed independently on each side of the border. These are listed below.

#### Fields on the Syrian side:

**Al-Hawl** is a gas discovery dating from 1976. Some oil has also been reported in the field. It could extend into the Qahtan structure in Iraq.

**Gbeibe** or Kbeibe is a 1976 discovery. It was producing few thousand barrels per day in the early 1980s.

**Ghouna's** oil was discovered in 1979 although the well tests in the field in 1949 had shown natural gas.

**Hamza** was discovered in 1963 and went on stream in 1975. The field's reserves had been estimated at few hundred million barrels.

**Jerribe** was discovered in 1978. It could extend into Jabal Sinjar structure in Iraq.

**Karachok** is a 1956 discovery - the first in Syria. Its ultimate reserves were estimated as several hundred million barrels, but further work could have increased this figure. It went on stream in 1969 and its production was about 25,000 bpd in the 1980s.

**Swaidiyah** (or Souedie) oilfield was discovered in 1959, the second discovery in Syria. It went into production in 1968 at rates about 100,000 bpd reported in the 1970s and 1980s and 70,000 bpd by 2003. Oil reserves had been estimated at 1 or 2 bn bbls. The implementation of enhanced oil recovery methods in this decade has increased its production to around 100,000 bpd. The field extends into Iraq where it is known as Sufayah field.

#### Fields on the Iraqi side:

**Abtakh** is a potential discovery.

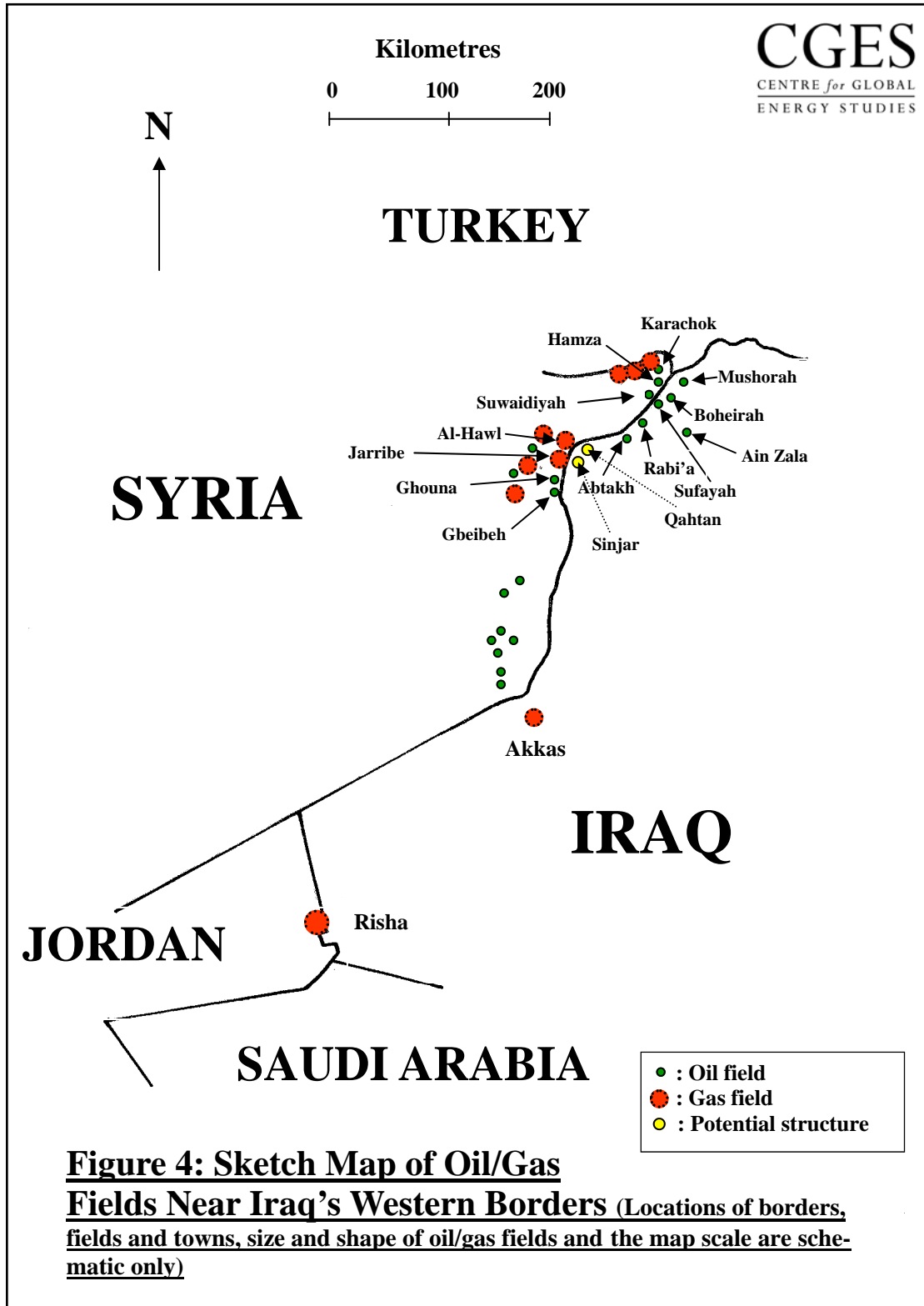
**Boheira** is a small discovery of late 1950s-early 1960s. Its potential has not been evaluated.

