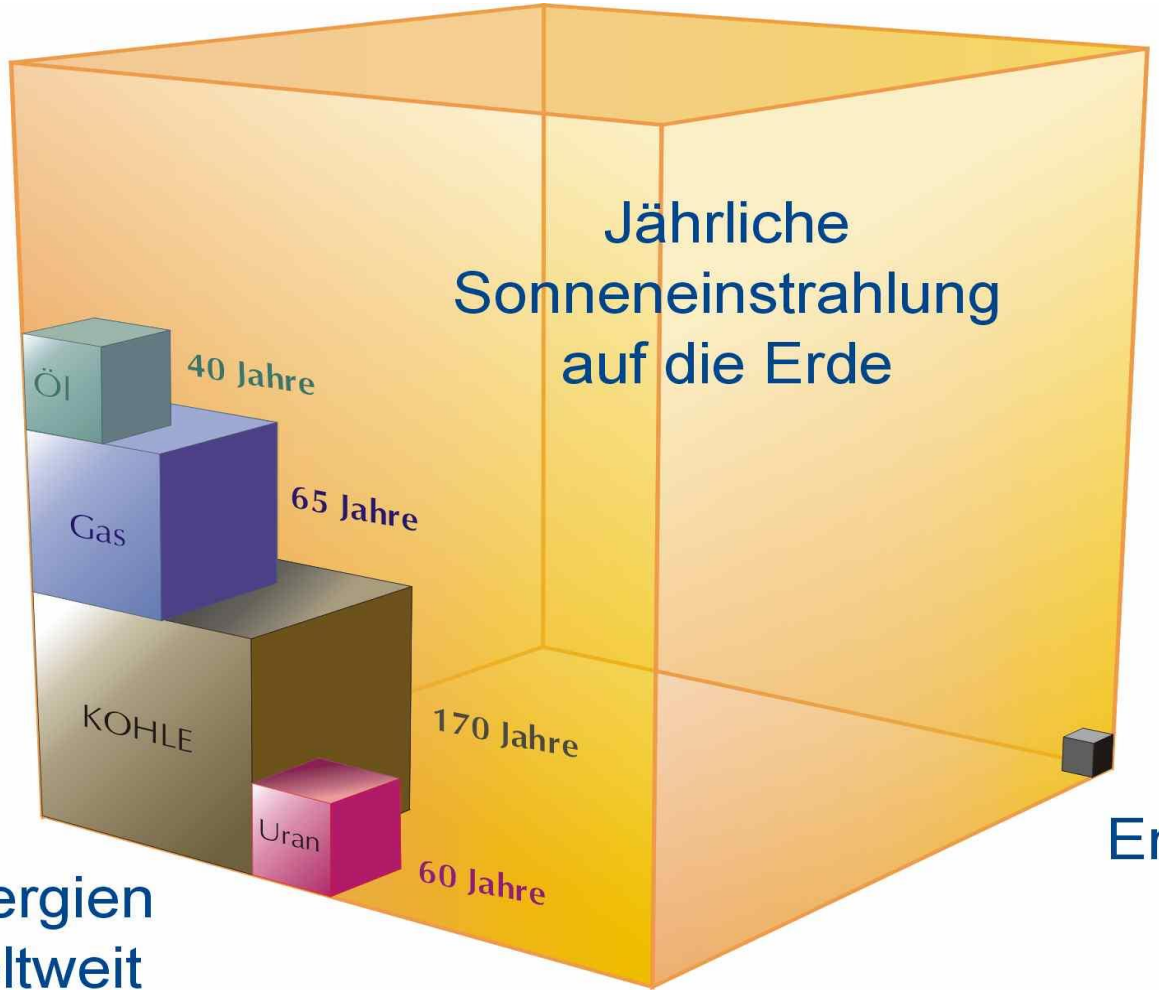
Grid 2020

Stadtwerke Schwäbisch Hall GmbH

Peter Breuning
Victor Thamburaj : CEO iPLON India

business forum Bangalore / India

Energieversorgung und Energiebedarf



Fossile Energien
Vorräte weltweit

Weltweiter
Energieverbrauch

stadtwerke
Schwäbisch Hall GmbH

Peter Breuning

Head of department: grid control & engineering services at Stadtwerke Schwäbisch Hall GmbH (multiy utility)

Lecturer University Heilbronn & Harz

Speaker IDS User Group --52 Multi Utility Companys

Member working group FNN (VDI) (directive for power plant connections, HV-grids)

Technical Direktor "power grids" - Smart Grid platform BaWü

Benchmarking Germany / Tamil Nadu

Country	Area	Per person Consumption	Number of Utility Companies	Population
Germany	357,021km^2	7081 kWh/year	> 800	80,767,000
Tamilnadu, India	130,058 km^2	684 kWh/year	1	72,138,958

stadtwerke
Schwäbisch Hall GmbH

Agenda

- 1 Power company in a smart city environmrnt
  - Stadtwerke Schwäbisch Hall
- 2 Grid stabilty issues and solutions in Germany
- 3 What solution patterns can be used in India as Best practice ??
  - Utility Plants
  - Rooftops
  - Micro grids
  - O&M / AMC of Control sysytems

stadtwerke Schwäbisch Hall GmbH

Power Supply

1214 Mio-kWh/a commercially

Natural Gas Distributi

1458 Mio-kWh/a commercially

Water Supply

27 Mio-m^3/a

Thermal Energy Suppl

130 Mio-kWh/a

Indoor/Outdoor Swimming Area and Halls

700,000 people

Car Parking

2000 cars

Stadtwerke Schwäbisch Hall GmbH

500 employees

16 trainees

262 Mio-Euro Sales

Energy Services

Contracting

Payer Remote Reading & EDM

Process Leadership

Technical Installations

Facility Management

224 stations

18900 data points

Power Plants

48 CHP Models

1 Combined Cycle

6 Biomass-CHP

3 Wood Heating

6 Hydro Electric

2 Wind Turbine

Renewable Energy

Photo Voltaic	: 43MW
Hydro Electric	: 2.45MW
Wind Turbine	: 27MW
Biomass	: 8MW
Waste Management	: 455kw

stadtwerke Schwäbisch Hall GmbH

First multi utility Company—CERTIFIED GRID CONTROL

Since June 2014

ZERTIFIKAT ◆ CERTIFICATE ◆ 認證證書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

TÜV SÜD Management Service

ZERTIFIKAT

Die Zertifizierungsstelle
der TÜV SÜD Management Service GmbH
bescheinigt, dass das Unternehmen

stadtwerke Schwäbisch Hall GmbH

Stadtwerke Schwäbisch Hall GmbH
An der Limpurgbrücke 1
74523 Schwäbisch Hall
Deutschland

in den Bereichen

Leitstellensicherheit und Netzbetriebsführung

erfolgreich geprüft wurde.
Durch ein Audit wurde der Nachweis erbracht,
dass die Forderungen des

TÜV MS Standards Zertifizierte Netzbetriebsführung

hinsichtlich Sicherheitspolitik, Prozesse des
Leitstellensicherheitsmanagementsystems, Risikomanagement und
hinsichtlich Organisation, Personal und Technik erfüllt sind.
Dieses Zertifikat ist gültig vom 2014-06-12 bis 2017-06-11.
Zertifikat-Registrier-Nr. 12 730 48110 TMS

Product Compliance Management
München, 2014-06-17

TÜV SÜD Management Service GmbH • Zertifizierungsstelle • Ridlerstraße 65 • 80339 München • Germany

