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Extractive Industries and Sustainable Job Creation

Innovation and Technology Transfer in Exploration &Production Industry in Sudan

By

Abdelmajed Mansour Abdelmajed
Development Manager
Oil Exploration and Production Authority (OEPA), Ministry of Petroleum & Gas, Republic of Sudan

The views expressed are those of the author and do not necessarily reflect the views of UNCTAD.

Republic of Sudan
Ministry of Petroleum & Gas
Oil Exploration and Production Authority (OEPA)

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CONFRERENCE AND EXHIBITION
SUDAN 2015

Presented by: Abdelmajed Mansour Abdelmajed

Outlines

1. • Objectives
2. • Background
3. • Overview of Sudan O&G Industry
4. • New Regime for Innovation
5. • Way Forward

Objectives

- To improve **innovative spirit** to assure the link between research-development, oil and gas industry.

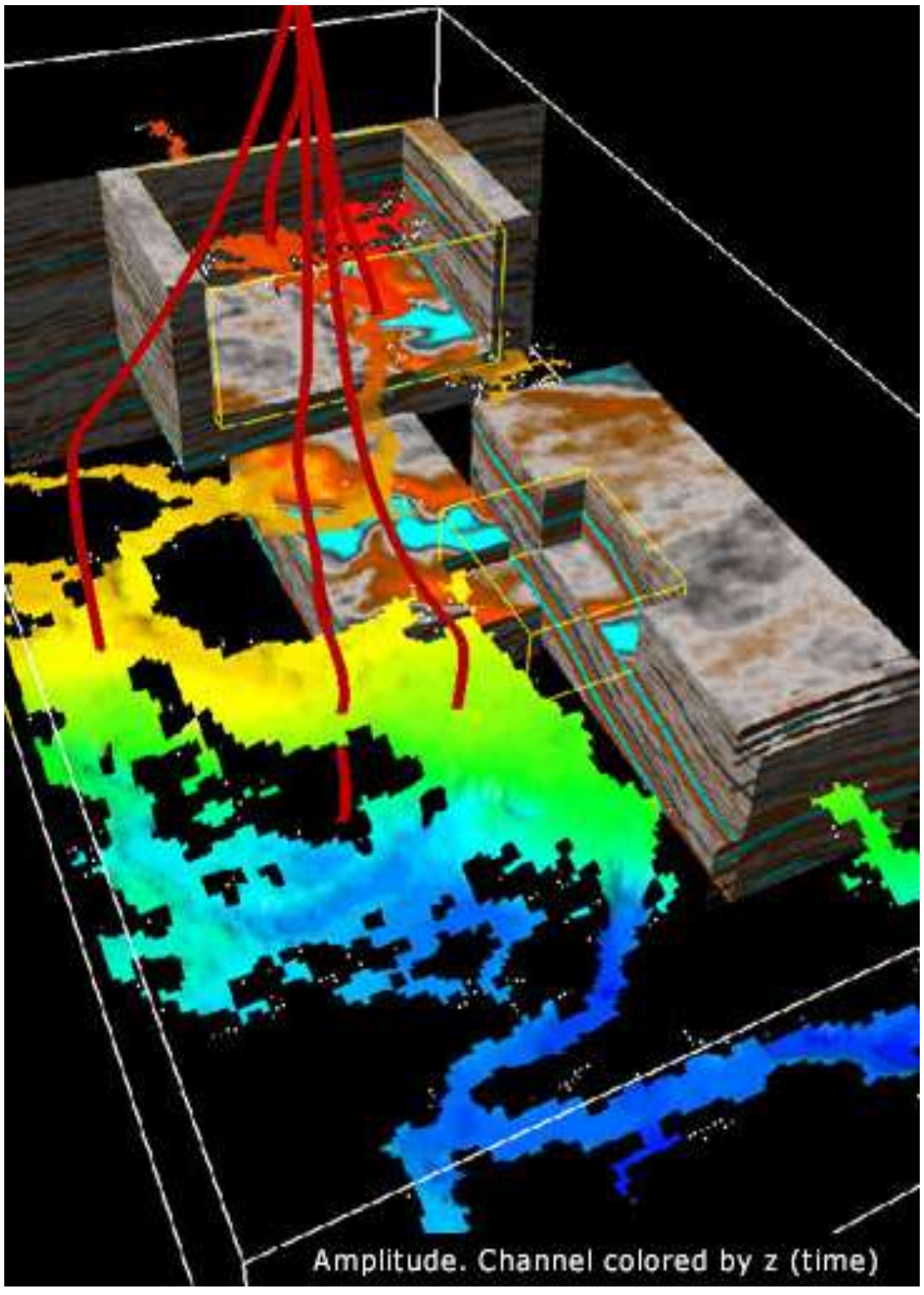
- To institute an intelligent, sustainable and **competitive economy** through involvement of all the actors in the innovation cycle.

- To assure the innovative ideas can be turned into products and services to grow the **competitiveness and jobs**.

- To look at a new regime for Innovation and **Technology transfer** in Sudan oil and gas industry

