CHALLENGES OF THE UPCOMING GERMAN GAS MARKET CONVERSION: CONTRIBUTION OF LNG USE FOR THE LOW CALORIFIC GAS NETWORK’S SAFE AND SUSTAINABLE OPERATION

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GWI is a research institute dedicated to applied technology – Gas and heat are our specialty

- Legal Status: Non-Profit Association
- Founding: by the German Gas Industry
- 62 Members:
  - Gas distribution companies,
  - Gas transportation companies,
  - Equipment manufacturers,
  - Public utilities,
  - Associations
- 63 Staff
Demand and production of natural gas in Germany

The natural gases used in Germany

- Russia: 34%
- Norway: 30%
- The Netherlands: 19%
- Own production: 14%
- Other: 3%

Source: IEA

Annual production and demand of natural gas in Germany, bn m3

Source: EUROGAS

Annual production of natural gas in Groningen gas field, bn m3

Source: Energate

Annual production of natural gas in the EU and Norway, bn m3

Source: IEA
Demand and production of natural gas in Germany

- Reduction of the imports from the Netherlands
- Exhaustion of the German own natural gas sources

**The changing information support**

<table>
<thead>
<tr>
<th>Before 2021</th>
<th>Now 2014</th>
</tr>
</thead>
</table>

Reduction of L-gas imports after 2020 by 10% per annum

Shut down of gas imports from the Netherlands by 2030

5 million units of domestic gas appliances

1.2 + ... bn EUR

Source: Buderus

Source: NEP Gas 2013
Ways of LNG transport to Germany

L-gas network

H-gas network

Source: NEP Gas 2013
Ways of LNG transport to Germany

Existing and being constructed LNG infrastructure in Germany and around it

Source: Gas LNG Europe
LNG and natural gas qualities

The average compositions of LNG being delivered or to be delivered to the LNG terminals in Rotterdam and Swinoujscie:

<table>
<thead>
<tr>
<th>Origin</th>
<th>Nitrogen [mol%]</th>
<th>Methane [mol%]</th>
<th>Ethane [mol%]</th>
<th>Propane [mol%]</th>
<th>Butane and higher hydrocarbons [mol%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria / Arzew</td>
<td>0.71</td>
<td>88.92</td>
<td>8.41</td>
<td>1.59</td>
<td>0.37</td>
</tr>
<tr>
<td>Nigeria</td>
<td>0.03</td>
<td>91.70</td>
<td>5.52</td>
<td>2.17</td>
<td>0.58</td>
</tr>
<tr>
<td>Norway</td>
<td>0.46</td>
<td>92.03</td>
<td>5.75</td>
<td>1.31</td>
<td>0.45</td>
</tr>
<tr>
<td>Qatar</td>
<td>0.27</td>
<td>90.90</td>
<td>6.43</td>
<td>1.66</td>
<td>0.74</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>0.01</td>
<td>96.78</td>
<td>2.78</td>
<td>0.37</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Source: GIIGNL

GCV and Wobbe number of gas being delivered or to be delivered to the LNG terminals in Rotterdam and Swinoujscie:

<table>
<thead>
<tr>
<th>Origin</th>
<th>GCV [MJ/m₃]</th>
<th>Wobbe number [MJ/m₃]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria / Arzew</td>
<td>43.38</td>
<td>55.00</td>
</tr>
<tr>
<td>Nigeria</td>
<td>43.32</td>
<td>55.39</td>
</tr>
<tr>
<td>Norway</td>
<td>42.58</td>
<td>54.68</td>
</tr>
<tr>
<td>Qatar</td>
<td>43.34</td>
<td>55.18</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>40.94</td>
<td>53.99</td>
</tr>
</tbody>
</table>

Source: GIIGNL

The German gas sources’ Wobbe number and GCV:

<table>
<thead>
<tr>
<th>Origin</th>
<th>GCV [MJ/m₃]</th>
<th>Wobbe number [MJ/m₃]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russia</td>
<td>40.3</td>
<td>53.1</td>
</tr>
<tr>
<td>Norway</td>
<td>41.9</td>
<td>52.9</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>36.8</td>
<td>46.0</td>
</tr>
<tr>
<td>Germany</td>
<td>35.4</td>
<td>44.7</td>
</tr>
</tbody>
</table>

Source: DVGW e.V.
LNG and natural gas qualities

DVGW Code of Practice G 260:2013 “Gas composition”

Relative density
Calculated 0.59 - 0.69

0.55 requirements 0.75

DIN 51624:2008 “Automotive fuels – Compressed natural gas – requirements and test methods”

requirements
below 50 mol% nitrogen

highest calculated value 16.8 mol%

DVGW Code of Practice G 685:2008 „Gas billing“

deviations of GCV in networks of more than ±2 % over the billing cycle is not allowed
Contact information

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