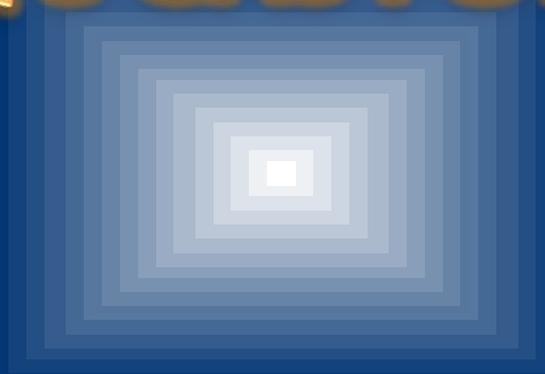


SOME ASPECTS OF THE STRATEGY FOR EXPLORATION AND DEVELOPMENT OF IRAQ'S GAS POTENTIAL



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Introduction

Recently revised estimates of Iraq's Proven Gas Reserves have put them at nearly (130) TCF, some (80%) of which are considered associated directly and in domes with the Oil.

The Additional Reserves Estimates are put between (100)TCF and (300)TCF, however, possibly (80%) of these are non-associated.

Thus the expected Total Potential Reserves could range from some (200)TCF to more than (400) TCF, a huge figure by any standard which even when taken against a possible growth in domestic demand in twenty years, of some (5000) MMSCF/D, over the present level of nearly (2000)MMSCF/D and also against potential exports to the Middle East and Europe of an average estimated at another (4000) MMSCF/D, by the end of the present Decade, the R/P ratio would still be one of the longest in the World.

This development task would require for the base step the assertion and conversion of a sizable part of the said Additional Potential Reserves, of mainly non-associated gas, to Proven Reserves in the same time-frame, in order to align with the envisaged production and to compensate for commensurate depletion.

The Initial Step

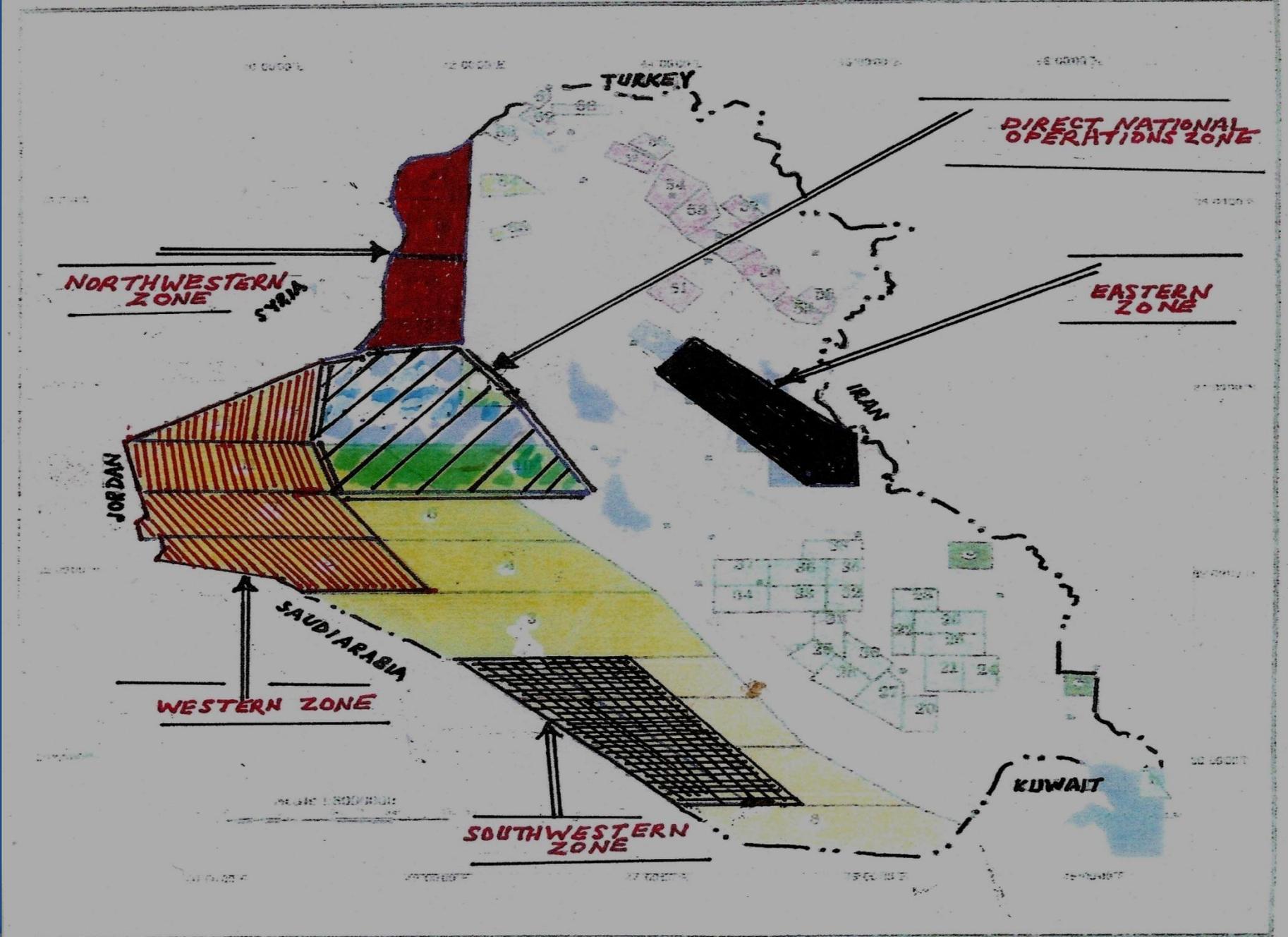
Emphasis was laid on establishing a general medium term STRATEGY for non-associated gas which would then serve as the basis for Policies and Plans for Exploration and Development of the Resource.