Background

O&G Industry is Technologically One of the most Advanced

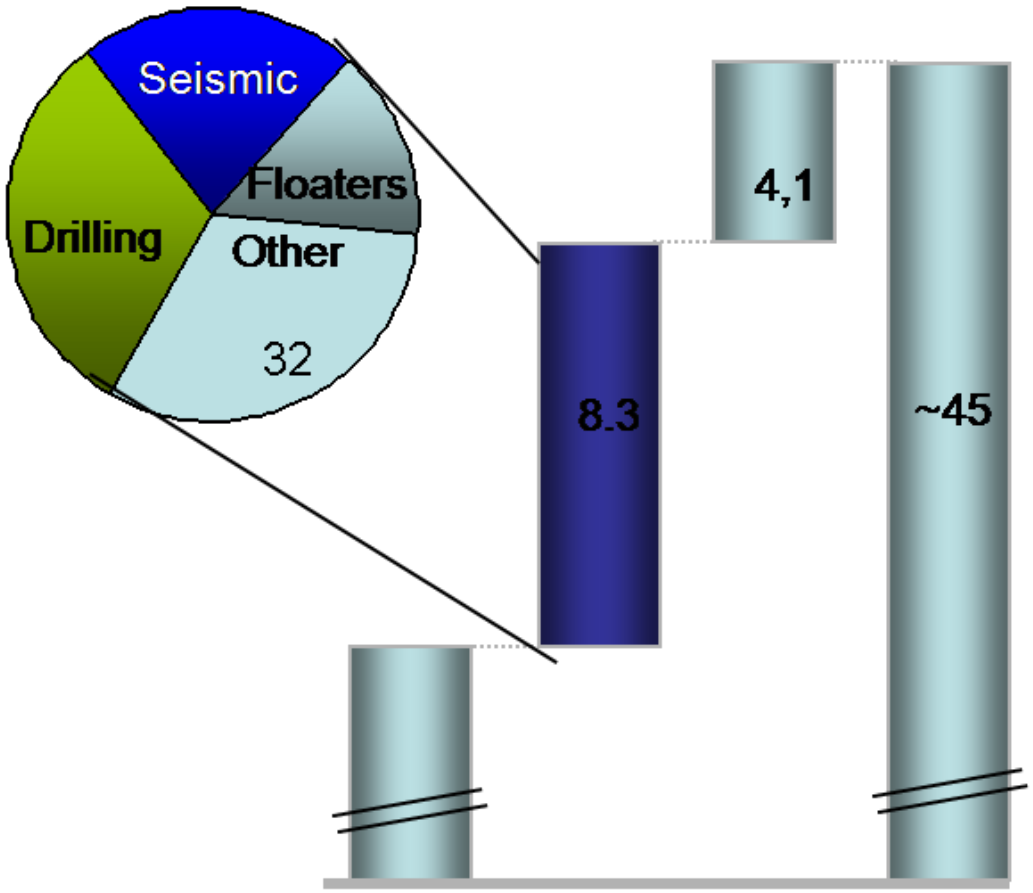


- The O&G industry at the leading edge of many technologies.
- It was the key driver behind the explosive growth in 70's and 80's…
- New technologies (e.g. 3D Seismic, Horizontal wells,) fully Penetrated the market in the '90s.
- Today it continues to integrate advanced Software, Material Science and Computerized.

New Technologies Created Significant Value in the Industry

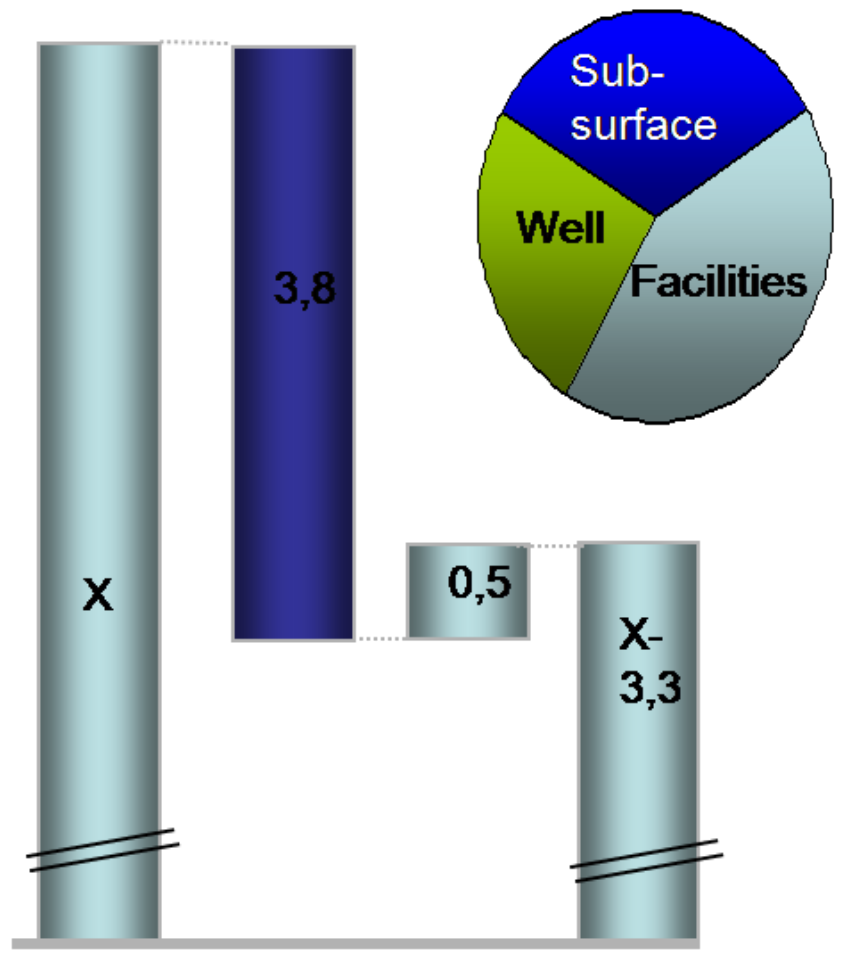
EU study: Reserves gains 1990-1997

8.3 Billion BOE oil and gas reserves in UK, Norway and Denmark



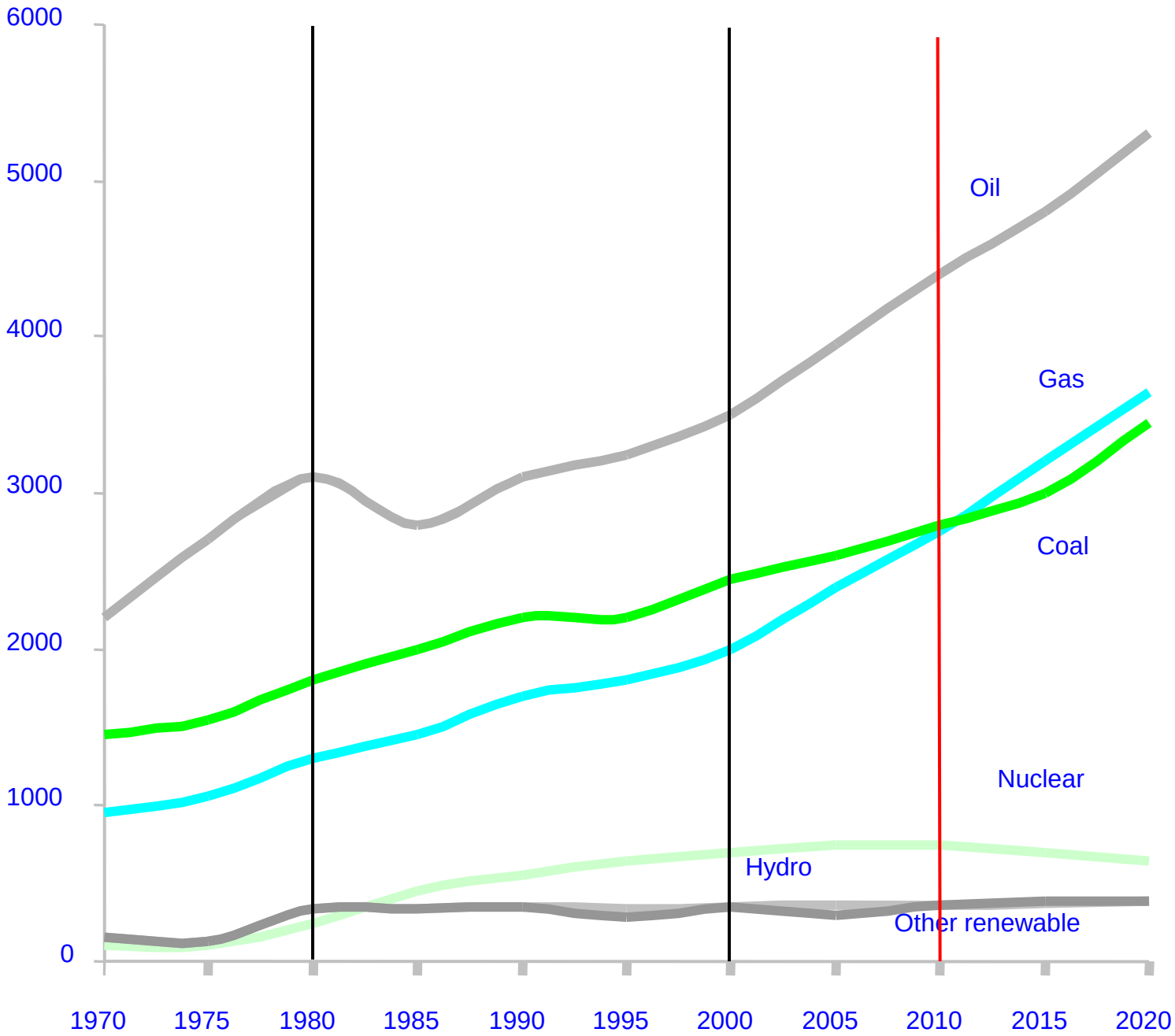
Shell study: Total pre-tax benefit in 5 Shell units

