



## **Iraq – Sizing the Potential, Assessing the Damage**

By

Alan M Taylor and Brian Haig,

AT Energy Limited, England

AIPN Conference, 12<sup>th</sup> – 15<sup>th</sup> October 2003

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## INTRODUCTION

Distinguished guests, ladies and gentlemen – Good Morning.

AT Energy has worked on many projects in Iraq for several years now and in the course of our work we have made many good friends. It has deeply saddened us to watch recent events unfold. The country has massive potential and I'm sure will one day become a prominent business centre and the country of choice for investment. Indeed 30 years ago Baghdad was the place to be – let us all hope and pray that peace and prosperity returns to Iraq in the not too distant future.

## SIZING THE POTENTIAL

I want to begin my talk by looking at the size of this potential starting with oil.

First of all let us remind ourselves of the somewhat familiar story of 112 billion barrels of proven reserves, making up 11% of world reserves and 14% of OPEC reserves. However, whilst oil field technology in the rest of the world has advanced over the last two to three decades, Iraq's oil industry has largely stood still, grappling with war and international instability. Consequently, there has been little serious exploration effort since 1980 let alone a full and proper inventory of proven and potential reserves.

The 112 billion barrels estimate is without regard for advanced reservoir management techniques and modern technology and is based on a relatively poor database – 2D seismic coverage is sparse compared to other parts of the world and no 3D seismic has been acquired. Indeed many field reserve cases, especially in the north, are based mostly on surface maps and well control.

Probable plus possible reserves are potentially enormous and claims that Iraq's reserves could equal those of Saudi Arabia are not without foundation. Iraq has quoted probable reserves in the order of 100 billion barrels; that is reserves contained in fields discovered but yet to be appraised. As a less than wild guess, exploration targets that have been identified but not drilled could easily double these numbers, and there remain many areas of the country where no exploration has taken place.

A word of warning; the oil ministry and its affiliates have been compelled to produce oil at maximum rates under very difficult conditions for over two decades. Coupled with this, critical fields have undergone water, gas, de-gassed oil and even fuel oil injection in the quest to maintain these rates. Whilst injection is widely used throughout the world to enhance production, it is done under very carefully controlled and monitored conditions: this has not happened in Iraq. Reservoir practises in Iraq have not benefited from modern techniques and advances in technology, resulting in a substantial but unquantifiable loss in ultimate recoverable reserves. Ideally the tired old fields of Kirkuk and Rumaila should be laid to rest whilst proper reservoir modelling and development planning is applied – this is not an ideal world and that will not happen, certainly not in the near to medium term.

Let us now turn to gas which is immensely important to Iraq and cannot be overlooked.

Total gas 'reserves' are estimated at about 3,100 billion cubic metres, the vast majority of which is associated gas; that is gas contained in solution with the oil, with only 30% being free gas or contained in gas caps. These reserve estimates are therefore heavily dependant on oil production forecasts and are also subject to the same uncertainties as the oil reserve estimates.

Historically, Iraq has produced up to 20 billion cubic metres per year; in the '70s over 80% of this was flared, and by 1990 still only 50% was utilised including exports to Kuwait. Plans were being implemented to use or export all associated gas; for example for power, for LPG exports and for

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exports to Turkey.

In the future, flaring of gas will not be tolerated and, quite apart from international corporate policies, Iraqi government laws prohibit flaring except under temporary or emergency conditions.

There are several markets for the gas.

Gas is a resource needed for local markets; for power, for industry and for domestic customers. Hence, in the past and today, the frequent need to recycle oil production to supply gas to the market.

Significant volumes of gas will be required for oil field injection.

Development of the northern gas fields will be required as substitute for associated gas to fulfil contracts, especially under export schemes to, for example, Syria, Turkey, or even onwards to the European market.

If plans to substantially increase Iraq's oil production are successful, and we all hope they are, this will result in an oversupply of gas and therefore the development of gas (and/or power) export schemes will be vital and will need to be addressed by any future oil development.

### **ASSESSING THE DAMAGE**

I now want to make a few comments on the damage inflicted on Iraq's oil and gas industry and some of the issues that will need to be faced in the future reconstruction and development.

With regard to the oil industry, relatively little damage has been caused by the recent war and its aftermath but much damage has occurred through more than 20 years of wars and international sanctions. Much of the damage in the south was caused by the Iran-Iraq war and significant damage resulted from the 1991 Gulf war. Rightly or wrongly, UN sanctions have had by far the most devastating effect, primarily by preventing highly qualified and dedicated engineers from doing their job. As a result there is now a marked trend of decline in overall production. Lack of maintenance and investment during 13 years of sanctions led to such fundamental oil field problems as wells watering out in Kirkuk and wellbore corrosion in Rumaila. In addition, Iraq's pipelines and infrastructure could not be repaired fully or upgraded. The Ministry and its operating companies were fully aware of the oil field issues and what was needed to arrest this decline but, as project after project was put on hold through the UN process, Iraq's engineers were powerless to act.

I have a couple of slides that illustrate some of the problems.

The first is a picture of the pumping and storage facilities at Fao which look very similar today as they did in 1988 following the Iran-Iraq war. Other than the early rebuilding done up to 1990, no proper repair or maintenance work has been carried out. These facilities urgently require substantial upgrading and expansion in order to meet future export needs; over 40 storage tanks with pumping facilities will be needed to efficiently supply the two Gulf terminals.

The second is a series of pictures of corroded oil pipelines. Pipeline corrosion such as this is common place and large tracts of the pipeline network need urgent repair or replacement.

It is rather pointless to assess the damage in terms of what has occurred but instead to look forward and ask – what is needed? Although Project RIO has been charged with repairing the recent damage, it is the problems caused by the previous 20 years that will need to be addressed.

The principal production is from Kirkuk in the north and Rumaila in the south with contributions from a number of smaller fields. All of these fields need significant rehabilitation both in the sub-surface and in the surface facilities. As mentioned before all the pipeline and export systems need major improvement and the gas (and power) infrastructure is currently inadequate for future needs.

### **DEVELOPING THE POTENTIAL**

I want to move on now to a discussion of the way forward in developing Iraq's oil and gas potential and to highlight what we feel is one of the biggest challenges.

In the 1990's the Ministry of Oil developed its plan to increase production to over 6 million barrels a day. This plan envisioned the restoration of sustained production capacity from existing fields to 3.5 million barrels of oil per day through the investment of 6 billion dollars – today that estimate would be more like 10-12 billion dollars. The remaining 2.5 million barrels per day capacity would come from foreign investment in the development of relatively greenfield sites of the five giant oil fields in the south of the country; West Qurna (Phase Two), Majnoon, Nahr Bin Omar, Halfayah and Nassiriyah. Numerous other but smaller oil fields would be developed in parallel.

Exploration would provide sustained production capacity in the longer term.

Looking ahead, we believe the fundamentals of the Ministry's earlier plan are still valid, and we believe still form the basis for the Ministry's current thinking, but sadly the baseline has shifted somewhat and under current circumstances foreign investment still remains elusive, at least for the short term.

First of all we believe the estimate of production capacity, post Project RIO, is more likely to be around 2.5 million barrels per day with a natural decline in existing production similar to the earlier plan. As previously mentioned, major fields such as Kirkuk and South Rumaila are declining because of poor reservoir management and downhole well problems, neither of which are war, and therefore Project RIO, related.

Assuming Project RIO is completed on schedule, we estimate that this will provide export earnings to Iraq in 2004 of around 13 billion dollars [\$22 per barrel, 5% of revenues to the UNCC reparation fund and \$1/bbl operating costs. Our calculations also assume 500,000 barrels of oil per day domestic consumption].

This will clearly not support the ongoing budget of a newly developing country let alone the massive capital expenditure needed to upgrade health, water, education and all the other functions of a deprived nation of 22 million people. For example, in July the Coalition Provisional Authority suggested that the electricity sector needed near term investment of 13 billion dollars and water 16 billion dollars. These numbers just touch the surface of the total bill for social and economic re-development. Needless to say, the country's debt and the UNCC reparations bill add a further financial burden and there is little sign of debt relief other than rescheduling. It is therefore vital that the oil field revenues are increased greatly and soon.

