Major Developments in the East of Suez Oil and Gas Markets in a Global Context

Presented to Saudi Aramco
By Dr. Fereidun Fesharaki, Chairman
FACTS Global Energy

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Short-Term Oil Market: MENA Unrest and OPEC Spare Capacity
Oil Demand in 2011 and 2012 Continues to be Strong

Change y-on-y, mmb/d

OECD  Non-OECD  Net Global Growth

-1.4 mmb/d  +2.7 mmb/d  +1.6 mmb/d  +1.4 mmb/d
Libya’s Main Crude Export Streams & Export Terminals

<table>
<thead>
<tr>
<th>Export Stream</th>
<th>Loading Terminal</th>
<th>Estimated Capacity (kb/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Es Sider</td>
<td>Es Sider</td>
<td>350</td>
</tr>
<tr>
<td>El-Sharara</td>
<td>Zawiyah</td>
<td>340</td>
</tr>
<tr>
<td>Sarir</td>
<td>Marsa El-Hariga</td>
<td>200</td>
</tr>
<tr>
<td>Amna</td>
<td>Ras Lanuf</td>
<td>180</td>
</tr>
<tr>
<td>Mellitah</td>
<td>Mellitah</td>
<td>140</td>
</tr>
<tr>
<td>Abu Attifel</td>
<td>Zueitina</td>
<td>120</td>
</tr>
<tr>
<td>Sirteca</td>
<td>Ras Lanuf</td>
<td>75</td>
</tr>
<tr>
<td>Brega</td>
<td>Marsa El-Brega</td>
<td>70</td>
</tr>
<tr>
<td>El-Bouri</td>
<td>Offshore</td>
<td>45</td>
</tr>
<tr>
<td>Al-Jurf</td>
<td>Offshore</td>
<td>40</td>
</tr>
<tr>
<td>Zueitina</td>
<td>Zueitina</td>
<td>40</td>
</tr>
</tbody>
</table>

Sources: IEA, Lloyds Marine, various reports

Libya Updates:
1. Libya’s oil fields, the 220 kb/d Ras Lanuf and 120 kb/d Zawiyah refineries are almost unscathed.
2. Three export terminals in central Libya (Es Sider, Ras Lanuf, and Marsa El-Brega) are severely damaged, accounting for 675 kb/d of Libya’s crude loadings.
3. Other export terminals at Marsa El-Hariga (Tobruk) in eastern Libya, Zueitina near Ajdabiya, Mellitah in western Libya, Zawiyah west of Tripoli, and offshore terminals are known to be functional (totaled 925 kb/d).

FGE expects Libya oil production to reach 800 kb/d by end 2011 and 1.6 mmb/d by end 2012.
Brent/WTI Differential to Stay High?

Factors on Future Brent/WTI Spread in Medium Term:

- Liquid production from the US shale gas plays – up from ~700 kb/d in 2011 to 1.3 mmb/d in 2013 and 1.9 mmb/d in 2015.

- Increase in western Canadian crude exports to US – up by 700 kb/d by 2015.

- Progression on the two proposed major pipelines: Keystone XL pipeline (500 kb/d) and Enbridge Monarch pipeline (expand from 150 kb/d to 350 kb/d).
The Japanese Disaster has Limited Impact on Oil Markets

FGE’s forecast: **Total oil demand in 2011 will remain at almost the same level as 2010**

<table>
<thead>
<tr>
<th>Unit: kb/d</th>
<th>2010</th>
<th>2011</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline</td>
<td>1,006</td>
<td>935</td>
<td>Down by 7% due to weaker consumer spending</td>
</tr>
<tr>
<td>Gasoil</td>
<td>835</td>
<td>837</td>
<td>Up slightly due to reconstruction of infrastructures</td>
</tr>
<tr>
<td>Fuel oil for power</td>
<td>183</td>
<td>303</td>
<td>Up significantly to make up for lost nuclear power generation capacity</td>
</tr>
<tr>
<td>Direct crude use for power</td>
<td>75</td>
<td>110</td>
<td></td>
</tr>
</tbody>
</table>

**Japan Refineries & Throughputs:**
1. There is enough spare refining capacity.
2. JX Kashima refinery restarted in early June 2011.
3. Immediate shortage of gasoline and kerosene in devastated districts is due to logistic bottlenecks, not lack of products availability.
4. Refiners are being asked to produce more LSFO for power generation.

**Shutdown of refineries after the disaster**

<table>
<thead>
<tr>
<th></th>
<th>Capacity (kb/d)</th>
<th>Restart Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>JX Group Kashima</td>
<td>-253</td>
<td>Restarted in June 2011</td>
</tr>
<tr>
<td>JX Group Sendai</td>
<td>-145</td>
<td>Summer 2012</td>
</tr>
<tr>
<td>Cosmo Oil Chiba</td>
<td>-220</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

**Temporary Expansions**

<table>
<thead>
<tr>
<th></th>
<th>Capacity (kb/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cosmo Oil Yokkaichi</td>
<td>50</td>
</tr>
<tr>
<td>Cosmo Oil Sakaide</td>
<td>30</td>
</tr>
<tr>
<td>JX Group Mizushima</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
OPEC Spare Capacity Estimated Below 5 mmb/d

*Nigeria/Iraq/Libya/Angola – output constrained by temporarily unavailable capacity.*
Price Will Stay at US$100-110/b in 2011 and 2012

<table>
<thead>
<tr>
<th>Base Case Dubai Crude (US$/b)</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>$44.27</td>
<td>$59.12</td>
<td>$67.93</td>
<td>$75.43</td>
</tr>
<tr>
<td>2010</td>
<td>$75.83</td>
<td>$78.12</td>
<td>$73.90</td>
<td>$84.31</td>
</tr>
<tr>
<td>2011</td>
<td>$100.49</td>
<td>$110.72</td>
<td>$107.10</td>
<td>$99.00</td>
</tr>
<tr>
<td>2012</td>
<td>$101.33</td>
<td>$111.83</td>
<td>$109.17</td>
<td>$104.50</td>
</tr>
</tbody>
</table>
Long Term: Market Tightness to Return and OPEC Holds the Cards for Additional Supply
Long Term: Market Tightness Will Return

Annual “Base-Load” Demand Growth: 2010-2020, kb/d

- **OECD countries** – Oil demand has peaked;
- **Non-OECD countries** – Strong “base-load” demand growth of ~**1.0 mmb/d** in the next decade.