3.8 US$ billions (1991-1993)

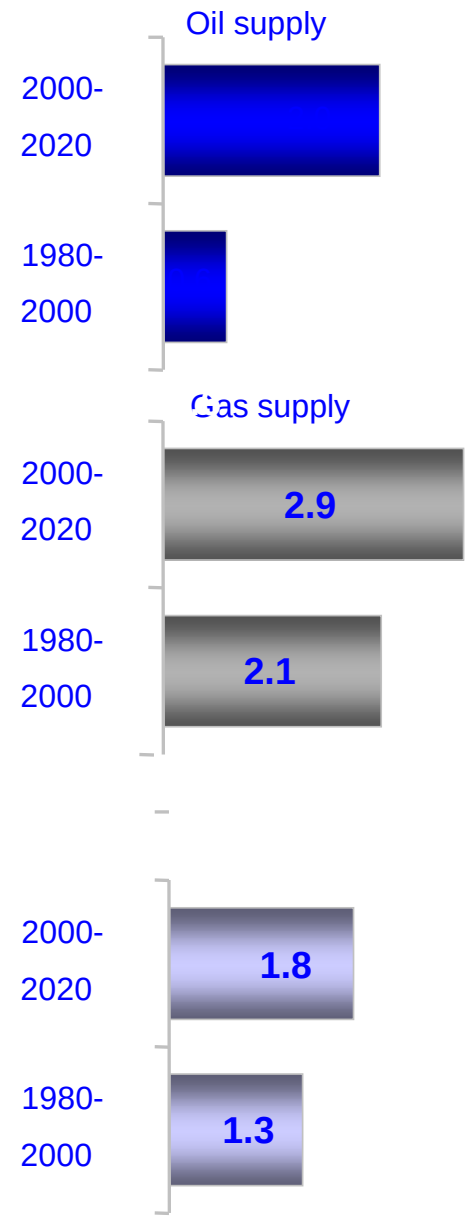


Oil and Gas Supply Prediction

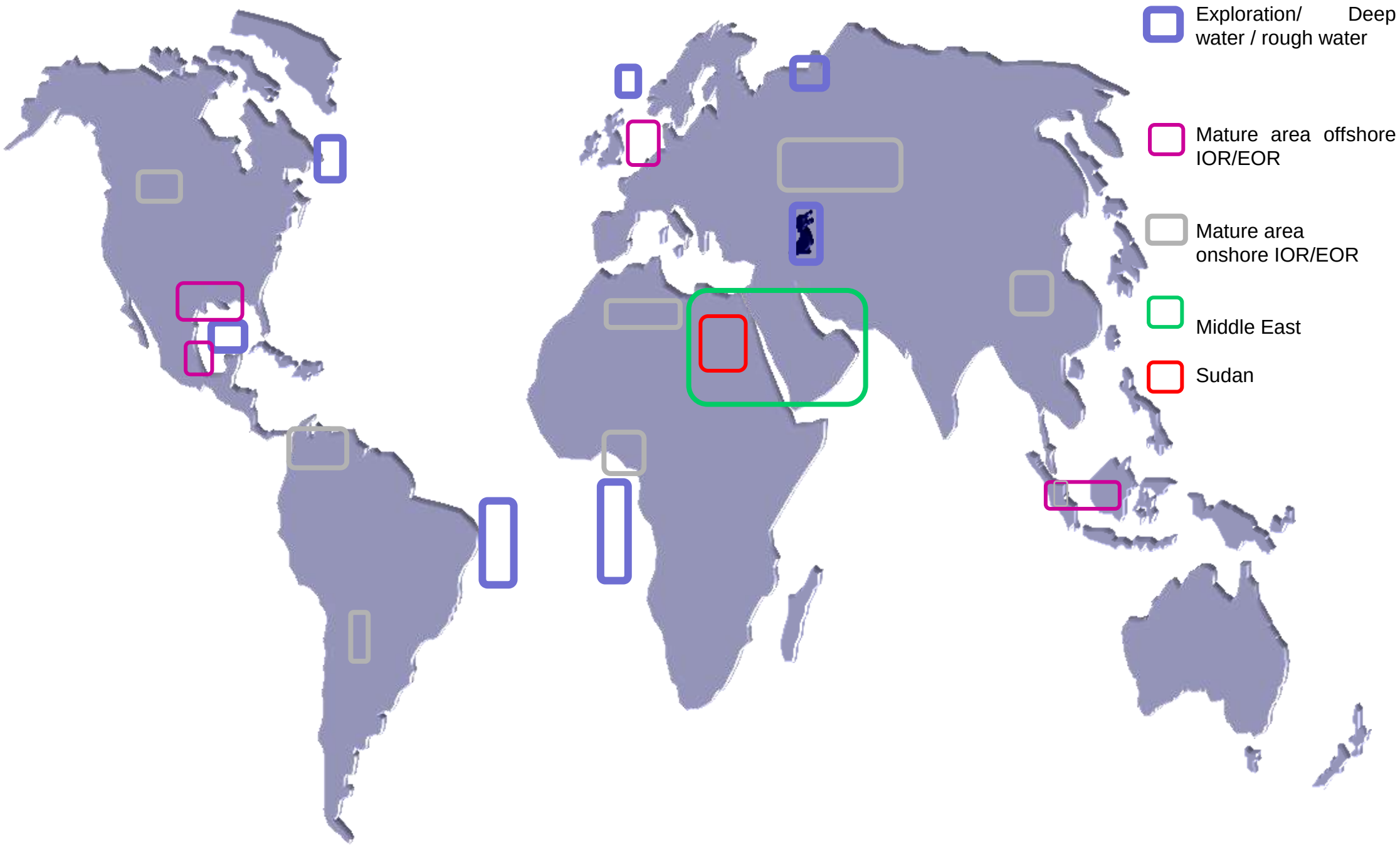
World energy supply (Mtoe)



Average annual growth rate (%)