This exercise was conducted over a period of about six months, starting at the end of 2010, by Experts from the Prime Minister Advisory Commission (PMAC) and the relevant Entities of the Ministry of Oil.

Broad Targets

The main investigated parameters of the STRATEGY were as follows:-

- 1) Additional Reserves to be proven within ten years were earmarked at nearly (30) TCF.
- 2) Reservoirs targeted were to range from the Tertiary, in the East, to the Paleozoic in the West (Jeribe–Euphrates, Khlaisia, Akkas, Risha and Chiaziri Plays).
- 3) National and International execution via a new Licensing Round were envisaged.
- 4) Exploration and Development Blocks in five Zones were situated mainly in the West of Iraq, with Areas in the (6000-9000)km.sq range per Block and totaling some (120000)km.sq (FIG-1-)

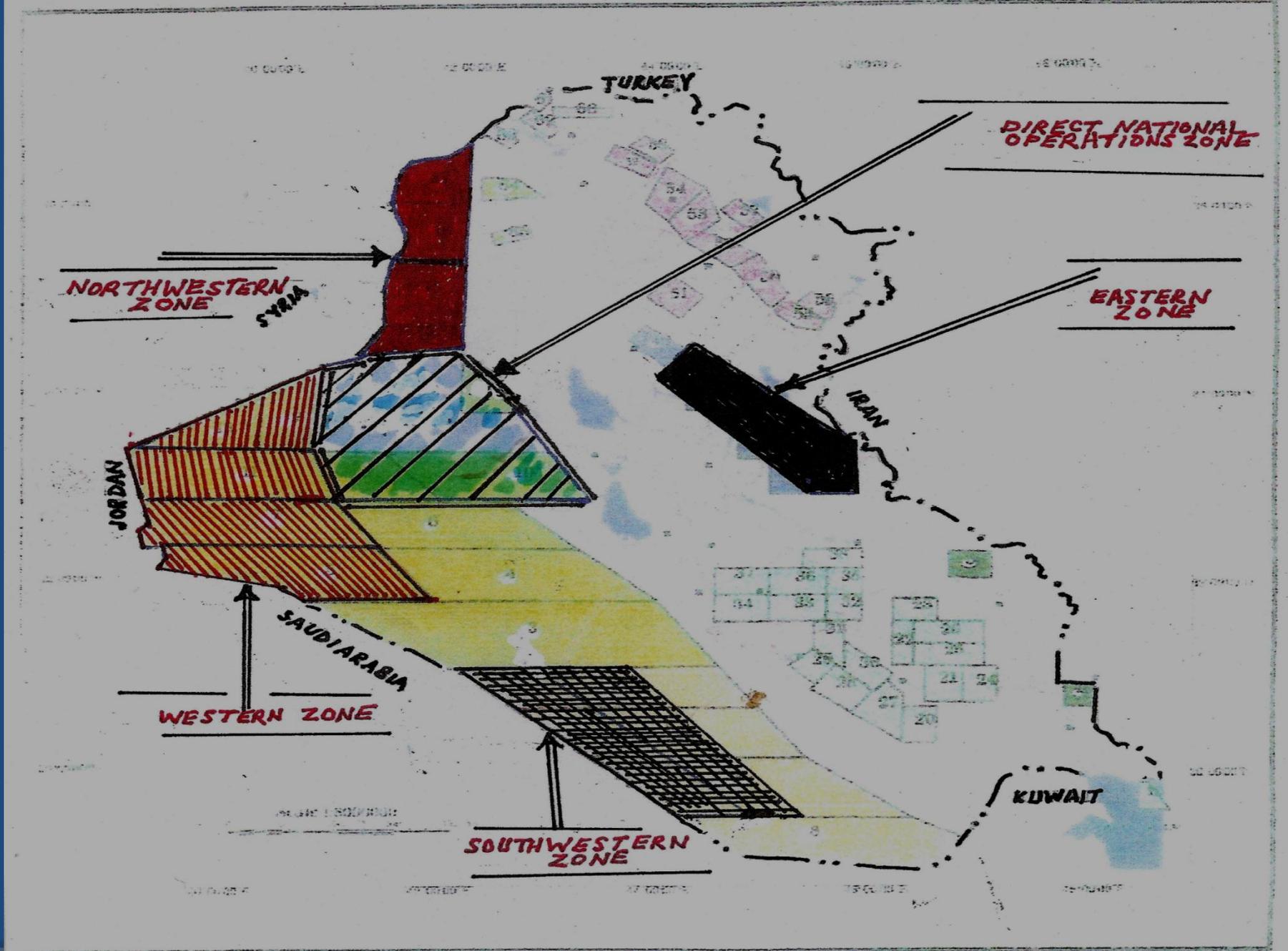


FIG(1)

DESIGNATION OF THE BLOCK'S ZONES AND THEIR POTENTIAL (FIG-1) -4TH Bid Round.

Four major geographic-geological (Zones) were designated to be subdivided into Exploration Blocks for the 4th.Bid Round:-

1. **EASTERN ZONE** : North-East Baghdad and East Diyala, targeting the Tertiary Reservoirs at a depth range of (2000-2500)M.B.S in the Jeribe-Euphrates Reservoirs where some (5)TCF of geological reserves are expected. This Zone extends to the Iranian border.
- 2- **WESTERN ZONE**: Central (Western Desert) extending towards the Syrian, Jordanian and Saudi borders, targeting the Siluro-Ordovician Reservoirs at a depth range of (3500-4500)M.B.S Where more than (5)TCF of geological reserves are expected.
- 3- **SOUTH WESTERN ZONE**: Southern (Western Desert) extending towards the Saudi border targeting a depth range of (4000-4500) M.B.S where up to (5)TCF of geological reserves are expected in the Upper and Lower Paleozoic Reservoirs .
