Distribution Grids in Germany – Overview and Perspective

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End of 2022:
last nuclear power plant decommissioned

RES share of gross electricity consumption in percent

- 2010: 17%
- 2013: 25%
- 2025: 45%
- 2035: 60%
- 2050: 80%
Replacing Nuclear Power

8 nuclear power stations already shut down

9 will follow until end of 2022

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* 2.1 GW already removed from the grid since 2008
Flexibility Options

1. Generation
2. Consumption
3. Grid
4. Storage Facilities
Challenges for the distribution grid

- **Yesterday:** Nearly all power plants fed into the transmission grid.

- **Today:** Ca. 25% of the produced electricity is fed into the distribution grid.

- **2050:** More than 70% of the produced electricity is fed into the distribution grid.
Grid Expansion

**Transmission Grid:**

Length today: ca. 112 000 km  
Additional (until 2023): ca. 3200 km  
Costs (until 2023): ca. 22 bn €

**Distribution Grid:**

Length today: ca. 1.6 Mio km  
Additional (until 2030): ca. 100 000 km  
Kosten (until 2030): ca. 28 bn €
Necessities

Distribution grids must become more intelligent,
- to limit grid extension,
- to maximize capacity for RES,
- to keep the system reliable

Going the way to smart grids consequently
Smart Grid

Transport

Production

Information and Communication Technology

Smart Meter

Smart Home

Consumption

Storage Facilities
Current situation and developments in Germany

- Strategic network development plan at distribution systems level
- Cost-benefit analysis smart meter
- Protection profile for smart meter gateways
- Use of adjustable local transformers
- All new RES facilities can be controlled
- Project E-Energy (http://www.e-energy.de/en/)
What we learned from the E-Energy programme

- There is no such thing as "the" smart grid. Differing network topologies and requirements call for customised solutions.
- Connecting various decentralised generating installations to form a virtual power plant can significantly increase system stability.
- Minimising the residual load by using virtual power stations, storage and flexible consumers.
- Providing system services on the distribution systems level
- Intelligent buildings help reduce complexity in the smart grid.
- Communication via price signals and switching commands can lead to the technical and economic optimum.
Important notice

Our goal is not to feed in the last produced RES kWh, but to find an optimum utilisation of grids.

Our goal is not to build a lot of energy autonomous regions within Germany, but to build a reliable system for the whole of Germany with 80% RES at bearable costs.
Thank you for your attention!