Whether Trade at EU Hubs Adequately Reflects Gas Price for the Whole EU Gas Market?

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Questions to Cover

• Does rational for oil-indexation on the European market still holds?

• How volumetric flexibility makes hub and LTC prices different?

• Why hub prices are not an indication of the market equilibrium for the whole European market but only for the volumes not contracted under LTCs?
There is only Virtual Competition between Natural Gas and Oil Products in the OECD Europe Power Generation

Source: IEA
There is Strong Competition between Natural Gas and Oil Products in Commercial and Residential Sector

Source: IEA

2013 Final Energy Consumption in Residential & Commercial Sector by Country (OECD Europe)
There is Strong Competition between Natural Gas and Oil Products in Industry

2013 Final Energy Consumption in Industry by Country (OECD Europe)

Source: IEA
Competition between Natural Gas and Oil Products is Emerging in Transportation Sector

2013 Final Energy Consumption in Transport Sector by Country (OECD Europe)

Source: IEA
In ssLNG Projects Price Formulas Directly Link Natural Gas to Oil Products

Typical example: price formula in the MZA (LNG-fueled buses, Poland) project relates physical volumes of LNG to diesel:

\[ A + 670.00 + 159.71 = 1,337 \times 50.00\% \times [(93\% G + 7\% F) \times K \times 0.845 + 1171.00 + 288.05 + 43.00 \times 1.065 \times 0.832] \]

which can be simplified to:

1kg LNG price (incl. excise and fuel tax) = 66.85*% \times \text{dm3 diesel price}

* The ratio between the prices LNG and diesel = 66.85% = 50% \times 1,334 \text{ m3/kg (gas density of LNG)}
Forecasts for LNG Demand in Bunkering is Gaining in Optimism, Emission Control Areas

<table>
<thead>
<tr>
<th>Company</th>
<th>Year</th>
<th>Demand forecast for 2025, mtpa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lloyds</td>
<td>2012</td>
<td>Base case – 24.1, Low – 0.7, High – 69.6</td>
</tr>
<tr>
<td>Poten&amp;Partners</td>
<td>2013</td>
<td>8.5</td>
</tr>
<tr>
<td>BCG</td>
<td>2015</td>
<td>89.0</td>
</tr>
<tr>
<td>Transparency Market Research</td>
<td>2016</td>
<td>24.5</td>
</tr>
</tbody>
</table>
Natural Gas and Oil will Remain Competing Fuels in the Foreseeable Future: Commercial and Residential Sector in OECD Europe

Source: IEA
Natural Gas and Oil will Remain Competing Fuels in the Foreseeable Future: Industry in OECD Europe

Source: IEA

The chart illustrates the forecast of energy consumption in OECD Europe from 2013 to 2035. The consumption is measured in Mtoe (Mtoe = Million Ton Oil Equivalent). The chart shows the percentage contribution of different energy sources over time. Gas, Oil, Coal, Bioenergy, and Heat are represented with different colors and categories. The percentages for each category are shown above each bar segment for the years 2013, 2020, 2025, 2030, and 2035.
LTCs with Flexibility are Premium Products Compared to Flat Products

Gazprom is the major provider of supply flexibility to Europe. Seasonal swing in Russian gas daily deliveries doubled over the last 20 years.

1998-2005
80-100MCM/d seasonal swing

2005-2015
150-220MCM/d seasonal swing
# Recent Market Trends Affecting Value of Flexibility

<table>
<thead>
<tr>
<th>Recent gas market trends (2012-2015)</th>
<th>Impact on flexibility premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arbitrage opportunities</td>
<td>![Down Arrow]</td>
</tr>
<tr>
<td>Cost of storage</td>
<td>![Up Arrow]</td>
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<tr>
<td>Seasonality in consumption</td>
<td>![Flat Line]</td>
</tr>
<tr>
<td>Seasonal spreads on hubs, forward and actual</td>
<td>![Down Arrow]</td>
</tr>
<tr>
<td>Midstreamers business model</td>
<td>![Down Arrow]</td>
</tr>
</tbody>
</table>