Our projection of future production beyond Project RIO looks a little different from the 1990's plan.

The increase of production capacity to 3.5 million barrels a day from "brownfield" development will require necessary improvements to the infrastructure of the existing fields. As I previously mentioned, in 1990 the Ministry of Oil estimated the cost of these improvements at six billion dollars, more like 10-12 billion dollars today. We believe the Ministry of Oil will be hard pressed to fund these improvements on its own.

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However, Iraq has no choice but to develop its oil fields – otherwise the continued decline of existing production will lead to a catastrophic decline in export revenues. Consequently the funds have to be made available to improve production.

If these funds are made available and the 3.5 million barrels per day target is met, Iraq's net revenues could approach 20 billion dollars per annum in five years. However, this still represents a substantial budget deficit for the foreseeable future [Assuming \$22/barrel less 5% UNCC reparation fund, less \$2.5/barrel OPEX and CAPEX].

A grim picture in view of demands on capital.

Nothing is very certain in Iraq today but let us assume that major foreign investment will be possible within the next two to three years for the development of the giant strategic oil fields of south Iraq, the "greenfield" development. In six to seven years from now we may see first early production from these fields building up to plateau production relatively quickly. In the absence of significant "brownfield" development, production of 4 million barrels of oil per day could be achieved in 11 years.

Therefore, to achieve the target production rate of 6 million barrels of oil per day, and to address the short-term shortfall in oil revenues, Iraq has to address the "grey area" of "brownfield" development and to halt the decline of its existing oil fields.

To do this a way to attract additional investment has to be found.

### CONCLUSIONS

I want to leave you with some conclusions that I hope will aid the discussions for the remainder of this session.

Iraq's oil and gas reserves are potentially enormous although the precise levels are uncertain. Historically, production has suffered from the lack of investment in modern oil field technology and reservoir practices. This is a function of the conditions imposed on the Ministry and its operating companies and in no way reflects the efforts a brave band of highly motivated people. These conditions and those that the international community will have to address are a result of over 20 years of war and international sanctions.

In order to properly develop Iraq's vast oil and gas potential and to meet the revenue requirements necessary to rebuild Iraq and to ensure Iraq's future prosperity, foreign investment will be required to develop not only the "greenfield" sites in the medium term but also for "brownfield" rehabilitation in the immediate to short term.

Clearly the damage is in the legacy of the past 23 years – the challenge ahead is for security, peace and the development of investor confidence to facilitate the inflow of 20 to 30 billion dollars of capital needed to achieve these targets.

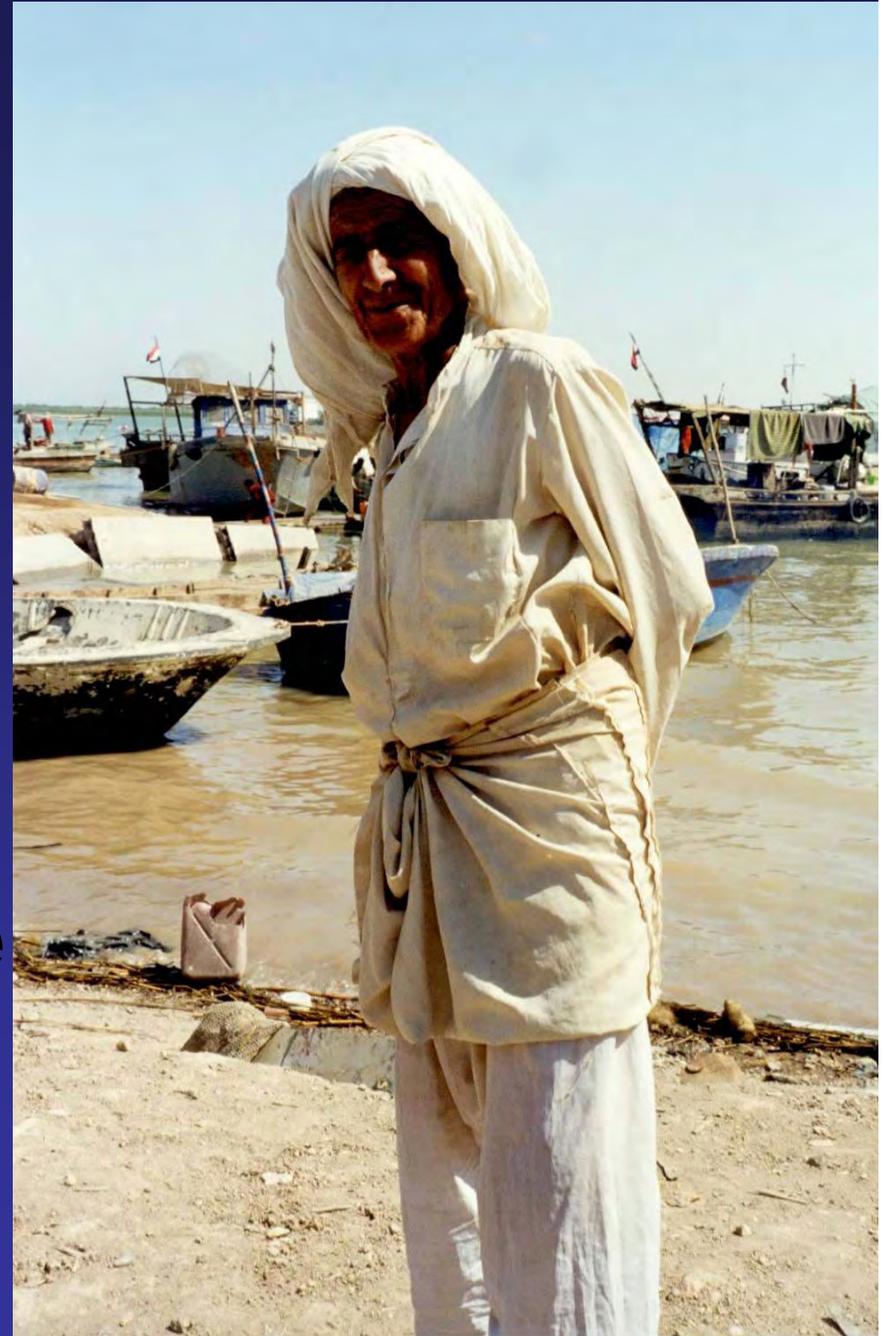
The Iraqi people deserve this.

Thank you.

# *IRAQ*

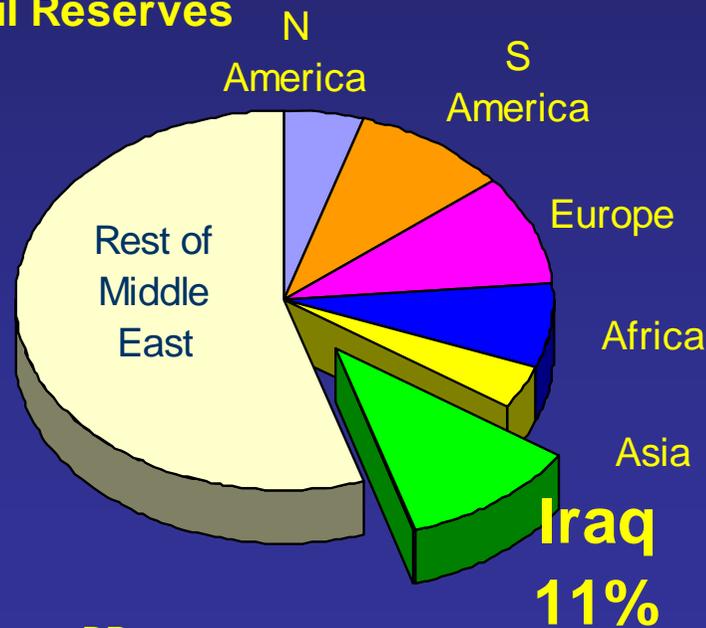
## **Sizing the Potential, Assessing the Damage**