<table>
<thead>
<tr>
<th>Region</th>
<th>Demand Growth (kb/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>467</td>
</tr>
<tr>
<td>India</td>
<td>127</td>
</tr>
<tr>
<td>Other Asia</td>
<td>97</td>
</tr>
<tr>
<td>Middle East</td>
<td>290</td>
</tr>
<tr>
<td>Others</td>
<td>56</td>
</tr>
<tr>
<td>Iran</td>
<td>30</td>
</tr>
<tr>
<td>UAE</td>
<td>31</td>
</tr>
<tr>
<td>Iraq</td>
<td>54</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>135</td>
</tr>
<tr>
<td>Others</td>
<td>56</td>
</tr>
</tbody>
</table>
Non-OPEC Production Plateau

But what will be the impact of shale gas related oil?

* Annual average of 5 years change
Additional Supplies Have to be From OPEC

<table>
<thead>
<tr>
<th>Year</th>
<th>Non-OPEC Supply Share</th>
<th>Global Oil Demand and Supply Growth mmb/d</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995-2003</td>
<td>62%</td>
<td>10.8</td>
<td>- Bulk of demand growth is supplied by non-OPEC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.7</td>
<td>- Dubai price was &lt;US$30/b</td>
</tr>
<tr>
<td>2004-2007</td>
<td>10%</td>
<td>6.9</td>
<td>- Bulk of demand growth had to be supplied by OPEC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.3</td>
<td>- Dubai price rose to more than US$80/b in end 2007</td>
</tr>
<tr>
<td>2008-2009</td>
<td>Nil</td>
<td>-1.9</td>
<td>- Global Financial Crisis—huge destruction of demand</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-2.0</td>
<td>- Dubai price dropped drastically in H2 2008/2009</td>
</tr>
<tr>
<td>2010-2020</td>
<td>22%</td>
<td>14.1</td>
<td>- Continued strong call for OPEC supply to meet future demand growth</td>
</tr>
</tbody>
</table>
OPEC Coming to Fill the Supply/Demand “Gap”? 

1. Clear lesson from 2004-2008 oil price run-up...

2. OPEC faces a natural decline of some 1.5 mmb/d

   Much new capacity is needed...

   ...just to stay in the same place

3. Global oil demand set to grow by some 1-1.5 mmb/d

4. OPEC will eventually have trouble adding 1-1.5 mmb/d of additional capacity annually...which may be required as non-OPEC plateaus.

Global oil production likely to reach plateau of 95-100 mmb/d by mid-decade. This is not a geological limit, but a geopolitical limit.
Asia Net Crude Imports Rising Fast

- Diversifying sources of crudes supplies, but Asia has to import more from OPEC (especially Middle Eastern countries).

- Asian NOCs aggressively acquiring overseas upstream assets.
  - China spent more than US$50 billion in overseas upstream oil and gas acquisitions in 2009 and 2010 alone;
  - India, Korea, and Japan are also aggressive in their overseas acquisitions.

- Establishing global trading network.
Wild Card: Sustained OPEC Spare Capacity?

The graph shows the mmb/d of oil production for different regions from 2005 to 2015. The regions include Saudi Arabia, Other Middle East OPEC, Other OPEC, and Iraq. The production levels are represented in different colors, with Saudi Arabia in blue, Other Middle East OPEC in red, Other OPEC in green, and Iraq in purple.
Longer-Term Oil Market Still Seen as Bullish

High, Base, and Low Price Forecasts for Dubai, US$/b

Note: Actual up to 2010 and forecasts in 2011$ thereafter.

What will choke off demand?

High-Case
Base-Case
Low-Case
A Real Game Changer: Liquids Production from Shale Gas Projects
US crude production declined from ~6 mmb/d in 2003 to 5 mmb/d in early 2009, but light crude production associated with shale gas plays has reversed the trend.

Current liquid production from shale is ~700 kb/d with projections to nearly 2 mmb/d by 2015.
Size & Scale of Operations – Huge!

Fracturing Operation: Bakken tight oil well

- More than 200 frac tanks at the drilling site.
- 87,000 barrels of water to frac one tight oil well with 80-100 people working 24 hours per day for up to 5 days.
- Average recoverable reserves for Barnett, Fayetteville, Haynesville, Marcellus, and Bakken ~2 to 5 bcf per well; therefore many wells.

Frac Tanks – can hold up to 500 barrels of water or proppants!

Source: Sundance Energy Ltd.
Environmental Impact – New York Case

• Fracking activity leads to severe 18-wheeler truck traffic.
• According to the New York State Department of Environmental Conservation “895 to 1,350 truckloads are required for rig mobilization, site preparation, demobilization, and well completion.”
• Increased traffic due to fracking truck convoys lead to local traffic standstills, lowering of property values, and safety hazards.
• Many tanker trucks also known to carry toxic chemicals/waste – labeled “hazardous” by NY DEC.
• Air pollution, noise pollution, and water pollution.
EIA Latest Shale Study

Total Recoverable Resource: 6,622 tcf

### Europe

<table>
<thead>
<tr>
<th>Country</th>
<th>Proven Natural Gas Reserves (tcf)</th>
<th>Technically Recoverable Shale Gas Resources (tcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>0.2</td>
<td>180</td>
</tr>
<tr>
<td>Germany</td>
<td>6.2</td>
<td>8</td>
</tr>
<tr>
<td>Netherlands</td>
<td>49</td>
<td>17</td>
</tr>
<tr>
<td>Norway</td>
<td>72</td>
<td>83</td>
</tr>
<tr>
<td>UK</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>Denmark</td>
<td>2.1</td>
<td>23</td>
</tr>
<tr>
<td>Sweden</td>
<td>2.1</td>
<td>41</td>
</tr>
<tr>
<td>Poland</td>
<td>5.8</td>
<td>187</td>
</tr>
<tr>
<td>Turkey</td>
<td>0.2</td>
<td>15</td>
</tr>
<tr>
<td>Ukraine</td>
<td>39</td>
<td>42</td>
</tr>
<tr>
<td>Lithuania</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Others*</td>
<td>2.71</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>639</td>
<td></td>
</tr>
</tbody>
</table>

* Bulgaria, Hungary, and Romania.