stadtwerke Schwäbisch Hall GmbH

stadtwerke
Schwäbisch Hall GmbH

Schwäbisch Hall GmbH

car parking

stadtwerke Schwäbisch Hall GmbH

indoor swimming pool

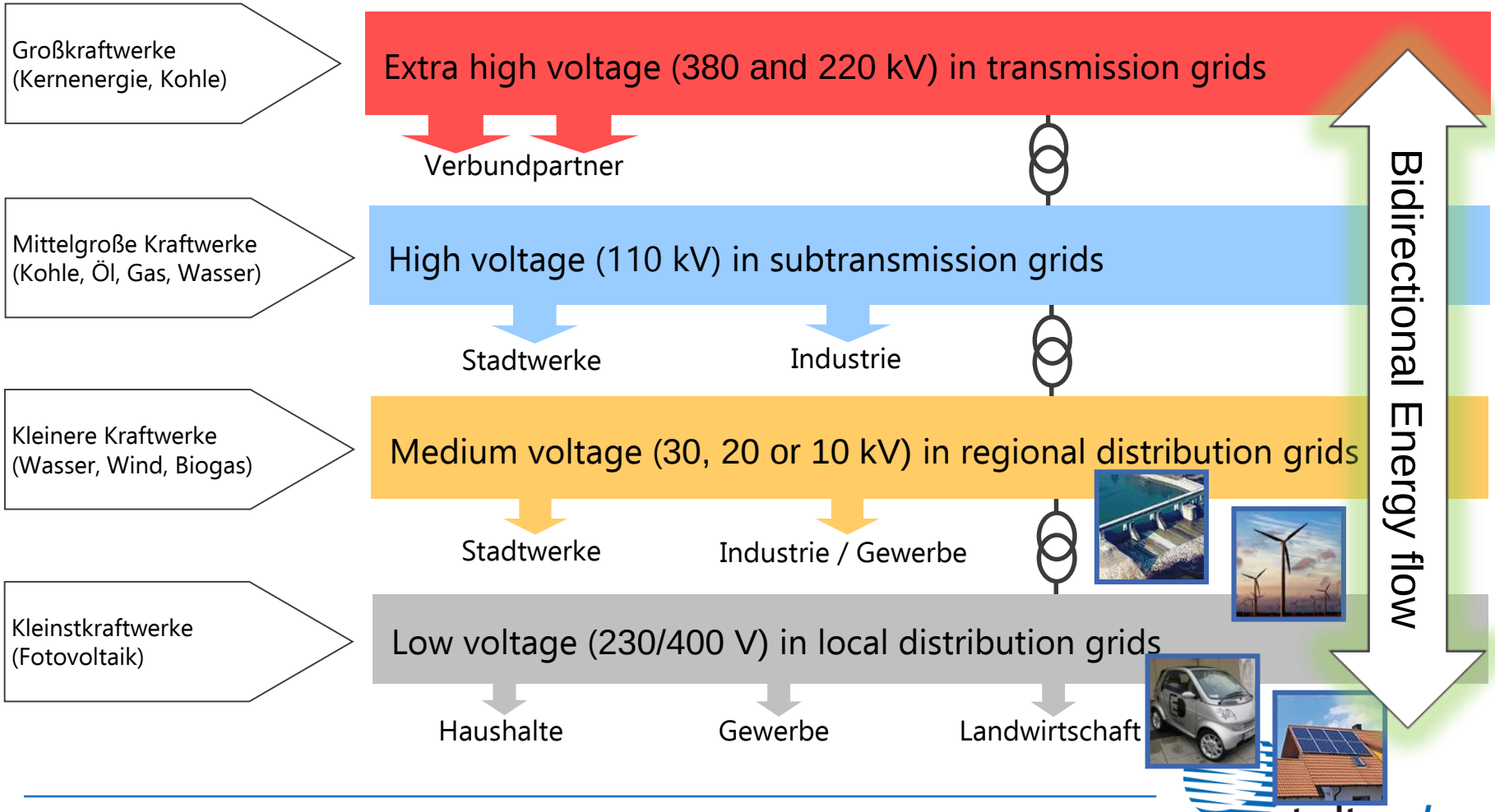
stadtwerke Schwäbisch Hall GmbH

sauna park

stadtwerke Schwäbisch Hall GmbH

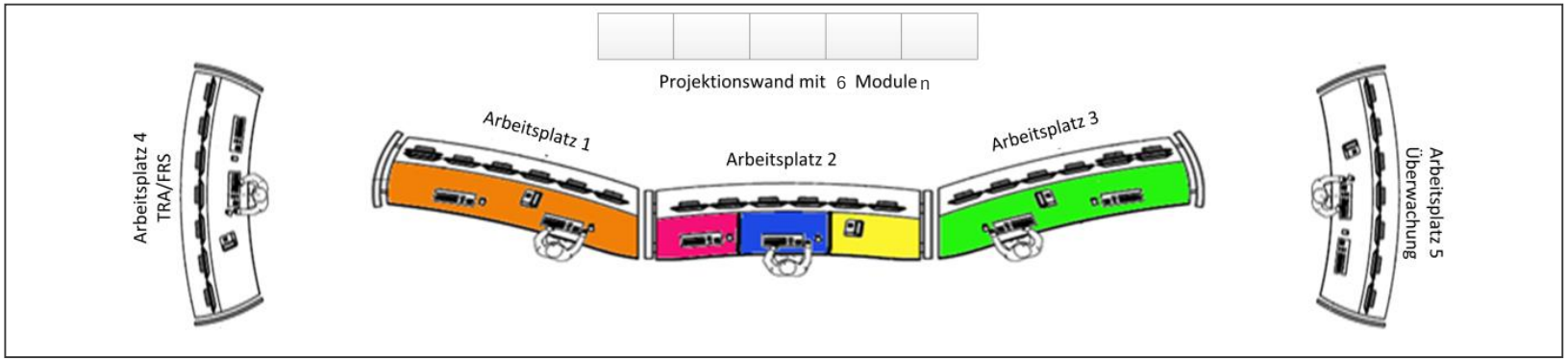
Decentral RE supply side Mangement

Energy flows in between the voltage levels with (renewable) DER



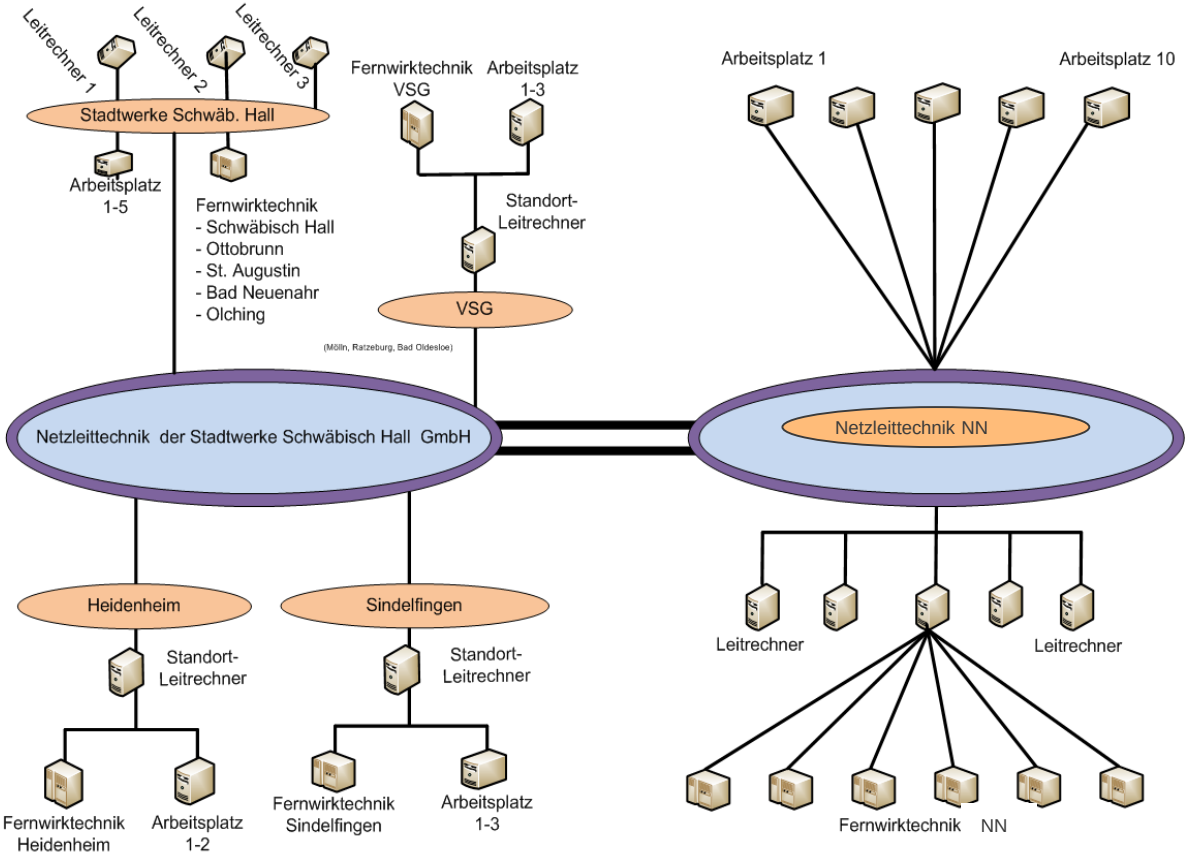
stadtwerke
Schwäbisch Hall GmbH

Multi utility control room at Stadtwerke Schwäbisch Hall



stadtwerke
Schwäbisch Hall GmbH

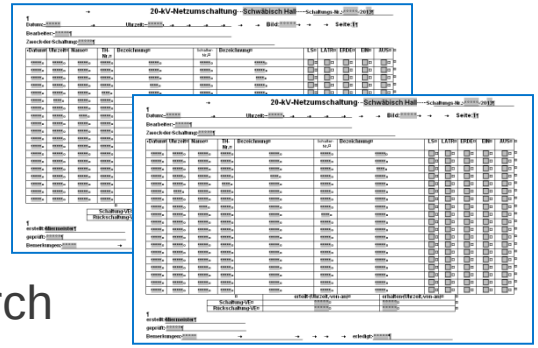
Integration of business partners



- reliability through redundant grid control centers
- increased workforce flexibilty due to sharing of tasks
- crisis-proof concept

stadtwerke Schwäbisch Hall GmbH

SCADA and EMS/DMS-functions control room Schwäbisch Hall (partly)



Switching orders

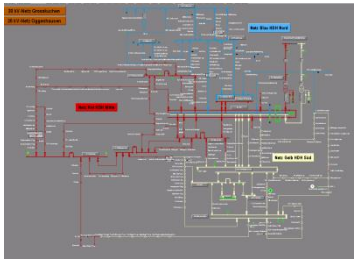
Voltage tracking topology

Automated short circuit and ground fault search

Check of switching registration and simulation with conditional clearance of interlocking functions

Updating of switching states (medium voltage)

Execution of 110-, 20-, 10- und 1 kV switching processes



SCADA – Supervisory Control and Data Acquisition

EMS – Energy Management Systems

DMS – Distribution Management Systems

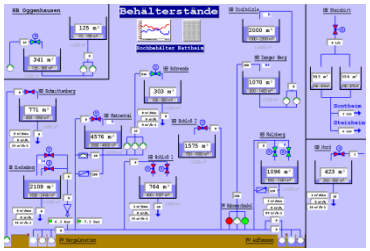
stadtwerke Schwäbisch Hall GmbH

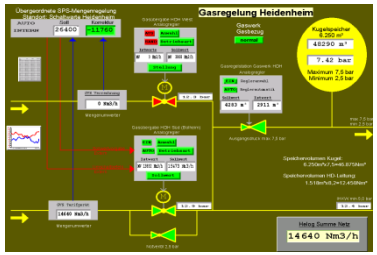
SCADA and EMS/DMS-functions control room Schwäbisch Hall (partly)

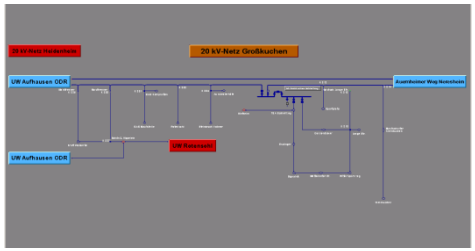
real-time power flow calculations in 20-kV-networks in monitoring system

Coupling-check of diffrent grid cells, e.g. in 1 kV-level

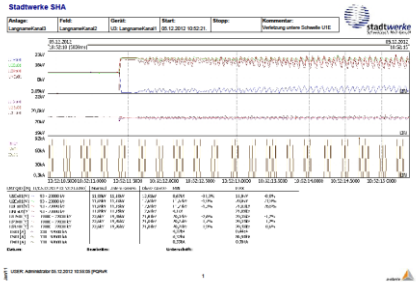
Monitoring of facilities and grids(power, gas, water, district heat, power plants)







Monitoring of power quality (10kHz sampling)



Remote analysis and parameterisation

of protection systems

stadtwerke Schwäbisch Hall GmbH

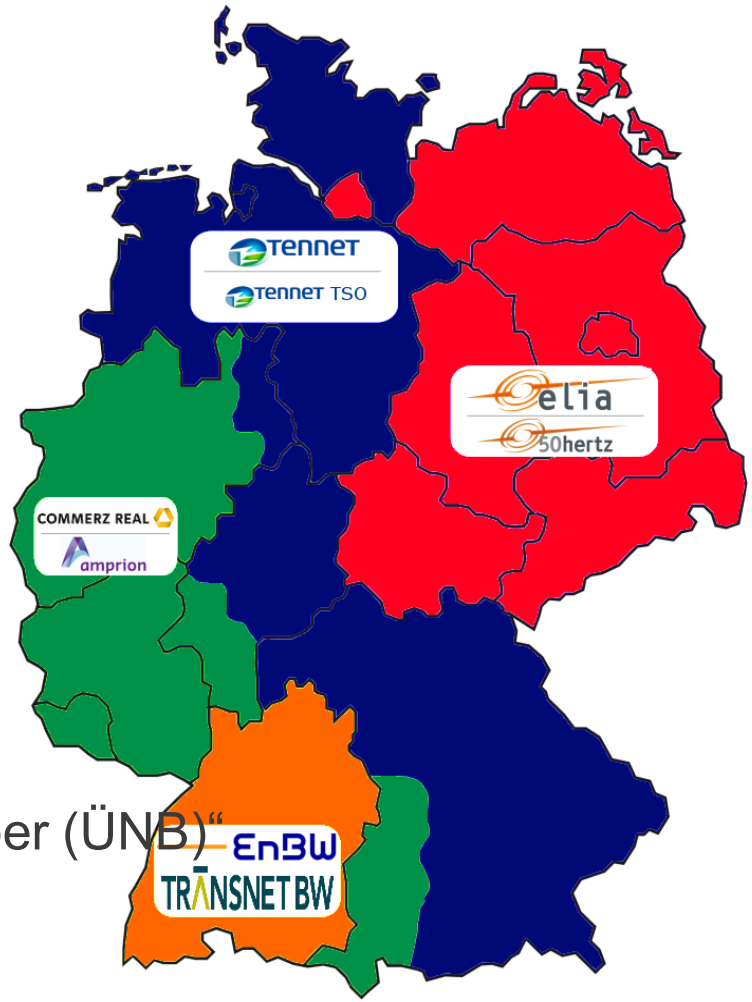
TSO in Europe and Germany

European Network of Transmission System Operators for Electricity (ENTSO-E)

