Germany’s decentralized energy revolution

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20 May 2014

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

Founders and benefactors

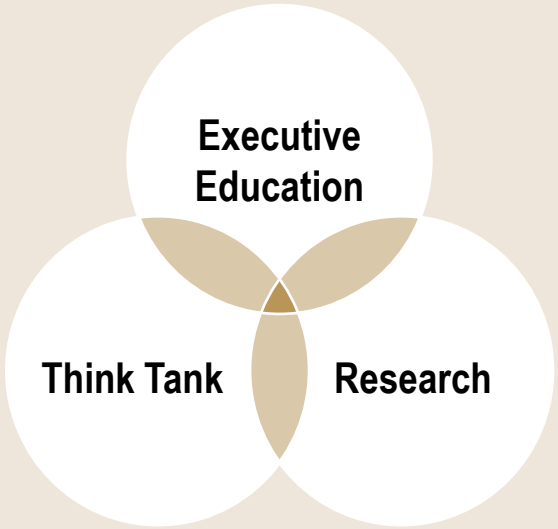
An integrated approach to the field of energy and sustainability based on three pillars

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

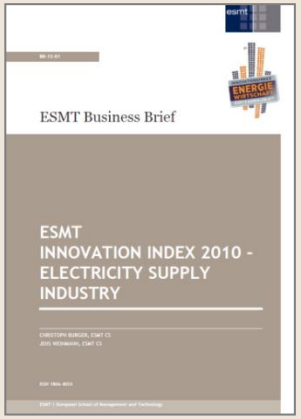