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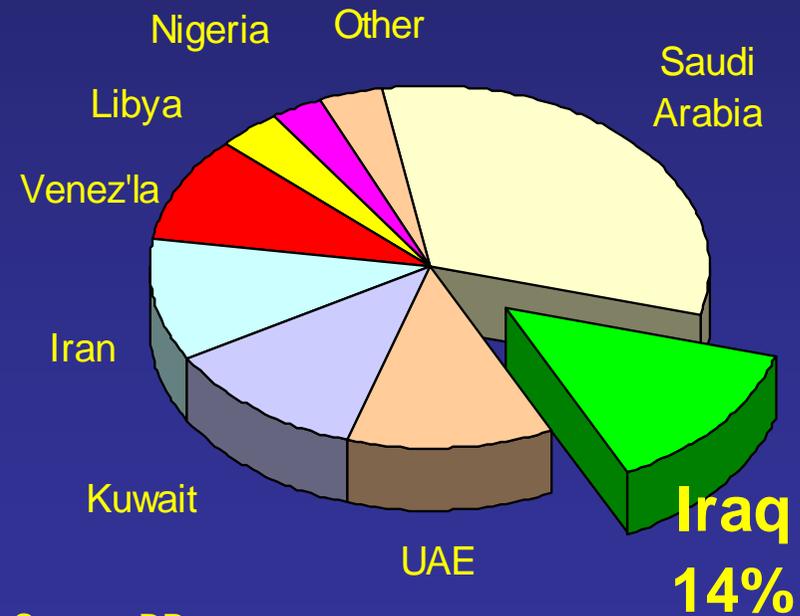
- **Proven reserves:** **112 billion barrels**
- Probable reserves: 100 billion barrels
- Proven + probable + possible reserves: 300 – 400 billion barrels

**World's Proven Oil Reserves**



Source: BP

**OPEC's Proven Oil Reserves**



Source: BP

# Production History

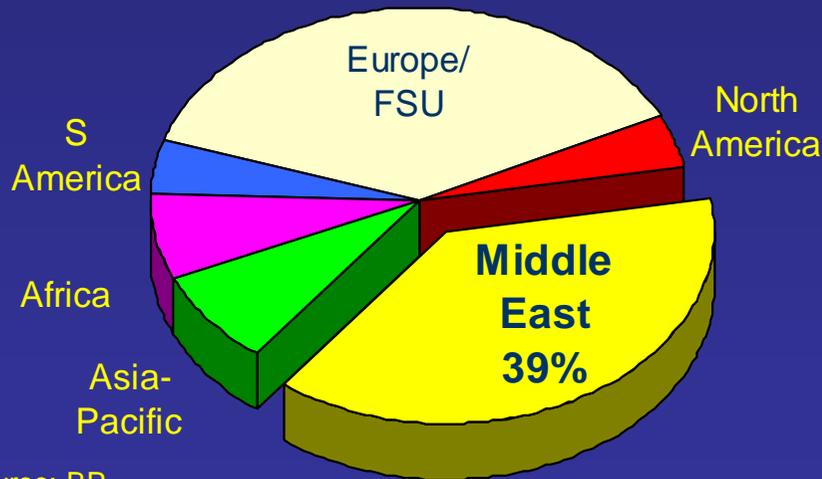


Source: MEES/BP

# Gas Reserves

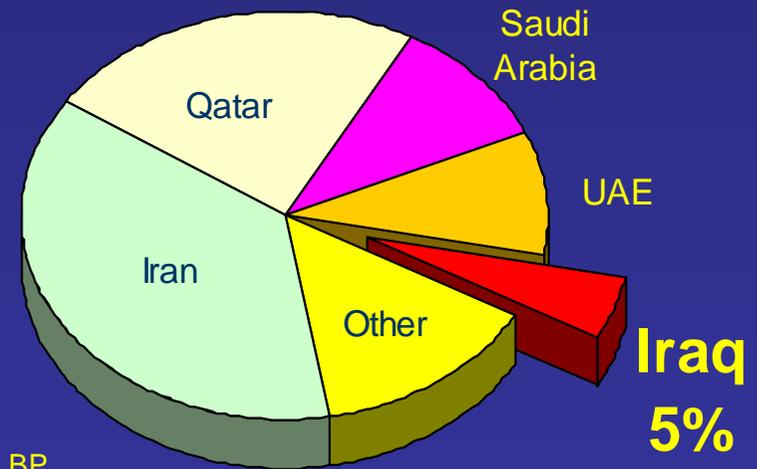
- Free gas reserves: 425 BCM
- Gas cap reserves: 460 BCM
- Associated gas 'reserves': 2,200 BCM
- **Total reserves: 3,085 BCM**