### Asia (incl. AU)

<table>
<thead>
<tr>
<th>Country</th>
<th>Proven Natural Gas Reserves (tcf)</th>
<th>Technically Recoverable Shale Gas Resources (tcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>107</td>
<td>1,275</td>
</tr>
<tr>
<td>India</td>
<td>37.9</td>
<td>63</td>
</tr>
<tr>
<td>Pakistan</td>
<td>29.7</td>
<td>51</td>
</tr>
<tr>
<td>Australia</td>
<td>110</td>
<td>396</td>
</tr>
<tr>
<td>Total</td>
<td>1,785</td>
<td></td>
</tr>
</tbody>
</table>

### South America

<table>
<thead>
<tr>
<th>Country</th>
<th>Proven Natural Gas Reserves (tcf)</th>
<th>Technically Recoverable Shale Gas Resources (tcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venezuela</td>
<td>178.9</td>
<td>11</td>
</tr>
<tr>
<td>Colombia</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>Argentina</td>
<td>13.4</td>
<td>774</td>
</tr>
<tr>
<td>Brazil</td>
<td>12.9</td>
<td>226</td>
</tr>
<tr>
<td>Chile</td>
<td>3.5</td>
<td>64</td>
</tr>
<tr>
<td>Uruguay</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>Paraguay</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>Bolivia</td>
<td>26.5</td>
<td>48</td>
</tr>
<tr>
<td>Total</td>
<td>1,225</td>
<td></td>
</tr>
</tbody>
</table>

### Africa

<table>
<thead>
<tr>
<th>Country</th>
<th>Proven Natural Gas Reserves (tcf)</th>
<th>Technically Recoverable Shale Gas Resources (tcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Africa</td>
<td></td>
<td>485</td>
</tr>
<tr>
<td>Libya</td>
<td>54.7</td>
<td>290</td>
</tr>
<tr>
<td>Tunisia</td>
<td>2.3</td>
<td>18</td>
</tr>
<tr>
<td>Algeria</td>
<td>159</td>
<td>231</td>
</tr>
<tr>
<td>Morocco</td>
<td>0.1</td>
<td>11</td>
</tr>
<tr>
<td>Western Sahara</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Mauritania</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>1,042</td>
<td></td>
</tr>
</tbody>
</table>

### North America

<table>
<thead>
<tr>
<th>Country</th>
<th>Proven Natural Gas Reserves (tcf)</th>
<th>Technically Recoverable Shale Gas Resources (tcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>272.5</td>
<td>862</td>
</tr>
<tr>
<td>Canada</td>
<td>62</td>
<td>388</td>
</tr>
<tr>
<td>Mexico</td>
<td>12</td>
<td>681</td>
</tr>
<tr>
<td>Total</td>
<td>1,931</td>
<td></td>
</tr>
</tbody>
</table>
Future of Shale Gas Liquids Outside the US

• The US resources are less than 8% of global resources.
• Very little non-US information on organic content.
• Speed of development outside the US will be slow due to lack of well servicing infrastructure.
• Shale gas requires pipeline infrastructure and a market.
• Shale gas exploration in China, Australia, Poland, and Argentina.
• What is potential for shale gas liquids by 2020-25? 5 mmb/d? 10 mmb/d? Equivalent of Iraq or Saudi Arabia production?
Refining Sector: Near-Term Outlook OK, but 2015-17 will be Difficult. Will Enough Capacity be Closed?
The Unbalanced World: Oil Demand, Supply, and Refining Capacity Growth, 2011-2015

- **WEST**
  - Demand for crude/NGLs as refinery feedstock: -0.04, -0.03
  - Supply: 3.59
  - Refining: -0.5, -4.1

- **EAST**
  - Demand for crude/NGLs as refinery feedstock: -0.04, -0.03
  - Supply: 3.59
  - Refining: -0.5, -4.1

Legend:
- Blue: Demand for crude/NGLs as refinery feedstock
- Light Blue: Demand for gas plant products (from NGLs)
- Green: Firm/Likely refining capacity additions
- Red: Firm/Likely capacity reductions
- Gray: Supply of crude, condensates, NGLs
- Orange: Assumed capacity closures

www.FGEnergy.com
Pressure on Refining Sector—Falling Utilization

Global Refining Capacity and Utilization Rates

To bring utilization rates back up to 82-83% globally will require closure of around 7 mmb/d of capacity between 2009 and 2015. (2 mmb/d already confirmed)

On the basis of current capacity + scheduled expansions, global utilization rates are set to fall to about 78% by 2015.

This is not feasible on a sustainable basis!
Who is Still Investing in Refining?

New Refinery Announcements Since Mid-2008 (kb/d)

- NOCs: 13,995
- Financials: 1,575
- IOC: 425
- Non-OECD Independents: 1,235
- Other: 995
- Other state: 650

Total since mid-2008: 19 mmb/d

Purchasers of Existing Refining Capacity Since 2008 (kb/d)

- NOCs, 1064
- Financials, 739
- IOC, 411
- Other, 620
- Atlantic Indep. 711
- Other state 995
- Non-OECD Independents 1,235
- Other 995
- Other 650

Total since mid-2008: 3.4 mmb/d
Refining Sector’s Response to Downturn: Closures

- Between 2008 and mid-May 2011, 2.3 mmb/d of refining capacity was permanently shut (1 mmb/d this year).
- A further 200 kb/d is confirmed to close by mid-2012, with another 450 kb/d of unspecified Japanese reductions by 2014, and up to 700 kb/d of US capacity.
- In total, we consider another 4.2 mmb/d will close by 2015, bringing the total to around 7 mmb/d.

Refinery Shutdowns (Cumulative)

Forecast Refinery Closures by Year
Refinery Closures and Sales Since 2008

Who?

- IOC:
- Atlantic Indep.
- Japanese Refiners
- NOCs
- Financials
- Other

Where?

- Europe
- North America
- Asia
- LatAm
- Africa

Action since 2008

- For Sale
- Sold
- Confirmed to close
- Closed (Sept 2011)
How is Consolidation Affecting Structure of Refining Sector?