ESMT serves as a platform for the exchange of ideas between industry, politics and academia

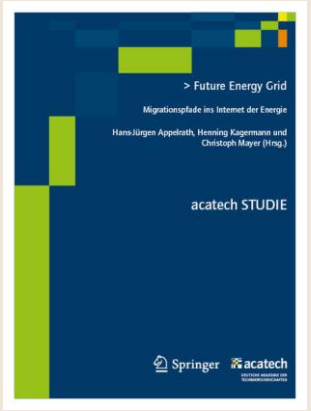


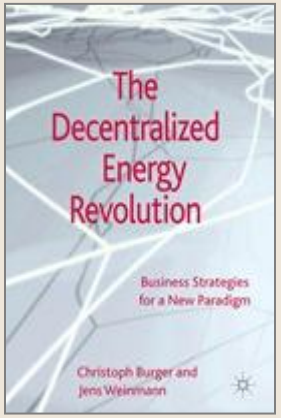
Research

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 – implications for utilities

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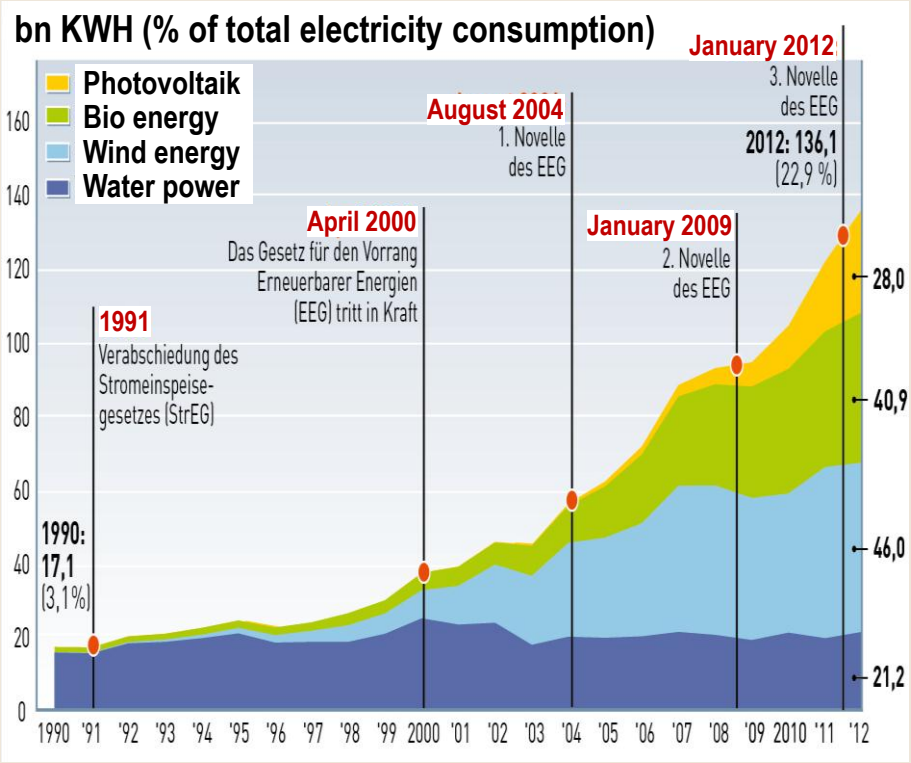
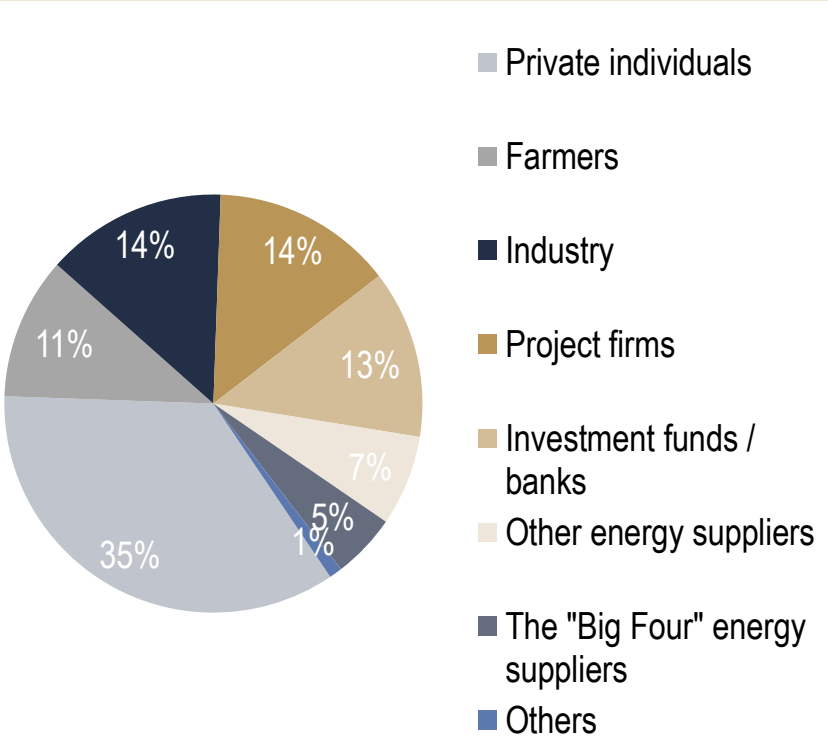
Energiewende: Driven by private individuals