**World's Proven Gas Reserves**



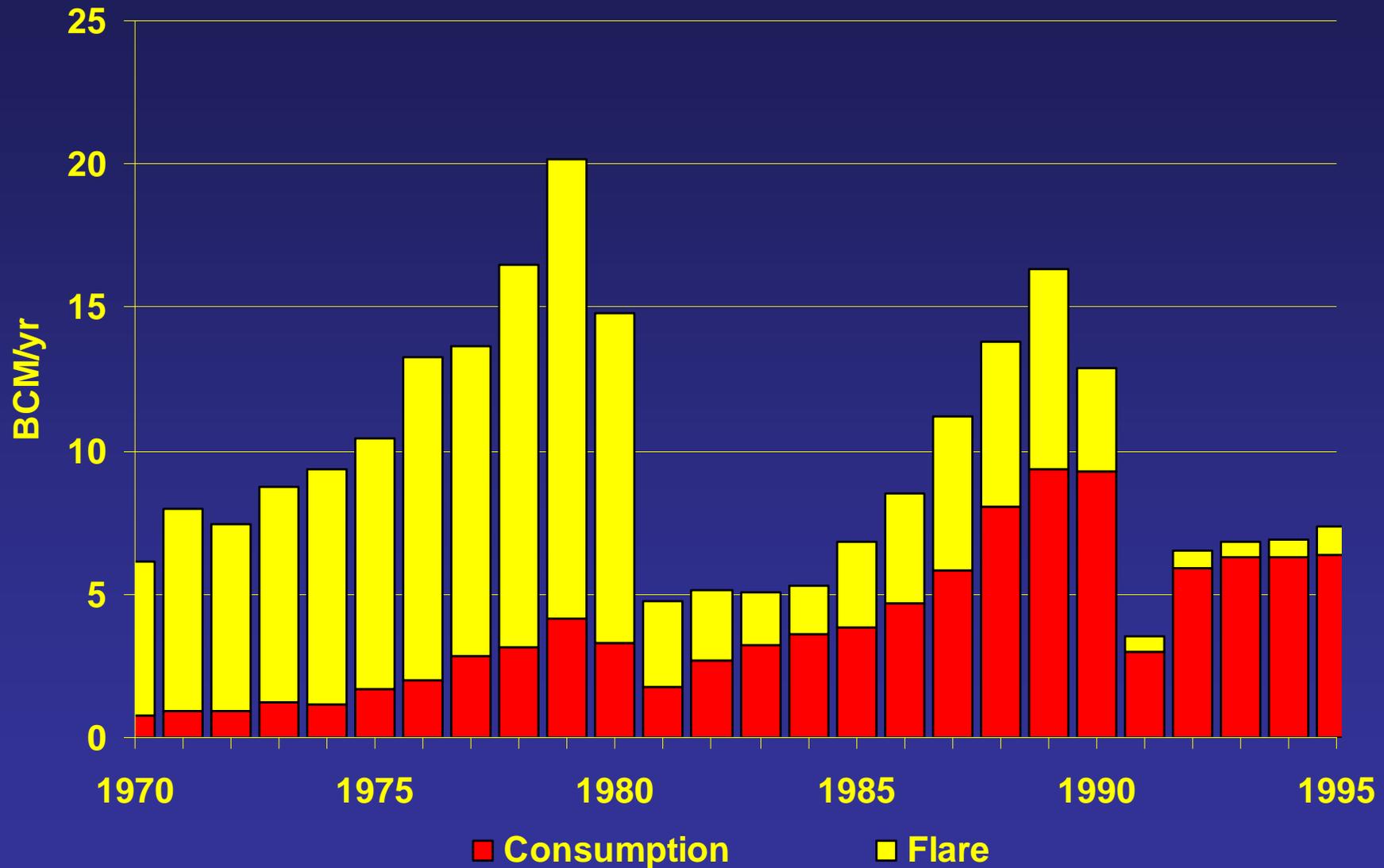
Source: BP

**Middle East Proven Gas Reserves**

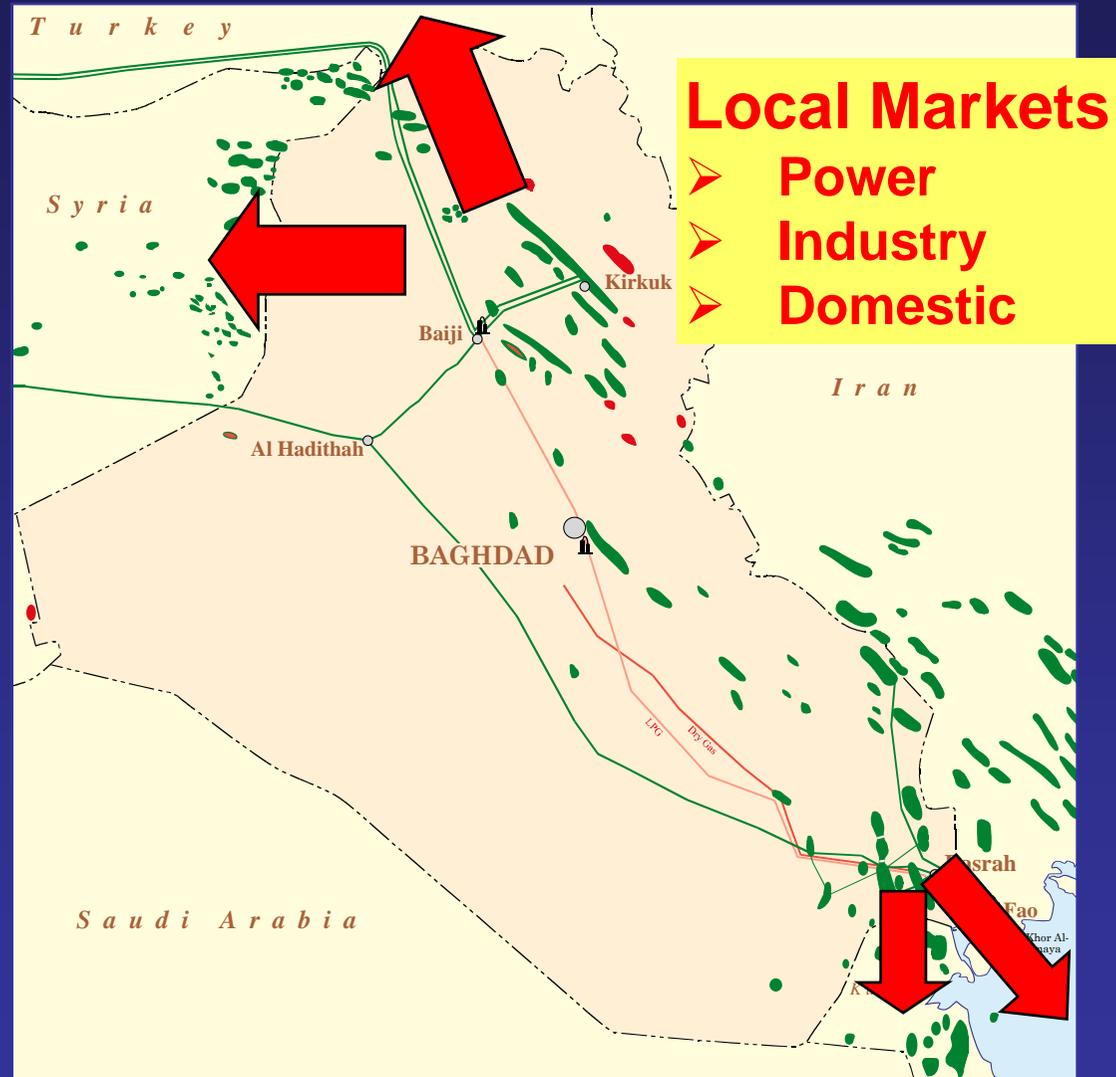


Source: BP

# Associated Gas Production



- Local markets
- Oilfield injection
- Gas export schemes to Syria, Turkey (?Europe)
- Rejuvenate Kuwait exports (reparations?)
- LPG export from the Khor Zubair terminal
- Other (?GTL)



- Little damage caused by recent war
- Much damage caused by Iran-Iraq war in south
- Significant destruction in 1991 Gulf War
- **Sanctions severely limited rebuilding and technology**
  - Lack of proper oilfield maintenance
  - Wells watering-out
  - Wellbore corrosion
  - Pipeline infrastructure not repaired or upgraded



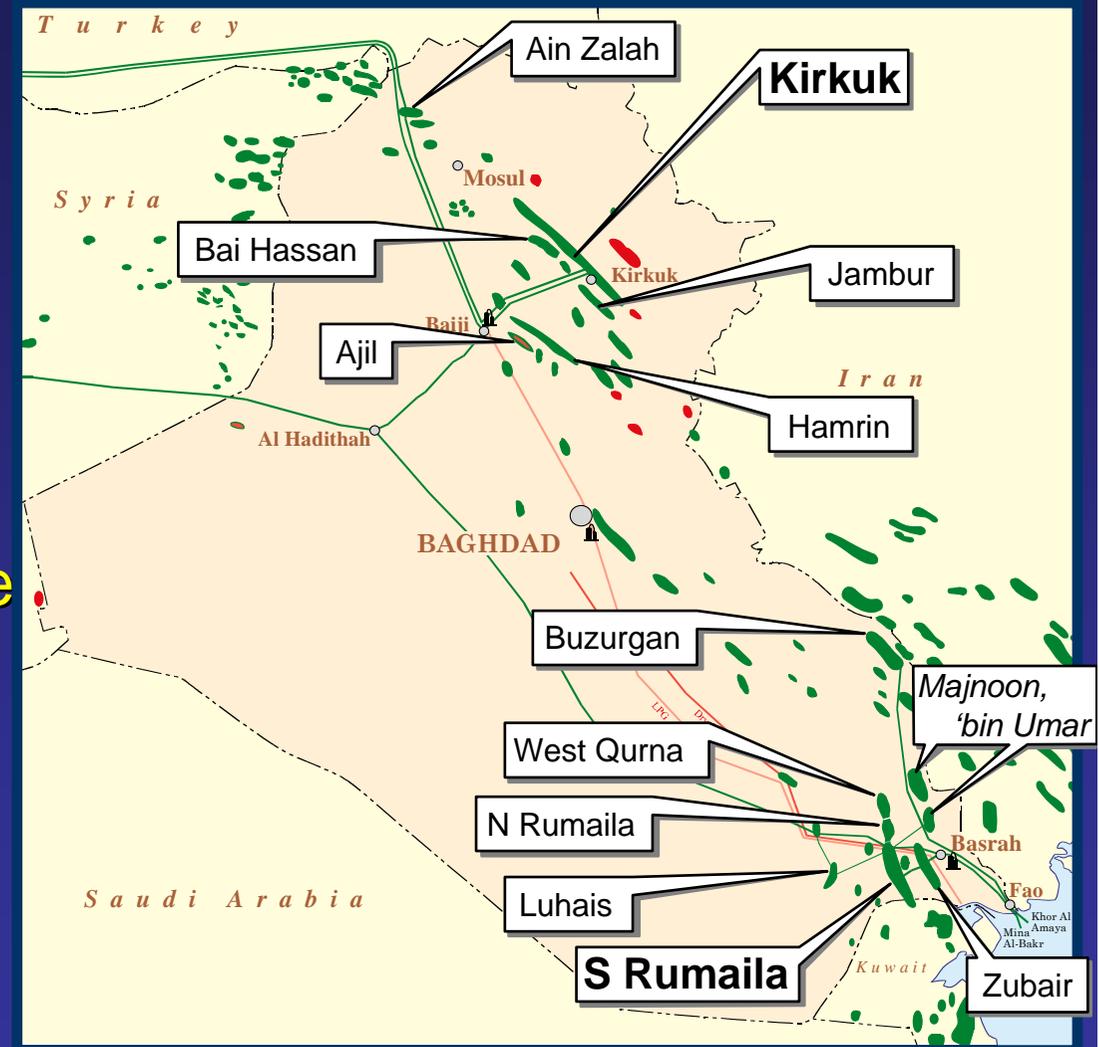
**Fao pumping and storage facilities,  
Post Iran-Iraq war, with limited rebuilding**



