Korean Oil & Gas E&P: Current Status and Outlook

North East Asian Forum
Institute of Energy Economics, Japan

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1. Global E&P Environment and Challenges for North East Asian Countries

2. E&P Policy of Korea

3. Strategy of KNOC

4. Concluding Remarks : Suggestion for Cooperation

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Global E&P Environment and Challenges for NEA
Increasing Difficulties

- Easy, Cheap Oil ⇒ **Tough/Hard Oil**
  - No more decent reserves in ‘Easy-to-access’ Area
    - the industry turns to untapped resources!
      (ex. deepwater, frontier, unconventional)
  - Face an array of Challenges!
    - Natural production declines in Mature fields
    - Number of new big discoveries are reducing!

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“Aboveground Access” Is what really matters!

- Sufficient Oil & Gas Resources underground
  - Proven Oil Reserves of 1.2 Trillion Barrels plus Non-conventional Oil (Upto 7 Tri.B) [IEA]
- However, Reserve Access is Limited due to:
  - Neo-Resource Nationalism in Producing Countries
  - Heightening Geopolitical Risk in Producing Countries
Global E&P Environment and Challenges for NEA
Increasing Difficulties

- **Spiraling E&P Costs!**
  - New E&P Spots: Deepwater, Frontier, Unconventional
  - Limited access promotes E&P cost escalation: More than doubled since 2000
  - Prolonged E&P activities in Frontier areas will underscore rising costs

Source: CERA data, Deutsche Bank estimates
Global E&P Environment and Challenges for NEA
Increasing Difficulties

- Lack of Investment
  - Lack of E&P Investment in the 1990s (Low Oil Price Times)
    causes:
    - Shortage of Skilled/Experienced personnel
    - Shortage of Adequate Equipments

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## Global E&P Environment and Challenges for NEA

### Vulnerability in Oil Supply Security

Dependence on Middle East for Crude Oil

<table>
<thead>
<tr>
<th>Middle East % of Total Imports</th>
<th>China</th>
<th>Japan</th>
<th>Korea</th>
<th>US</th>
<th>Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>50.0%</td>
<td>50.0%</td>
<td>86.9%</td>
<td>86.3%</td>
<td>18.6%</td>
<td>19.3%</td>
</tr>
</tbody>
</table>

### Alternative Sources

- FSU
- West Africa
- Almost None
- Almost None
- Canada
- Mexico
- South America
- Central America
- West Africa
- And so on...
- FSU
- North Africa
- West Africa
- South America
- Central America
- And So On...


- Compared to other regions NEA countries have few sources other than ME
- It is hard to secure stable supply from ME for the political reasons
- Thus it is inevitable for NEA countries to look for overseas E&P projects

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- **Limited Oil Import Sources other than Middle East**
E&P Policy of Korea

**Korea’s Petroleum Demand**

- Korea is the World Ninth Largest Oil Consumer (2.1mil. B/D)
- Oil Composes 43.3% of Total Energy Demand (2007)
  - To be reduced to 33.3% in 2030
- However, the absolute volume of consumption is to stay
  - Large Portion of Industrial Use : 55% (1,150th. B/D)
  - Especially, Naphtha demand : 40% (847th. B/D)

**Needs for Stable Supply Security ⇒ Needs for E&P**

**Target Rate of Equity Productions to Consumption**

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5.7%</td>
<td>7.4%</td>
<td>9.1%</td>
<td>13.9%</td>
<td>18.1%</td>
<td>20.0%</td>
<td>40.0%</td>
</tr>
</tbody>
</table>

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Milestones of Korea’s E&P History

- 1973 The First Oil Shock
- 1979 Establishment of KNOC
- 1981 KODECO starts E&P in Indonesia
- 1984 KNOC, SK Energy led consortium starts E&P in Yemen
- 1987 Gas Discovery in Korean Continental Shelf
- 1990 Discovery of Libyan Elephant Fields (Production commence in 2004)
- 1992 Vietnam Block 11-2 Awarded (as operator)
- 1998 Discovery of Donghae-1 Gas Field (Production commence in 2004)
- 2003 Myanmar Block A-3 spud (Daewoo, Production commence in 2005)
- 2004 Production commence in Camisea, Peru (SK Energy)
- 2006 Acquisition of Black Gold (Oilsands) Block in Alberta, Canada
- 2008 Acquisition of ANKOR(former Taylor Energy) in Gulf of Mexico, USA
- 2009 Acquisition of Petro-Tech (Peruvian)
Korean Equity Production and Reserves Increased through 2000s