Development renewable energy generation

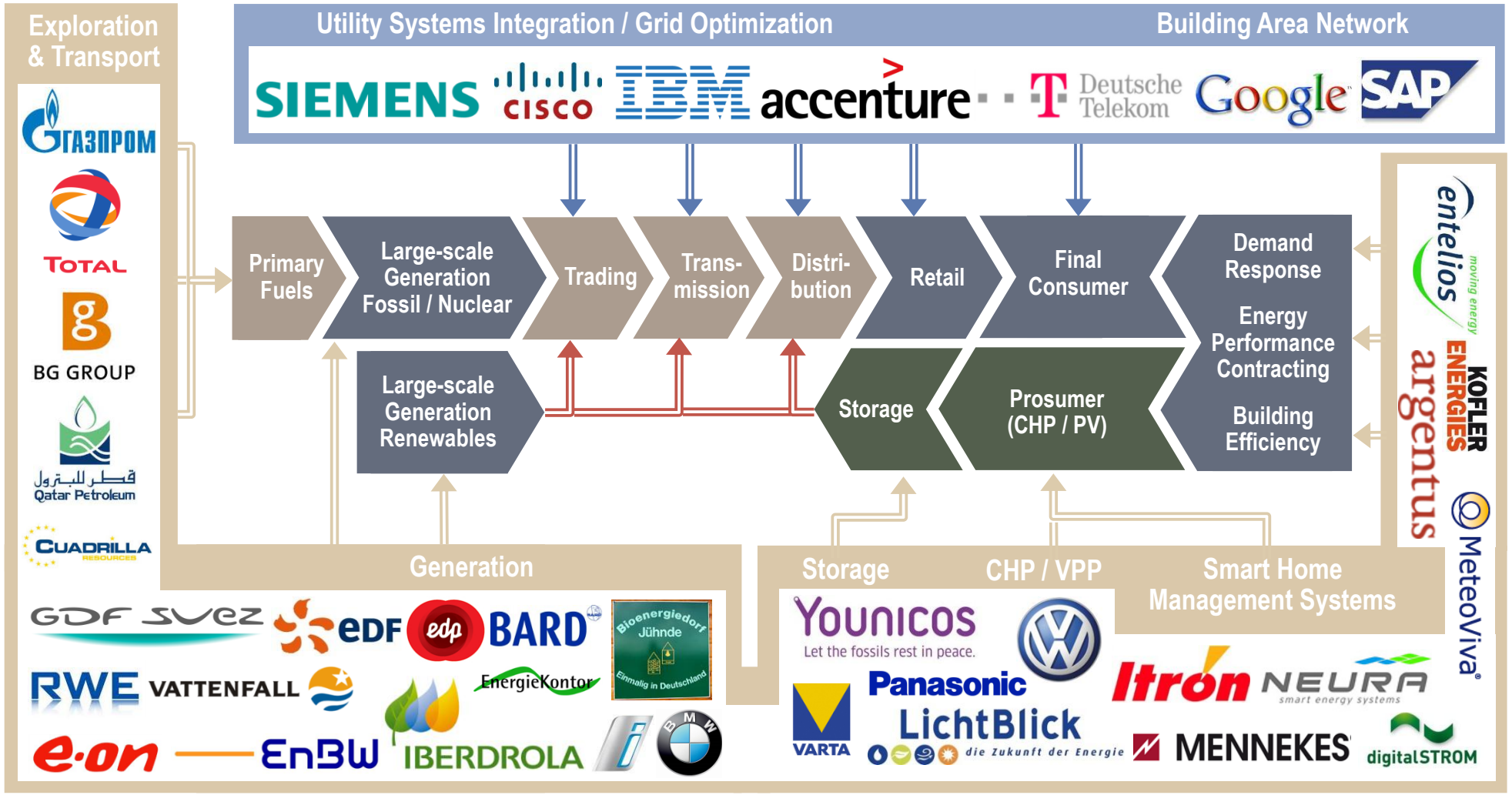


Ownership of renewable energy capacity



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)

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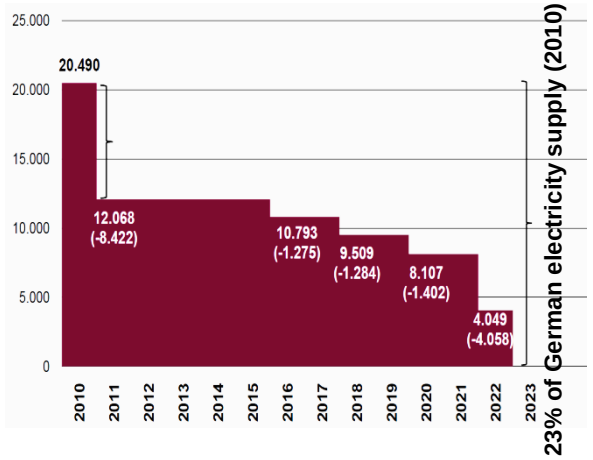
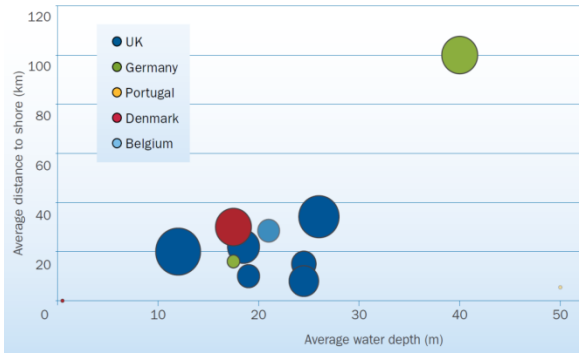
The issues: nuclear exit, off-shore wind, reduced mid-day peak

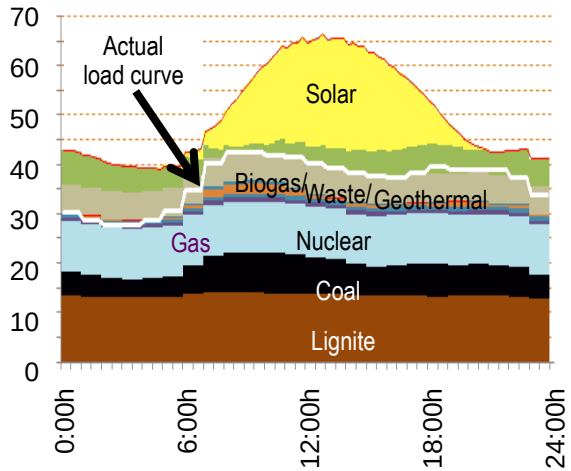
Gradual phase out of nuclear plants[1)]



Technical challenges of off shore wind new build[2)]



Decentralized renewables reducing mid-day peak of wholesale prices[3)]

