The New Geopolitics of Energy

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Global Oil Supply and Demand

Source: IEA Oil Market Report
Disruptions at Historic Highs

Unplanned Crude Oil Production Disruptions

Source: EIA
Where Will the Market Go?

Balances

Supply
North American Growth

Demand
Asia - slowing?
OECD flat

Risk

Disruptions?
Iraq, Libya, Nigeria

Additions?
Iran, Russia, Saudi Arabia

$80 – 85/barrel
Operator Performance Analysis

- Compares operator production in similar acreage
- The best operators have 3x the production of the worst operators

Operational efficiencies can have a dramatic impact on productivity outcomes
Breakeven Prices: Average vs. Best In Class Operator

Source: Drillinginfo, DI Analytics, $7.5MM well cost
China Oil Imports Passing Through Major Chokepoints

Country | Saudi Arabia | Angola | Iran | Russia | Oman | Iraq | Sudan | Venezuela | Kazakhstan | Kuwait | UAE | Brazil | Republic of Congo | Other
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | ---
% of total imports | 19.80 | 12.27 | 10.93 | 7.78 | 7.15 | 5.44 | 5.12 | 4.53 | 4.41 | 3.76 | 2.66 | 2.64 | 2.23 | 11.27

Source: NYU Center on International Cooperation
Stealing & selling: 50-60,000 bpd

ISIS Revenue: approx. $2 million/day
<table>
<thead>
<tr>
<th></th>
<th>2013 Avg.</th>
<th>Fall 2014</th>
<th>1^ Iraq 2014 Target</th>
<th>2^ Iraq 2020 Target</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Exports</strong></td>
<td>2.4</td>
<td>2.9</td>
<td>3.3</td>
<td>9.4</td>
</tr>
<tr>
<td><strong>North</strong></td>
<td>2.2</td>
<td>2.6</td>
<td>2.7</td>
<td>8.0</td>
</tr>
<tr>
<td><em>(Kirkuk)</em></td>
<td>0.2</td>
<td>0.3</td>
<td>0.6</td>
<td>1.4</td>
</tr>
<tr>
<td><em>(KRG)</em></td>
<td>(&lt;0.1)</td>
<td>(&lt;0.1)</td>
<td>(0.3)</td>
<td>(0.4)</td>
</tr>
<tr>
<td><strong>Domestic</strong></td>
<td>0.6</td>
<td>0.6</td>
<td>0.7</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Total Production</strong></td>
<td>3.0</td>
<td>3.5</td>
<td>4.0</td>
<td>10.4</td>
</tr>
</tbody>
</table>

1. Ministry of Oil Projection from February 2014 Energy JCC, and industry reporting
2. Iraq’s Integrated National Energy Strategy, base case scenario, and industry reporting

Source: Iraq SOMO
• Offshore loadings have been constrained:
  – Two existing single point moorings (SPMs) were together at 800 Kb/d effective capacity (<50% of nameplate).
  – Nationwide output in December 3 Mb/d.

• Initial Work Completed:
  – Central Metering-Monitoring Platform (CMMP) installed.
  – Adding up to 900 Kb/d of export capacity from the two existing SPMs.
  – Two new SPMs added.

• Other maintenance and upgrades ongoing
  – New offshore pipelines, connecting to new SPMs.
  – ABOT/KAAOT rehabilitation.
  – Additional pumping/storage.

Source: USG, Iraq Ministry of Oil, IEA, Reuters, Iraq Oil Report
## Kurdistan Region: Production and Revenue Scenarios

<table>
<thead>
<tr>
<th>Price</th>
<th>Production</th>
<th>Revenue*</th>
<th>Production</th>
<th>Revenue*</th>
<th>Production</th>
<th>Revenue*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>$80</td>
<td>200,000</td>
<td>5.8</td>
<td>300,000</td>
<td>8.7</td>
<td>400,000</td>
<td>11.6</td>
</tr>
<tr>
<td>$100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>300,000</td>
<td>8.7</td>
<td>400,000</td>
<td>10.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$100</td>
<td>400,000</td>
<td>11.6</td>
<td></td>
<td></td>
<td>800,000</td>
<td>23.2</td>
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<tr>
<td>$100</td>
<td></td>
<td></td>
<td>600,000</td>
<td>17.4</td>
<td></td>
<td>29.2</td>
</tr>
</tbody>
</table>