**TOTAL**
Arbitrage Opportunities Emerge with Flexible LTCs: Potential Premium Size (1)

Potential benefits of arbitrage depend on the share of flexible volumes and spread between hub and contract prices

Source: Saint Petersburg State University of Economics
Arbitrage Opportunities Diminished as Contract and Hub-Prices Converged After Diverging in the Past (2)

Contract- and hub-prices converged after seasonal (2005-2008) and systematical (2009-2014) diverging in the past years

Source: BAFA, Bloomberg, IEA, IMF, World Bank
Premium from arbitrage exists even in case of the least rational behavior of a buyer. Our estimate is based on its random choice, though this premium most likely resides between Max and Stochastic lines.

Source: Saint Petersburg State University of Economics
Value of Seasonal Flexibility: UGS Tariffs Increased Slightly (1)

1. Prices increased slightly
2. Minimum volume offered decreased in order to attract smaller clients
3. Aggregators are able to book capacity at lower rates (discounts on volume, auctions)

Value of Seasonal Flexibility: Consumption Profile Still Shows Strong Seasonal Variation (2)

Storage utilization model assumes that injections and withdrawals within a year equal to each other

<table>
<thead>
<tr>
<th>Countries</th>
<th>Storage requirements ranking</th>
<th>Upper limit, %</th>
<th>Lower limit, %</th>
<th>Upper limit, Euro/ mcm</th>
<th>Lower limit, Euro/ mcm</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>I</td>
<td>49</td>
<td>24</td>
<td>27</td>
<td>13</td>
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<tr>
<td>Netherlands</td>
<td>II</td>
<td>33</td>
<td>16</td>
<td>18</td>
<td>9</td>
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<tr>
<td>Germany</td>
<td>II</td>
<td>30</td>
<td>15</td>
<td>16</td>
<td>8</td>
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<tr>
<td>Italy</td>
<td>II</td>
<td>33</td>
<td>16</td>
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<td>9</td>
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<tr>
<td>UK</td>
<td>III</td>
<td>22</td>
<td>14</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Spain</td>
<td>III</td>
<td>25</td>
<td>23</td>
<td>14</td>
<td>13</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>-</td>
<td><strong>32</strong></td>
<td><strong>18</strong></td>
<td><strong>17</strong></td>
<td><strong>10</strong></td>
</tr>
</tbody>
</table>
Value of Seasonal Flexibility: But Market Prefers to Evaluate Cost of Storage on Seasonal Forward Spread (3)

Comparison of seasonal spreads forwards and actual day-ahead prices

That method is incorrect because it leads to economically ridiculous assessment of the price of flexibility: real cost of storage becomes negative.

Source: Bloomberg
Value of Seasonal Flexibility: Midstreamers Optimize Volumes via Hubs and Underestimate Value of LTC Flexibility (4)

Under current market conditions: $Q_1 > Q_2$
Hub Prices Overreact when the Market is in ‘Oversupply’ or in ‘Undersupply’

Source: Compass Lexecon
‘Homeopathic’ Reduction of Demand for Uncontracted Volumes Made Spot Prices in Asia Collapse in March 2014

Source: Bloomberg, Cedigaz, IHS, METI
Conclusions

• In OECD Europe rational for oil-indexation in gas pricing still holds due to strong competition between natural gas and oil products in industry and commercial and residential sector. There are no indications that it will discontinue in the foreseeable future.

• In transportation sector competition between natural gas and oil products is only emerging but has strong potential for growth.

• Flexibility in LTC volume nomination provide a buyer with arbitrage opportunities between contract and hub prices. Premium for arbitrage is now less noticeable as prices have converged.

• While end-users need flexible supplies due to remaining seasonality in demand, midstreamers underestimate its value as they optimize volumes via hubs that undermines storage business viability in EU.

• Hub prices are not an indication of the total supply and demand for Europe but for the residual volumes left when the bulk of demand is met with the LTCs.

• Thought total demand for gas in Asia increased, ‘homeopathic’ reduction of demand for uncontracted volumes made spot prices in Asia collapse in March 2014.
THANK YOU FOR YOUR ATTENTION!