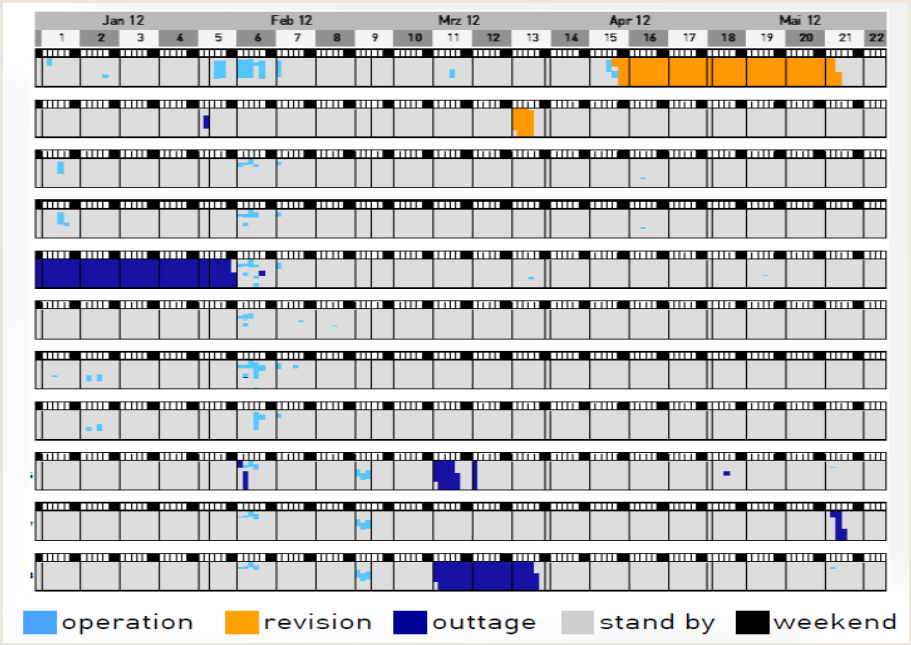


Demand and supply on 25 May 2012 (in GW)

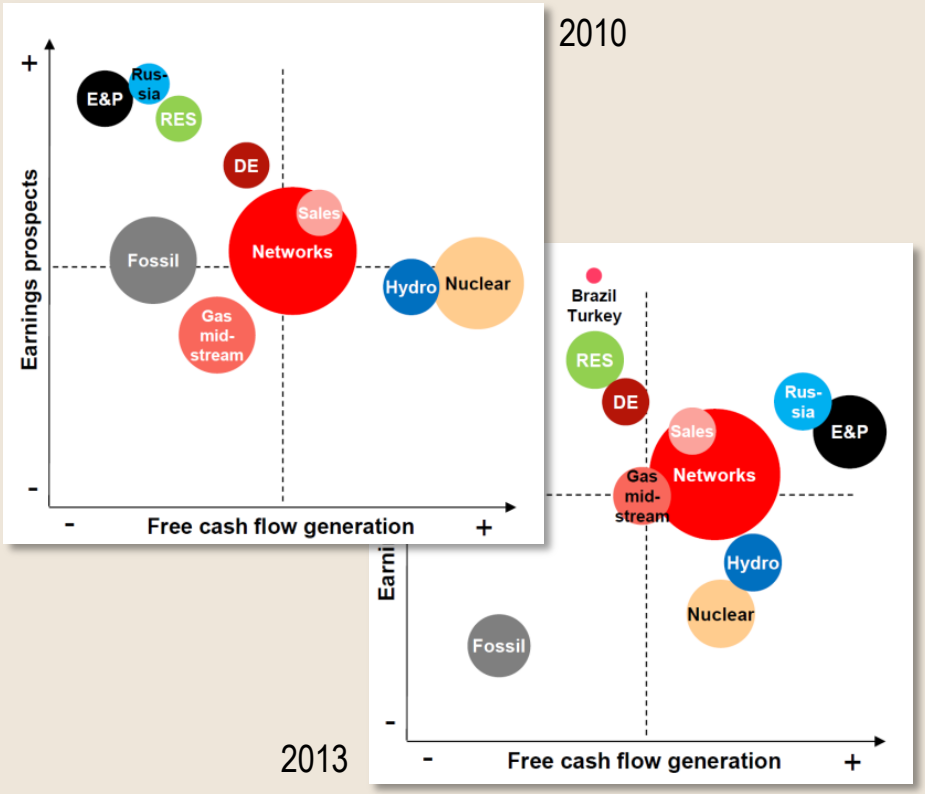
1) Sources: BDEW (2012)/Atomgesetz (ATG) §7; 2) Source: EWEA,The European offshore wind industry key trends and statistics 2011 (2012); 3) Source: EEX / ENTSO-E (2012)

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 represents EBITDA contribution
RES = Renewables, DE = Distributed energy