Oil & Gas Technology Growth Areas



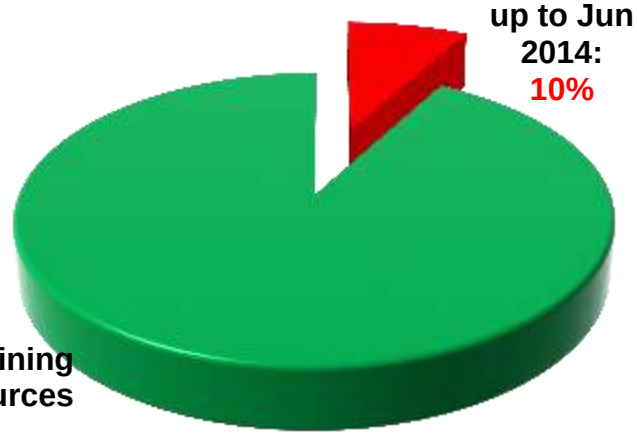
Growing Environmental Concerns with New Technologies

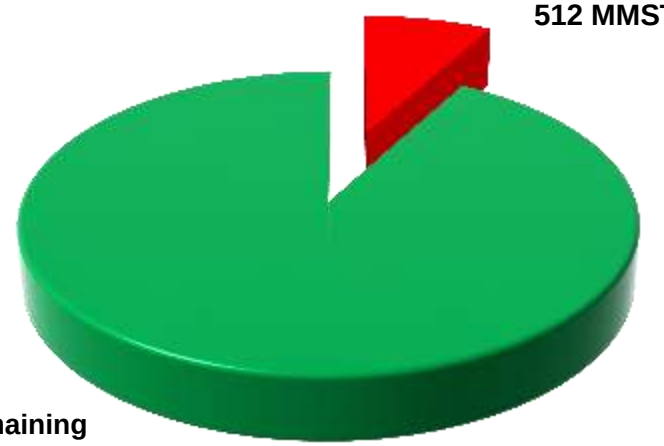
Continuing technology advances are essential for meeting expanding energy needs and reducing its environmental impact

- **Reduce CO_2 emission, including gas flaring**
- **Reduces oil to water ratio**

- **Gas re-injection technologies**
- **Water re-injection technologies**

Overview of Sudan O&G Industry





GNPOC
Block 1,2,4
Daily Prod. 52 KBPD

Petro- Energy
Block 6
Daily Prod. 50 KBPD

Staroil
Block 17
Daily Prod. 8 KBPD

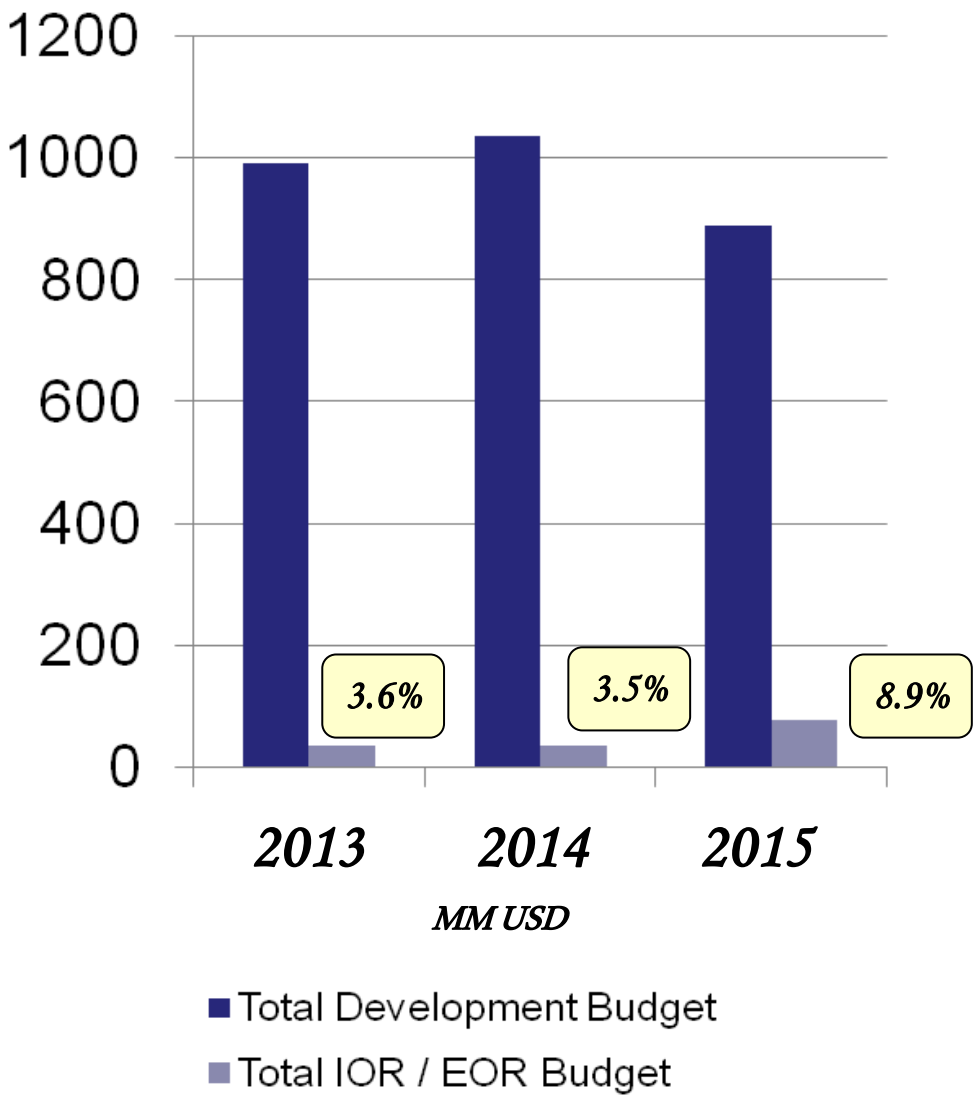
- **2 Exploration EPSAs and 18 Open Blocks**
- **5 JOCs operating a total of 5 EPSAs**

