Energy in 2013: Taking stock
Energy in 2013: Taking stock

Christof Rühl, Group Chief Economist
Outline

- Introduction
- Energy and the economy
- Fuel by fuel
- Concluding remarks
Energy demand and prices

Primary energy consumption

- OECD
- Non-OECD

$2013/boe

- Oil Brent
- Gas European spot
- Gas US
- Coal basket

Source: includes data from ICIS Heren Energy, Energy Intelligence Group, IHS McCloskey and Platts

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Reserves and new sources of energy supply

Oil reserves

Gas reserves

Energy production growth 2013

Trillion bbls

<table>
<thead>
<tr>
<th>Year</th>
<th>North America</th>
<th>FSU</th>
<th>Other</th>
</tr>
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<td>1983</td>
<td>0.8</td>
<td>1.2</td>
<td>0.4</td>
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Tcm

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Annual change, Mtoe

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<tr>
<td>US gas</td>
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<tr>
<td>World total</td>
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</tbody>
</table>

* Includes biofuels

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Energy and the economy

GDP growth

Annual change, %

-10% -8% -6% -4% -2% 0% 2% 4% 6% 8% 10%

2003 2005 2007 2009 2011 2013

World OECD Non-OECD

Energy and GDP in 2013

Annual change, %

-10% -8% -6% -4% -2% 0% 2% 4% 6% 8%

GDP Energy GDP Energy

Non-OECD OECD

10 year average

Source: includes data from Oxford Economics
Note: GDP growth based on Purchasing Power Parity measure of GDP

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Energy consumption in 2013

Growth by region

Annual change, %

-3% 0% 3% 6% 9%

Africa
Middle East
S & C America
Europe & Eurasia
Asia Pacific
of which China
North America
of which US

Growth by fuel

Annual change, %

-3% 0% 3% 6% 9%

Renewables
Nuclear
Hydro
Gas
Coal
of which China
Oil
of which US

10 year average

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Energy consumption in 2013

Growth by region

Annual change, %

<table>
<thead>
<tr>
<th>Region</th>
<th>-3%</th>
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<th>3%</th>
<th>6%</th>
<th>9%</th>
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<tr>
<td>S &amp; C America</td>
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<td>Europe &amp; Eurasia</td>
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<tr>
<td>Asia Pacific</td>
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<td></td>
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<tr>
<td>of which China</td>
<td></td>
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<td></td>
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<tr>
<td>of which India</td>
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<tr>
<td>North America</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>of which US</td>
<td></td>
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Growth by fuel

Annual change, %

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<th>6%</th>
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<td>Nuclear</td>
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<td>Gas</td>
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</tr>
<tr>
<td>Coal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of which China</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of which India</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Oil</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>of which US</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

10 year average
The oil market in 2013

Oil prices and volatility

- Price volatility (RHS)
- Oil price

Volatility*
- 90%
- 75%
- 60%
- 45%
- 30%
- 15%
- 0%

Production and consumption growth

Annual change, Mb/d
- Production
- Consumption

Source: Includes data from Platts
* Three year standard deviation

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Oil consumption

Oil consumption

Mb/d

- OECD
- Non-OECD

2003 2005 2007 2009 2011 2013

Kb/d

Largest changes in 2013

US
China
Brazil
Russia
S. Arabia
Italy
Mexico
Israel
Spain
Japan

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Oil consumption by product

Growth by product type in 2013

- **Non-OECD**
  - Middle distillates: 300 Kb/d
  - Gasoline: 200 Kb/d
- **OECD**
  - Middle distillates: 100 Kb/d
  - Gasoline: 20 Kb/d

10 year average

**US growth in 2013**

- **LPG* and naphtha**: -100 Kb/d
- **Gasoline**: 50 Kb/d
- **Middle distillates**: 200 Kb/d
- **Other**: -50 Kb/d

10 year average

* Includes ethane

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Oil production

Largest changes in 2013

<table>
<thead>
<tr>
<th>Mb/d</th>
<th>Non-OPEC</th>
<th>UAE</th>
<th>Canada</th>
<th>Russia</th>
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<tr>
<td>-1.0</td>
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<td></td>
<td>US</td>
</tr>
<tr>
<td>-0.5</td>
<td></td>
<td></td>
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<tr>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5</td>
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<tr>
<td>1.0</td>
<td>US</td>
<td>UAE</td>
<td>Canada</td>
<td>Russia</td>
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Largest oil production increases