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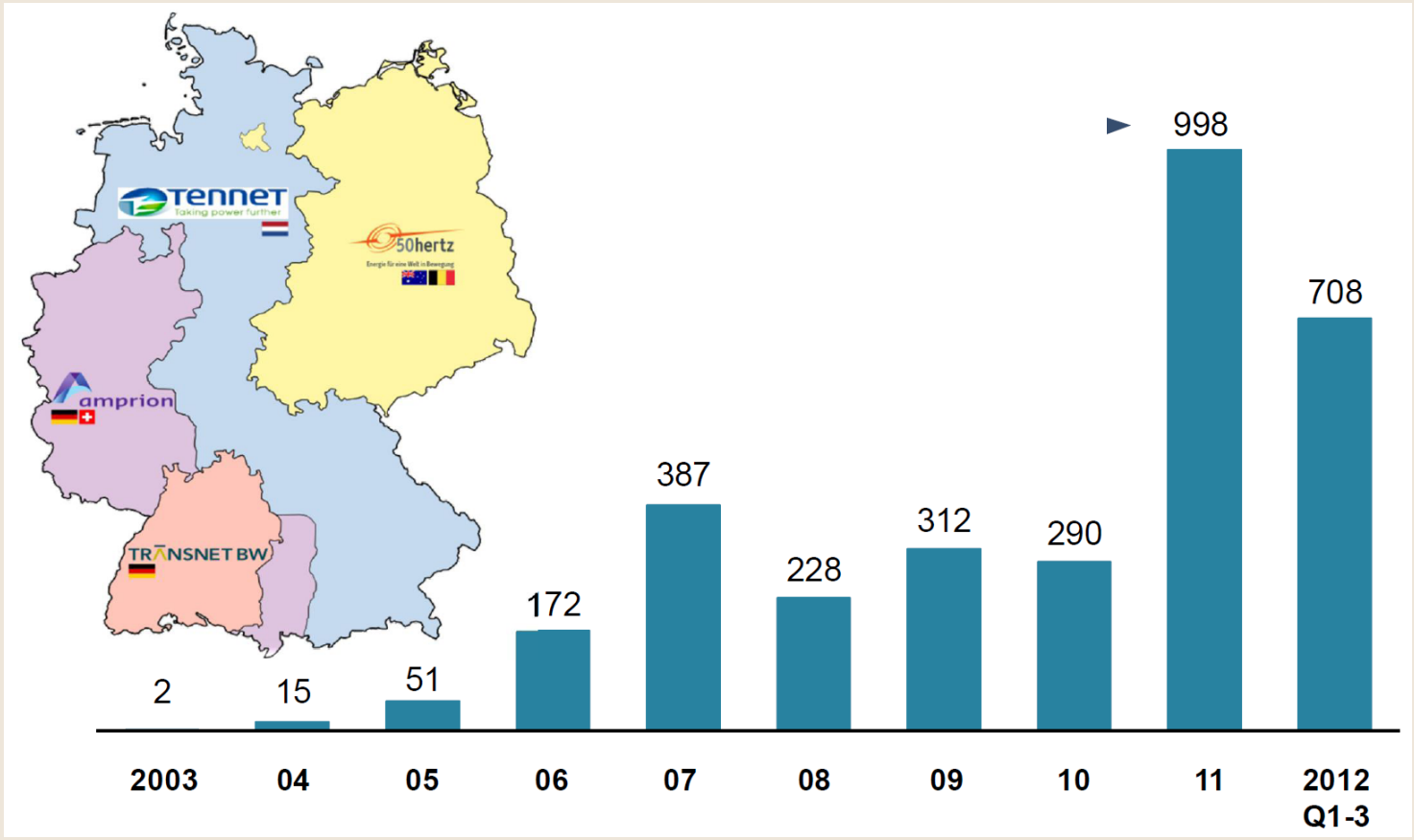
Due to the transformation, grid resiliency becomes a threat and opportunity

Grid interventions of TenneT

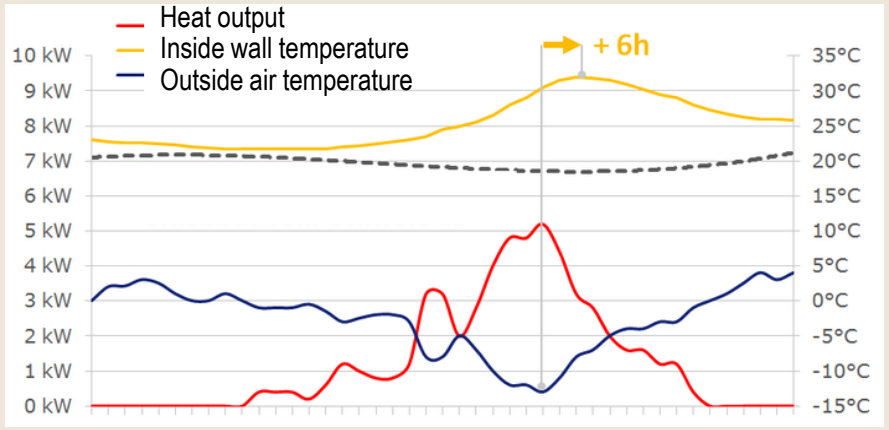


Source: TenneT/ Bier / Siemens (2013)

