Umsetzung des Smart-Grid im Verteilernetz der EnBW

Emploi des Smart-Grids dans le réseau de distribution EnBW

21.3.2014
Deutsch-Französische Tagung
Smart Grid, Obernai

Willi Schweinfort
Technology Innovation
Netze BW GmbH

Ein Unternehmen der EnBW

VDI Bezirksvereine Schwarzwald und Karlsruhe

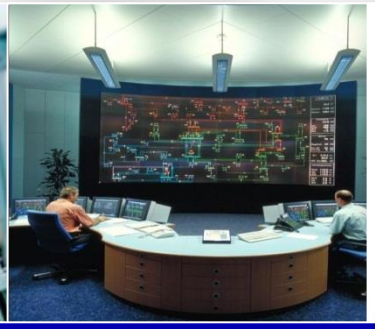
Netze BW

About us



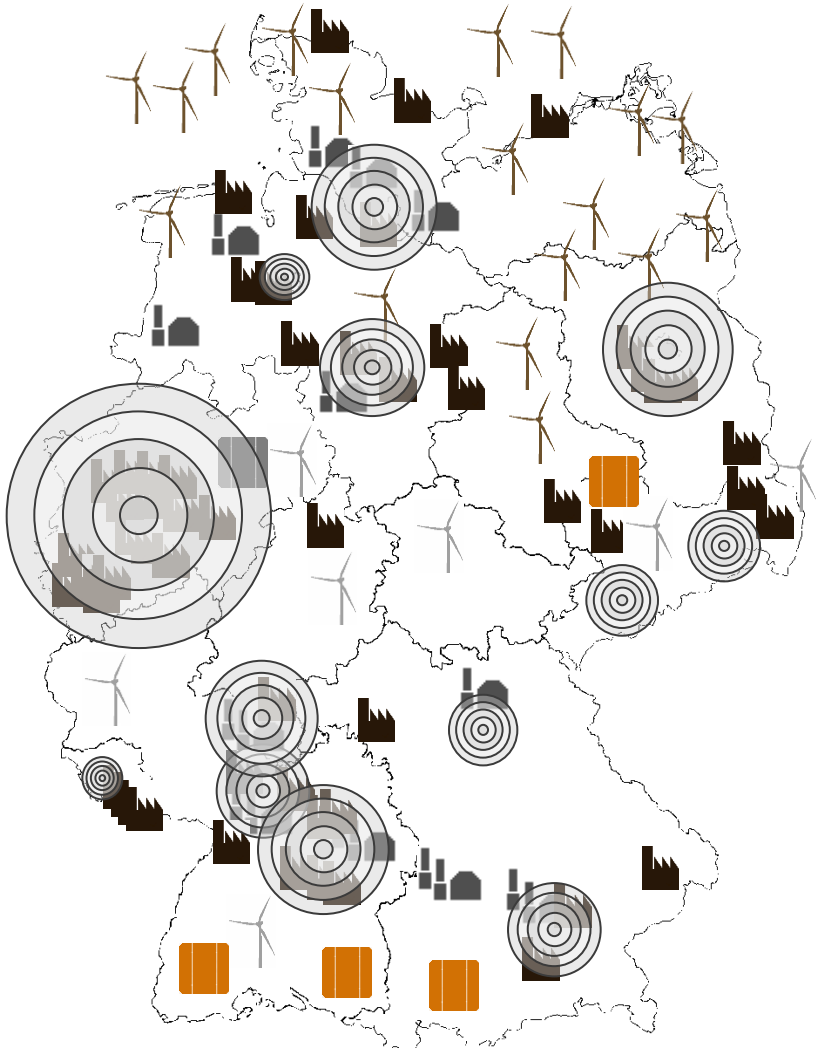


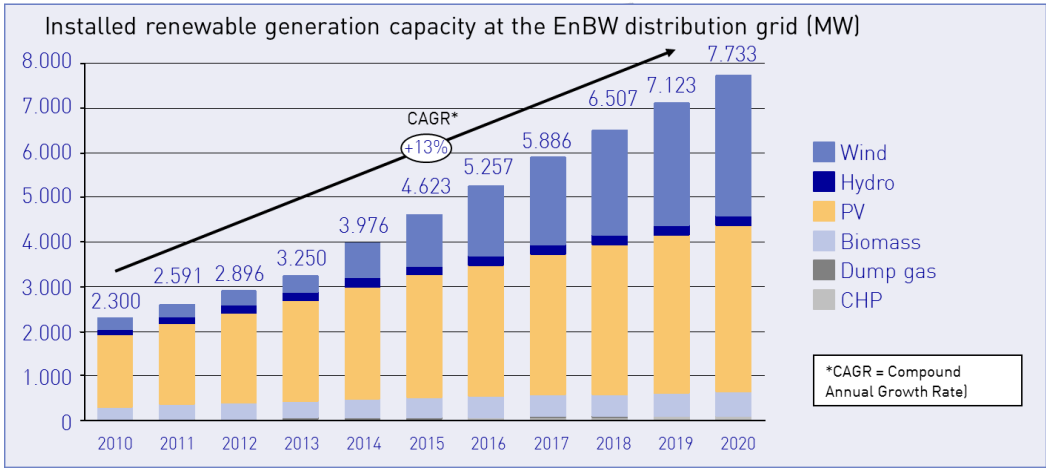





- Deeply rooted in Baden-Württemberg (ca. 3.200 employees)
- Certified DSO with 100 % efficiency
- State-of-the art control center
- Excellent grid availability of 99,996 %
- > 17.000 renewable grid connection requests in 2012
- Yearly grid investments of more than 300 Mio. € (electricity only)

The German power generation relocates form high population to the rural areas