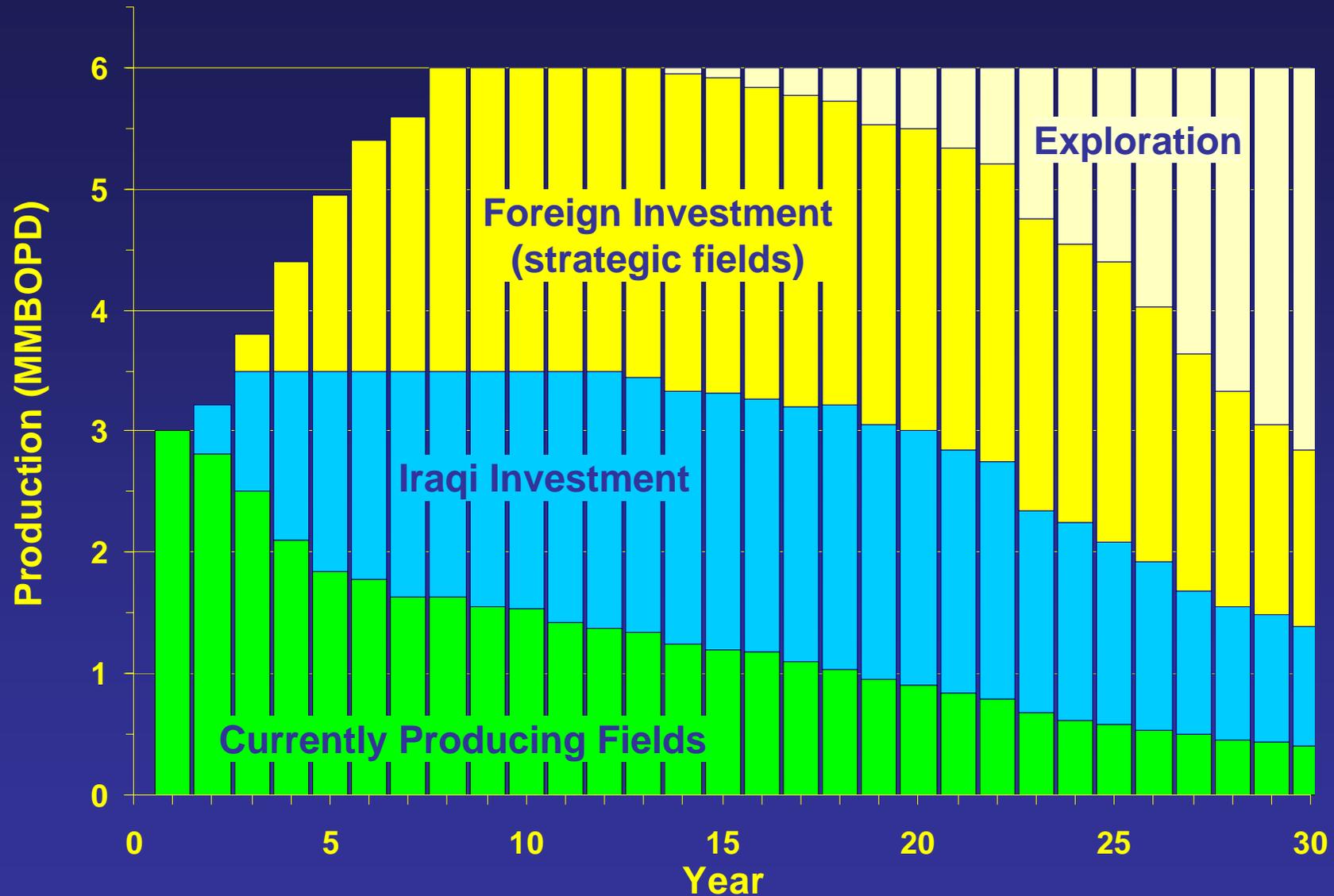
➤ **Corrosion – a major problem resulting from sanctions**

# Producing Fields

- Principal production from Kirkuk and S Rumaila
- All fields need significant rehabilitation
- All export systems require major improvement
- Gas (and Power) infrastructure inadequate