**Equity Reserves and Production**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves</td>
<td>1,079,627</td>
<td>259,749</td>
<td>2,248,346</td>
</tr>
<tr>
<td>Equity Production (B/D, Ton/D)</td>
<td>89.6</td>
<td>11.3</td>
<td>186</td>
</tr>
</tbody>
</table>

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174 E&P Projects in 39 Countries (Including Korea) (as of Aug. 31, 2009)

E&P Policy of Korea

Producing (47)
Developing (17)
Exploration (110)

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Policy for Supporting E&P Business

- Supporting KNOC to be Regional Major Company and Leads the Korean E&P Sector
- Active Support of Private E&P Companies
- Use of Private Sector Funds in Producing Projects
  - Low Risk, but Large Amount of Funds Required
  - Oil Development Fund, Pensions
- National Oil Company Lead with Government Support in Exploration and Developing Projects
  - High Risk, but Small Amount of Funds Required
  - Inducing Investment for Private E&P Companies
E&P Policy of Korea

Energy Strategies in 2009

Prior Policy 1
Green Growth

Prior Policy 2
Stable Energy Demand/Supply

Prior Policy 3
Resources Development Projects

Prior Policy 4
Energy Welfare & Safety

Raising Global Competency in E&P
Reinforcing Diplomatic Relationship with Producing Countries
Expanding E&P Infrastructure
Concentrating on Non-Conventional and Domestic E&P

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E&P Policy of Korea

Raising Global Competency E&P

• Enlarging Size and Capability of KNOC
  • World’s 60th Company by 2012

• Acquiring Producing Assets
  • Adding Producing Blocks to Secure Stable Oil Supply

Reinforcing Diplomatic Relationship with Producing Countries

• Strengthening Official Development Aid (ODA) for Developing Countries

• Interactive Multi-dimensional Cooperation with Producing Countries

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E&P Policy of Korea

Expanding E&P Infrastructure

- Financing for E&P
  - Establishing Oil Development Funds: KNOC invest 100 bil. Won ($84 mil.) to induce Private Sector
  - State-controlled Financial Institutes to Support Loans and Guarantees
- Nurturing Experts
  - Establishing ‘School of Petroleum Engineering’
- Improving Core Technical Skills
  - Strengthening Support for Research & Development

Concentrating on Non-Conventional and Domestic E&P

- Non-Conventional Oil
  - Participating in Extra-Heavy Oil Projects
- Korean Continental Shelf

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Strategy of KNOC
Overview

Introduction

- Founded March 1979
- To Provide Hope and Comfort the People through Stable Oil Supply