**Mushorah** is a discovery well dating back to late 1950s-early 1960s. Its potential has not been evaluated.

**Rabi'a** is a potential discovery.

**Sufaya** or Sfaiya was discovered in 1974 that went on stream in mid-1980s (sock-rod pumps were used). Its reserves were estimated at few hundred million barrels with a production of less than 10,000 bpd.

**Jabal Sinjar** and **Qahtan** are two structures that could be connected to the Syrian side gasfields of Jerribe and Al-Hawl respectively.



### JORDAN AND IRAQ

A smaller number of fields or potential structures exist near the Jordan/Iraq border (Figure 4) than close to the country's other borders.

#### **Gasfield on the Jordanian side:**

**Risha** is a gasfield discovered in the Palaeozoic formations in 1987. Recoverable reserves could be up to 0.5 tcf. The field's discovery caused a great deal of excitement among explorationists.

Gas production from this field started in 1989 at rates rising up to more than 35 million cubic feet per day (mcfpd). The recent production has been about 27-30 mcfpd. Plans are for increasing its production to about 50 mcfpd in the coming years. Seismic surveys indicate that the field extends into Iraq.

#### **Gas/oilfield on the Iraqi side:**

**Akkas** is a 1992 discovery that also generated a great deal of excitement. It confirmed the presence of natural gas and oil in Iraq's Western Desert that had not been conclusive from previous drilling (e.g. Khleisyia well in 1958/59). More importantly the Akkas discovery showed that a large thickness of Palaeozoic formations is present in western Iraq. This has led to different 'play' concepts for exploration in Iraq and Syria.

Akkas field's gas reserves could be up to 4 tcf, together with about 50 mn bbls of condensates. The light oil in place in a different formation within the Palaeozoic system is estimated at about 200 mn bbls of which about 30 mn bbls could be recoverable.

### CONCLUDING REMARKS

We should note that in general when one side of the border is explored and the oil or gasfields are developed and producing, there is always a tendency for the country on the other side to suspect it is losing its hydrocarbons to the producing side. This will happen even if no well has been drilled close to the border and no directional or horizontal well has crossed the border in the subsurface. Such suspicions and disputes have occurred frequently in the past. A recent example is the concern by Mexico that production on the US side of the border in the Gulf of Mexico shall result in Mexican oil flowing into the US side.

#### **Azadegan/Majnoon – an example of fields near the border**

From the news items in early February, it appears that one of the main concerns in the Iraqi media was about Azadegan oilfield and that Iran was commencing oil production in this field. Six production wells had been planned with each well expected to produce about 3,000 bpd. However, it should be noted that it is not yet certain that Azadegan field extends into Iraq's Majnoon field and that the reservoirs of the two are in communication. In any case, the Majnoon field has already been in production - the recent rates have been 50 ttpd.

