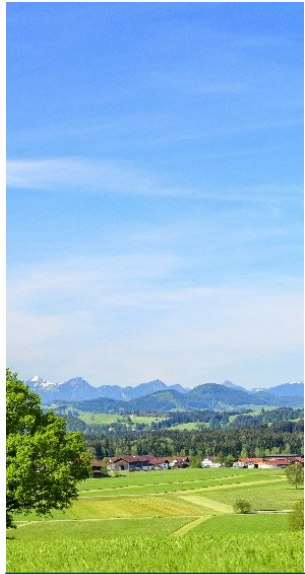


Digitalization in Bavaria: Challenges in the energy sector



Regional
implementation



Innovative
energy services



Interoperable
structures



Dependable
building blocks

Coordinator „Digitization in
the energy sector“:
Maximilian Irlbeck

Project leader
Multi-energy aggregation and
management platform
(MEMAP)
Virginia Ahuir

Economic speaker:
Dr.-Ing. Roland Hofer
Bayernwerk AG

Scientific speaker:
Prof. Dr.-Ing. Joachim Schenk
Hochschule München

Maximilian Irlbeck, Zentrum Digitalisierung.Bayern

➤ 9.11.2017 | Russian-Bavarian Conference on „Economics and Business Administration“, FAU Erlangen-Nürnberg



Center Digitization Bavaria

Founded **01.11.2015**
Initiative of the Bavarian Government

Our Mission:

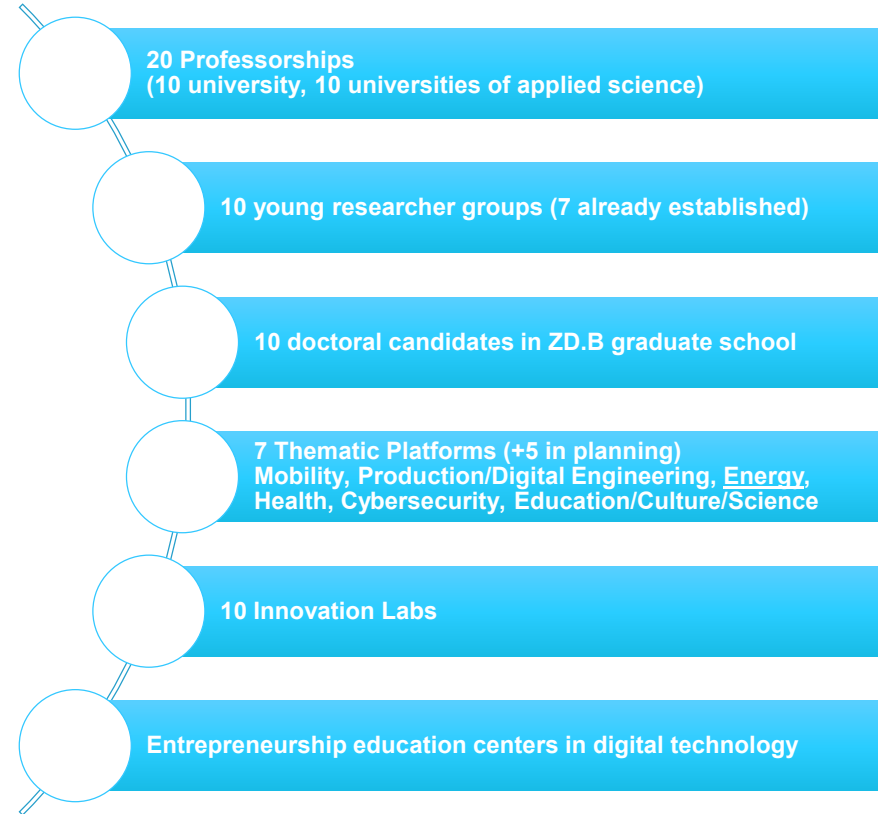
To support and guide

- **economy,**
- **science, and**
- **society**

in Bavaria on the path into digital transformation.



Initiatives at Center Digitization.Bavaria



Impressions of 2 years of ZD.B (11/15-11/17)



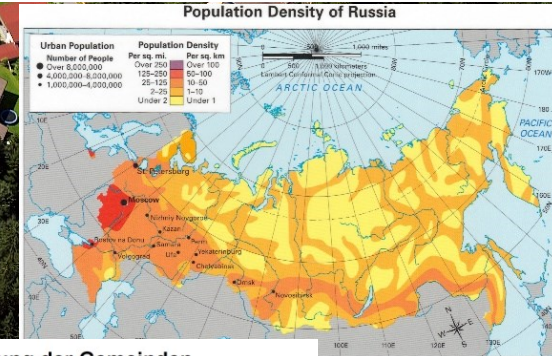
Digitization/Energy: A regional topic – in Bavaria & Russia!