- 4- **NORTH WESTERN ZONE**: (Upper-Euphrates) Region, targeting the Triassic and Paleozoic Reservoirs at a depth range of (4000-4500)M.B.S where up to (10)TCF of geological reserves are expected.



FIG(1)

DESIGNATION OF THE ZONE FOR DIRECT NATIONAL OPERATIONS AND ITS POTENTIAL

This Zone is located in the Central Western Desert adjacent to the Euphrates River, targeting the Triassic and Paleozoic Reservoirs at a depth range of (3500-4000)M.B.S where up to (10)TCF of geological reserve are expected.

Several exploration well locations have already been given in this Zone on the Anz, Rutba and Anbar structures and related stratigraphic anomalies on the basis of existing seismic and geological studies. Their drilling is programmed to start in 2012.

Methodology

Both National and International Campaigns are to be undertaken, the latter in the form of the new Fourth Licensing Round, in a single phase format i.e., Exploration, Development and Production of Commercial Discoveries in one contractual PACKAGE.

A medium term time-frame(2012-2022) for Exploration and Appraisal to be staggered with the Development and Production of Commercial Reserves lasting another Twenty Years and thus a Thirty Years Total Contract Term, were envisaged.

Minimum Work and Expenditure Obligations for each Block to include 2D and 3D seismic, exploration and appraisal drilling and commensurate studies, to determine Commerciality, to the tune of estimated (150) million dollars per Block, were envisaged (FIG-2-). The National Effort would concentrate on the Central Western Desert covering an area of about (40) thousands km.sq. over mainly the Rutba, Anbar and Anz Prospects. (FIG-1-)

The basic philosophy of the Model Contract is that it would be an Exploration Risk contract for the first part, and then it would evolve into a Service Development and Production format, similar to that used in Round Three.

