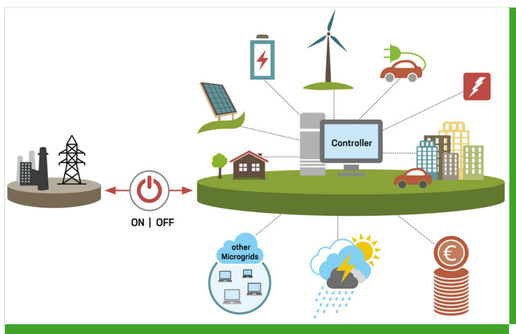

Microgrids and Smart Energy Communities – Reference Projects and Use Cases

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Area 2.3 – Microgrids and Smart Energy Communities

Microgrids and Smart Energy Communities

The Sub-Area 2.3 deals with the development of standardized, holistic tools for the planning and control of decentralized energy systems (energy communities, cellular energy systems) and microgrids. The applied methods include Mixed Integer Linear Programming (MILP), linearized MILP and Model Predictive Control (MPC) methods as well as artificial intelligence (AI) based prediction models.

Fig. 1: Research Team: Microgrids and Smart Energy Communities at BEST GmbH

Through the development and application of novel, mathematical algorithms, interactions between energy sectors and the use of storage and load shifts, among others, are optimally considered and integrated into energy systems. The results are:

- a significant increase in **flexibility**
- increasing **stability** in microgrids and decentralized energy systems

Research Topics:

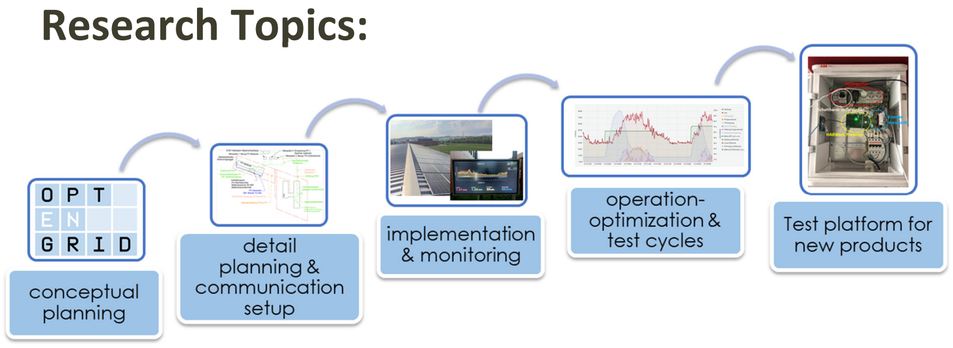

Fig. 2: Holistic Energy Concepts for Decentralized Microgrids and Smart Energy Communities

- Optimization-based, holistic planning of decentralized energy systems: **OptEnGrid**
- Development of model-predictive control for operational optimization: **integrated smart and microgrid control**
- Testing and optimization of microgrid controllers in the **Microgrid Lab**

The project partners of Area 2.3 are grid operators, energy suppliers, service providers, component and product developers as well as municipalities and energy communities.

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Reference Projects and Use Cases

Clean Energy 4 Tourism

- Optimal technology portfolio for nine ropeways
- Sector-coupled planning of decentralized technologies (electricity, heat, fuel, hydro power plant (HPP))

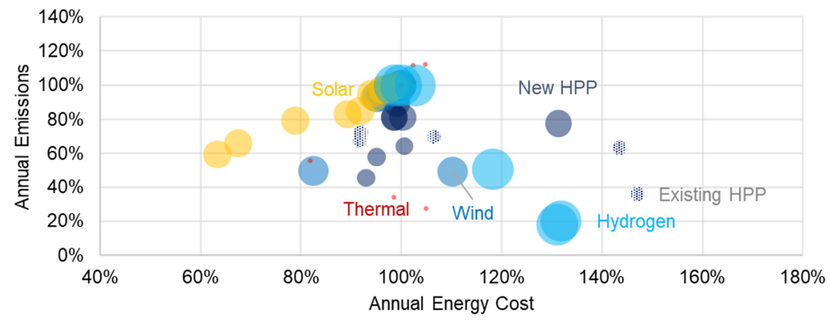

Fig. 3: Overview of Several Use Cases Based on Relative Energy Costs and CO_2 Emissions

Use Case: Mallnitz

- Concept with DESIGN – BUILT – OPERATE platform (iGE+)
- 100% renewable energy supply with energy-plus buildings