*Revenue in billions of dollars
Border Crossings

**Sell to local consumers for small-scale generation**

**Process in makeshift refineries in Raqqa, Syria (ISIS ‘capital’), sent to Iraq or smuggled to Turkey**

**Sell to black market at $26/barrel**

**Transport fuel to Mosul, triple prices**

*... also sells to Syrian gov’t*

Source: Institute for the Study of War
European Gas Imports by pipeline and LNG

- LNG Terminals
  - Existing or Under Construction
  - Proposed

- Gas Flows
  - Pipeline
  - LNG

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2013</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>OECD Europe Demand</td>
<td>567</td>
<td>504</td>
<td>504</td>
</tr>
<tr>
<td>LNG Imports</td>
<td>86.2</td>
<td>45.8</td>
<td>68</td>
</tr>
<tr>
<td>Pipeline Imports</td>
<td>301.2</td>
<td>296.3</td>
<td>270</td>
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</table>

Source: Gas Infrastructure Europe and IEA Medium-Term Gas Market Report 2010, 2014
# Ukraine Gas Balances (bcm)

<table>
<thead>
<tr>
<th></th>
<th>2013/2014</th>
<th>2014/2015</th>
<th>10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Consumption</strong></td>
<td>50</td>
<td>42</td>
<td>45</td>
</tr>
<tr>
<td><strong>Production</strong></td>
<td>20</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td><strong>Reverse Flow</strong></td>
<td>2</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td><strong>Supply Gap</strong></td>
<td>28</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td><strong>Storage</strong></td>
<td>16 ⇔ 16</td>
<td>16 - 10 = 6</td>
<td>30 ⇔ 30</td>
</tr>
<tr>
<td><strong>Russia</strong></td>
<td>28</td>
<td>5</td>
<td>Price?</td>
</tr>
</tbody>
</table>
Eastern Ukraine: Russian Intent?
Russian Economic Developments

Exchange Rate Plummets

Inflation Rises

FX Depreciation Helps Exports

People are Poorer

Source: CBR

Source: Rosstat, Haver Analytics, World Bank team
World Energy Consumption Forecast

Total Primary Energy (Quads)

- Total
- Non-OECD
- OECD

Power investment in Asia (GW)

Additions:
- Other
- Wind and solar PV

Retirements:
- Other
- Wind and solar PV

Source: EIA 2013 IEO, IEA 2014 WEIO
Energy Demand and CO₂ Emissions

New Policies Primary Energy Demand and Related CO₂ Emissions

Source: IEA, World Energy Outlook 2013
Global growth in coal demand from 2013 to 2018 is dominated by Asia.

Projections of coal demand 2013-2018

Growth in global in coal demand 2013-2018 (817Mtce)

Source: IEA Medium Term Coal Report, 2013
Levelized Cost of Energy: Capital Costs, O&M, Performance and Fuel

Wind-Onshore

- Electricity price
  - Range: 50 USD/MWh to 120 USD/MWh
- Load factor
  - Range: 20% to 26%
- Construction cost
  - Range: 3000 USD/MWh to 6000 USD/MWh
- Construction duration
  - Range: 1 year to 3 years

Source: OpenEI, NREL, DOE
Global Capacity Flows 2014-2035

Source: IEA, World Energy Investment Outlook 2014
Energy poverty by country: percentage of population vs. total number of people

**Figure 2.14A Top 20 Countries with Lowest Access Rates**

**Figure 2.14B Top 20 Countries with Largest Access Deficits**

**Source:** World Bank’s Global Electrification Database 2012.

**Note:** CAR = Central African Republic; PNG = Papua New Guinea; DR = Democratic Republic.
Energy, Employment & Economic Growth

Figure 11: GDP per capita vs. electricity access

Source: GDP per capita is from World Bank and Electricity Access from IEA, accessed in 2011
Dynamic Global Energy Landscape

- Structure of Demand
- Diversity in Oil Supply
- Energy Finance and Poverty
- Competition in Natural Gas
- Fuel Mix and Climate Change
- U.S. Energy Revolution