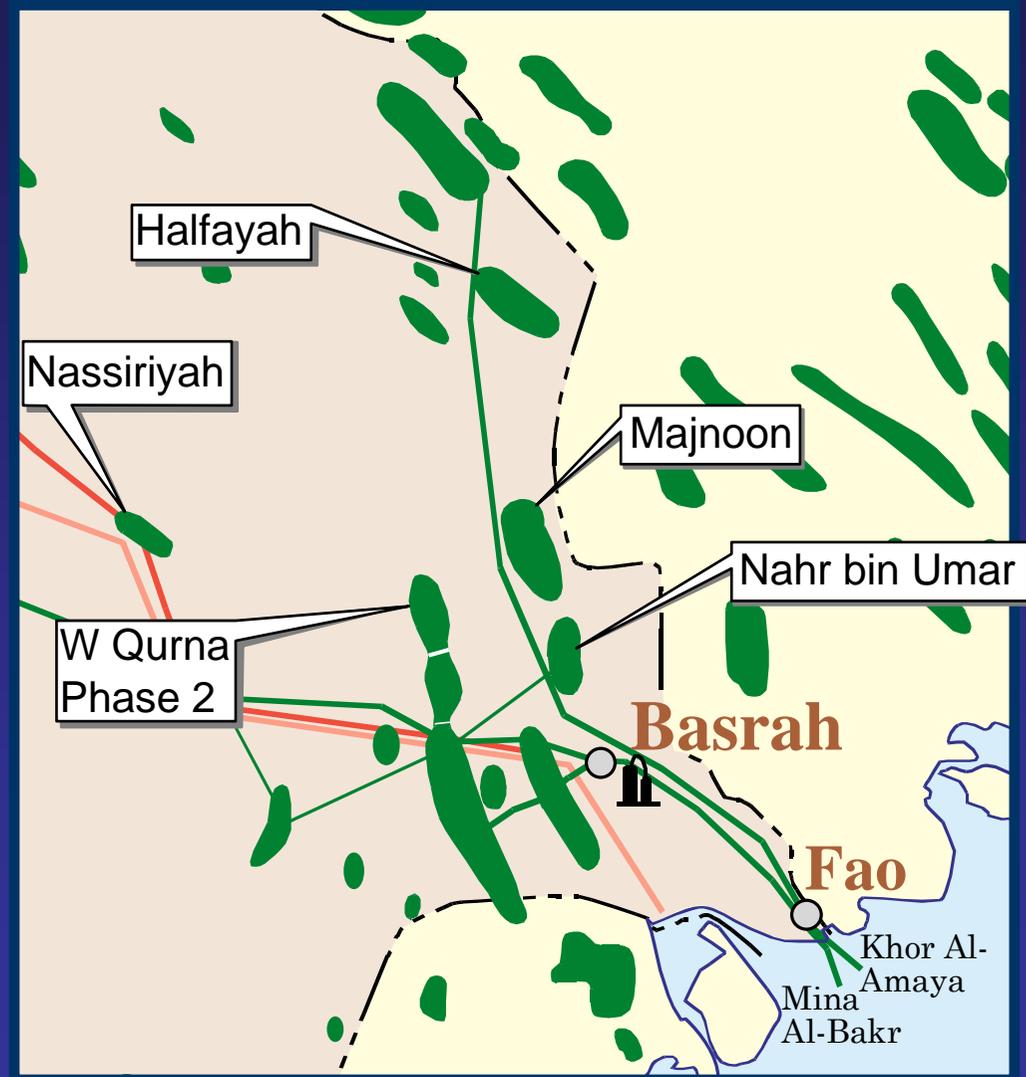


# Ministry of Oil Former Plans

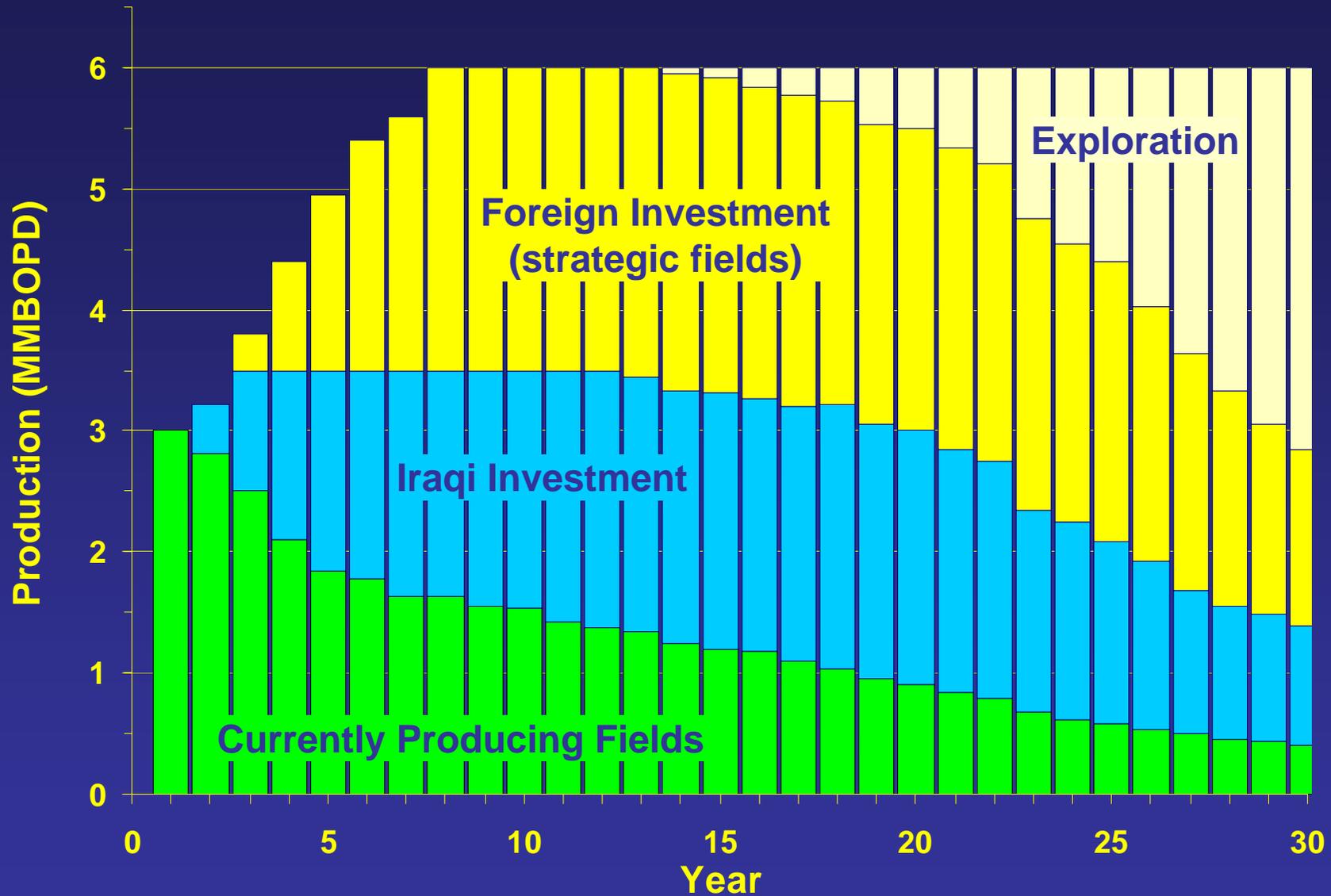


# Strategic Oilfield Developments

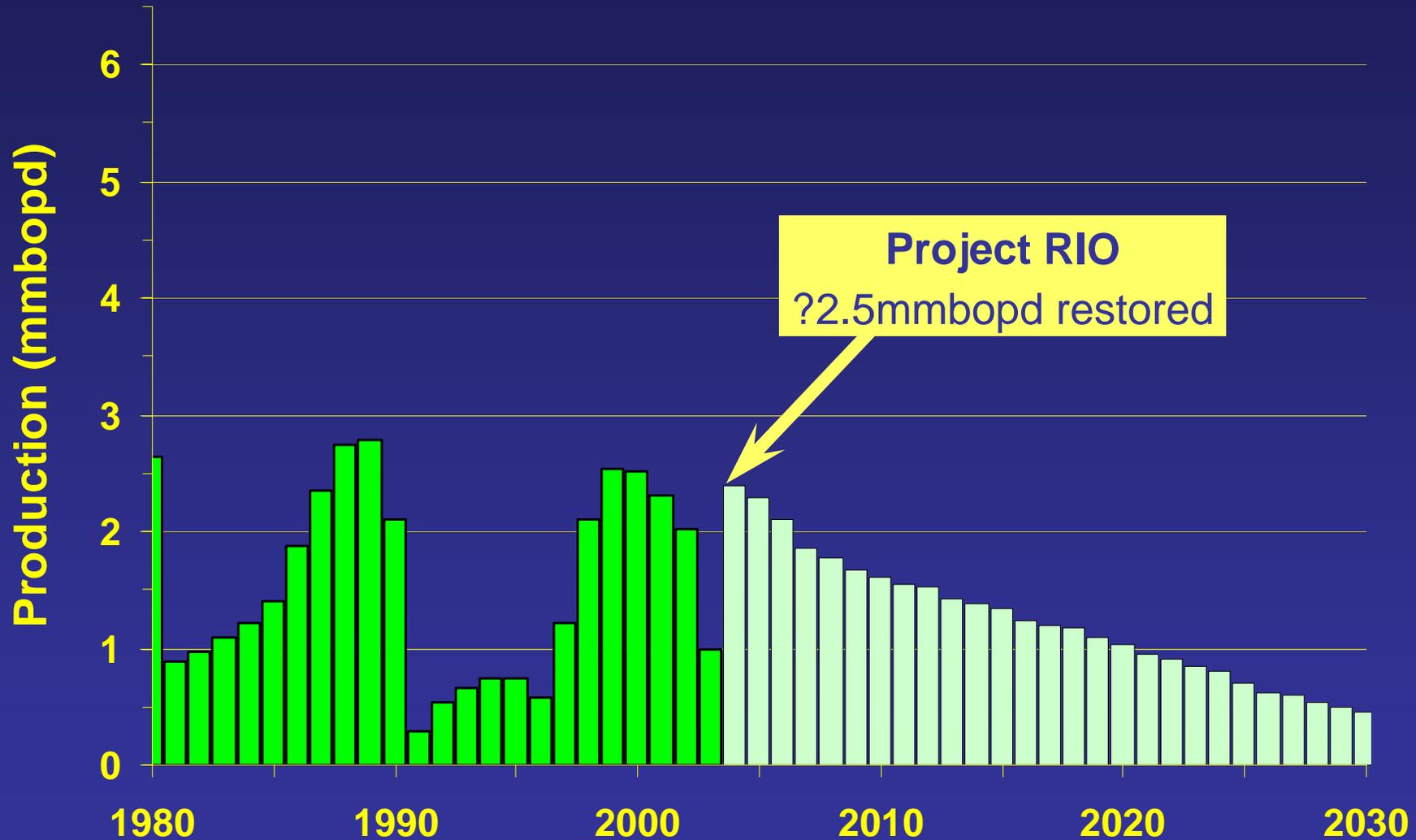
- Five strategic fields
- Plateau production potential in excess of 2.5 mmbopd