Regions with high population

Nuclear power plants(operational)

Coal power plants(brown and hard coal)

Wind turbines
(areas with high generation)

Photovoltaic (PV)
(areas with high generation)

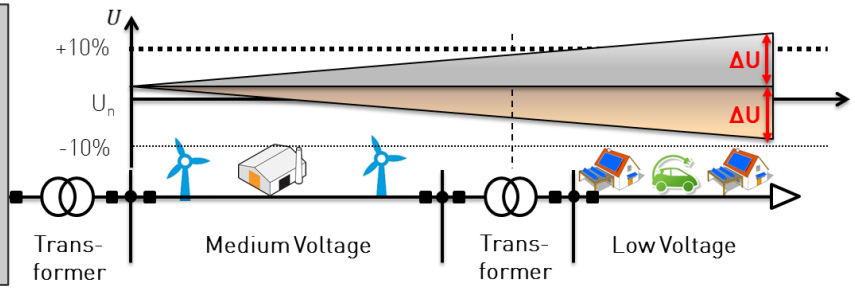
Technical challenges for a grid operator

local

global

Voltage (U)

Voltage level in the range ±10 % of nominal voltage level (230 V).



Decentralized power generation increases risk of (upper) voltage range violations

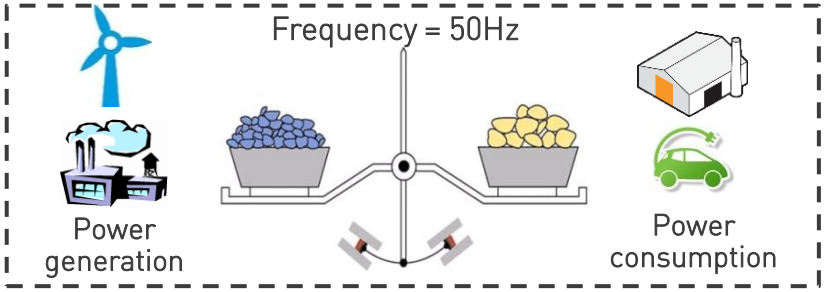
Overload (I)

Overload of installations reduces durability (Cables, transformers…)

New local loads – energy consumption as well as generation - require grid modifications

Frequency (f)

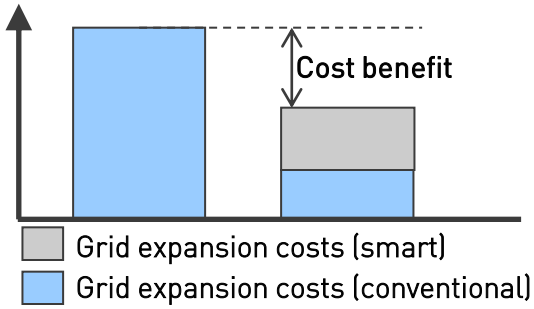
To ensure the frequency of 50 Hz, offer and demand have to be balanced at any time