- Reducing refining exposure:
  - IOCs: disposed of 2.3 mmb/d of capacity, purchasing only 300 kb/d (Lukoil).
  - Independents: disposed of 2 mmb/d (plus 550 kb/d by Japanese refiners).

- Increasing refining exposure:
  - State-owned oil companies and wealth funds (IPIC, Rosneft, and PetroChina).
  - Financials/private equity.
  - Essar, traders, local operators.
East of Suez Refinery Build and Demand Growth

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AP CDU Addition</td>
<td>2.93</td>
<td>2.51</td>
<td>3.92</td>
</tr>
<tr>
<td>ME CDU Addition</td>
<td>0.39</td>
<td>0.32</td>
<td>2.24</td>
</tr>
<tr>
<td>AP Demand Growth</td>
<td>0.76</td>
<td>3.53</td>
<td>2.67</td>
</tr>
<tr>
<td>ME Demand Growth</td>
<td>0.59</td>
<td>1.24</td>
<td>1.31</td>
</tr>
<tr>
<td>Gap</td>
<td>1.97</td>
<td>(1.94)</td>
<td>2.19</td>
</tr>
</tbody>
</table>
Who is Building in the East of Suez?

Firm and Likely CDU Addition in East Suez (2011 - 2020)
11 mmb/d

- **NOCs** will be involved in ~90% of the refining capacity expansions in 2011-2020.
- Unlike the 2001-2010 period, independents will build much less refining capacity.
- IOCs are only involved in joint-venture projects with Chinese NOCs in China.
Who is Building in the East of Suez?

Total Net Refining Capacity Additions in East of Suez, 2011-2020

9,000 kb/d

kb/d

Chinese NOCs

Chinese NOCs with Crudes

Suppliers

Chinese NOCs with IOCs and

ME Suppliers

Indian NOCs

ME NOCs

ME NOCs with

IOCs

Others (Net)

3900

1,000

640

660

1,805

400

511

0

1,000

2,000

3,000

4,000

5,000

6,000

7,000

8,000

9,000

10,000

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32
Refining Industry – Structural Pressures

- Emerging market NOC’s
- Crude Producer NOC’s
- IOC Integrated
- Independents
- Financial Investors

Strategic requirements to meet domestic market growth

High domestic demand plus shift to products exports?

Excessive exposure to sector and mature markets, poor returns

Core business, need to improve efficiency, diversify operations, but no easy exit options

Attracted by cheap assets, not long term players
NOCs vs IOCs

Upstream
• IOCs – Experienced in mega projects requiring sophisticated coordination of complex technologies and financing.
• NOCs – Aggressive in upstream acquisitions (e.g., Chinese NOCs) with access to relatively cheap capital and strong government support in the name of “energy security.”
• IOCs and NOCs are not necessarily competing with each other (cooperation in the upstream developments in Iraq).

Downstream
• IOCs, NOCs, and independents have similar capabilities.
• Rates of return in the refining sector are much lower than the upstream.
• IOCs are exiting the downstream sector:
  • BP only has small refining assets in Australia and New Zealand.
  • Shell is planning to shutdown refineries in Australia (Clyde), Japan (Showa Shell), and the Philippines.
• NOCs are aggressively expanding in the downstream sector (either for strategic reasons or as a heavy crude disposal avenue).
East of Suez refineries are becoming more complex with higher conversion ratios, thus more fuel oil will be converted to gasoline and diesel, leading to higher surplus of transportation fuels and larger deficit of fuel oil.
Incremental East of Suez Refinery Supply: 2010-2013

Additional upgrading capacity increases East of Suez gasoline and diesel/gasoil supply significantly between 2010-2013, but also reduces fuel oil supply.

Has too much upgrading been planned?
Survival of the Fittest?

Selective Refineries’ Complexities and Products Export Ratio, End 2010*

* Note: the bubble size represents the size of the refinery.
Refinery Closures and Sales in Asia

Closures (2009-H1 2011)
- 515 kb/d (all in Japan)
- 279 kb/d in Japan
- 112 kb/d in PH (Shell)
- 205 kb/d in Taiwan
- 1,000 kb/d in China (local refineries)

Confirmed Closures
- 76 kb/d in Australia (Shell)
- 205 kb/d in Taiwan
- 500 kb/d in China (local refineries)

Potential Closure
- 558 kb/d in Japan
- 112 kb/d in PH (Shell)
- 50% stake of the Singapore SRC refinery

Sold
- PetroChina bought the 107 kb/d Osaka refinery from JX Group
- San Miguel bought the Esso Malaysia's 85 kb/d in Port Dickson

Japan | Taiwan | China | Singapore | IOCs (Ex-Japan)

kb/d

500
400
300
200
100
0

Facts Global Energy
Non-refinery Supply in East of Suez

Middle East will increase non-refinery LPG and naphtha supplies significantly
- Non-refinery LPG – up by 14 kb/d in AP and 465 kb/d in ME in 2010-2015
- Non-refinery naphtha – up by 83 kb/d in ME in 2010-2015
- Biofuels will still be relatively small by 2015
Condensate Production in East of Suez

1.7 mmb/d of additional condensate supply in East of Suez is expected by end of the decade.

- Only ~1 mmb/d of new condensate splitters are under construction/plan in East of Suez
- Where will the other 700 kb/d of condensates go?
East of Suez Products Trade: More Gasoline and Diesel Must Leave the Region
China – Becoming a Larger Exporter of Gasoline and Diesel

China Petroleum Product Balance

(Net Import) / Net Export (kb/d)

Year


-800 -600 -400 -200 0 200 400 600

LPG
Naphtha
Gasoline
Kero/jet
Gasoil
Fuel Oil

FGE FACTS GLOBAL ENERGY
The Trade Balance is Shifting

AP NI: Asia Pacific Net Imports, ME NX: Middle East Net Exports

Can West of Suez handle the imbalance?
Global Oil Trade: More Imbalances Across the Barrels and Regions
Crude & Product Trade Flow Changes (2010-15)

+0.5 mmb/d
Product

+0.3 mmb/d
Crude Oil

+1.5 mmb/d

+0.1 mmb/d

Products

www.FGEnergy.com
Product Trade Outlook

• More product trade—short and long haul
• Diesel/gasoil and LPG dominate growth
  • Europe: more gasoil imports
  • Asia: more LPG and naphtha imports
  • US: gasoline imports
• New players involved
  • Eastern heavyweights
  • Traders
• Larger tankers, plus small for shuttling
• More storage needed
  • Higher price volatility
  • More trading plays (contango, new players)
  • Make/break bulk
  • Receive larger cargoes
Implications of Higher Product Trade