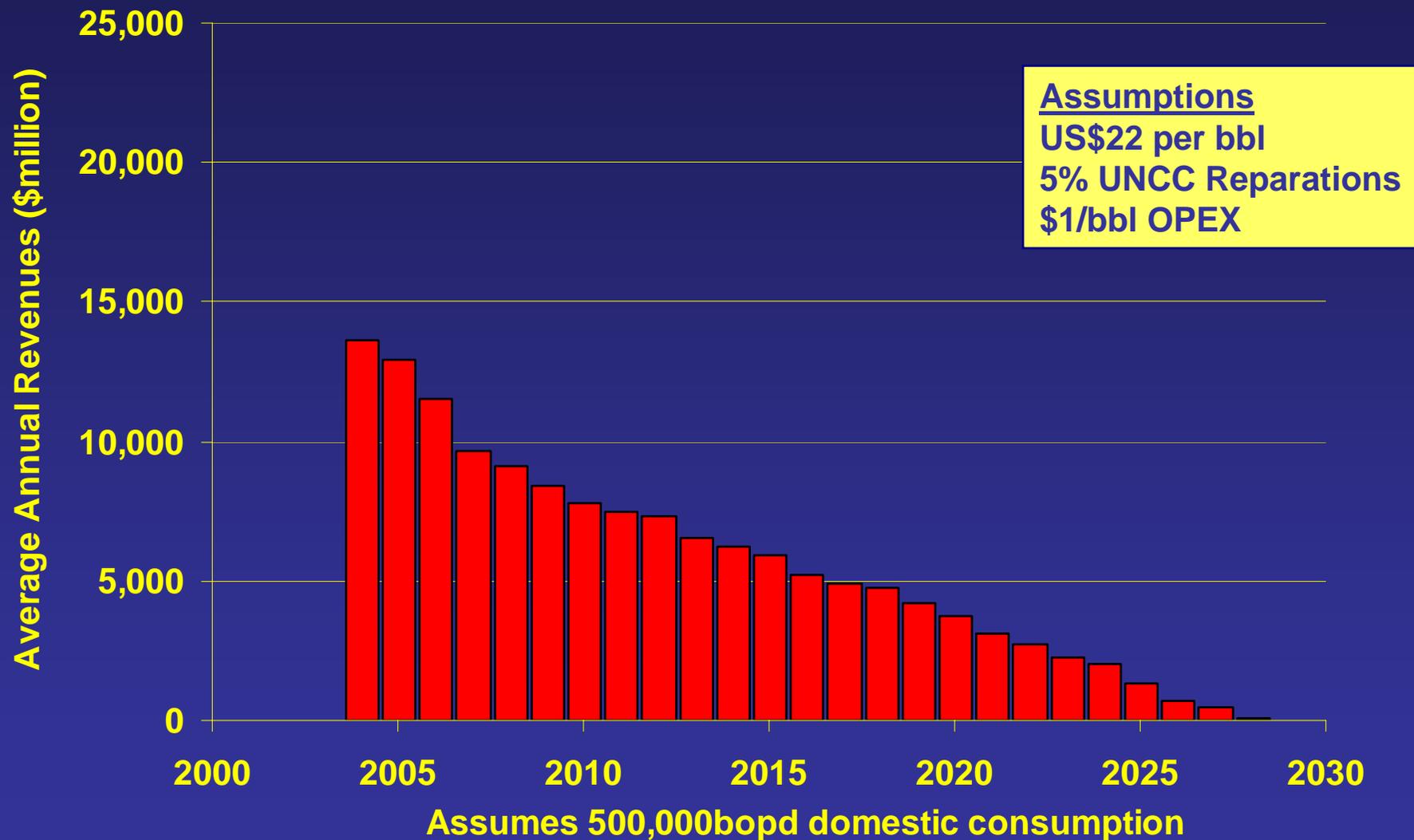
# Ministry of Oil Former Plans



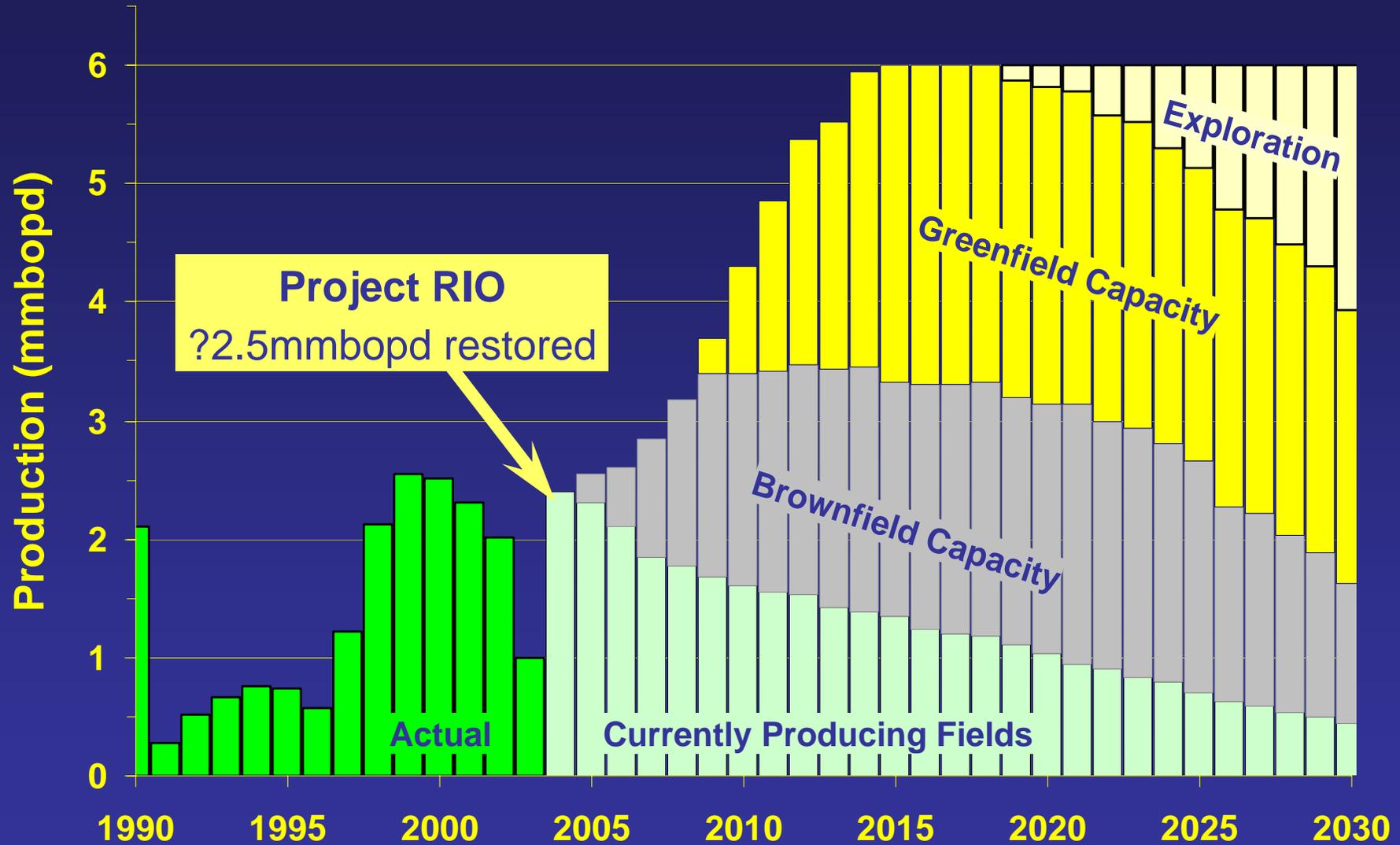
# *Forward Production Currently Producing Fields*