Exploration & Production
Production 72 thou. B/d
Reserves 622 MMBbl

Stockpiling Petroleum
Storage 115 MMB
Capacity 138 MMB

Improving Petroleum Distribution
Infra-structure

Financing & Technical Support

Stabilizing Petroleum Supply

Contributing to the Korean Economy

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Strategy of KNOC
Overview

47 On-Going Projects in 18 Countries (Inc. Korea)
As of Aug. 31, 2009

Producing: 11
Developing: 3
Exploration: 33
Operatorship: 18
Joint Op.: 7

47 On-Going Projects in 18 Countries

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## Achievements during 2008

- **9 Exploration Blocks, 2 Producing Blocks**

<table>
<thead>
<tr>
<th>Name of Blocks</th>
<th>KNOC Interest</th>
<th>Oil/gas</th>
<th>Total Resources (Oil Equivalent)</th>
<th>KNOC's Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>US Taylor Producing</td>
<td>80%</td>
<td>Oil</td>
<td>61 mmbbl</td>
<td>48.8 mmbbl</td>
</tr>
<tr>
<td>Kazakhstan Zhambyl</td>
<td>9.45%</td>
<td>Oil</td>
<td>1,600 mmbbl</td>
<td>151.2 mmbbl</td>
</tr>
<tr>
<td>Iraq KRG Qush Tappa</td>
<td>80%</td>
<td>Oil</td>
<td>1,008 mmbbl</td>
<td>806 mmbbl</td>
</tr>
<tr>
<td>Iraq KRG Sangaw South</td>
<td>60%</td>
<td>Oil</td>
<td>320 mmbbl</td>
<td>192 mmbbl</td>
</tr>
<tr>
<td>Iraq KRG Sangaw North</td>
<td>20%</td>
<td>Oil</td>
<td>786 mmbbl</td>
<td>157 mmbbl</td>
</tr>
<tr>
<td>Iraq KRG Khabat</td>
<td>15%</td>
<td>Oil</td>
<td>1,094 mmbbl</td>
<td>164 mmbbl</td>
</tr>
<tr>
<td>Iraq KRG Dimir Dagh</td>
<td>15%</td>
<td>Oil</td>
<td>630 mmbbl</td>
<td>95 mmbbl</td>
</tr>
<tr>
<td>Iraq KRG ZAB</td>
<td>15%</td>
<td>Oil</td>
<td>1,496 mmbbl</td>
<td>224 mmbbl</td>
</tr>
<tr>
<td>Iraq KRG Hawler</td>
<td>15%</td>
<td>Oil</td>
<td>617 mmbbl</td>
<td>93 mmbbl</td>
</tr>
<tr>
<td>Iraq Bazian</td>
<td>20%</td>
<td>Oil</td>
<td>1,272 mmbbl</td>
<td>254 mmbbl</td>
</tr>
<tr>
<td>Columbia exploration</td>
<td>30%</td>
<td>Oil</td>
<td>333 mmbbl</td>
<td>100 mmbbl</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>9,454 mmbbl</td>
<td>2,285 mmbbl</td>
</tr>
</tbody>
</table>
KNOC discovered the first commercial natural gas field Donghae-1 in East Sea of South Korea.

- Share (%)
  * KNOC 100%
- Reserves : 169 bil.cf
- Production Start : Jul. 2004
- Current Prod. Rate : 50 mil.cf/d
A milestone in a 20-year history of overseas oilfield development

- Participated in 1998
- Share (%)
  * Korea : KNOC 14.25%, SK 9.0%
  * Vietnam : PV 50%
  * USA : ConocoPhillips 23.25%
  * France: Geopetrol 3.5%
- Reserves : 568 mil.Bbl
- Production Start : Oct. 2003
  * Current Prod. Rate : 103,000 b/d
KNOC operates the producing block using Korean technology and capital

- Participated in 1992
- Share (%)
  * Korea: 75% [KNOC 39.75%, LG11.25%, Daesung 6.9375%, Daewoo etc. 7%]
  * Vietnam: PVEP (25%)
- Reserves: 163 mil. BOE
- Production Start: Nov. 2006
  * Current Prod. Rate: 30,000 boe/d
- Oil discovered in RONG TRE prospect in 2005
Zhambyl (Kazakhstan)

Operating large exploration block in CIS region with Kazakhstan’s National Oil Company
- Participated in Jan 2009
- Share (%)
  * KC Kazakh B.V. (Korea) : 27%
    (KNOC 9.45%, SK etc. 17.55)
  * KMG (Kazakhstan) : 73%
- Operator : KC Kazakh B.V. & KMG
  (Joint Operation)
- Exploration Period : 6 years
- Prospected Resources : 1.6 billion bbl

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Acquisition of BlackGold Oil Sand in 2006

- Participated in 2006 (Jul.)
- Share (%)
  * Korea : KNOC 100%
- Reserves : 234 million barrel
- Current Stage : Development
- Production Schedule
  *10,000b/d(’12), 30,000b/d(’18)
KNOC’s successful M&A deal (Taylor Energy)
- Acquired in Mar. 2008
- 5 production blocks
- Share (%)
  * KNOC 80%,
  * Samsung 20%
- Reserves: 76 mil. Bbl
- Current Prod. Rate: 18,000 boe/d
KNOC’s successful M&A deal