• Greater product trade means more storage will be needed around exporting and importing hubs.
• For make/break bulk, terminals that can receive larger vessels will have an advantage.
• Depth.
• Discharge/load full cargo.
• Price volatility is expected to lead to more arbitrage and contango plays.
Greater global product trade means:

- Larger tankers needed to exploit scale economies;
- Therefore more make/break bulk.
- Increased role of trading hubs and opportunities for new ones if there is sufficient depth, size, and location.
- More commercial storage required.
- More strategic storage required.
Bunker Sector Changes—Major Challenge for Refiners

Existing and Planned Emission Control Areas

- **California:**
  - 2009: max 1.5%
  - 2012: max 0.1%

- **US and Canada:**
  - Planned: from August 2012

- **Existing:**
  - Baltic Sea (2006)
  - North Sea (2007)

- **Possible:**
  - Mediterranean
  - South Korea
  - Malacca Straits

- **Mexico/Panama:**
  - Possible by 2018

- **NE Atlantic:**
  - unlikely

- **Med:**
  - Part or all by 2018

- **Hong Kong:**
  - (voluntary)

- **Malacca Straits:**
  - Unlikely by 2018

**Residual bunker fuel demand:**
- 2011: 4.9 mmb/d
- 2030: 2.3 mmb/d?

**Timeline for Bunker Specification Changes:**
- Global Cap 4.5%
  - Baltic and North Sea
  - SOx ECA 1.5%

- Global Cap 3.5%
  - Jan

**Yet to determine whether to use scrubbers or alternative fuels**

**Source:** Outlook for Marine Bunkers and Fuel Oil to 2030 (FGE/Robin Meech)
How will Specification Changes Impact Bunker Demand?

**Bunker Demand with IMO Global Cap in 2025 (base case)**

- Distillate
- Residual

Additional 2.2 mmb/d distillate demand vs 2011

**Bunker Demand with IMO Global Cap in 2020**

- Distillate
- Residual

Additional 1.3 mmb/d distillate demand vs base case

---

**2010**
- FO >4%
- FO 3.5%
- FO 1.5%
- FO 1%
- Distillate >0.5%
- Distillate 0.1-0.5%
- Distillate <0.1%

**2020**
- FO >4%
- FO 3.5%
- FO 1.5%
- FO 1%
- Distillate >0.5%
- Distillate 0.1-0.5%
- Distillate <0.1%

**2030**
- FO >4%
- FO 3.5%
- FO 1.5%
- FO 1%
- Distillate >0.5%
- Distillate 0.1-0.5%
- Distillate <0.1%

*Source: Outlook for Marine Bunkers and Fuel Oil to 2030 (FGE/Robin Meech)*
Price Pressures: Bearish in LPG but Bullish in Diesel
LPG Expected to be in Huge Surplus in East of Suez

- ME non-refinery LPG production to surge, driven largely by gas projects.
  - Qatar LNG projects and other gas projects;
  - Iranian LNG projects (South Pars) and domestic associated gas production;
  - UAE gas production (third NGL train at the Ruwais plant).
- More LPG used as feedstock for ethylene plants in Asia?
Gasoil/Diesel Leads Global Demand Growth

Changes in Demand for Oil Products 2010-15 and 2016-20 (mmb/d)

- Fuel Oil
- Gasoil/Diesel
- Gasoline
- Kero/jet
- Naphtha

2010-2015
2016-2020

FGE
FACTS GLOBAL ENERGY
Middle Distillates at a Premium to Gasoline

Price* Differentials Against Dubai Crude
(Annual Averages)

*Singapore spot vs Dubai (FOB); actual prices up to 2010 and forecasts in 2011$ thereafter.
Refining Margins to Remain Moderate in Near Term

Past and Projected Refining Margins for Dubai Crude, Singapore Market (US$/b)*

* Actual up to 2010 and forecasts in 2011$ thereafter.
## Relative Winners/Losers

<table>
<thead>
<tr>
<th>Winners</th>
<th>Losers</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Upstream</td>
<td>• Less complex refiners in mature markets</td>
</tr>
<tr>
<td>• Trading/storage</td>
<td>• Refiners without feedstock/integration/logistics advantage</td>
</tr>
<tr>
<td>• Secure access to supply</td>
<td></td>
</tr>
<tr>
<td>• Targeted upgrades where feasible?</td>
<td></td>
</tr>
</tbody>
</table>
Unconventional Gas Beyond the US
Non-Conventional Supply: Shale Gas Revolution Continues

Total Recoverable Resource: 6,622 tcf

Europe

<table>
<thead>
<tr>
<th>Country</th>
<th>Proven Natural Gas Reserves (tcf)</th>
<th>Technically Recoverable Shale Gas Resources (tcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>0.2</td>
<td>180</td>
</tr>
<tr>
<td>Germany</td>
<td>6.2</td>
<td>8</td>
</tr>
<tr>
<td>Netherlands</td>
<td>49</td>
<td>17</td>
</tr>
<tr>
<td>Norway</td>
<td>72</td>
<td>83</td>
</tr>
<tr>
<td>UK</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>Denmark</td>
<td>2.1</td>
<td>23</td>
</tr>
<tr>
<td>Sweden</td>
<td>11</td>
<td>41</td>
</tr>
<tr>
<td>Poland</td>
<td>5.8</td>
<td>187</td>
</tr>
<tr>
<td>Turkey</td>
<td>0.2</td>
<td>15</td>
</tr>
<tr>
<td>Ukraine</td>
<td>39</td>
<td>42</td>
</tr>
<tr>
<td>Lithuania</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Others*</td>
<td>2.71</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>639</td>
<td></td>
</tr>
</tbody>
</table>

* Bulgaria, Hungary, and Romania.