Population distribution in Bavaria

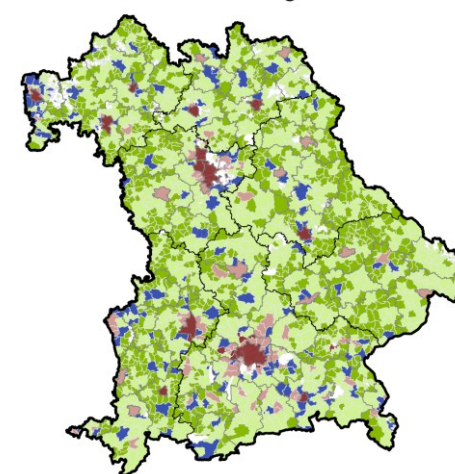
- ~ **25%** live in villages with max. 5.000 inhabitants
- Only **20%** live in cities > 100.000 inhabitants
- Decentralized economic structure, e.g. huge chemical industry near Altötting
- Energy and digitalization are regional topics!

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 |



Strukturklassenzuordnung der Gemeinden



Datenquelle: Bayerische Vermessungsverwaltung – www.geodaten.bayern.de

The energy system in Bavaria: Heterogeneous!

Map of DSOs in Bavaria



Stadtwerke Rödental
(utility/DSO)
340 km electrical grid
14.000 customers



Bayernwerk AG (DSO)
Regensburg
154.000 km electrical grid
> 5.000.000 customers

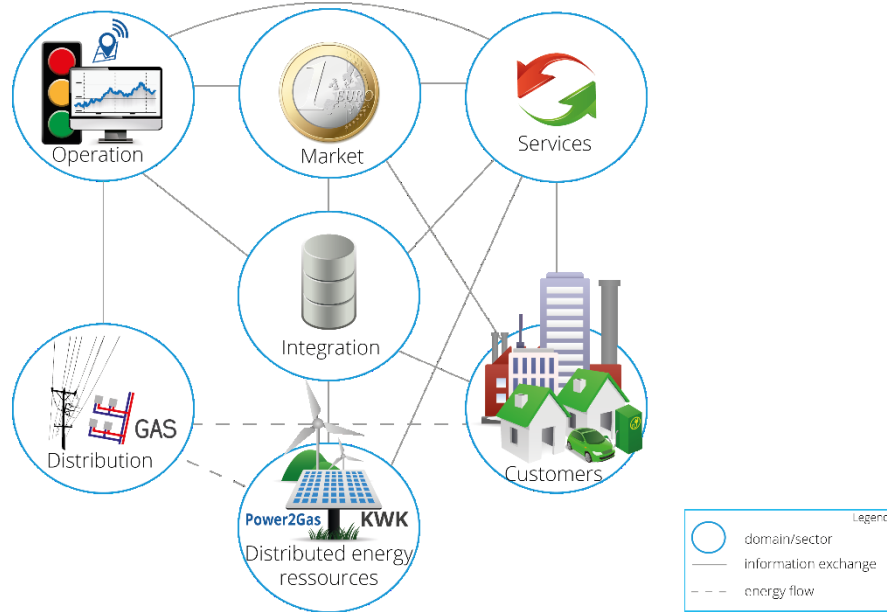


Wacker Chemie AG
Burghausen
~ 4.100 GWh/year
0,8 % of german demand



- 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 decentralized, digital, scalable, safe system