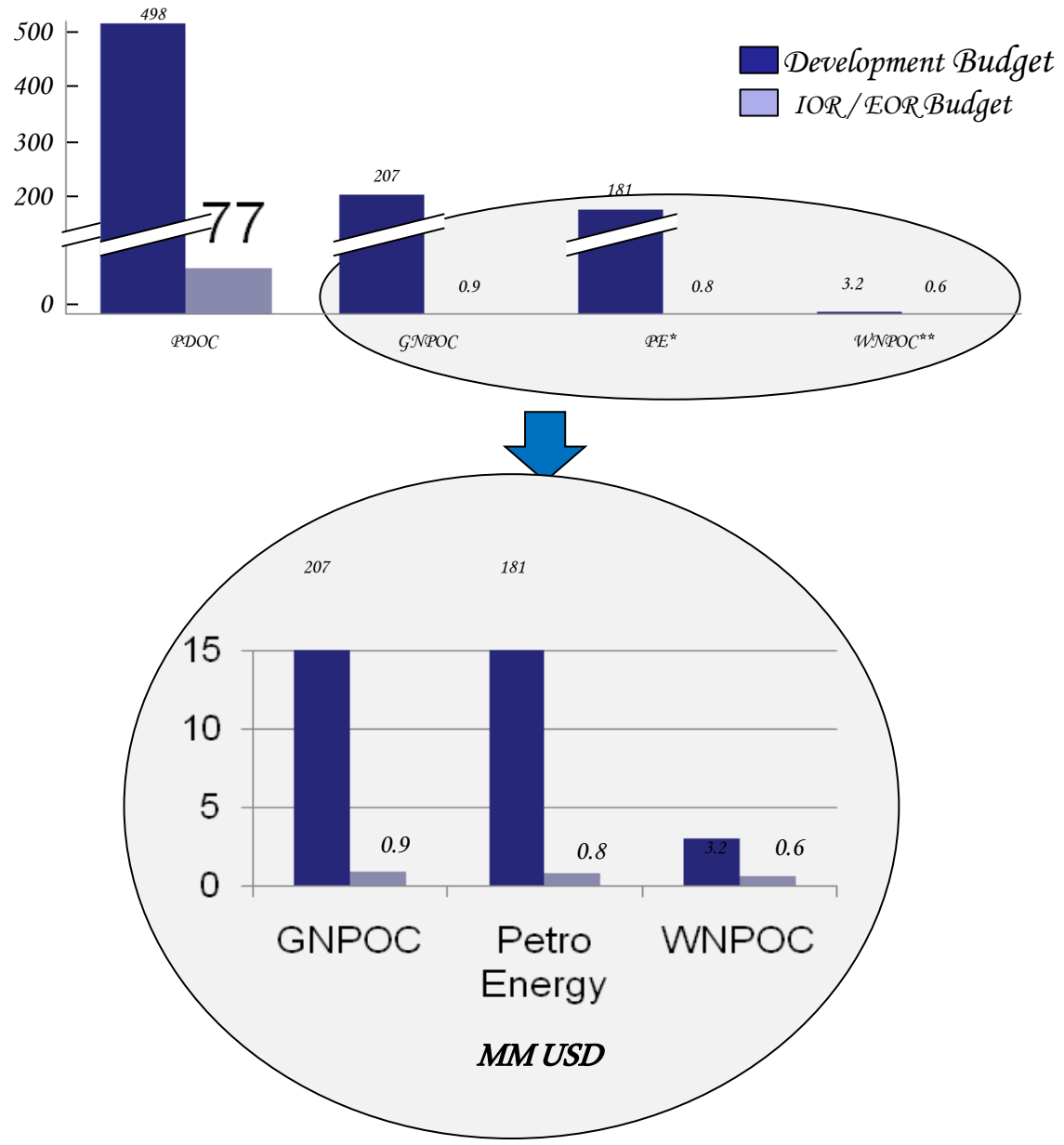
- **Total STOIIP is 5 Billion STB**
- **Average calculated RF 24% is considered low**
- **Recovery factor up to date 10%**
- **Reserves over 660 MMSTB**

Enhance Oil Recovery Activities

CONSOLIDATED DEVELOPMENT AND IOR / EOR BUDGET FOR ALL JOC'S.