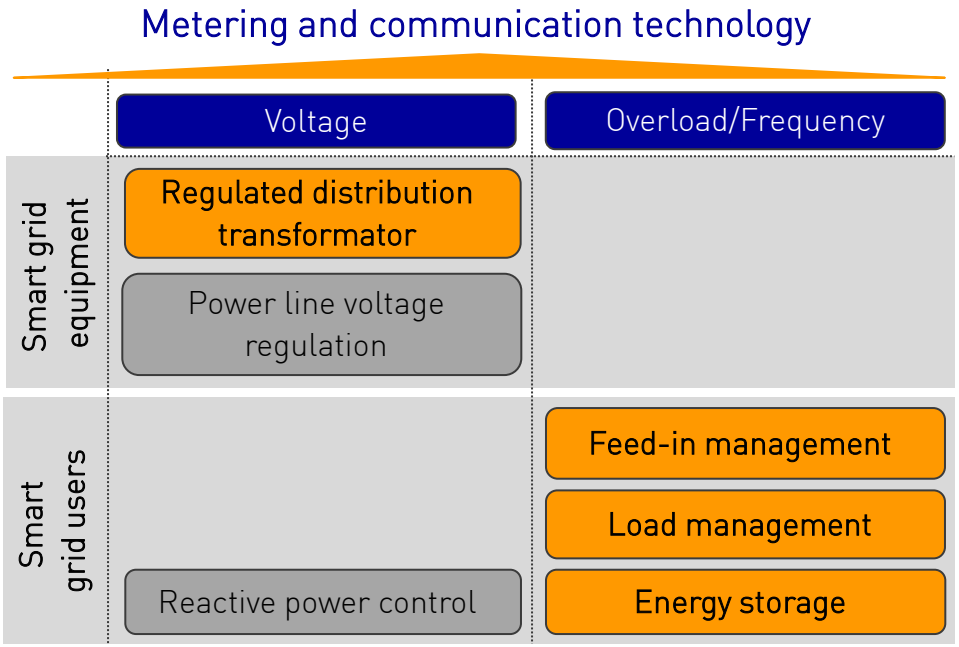
In the future, due to fluctuations of renewables, demand-side will have to contribute to system stability

Smart Grid Definition & Components

The term "Smart Grid" means a **smart integration and control of grid users** (e.g. energy generators, consumers and storages), and of **grid equipment** (e.g. transformer, switchgear) **using information and communication technologies** (ICT)