- 41 Transmission System Operator* (TSO) in 34 Countries

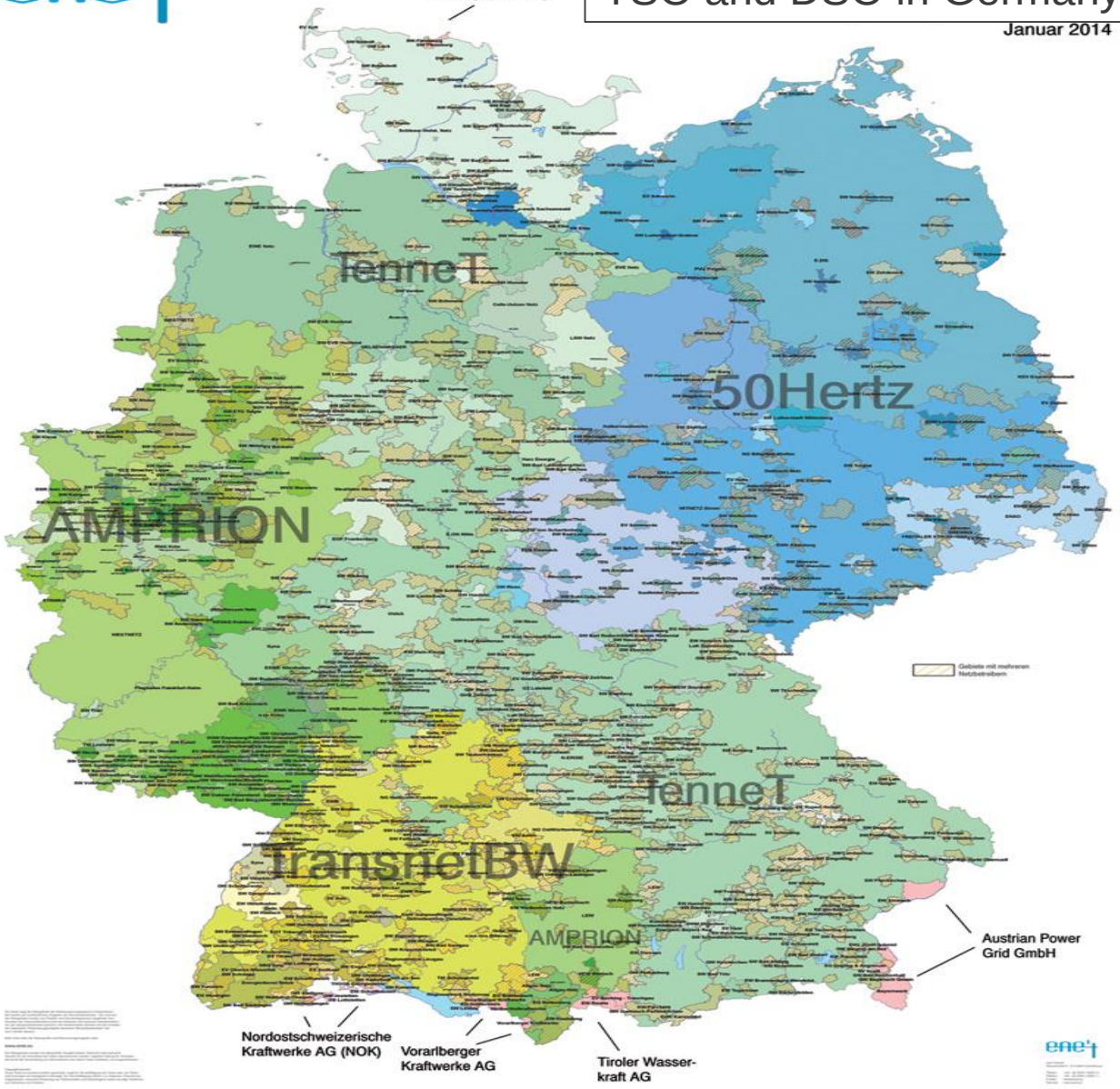
German TSO

- Amprion GmbH
- Tennet TSO GmbH
- TransnetBW GmbH
- 50Hertz Transmission GmbH

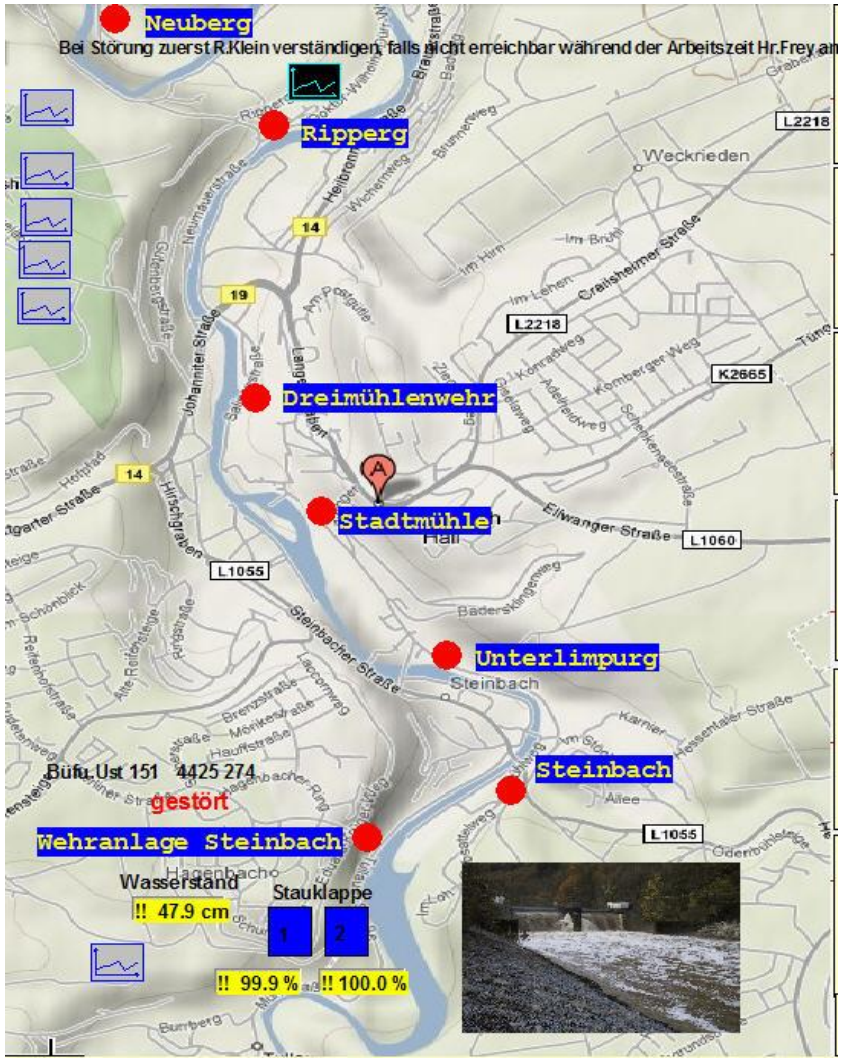


* in Germany TSO - „Übertragungsnetzbetreiber (ÜNB)“

TSO and DSO in Germany



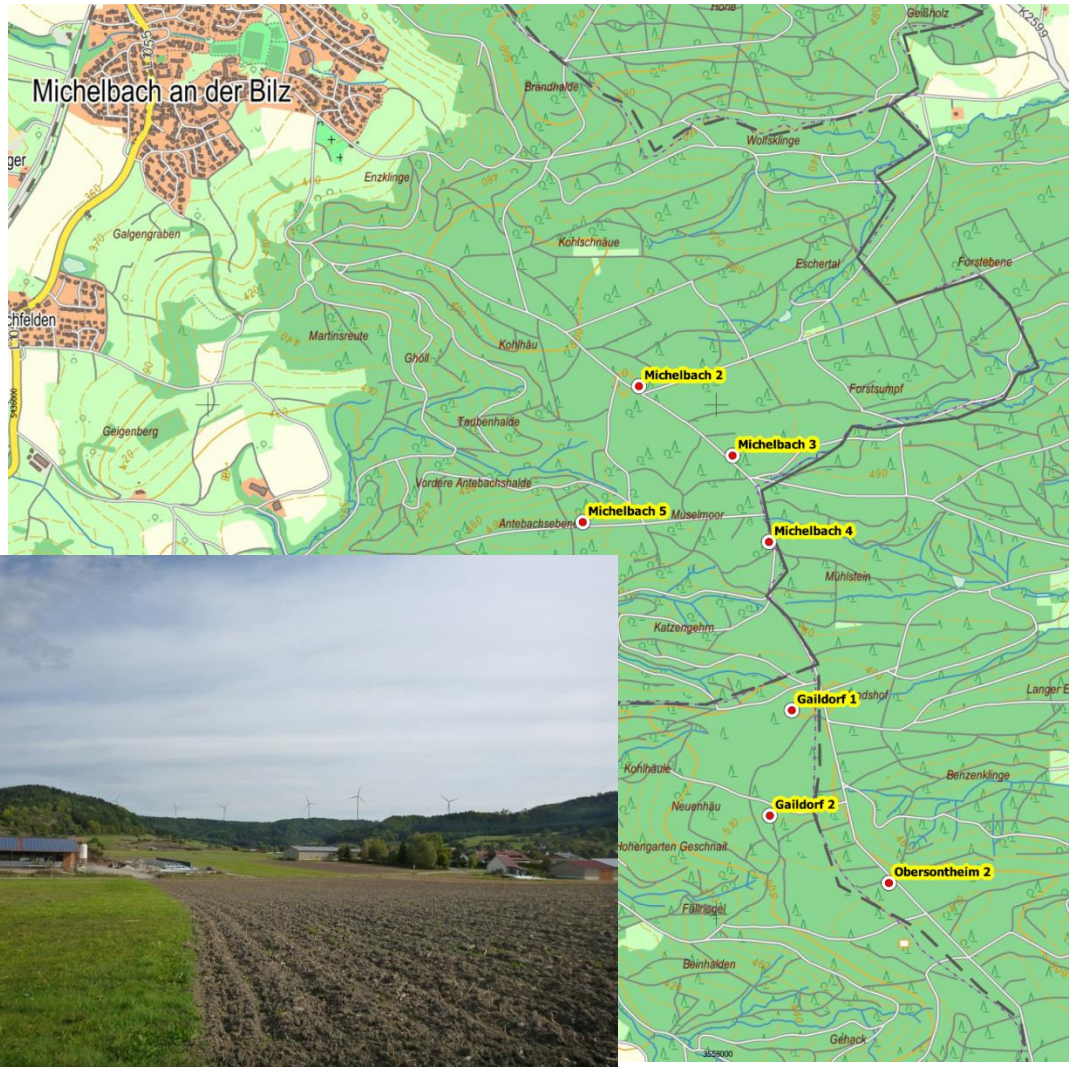
hydro power in Schwäbisch Hall



- ✓ 7 hydro power plants
- ✓ total install 2,45 MW
- ✓ 8% from the consumption SHA

stadtwerke Schwäbisch Hall GmbH

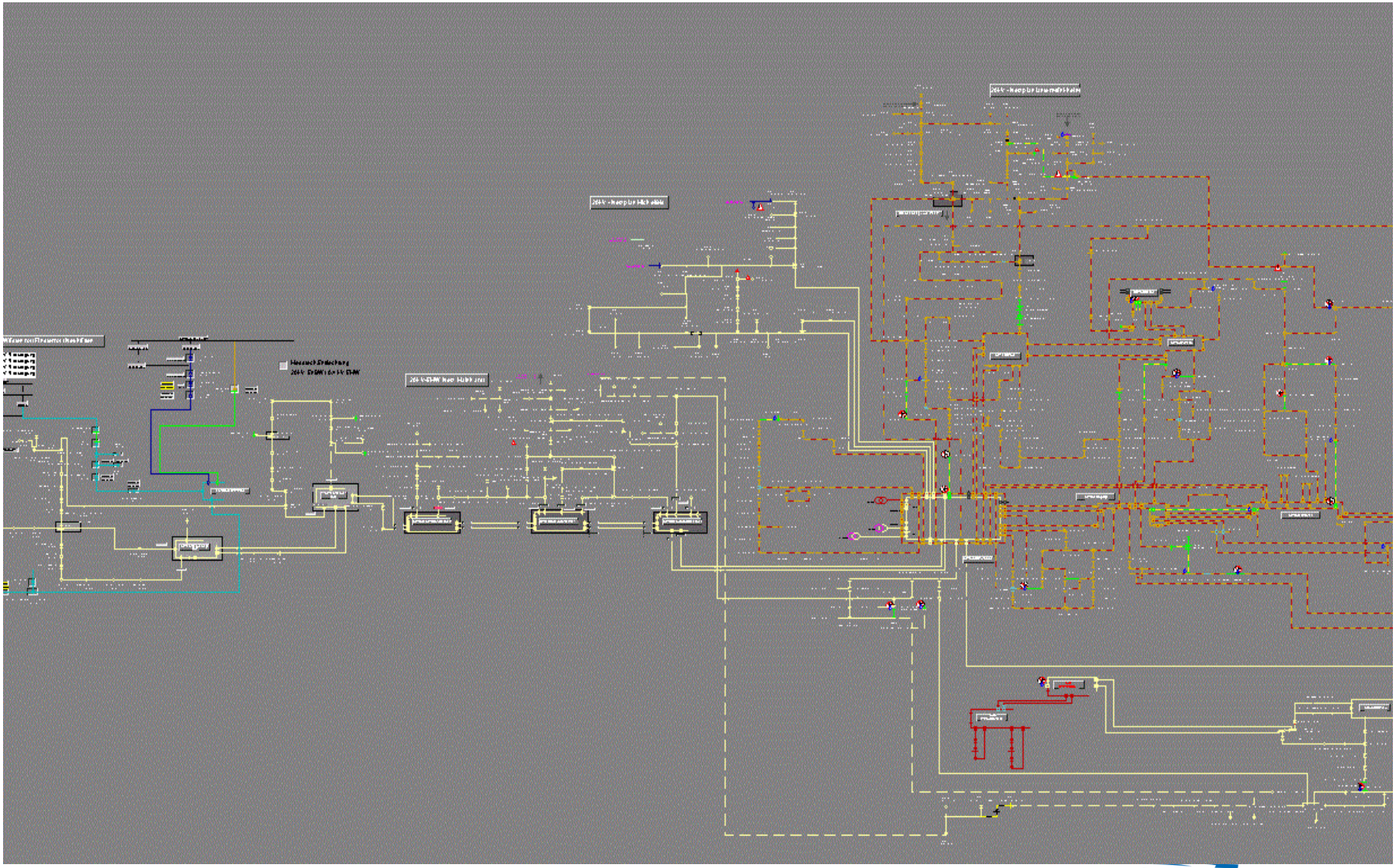
the new projekt last year (2015)



Projekt Kohlenstrasse

- ✓ 7 wind turbines
- ✓ 3.3 MW/turbine
  Investment 43 Mio. €

Electrical Grid Company Schwäbisch Hall



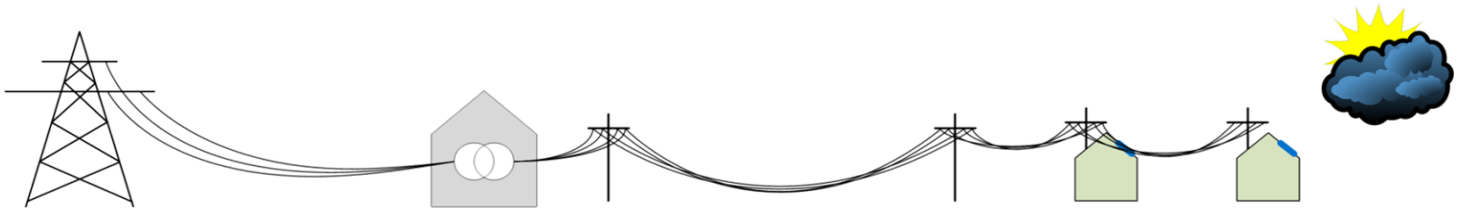
stadtwerke Schwäbisch Hall GmbH

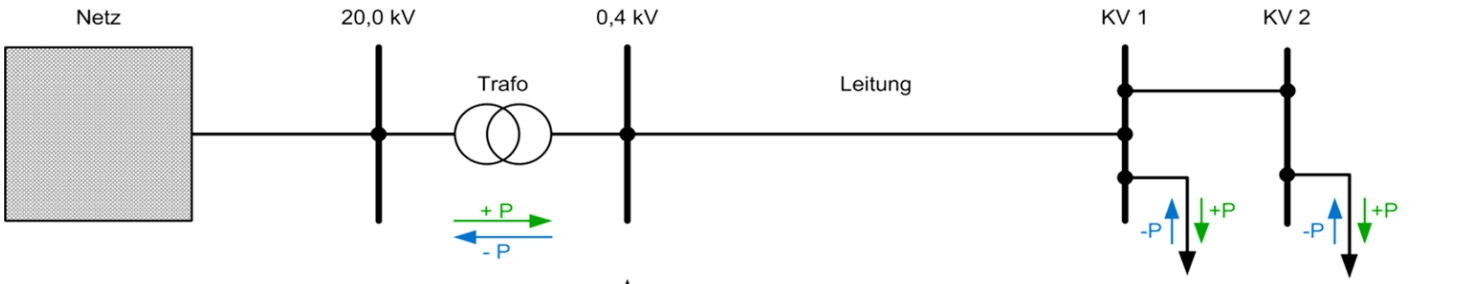
2 Grid stability

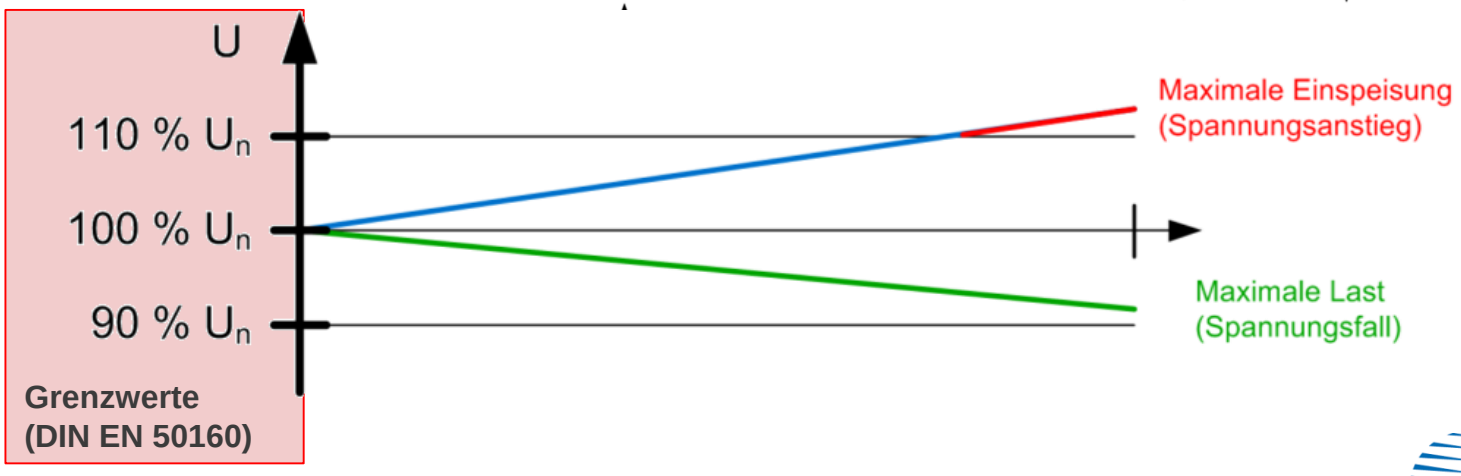
- not enough electrical power in the grids
- electric powered cars (e mobility)
- the customer now produces his own energy/ Prosumer

