Digitalization in Bavaria: Challenges in the energy sector

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Regional implementation
Innovative energy services
Interoperable structures
Dependable building blocks

Maximilian Irlbeck, Zentrum Digitalisierung.Bayern

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Founded 01.11.2015
Initiative of the Bavarian Government

Our Mission:
To support and guide
- economy,
- science, and
- society
in Bavaria on the path into digital transformation.
Initiatives at Center Digitization.Bavaria

- 20 Professorships (10 university, 10 universities of applied science)
- 10 young researcher groups (7 already established)
- 10 doctoral candidates in ZD.B graduate school
- 7 Thematic Platforms (+5 in planning): Mobility, Production/Digital Engineering, Energy, Health, Cybersecurity, Education/Culture/Science
- 10 Innovation Labs
- Entrepreneurship education centers in digital technology
Impressions of 2 years of ZD.B (11/15-11/17)
Digitization/Energy: A regional topic – in Bavaria & Russia!

Population distribution in Bavaria
- ~25% live in villages with max. 5,000 inhabitants
- Only 20% live in cities > 100,000 inhabitants
- Decentralized economic structure, e.g. huge chemical industry near Altötting
- Energy and digitalization are regional topics!

TOP 5 of the biggest cities in Bavaria
1) München 1,5 Mio E.
2) Nürnberg 500,000
3) Augsburg 280,000
4) Regensburg 145,000
5) Ingolstadt 130,000
The energy system in Bavaria: Heterogeneous!

- Rural, suburban and urban grids
- Boom of PV especially in rural areas
- 239 different DSOs in Bavaria in all sizes
- Regional forms of demand and supply differ a lot!
- Future of energy in Bavaria:
  - renewable AND fossil
  - volatile
  - centralized AND decentralized
  - focused on distribution grids
  - digital
  - regional
The challenge: Build a dezentralized, digital, scalable, safe system

System domains, focus: distribution
Goals of the thematic platform energy

Security of supply

Digitization of energy systems

Environmental sustainability

Economic feasibility

Regional implementation
Innovative energy services
Interoperable structures
Dependable building blocks

M. Irlbeck: Digitalization in Bavaria - Challenges in the energy sector
Examples of technological trends & topics

Blockchain
- Dezentralized database/computer
- Highly secure
- No need for central platform and trust
- Smart contracts
- Consensus mechanism

Microgrid
- Localized grouping of electricity sources and loads
- Operates connected to traditional centralized electrical grid
- Can disconnect and function autonomously

Cellular Systems
- Idea: optimize the energy system bottom-up
- Minimize power flow
- Create controllable cells (e.g. microgrid)
- Dezentralized communication scheme

Smart Metering
- Roll-out of measuring devices for special customers
- SM Gateway manages access for market
- Highly secure communication infrastructure

Smart Home/Smart Building/BIM
- Manage houses and buildings more efficiently
- Comfort and Convenience in Smart Homes
- Understand demand and generation of buildings
- Models to plan, build, operate and destroy buildings

Integrated energy
- Combine electrical power with heat, cold, gas or mobility
- Use different load profiles
- Improve overall efficiency
- Use other forms of energy as storage
- Use available energy more efficiently

KRITIS
- Role of critical infrastructures
- Saving functionality
- Enabling robustness
- Work modes under critical circumstances (e.g. catastrophes)
- Role of ICT in KRITIS scenarios

Energy efficiency
- Saving energy through better understanding of its usage
- Modeling different forms of energy usage
- Analysing measures to better use energy

Flexibility
- Flexible loads
- Flexibility in generation
- Load shifting
- Peak shaving
- Price for flexibilities
- Data format for flexibilities

Districts
- Group of several buildings as building block of the energy system
- Analyze shared usage of resources within districts
- Implement communication schemes and platforms
Multi Energy Management and Aggregation Platform

Research project MEMAP

06/17 – 06/21

Partner:
Research project: MEMAP

Integration of *intelligent Optimization algorithms* in local EMS

Integration and *linking of storages and power generating units"

Development of an *Aggregation platform* for control and optimization

- Development of a planning tool for configuration and simulation
- Sample monitoring applications and user interfaces
- Development and analysis of business models
- Analysis and evaluation of the aggregation platform
Example of active organizations and institutions
Thank you.

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Bavaria in a nutshell

Some numbers and facts
- 12.7 m. inhabitants, 7.27 m. full-time employed
- GDP (2013): 522 bn. € with 3.1 % invest into research & development
- 18.1% growth in 10 years
- Approx. 30% of German patents emerge from Bavaria

Higher Education
- 19 (state) universities
- Approx. 250.000 students
- Good standing in
  - Excellence initiatives
  - Internationalization

Economy
- Excellent standing in
  - German job market w/ approx. 50% export
  - Automotive, Avionic, ICT
- Active entrepreneurship support
<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhabitants</td>
<td>4.4 million</td>
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<tr>
<td>Number of ICT companies</td>
<td>35,000</td>
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<tr>
<td>Business volume (ICT)</td>
<td>€48.1 billion</td>
</tr>
<tr>
<td>Investment volume (ICT)</td>
<td>€4.5 billion</td>
</tr>
<tr>
<td>Full-time employed</td>
<td>146,100</td>
</tr>
</tbody>
</table>

Munich is Europe's top ICT hub.*

* based on a study by the European Commission.