Another point that should be noted about **Azadegan** is that a production of about 20 ttpd (later to go up to 50 ttpd) will still be too low relative to the production potential of this 9 bn bbl field. Moreover, Azadegan is a heterogeneous and complex multi-reservoir oilfield. Its reservoirs are difficult to produce due to their unfavourable rock properties (tight and heterogeneous) and their varied fluid contents (light and heavy oil).

For such a complex field, the development has to be planned meticulously following extensive tests, simulation modelling, evaluating the different

reservoirs and various options for phased or whole-field development and for the surface facilities. The capital requirements would be few billion Dollars. One could speculate that the present production in this field is preliminary and could be used as a long-term production test, helping with reservoir evaluation and the final planning for field development. Otherwise, continuing to produce from the more productive layers might result in long-term loss of recoverable reserves from the field. Lastly, the expected future production from the fully developed Azadegan field will still be significant, but due to these complexities, the production rate will not be as high as the production from a simpler oilfield but with similar size of reserves.

Similar comments could be said about the **Majnoon** field which is also a multi-reservoir oilfield with similar production expectation and investment requirements as for Azadegan. It will also need comprehensive studies and an optimum field development plan. However, the development of this and similar fields will be major projects requiring heavy investments, teams of experts in different disciplines and management experience for implementing large projects. Both Iran and Iraq have planned for the involvement of foreign oil companies to develop these fields.

The continuity of Azadegan and Majnoon fields cannot be confirmed or refuted without further studies such as seismic surveys and exploration drilling in the area between the two and across the border. Such a study, though ideal, cannot be carried out that easily. Decisions are required by politicians on both sides. Rather than political considerations, priority should be given to technical/economic parameters, cooperation, field study, planning and project implementation jointly by the two sides. There are also logistic problems due to the extensive land mines and unexploded ammunition still remaining from the tragic Iran-Iraq war. Their detection and destruction is a major operation. However, given goodwill on both sides,

such operation could be arranged. The least outcome of this joint operation will be the determination of the architecture of the two structures and the confirmation of the existence of fluid and pressure communication between the two fields or the separation and independence of their reservoir systems.

### **Technical and political expediency is required**

It is encouraging to note the response of authorities in Iraq and Iran to the headlines and the emotional media coverage about Iraq's oilfields near the Iranian border. The Iraqi oil minister has denied the story, saying that the location of the Iran/Iraq border had been agreed both at sea and on land, but not all of it had been marked on the ground – possibly due to concealed land mines and unexploded ammunitions still remaining in the border area. He also said that Iran has been purchasing Iraqi crude at international prices and selling petroleum products to Iraq, also at international prices. The existence of crude pipelines from Iraq to Iran could have partly caused the misunderstanding. It is also good to hear that the Iranian petroleum minister had apparently decided to cancel the inauguration ceremony marking the commencement of production at the Azadegan oilfield.

As further encouraging news, it was just reported that the Iraqi government decided to form a committee to deal with the portfolio of joint

oilfields on the border with the neighbouring countries. The Council of Ministers decided to form a committee to take responsibility for the oilfields that are on Iraq's borders and to reach an understanding about the fields with Iraq's neighbours. The committee will be under the chairmanship of the under secretary of the Ministry of Foreign Affairs and with the membership of the Prime Minister's legal adviser, as well as the representatives of the Ministries of Oil and Interior.

Hopefully, exchange of technical information and operational cooperation on the oil and gasfields near the borders will expand between Iraq and its neighbours. One can even hope that joint development might be initiated for some of these fields. The two sides could jointly conduct delineation, evaluation, development and production operations in the fields located on their common border and even for the fields on either side but close to the border. Deciding on such an approach would be indeed a healthy, brave and beneficial policy for both sides. Following decades of hostile policy by the Saddam regime, such an arrangement will be most welcome. Lastly, although the fields located on the border (e.g. Naft Shahr/Naft Khaneh on the Iran/Iraq border or the Ratga/South Rumaila or Abdalli/Safwan/Zubair on the Kuwait/Iraq border) have been developed independently by the two sides and have been producing oil for years or even decades, there could still be technical and economic arguments supporting a joint operation for the rest of the life of those fields.

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