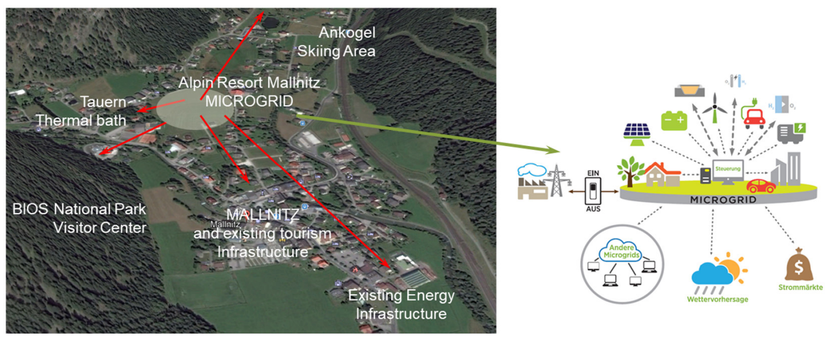

Fig. 4: Microgrid Concept of Use Case Mallnitz

Use Case: Energy Community in Kärnten

- 8760h-cost optimization for entire energy community
- Results with variable feed-in tariffs (spot market price):

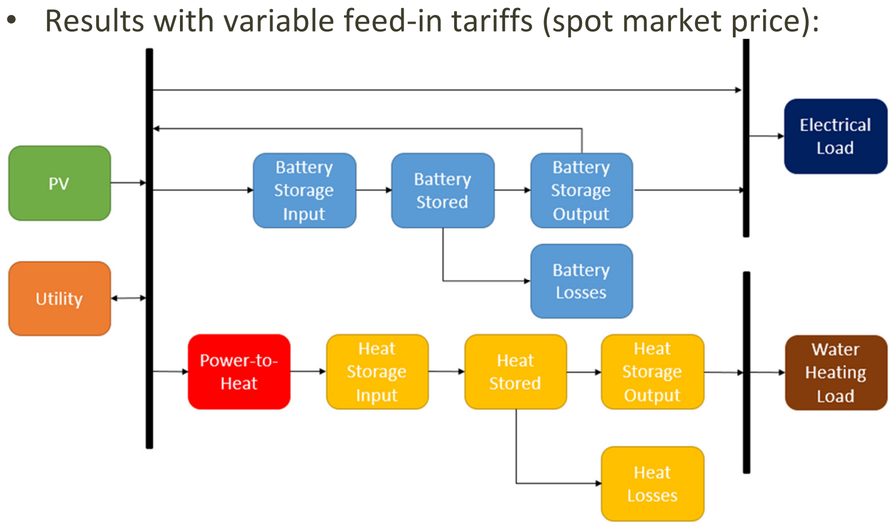

Fig. 5: Concept of 8760h-Cost Optimization with Power-to-Heat

Use Case: Seba-Mureck

Cellular energy system as energy self-sufficent as possible: PV: 2.5 MW (existing), biogas plant: 1 MW (existing); seasonal hydrogen storage: 700 MWh, Fuel cell and electrolysis

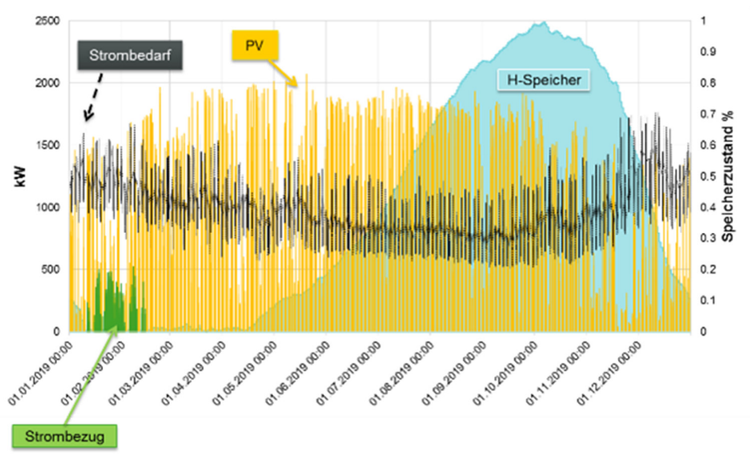

Fig. 6: Increase of Energy Independency for Seba-Mureck

FFG Forschung wirkt. | Bundesministerium Arbeit und Wirtschaft | Bundesministerium Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie | wirtschaftsagentur wien | Für die Stadt Wien | Niederösterreich | Das Land Steiermark – Wirtschaft, Tourismus, Regionen, Wissenschaft und Forschung | SFG – Neues denken. Neues fördern.