- Voltage stabiliser
- Phase shifter
- Smart meter bidirectional information (customer behaviour)
- Battery / storage

high voltage in the end of the grid







stadtwerke Schwäbisch Hall GmbH

grid stability 1 voltage regulation with transformers

benefit

+ prove technology

+ low maintenance

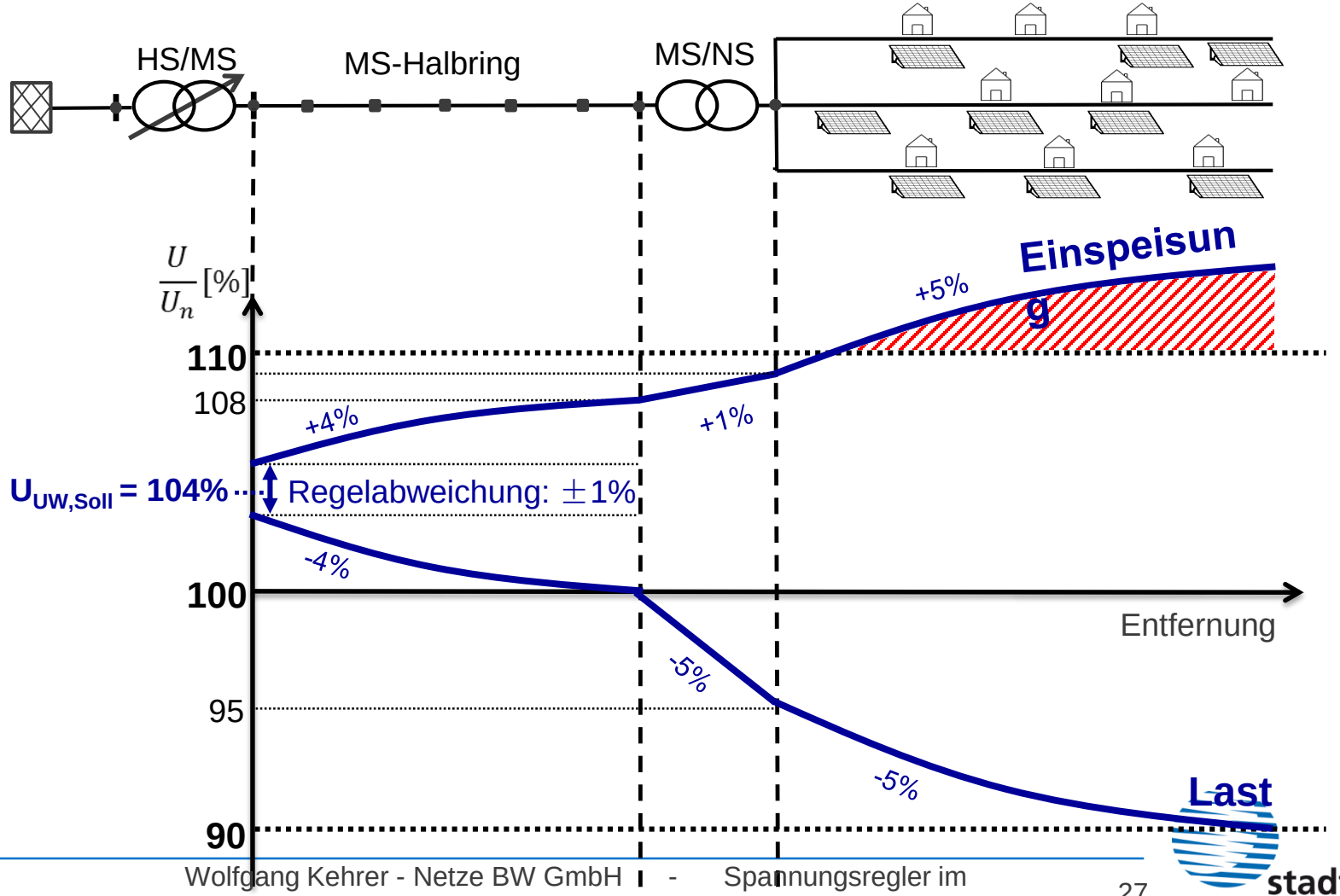
+ save money

handicap:

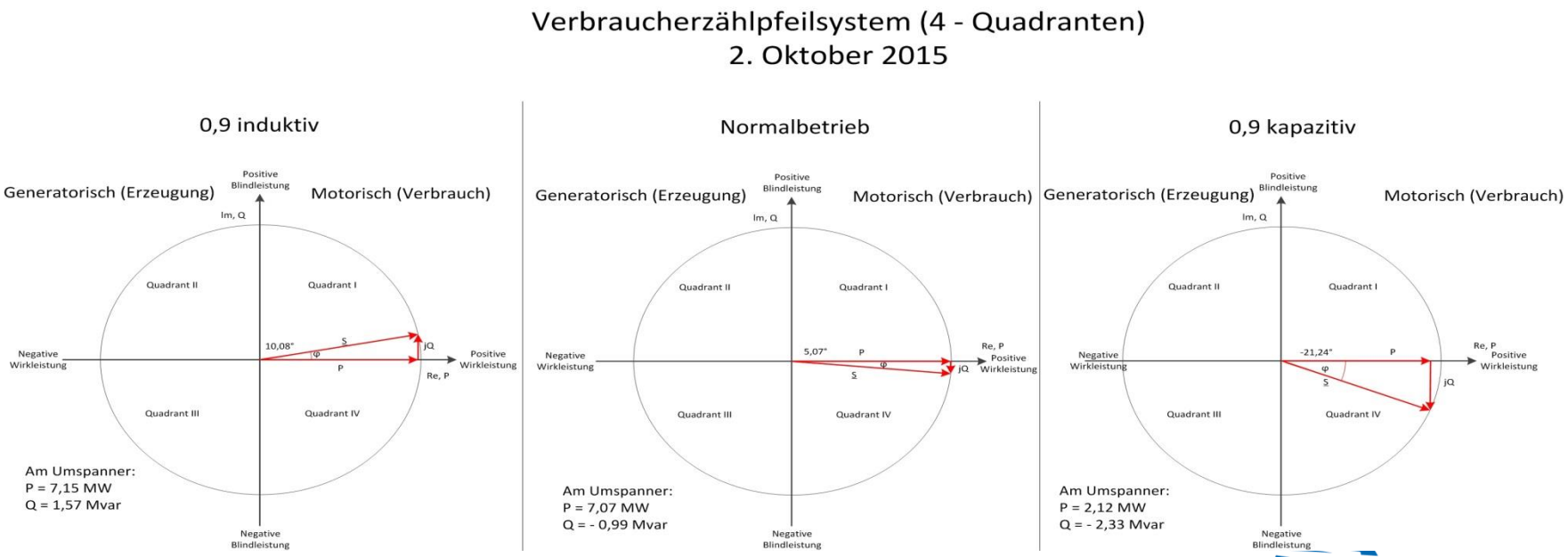
- expencive (3:1)

GRIDCON® Transformer (Trafo) & iTAP® (Regeleinheit)
von Maschinenfabrik Reinhausen GmbH
Quelle: MR GmbH

example

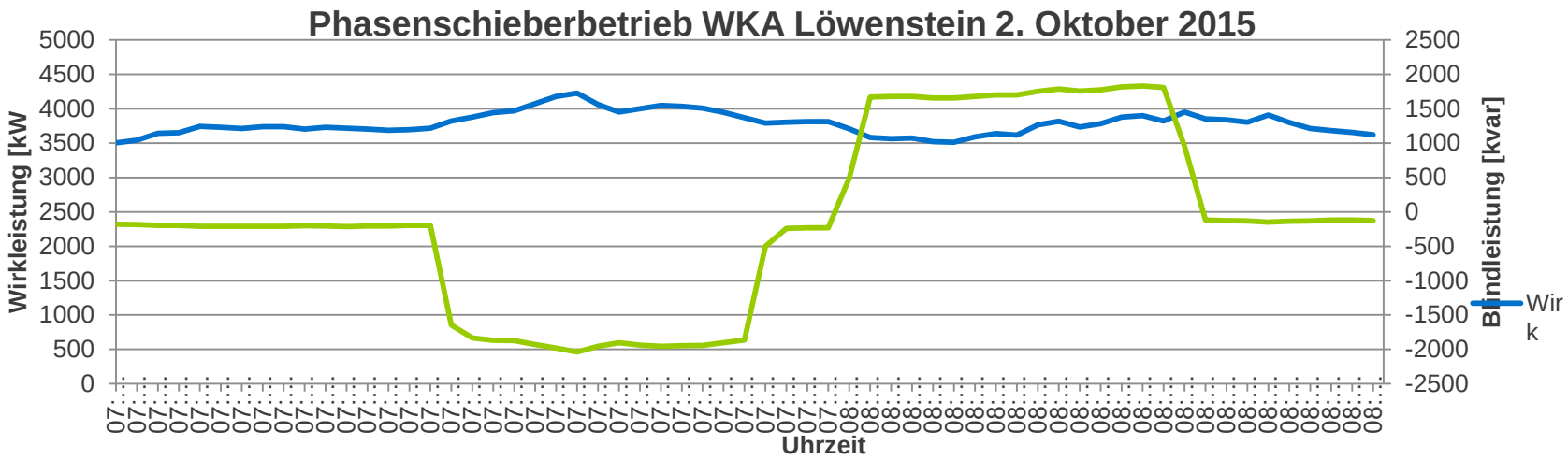

HS/MS
MS-Halbring
MS/NS
$\frac{U}{U_n}$ [%]
110
108
100
95
90
+4%
+1%
+5%
Einspeisung
$U_{UW,Soll}$ = 104%
Regelabweichung: ±1%
-4%
-5%
-5%
Last
Entfernung

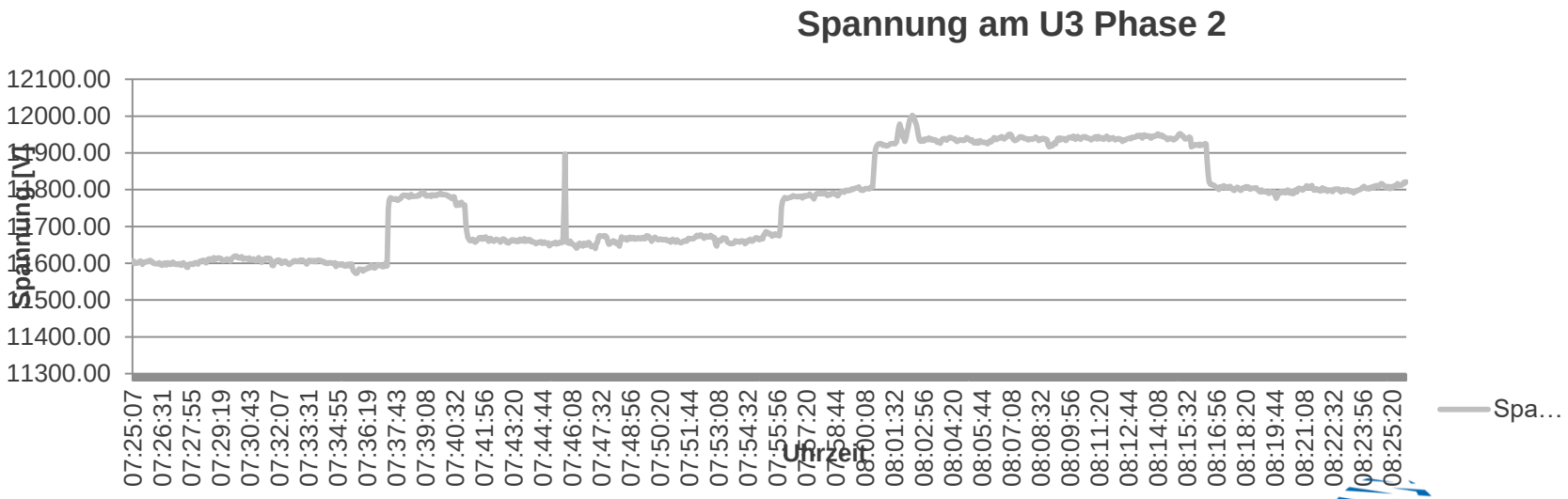
grid stability 2 phase shifter



stadtwerke Schwäbisch Hall GmbH

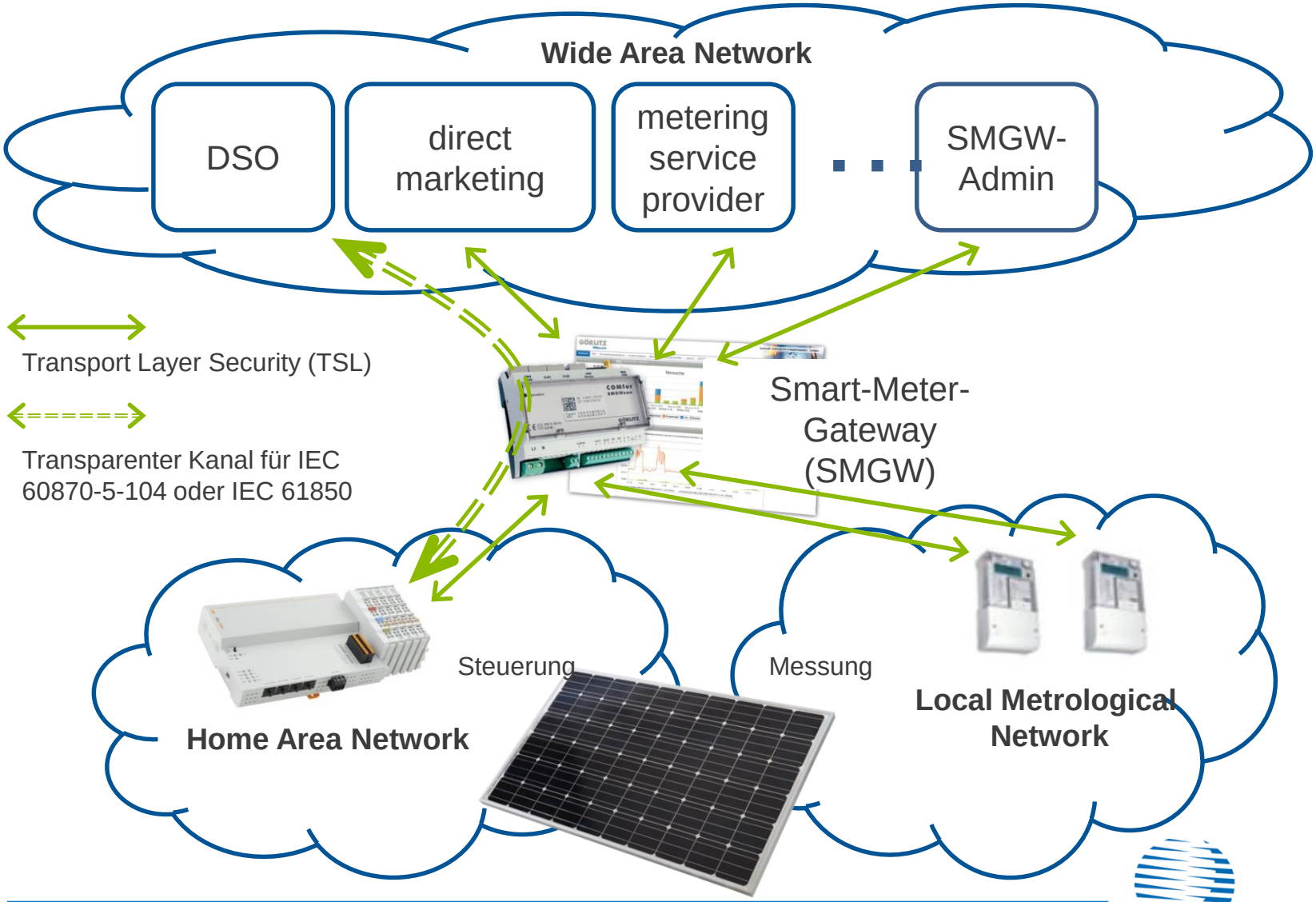
phase shifter (300 V is posible, 11.6 KV to 11.9 KV)





