Follow-up study to the LNG and Storage Strategy
- Key findings -

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Stakeholder workshop on the follow-up study to the EU's LNG and storage strategy
Brussels, 27 September 2017
Tasks

- Task 1-2: modelling infrastructure
- Task 3: gas quality
- Task 4: assess the impact of access, capacity allocation and other regulatory measures on infrastructure use
- Task 5: identify potential regional cooperation mechanisms
- Task 6: identify the barriers and limitations stemming from the specific storage measures and regimes in Member States
- Task 7: draw up potential directions for actions and specific actions that could be taken in order to address the barriers identified under tasks 4 and 6
- Task 8: Identify and assess the key issues regarding the liquidity and transparency of the global LNG market and the current level of development
- Task 9: Identify and describe possible measures and initiatives
Implementing the infrastructure of the Strategy brings price convergence to Europe

<table>
<thead>
<tr>
<th>Name</th>
<th>Maximum flow GWh/d</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR-LNG</td>
<td>50</td>
<td>~0-30% utilization, tariff issues</td>
</tr>
<tr>
<td>RO-HU</td>
<td>126</td>
<td>~18-33% utilization, depends on RO demand</td>
</tr>
<tr>
<td>HU-RO (BRUA)</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>FI-EE (Balticconnector)</td>
<td>79</td>
<td>~32% utilization</td>
</tr>
<tr>
<td>EE-FI (Balticconnector)</td>
<td>79</td>
<td></td>
</tr>
<tr>
<td>PL-LT (GIPL)</td>
<td>74</td>
<td>direction of flows depend on global LNG dynamics</td>
</tr>
<tr>
<td>LT-PL (GIPL)</td>
<td>51</td>
<td></td>
</tr>
<tr>
<td>LT-LV</td>
<td>52</td>
<td>Low yearly utilization (~7%), but congested in high demand</td>
</tr>
<tr>
<td>EE-LV</td>
<td>105</td>
<td>~85-90% utilization</td>
</tr>
<tr>
<td>LV-EE</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>ES-PT</td>
<td>85</td>
<td></td>
</tr>
<tr>
<td>PT-ES</td>
<td>70</td>
<td>Not in use</td>
</tr>
<tr>
<td>ES-FR (MIDCAT)</td>
<td>110</td>
<td>Not in use</td>
</tr>
<tr>
<td>FR-ES (MIDCAT)</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>In reference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IGB (GR-BG)</td>
<td></td>
<td>~27-35% utilization, used in SOS to 100%</td>
</tr>
<tr>
<td>IBS (BG-RS)</td>
<td></td>
<td>~42-85% utilization, can serve in SOS</td>
</tr>
</tbody>
</table>
Risk for supply cut shifts to North-West Europe

Nord Stream 1-2 route

Ukrainian route

Algerian supply

Trans Adriatic route
Price difference is not within the EU but between EU-EnC

- Price „hikes” are not extreme in SOS scenarios
- Short term demand shocks are the most relevant
  - LNG flexibility matters
- Combined demand and supply shock is an extreme assumption

Wholesale price increase, €/MWh
Wholesale price, €/MWh

EnC EU
Short-term effects
Storage and LNG are the key sources of flexibility

- Production
- Norway
- Russia
- LNG
- Other (AZ, DZ, LY)
- Storage
- Consumption

Demand response

Monthly volumes, TWh

- 2020
- 2025
- 2020
- 2025
- 2020
- 2025
- 2020
- 2025

UA cut
NORD STREAM 2
TAP cut
North Africa cut
Sensitivity scenarios

Schematic representation of sensitivity runs

- High demand low LNG supply
- High demand
- High demand and high LNG supply
- Low LNG
- Reference
- Low demand
- Low demand and low LNG supply
- Low demand and high LNG supply
- High LNG
Sensitivities: demand

*Figure 1. Demand forecasts for Europe up to 2030 (TWh/yr)*

Source: PRIMES, ENTSOG TYNDP and EGMM assumptions
Sensitivities: supply structure

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Production</th>
<th>Russia</th>
<th>Norway</th>
<th>LNG</th>
<th>Other (AZ, DZ, LY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td>469</td>
<td>570</td>
<td>906</td>
<td>1066</td>
<td>1053</td>
</tr>
<tr>
<td>Low LNG, low demand</td>
<td>471</td>
<td>371</td>
<td>942</td>
<td>772</td>
<td>1479</td>
</tr>
<tr>
<td>High LNG, low demand</td>
<td>477</td>
<td>878</td>
<td>772</td>
<td>1313</td>
<td>772</td>
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<tr>
<td>Low lng, high demand</td>
<td>472</td>
<td>460</td>
<td>1056</td>
<td>890</td>
<td>1053</td>
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<tr>
<td>High LNG, high demand</td>
<td>481</td>
<td>1479</td>
<td>772</td>
<td>890</td>
<td>1053</td>
</tr>
</tbody>
</table>
Sensitivities: regional price gap does not widen, prices are up and down in a +/-10% range

