Security of natural gas supply for Europe in the special case of Austria under consideration of grid and storage expansion

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Agenda

• Motivation
• Method
• Scenarios
• Results
• Conclusion
Motivation

- Russian-Ukraine Gas Conflict 2009
- Uncertainties in energy policy
- Today’s political situation
- Dependency on Russian NG:

Source: Eurostat
Central Europe’s NG Supply

Source: Petroleum Economist
Austria:
Annual natural gas consumption: 8.5bcm
Storages: 7.5bcm
Method: Central European Model (I)

- Model of the European Transmission Grid
- Modelled in eTransport
- Linear Mixed Integer Program
- Time horizon: 1 year

Source: Author
Method: Central European Model (II)
Scenarios

**Scenario 1:** Austria = natural gas island, with full storages
   a) without storages 7Fields and Haidach
   b) 1a) + demand reduction
   c) with storages 7Fields and Haidach

**Scenario 2:** sensitivity analysis in regard of supply region
   a) Russia
   b) North Sea
   c) LNG and North Africa imports

**Scenario 3:** Scenario 2 with grid and storage expansion
## Results: Scenario 1

Time horizon 1/2 year

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Undersupply starting at day/365</th>
<th>Not supplied natural gas in bcm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 1a</td>
<td>100</td>
<td>0.7</td>
</tr>
<tr>
<td>Scenario 1b:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>demand reduction of <strong>5%</strong></td>
<td>111</td>
<td>0.57</td>
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<tr>
<td>Scenario 1b:</td>
<td></td>
<td></td>
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<tr>
<td>demand reduction of <strong>10%</strong></td>
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<td>0.45</td>
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<tr>
<td>Scenario 1b:</td>
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<td></td>
</tr>
<tr>
<td>demand reduction of <strong>15%</strong></td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Scenario 1c</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Results: Scenario 2

Degree of undersupply in Central European States

- Scenario 2a (Russia)
- Scenario 2b (North Sea)
- Scenario 2c (LNG and North Africa)
Results: Scenario 3

Degree of undersupply in Central European States

- Scenario 3a (Russia)
- Scenario 3b (North Sea)
- Scenario 3c (North Africa)

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Results: Scenario 2/3

Scenario 2

- Scenario 2a (Russia)
- Scenario 2b (North Sea)
- Scenario 2c (LNG and North Africa)

Scenario 3

- Scenario 3a (Russia)
- Scenario 3b (North Sea)
- Scenario 3c (North Africa)

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Conclusions & Outlook

• SoS enhancement by:
  • Load reduction
  • Higher diversification
  • Grid and storage expansion
  • European and national emergency plans

• Outlook
  • Expand the model with Eastern and South European Countries
  • Higher spatial resolution
Thank you!

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Natural Gas Dependency according to the ENTSO-G

Source: ENTSO-G