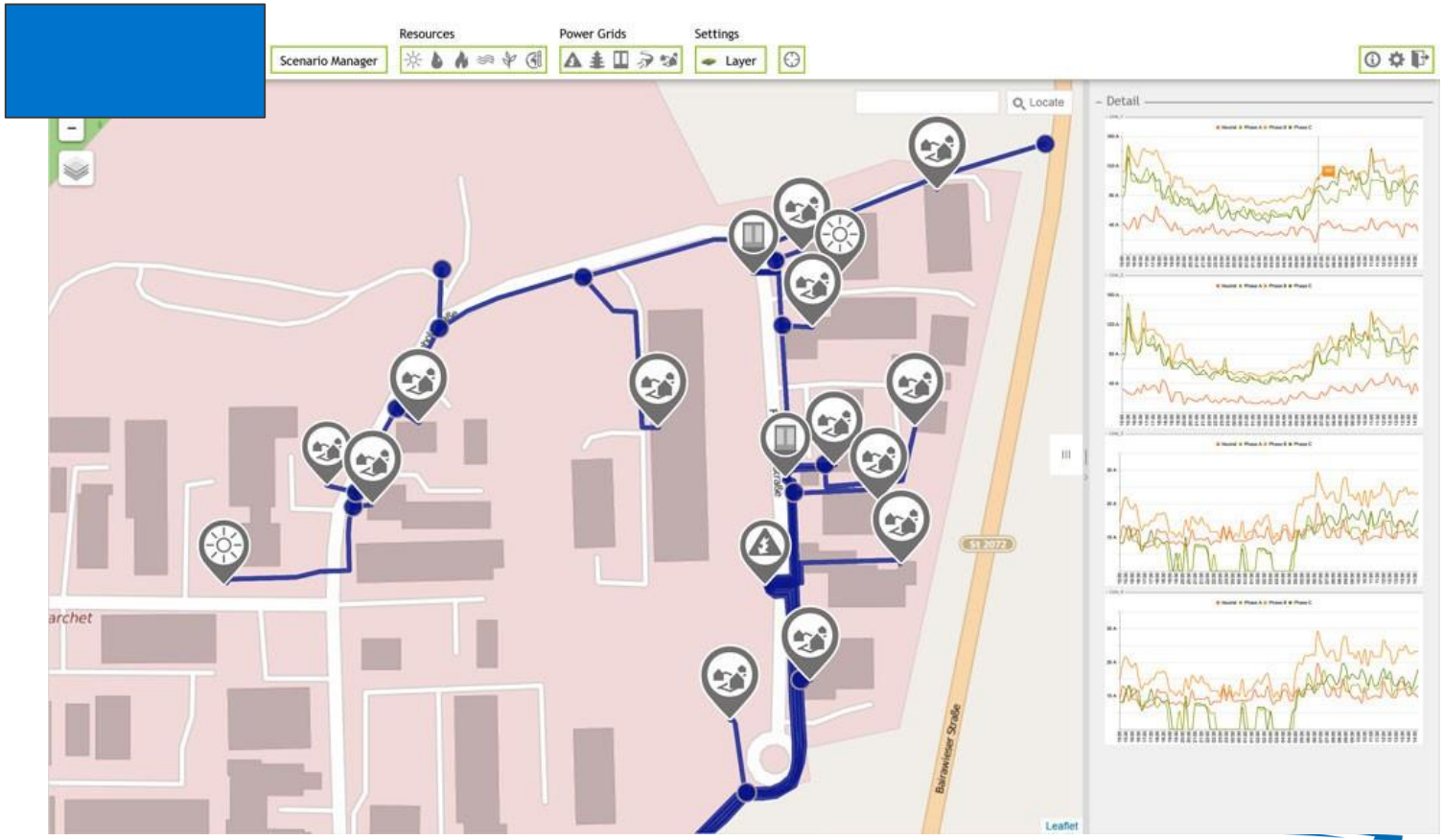
stadtwerke Schwäbisch Hall GmbH

grid stability 3 smart meter



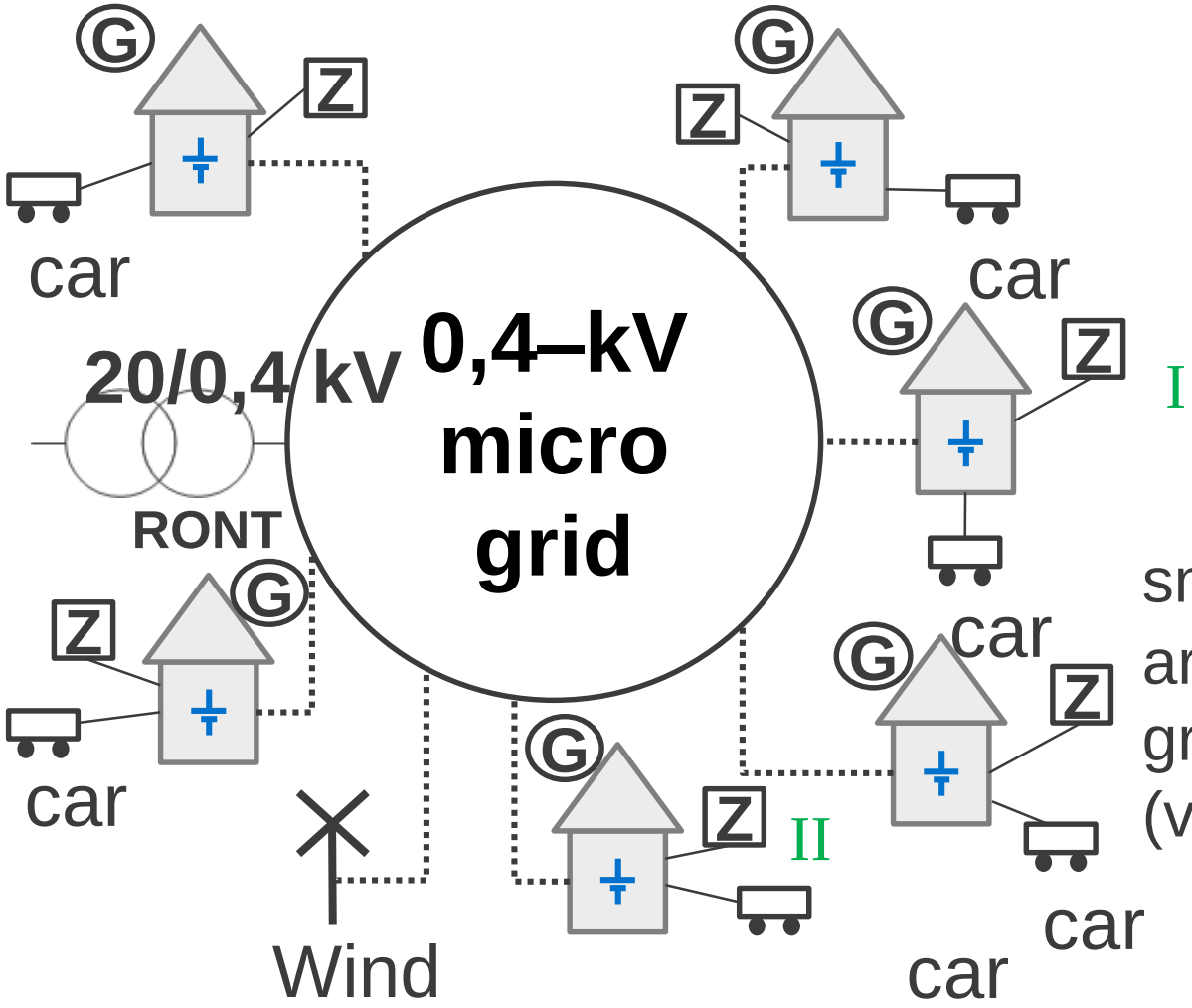
stadtwerke Schwäbisch Hall GmbH

information from low voltage grid (smart meter)



micro grids with smart meters and electrical cars

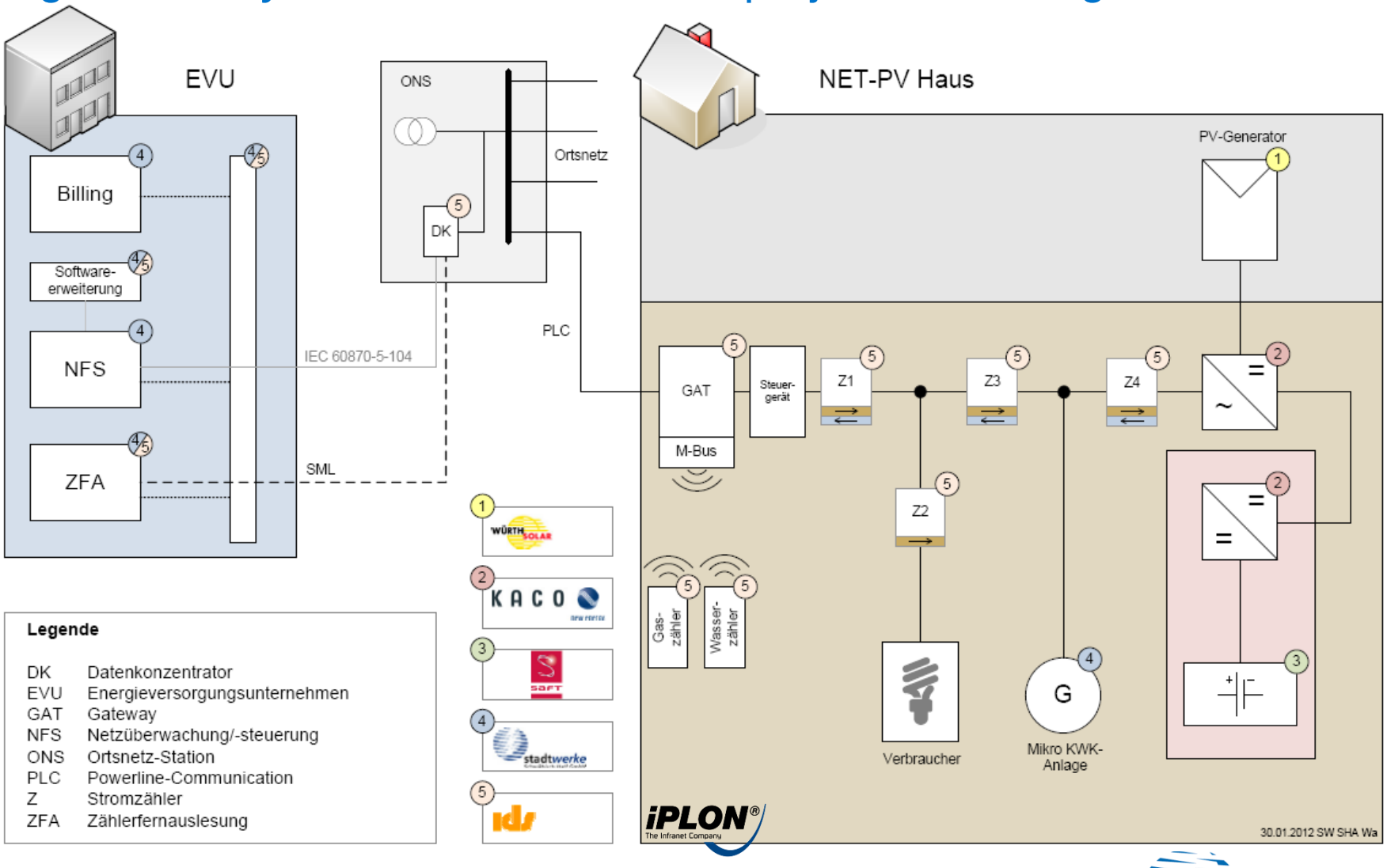
mirco grid



smart meter I u. II are connectet to the grid control (voltage, power)