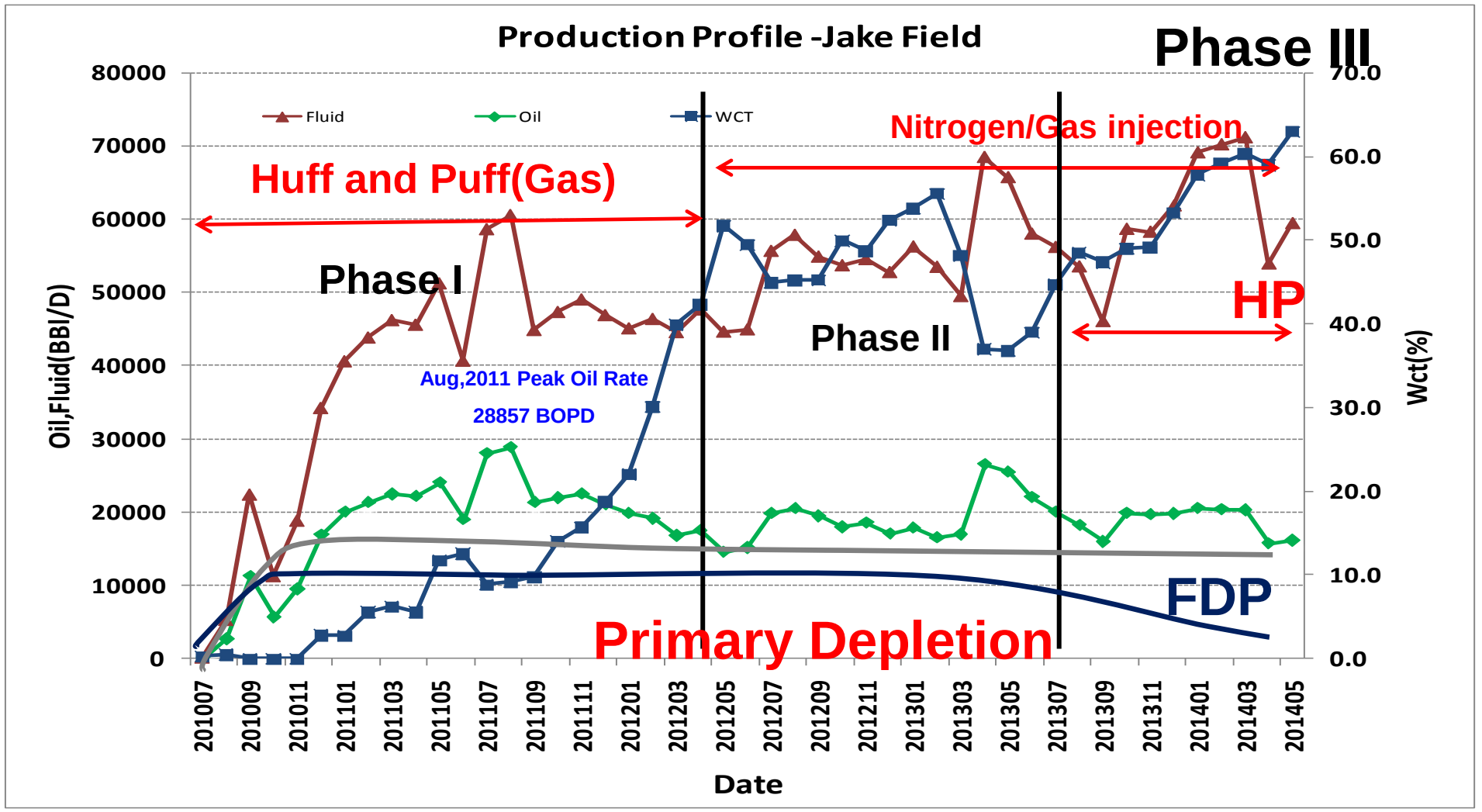
'Million $





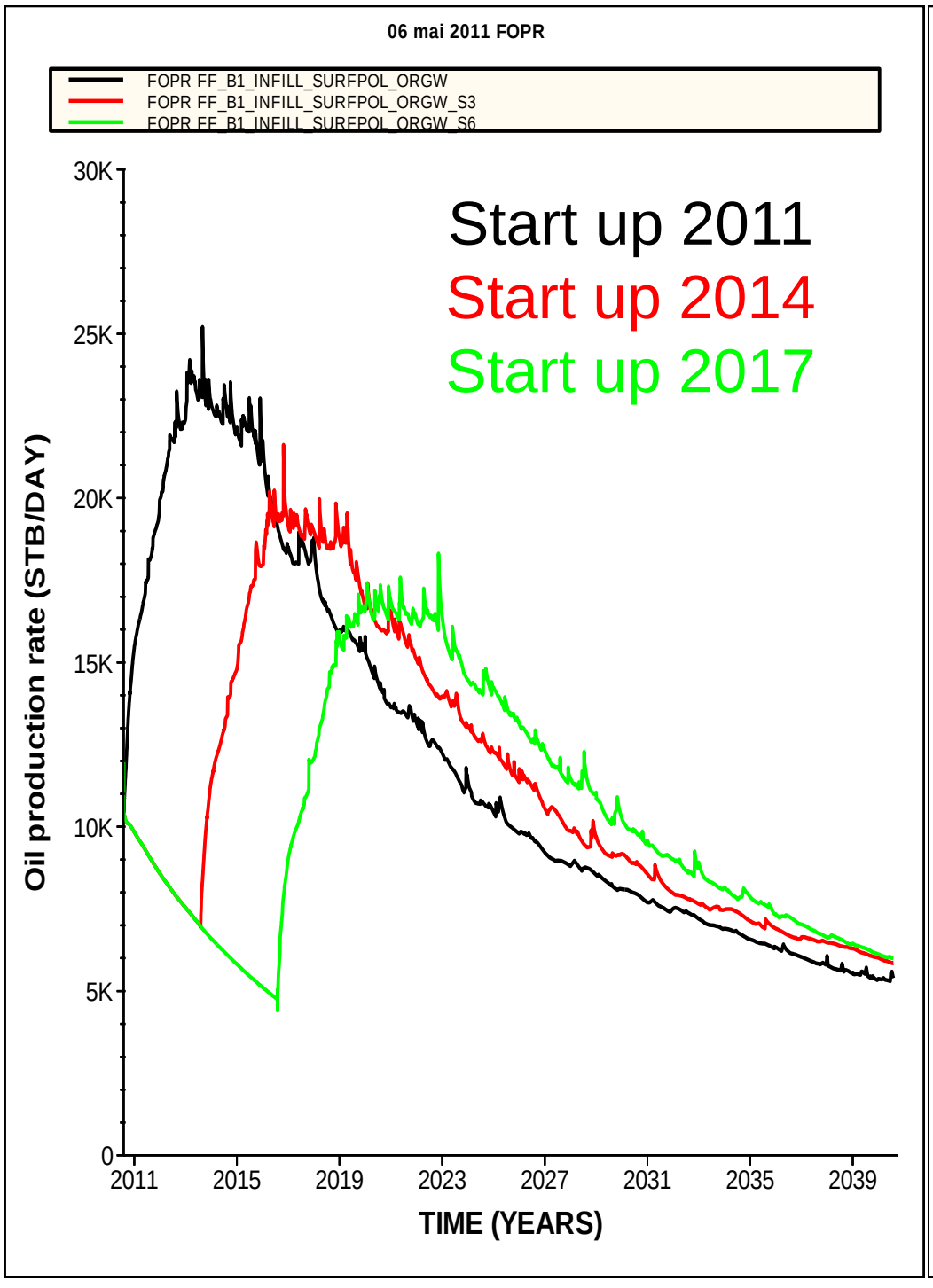
Nitrogen Injection in Jake Field

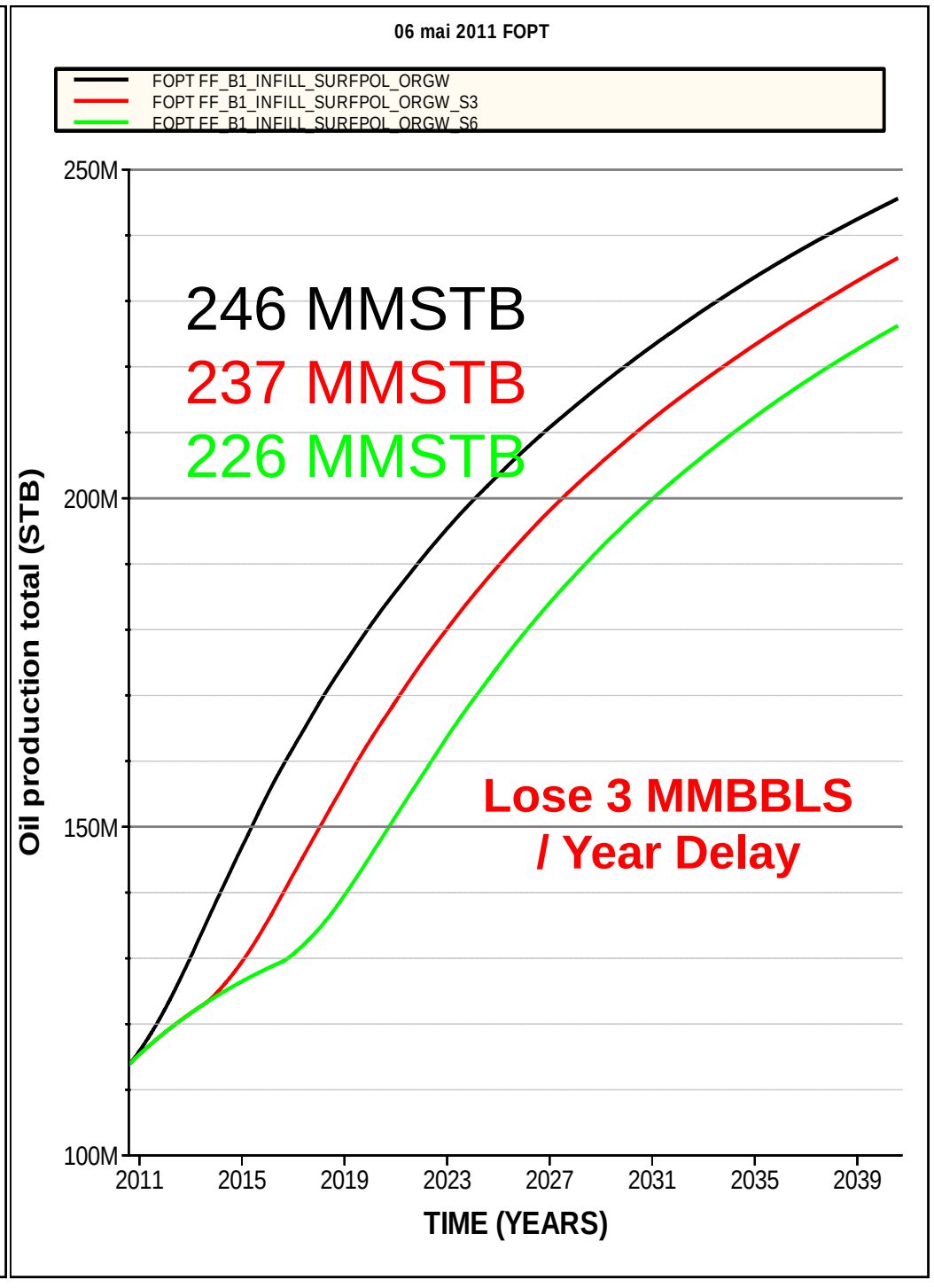
Jake Field



- Start of Production: July 2010(Gas injection plus gas lift).
- Nitrogen Injection: 2012.
- Oil rate:14,000 BOPD Water cut: 55.7%, Cum oil: 30.1 MMbbl,
- RF to date: 20%