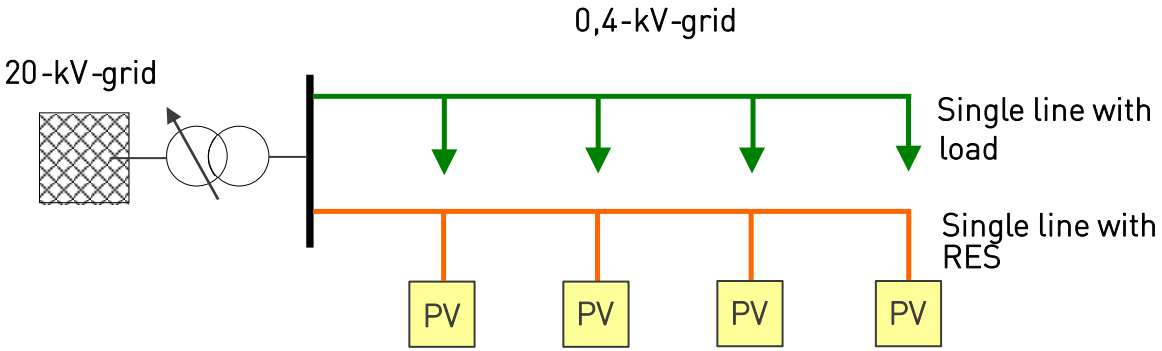
Target: Minimize grid expansion costs



Regulated distribution transformer with step switching

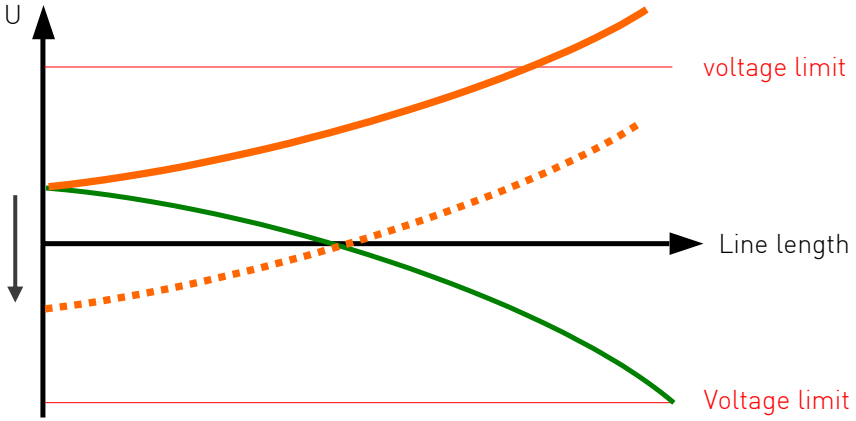
Goal

- Automated voltage adaptions enabling quick reactions to voltage changes



Measures

- Minimize conventional grid extension
- Avoid voltage range deviations
- Automated control on the spot



The grid laboratory of the EnBW Regional AG
The future distribution grid already today

1 Freiamt

Population	4264	
RES-connected power	6,8	MW
Load	1,8	MW
Amount of secondary substations	60	

2 Sonderbuch

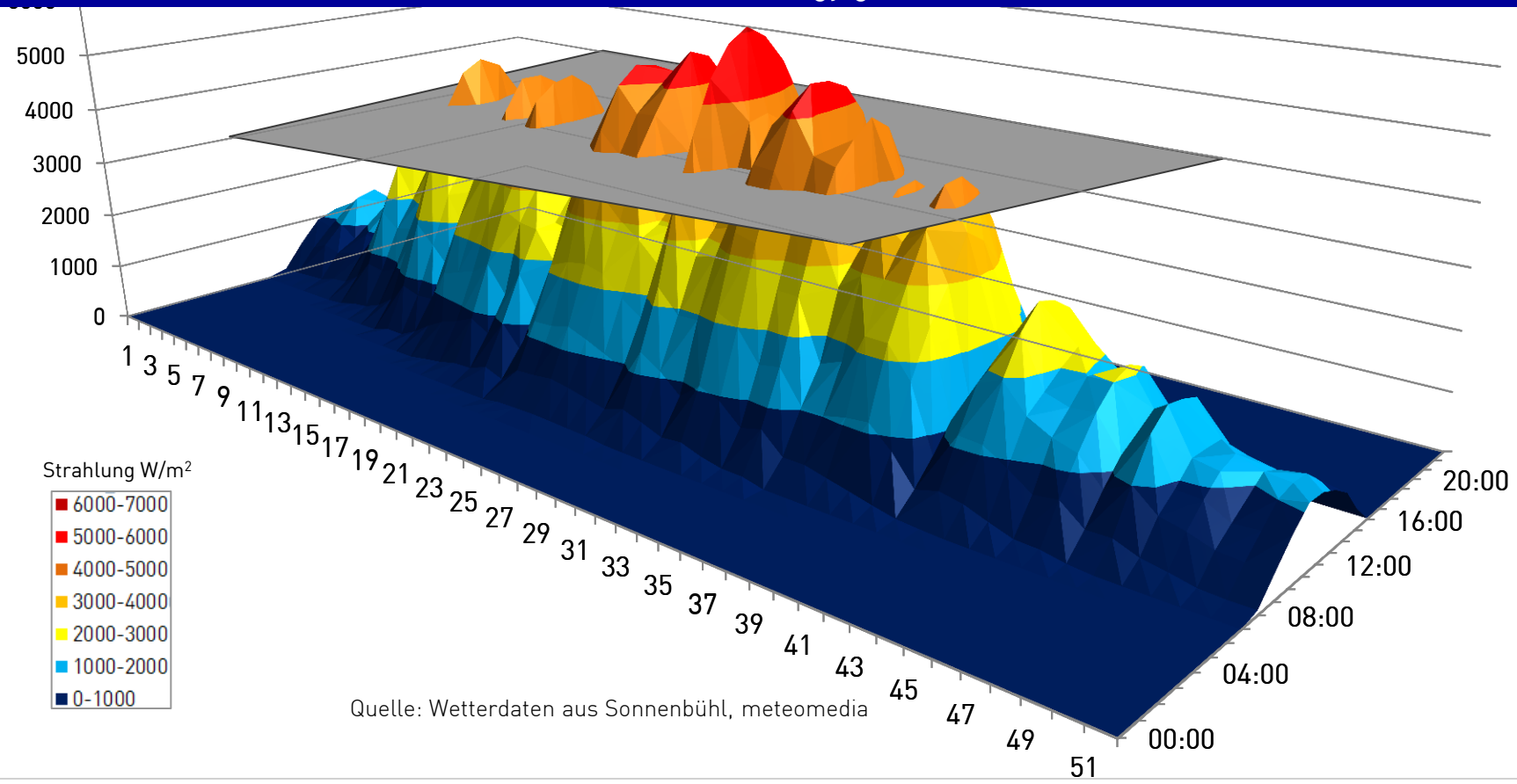
Population	190	
RES-connected power	1,2	MW
Load	0,2	MW
Amount of secondary substations	3	

