Iraq’s Ambition
What is the Role of Natural Gas?

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Key Points

• Critical role of expectations in oil and gas markets

• Why forecasters should show humility

• Iraq’s role as a game changer (oil vs. gas)

• What should be done with the natural gas?
A Series of Unfortunate Events Leading to New Expectations

Positive Expectations

- Oil development in Iraq delayed
- Outlook positive for new oil field rehabilitation

Expectations Shift

- Yukos -- Kremlin taking control of Russian oil development
- Congress continues ban on ANWR and offshore development
- OPEC Excess Capacity remains limited

Negative Expectations

- Russia takes over Sakhalin II, Chavez Nationalizes Projects
- Russia takes over Sakhlan II
- Continuing civil strife in Sudan, Nigeria
- Nigeria rebels hurt output
- Continuing civil strife in Sudan, Nigeria

Global Production, million b/d

- Global Production (EIA)
- Expected Production (EIA 2001 Predictions)
- OPEC Excess Capacity (EIA)
- Crude Oil Price

Crude Oil Price ($/bbl)

Outlook positive for expanded output from Nigeria, Mexico, Venezuela, Russia, North Slope
Forecasting and Humility (Hubbert’s Limitations)

Source: EPRINC Study
A Decoupling of Politics and Oilfields Development

Although oil development is in an early stage it is moving forward, same cannot be said for politics and security.
## Gas Reserves and Location

### Estimated Gas Reserves (Tcf)

<table>
<thead>
<tr>
<th>Field</th>
<th>Reserves (Tcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akkas</td>
<td>5.6*</td>
</tr>
<tr>
<td>Mansuriyah</td>
<td>4.5*</td>
</tr>
<tr>
<td>Kashm al-Ahmar</td>
<td>2.2</td>
</tr>
<tr>
<td>Siba</td>
<td>1.5*</td>
</tr>
<tr>
<td>Tel Gazal</td>
<td>0.2</td>
</tr>
</tbody>
</table>

*Gas in place

### Oil Fields with Associated Gas

<table>
<thead>
<tr>
<th>Field</th>
<th>Reserves (Tcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>West Qurna</td>
<td>13.7</td>
</tr>
<tr>
<td>Majnoon</td>
<td>11.8</td>
</tr>
<tr>
<td>Rumaila</td>
<td>9.8</td>
</tr>
<tr>
<td>Zubair</td>
<td>2.9</td>
</tr>
<tr>
<td>Nasiriyah</td>
<td>2.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>43.2</strong></td>
</tr>
</tbody>
</table>

Source: Oil Ministry, Energy Intelligence
Iraqi Gas

• Development of the Siba and Mansouriya gas fields has been initiated in Bagdad, but the Akkaz development has not been signed. They all await ratification by the cabinet which has yet to be formed.

• Total plateau production for three fields is 820 mn cfd, the anticipated was 685 mmcf/d

• Maximum total gas in place of 11.6 tcf, 7.4 is proven reserves, this implies a 63.8% recovery factor. 900 mmcf/d max daily production would give fields a life of 22.5 years.

• 700 mmcf/d of associated gas is flared in Iraq each day
Provincial Opposition and Electricity Concerns

• There is strong opposition by provincial governments for the Akkaz field bidding.

• Electricity is a major issue within Iraq leading to unrest, security concerns, instability, and infrastructure stagnation.

• Iraq puts out just 4-5 hours of electricity each day from the national grid. While there is 50% more electricity generation than before the invasion of Iraq in 2003, the electricity is spread throughout the country rather than giving it all to Iraq.

• Energy consumption has doubled in the last 7 years.
Key Gas Contract Features?

- Allow companies to export 50 percent
- Costs are recoverable
- Iraqi government agreed to take or pay 100 percent of gas production
- No signature bonus
- Commitment for TTSF (Training, Technology, and Scholarship Fund)—very important
- Conversion factor for barrel of oil equivalent reduced from 8,000 to 6,000 cu ft. *(EPRINC Calculations are 5.75 for value estimate).*
- Remuneration fee 90% of scoring formula and remuneration fee and cost recovery paid with 25% plateau target needed to be reached within 3 years.
## Iraqi Gas Field Awards

<table>
<thead>
<tr>
<th>Bid Consortium (Participation %)</th>
<th>Winner</th>
<th>Renumeration Fee ($/mcf)</th>
<th>Plateau Production Target (mmcf/d)</th>
<th>Plateau Period (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Akkaz</strong></td>
<td>Kogas/KMG (50/50)</td>
<td>Kogas/KMG</td>
<td>$0.95</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>Total/TPAO (50/50)</td>
<td></td>
<td>$3.30</td>
<td>375</td>
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<tr>
<td><strong>Mansouriya</strong></td>
<td>TPAO/KE/Kogas (50/30/20)</td>
<td>TPAO/KE/Kogas</td>
<td>$1.22</td>
<td>320</td>
</tr>
<tr>
<td><strong>Siba</strong></td>
<td>KE/TPAO (60/40)</td>
<td>KE/TPAO</td>
<td>$1.30</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>KMG (100)</td>
<td></td>
<td>$2.78</td>
<td>65</td>
</tr>
</tbody>
</table>

Source: MEES November 8, 2010
What are the best options for Iraqi natural gas? (some preliminary observations)

- Power generation, industrial, and residential
- Re-injection
- GTL
- Regional pipeline sales
- LNG
- Long haul pipeline sales (Nabucco)
Natural Gas and Crude Oil Prices Through 2030

Source: EIA Annual Energy Outlook 2009
Japan Korea Marker Remains Well Above US and UK Spot Prices

Source: Platts
Natural Gas Offers Lower Busbar Cost Escalation Risk (cents per kwh)

**Coal**
Coal Supercritical: 10.554
Coal Integrated Gasification Combined Cycle (IGCC): 11.481
Coal IGCC with Carbon Capture & Storage (IGCC with CCS): 17.317

**Alternatives**
Biogas: 8.552
Wind: 8.910
**Gas Combined Cycle: 9.382 (assumes $5.50 to $6.50/MMBtu for gas)**
Geothermal: 10.182
Hydroelectric: 10.527
Concentrating solar thermal (CSP): 12.653
Nuclear: 15.316
Biomass: 16.485

Note: Busbar means the price of the power leaving the plant. All capital, fuel, and operating costs are taken into account in busbar costs.

Source: *California Energy Commission, “Comparative Costs of California Central Station Electricity Generation Technologies,” CEC Staff Report, June 2007*
Capital Costs and the Gas Crude Spread*

Current capital costs ($200,000/bbl) at Chevron's Escravos plant require $90 oil to break even.

To be competitive at current prices, capital costs would have to be reduced to $125,000/bbl

*EPRINC preliminary estimates
Nabucco Prospects

Nabucco is contingent upon securing supplies from either Azeri gas and/or Iraqi gas - Expect 10 bcm from Iraq and 8 bcm from Shah Deniz – yet both supplies are far from certain at the moment.

Nabucco would require a supply agreement from Shah Deniz phase II in Azerbaijan. But such supplies face competition from other pipelines and from the Russian government, which has been working to maintain control over Central Asian gas.

Other option is Iraq, but is not likely to be highest value for gas output

The Nabucco consortium has recently called Iraq the most likely supplier because of Russia’s influence over Central Asia (pipe dream