Energiewende: Challenges for municipal energy supplier in Germany

SPECIAL Training Week

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VKU represents 1,429 local public utilities

Distribution of electric power to final customers: 49.1 %

... of gas: 58.4 %

District Heat: 60.0 %

Water: 77.2 %

Wastewater: 16.5 %

Data for 2010. Source: VKU kompakt 2012
Energiewende: Climate policy targets and challenges

- **2020**
  - Greenhouse gas emissions: - 40 %
  - Share of Renewables (RE) in electricity consumption: 35 %

- **2030**
  - Greenhouse gas emissions: - 55 %
  - Share of RE in electricity consumption: 50 %

- **2040**
  - Greenhouse gas emissions: - 70 %
  - Share of RE in electricity consumption: 65 %

- **2050**
  - Greenhouse gas emissions at least: - 80 %
  - Share of RE in electricity consumption: 80 %

Nuclear phase out until 2022

Energy concept 2010 amended in 2011
Theory:
Resulting change of electricity mix (simplified) until 2050

Bruttostromverbrauchsminderung
i.Vgl. zu 2008:
- 10 % bis 2020 sowie - 25 % bis 2050
Anteil erneuerbarer Energien:
2020: 35 %; 2030: 50 %; 2040: 65 %;
2050 80 %
Reality: Share increased from 3.1% (1990) to 23.9% (2012)

Development of renewables-based electricity generation in Germany since 1990

- Hydropower
- Wind energy
- Biomass *
- Photovoltaics

Key Dates:
- EEG: January 2009
- EEG: January 2012
- EEG: April 2000
- EEG: August 2004
- Amendment to BauGB: November 1997

* Solid and liquid biomass, biogas, sewage and landfill gas; biogenic fraction of waste; electricity from geothermal energy not presented due to negligible quantities produced; 1 GWh = 1 million kWh.

Source: BMU - E11 according to Working Group on Renewable Energy Statistics (AKSEE-Stat); image: BMU / Christoph Edelhoff; as at: February 2013; all figures provisional.
**Electricity in Germany: Facts and figures 2012**

| Capacities (GW) | • Total of **174.1 GW** installed capacity  
|                | • Share of **76 GW** (44%) of **renewable capacities**  
|                | • ~950 local utilities own ~20% of conventional generation capacities  
|                | (the remainder owned by few companies like E.On, RWE, Vattenfall, EnBW) |

| Generation (kWh) | • 23% renewables  
|                 | • Conventional plants: reduction of annual load hours by 20% (2010-2012)  
|                 | • Need for new balance mechanisms (storage, load management) |

| Electricity grid (km) | • Total of 1,779,197 km  
|                       | • Transmission/overlay grid and 4 companies - unbundled  
|                       | • Distribution grid: around 900 companies, approx. 60% run by LPE |
Change in actors structure

Energy cooperatives in Germany

Renewable energy generation: Ownership structure in 2010 in % of total installed capacities

Source: Agentur für Erneuerbare Energien, Klaus Novy Institut 5/2012

Source: trend:research
Change in generation structure

97%

of renewables and cogeneration are decentral generation units, connected to the local distribution grid

Source: Bundesnetzagentur 2012
Energiewende requires flexible and reliable capacity

Electricity demand and renewable generation in three exemplary weeks in the year 2022

Source: Agora Energiewende 2012
However, the increase in renewables becomes an economic problem for backup capacities

Need for fossil flexible plants for backup purposes
However, current market situation puts pressure on economic viability of power stations:
- Shrinking annual load hours
- Comparatively high input costs (world market prices)
- Low levels of spotmarket prices
Result: Energy producers analyse the economic viability and increasingly face the need for preterm retirement of plants

As a result, debates about capacity markets are vivid at the moment
- Auctions, prescriptions, strategic reserves, partial or full market concepts etc.
- Central market makers vs. distributed models with capacity certificates
- International examples in many countries

Source: Enervis 2013
Contribution of local energy companies:
Highly efficient generation of heating and cooling

Modern gas-fired power plants
Efficiency-degrees of up to 60%.