Asia (incl. AU)

<table>
<thead>
<tr>
<th>Country</th>
<th>Proven Natural Gas Reserves (tcf)</th>
<th>Technically Recoverable Shale Gas Resources (tcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Korea</td>
<td>107</td>
<td>1,275</td>
</tr>
<tr>
<td>India</td>
<td>37.9</td>
<td>63</td>
</tr>
<tr>
<td>Pakistan</td>
<td>29.7</td>
<td>51</td>
</tr>
<tr>
<td>Australia</td>
<td>110</td>
<td>396</td>
</tr>
<tr>
<td>Total</td>
<td>1,785</td>
<td></td>
</tr>
</tbody>
</table>

North America

<table>
<thead>
<tr>
<th>Country</th>
<th>Proven Natural Gas Reserves (tcf)</th>
<th>Technically Recoverable Shale Gas Resources (tcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>272.5</td>
<td>862</td>
</tr>
<tr>
<td>Canada</td>
<td>62</td>
<td>388</td>
</tr>
<tr>
<td>Mexico</td>
<td>12</td>
<td>681</td>
</tr>
<tr>
<td>Total</td>
<td>1,931</td>
<td></td>
</tr>
</tbody>
</table>

* Already banned!
EIA Latest Shale Study (2)

Focus: **Shale gas potential beyond the US**
- EIA Shale Gas Study in April estimates technically recoverable shale in 32 countries outside the US
- China holds the largest reserves of 1,275 tcf

FGE’s forecast: **China**

China’s production limited by:

1. Industry still in initial stages of development with a wait-and-see approach by investors
2. Limited technical know-how
3. Infrastructural constraints (e.g., pipeline access)
4. Potential acreage access conflicts with coal miners
Outlook For China’s Unconventional Gas

- **Shale Gas Output**
- **CBM Output**
- **Share in Domestic Gas Production**

- **2009**
- **2010**
- **2015**
- **2020**

- **Share**
  - 0.0%
  - 0.5%
  - 1.0%
  - 1.5%
  - 2.0%
  - 2.5%
  - 3.0%
  - 3.5%
  - 4.0%
  - 5.0%
  - 6.0%
  - 7.0%
  - 8.0%
  - 9.0%
  - 10.0%
  - 11.0%
  - 12.0%
  - 13.0%
  - 14.0%
  - 15.0%
  - 16.0%
  - 17.0%
  - 18.0%
Asian LNG Imports: Focus on Post-Japan Disaster
Global LNG Trade: Asia is Still King

Global LNG Trade: 1990-2010

- **1990**: 73% Asia, 24% Europe, 3% Middle East, 2% Americas
- **2000**: 72% Asia, 23% Europe, 5% Middle East, 1% Americas
- **2010**: 60% Asia, 30% Europe, 9% Middle East, 1% Americas

Legend:
- Blue: Asia
- Red: Europe
- Green: Americas
- Purple: Middle East

mmt: Million Metric Tons
Regional LNG Import Outlook (mmtpa)*

- **Europe**
  - 2010: 65
  - 2020: 122
  - 2030: 149

- **Middle East**
  - 2010: 2
  - 2020: 15
  - 2030: 31

- **Asia**
  - 2010: 132
  - 2020: 221
  - 2030: 290

*Base-case scenario*
Snapshot of Japan’s Nuclear Power Situation: Most Affected
Japan on the Lookout for Longer-Term Supplies

- Additional demand post-quake
- Pre-quake demand
- Contracted LNG demand with potential renewals
Longer-Term Outlook: Who Leads the Growth?

Asia Pacific LNG Imports by Country (Year-on-Year Change)

- Recovery in LNG demand $\rightarrow$↑ Industrial sector gas demand; cost competitiveness; seasonality drivers
- ‘Shrinking’ demand

* Includes Indonesia, Malaysia, Singapore, and Thailand.
### Asia Overview: Imports and Uncontracted Demand

#### Asia Pacific LNG Import Forecasts Scenarios (mmtpa)

<table>
<thead>
<tr>
<th>Year</th>
<th>Japan</th>
<th>South Korea</th>
<th>Taiwan</th>
<th>India</th>
<th>China</th>
<th>Likely New Markets*</th>
<th>Mature Markets</th>
<th>Emerging Markets</th>
<th>Other Potential Markets</th>
<th>Total Asia Pacific Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>69.3</td>
<td>27.3</td>
<td>9.0</td>
<td>8.2</td>
<td>3.3</td>
<td>0.0</td>
<td>105.5</td>
<td>11.5</td>
<td>117.0</td>
<td>0.2</td>
</tr>
<tr>
<td>2009</td>
<td>64.6</td>
<td>25.8</td>
<td>8.6</td>
<td>9.1</td>
<td>5.5</td>
<td>0.0</td>
<td>99.0</td>
<td>14.6</td>
<td>113.6</td>
<td>0.5</td>
</tr>
<tr>
<td>2010</td>
<td>70.1</td>
<td>32.6</td>
<td>10.8</td>
<td>8.9</td>
<td>9.4</td>
<td>0.0</td>
<td>113.5</td>
<td>18.3</td>
<td>131.8</td>
<td>3.6</td>
</tr>
<tr>
<td>2011</td>
<td>78.8</td>
<td>35.3</td>
<td>11.5</td>
<td>12.1</td>
<td>13.0</td>
<td>0.5</td>
<td>125.6</td>
<td>25.6</td>
<td>151.2</td>
<td>3.5</td>
</tr>
<tr>
<td>2012</td>
<td>81.6</td>
<td>36.8</td>
<td>11.5</td>
<td>12.5</td>
<td>16.4</td>
<td>1.7</td>
<td>129.9</td>
<td>30.6</td>
<td>160.5</td>
<td>6.0</td>
</tr>
<tr>
<td>2015</td>
<td>77.0</td>
<td>36.2</td>
<td>12.7</td>
<td>13.4</td>
<td>25.5</td>
<td>7.1</td>
<td>125.9</td>
<td>46.0</td>
<td>171.9</td>
<td>12.3</td>
</tr>
<tr>
<td>2020</td>
<td>85.4</td>
<td>36.6</td>
<td>14.6</td>
<td>16.9</td>
<td>40.0</td>
<td>18.0</td>
<td>136.6</td>
<td>74.9</td>
<td>211.5</td>
<td>14.3</td>
</tr>
</tbody>
</table>

*Includes Indonesia, Malaysia, Singapore, and Thailand.