Second Priority Oil Discoveries

Owing to the fact that it was a second priority to develop new oil reserves because of the expected high production rates from the development and redevelopment of the fields of Rounds One and Two, it was first thought that the envisaged work under Round Four should be executed in two phases. The first is to deal with exploration and appraisal, and after determining the types and estimating the amounts of the commercial reserves, a second phase to develop the gas Commercial Discoveries would then be undertaken. However, this approach was finally abandoned for a single phase and single package exploration and development Model Contract in the interest of expediting the operations, but another mechanism was contemplated to deal with the second priority oil reserves in the form of putting the oil discoveries on hold for up to a certain number of years then making a decision on dealing with their development i.e., similar to the scenario of holding a gas discovery until finalizing a marketing agreement, well known in the International Industry.

Development Periods of the Gas Reserves

The envisaged Exploration and Appraisal Period was (8-10) years which would allow for the contemplated Development and Production of non-associated gas fields in the medium term i.e., between (2017) and (2022), when they would be most needed to supplement the associated gas reserves to enable Iraq satisfy domestic demand and enter into some long term export contracts on the basis of a firmly available Resource Base, whether via pipe-line and /or (LNG) projects. Otherwise, the expected gas surpluses of the mid-(2020s) would not be sufficient to guarantee long term gas export contracts , beyond the Milestone when potential tight supply or shortages are expected i.e., (2025-2030).

Volumes and Costs of Exploration

It was estimated that each Block needs up to (8000) line kilometers of modern (2D) seismic and (1000)square kilometers of (3D)seismic, plus (3) exploration wells and (6) appraisal wells with the necessary studies and laboratory analyses ...etc to sufficiently evaluate it. This would entail an expenditure of (250-270) MMUSD per Block.

However, For Minimum Contractual Work and Expenditure Obligations, (1) exploration well and (2) appraisal wells plus (5000)Km of (2D) seismic and (1000)Km.sq of (3D) seismic were estimated to be needed. This work volume would then bring Minimum Expenditure Obligations to around (150MMUSD) per Block(FIG-2-)

Direct National Operations

The Zone allocated to Direct National Operations to be executed by the relevant Ministry of Oil Companies would involve first the Oil Exploration Co.(OEC) in an exploration and appraisal effort over an area of about (40) thousands square kilometers in the Central Western Desert, extending from the Euphrates Westwards.

The period envisaged for this activity is (2012-2017) and (OEC) may utilize in the process its own means, service contractors and even (JV) operations with International Petroleum Services Companies to accomplish the program which is equivalent to that contemplated in (4-5) Blocks designated for Round Four.

However, some exploration drilling is already earmarked in this Zone which would also entail the joint effort with the relevant National Oil Cos. i.e., North Oil Co., Midland Oil Co. and /or South Oil Co. who would continue with the Development Operations after that.

The estimated Budget for these Exploration and Appraisal works would be (0.75-1.25) billion U.S.D over the said period.

The Contractual Format

For the contractual format, an option was first discussed similar to that used by Saudi Arabia gas exploration campaign in the (Empty Quarter) where basically any oil discoveries would revert to the State.

However, it was finally decided, despite the second priority for Oil Development, to keep the option of developing an oil field or an oil reservoir discovered with a gas field, after a certain holding period in order to clarify its position within the total scheme of Iraq's oil Production Plan.

It was also decided that even within the one contract format, the Exploration Phase would be risk based whereby contractor would not be compensated and the contract would expire in the event of no Commercial Discovery.

As to the Development Phase, it was decided to choose the same Service Contract Format as that of the Gas Fields of Round Three with appropriate modifications to cater for multi Commercial Discoveries in one Development Area Scenario and also multi Development Areas possibility in the one Contract Area.

Aftermath and Conclusion

The principles of the STRATEGY described in this paper were adopted in general and the planning of Round Four and the National Effort Campaigns were, therefore, generally based on it, with some variations in the details that arose out of considerations for some logistical constraints and out of some benefits derived from accumulated experience during the execution of some of Rounds One, Two and Three Projects.

International Interest

More than (45) International Oil and Gas Companies have been qualified to participate in the 4th Licensing Round which reflects an initial favorable response and wide interest of the International Industry in Iraq's future Gas Potential and in the available strong incentives by way of an enormous Resource Base and potentially Large Market, whether for piped gas or (LNG) exports to the M.E Gulf Region and/or Europe, and not to mention the fast increasing local demand for Gas both for Electric Power Generation and as Industrial Feed-stock.

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