Curtailment of renewable energy sources
Problems only occur during very few hours

Netze BW

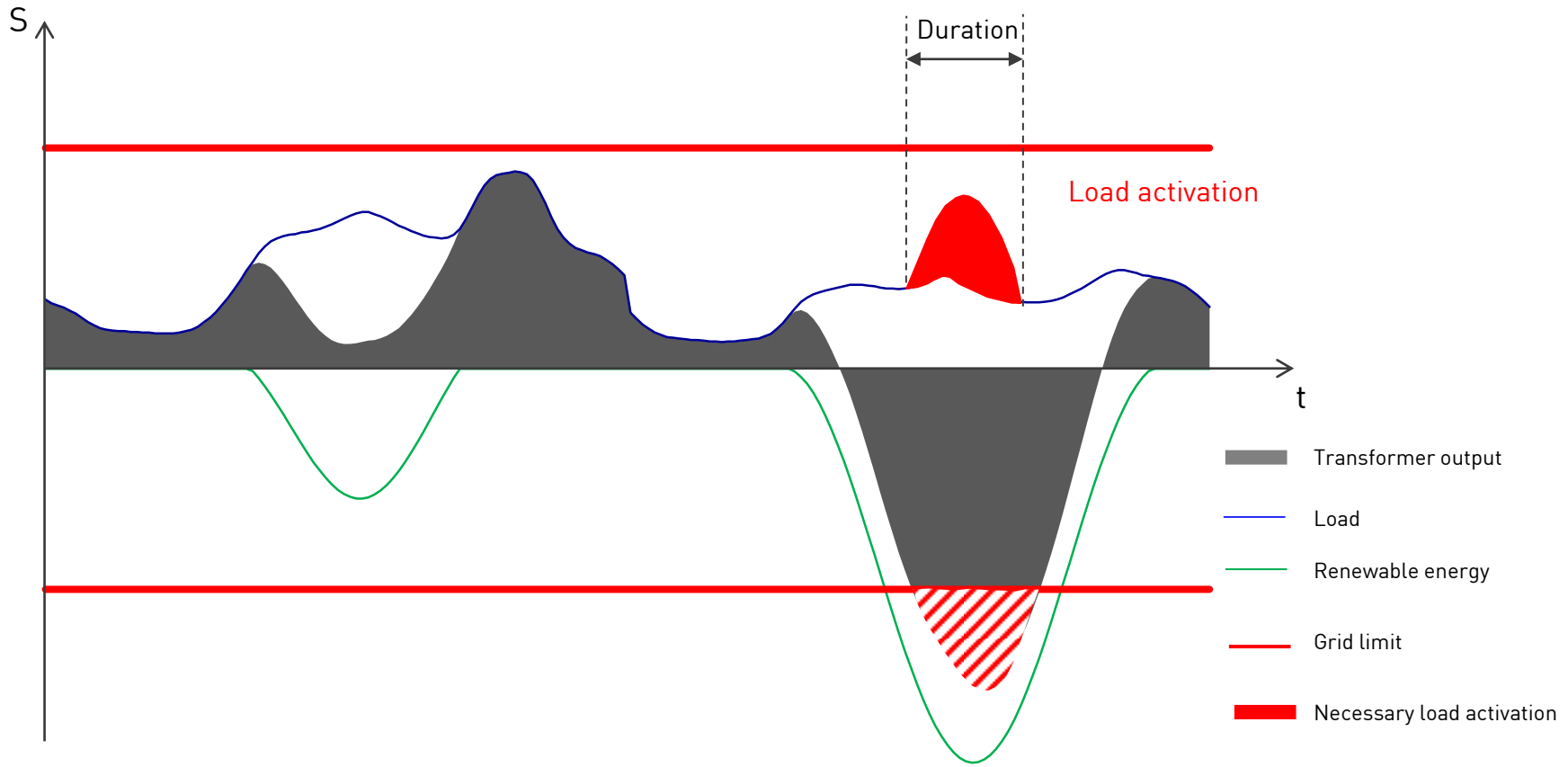
5%-Hypothesis:

If 5% of the generated renewable energy can be curtailed, the current grid can deal with twice as much renewable energy generation



Quelle: Wetterdaten aus Sonnenbühl, meteomedia

Load management to avoid grid congestion (1/2)



How can suppliers and DSO work together to implement load management, which is compatible with current design of the energy market?