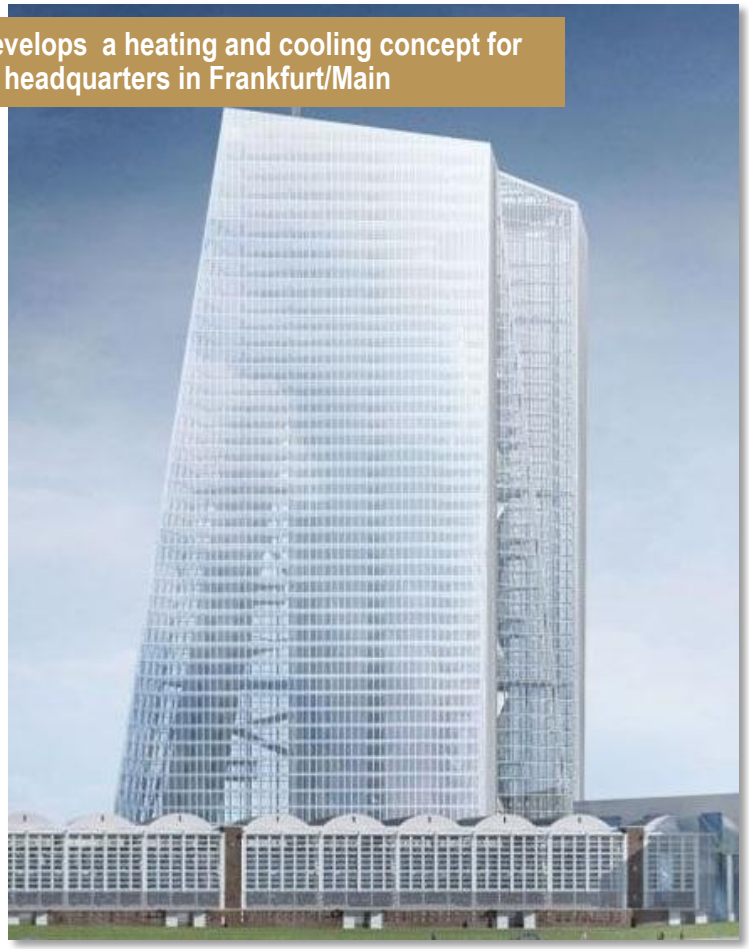
Regulatory answer: capacity markets / strategic reserve

Source: Mainova (2013)

Business model answer: energy efficiency …
MeteoViva - using local weather forecasts to optimize heating demand



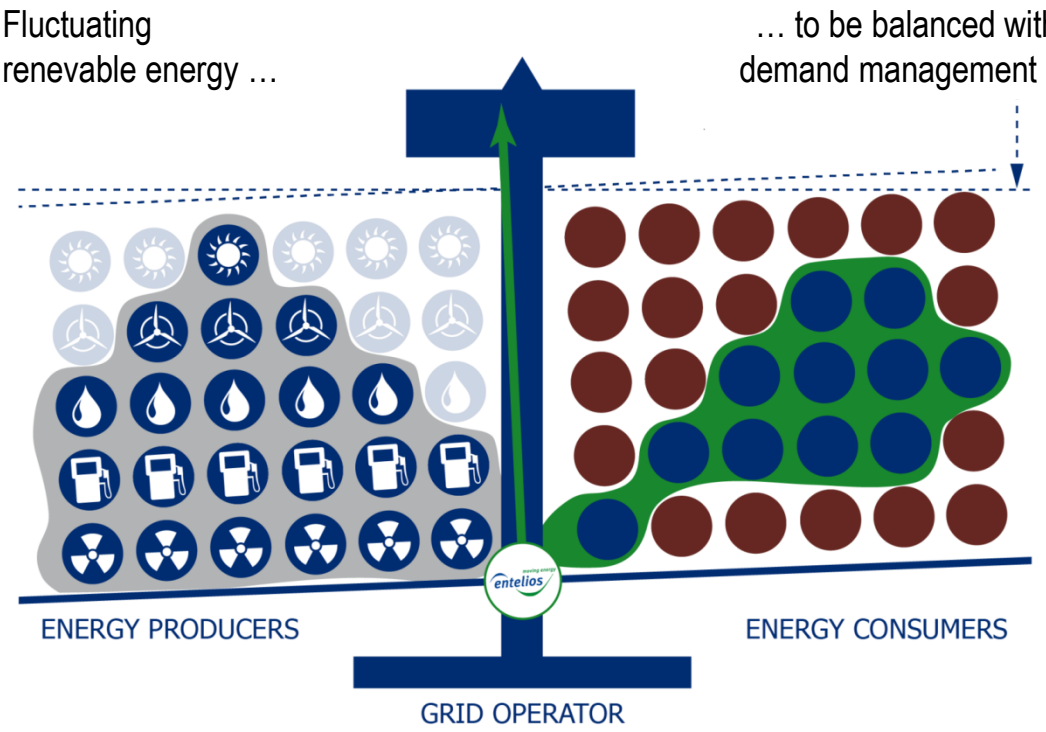
MeteoViva develops a heating and cooling concept for the new ECB headquarters in Frankfurt/Main



Source: MeteoViva (2013)

…or demand response …

Entelios: up to 9 GW demand response potential from Germany's industrial sectors alone[1)]