stadtwerke Schwäbisch Hall GmbH

grid stability 4 -NET-PV Research project from the gouvernment



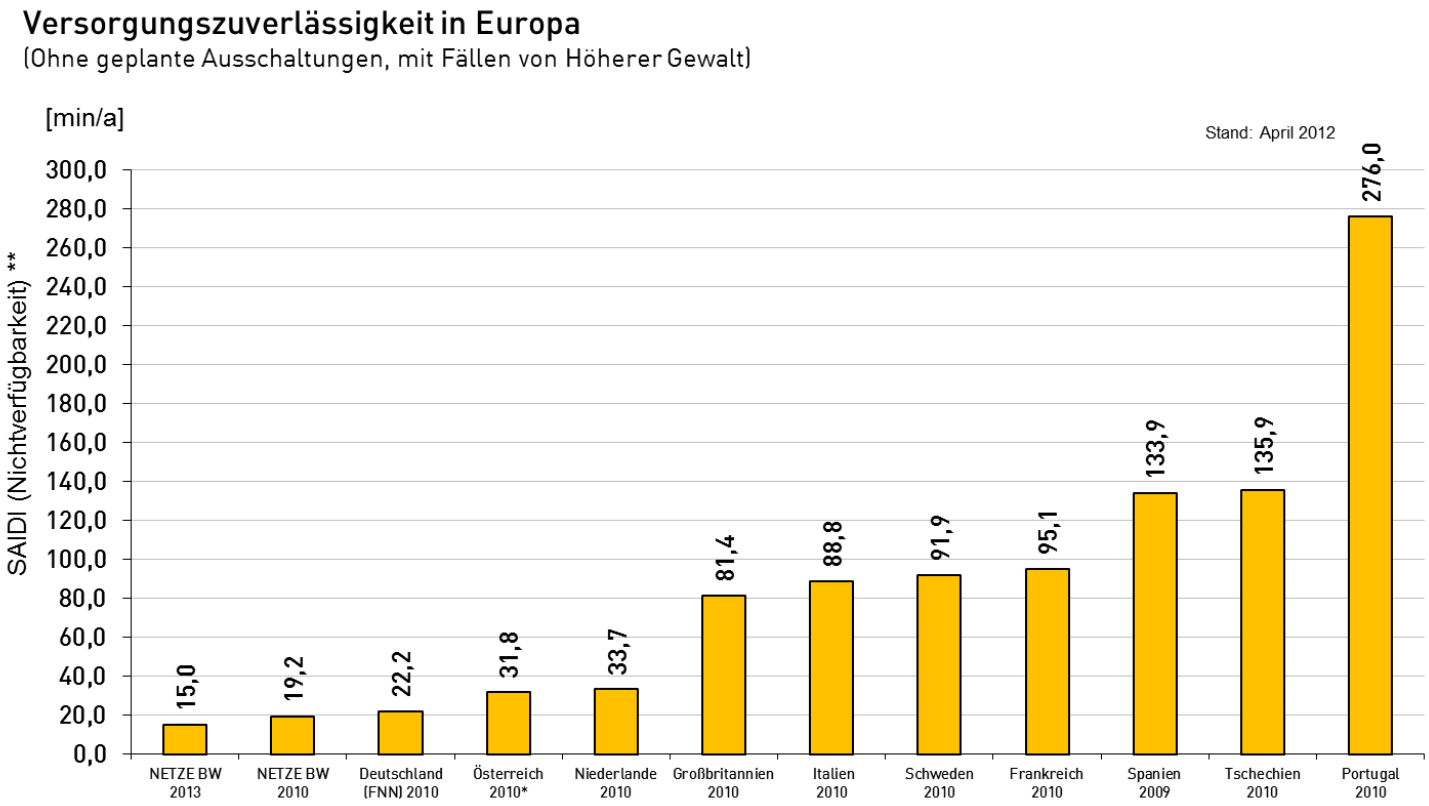
stadtwerke Schwäbisch Hall GmbH

batterie works

building with batteries

stadtwerke
Schwäbisch Hall GmbH

germany is the best electrical grid in europe



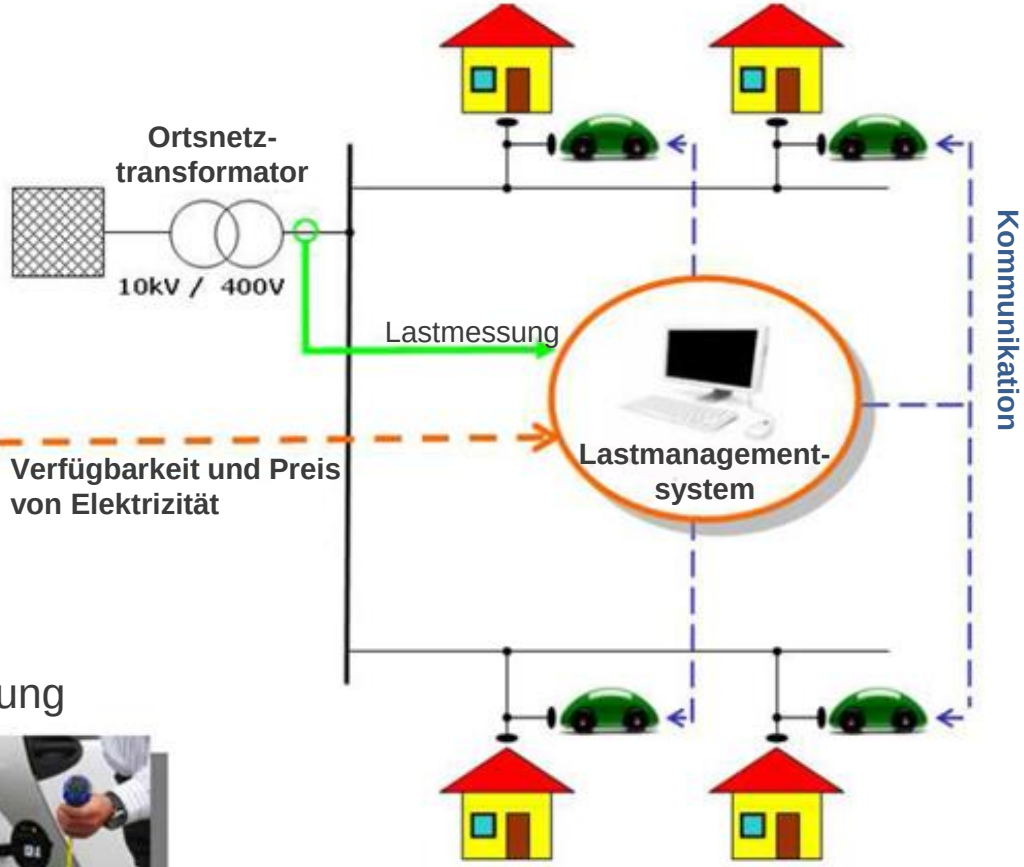
* ohne Niederspannung
** für Endkunden in der Niederspannung
Quellen: 5th CEER Benchmarking Report on the Quality of Electricity Supply 2011, Council of European Energy Regulators (CEER);
Störungs- und Verfügbarkeitsstatistik 2010, Forum Netztechnik/Netzbetrieb im VDE (FNN), Berlin