Investment in renewable energy while considering local and regional characteristics and resources

Cogeneration: Small- and medium-sized CHP units with efficiency degrees of up to 90% produce low-carbon heat and power for housing areas or business premises.
Capacities of LPU for power generation 2012

Insgesamt >> 20.434 MW (Megawatt)

Kommunale Kraftwerke vor Ort >> 12.280 MW

- Erneuerbare Energien
  1.518 MW / 12,4%
- Kondensationskraftwerke
  3.436 MW / 28,0%
- Kraft-Wärme-Kopplung
  7.326 MW / 59,7%

Kommunale Kraftwerkskooperationen und Beteiligungen >> 8.152 MW

- Erneuerbare Energien
  803 MW / 9,9%
- Kondensationskraftwerke
  5.786 MW / 71,0%
- Kraft-Wärme-Kopplung
  1.563 MW / 19,2%

Source: VKU
Contribution of LPU: Total capacities 2012

Share of LPU in Installed net generation capacities

- 153.723 MW (88%)
- 20.434 MW (12%)

Source: VKU Erzeugungsabfrage 2013; BNetzA
Contribution (2): Reliability and flexibility

Non-renewable capacities

Source: VKU Erzeugungsabfrage 2013; BNetzA
Contribution (3): Combined heat and power generation

local generation capacities: 12.280 MW (excl. Cooperations)
Need for decentral solutions in the energy sector

- They cover local and **regional characteristics** (demography, landscape, grid-coverage, infrastructure etc.).

- They help to take the optimum out of **local potentials** (natural resources, power- and heat-sinks, menpower etc.).

- They help to **synchronize power- and heat-generation with power- and heat-consumption**, therefore they promote grid-stability and may avoid the need for investment in transmission networks.

- **Citizen value** instead of shareholder value: They help to create values locally, promote local economic growth and increase income for people, municipalities and regions.
Summary

Decentralisation is simply a matter of fact, as the potentials for renewables and for energy efficiency are located locally.

Technologically, the electricity Energiewende means a major change in the incumbent system.

Economically, market-driven models of Energiewende will trigger more innovation and individual local action than central regulation.

Local public enterprises face many challenges but also chances.

Acceptance of change and local action are crucial for success. Local public enterprises have some potential to contribute to building confidence.
Thank you for your attention!

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Other sources of Pictures:
VKU/regentaucher.com
VKU Proposal for a Sustainable Energy Market Design

- EU-ETS: EU-wide coordination of CO₂ mitigation
- Generators: Energy-Only-Market as a tool for the short-term dispatch of power plants and electricity demand
- Performance market for the coordination of capacity reserves
- Renewable capacity auction for the coordination of renewable investments (quantity, technology, region)
- Network operators: Quality and investment incentives for network operators
- Consumers: Large customers, Commercial sector, Suppliers and Traders, Small customers, Households
- Regulators: EU and German flags
## Central transfer mechanisms

<table>
<thead>
<tr>
<th>Electricity Market (EOM)</th>
<th>Thermal Generation</th>
<th>Electricity Storage</th>
<th>Suppliers &amp; End Users</th>
<th>Grid Operators</th>
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<tbody>
<tr>
<td><strong>Renewable Generation</strong></td>
<td>• Power plants generate revenues by selling electricity in the EOM</td>
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<td>• Dispatch decisions are coordinated efficiently via these revenue incentives</td>
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<td><strong>Performance Market</strong></td>
<td>• Providers of reliable capacity receive revenues depending on the abilities (performance) of their assets</td>
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<td></td>
<td>• The performance market coordinates the investment decisions of the generators</td>
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<tr>
<td><strong>Renewable Capacity Auction</strong></td>
<td>• Coordination of investment decisions for renewables</td>
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<td><strong>Incentive Regulation</strong></td>
<td>• Reallocation of differential costs of renewables subsidy</td>
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<td>• Revenue regulation by efficiency criteria</td>
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<td>• Cost limitation</td>
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<td>• Short-term refinancing of grid costs</td>
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**Control of investments, innovation and quality**

**Revenue** ✔

**Costs** ✗
Shareholder Structure of VKU members

Data for 2010
Source: VKU 2012
Legal organization

Owner

Municipality

Legal Bodies

Waste management company
Public transport company
Energy Utility
Leisure facility

Divisions

Power, heat, cold-generation
Distribution-network
Sales

…