Grid beneficial (reliable) – Enabling energy balancing and clearing – Customer friendly

Load management to avoid grid congestion (2/2)

Netze BW

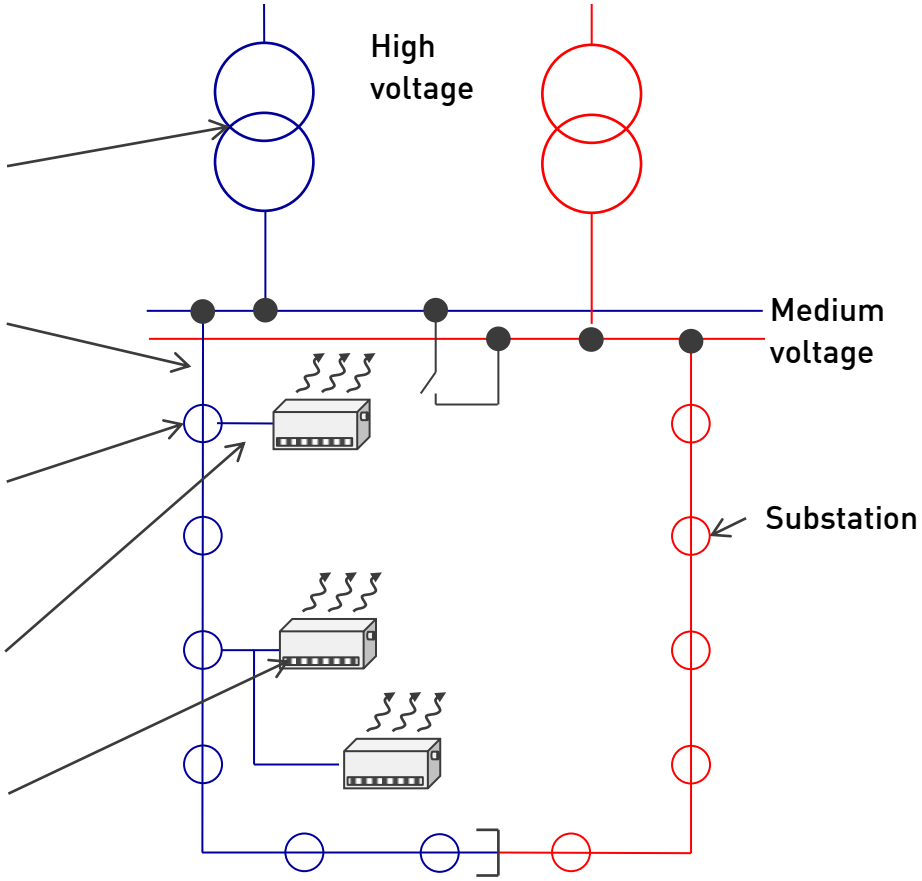
Level1 HS/MS-Transf. — x % of thermal load can be activated

Level 2 MS-circle — x % of thermal load can be activated

Level 3 MS/NS-Transf. — x % of thermal load can be activated

Level 4 NS-circle — x % of thermal load can be activated

Level 5 Home connection — x % of thermal load can be activated



Goal is to maximize flexibility while avoiding grid congestions caused by too much consumption load.