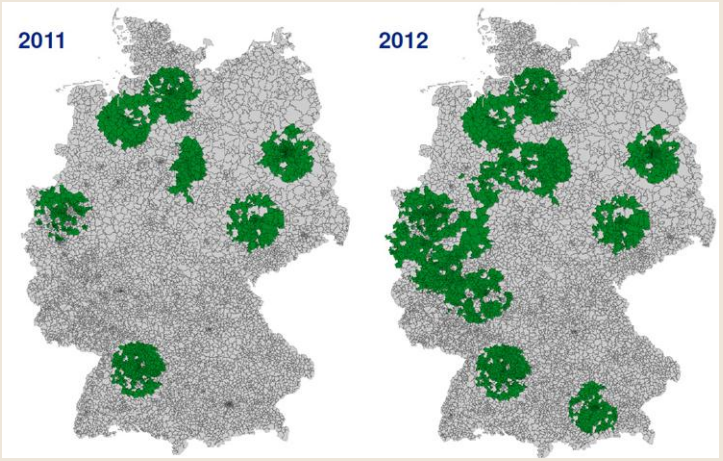


Source: Entelios (2013), http://entelios.com/demand-response/

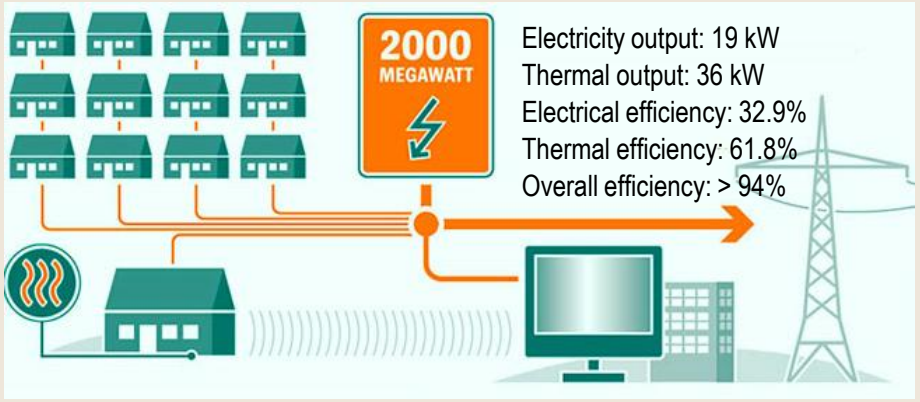
1) according to the VDE, the Association for Electrical, Electronic & Information Technologies in Germany, the potential is even higher at 24-25 GW for industry and commercial consumers

… or flexible supply, e.g. virtual power plants …
LichtBlick: combining micro CHP to a virtual power plant

Sales of ZuhauseKraftwerke (March 2014): **1,400 units**
Target: **100,000 units**



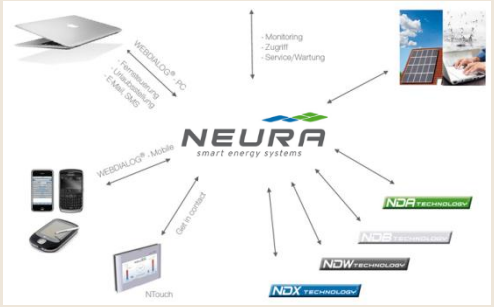
Extension of sales areas from 2011 to 2012



Electricity output: 19 kW
Thermal output: 36 kW
Electrical efficiency: 32.9%
Thermal efficiency: 61.8%
Overall efficiency: > 94%

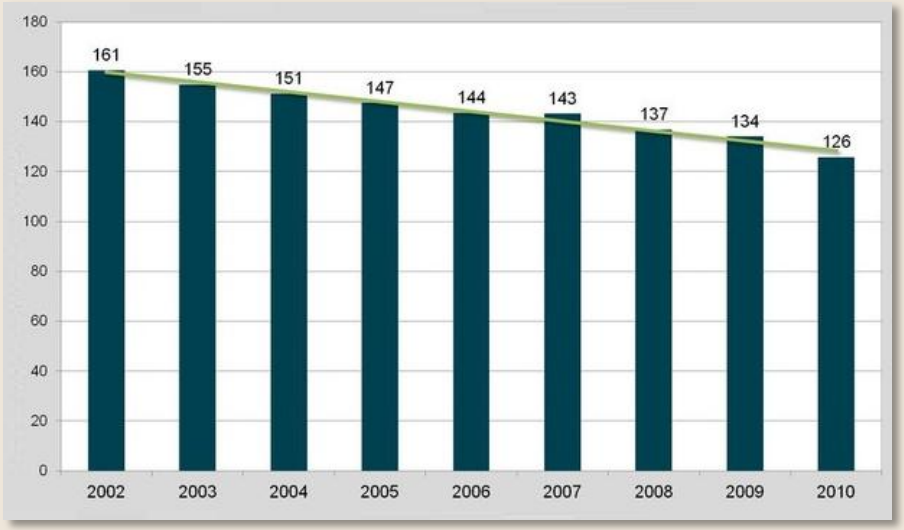
Sources: LichtBlick (2014); Volkswagen (2014)