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual change, Mb/d</th>
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<tr>
<td>Saudi 1973</td>
<td>1.5</td>
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<td>Saudi 1986</td>
<td>1.0</td>
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<td>Saudi 1976</td>
<td>0.5</td>
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<td>Saudi 1990</td>
<td>0.0</td>
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<td>Saudi 1979</td>
<td>-0.5</td>
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<tr>
<td>Saudi 1972</td>
<td>-1.0</td>
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<tr>
<td>Saudi 2003</td>
<td>-1.5</td>
</tr>
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<td>Saudi 1988</td>
<td>-2.0</td>
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<td>US 2013</td>
<td>-2.0</td>
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<td>Iran 1982</td>
<td>-1.0</td>
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<td>Saudi 2011</td>
<td>-0.5</td>
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<td>Libya 2012</td>
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<tr>
<td>US 2012</td>
<td>0.5</td>
</tr>
</tbody>
</table>

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Oil supply disruptions

Cumulative change since 4Q10, Mb/d

- Libya
- Iran
- Other

Source: Includes data from US Energy Information Administration
Note: Other includes Sudan/S Sudan, Syria & Yemen

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Oil supply disruptions and US production growth

Cumulative change since 4Q10, Mb/d

- Libya
- Iran
- Other
- US
- Net

Source: includes data from US Energy Information Administration
Note: Other includes Sudan/S Sudan, Syria & Yemen

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Refining capacity

Capacity growth in 2013

Mb/d

-0.6  -0.3  0.0  0.3  0.6  0.9

N America
S & C America
Middle East
Africa
Asia Pacific
FSU
Europe

Crude run changes

Cumulative spare capacity growth

Mb/d since 2005

Non-OECD
OECD

Source: Includes data from ICIS Parpinnelli Tecnology and Energy Security Analysis, Inc.
Refinery utilization and crude differentials

**Refinery utilization**
- World
- OECD
- Non-OECD

**Brent-WTI**

<table>
<thead>
<tr>
<th>Year</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014 ytd</th>
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</tbody>
</table>

Source: Includes data from Energy Security Analysis, Inc. and Platts

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Global natural gas markets

Natural gas prices

$/mmBtu

- Japanese import
- German import
- UK NBP
- US HH


Gas consumption growth in 2013

Annual change, %

-2% 1% 4% 7%

- S & C America
- Middle East
- North America
- Asia Pacific
- Africa
- Europe & Eurasia

10 year average

Source: Includes data from BAFA, Energy Intelligence and ICIS Heran Energy

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Global natural gas markets

Natural gas prices

$/mmBtu

20
16
12
8
4
0


Japanese import
German import
UK NBP
US HH

Gas consumption growth in 2013

Annual change, %

-13% -8% -3% 2% 7%

S & C America
Middle East
North America
Asia Pacific
of which India
Africa
Europe & Eurasia

10 year average

Source: includes data from BAFA, Energy Intelligence and ICIS Heren Energy
US natural gas market

Horizontal drilling rigs

Number of rigs

<table>
<thead>
<tr>
<th></th>
<th>Feb-11</th>
<th>Feb-12</th>
<th>Feb-13</th>
<th>Feb-14</th>
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<tbody>
<tr>
<td>Oil</td>
<td>1050</td>
<td>1100</td>
<td>1300</td>
<td>1400</td>
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<tr>
<td>Gas</td>
<td>350</td>
<td>400</td>
<td>500</td>
<td>550</td>
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Consumption growth in 2013

Annual change, Bcm

- Residential & Commercial: 60 Bcm
- Industrial: -20 Bcm
- Power: 40 Bcm

10 year average: -40 Bcm

Source: Includes data from Baker Hughes and US Energy Information Administration

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Global LNG and Asian supply

Global LNG imports

<table>
<thead>
<tr>
<th>Year</th>
<th>Bcm</th>
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<tbody>
<tr>
<td>2003</td>
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<tr>
<td>2005</td>
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<td>2007</td>
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<tr>
<td>2011</td>
<td>360</td>
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<tr>
<td>2013</td>
<td>360</td>
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Asian supply growth in 2013

<table>
<thead>
<tr>
<th>Country</th>
<th>Annual change, Bcm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan &amp; South Korea</td>
<td>8</td>
</tr>
<tr>
<td>China</td>
<td>16</td>
</tr>
<tr>
<td>India</td>
<td>-8</td>
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</tbody>
</table>

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EU natural gas market

Power generation mix

Share of total generation, %

- Coal
- Gas
- Renewables
- Other *

2003 2005 2007 2009 2011 2013

Natural gas supply

Annual change, Bcm

- Norway
- Other
- LNG
- Production
- Net imports
- Russia
- N. Africa

Source: Includes data from ENTSOE and IHS CERA

* Includes hydro, nuclear and oil

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Russian natural gas market and global trade

