Innovation and Technology Transfer in Exploration & Production Industry in Sudan

By

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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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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

- Operating cost 1991
- Total benefit from new tech
- Total cost of R&D
- OPEX 1994
World energy supply (Mtoe)

Average annual growth rate (%)
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

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

- 2 Exploration EPSAs and 18 Open Blocks
- 5 JOCs operating a total of 5 EPSAs
### Enhance Oil Recovery Activities

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Development Budget</th>
<th>Total IOR / EOR Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>498 MM USD</td>
<td>0.6 MM USD</td>
</tr>
<tr>
<td>2014</td>
<td>207 MM USD</td>
<td>0.8 MM USD</td>
</tr>
<tr>
<td>2015</td>
<td>181 MM USD</td>
<td>0.6 MM USD</td>
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**Legend:**
- **Development Budget**
- **IOR / EOR Budget**
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

246 MMSTB
237 MMSTB
226 MMSTB
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
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 – lack of “win-win” incentives
The conduct of E&P companies and Government policies directly influences innovation and technology development.
<table>
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<th>Opportunity</th>
<th>Examples</th>
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<tr>
<td>Successful Field Exploration</td>
<td>• Applying 4D and advance 3D, to discover unconventional prospects</td>
</tr>
<tr>
<td>Improvement Drilling</td>
<td>• Improved well design (slim holes, fewer sections)</td>
</tr>
<tr>
<td>Oil Field Enhancement</td>
<td>• A aggressively invested in IOR/EOR, RMP - technology.</td>
</tr>
<tr>
<td>Sub-Salt Exploration</td>
<td>• Sub-salt imaging, deepwater exploration and option based risking</td>
</tr>
<tr>
<td>Gas Development</td>
<td>• Gas exploration, development, and marketing using the latest technology</td>
</tr>
<tr>
<td>Environmental Issues</td>
<td>• waste management technology</td>
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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!