### LNG Uncontracted Demand

- **Likely New Markets** Uncontracted Demand
- **India** Uncontracted Demand
- **China** Uncontracted Demand
- **Taiwan** Uncontracted Demand
- **Korea** Uncontracted Demand
- **Japan** Uncontracted Demand

Likely uncontracted demand including contract renewals.
Other Markets To Keep An Eye On…

Southeast Asia LNG Import Forecast (2020)
18 mmtpa

- Malaysia 30%
- Indonesia 20%
- Thailand 31%
- Singapore 19%

Middle East LNG Import Forecast (2020)
15 mmtpa

- Saudi Arabia 27%
- Bahrain 21%
- Kuwait 21%
- UAE (Dubai) 22%
- UAE (Northern Emirates) 9%

- Southeast Asia is an increasingly exciting market that complements the growth from existing LNG market players.
- Total imports from the above four countries alone are expected to represent roughly 9% of existing LNG importer’s requirements by 2020.
- Another quiet but emerging player is the Middle East—domestic market is growing fast and is expected to have an influence not only on Middle East LNG exports, but also imports for the region.
Where Are The Supplies?
# The Big Picture

## Liquefaction Capacity (in mmtpa)

<table>
<thead>
<tr>
<th>Country</th>
<th>In Operation/Under Commissioning</th>
<th>Under Construction</th>
<th>Announced</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qatar</td>
<td>77.1</td>
<td></td>
<td></td>
<td>77.1</td>
</tr>
<tr>
<td>Nigeria</td>
<td>22.2</td>
<td></td>
<td>8.5 - 45.9</td>
<td>30.7 - 68.1</td>
</tr>
<tr>
<td>Australia</td>
<td>20.3</td>
<td>53.1</td>
<td>29.2 – 102.6+</td>
<td>102.6 – 176.0+</td>
</tr>
<tr>
<td>Russia</td>
<td>9.6</td>
<td></td>
<td>80.4</td>
<td>90.0</td>
</tr>
<tr>
<td>Iran</td>
<td></td>
<td></td>
<td>40.8*</td>
<td>40.8</td>
</tr>
</tbody>
</table>

*Iran LNG (2X5.4 mmtpa) is supposedly “under construction” but progress has only been made to jetty and storage tanks and not the liquefaction units.

> 3/4 of planned capacity globally
Massive Wave of Planned Australasia Projects*

Potential for a massive wave of Greenfield LNG projects coming from Australia and PNG from post-2013. Two projects that reached FID in 2009 have already started construction. Since then, another five projects have reached FID.

* Indicative commissioning dates and non-exhaustive list.
** Excludes LNG from Asian buyers’ equity stake in LNG projects.
**Why divert?**

East-West price differential of US$5-7/mmBtu differential translates into US$31-43 million per Q-max cargo

---

*Qatargas announced in mid-April 2011 that it will supply more than 60 conventional size cargoes to Japan (equivalent to 4 mmt of LNG) for one year. The first cargo was discharged prior to the official announcement.*
New Supply Source: US LNG Exports

- FGE forecasts that a minimum of 7.5 mmtpa could potentially be exported from the US.

- US LNG exports will come into the market over next 3-5 years. However, the size and direction of exports will depend on:
  
  i. Consumer comfort levels.
  ii. Continued confidence in smooth growth of US shale production.
  iii. Free Trade Agreements:
     • LNG exports are limited to countries with existing US FTAs.
     • Exports to other countries awaiting DOE approval.

- Countries with existing US FTAs:
  
  Australia  Bahrain
  Canada  Chile
  Costa Rica  Dominican Republic
  El Salvador  Guatemala
  Honduras  Israel
  Jordan  Mexico
  Morocco  Nicaragua
  Oman  Peru
  Singapore

- Countries pending congressional approvals for FTAs: South Korea, Panama, and Columbia.
Soft Market Expected to Emerge Later This Decade

Asia Pacific Supply (up to planned projects)
Asia Pacific Realistic Projects
US Exports Projects
East of Suez Demand

mmtpa


www.FGEnergy.com
Outlook for LNG Prices
Pre-Quake: “Latest Trends” of the Asian LNG Contract Negotiations

What was on the table – *besides* price?

SPAs less standard =

More flexibility on both sides =

More negotiation space apart from slopes and constants

- Relaxed Destination Clauses
- Price reviews
- Creative pricing mechanisms: Step-up, tranche pricing
- Shipping terms (FOB/DES)
- Dedicated + Portfolio Supplies
- Increased DQT
Japan Disaster: Impact on Asian LNG Price Discussions

- Slopes ~15ish negotiated/concluded
- ‘S’-curves ✗

Pre-Quake

Post-Quake

- Slopes discussed
- ‘S’-curves – high kinks

2009  
2010  
2011

H1 2010
- Slopes negotiated ➡️
- ‘S’-curves ✔️ (unconventional)

H2 2010
- Slopes weakened further ➡️
- ‘S’-curves ✔️ (unconventional)
2010-2020
- Widening differential between oil and gas prices.
- Driven by gas-on-gas competition.
- While US shale gas production is expected to grow, FGE’s projections are less bullish compared to EIA’s.

2020-2025
- Market starts adjusting itself after years of disconnect between oil and gas prices.
- Steeper upward trend in HH reflective of higher costs from rising oil prices and limit on domestic surplus situation.
- More shale gas production expected but increasingly “unfriendly” investment environment increases costs.
- Potential LNG exports may also contribute to narrowing differentials in Atlantic Basin prices.

2025-2030
- Gas prices in the US start to track oil product prices more closely—as they have in the past.
- Forecasts follow a more methodological approach: dual product-price-based method, closely linked with FGE projections of gasoil and fuel oil prices.
FGE Asian Long-Term Contract Price Definition

**Long-term Asian** LNG price at time X: the agreed price at time X for a long-term contract (contract duration of **10 years** or more) from a project sanctioned (FID taken) or under construction with first delivery scheduled in approximately **4 years**.

i.e., delivered price in 2010 reflects price negotiations from 2006.

Note: For the purposes of the following projections, we assume a 20-year contract duration.

**Short-term Asian** LNG price at time X: the agreed price at time X for a short-term contract (contract duration of **2 years or less**) from an existing project or one under construction with first delivery scheduled in approximately **1 year**.

i.e., delivered price in 2010 reflects price negotiations from 2009.

