SUMMARY

Medium and Long Term Natural Gas Outlook 2016

CEDIGAZ, June 2016
CEDIGAZ - More than 50 years of gas market intelligence

- Founded in 1961, 90 members in 40 countries
- Databases (gas statistics, supply contracts, UGS, LNG)
- Annual surveys and thematic studies
- LNG Service, News (CEDIGAZ News Report)

WORLD UGS and LNG Storage
June 2016

RECENT STUDIES

THE UNDERGROUND GAS STORAGE AND LNG STORAGE MARKET IN THE WORLD 2015-2035
June 2016
Sylvie Carnot-Gandolphe

CEDIGAZ, the International Association for Natural Gas

The 2015 Natural Gas Year in Review
First Estimates
April 2016

Subsidy – blessing or curse?
An Assessment of Impact of Gas Price Subsidies on Gas Markets and Consumers

LNG in TRANSPORTATION
A report published by Cédigaz
Christopher Le-Fèvre, Mike Maddox, Nick White
CEDIGAZ Reference Scenario – Methodology

Global energy trends and the role of gas

Energy balances and natural gas prospects by main region and country

Main global trends in natural gas supply and the role of unconventional gas

Prospects for international natural gas trade

Evolution of CO2 emissions

CONCLUSION
CEDIGAZ Reference Scenario: Main assumptions

- In order to frame its gas demand and supply prospects within a wider energy environment, CEDIGAZ has made projections on global primary energy demand, which are based on assumptions on the evolution of the world economy, population, policies and technology.

### Energy and environmental policy
- No 2°C target but INDCs are assumed to be achieved.
- Cédigaz Scenario brings about a trajectory of CO2 emissions from the energy sector that is consistent with INDCs.
- Only current and planned national energy policies are considered, although some elements of national long term strategic energy plans are viewed with caution and not fully integrated (natural gas and solar prospects in India, nuclear prospects in the MENA).
- Cédigaz Scenario incorporates the Clean Power Plan (US) and Europe’s 2030 Climate & Energy Package (40-27-27).

### Economy/demographics/pricing
- World economic growth of 3.5%/year over 2013-2035. Strong economic growth in the Middle East, Africa and India.
- Population growth of 0.9%/year (slight decrease in Russia and Japan, but high growths in Africa, the Middle East and India).
- Henry Hub price as a growing component of gas pricing in the long term.
- Globalization of gas markets via a strong expansion of the LNG trade (flexible LNG).
- Oil prices will recover fast and reach $110/bbl by 2035.
- High CO2 price post-2020 (Europe, China).
- Rebalancing of the coal market post-2020.

### Technologies
- The Scenario only considers technologies that are already in use at the current time or those that have been approved.
- Increasing technological progress, cost reductions of low-carbon technologies and continued improvements in energy efficiency.
- Policy initiatives stimulating the deployment of low carbon technologies.
- World energy intensity reduced by 42% over 2013-2035 (-2.5%/year), with the largest decrease posted in China (-4.5%/year).
- Absence of any significant technological revolutions or breakthroughs. Decarbonisation is mostly achieved in the power sector (unlike the transport sector).
CEDIGAZ Reference Scenario: Macroeconomic trends

The economy and energy prices are key determinants of future demand and supply patterns. In CEDIGAZ Scenario, price developments enable natural gas to expand its role in the energy mix and also stimulate sufficient investment in E&P and infrastructures to meet rising gas demand.

Assumptions on prices

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2020</th>
<th>2035</th>
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<tbody>
<tr>
<td>$/MBtu - $2014</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Henry Hub</td>
<td>4.4</td>
<td>4.7</td>
<td>6.2*</td>
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<tr>
<td>NBP</td>
<td>8.3</td>
<td>7.0</td>
<td>10.8</td>
</tr>
<tr>
<td>Japan LNG</td>
<td>16.1</td>
<td>10.5</td>
<td>13.8</td>
</tr>
<tr>
<td>CO2 – EUA ($/t)</td>
<td>10</td>
<td>21</td>
<td>50</td>
</tr>
<tr>
<td>Coal CIF ARA ($/t)</td>
<td>78</td>
<td>95</td>
<td>105</td>
</tr>
<tr>
<td>Brent ($/bbl)</td>
<td>99</td>
<td>80</td>
<td>115</td>
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*This scenario assumes a restricted availability of low-cost US shale gas resources.*
CEDIGAZ Reference Scenario: Main trends