- Acquired in Feb 2009
- Share (%)
  * Korea : KNOC 50%,
  * Columbia : Ecopetrol 50%
- Reserves(2P) : 158 million barrel
- Production : 14,900boe/d
The biggest oil discovery since mid 1980s in Libya
- Participated in 1991
- Share (%)
  * Korea: 4% [KNOC 2%, SK etc. 2%]
  * Italy: ENI (8%)
  * NOC: Libya [88%]
- Reserves: 488 mil. Bbl
- Production Start: May 2004
  * Current Prod. Rate: 121,000 b/d
Strategy of KNOC
Successful E&P Activities

Block OPL321,323 (Nigeria)

**Upstream**
- OPL 321 & OPL323
- Co-Biz Structure
- Korea 60%, Equator 30%, Nigeria Local 10%

**Downstream**
- Electronic Power Business
- Building 2 Power Station [2,250MW] and Gas Pipeline [1,200km]

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Strategy of KNOCC
Tasks

Regional Major Company

Production of 300 thou. B/D by 2012

- Enlarging Organizational Scale
  - Organic Growth thru M&A (Producing Assets)
  - Financing Ability
  - Operator Capability

- Focusing on Key Projects
  - Focusing on Core Areas
  - Expanding Support for R&D
  - Strengthening Int’l Network

- Global Competency
  - Improving Operating Techniques
  - Nurturing Talented Experts

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Reserves (Billion bbl) 0.6 1.9 x4
Asset (Billion $) 9.4 30 x3
Production (1000 b/d) 60 300 x5
Technical Experts (100 personnel) 5 25 x5
World Ranking 98th 60th

Strategy of KNOOC Target by 2012
Regional Oil Major Establishment as a Competitive Oil Major

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Growing up of KNOC

KNOC's role has evolved from oil stockpile to a major player in upstream in and outside the country.

1979
- KNOC founded
- to secure oil supplies for the nation

1989
- Discovered natural gas in domestic continental shelf
- Participated in overseas E&P ventures

1999
- The concept for stockpile changed from "Static" to "Dynamic"
- invested in twenty E&P ventures in domestic and

2008
- Industry Opportunities and National Interests Support Case for a new KNOC Mission

2012
- 6X Growth in Production
- 4X Growth in E&P Reserves
- 3X Growth in asset
- Proved and Experienced energy company

Established World Class National Petroleum Company

Growth Strategy focused on Upstream

Stockpiling
E&P Ventures Acquisition
Growth Strategy focused on Upstream

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Advanced Technical Skills

**Deepwater Exploration**
- Improving Offshore Exploration Tech in:
  - Korean Continental Shelf
  - Nigeria Deepwater

**Enhanced Oil Recovery**
- Increasing Reserves in Producing Area:
  - US Gulf of Mexico

**Non-Conventional (Heavy Oil)**
- Stable Producing base:
  - Canadian Black Gold
- Venezuelan, Colombian
  - Extra-Heavy Oil

Strategy of KNOC
Technical Advancing

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Concluding Remarks
Suggestion for Cooperation

- Recognize and Take common View: North East Asia is World’s Largest Demand Center
  - Needs to co-operate among the North East Asian Countries
  - Seek Mutual interest together

- Joint Development projects in:
  - High Risk Area nearby
    - East Siberia, Arctic
  - Non-conventional Oil and Gas Resources
    - Technical Research & Development
    - Joint Survey

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Concluding Remarks
Suggestion for Cooperation

- Healthy Competition and Cooperation
  - Avoid Excessive Competition in Overseas E&P projects
  - Seeking Synergy Effect in Securing Energy Supply

- ‘Win-Win’ Model for State-owned/State-controlled companies/organizations
  - Effective Way to Detour Resources Nationalism in Producing Countries
  - Mutual Interest for NEA Countries
  - Synergy Effect for the benefits of North East Asian Countries and Producing Countries

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Thank you for your Attention

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