Gas Flows and Gas Prices in Europe: What is the Impact of Nord Stream 2

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Why analysis of global gas markets at SWM?

- Electricity: generation, distribution, sales
- Natural gas: production, transport, distribution, sales
- District heating: generation, distribution, sales
- Water: collection, distribution, sales
- Swimming pools: indoor pools, open-air pools, saunas, ice skating
- Mobility: subway, tram, bus, cycle rental system, etc.
- Telecommunications: Internet, phone and TV with fibreoptic technology
WEGA delivers gas flows and gas price development

- WEGA is the abbreviation of ‘Weltweites Gasmarktmodell’
- Worldwide model in daily resolution 2018-2040
- Goal of optimization → cover the demand in each zone/country/hub at each day at minimized costs

- The model was developed by PÖYRY Management Consulting (here: Pegasus)
- Linear Programming with Xpress from FICO
- Source code and dataset was purchased by SWM
- **The complete dataset was modified by SWM** → Results are an own view of SWM
Modification of parameters by SWM

- Oil price and EUR/USD exchange rate
- Pipelines, Interconnections
- LNG terminals
- Storages
- Gas demand / own fundamental electricity model
- Costs (commercial databases for CAPEX, OPEX, transport costs)
- Contracts (CEDIGAZ, BNEF LNG contract database)
- Production volumes and flexibility of gas fields
- Actual gas flows and backtesting
Worldwide gas market as a grid of nodes and edges

- **Source:** pipeline or LNG
- **Source:** indigenous production
- **Source:** demand shedding
- **Delivery point:** pipeline or LNG
- **Demand zone:** country / region / rest of the world
- **Storage:** in demand zone
- **Interconnection:** between demand zones
User interface of WEGA
Nord Stream 2

- Two strings
- Capacity 55 bcma

- European gas demand -15% until 2040
- Transit flows Ukraine limited, but > 0

- Calculated average price difference in EUR\textsubscript{2017}/MWh on wholesale gas prices in the period of 2020 till 2040 if Nord Stream 2 would not be built

<table>
<thead>
<tr>
<th>United Kingdom</th>
<th>France</th>
<th>Netherlands</th>
<th>Germany</th>
<th>Czech Republic</th>
<th>Poland</th>
<th>Italy</th>
<th>Bulgaria</th>
<th>Romania</th>
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<td>0.79</td>
<td>0.80</td>
<td>0.89</td>
<td>0.70</td>
<td>0.55</td>
<td>0.39</td>
<td>0.15</td>
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</tbody>
</table>
Pipeline flows in 2028 with Nord Stream 2

rounded volumes in bcm; only gas flows ≥ 1 bcm
Pipeline flows in 2028 **without** Nord Stream 2

rounded volumes in bcm; only gas flows ≥ 1 bcm
With North Stream 2 in the presented Base Case

- North Stream 2 is not fully utilized on an annual level
- Gas flows from Norway to Germany are directed to Northwest Europe
- Ca. 20 bcm of LNG are pushed out of the merit order in Northwest Europe in 2028
- More transit flows via Germany (+17 bcm in 2028)
- Less gas flows from Poland to Germany (-14 bcm in 2028)
- Moderate reduction of wholesale gas prices in Europe

- Transit contract between Gazprom and Naftogaz expires; uncertainty about transit flows via Ukraine in long-term
- Transit flows via Ukraine are only a last option for Russia
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