- Strong slowdown in energy demand growth in China as its industry restructures, which is offset by a pickup in India.
- No energy demand growth in OECD Asia and a significant reduction in energy consumption in Europe.
- Virtually all of the additional energy is consumed in non OECD countries.
- Emerging economies account for 85% of gas demand growth.
Prospects for energy consumption by zone and the role of natural gas

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Structure of global energy consumption, 2013-2035

2013: 13.7 Gtoe

- Coal: 29%
- Oil: 32%
- Gas: 21%
- Nuclear: 5%
- Hydro: 7%
- Bioenergy: 2%
- Other renewables: 10%

2035: 16.9 Gtoe

- Coal: 24%
- Oil: 26%
- Gas: 11%
- Nuclear: 5%
- Hydro: 3%
- Bioenergy: 7%
- Other renewables: 11%

Renewables and natural gas are gaining share relative to coal and oil

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Prospects for energy balance by region

Growth 2013-2035
Energy: + 1% / year
Gas: + 1.5% / year

Unit: Mtoe
Natural gas demand prospects

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Natural gas production prospects

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Unconventional natural gas prospects

- Unconventional gas provides 68% of supply growth, rising from 704 bcm in 2014 to 1602 bcm in 2035.
- The share of unconventional gas in total supply is expected to grow from 20% in 2014 to 34% in 2035.
- The bulk of projected unconventional gas production is in the form of shale gas.
The growing role of LNG for interregional trade

2014 = 432 Bcm*

LNG 47%

Pipeline 53%

Growth 2014-2035
World gas supply: + 1.6 %/year
Long-distance LNG trade: + 3.1 %/year
Long-distance pipeline trade: + 1.9 %/year

2035 = 722 Bcm

LNG 53%

Pipeline 47%

Strategic role of LNG to meet growing external import needs of Europe and Asia

*Total trade between the seven CEDIGAZ regions (North America, Latin America, Europe, CIS, Africa, Middle East, Asia Oceania), not including trade within CEDIGAZ regions.
Prospects for the international LNG market

Deferred investment in LNG supply in a low price environment pre-2020 brings a risk of tighter markets in the 2020s.
Prospects for global CO2 emissions and carbon intensity

- In CEDIGAZ Scenario, the growth of global emissions declines more strongly compared to other baseline scenarios, but emissions remain well above the 2°C path despite the deployment of renewables and efficiency, as well as coal to gas switching.

Medium and Long Term Natural Gas Outlook 2016
CONCLUSION: Natural gas will play a growing role in a gradually decarbonising energy system

- The roles for natural gas and renewables continue to expand.
- Along with efficiency measures, the substitution from coal and oil to gas and renewables in a more powered energy system is key to meet environmental challenges.
- Nuclear development, especially in Asia-Pacific and the CIS also participates to this way.
- Crucial role of energy & climate policies in emerging markets (institutional reforms, subsidies’ removal).
- US is on a positive path but other markets (EU28, China) need strong action in the medium term to promote coal-to-gas switching.
- The environmental advantages and flexibility of gas makes it a valuable component of a gradually decarbonising electricity system.
CEDIGAZ Publication
« Medium and Long Term Natural Gas Outlook 2016 »
is available online:

http://www.cedigaz.org/members/gas-market-analysis.aspx
CEDIGAZ, the International Association for Natural Gas

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About CEDIGAZ
CEDIGAZ is an international association with around 90 members in 40 countries. Dedicated to natural gas information, CEDIGAZ collects and analyses economic information on natural gas, LNG and unconventional gas in an exhaustive and critical way. CEDIGAZ data has been the industry's reference since its foundation in 1961.