System domains, focus: distribution

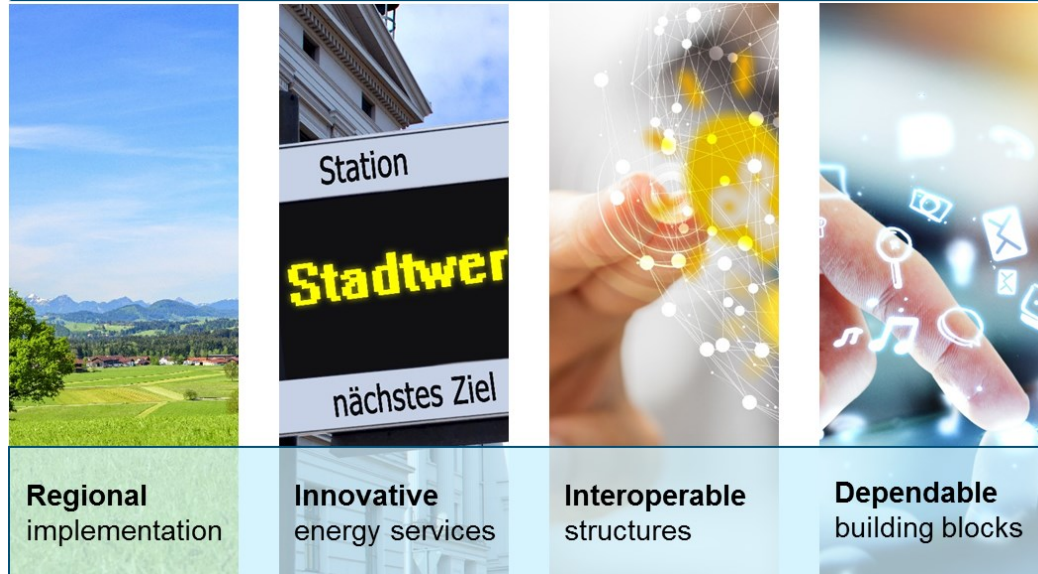
Goals of the thematic platform energy

Security of
supply

Environmental
sustainability

Digitization of energy systems

Economic
feasibility



Examples of technological trends & topics

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

Blockchain



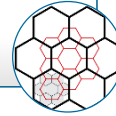
- Localized grouping of electricity sources and loads
- operates connected to traditional centralized electrical grid
- can disconnect and function autonomously

Microgrid



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

Cellular Systems



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

Smart Metering



- 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

Smart Home/Smart Building/BIM



- 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

Integrated energy



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

KRITIS



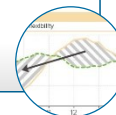
- Saving energy through better understanding of ist usage
- Modeling different forms of energy usage
- Analysing mesasures to better use energy

Energy efficiency



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

Flexibility



- Group of several buildings as building block of the energy system
- Analyze shared usage of resources within districts
- Implement communication schemes and platforms

Districts



Multi Energy Management and Aggregation Platform



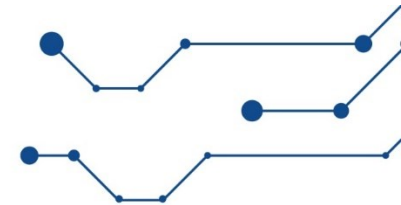
Research projec **MEMAP**

06/17 – 06/21

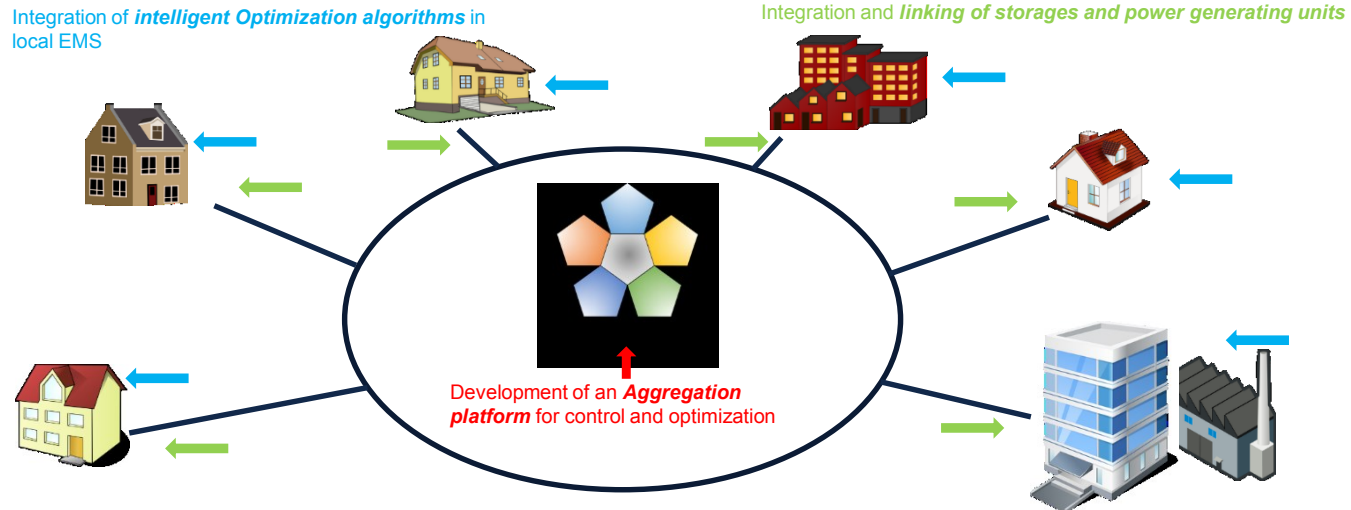
Partner:



fortiss



Research project: MEMAP



- 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





Maximilian Irlbeck

Coordinator energy

Maximilian.Irlbeck@zd-b.de

+49 89 - 24 88 07 -112

Thank you.

www.zentrum-digitalisierung.bayern

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

Centre of Digitalization: Munich - ICT hub of Europe

| | |
|--------------------------|----------------|
| Inhabitants | 4.4 million |
| Number of ICT companies: | 35.000 |
| Business volume (ICT): | € 48.1 billion |
| Investment volume (ICT): | € 4.5 billion |
| Full-time employed: | 146.100 |



Munich is Europe's top ICT hub.*