EOR Delay Effect in Heglig Field





Major Challenges faced O&G industry in Sudan

- Medium to low exploration success ratios
- Unconventional plays
- Low oil recovery factors
- Lack of advance petroleum services
- Gas Development
- High UDC & UPC costs
- Lack of Innovation

Joint Research & Development Project

PRLS

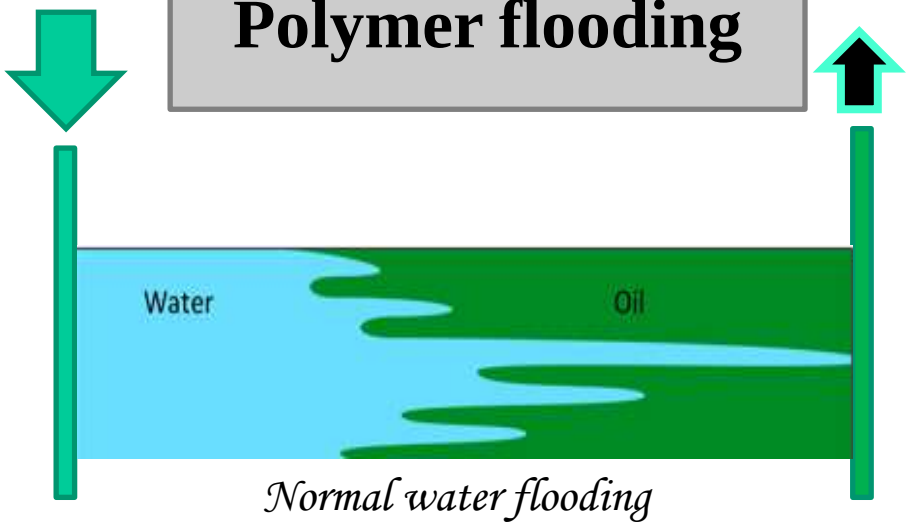
Research Project:

Guar and Arabic Gums Properties Improvement for Potential Use in EOR & Sand Control in Sudanese Oil Fields

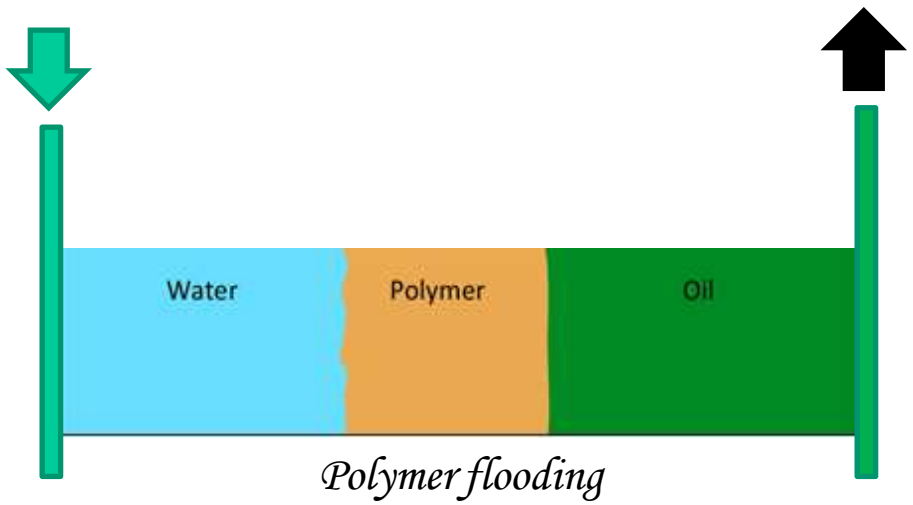
Project Overview

Guar and Arabic Gums Properties Improvement

Polymer flooding

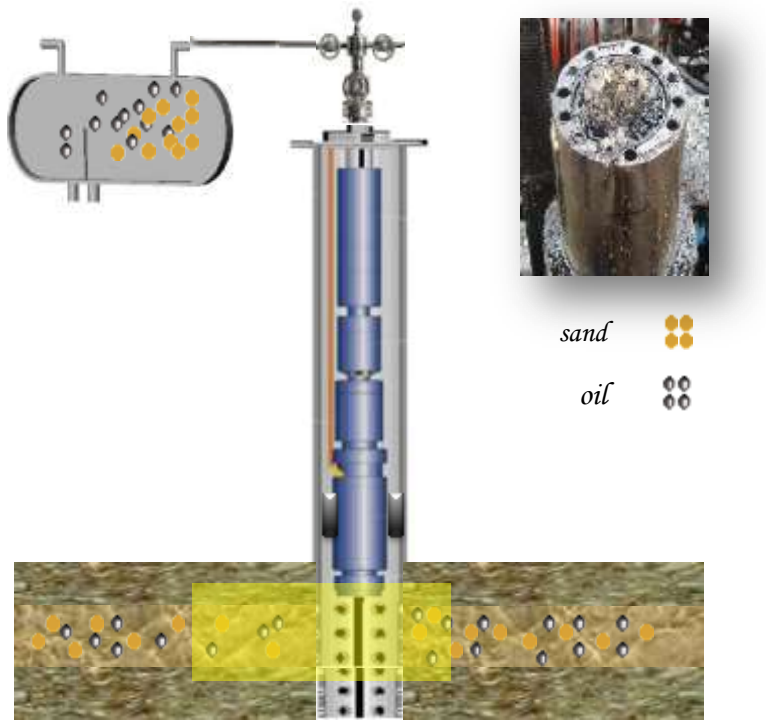


Normal water flooding



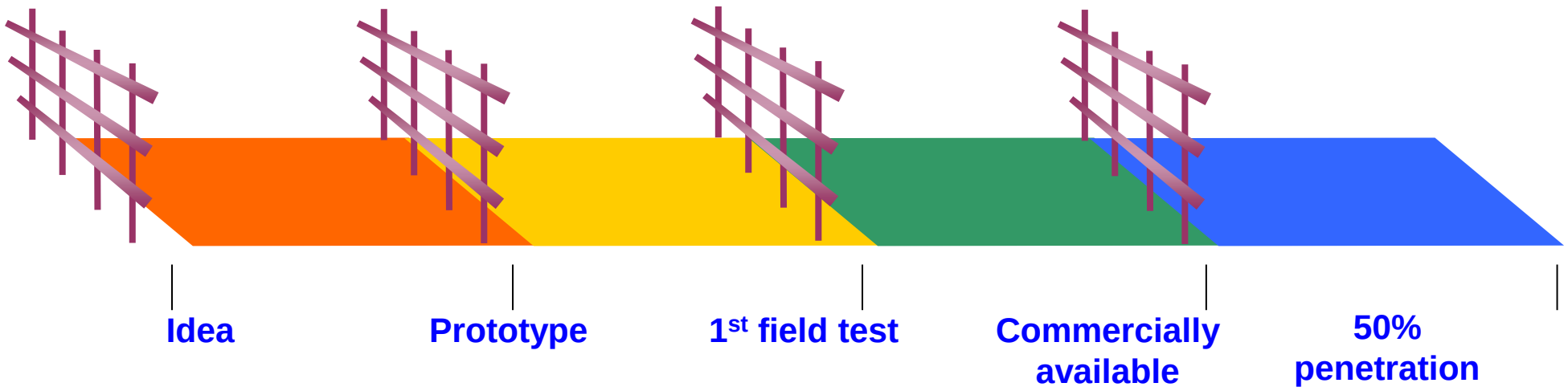
Polymer flooding

Sand Consolidation



We proposed to use natural gum (produced in Sudan) to consolidate the sand without preventing oil of being produced

