Germany’s decentralized energy revolution
ESMT – the business school founded by business

- Founded in Germany in 2002 by 25 leading global companies and institutions with the goal to create a business school with global reach and European identity
- Based in the heart of Europe in Berlin complemented by Schloss Gracht close to Cologne
- Comprehensive program portfolio: Fulltime MBA, Executive MBA with currently more than 100 students enrolled, Open Enrolment Programs, Customized and Consortia Programs
- More than 12,000 participants have finished our Executive Education programs since 2003
- 32 professors and faculty professionals from 19 nations
- Accredited by AACSB, AMBA, and FIBAA
- FT-Ranking 2013 in executive education programs: No. 20 worldwide, No. 12 in Europe and No. 1 in Germany
An integrated approach to the field of energy and sustainability based on three pillars

**Executive education**
ESMT offers tailored programs and workshops for companies. They focus on competitive differentiation, tools for decision making, and how to identify and scale new business models.

**Think tank**
ESMT serves as a platform for the exchange of ideas between industry, politics and academia.

**Research**
Energy research at ESMT focuses on innovation, new business strategies, and changes along the energy value chain.

On a macro perspective, we focus on innovation policy and consolidation in the energy supply industry, while our research on the micro perspective examines corporate decision making, the organizational implementation of innovation and strategic orientation of individual companies.
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Energiewende: Driven by private individuals

### Development of renewable energy generation

<table>
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<tr>
<th>Year</th>
<th>Photovoltaik</th>
<th>Bio energy</th>
<th>Wind energy</th>
<th>Water power</th>
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<tr>
<td>1990</td>
<td>17,1 (3.1%)</td>
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<td>1991</td>
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<td>April 2000</td>
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<tr>
<td>August 2004</td>
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<tr>
<td>January 2009</td>
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<td></td>
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<tr>
<td>January 2012</td>
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</tbody>
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### Ownership of renewable energy capacity

- Private individuals: 35%
- Farmers: 14%
- Industry: 14%
- Project firms: 13%
- Investment funds / banks: 7%
- Other energy suppliers: 5%
- The "Big Four" energy suppliers: 1%
- Others: 35%

Source: www.unendlich-viel-energie.de; BMU, BEE, AEE (Stand: 2/2013); Agentur für erneuerbare Energien; trend:research (4/2013)
Energiewende: fundamental changes in the energy value chain

Source: Burger/Weinmann (2014)
Contents

- Energiewende – what does it mean?
- Energiewende – implications for utilities
- Energiewende – searching for successful business models
The issues: nuclear exit, off-shore wind, reduced mid-day peak

The impact: utilization and portfolio consequences

Utilization consequence – gas turbine utilization of EnBW ¹)

Portfolio consequences – the case of E.ON ²)

¹) Source: Annual Investor Update, EnBW (March 2013); 2) Sources: E.ON (2013)

Bubble sizes represent EBITDA contribution
RES = Renewables, DE = Distributed energy
Contents

Energiewende – what does it mean?
Energiewende – implications for utilities
Energiewende – searching for successful business models
Due to the transformation, grid resiliency becomes a threat and opportunity.
Regulatory answer: capacity markets / strategic reserve

Source: Mainova (2013)
Business model answer: energy efficiency ...
MeteoViva - using local weather forecasts to optimize heating demand

MeteoViva develops a heating and cooling concept for the new ECB headquarters in Frankfurt/Main

Source: MeteoViva (2013)
...or demand response ...

Entelios: up to 9 GW demand response potential from Germany’s industrial sectors alone\(^1\)

Fluctuating renewable energy … … to be balanced with intelligent demand management by Entelios


1) according to the VDE, the Association for Electrical, Electronic & Information Technologies in Germany, the potential is even higher at 24-25 GW for industry and commercial consumers
… or flexible supply, e.g. virtual power plants …

LichtBlick: combining micro CHP to a virtual power plant

Sources: LichtBlick (2014); Volkswagen (2014)
… or combining PV and heat pumps …

Specific heat consumption of residential buildings

Sales of heat pumps in Germany (1978-2012)

1) Source: Neura / Climate Change Capital (2013); 2) n kWh/(m²·yr) Source: co2online (2013); 3) Source: IKZ (2013)
... or developing energy-autonomous regions

888 energy cooperatives in Germany

Local energy production via Stadtwerke

Objectives of cooperatives
- Contribution to Energiewende
- Strengthening local value creation
- Investment opportunity
- Independence from suppliers

Source: Agentur für erneuerbare Energien (2014), trend:research, Leuphana, Definition und Marktanalyse von Bürgerenergie in Deutschland (2013)
Energiewende: significant increase of decentralized energy generation expected with many opportunities arising

**Energy system trajectory**

- **Ownership**
  - Public
  - Central
  - Private
- **Structure**
  - Public
  - Central
  - Decentralized
- **Energy mix**
  - Fossil
  - Carbon-free

**Drivers**

- **Technological**
  - Learning curves of existing technologies, e.g. grid parity PV, heat pumps micro CHP
  - Progress of ICT
- **Regulatory**
  - Avoiding negative externalities due to climate change, security of supply
  - Trade off between transmissions lines and decentralized systems
- **Empowerment**
  - Rio 1992: Local Agenda 21
  - From consumer to prosumer

Source: Analysis ESMT; 1) Information an communication technology
Thank you for your attention

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