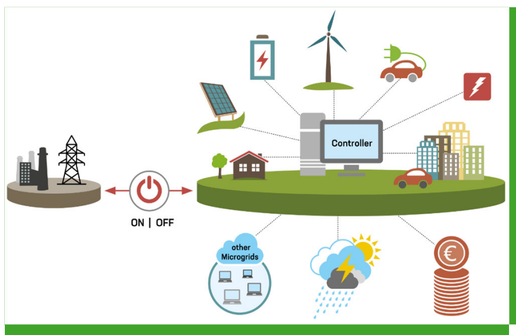


Optimized Planning of Microgrids and Smart Energy Communities

Stefan Aigenbauer
Michael Stadler
Pascal Liedtke
Rita Sturmlechner
Christine Mair
Muhammad Mansoor
Christian Oberbauer
Fatema Alavi
Nikolaus Houben
Reinhard Haas

Area 2.3 – Microgrids and Smart Energy Communities

Microgrids and Smart Energy Communities

Microgrids generate and store energy for self consumption (electricity, heating, cooling, etc.). Decentralized and renewable generation and storage technologies, as well as energy strategies increase efficiency, resilience, grid stability, independency of imports, sustainability, and climate neutrality.

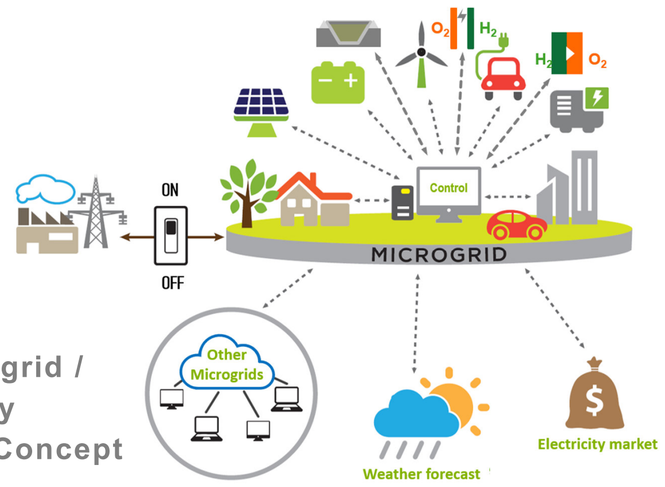


Fig. 1: Microgrid / Smart Energy Community Concept

Requirements and Challenges

The planning of local energy networks has to consider a variety of factors and framework conditions. Furthermore, there are complex interactions between technologies, methodologies and user-friendliness.

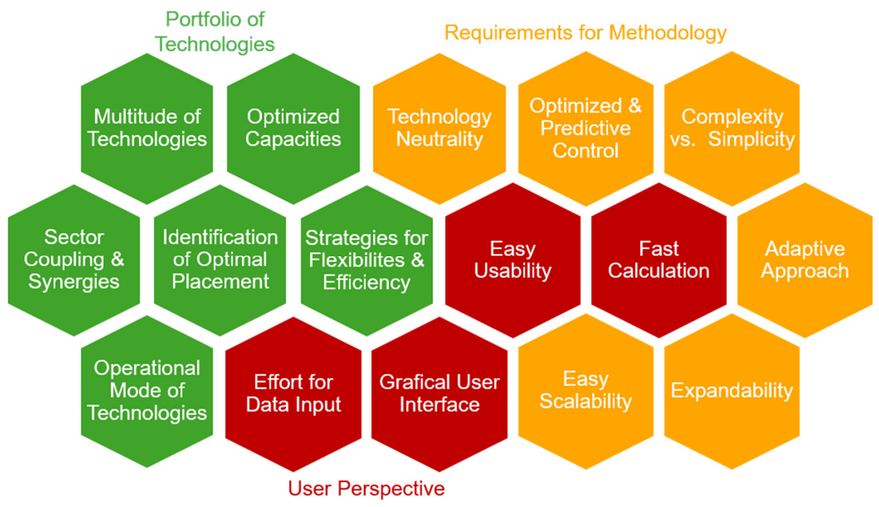


Fig. 2: Necessary aspects for planning Microgrids

The Planning Tool *OptEnGrid*

An **automated standardized planning** methodology is needed for a cost-effective and rapid planning. The planning tool *OptEnGrid* (developed by BEST GmbH) already meets these requirements by applying it to numerous reference projects. The following aspects and parameters have been taken into account:

- Combined consideration of planning and a holistic operation of technologies and consumers
- Cost or CO_2 optimization as project objectives as well as blackout scenarios