The Project „Flexible heat energy“
Goals and figures

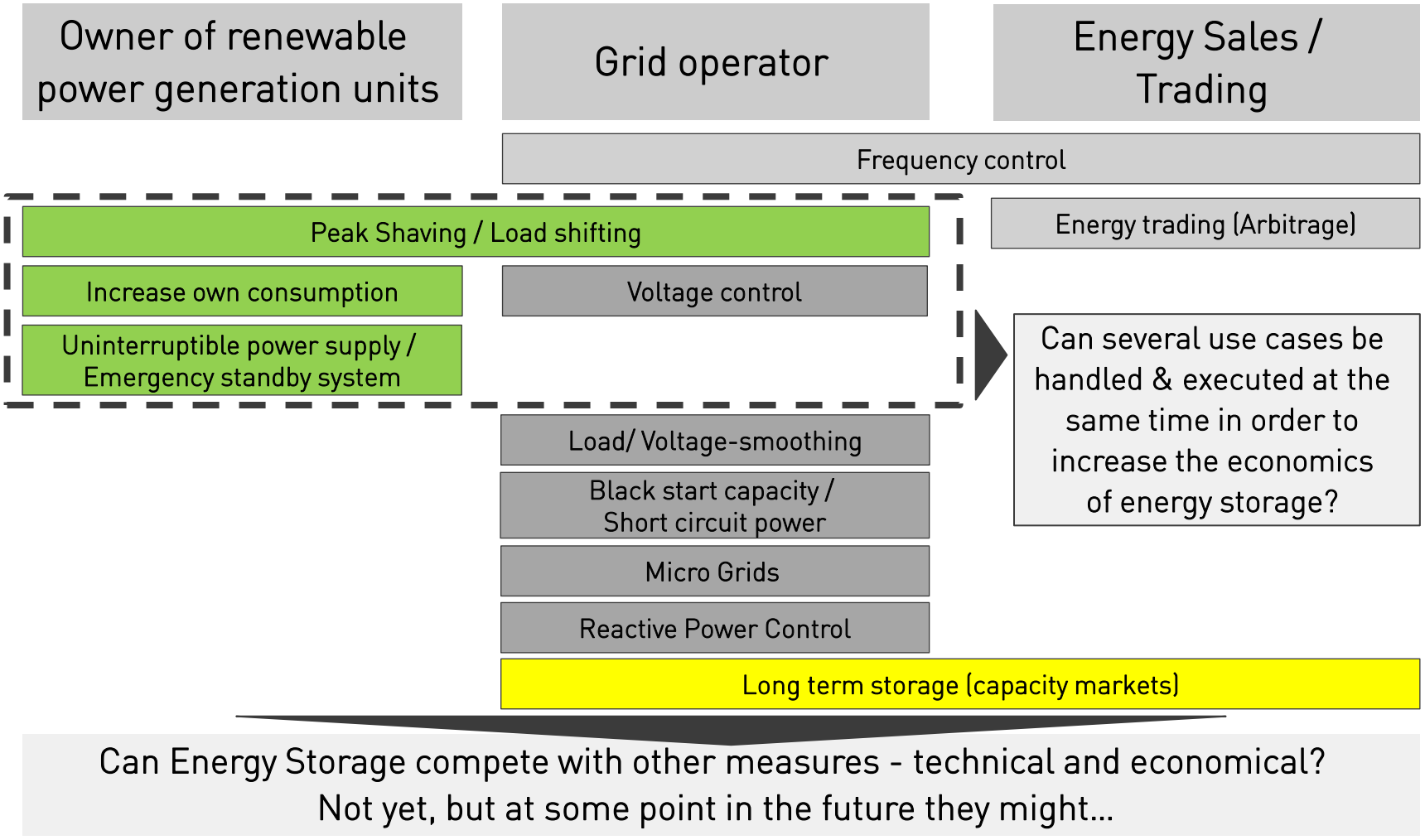
Project goals:

- Forecast and control of productions peaks in the medium voltage grid using controllable loads (electric heating installations)
- Test a new approach to implement intelligent energy supply solutions in accordance with grid constraints (quotas)
- Operational and actual load control

Key figures:

- Power Generation: 20 MW (10 MW PV / 10 MW Wind and increasing)
- 10 MW (controllable) Load (app. 800 electrical heating installations)
- Installation of various measurement instruments for monitoring and validation purposes