### Yearly regional prices in the alternative scenarios (€/MWh)

<table>
<thead>
<tr>
<th>Region</th>
<th>ref</th>
<th>low_lng &amp; low_demand</th>
<th>high_lng &amp; low_demand</th>
<th>low_lng &amp; high_demand</th>
<th>high_lng &amp; high_demand</th>
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<tbody>
<tr>
<td>NWE</td>
<td>17.83</td>
<td>17.95</td>
<td>16.18</td>
<td>18.84</td>
<td>16.61</td>
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<tr>
<td>SEE</td>
<td>18.62</td>
<td>19.36</td>
<td>17.09</td>
<td>21.68</td>
<td>18.78</td>
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<tr>
<td>EU28</td>
<td>18.31</td>
<td>18.45</td>
<td>16.70</td>
<td>20.55</td>
<td>17.39</td>
</tr>
<tr>
<td>EnC</td>
<td>22.41</td>
<td>22.43</td>
<td>21.41</td>
<td>23.72</td>
<td>21.81</td>
</tr>
<tr>
<td>TR</td>
<td>19.16</td>
<td><strong>24.23</strong></td>
<td>16.54</td>
<td><strong>24.40</strong></td>
<td>16.72</td>
</tr>
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Turkish price is more sensitive for LNG supply +27/-14%
FOCUS ON STORAGE RELATED RESULTS
Results are robust regarding the need for storage: 700-800 TWh on a market basis

- Modelled yearly storage is ~730 TWh.
- Depending on European demand and availability of LNG for Europe storage fill level is between ~700-800 TWh (within a +/-10% range)
More use of available storage withdrawal capacity in SEE than in NWE

Withdrawal utilization is much higher in South East Europe than in North West Europe.

<table>
<thead>
<tr>
<th></th>
<th>TWh/Jan 2020</th>
<th>2020</th>
<th>TWh/Jan 2025</th>
<th>2025</th>
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<tbody>
<tr>
<td>SEE</td>
<td>15.9</td>
<td>50%</td>
<td>16</td>
<td>51%</td>
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<tr>
<td>EnC</td>
<td>20.6</td>
<td>40%</td>
<td>22.1</td>
<td>43%</td>
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<tr>
<td>NWE</td>
<td>31.3</td>
<td>12%</td>
<td>29.1</td>
<td>11%</td>
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<td>EU28</td>
<td>112.4</td>
<td>22%</td>
<td>112.8</td>
<td>22%</td>
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100% used withdrawal capacity modelled

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Few storages work critically close to their maximum capacity.
More obstacles than opportunities for regional cooperation?
Short-term rationale for storage obligation is confirmed (2020)...

- Modelling confirmed the short-term benefits of storage obligation in certain countries
- Having the stocks in place, consumers are protected from price hikes
...but also distorts the market

Impact of removing storage obligation results in the reallocation of the same volume of stored gas
Alternative regulatory scheme

- VOLL-based firm and obligatory financial compensation scheme, which:
  - can ensure that customer welfare is protected even when customer restrictions are unavoidable and implemented;
  - send the proper incentive for suppliers to optimally utilize commercial storage;
  - will contribute to the elimination of legal barriers to cross-border gas trading during gas supply security incidents.
- In each case a supplier can’t physically meet its supply contract, it is obliged to pay a firm monetary compensation to its customers that equals the quantity of non-supplied gas times the Value of Lost Load (ENS*VOLL) No *vis major* argument should apply.
- NRAs should produce reliable VOLL estimates for their respective (protected) customers.
Payments and incentives

COMMERCIAL STORAGE  SUPPLIER  CUSTOMER

NORMAL

CRISIS

ES*p  ES*p

Welfare protected by financial compensation

ENS*VOLL
Payments and incentives

- **COMMERCIAL STORAGE**
- **SUPPLIER**
- **CUSTOMER**

**NORMAL**
- ES*p from supplier to customer

**CRISIS**
- ENS*VOLL from supplier to customer

**STRATEGIC STORAGE**
- ES*p from supplier to customer

Welfare protected by physical supply from str. storage.
Thank you for your attention!

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