Innovation and Technology Transfer in Exploration & Production Industry in Sudan

By

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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
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**

Reserves 1990 (minus prod 90-97)
- Drilling 32
- Seismic
- Floaters
- Other

Due to other factors
- Reserves 1997
- 4.1

Operating cost 1991
- Total benefit from new tech

Total cost of R&D. 1994
- OPEX. 1994
- 0.5

Sub-surface
- Facilities
World energy supply (Mtoe)

Average annual growth rate (%)

- Oil supply: 2.0
- Gas supply: 2.9
- Other renewable: 1.3
- Hydro
- Nuclear
- Coal
- Gas
- Oil

Oil and Gas Supply Prediction


2000-2020
2000-2000
1980-2000
1980-2000
1980-2000
Oil & Gas Technology Growth Areas

- Exploration/Deep water/rough water
- Mature area offshore IOR/EOR
- Mature area onshore IOR/EOR
- Middle East
- Sudan
Growing Environmental Concerns with New Technologies

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

- Reduce CO₂ emission, including gas flaring
- Reduces oil to water ratio

- Gas re-injection technologies
- Water re-injection technologies
Overview of Sudan O&G Industry

- 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 $’

- Development Budget
- IOR / EOR Budget

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- 3.6% 2013
- 3.5% 2014
- 8.9% 2015
Nitrogen Injection in 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

Start up 2011
Start up 2014
Start up 2017

Lose 3 MMBBLS
/ Year Delay
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

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

Sand Consolidation

Normal water flooding

Polymer flooding

We proposed to use natural gum (produced in Sudan) to consolidate the sand without preventing oil from being produced.
Barriers to Technology Development

- 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 – lack of “win-win” incentives
The conduct of E&P companies and Government policies directly influences innovation and technology development.
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
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 gas 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.