stadtwerke Schwäbisch Hall GmbH

Thank you

example for a new grid management

Netzleitstelle



Kommunikation
Über Steckverbindung

stadtwerke Schwäbisch Hall GmbH

SchwäbischHall

erke
GmbH

Power plants Grid Schwäbisch Hall

emergency power system (EPS): a total of 7.9 MW

combined heat and power (CHP): a total of 21 MW

wind power: a total of 28 MW

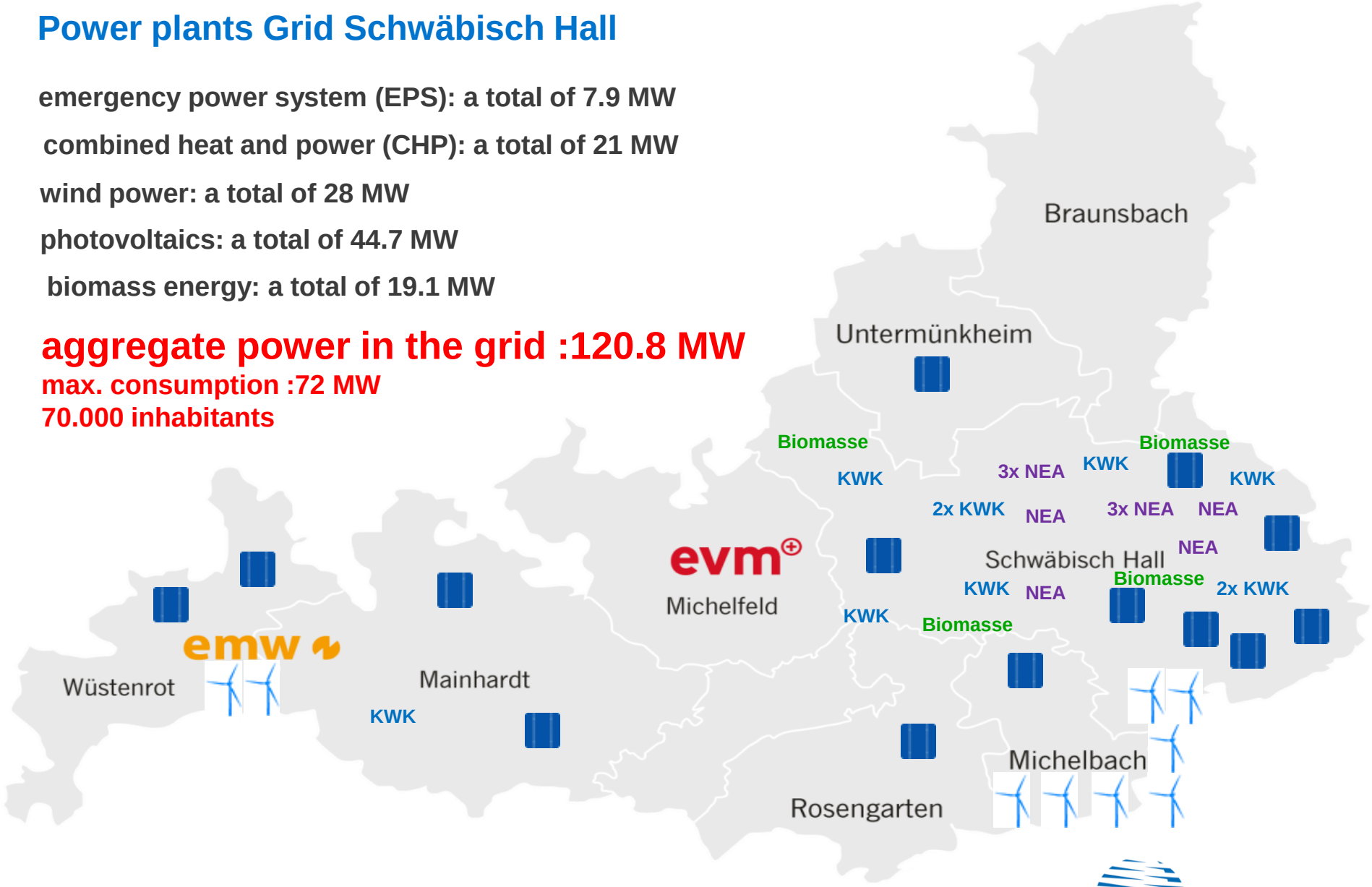
photovoltaics: a total of 44.7 MW

biomass energy: a total of 19.1 MW

aggregate power in the grid :120.8 MW

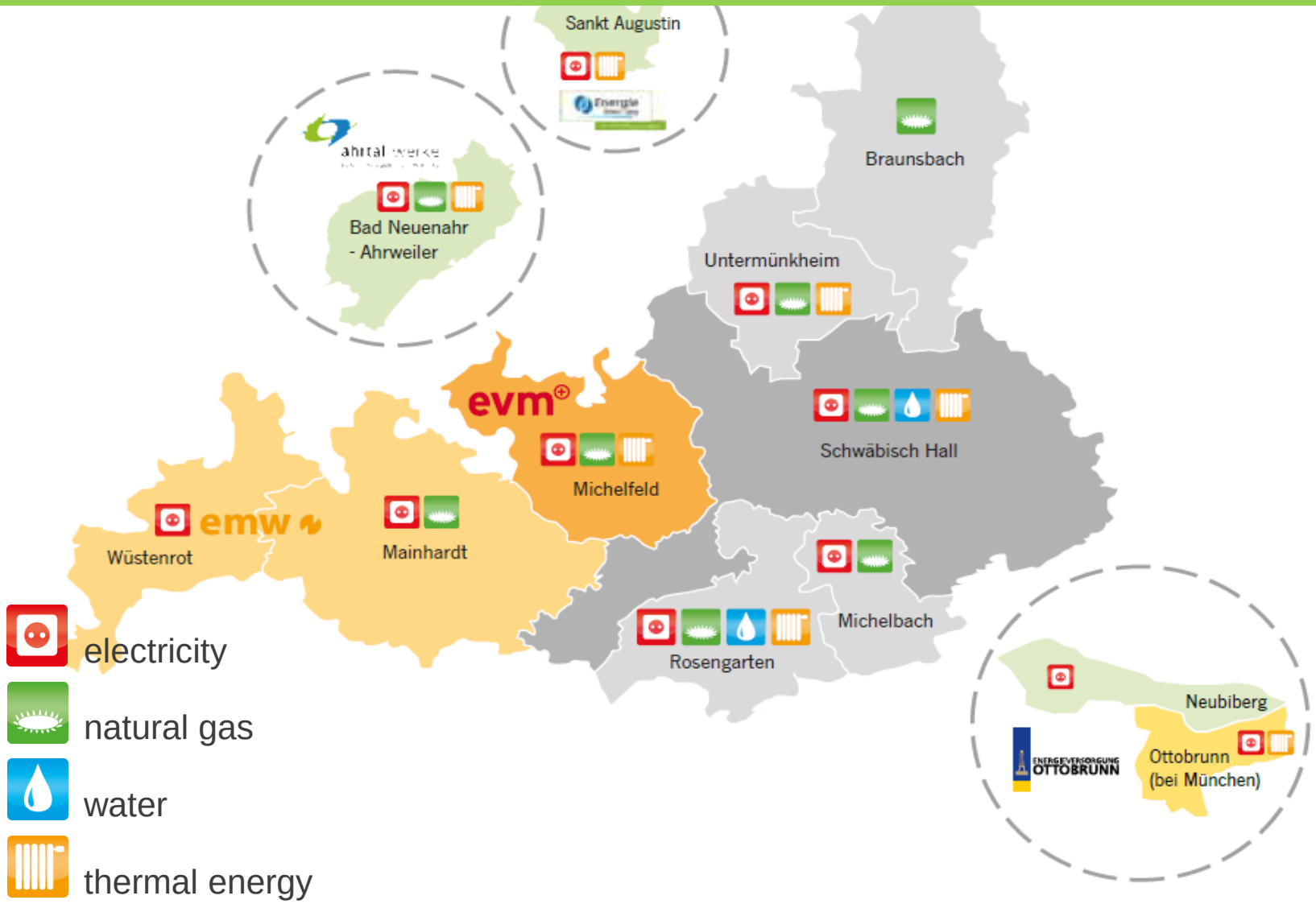
max. consumption :72 MW

70.000 inhabitants



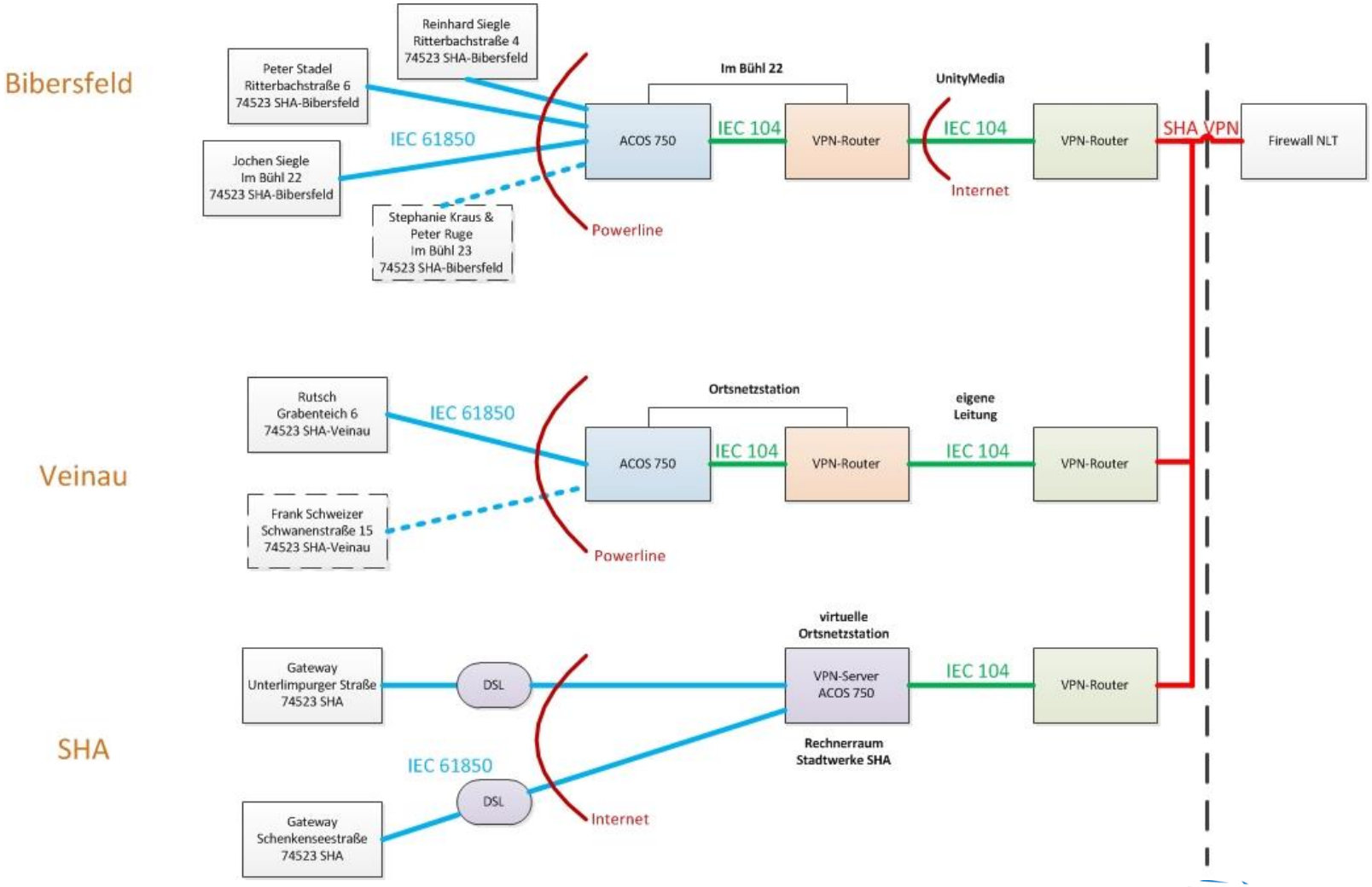
stadtwerke
Schwäbisch Hall GmbH

concession area Stadtwerke Schwäbisch Hall GmbH 70.000 inhabitants are living in the grid Schwäbisch Hall



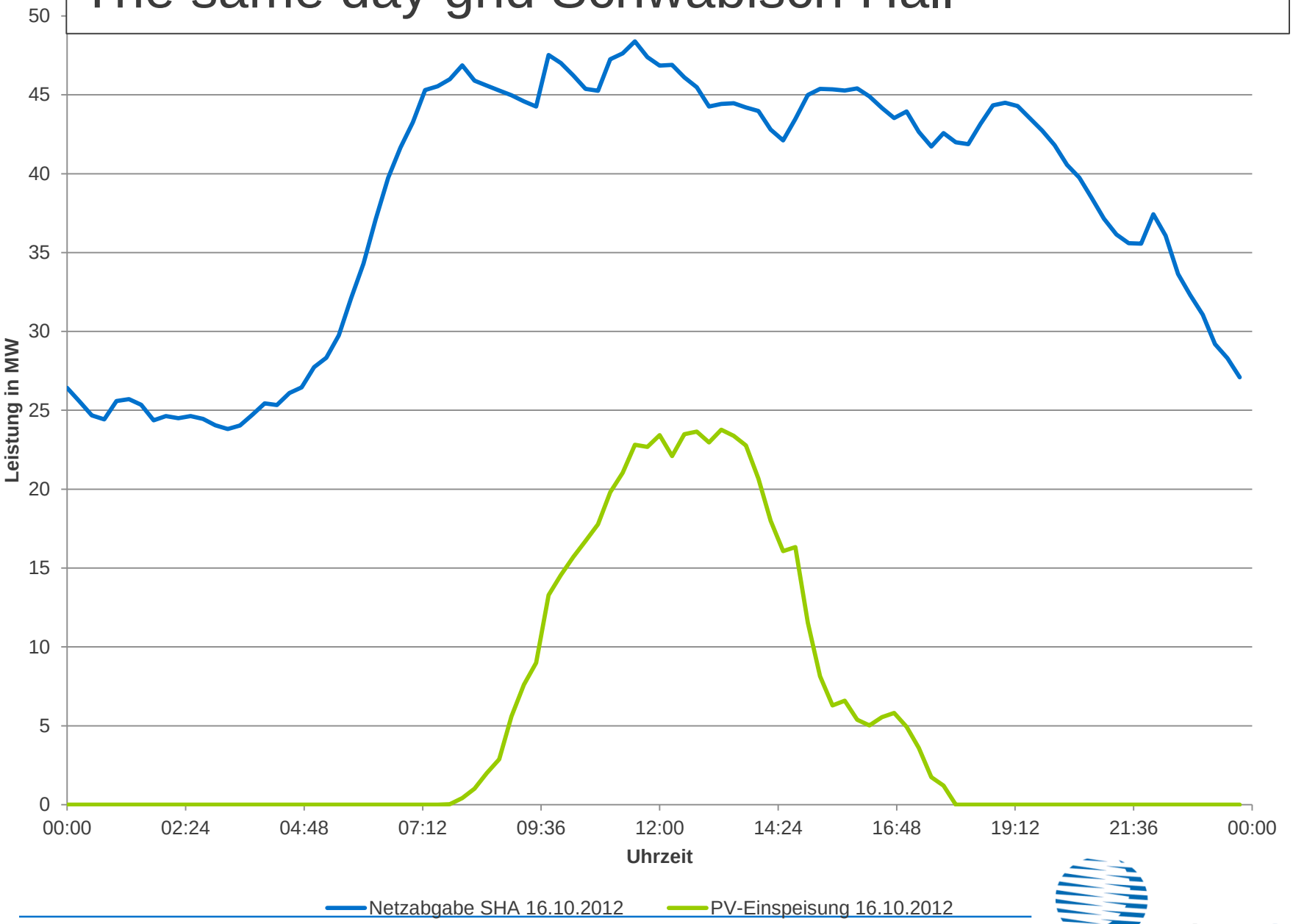
stadtwerke Schwäbisch Hall GmbH

smart meter and l-ion battries in the grid



stadtwerke
Schwäbisch Hall GmbH

The same day grid Schwäbisch Hall



stadtwerke Schwäbisch Hall GmbH

TOP 1 Power Company Schwäbisch Hall in a smart city

electricity

natural gas

water

4 Quellwasseranlagen

thermal energy

indoor/outdoor swimming 700.000 people in 2015

parking for 2000 cars

Stadtwerke Schwäbisch Hall GmbH

ca. 500 Mitarbeiter, davon
16 Auszubildende
262 Mio. € Umsatz

Energiedienstleistungen:
Contracting
Sherpa: ca. 600.000 Kunden
Zählerfernauslesung und EDM
Prozessführung von technischen Anlagen

Facility-Management
224 Stationen
18.900 Datenpunkte

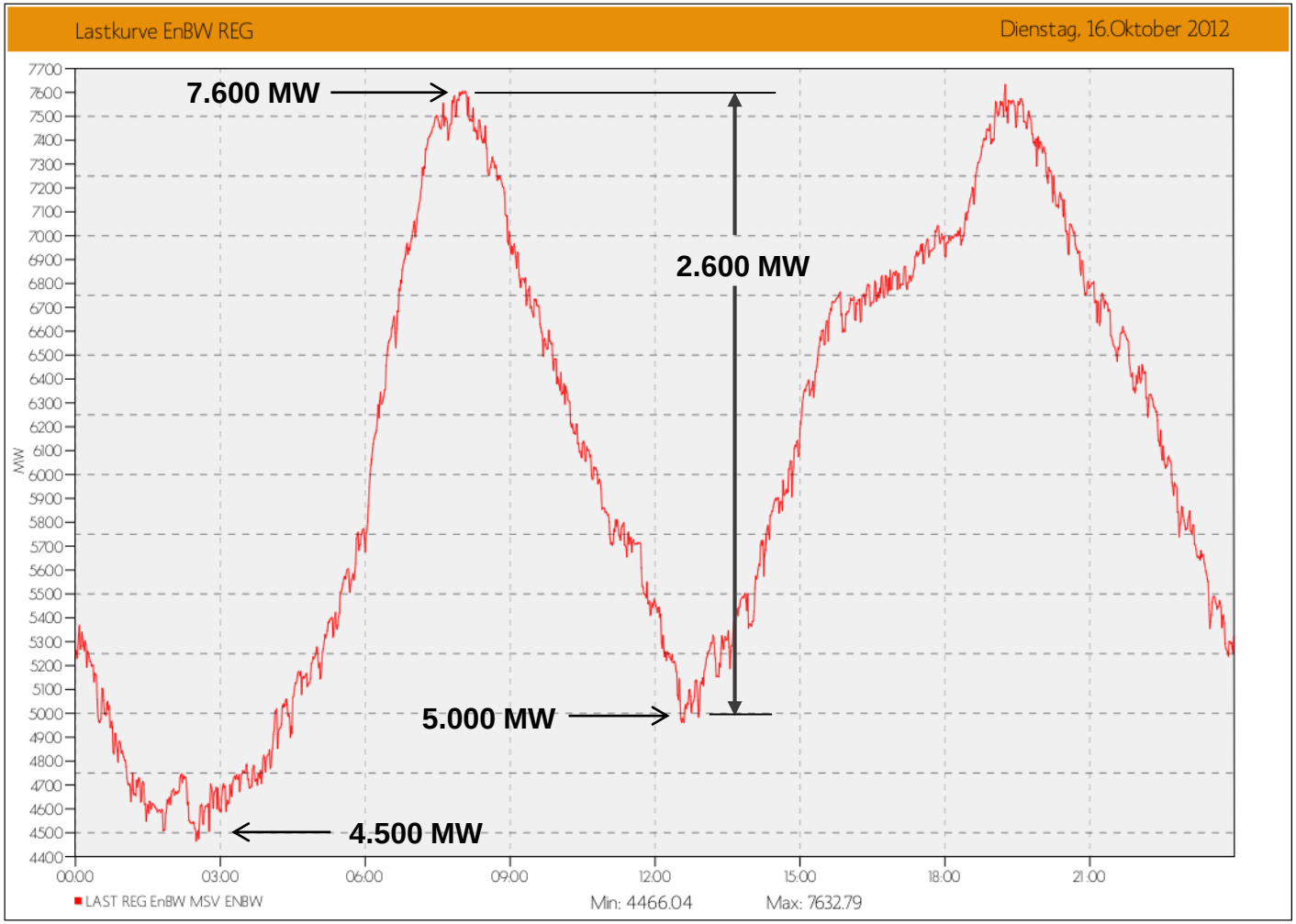
Kraftwerke:
48 BHKW-Module
1 GuD-Kraftwerk
6 Biomasse-KWK-Anlagen
3 Holzheizwerke
6 Wasserkraftwerke
2 Windkraftanlagen

