DSOS AS SYSTEM MANAGERS OF THE ENERGY TRANSITION

Verband kommunaler Unternehmen e.V. (VKU)
[The German Association of Local Utilities]

Rainer Stock
Grid Management
June 26th

DIE KOMMUNALEN UNTERNEHMEN

Welcome to VKU
The Association of Local Public Utilities

- The „Verband kommunaler Unternehmen” (VKU) represents around 1,460 local utilities in Germany in the sectors of energy, water/waste water, waste management and telecommunication.
- With more than 260.000 associated employees, the members of VKU achieved a turnover of over 114 billion euros in 2017, in which year they also invested around 10 billion euros.
- In the end-customer segment, the VKU’s member companies have a market share of 60 percent in electricity, 65 percent in natural gas, 87 percent in drinking water, 69 percent in heating supply and 42 percent in waste-water disposal.

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LOCAL GOVERNMENT IN GERMANY

Facts & Figures about local government in Germany

12,000 municipalities

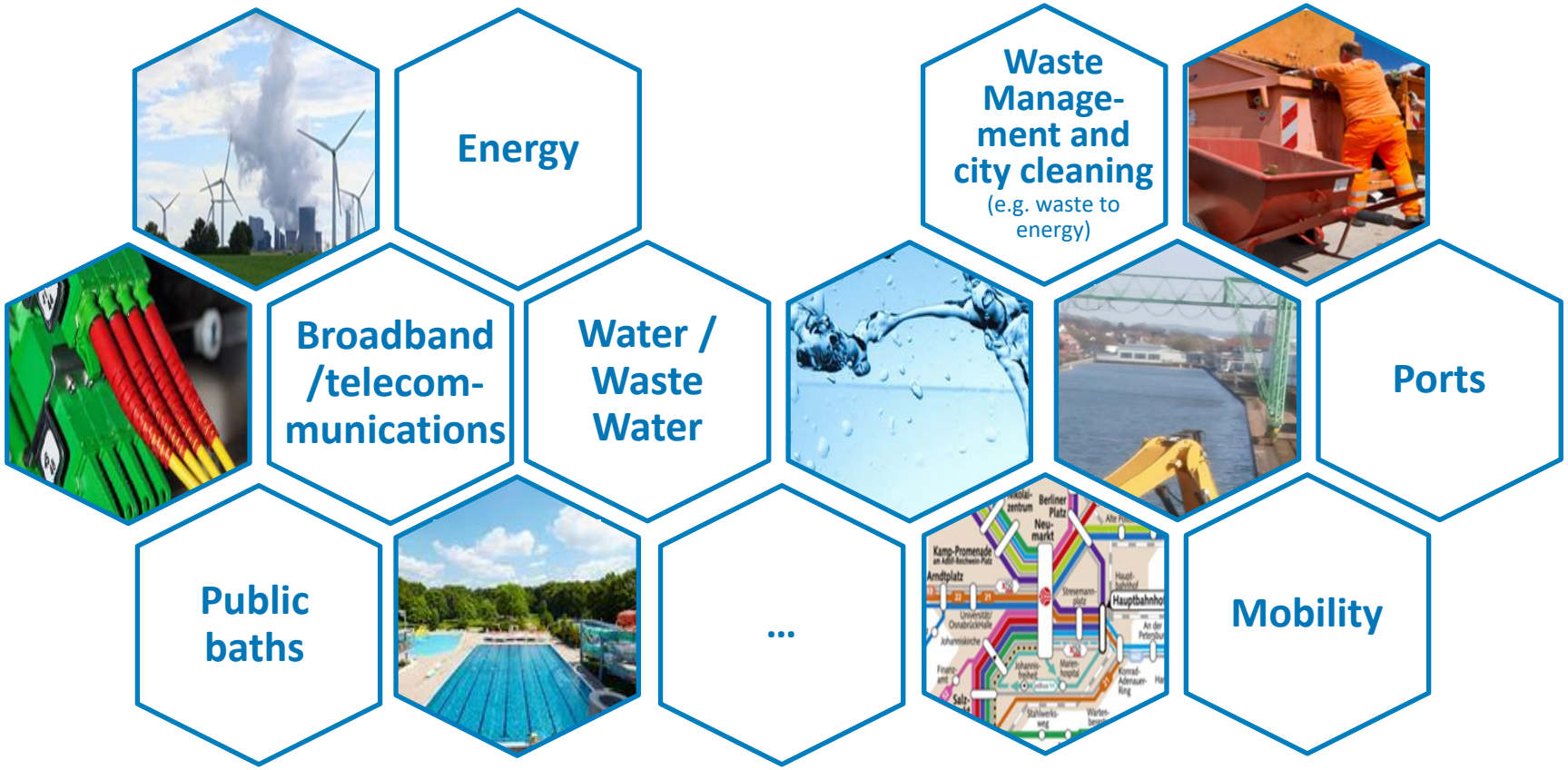
3,400 towns (more than 5,000 inhabitants)

