Comments on  
The Changing Fundamentals of Global Gas Markets – Europe as the Battleground

Branko Terzic, P.E., Sc. D (h.c.)  
Executive Director, Deloitte Center for Energy Solutions  
for the  
Carnegie Endowment for International Peace  

October 12, 2010

The 21st Century’s Triad

- Securing an adequate energy supply at reasonable cost (not new)
- Intelligently managing energy demand to lower consumer bills (not new)
- Managing the greenhouse gas (“climate change”) issue (new)
Power system overview

Basic Structure of the Electric System

Color Key:
Blue: Transmission
Green: Distribution
Black: Generation

Transmission Lines
(690, 465, 230, and 138 kV)

Subtransmission
690 kV and 230 kV

Primary Customer
138 kV and 4 kV

Secondary Customer
138 kV and 4 kV

Generating Station
Generator Step-Up Transformer
Transmission Customer
138 kV or 230 kV

Figure 2.0 Primary Energy Consumption by Source and Sector, 2008
(Quadrillion Btu)

Supply Sources

<table>
<thead>
<tr>
<th>Source</th>
<th>Percent of Source</th>
<th>Percent of Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petroleum</td>
<td>37.1</td>
<td>7.1</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>23.8</td>
<td>85</td>
</tr>
<tr>
<td>Coal</td>
<td>22.5</td>
<td>20.6</td>
</tr>
<tr>
<td>Renewable Energy</td>
<td>7.3</td>
<td>10.8</td>
</tr>
<tr>
<td>Nuclear Electric Power</td>
<td>8.5</td>
<td>40.1</td>
</tr>
</tbody>
</table>

Demand Sectors

- Transportation: 27.8
- Industrial: 20.6
- Residential: 10.8
- Electric Power: 40.1

Notes:
- Does not include the fuel ethanol portion of motor gasoline—fuel ethanol is included in "Renewable Energy".
- Includes supplemental gaseous fuels.
- Includes data from 1, 2, supplement B of coal coke, and steel.
- Includes hydroelectric, nuclear, geothermal, wind, solar, and biomass.

Copyright © 2010 Deloitte Development LLC. All rights reserved.
Coal, Oil, and Natural Gas Will Remain Indispensable

1990
8,755 Million tons of Oil Equivalent

2005
11,429 Million tons of Oil Equivalent

2030
17,721 Million tons of Oil Equivalent

Source: IEA 2007 World Energy Outlook

Range of Global Supply Projections – Gas

Source: NPC Survey for the Oil & Gas Study
Regional Gas Supply Outlooks

Incremental projected natural gas supplies by 2030 will come from non-OECD Europe & Eurasia, Asia & Oceania, and the Middle East.

Comments on A. J. Melling Paper

European Gas Prices/Contracting Structures for Power Generators: Long-Term Oil-Indexed Contracts v. Spot-Price Contracts

- Long-term, oil-indexed GSAs are suboptimal for power generators in particular for independent/competitive generators running CCGTs.
- Generators under LT contracts may at times be forced to purchase large volumes of gas while selling their power at prices that do not cover the cost of the gas (or face large ToP penalties).
Comments cont’d

- Long-term oil-indexed GSAs more feasible for gas-fired generation capacity that is used to meet base-load power demand.
- Liquid spot gas markets in northwestern Europe (as opposed to much of Central and Eastern Europe) supports CCGT development there.
- Superior characteristics of spot GSAs for power generators will help spot gas contracting (and thus spot gas markets) to continue to gain ground in Europe.
- Long-term, oil-indexed GSAs will not completely disappear from European gas markets (at least not in the foreseeable future).

“the Statoil-Poweo GSA of June 2010”—may represent the way forward for CCGT developers in Europe
- Major gas producers are more likely to remain open to increased/novel market-based GSAs with CCGT developers, if the producers continue to face widespread competition from secondary gas suppliers (who source and resell spot gas) in the broader European marketplace.
- Future EU renewable energy/carbon policy represents a wildcard with respect to future CCGT development.
Summary

- There will be need for new firm electricity capacity.
- New firm electricity capacity must come from generation which can be “dispatched” i.e. traditional fuel sources: Coal. Natural gas, oil, hydro-electric.
- Natural gas has advantages for electricity production in Europe: available, deliverable, relative lower CO2 emissions and can be priced competitively
- Natural gas contract forms need to meet the dynamic demands of competitive generation.

Branko Terzic
bterzic@deloitte.com
Office +1 703 251 4350