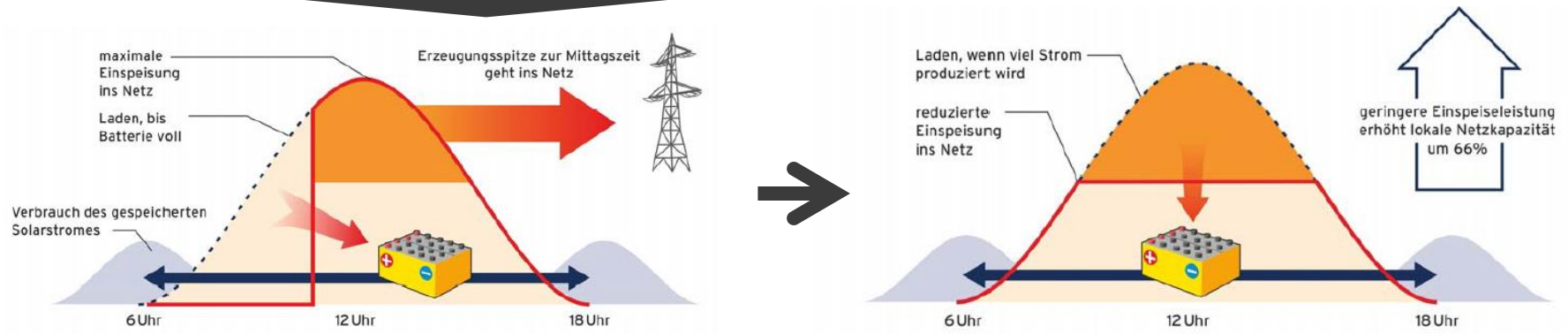
Use Cases for energy storage



Use Cases for energy storage

Netze BW

Owner of renewable power generation units	Grid operator	Energy Sales / Trading
	Frequency control	
Peak Shaving / Load shifting		Energy trading (Arbitrage)
Increase own consumption	Voltage control	
Uninterruptible power supply / Emergency standby system		



Maximizing own consumption and minimizing grid load simultaneously

Quelle: BSW-Solar www.solarwirtschaft.de

Summary

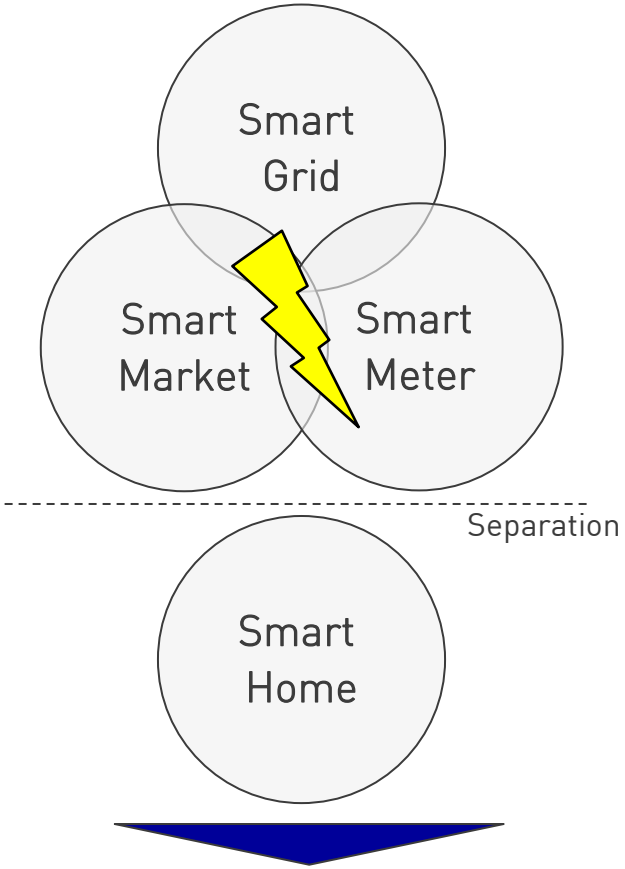
Netze BW

Central load management and **intelligent grid equipment** help to improve integration of renewable energy sources and minimize conventional grid expansion

Communication and control measures, as well as grid-based constraints are required

Current focus of Netze BW:

1) Operational deployment of new intelligent grid equipment
2) Prototypic implementation of central load management



Several areas of conflict have to be solved first

Suppliers:

SAG, ABB, Landis+Gyr, SIEMENS, T-Systems, MR

DSO's:

Stadtwerke Düsseldorf Netz GmbH, ZEAG energie, EWE NETZ, EnergieDienst, PRE, EnBW ODR

Universities:

RWTH AACHEN UNIVERSITY, KIT, TECHNISCHE UNIVERSITÄT DRESDEN, Universität Stuttgart

Thank you!

Willi Schweinfort
Schelmenwasenstraße 15
70567 Stuttgart

Telefon +49 711 289 -82387
Mobile +49 151 46744210
w.schweinfort@netze-bw.de

Ein Unternehmen der EnBW

Netze BW