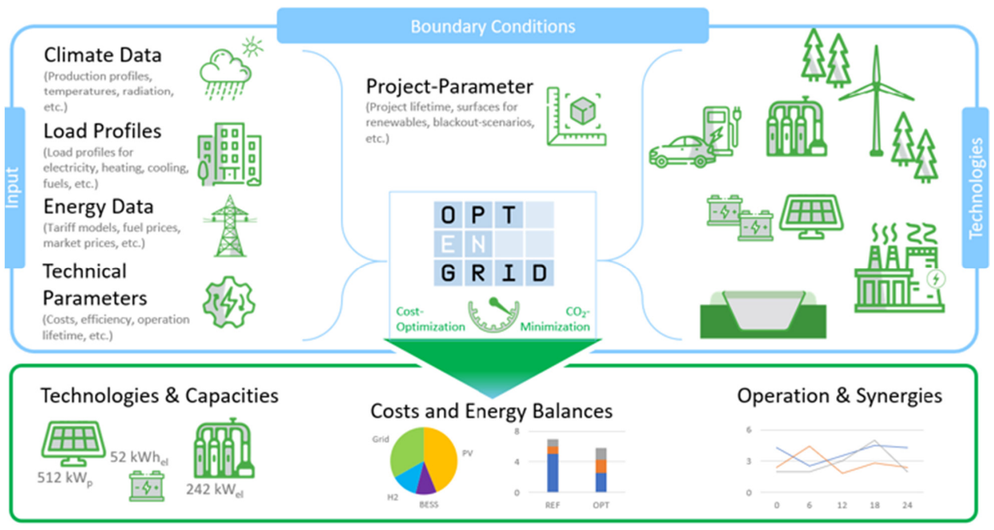


Fig. 3:Schematic of *OptEnGrid*

Reference: Energy Optimization for an Austrian Municipality

Optimized planning of an Austrian municipality towards:

- Increase of share of **renewable technologies**
- Increase of local **self-sufficiency.**

Following major steps have been completed:

1) Data acquisition (existing technologies, energy demand, mobility, current prices, etc.)
2) Calculation of reference case (business as usual)
3) Cost and CO_2 optimization scenarios.

Results: Optimal technology mix and capacities, holistic control strategies for technologies, cost & CO_2 savings, share of local self-sufficiency.

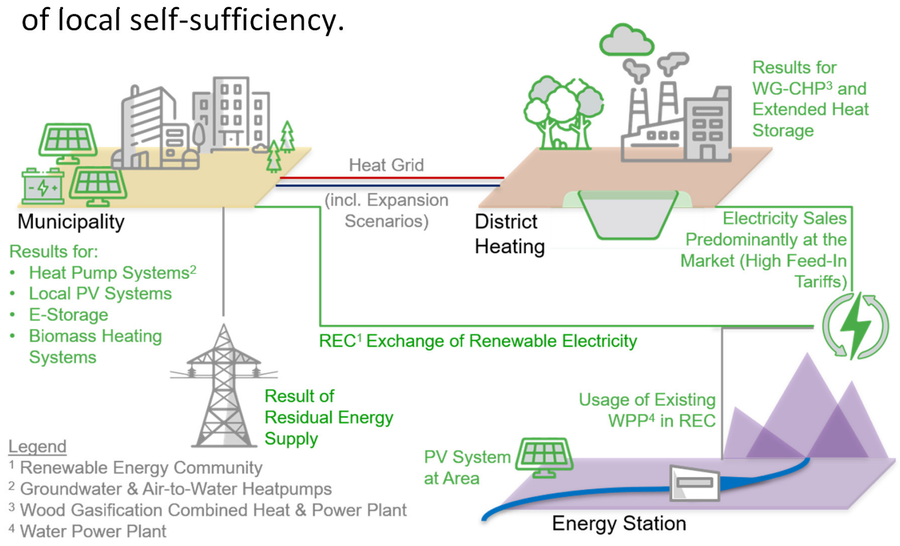
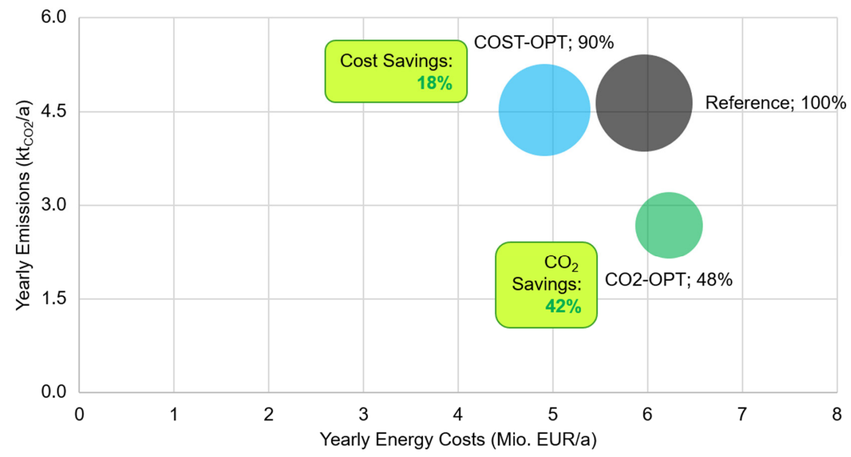


Fig. 4: Schematic of reference (grey) and CO_2 optimization scenario (green) for the tested municipality



Public Grid Consumption of 100% = Reference Case
Public Grid Consumption of 0% = Total Self-Sufficiency

Fig. 5: Cost and CO_2 savings, as well as share of public grid consumption (bubble size)

Outlook

The further development of *OptEnGrid* or optimized planning aims at the following aspects:

- **Optimized planning and control of microgrids within a holistic platform** with innovative storage technologies, especially hydrogen and flexible loads (energy communities, commercial & industrial)
- **Multisectoral energy systems** (networking energy communities)
- **Co-simulations** for load profile generation and validation
- Extended web-based and **graphical user interface** for easy usability for broad application (private persons to planners and energy consultants)
- **Automated data acquisition** for facilitated planning processes.

Acknowledgement

This research work was funded by the Climate and Energy Fund and the BMK, within the framework of the COMET program of the Austrian Research Promotion Agency (FFG) and funding initiatives of the province of Lower Austria.

BEST – Bioenergy and Sustainable Technologies GmbH

Head Office Graz
Inffeldgasse 21b
A 8010 Graz

T +43 5 02378-9201
office@best-research.eu
www.best-research.eu