Russian natural gas

Annual change, Bcm

2012
2013

-30
-20
-10
0
10
20

Other
Gazprom
Production
Consumption
Net export

Trade share of global consumption

Share of consumption, %

1993
1998
2003
2008
2013

LNG
Other pipeline
Russian pipeline

Source: Includes data from CDU MoE

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The coal market

Coal prices

$/tonne

150
125
100
75
50

Asia | Europe | US

2009 2010 2011 2012 2013

Growth in China

Annual change, Mtoe

2009 2010 2011 2012 2013

Consumption (10 year avg.)

Consumption
Production

Source: Includes data from IHS McCloskey and Platts

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Hydro, renewables and nuclear

Power generation

<table>
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<tr>
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<td>3.0</td>
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Output changes in 2013

<table>
<thead>
<tr>
<th>Annual change, TWh</th>
<th>Nuclear</th>
<th>Hydro</th>
<th>Renewables</th>
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<tbody>
<tr>
<td>EU</td>
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<td>-50</td>
<td>50</td>
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</tr>
<tr>
<td>US</td>
<td>25</td>
<td>-10</td>
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<tr>
<td>Other</td>
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Renewables in power generation

Growth by region

Annual change, TWh

<table>
<thead>
<tr>
<th>Year</th>
<th>Other</th>
<th>China</th>
<th>US</th>
<th>EU</th>
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<td>2008</td>
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<tr>
<td>2013</td>
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Annual change, %

28%

Growth (RHS)

Renewables share of power

<table>
<thead>
<tr>
<th>Year</th>
<th>EU</th>
<th>US</th>
<th>World</th>
<th>China</th>
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<td>1998</td>
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<td>2003</td>
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Renewables in power generation

Growth by region

Annual change, TWh

Annual change, %

<table>
<thead>
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<th>Other</th>
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<td>2008</td>
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<tr>
<td>2013</td>
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Renewables share of power

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<td>World</td>
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</tr>
<tr>
<td>China</td>
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<tr>
<td>India</td>
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</tbody>
</table>

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Fuel shares and carbon emissions

Shares of global primary energy

- Oil
- Coal
- Gas
- Hydro
- Nuclear
- Renew. 2013

Energy and emissions growth in 2013

Annual change, %

- Carbon
- Energy

10 year average

World
OECD
Non-OECD
US
EU

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Fuel shares and carbon emissions

Shares of global primary energy

<table>
<thead>
<tr>
<th>Year</th>
<th>Oil</th>
<th>Coal</th>
<th>Gas</th>
<th>Hydro</th>
<th>Nuclear</th>
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<tr>
<td>1973</td>
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<td>25%</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td>1983</td>
<td>45%</td>
<td>15%</td>
<td>30%</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>1993</td>
<td>40%</td>
<td>20%</td>
<td>35%</td>
<td>20%</td>
<td>5%</td>
</tr>
<tr>
<td>2003</td>
<td>35%</td>
<td>25%</td>
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<td>25%</td>
<td>5%</td>
</tr>
<tr>
<td>2013</td>
<td>30%</td>
<td>30%</td>
<td>40%</td>
<td>20%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Energy and emissions growth in 2013

Annual change, %

- World: 3%
- OECD: 0%
- Non-OECD: 6%
- China: 9%
- India: 8%

10 year average

- World: 2%
- OECD: 0%
- Non-OECD: 4%
- China: 7%
- India: 6%
Changes in energy balances

Fossil fuel imbalances

Change in imbalances, 2003-2013

Note: imbalances defined as production minus consumption
Trade balances and energy

Source: Includes data from CEIC and Thomson Reuters Datastream
Trade balances and energy in India

Change in imbalances, 2003-2013

Mtoe

Coal Gas Oil

Source: includes data from Thomson Reuters Datastream
Note: imbalances defined as production minus consumption

Trade balance (fiscal year)

Billion $US

Other goods & services
Energy
Net balance

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Energy in 2013

- Energy and the economy – a two way relationship
- When things happen – ask the data
- Markets work – if you let them
Energy in 2013: Taking stock
Hydro, renewables and nuclear in India

Power generation in India

- Hydro
- Nuclear
- Renewables

Non-fossil share of power (RHS)

Output changes in 2013

Annual change, TWh

India

Other

EU

China

US

Nuclear

Hydro

Renewables