Challenges and future roles of DSOs in a decentralized electricity system

Trends in the Power Industry in the European Context XII.

Špindlerův Mlýn, hotel Horal
April 11-12, 2017
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We are a strong pillar of the EWE AG with a solid asset base of infrastructures in northern Germany

EWE NETZ GmbH at a glance

Some figures for 2015:
- turnover: 2470 €M
- Investments: 183 €M
- workforce: Ø 1.667
- Power network: 80.000 km
- Gas network: 55.000 km
- Telecommunication network: 36.000 km
- Water network: 700 km

Our shareholders are:
- EWE AG
- KNN GmbH: 82 cities and municipalities of the Ems-Weser-Elbe-Region
Our high-quality networks supply over two million customers

EWE NETZ stands for
- reliable electricity networks
- safe gas networks
- modern telecommunications networks
- superior drinking water networks
EWE NETZ grid area is decades ahead of Energiewende targets on RES in Germany

Development goal of the German government = Energiewende targets on RES
Share of power generated based on Renewables or conventional Sources

<table>
<thead>
<tr>
<th>Year</th>
<th>Renewables</th>
<th>Conventional</th>
</tr>
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<tr>
<td>2014</td>
<td>28%</td>
<td>72%</td>
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<tr>
<td>bis 2050</td>
<td>80%</td>
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EWE NETZ: RES infeed provides 75% of consumption, in some month 94%
Share of power generated based on Renewables or conventional Sources

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<th>Year</th>
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<tr>
<td>2014</td>
<td>75%</td>
<td>25%</td>
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<tr>
<td></td>
<td>82%</td>
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In Germany, more than 95% of RES capacity is integrated in distribution grids. That’s >114 GW!

LV = 230-400V
1,150,000km

MV = 10/20/30kV
510,000km

HV = 110kV
95,000km

EHV = 220/380kV
35,000km

not smart
not smart
not smart

smart, if strong enough

redispatch

RES curtailment

RES curtailment

RES generation capacity connected (120 GW):

25%

45%

25%

5%
The energy transition implies:
The transformation of our infrastructure

ENERGIEWENDE

... = KICK start
towards decentralization, decarbonisation,
smart systems & digitization

DIGITIZATION

... = INCUBATOR of the Energy transition “Energiewende“

What roles do DSOs have to play and what is their agenda in the context of digitization and the energy transition?
DSO’s role – Governance tendencies to bridge the gap towards 2025

ACER – “A Bridge to 2025” – DSO’s role in 2025

- A neutral supporter of the market: **DSO has the purpose of encouraging the development of market-based services** provided by 3rd parties
- **DSO’s role** has to be consistent with its responsibility of **maintaining reliable network operation**
- The need for coordination will increase between DSOs and TSOs
- **DSOs should increase security of supply** in the context of existing and future hazards for **supply reliability** (including cyber security)
- **DSOs should ensure protection of customer data**
- **DSOs** have to be able to adapt their **network expansion to the new requirements** (charging poles for E-cars: gas stations for gas-driven cars) **even by deploying smart grid solutions** for improving the way decentralized generation systems are integrated.
The roles of DSOs increase in size and complexity

Key roles of DSOs: Network & System Operation

1. Plan, build and optimize the grid infrastructure according to market needs
2. Connect new customers to the grid and manage grid fees in a non-discriminatory way
3. Operate the grid in a safe, secure and efficient way
4. Provide system services from the distribution grid for the energy system

Optional activities of DSOs related to market facilitation

- Metering and SM-gateway administration
- Plan, build and operate e-mobility infrastructure
- Plan, build and operate digital communication infrastructure
- Integrate storages
- …
Our mission: DSOs act as neutral and efficient infrastructure service suppliers for the market
DSOs must be fully responsible for switching and operations in their own grids

_How could a system look like, where multiple operators may try to conduct the system at the same node?_
Conclusion: DSOs are shaping up for success in the energy transition

DSO 1.0
- Centralised generation
- HV
- MV
- LV
- Consumer

DSO 1.5
- Centralised generation
- HV
- MV
- LV
- Prosumer
- Micro cogeneration

DSO 2.0
- Centralised generation
- HV
- Active MV
- Active LV
- Prosumer

Past
- From the generator to the consumer
- Transformer energy flow

Today
- Streamlining the classical network business
- Integrating decentralized generation

Tomorrow
- System manager with new roles of the DSO

EWE NETZ GmbH | Marcus Merkel | April, 2017
DSO’s responsibility: providing system services beyond the DSO grid borders

*For separated, cellular subsystems

Highly efficient communication and data exchange between DSOs and TSOs is required
Data becomes key for system operators to optimize the network as infrastructure asset

DSOs must be responsible for their data management and their communication within their own network
Evolved TSO-DSO data management is required
DSO and TSO have agreed on common principles

Report by DSO and TSO associations on data management presented to EC

Clear need for improved TSO-DSO data management identified in five use-cases:

- Congestion management
- Balancing
- Use of flexibility
- Real-time control and supervision
- Network planning

Shared key principles of TSO-DSO data management

- Guarantee data privacy, data / communication security
- Guarantee a fair, equal access to the data / information
- Deliver a non-discriminatory processing of the data
- Be of proven cost efficiency, as accepted by the National Regulatory Authorities (NRAs).
- Facilitate innovation by opening, as much as possible and legally allowed, the access to the data
### Grid and system state

#### System stability endangered
- Acute congestion or overload
- Market flexibility exhausted

#### Congestion foreseen
- Some system states
- Market flexibility available

#### Normal operations
- Generation and consumption balanced by market participants
- Sufficient reserves and market flexibility available

### DSO activities
- Non marked-based congestion management, e.g. by peak load capping
- Marked-based congestion management, e.g. by buying flexibility
- Optimized grid control
- DSO acts as a market facilitator through grid enforcements

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*An active grid optimization is the responsibility of the DSO – including the choice of the right tools and flexibility measures*
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Transformation of Everything – enera
Taking the next big step towards a sustainable world!

Transformation of the grid

From a centralized towards a decentralized energy system

From a static towards a dynamic energy system

From consumer to prosumer

Digitization as an incubator
The „Smart Energy Showcase“ in northwestern Germany

- Countries of Aurich, Friesland & Wittmund
- Independent Cities of Emden and Lingen (Lastschwerpunkt)
- Area of 2.665 km²
- 390,000 inhabitants
- 200,000 households
- 1,75 GW installed renewable energy generation capacity
- 1,50 GW generated wind power
- 170% renewable energy

The modelregion is a large renewable power plant!
www.projectenera.com
Associated Partners

- County of Aurich
- County of Friesland
- County of Wittmund
- City of Aurich
- Municipality Bockhorn
- City of Emden
- Integrated Municipality Brookmerland
- Municipality Dornum
- City of Emden
- Integrated Municipality Esens
- Municipality Friedeburg
- Municipality Großefehn
- Municipality Großheide
- Integrated Municipality Hage
- Municipality Hinte
- Integrated Municipality Holtriem
- Municipality Ihlow
- City of Jever
- Municipality Krummhörn
- City of Lingen
- City of Norden
- Municipality Sande
- City of Schortens
- Municipality Südbrookmerland
- City of Varel
- Municipality Wangerland
- City of Wiesmoor
- City of Wittmund
- Municipality Zetel
Feel free to follow the enera project on facebook or twitter!

Thank you for your attention!

Marcus Merkel MBA
EWE NETZ GmbH
Cloppenburger Str. 302
26133 Oldenburg
T.: +49 (0) 441 48081152
marcus.merkel@ewe-netz.de
www.ewe-netz.de