… or combining PV and heat pumps …

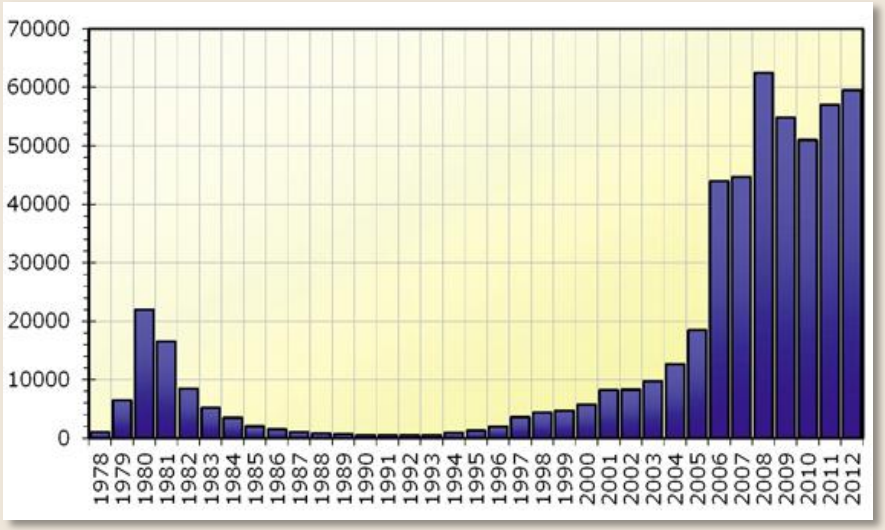


1)

Specific heat consumption of residential buildings[2)]



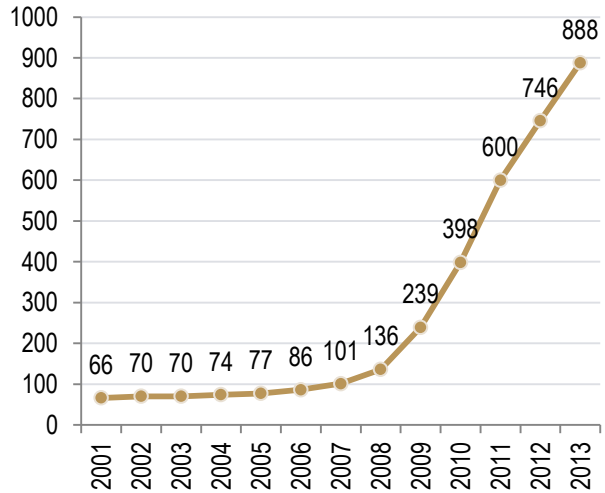
Sales of heat pumps in Germany (1978-2012)[3)]



1) Source: Neura / Climate Change Capital (2013); 2) n kWh/(m^2*yr) Source: co2online (2013); 3) Source: IKZ (2013)

… or developing energy-autonomous regions

888 energy cooperatives in Germany



Objectives of cooperatives

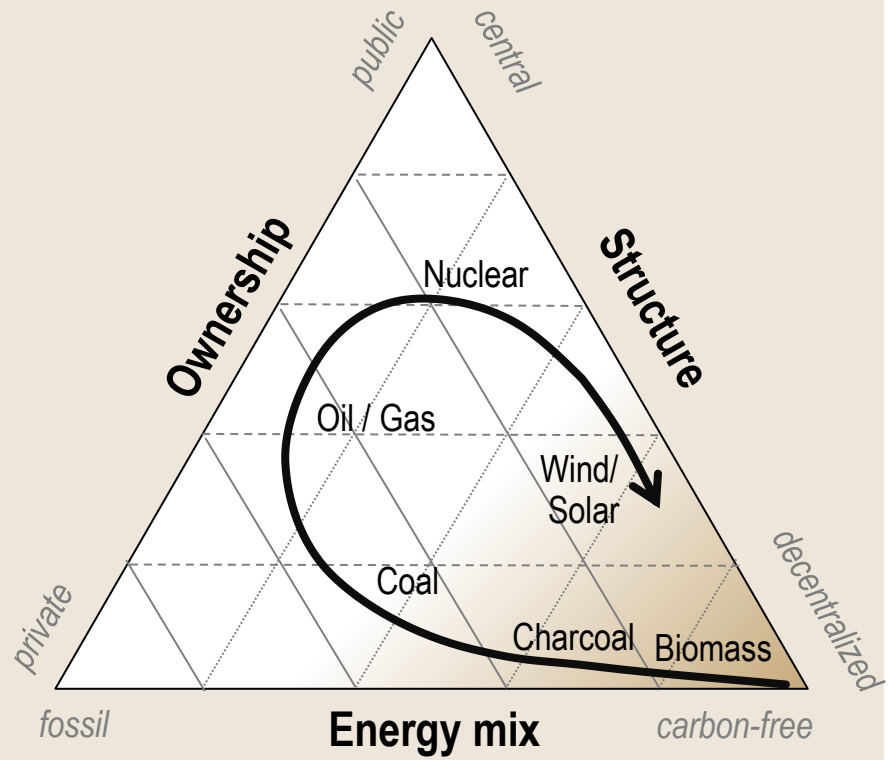
- Contribution to Energiewende
- Strengthening local value creation
- Investment opportunity
- Independence from suppliers

Local energy production via Stadtwerke

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



Drivers

- Technological
  - Learning curves of existing technologies, e.g. grid parity PV, heat pumps micro CHP
  - Progress of ICT[1)]
  - New technologies, e.g. smart meters, e-vehicles
- 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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