Barriers to Technology Development

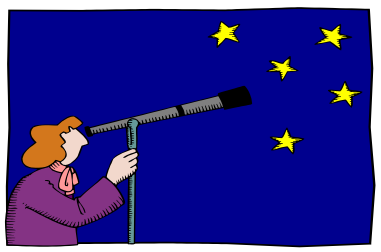


Barriers

- Weak understanding of strategic rationale for being technology leader
- Lack of stability in funding
- Lack of incentives
- Organisational conservatism and risk averse approach to technology decisions
- Insufficient cooperation with technology suppliers

Barriers Impede the four Key Drivers of Technology in Sudan

Strategy



Less strategic/holistic perspective

- *Lack of companies taking the "Risk" - Easy to be fast follower*
- *Lack of government R&D strategy*

Funding

Lack of stability in funding

- *Especially difficult to fund "field test phase" – none take the responsibility*

Organisation

Organizational conservatism and risk aversion in technology decisions

- *Cost Cut used as a reason for rejecting new technology*
- *Lack of openness for external ideas*

Sourcing

Insufficient cooperation with technology suppliers

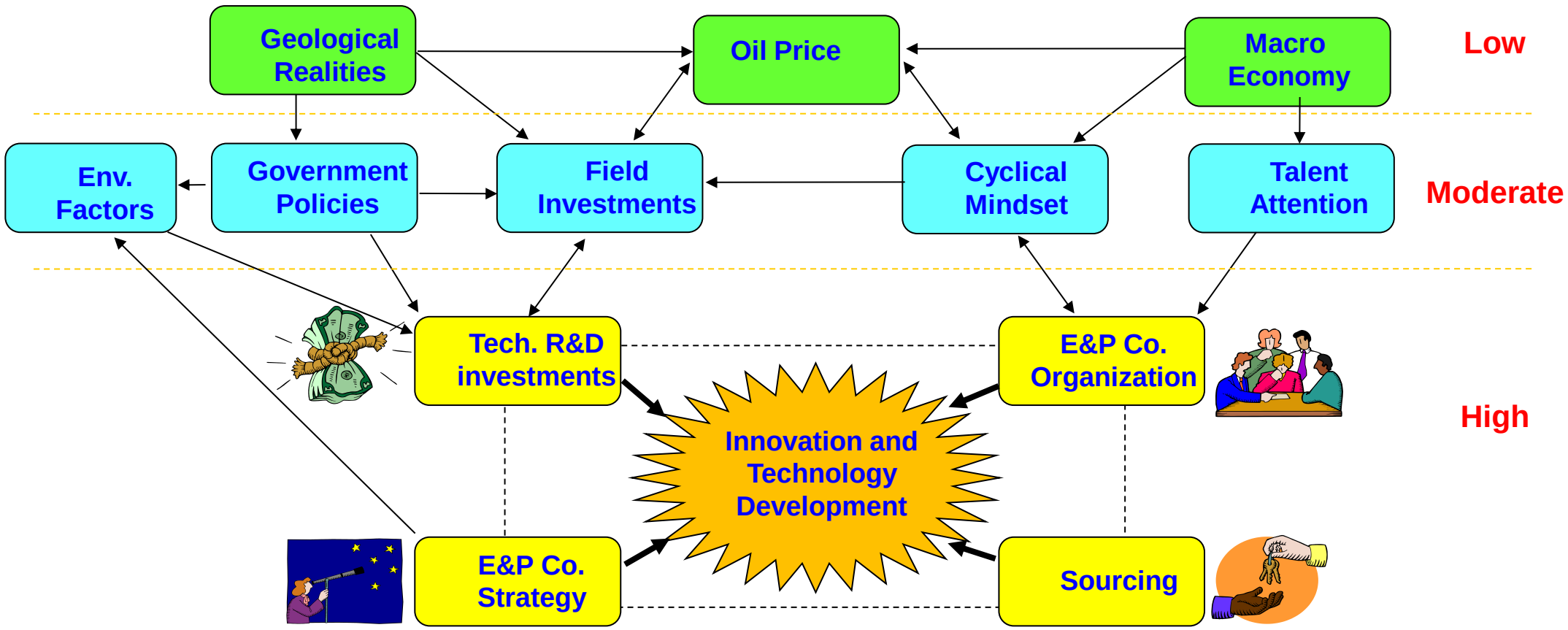
- *Independent players with great ideas/products have limited access*
- *Poor set-up of many joint industry projects – ack of"win-win" incentives*

A new Regime for Innovation and Technology Transfer

The conduct of E&P companies and Government policies directly influences innovation and technology development

Factors Influencing Innovation and Technology

Level of influence



Opportunities for value Creation by Using Advanced Technology

Opportunity	Examples
Successful Field Exploration	• *Applying 4D and advance 3D, to discover unconventional prospects*
Improvement Drilling	• *Improved well design (slim holes, fewer sections)*
Oil Field Enhancement	• *A aggressively invested in IOR/EOR, RMP - technology.*
Sub-Salt Exploration	• *Sub-salt imaging, deepwater exploration and option based risking*
Gas Development	• *Gas exploration, development, and marketing using the latest technology*
Environmental Issues	• *waste management technology*

Overview of Technology Transfer in Sudan

Technology transfer is the process of sharing of skills, knowledge, technologies, methods of manufacturing, samples of manufacturing and facilities among government and other institutions.

- **The transferor**
  - 75% of the services provided by foreign companies.
  - JVs model is the common model only in services (BGC, BGP).
  - International on job training – Cross Posting
  - IOR/EOR technologies still not developed
- **The transferee**
  - GDP growth contributed from the technology transfer.
  - R&D growth in oil and gas industry (PRLS)
  - Home-grown resources and employment.
  - 95% of manpower in oil and as are national

Way Forward

Policies Directed Toward R&D and Technology :

1. Adjust the **royalty structure** in order to encourage technology investment.
2. Make **Investment policy** in Sudan more favorable to encourage international players to develop and implement technologies.
3. Facilitate **co-operative technology** development and deployment (risk sharing) between smaller, independent operators.
4. Maintain the position of **Sudanese universities** at the leading edge of research in technology related to oil and gas.
5. Provide a mechanism for **consistent funding** of technology development and deployment

Thank You!