# Annual Revenues Currently Producing Fields

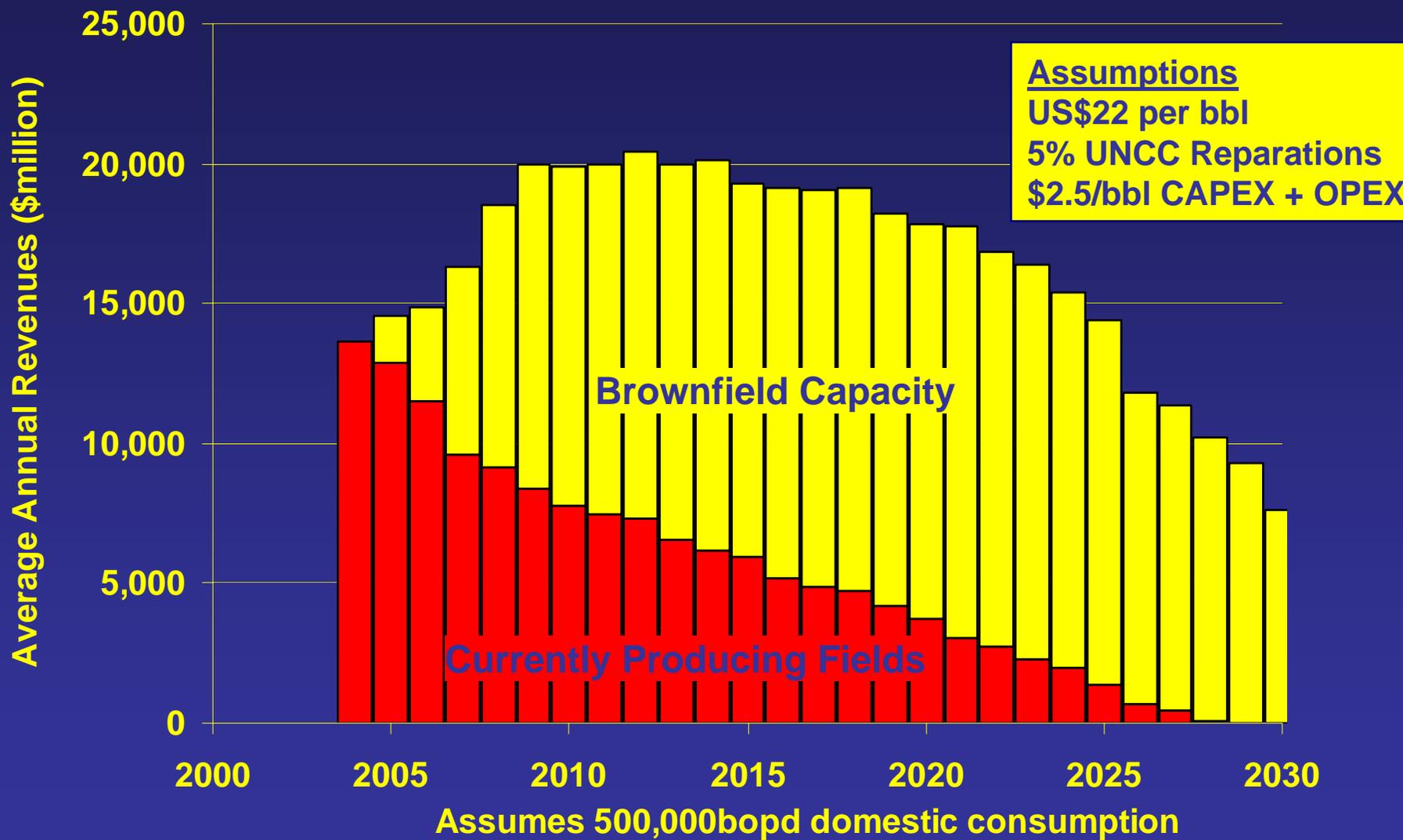


# Forward Production Best Case

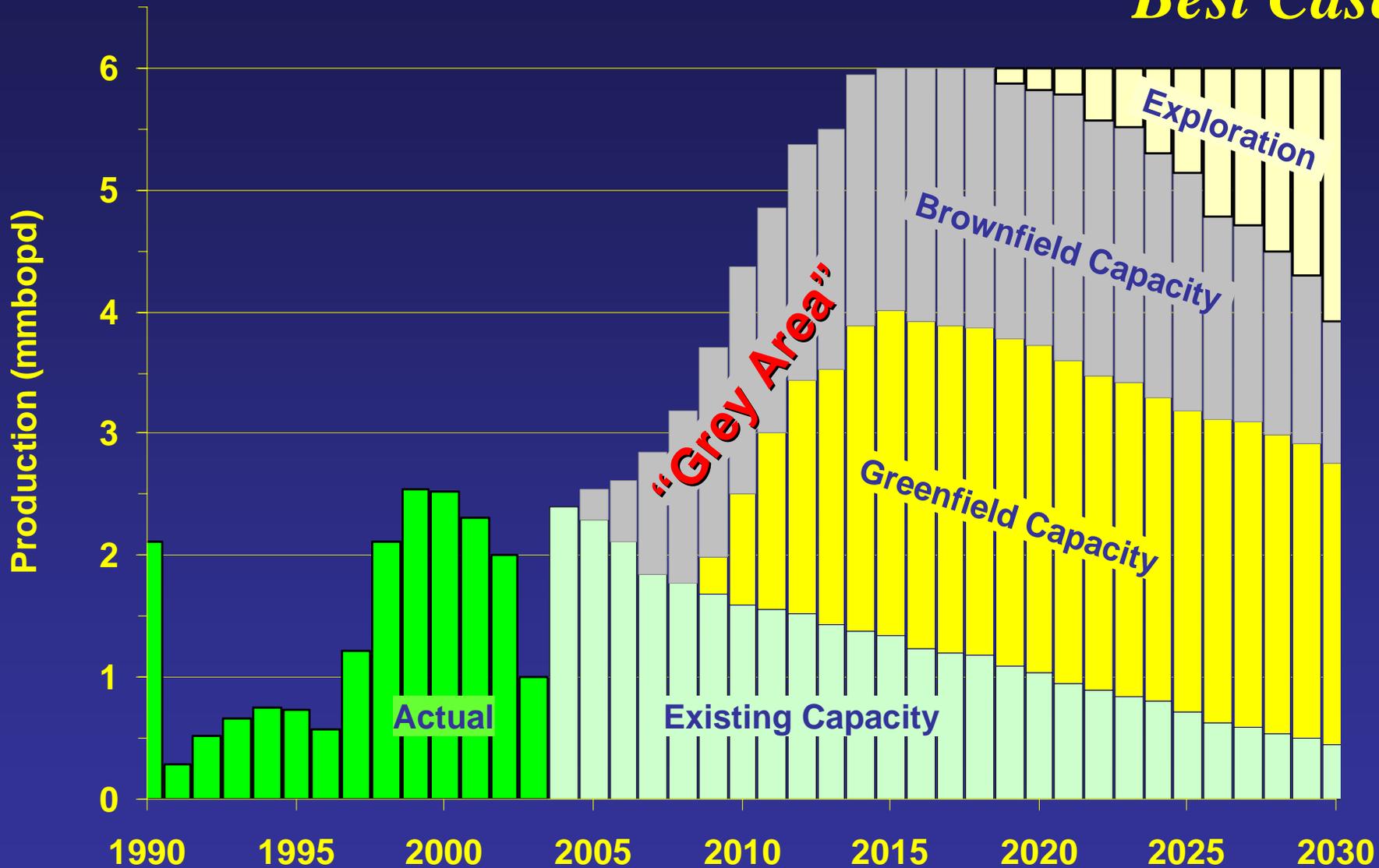


# Projected Net Export Revenues

## Best case



# Forward Production Best Case



- Iraq's Oil and Gas reserves are potentially enormous.
- Most damage caused by international sanctions:
  - Production suffered from lack of modern oilfield technology and proper reservoir practises.
  - Little replacement equipment
- Substantial budget deficit without foreign investment:
  - Arrest decline and expand existing production (brownfield)
  - New production (greenfield)

**The challenge ahead is for security,  
peace and the development of investor  
confidence.**

**The Iraqi people deserve this.**

