Regulatory challenges in the further development of the electricity transmission grid in Germany

Ministerialrat Michael Schultz
National and European electricity grids and electricity grid planning
Berlin, 22 November 2017
Germany is in a unique position to drive the transformation of the energy system in Europe

Germany at a glance

- Population: 82 million
- Largest economy in Europe, 4th largest in the world
- Gross electricity production 2016: 648,4 TWh
- Primary energy consumption 2016: 13,383 PJ
German TSOs have already handled hourly renewables shares of over 85%

**Amprion**
Variable RES-share 2016
- Annual generation: 9%
- Generation capacity: 29%

**TransnetBW**
Variable RES-share 2016
- Annual generation: 10%
- Generation capacity: 34%

**50Hertz**
Variable RES-share 2016
- Annual generation: 27%
- Generation capacity: 53%

**TenneT**
Variable RES-share 2016
- Annual generation: 36%
- Generation capacity: 58%
Renewables have become Germany’s No. 1 source of electricity

Electricity mix in 2016
(648.4 TWh in total)

- RES: 29%
- gas: 12%
- lignite: 23%
- nuclear: 13%
- coal: 17%
- others: 5%
- wind: 12%
- solar: 6%
- biomass & waste: 8%
- hydro: 3%

*preliminary data rounded figures*
Nuclear reactor to be switched-off according to Atomic Energy Law in Germany (Atomgesetz - AtG)
Internal energy market for electricity

Cross border electricity trade

(net values for scheduled commercial exchanges 2016, in TWh)

- Export: 63.3 TWh
- Import: 15.8 TWh
- Balance: 47.5 TWh

Import DE
Export DE
Germany has been a net electricity exporter for more than 10 years

Germany’s import and export balance of physical load flows

Net total 2016: 53.7 TWh/a

- Exports
- Imports
- Net total
Improved grid connections between Northern and Southern Germany are required to prevent shortages.
German grid planning ensures continuity through “one-stop shop” authority & stakeholder participation

**Process**

**Assessment of demand**

1. Scenario Framework
2. Network Development Plan & Environmental Assessment
3. Federal Requirement Plan

**Projects**

4. Federal Sectoral Planning
5. Planning Approval & Construction

**Responsible**

- TSO/regulatory authority
- Regulatory authority
- TSO

**Public involvement**

- **Who:** everybody
  - **What:** method and parameters
- **Who:** everybody
  - **What:** alternatives, technologies, environment
- **Who:** everybody
  - **What:** environment, public concerns
- **Who:** affected citizens
  - **What:** public & environmental concerns

**Timeframes**

- Every 2 years
- At least every 4 years
German grid projects

Priority Projects from EnLAG (Power Grid Expansion Act 2009)
- 22 projects
- totalling in 1,800 km
- 750 km realised by Q3 2017

Federal requirement plan (BBPIG) as of December 2016
- 5,900 km of priority lines planned
- 43 projects
- 3,050 km optimisation
- 150 km realised by Q3 2017
German projects of common interest (PCIs) – EU list

<table>
<thead>
<tr>
<th>Project</th>
<th>Project type</th>
<th>Progress</th>
<th>Expected commissioning date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 FCI 1.3.1</td>
<td>Interconnector with Denmark</td>
<td>Partially in approval process</td>
<td>2021</td>
</tr>
<tr>
<td>2 FCI 1.3.2</td>
<td>Internal line (Emsdetten – Næstved)</td>
<td>in approval process</td>
<td>2021</td>
</tr>
<tr>
<td>3 FCI 1.4.1</td>
<td>Interconnector with Denmark</td>
<td>in approval process</td>
<td>2020</td>
</tr>
<tr>
<td>4 FCI 1.4.2</td>
<td>Internal line (Aarhus – Hamburg/Föhr)</td>
<td>in approval process</td>
<td>2020</td>
</tr>
<tr>
<td>5 FCI 1.4.3</td>
<td>Internal line (Hamburg/Nord – Cuxhaven)</td>
<td>in approval process</td>
<td>2020</td>
</tr>
<tr>
<td>6 FCI 1.8</td>
<td>Interconnector with Norway</td>
<td>Under construction</td>
<td>2019</td>
</tr>
<tr>
<td>7 FCI 2.10</td>
<td>Internal line (Stadlinke)</td>
<td>Application for approval process in preparation</td>
<td>2025</td>
</tr>
<tr>
<td>8 FCI 2.11.2</td>
<td>Internal line (Rehlpacht – Hof)</td>
<td>Application for approval process in preparation</td>
<td>2020 (best case 2018)</td>
</tr>
<tr>
<td>9 FCI 2.11.3</td>
<td>Internal line (Punkt Willemstad – Punkt Niederwenzen)</td>
<td>Not in approval process yet</td>
<td>2020</td>
</tr>
<tr>
<td>10 FCI 2.11.3</td>
<td>Interconnector with Austria</td>
<td>Not in approval process yet</td>
<td>2022</td>
</tr>
<tr>
<td>11 FCI 2.12</td>
<td>Interconnector with The Netherlands</td>
<td>Under construction</td>
<td>2017</td>
</tr>
<tr>
<td>12 FCI 2.2.1</td>
<td>Interconnector with Belgium</td>
<td>in application process</td>
<td>2020</td>
</tr>
<tr>
<td>13 FCI 2.2.1</td>
<td>Pump storage – Pilch</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>14 FCI 2.9</td>
<td>Internal line (Ostseebad – Philippstorf (Uttrup))</td>
<td>in approval process</td>
<td>2021</td>
</tr>
<tr>
<td>15 FCI 3.1.1</td>
<td>Interconnector with Austria</td>
<td>in approval process</td>
<td>2024</td>
</tr>
<tr>
<td>16 FCI 3.1.2</td>
<td>Internal line (Mönchengladbach – Recklinghausen)</td>
<td>Application for approval process in preparation</td>
<td>2025</td>
</tr>
<tr>
<td>17 FCI 3.13</td>
<td>Internal line (Halle/Saale – Swinemünde)</td>
<td>Finalised</td>
<td>2015 (final completion 2017)</td>
</tr>
<tr>
<td>18 FCI 3.14</td>
<td>Interconnector with Poland</td>
<td>Approval process stopped</td>
<td>2020</td>
</tr>
<tr>
<td>19 FCI 3.15.1</td>
<td>Interconnector with Poland</td>
<td>Finalised, and commissioned at 220 kV Rannach, June 2016 – Aug. Summer 2016 powered off</td>
<td>–</td>
</tr>
<tr>
<td>20 FCI 4.1</td>
<td>Interconnector with Denmark</td>
<td>in approval process</td>
<td>2018</td>
</tr>
</tbody>
</table>
9 billion Euros were invested in German grids in 2015 - most of it in the distribution system
Network tariffs (including billing, metering and meter operation) (ct/kWh) (excluding VAT)

Household customers 3,500 kWh from 2016 Band DC (default tariffs)
Commercial customers 50 MWh
Industrial customers 24 GWh

Act on the Modernization of Network Tariffs (Netzentgeltmodernisierungsgesetz – NEMoG)

- entry into force: summer 2017
- act stipulates a gradual harmonization of transmission tariffs as of 1.1.2019
- full harmonization: 1.1.2023
- TSOs are enabled to procure so-called “special technical network components” in order to provide ancillary services
Thank you for your attention!