Note: For the purposes of the following projections, we assume a 2-year contract duration.
Projected Price of New Asian LNG Contracts vs HH, NBP, and JCC ($2011)

- Crude Oil Parity (JCC)
- Asian LNG Price (Long-Term Contracts)
- Asian LNG Price (Short-Term Contracts)
- NBP (UK)
- HH (USA)
Future Capital Expenditures for Liquefaction Plants?

Future relief?

Projects in operation
Projects under construction
Projects planned

Startup

Projects in operation:
- Trinidad (Atlantic LNG, T4)
- Oman (Oman LNG)
- Qatar (RasGas T3 & T4)
- Egypt (Idku)
- Equatorial Guinea
- Australia (NWS, T5)
- Qatar (Qatargas II)
- Yemen (Tangguh LNG)
- Indonesia (Arzew GLNG)
- Australia (Ichthyos)
- Indonesia (Donggi Senoro LNG)
- Angola (LNG)
- Algeria (Skikda Rebuilt)
- Algeria (Azaw. GLZ)
- PNG LNG
- Australia (Gorgon)
- Australia (GLNG)
- Indonesia (Bonggi Senoro LNG)
- Nigeria (Brass LNG)
- Australia (Gorgon)
- Australia (GLNG)
- Indonesia (Bonggi Senoro LNG)
- Nigeria (Brass LNG)

Projects under construction:
- 2003
- 2004-2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014/2015

Projects planned:
- 2015 and Beyond

Startup
High Cost Greenfield Projects

- Hypothetical cost breakdown for a US$1,000/tonne of capacity with a 12% rate of return on investment:

<table>
<thead>
<tr>
<th></th>
<th>US$/mmBtu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upstream</td>
<td>1.5-2.5</td>
</tr>
<tr>
<td>Liquefaction costs</td>
<td>3.5</td>
</tr>
<tr>
<td><strong>Minimum FOB price</strong></td>
<td><strong>5-6</strong></td>
</tr>
</tbody>
</table>

**Assumptions:**
- **Capex:** US$/tonne spread over 4 years
- **Opex:** 3% Capex
- **Project Life:** 30 years
- **Conversion Factor:** 1 tonne per annum = approx 52 mmBtu per annum

- Which markets will pay such high prices?
  - Eastern markets still the best option.
Asia’s Domestic Gas Pricing Conundrum
Domestic Gas Prices “Catch-Up” To Regional Benchmark Prices*

$/mmBtu

China^  India  Thailand  Malaysia  Indonesia

< 5% market share  > 80% market share  ~ 80% market share  ~ 70% market share

* Range based on retail prices to city gas (residential, commercial, and industrial) and power sectors.
** 2010 JLC and JCC levels.
^Estimated from average prices paid by various sectors in Beijing, Shanghai, Tianjin, Sichuan, Shenzhen, and Guangxi as of July 2010.
Historical/Future Price Range vs Current Retail Prices

- China
  - By 2020: average price based on FGE forecast of LNG and Turkmen imports
  - Highest paid cargo = ~$22/mmBtu (2008)

- India
  - By 2020: average import price from Qatar and the Pacific
  - Highest paid cargo = ~$20/mmBtu (2008)

- Thailand
  - By 2020: average import price from GLNG
  - Highest recorded export price = ~$21/mmBtu (2008)

- Malaysia
  - By 2020: average import price is estimated ~$12/mmBtu*

- Indonesia
  - Highest recorded export price = ~$22/mmBtu (2008)

Historical price range

NWS to CNOOC = ~$3.30/mmBtu
RasGas to Petronet (initial 5 years) = ~$3.20/mmBtu DES

*Pipeline gas imports from Myanmar
Middle East: An Exciting Market to Watch
Middle East Gas Exports—Feast or Famine?

**Iraq** has a potential to export gas by pipeline to Europe (500-700 mmscf/d) and/or Syria (300-500 mmscf/d). However, gas exports availability would be eliminated if the rehabilitation of Iraq progresses quickly.

**Iran**'s gas export volumes will be small.
- Large domestic gas market-price was $0.45/mmBtu; recently ~$2/mmBtu
- Massive gas re-injection of over 8-9 bscf/d
- Substantial political opposition to gas exports
- Political challenges for international investment

**Qatar** is now the largest LNG exporter in the world.
- We cannot assume infinite supplies.
- About 77 million tonnes are already committed.
- For now, no new sales are contemplated.

Yemen, Oman, and Abu Dhabi are out of supply.
Despite the region’s massive petroleum reserves, gas production in almost all Middle East countries are struggling to keep abreast with demand, especially for the industrial and power sectors.

Middle Eastern energy market dynamics shifted dramatically in 2009 as a result of the commencement of Kuwaiti LNG imports. Kuwait’s status as an LNG importer illustrates the Middle East’s strong dependence on natural gas and the rapidly increasing gap between supply and demand.

This is evidenced by the fact that other countries like the UAE, and possibly Bahrain, will use LNG to augment domestic gas supply in the coming years.
Challenges in Middle East Gas Projects

High costs are still an important challenging issue in upstream and downstream gas projects.

- **Upstream Projects**
  - Massive Increase in Drilling Costs (compared to 2003)
  - Massive Cost Increase in Equipment

- **Pipelines**
  - 80-100% Increase in Construction Costs for Gas Pipelines (Offshore and Onshore Pipelines)

- **Gas Processing Plants**
  - 100-120% Increase (compared to 2003) in Construction Costs for New Gas Processing Plants

More Expensive Gas Prices in Middle East Import Projects

More Pressure on Governments to Set Higher Prices for Their Domestic Consumers
A New Price Marker in the Making?

Atlantic Basin

Middle East price marker in the making?

Middle East

NBP/Zee/TTF Index & Brent/GO/FO Index

HH Index

Asia Pacific

JCC/No Real Time Index
What Could Be the Middle East Price Marker?

- Kuwait LNG Deals (8-10% slope)
- Dubai LNG Deal (14-15% slope)
- Saudi Arabia/Bahrain import potential?
- Iran-Turkmenistan (10-12% slope)
- New Iran Domestic Prices (~8-9% slope)
- Dolphin Project (2nd phase) (10-13% slope)
- NBP/Europe (13% slope)

Slopes estimated at US$80/b oil price scenario
Thank You

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