Energy markets – the short and the long term

Christof Rühl, Chief Economist, BP
Outline

• The economy
• A year of disruptions
• Long term implications
• Conclusion
Global growth: slow and on life support

2013 GDP and the good old days

Annual change, %

<table>
<thead>
<tr>
<th>Region</th>
<th>Eurozone</th>
<th>Japan</th>
<th>US</th>
<th>Brazil</th>
<th>China</th>
<th>India</th>
<th>Non-OECD</th>
<th>OECD</th>
<th>World</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>8%</td>
<td>6%</td>
<td>8%</td>
<td>8%</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
</tr>
</tbody>
</table>

Central Bank liquidity

Trillion $US* % of world GDP

*At constant 2011 exchange rates

Source: includes data from Thomson Reuters Datastream
Europe struggles into recession

Eurozone indicators

10-year benchmark bond yields

Source: includes data from Thomson Reuters Datastream
The US grows slowly

Components of domestic demand

Index: 1Q 2007=100

- Government
- Investment

“Fiscal cliff”

Budget deficit, % of GDP

Source: includes data from CBO August 2012 forecast and Thomson Reuters Datastream
The Chinese economy slows

Exports

% y-o-y, 3m ma.

Commercial bank loans

Change y-o-y, trillions of CNY  % y-o-y

Source: includes data from Thomson Reuters Datastream
Energy in 2011 – disruptions and continuity

Supply disruptions

Mtoe

<table>
<thead>
<tr>
<th>Country</th>
<th>“Arab Spring”</th>
<th>“Fukushima”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Libya</td>
<td>-80</td>
<td>0</td>
</tr>
<tr>
<td>Syria/Yemen</td>
<td>-60</td>
<td>-20</td>
</tr>
<tr>
<td>Japan</td>
<td>-10</td>
<td>-10</td>
</tr>
<tr>
<td>Germany</td>
<td>-20</td>
<td>-20</td>
</tr>
</tbody>
</table>

Source: includes data from Oxford Economics

GDP and energy growth

Annual change, %

<table>
<thead>
<tr>
<th>Period</th>
<th>GDP</th>
<th>Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001-11</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>2011</td>
<td>2%</td>
<td>1%</td>
</tr>
</tbody>
</table>

Source: includes data from Oxford Economics
Energy prices

Energy prices

$/boe

<table>
<thead>
<tr>
<th>Feb-08</th>
<th>Mar-09</th>
<th>Apr-10</th>
<th>May-11</th>
<th>Jun-12</th>
</tr>
</thead>
</table>

- **Oil Brent**
- **Gas Henry Hub**
- **Coal basket**

2011 price changes

Annual change, %

<table>
<thead>
<tr>
<th>Oil Brent</th>
<th>Gas HH</th>
<th>Coal basket</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10%</td>
<td>-20%</td>
<td>-10%</td>
</tr>
</tbody>
</table>

Source: includes data from Platts and McCloskey
The Fukushima Adjustment
Natural gas markets in 2011

Production and consumption growth

Regional gas prices

Source: includes data from Platts
US natural gas market

Production

Gas share in power generation

Source: includes data from Energy Information Administration
Global gas trade

Gas exports

LNG import growth in 2011

Source: includes data from Cedigaz, GIIGNL, CISStats, Poten, Waterborne
Coal prices and trade

Steam coal prices

Import growth in 2011

Annual change, Mtoe

Source: includes data from McCloskey, Eurostat, IHS CERA

*China, India, Japan, South Korea, Hong Kong, Taiwan
Natural gas demand growth is concentrated in the non-OECD

Energy Outlook 2030

IEEJ: 2012年10月 禁無断転載
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Unconventional gas will play a growing role

Gas supply by region

North America

Europe

China

- **Net pipeline imports**
- **Net LNG imports**
- **Syngas from coal**
- **Shale gas and CBM**
- **Conventional (inc. tight gas)**
Oil markets and trends
Crude oil prices

Source: includes data from Platts
Oil production growth in 2011

Decline

-1.5
Libya

-1.0

-0.5
UK
Angola
Azerbaijan
Norway

0.0

Increase

0.5
US
Iraq
Kuwait
UAE

1.0

1.5
Saudi Arabia
Oil consumption growth in 2011

<table>
<thead>
<tr>
<th>Country</th>
<th>Largest changes (Kb/d)</th>
<th>Regional growth by fuel type</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td></td>
<td>Light distillate</td>
</tr>
<tr>
<td>Russia</td>
<td></td>
<td>Middle distillate</td>
</tr>
<tr>
<td>India</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iran</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taiwan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US</td>
<td></td>
<td>Non-OECD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OECD</td>
</tr>
</tbody>
</table>
Oil consumption and production

World liquids demand and supply

OECD commercial oil stocks

Source: includes data from Energy Information Administration and Monthly Oil Data Services © OECD/International Energy Agency June 2012
US supply

US supply

Annual change, Kb/d

2008 2009 2010 2011 1Q12

0 250 500 750 1000 1250

Other
NGLs GoM TX/ND* Net

*Texas and North Dakota

Source: includes data from Energy Information Administration and Baker Hughes
Limits to oil consumption growth

Subsidised consumption

% of global demand

$/bbl

Vehicle fuel economy

Litres/100km for new sales

Source: includes data from the International Council for Clean Transportation and the US Environmental Protection Agency

* Includes light trucks
Liquids supply growth - OPEC and North America

Liquids supply by type

- OPEC share (rhs)
- OPEC NGLs
- OPEC crude
- Biofuels
- Oil Sands
- Other non-OPEC
- Non-OPEC conv.

Growth from 2010 to 2030

- Other
- Saudi Arabia
- Brazil
- Iraq
- US Shale Oil
- Biofuels
- NGLs
- Canadian Oil Sands
- Other
- OPEC
- Americas
- RoW

Energy Outlook 2030
The long term: energy security
Impact of oil prices on the economy

2011 net oil import bill

% GDP

- Oil import bill
- Exports to oil producers
- Net cost

Net oil imports

Mb/d

Source: includes data from the International Monetary Fund
Regional energy imbalances

Key:
Billion toe
1
Gas
Oil
Coal
0
1990 2010 2030
-1
Net importers
Net exporters

Source: includes data from the International Monetary Fund
Import dependency rises in Asia and Europe

### Import share of respective fuel

<table>
<thead>
<tr>
<th>Region</th>
<th>1990</th>
<th>2010</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>40%</td>
<td>47%</td>
<td>91%</td>
</tr>
<tr>
<td>China</td>
<td>6%</td>
<td>80%</td>
<td>42%</td>
</tr>
<tr>
<td>EU27</td>
<td>57%</td>
<td>80%</td>
<td>94%</td>
</tr>
<tr>
<td>US</td>
<td>32%</td>
<td>94%</td>
<td>91%</td>
</tr>
</tbody>
</table>
Long-term trends

Shares of world primary energy

- Oil
- Coal
- Gas
- Hydro
- Nuclear
- Renew.

Oil and gas reserves

Trillion bbls

Tcm

- Other
- North America
- FSU
- OPEC
Conclusion

• Key to the 2011 response: flexible markets
• Medium term: supply response, inter-fuel substitution and trade optimisation
• Long term: Global integration and its perils
Energy markets – the short and the long term