126 Mio. kWh/a Strom aus Eigenerzeugung

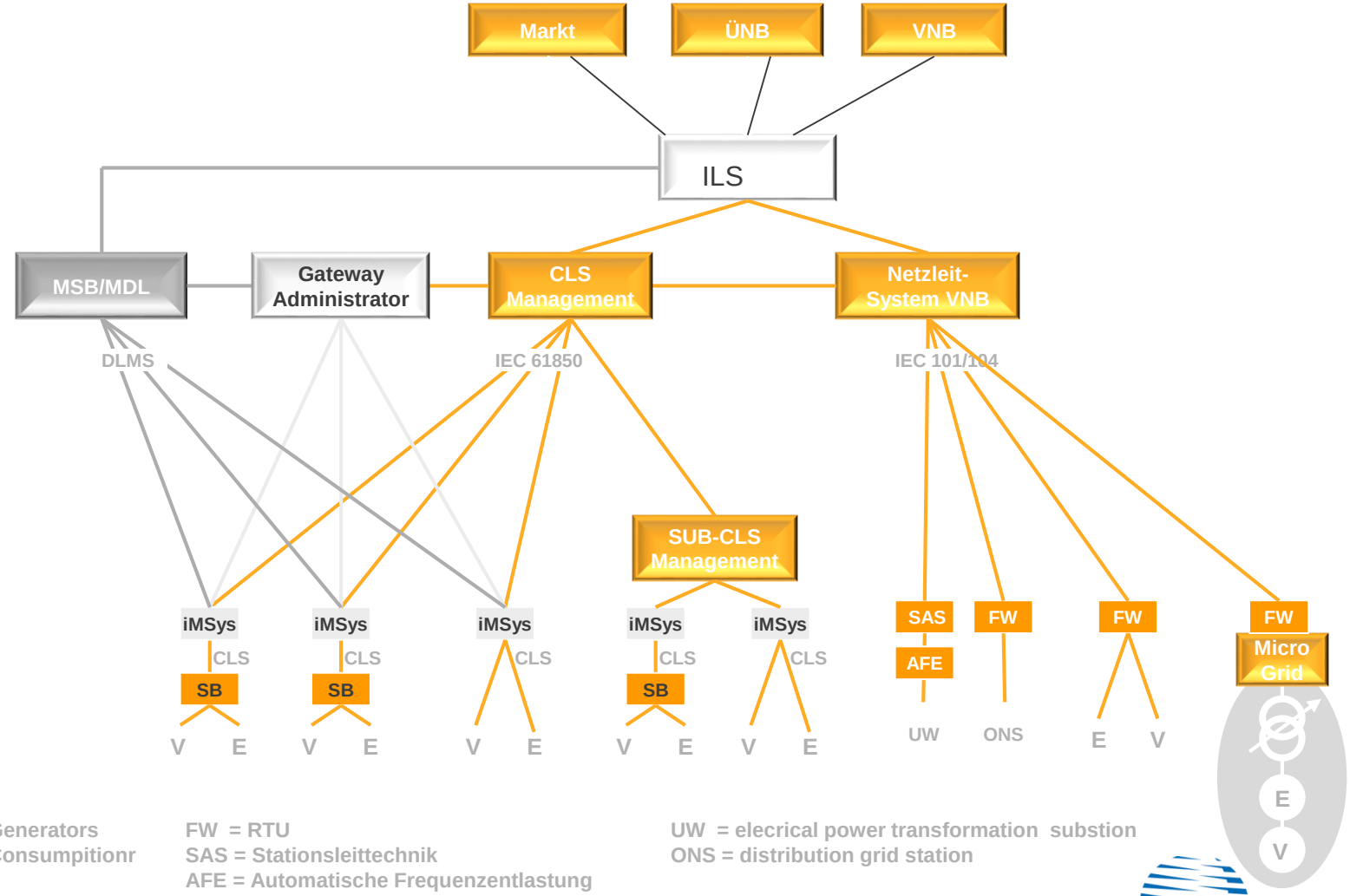
Erneuerbare Energien
Fotovoltaik: 43.000 kW
Wasserkraft: 2.450 kW
Windkraft: 27.000 kW
Biomasse: 8.000 kW
Deponie-/Klärgas: 455 kW

stadtwerke Schwäbisch Hall GmbH

Grid-Power TSO transnet BW
Thuesday, 16.10.2012, sunny day



smart meter for grid stability



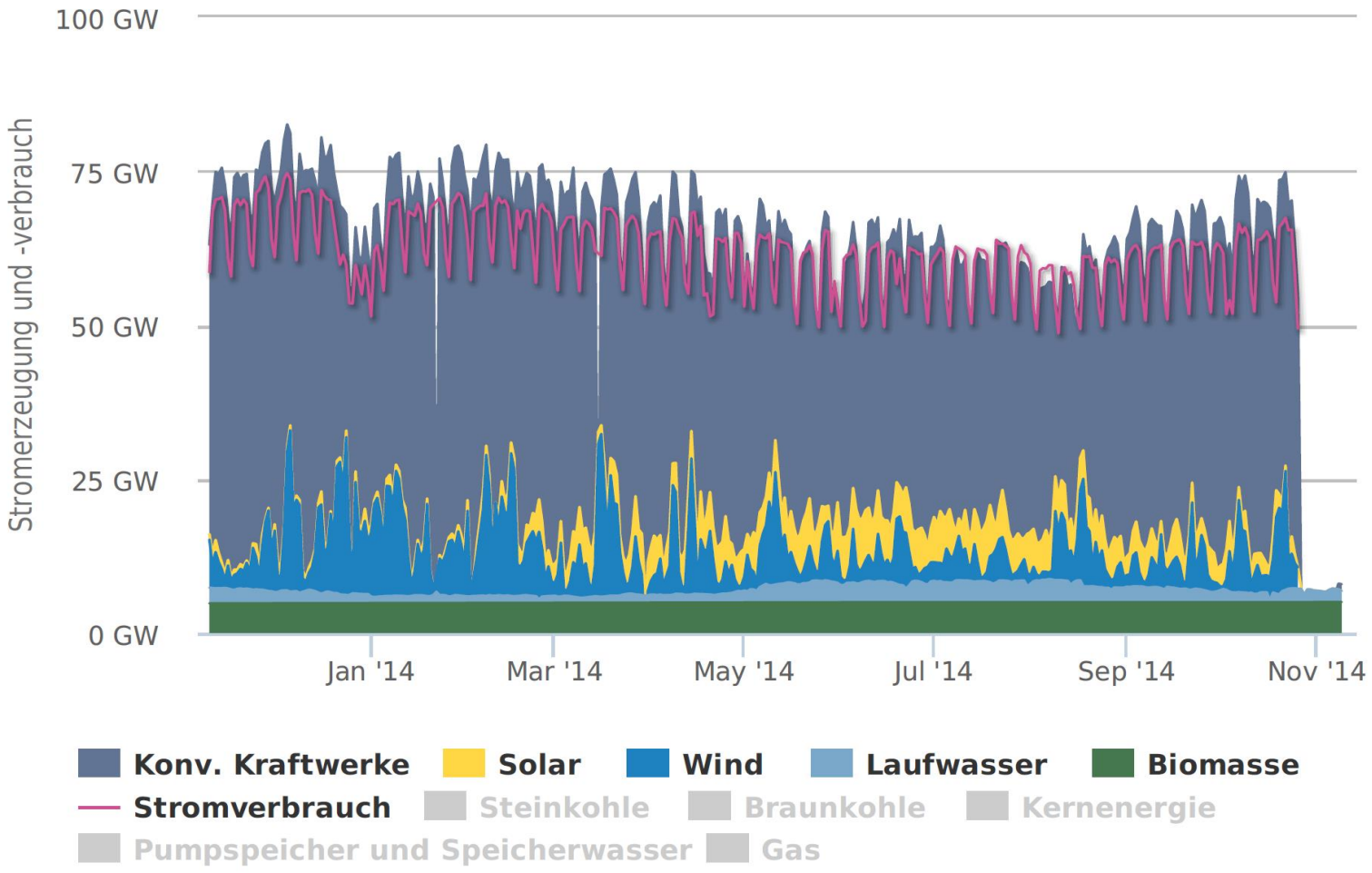
E = Generators
V = Consumpitionr

FW = RTU
SAS = Stationsleittechnik
AFE = Automatische Frequenzentlastung

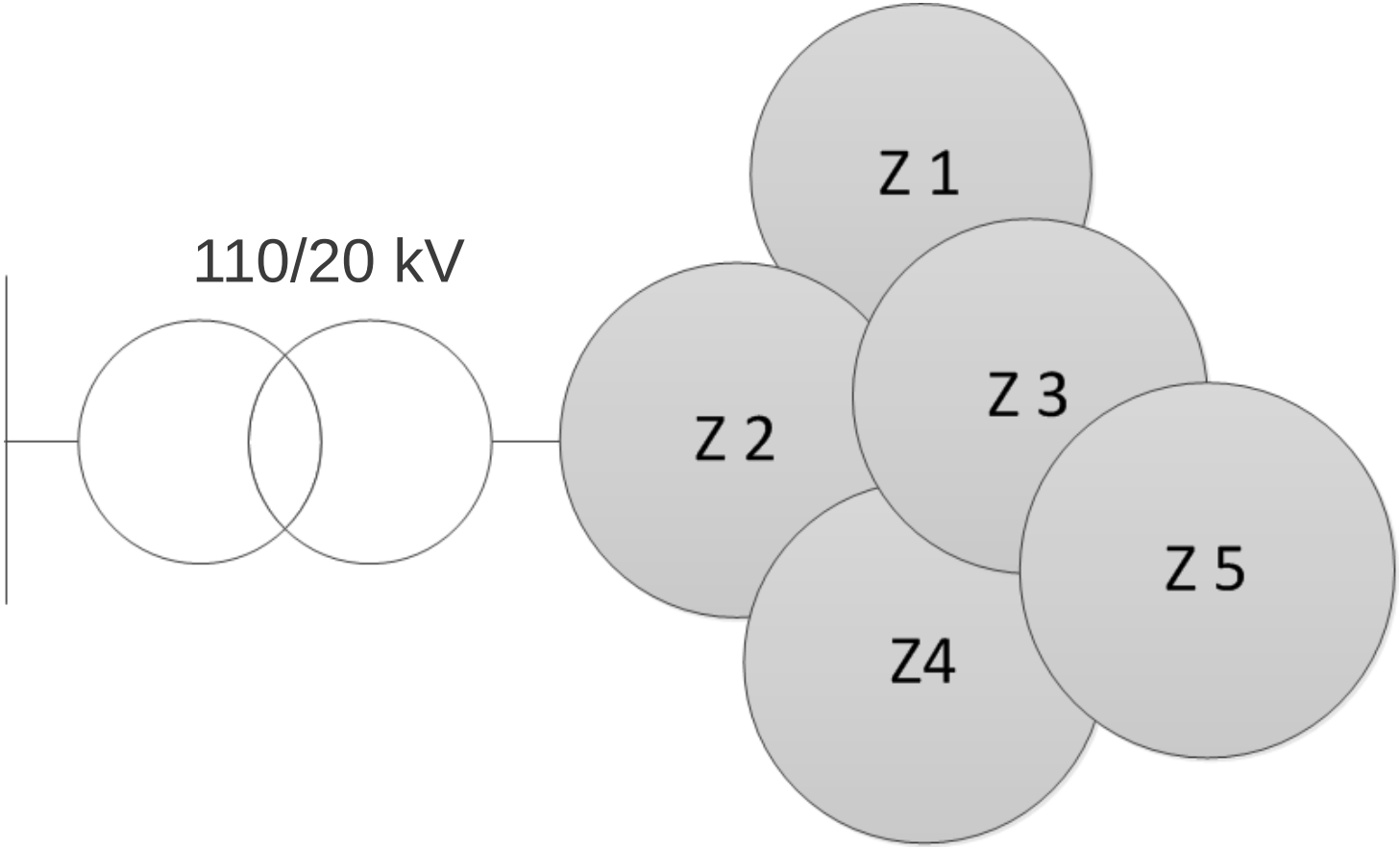
UW = elecrical power transformation substion
ONS = distribution grid station

stadtwerke Schwäbisch Hall GmbH

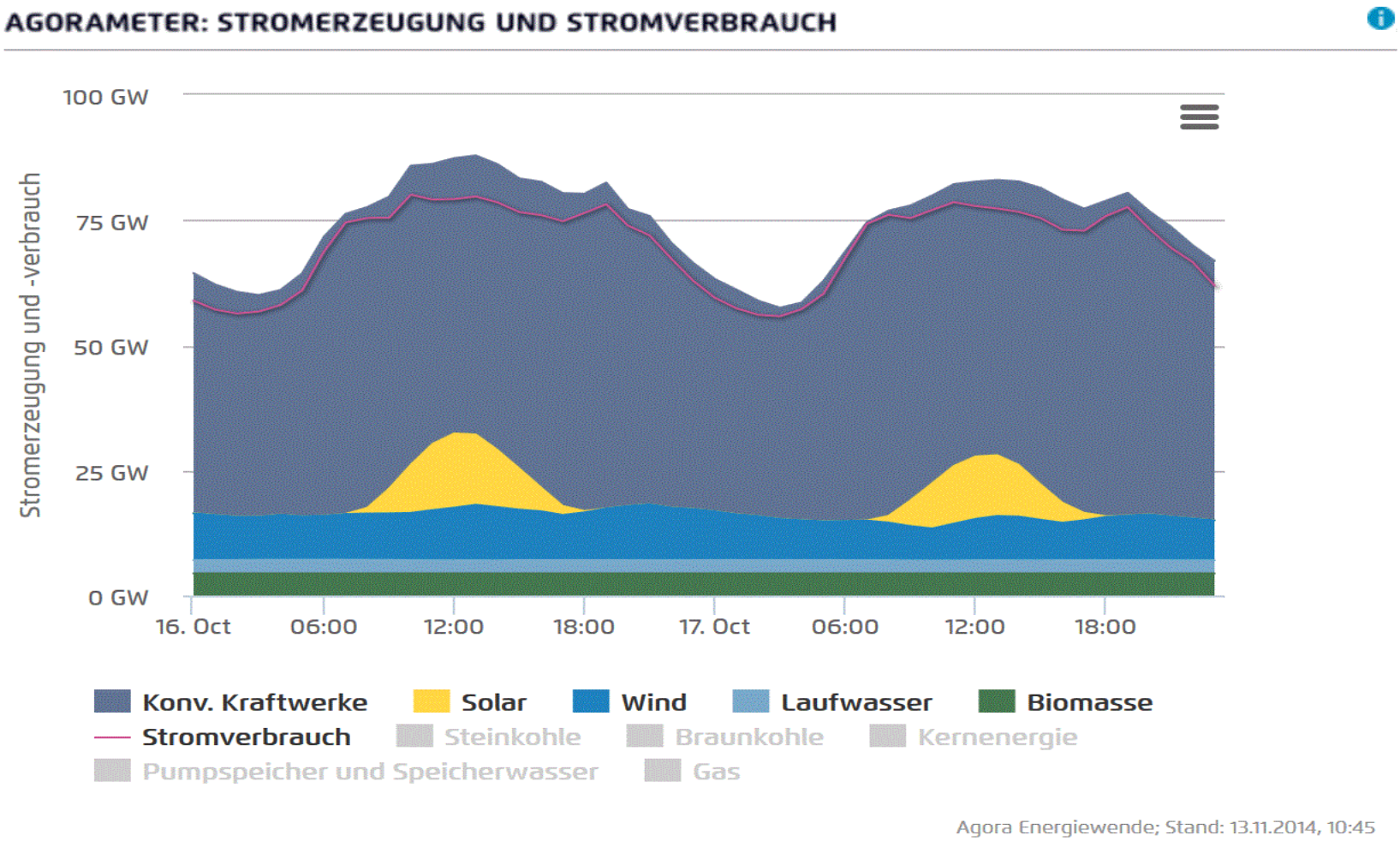
Grid-delivery and power generation in germany



the future , many micro grids,a blackout for all is not possible



many micro gids in a village with schedule from the grid control

stadtwerke Schwäbisch Hall GmbH

Gridpower Germany 16.10.2012