300 councils

8,400 local public utilities

Fields of activities of local utilities

Multi-utility-services



Source: VKU/Regentaucher, Stadtwerke Osnabrück, VKU

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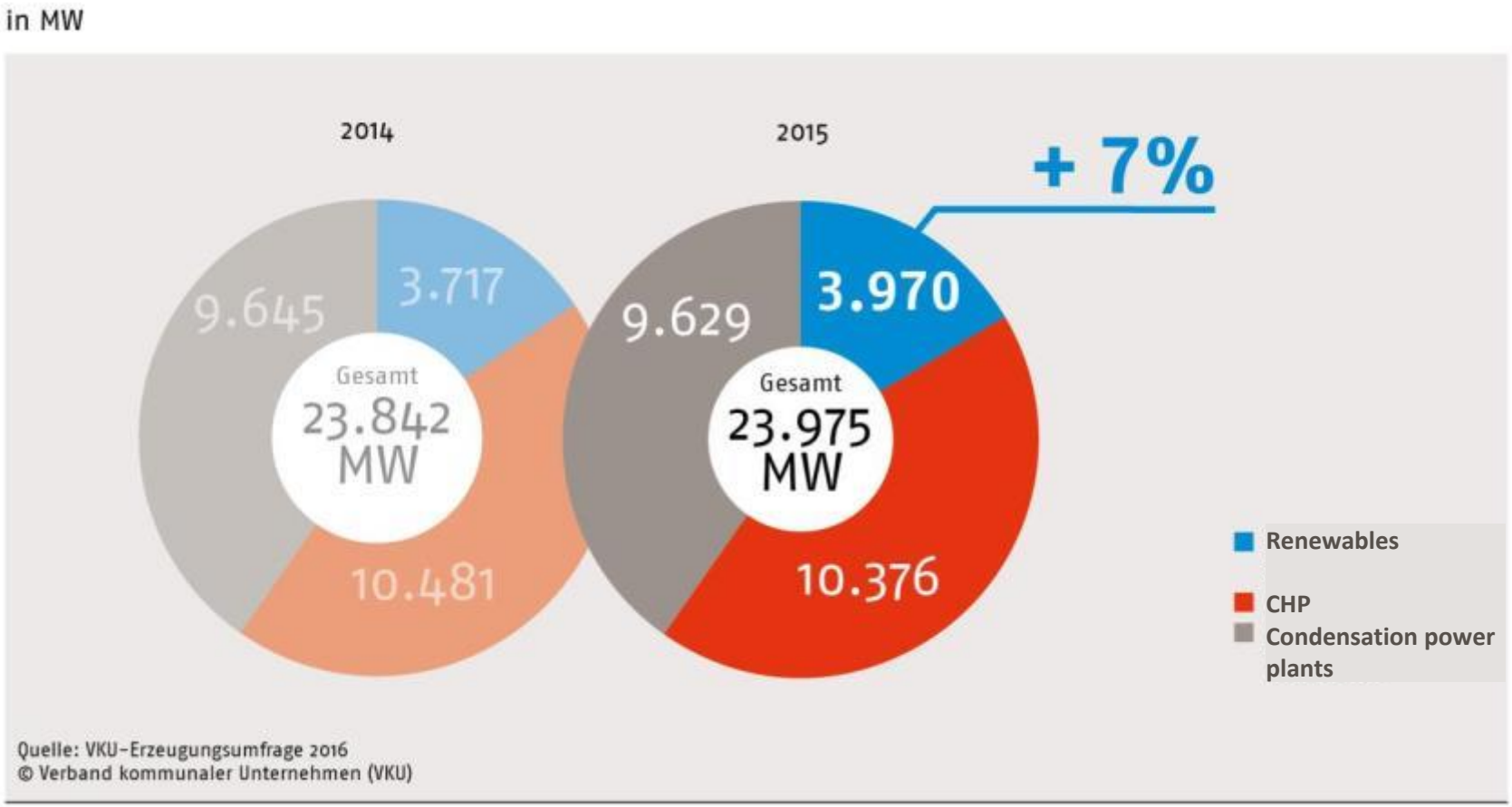
Energy mix and generation capacity of VKU‘s members



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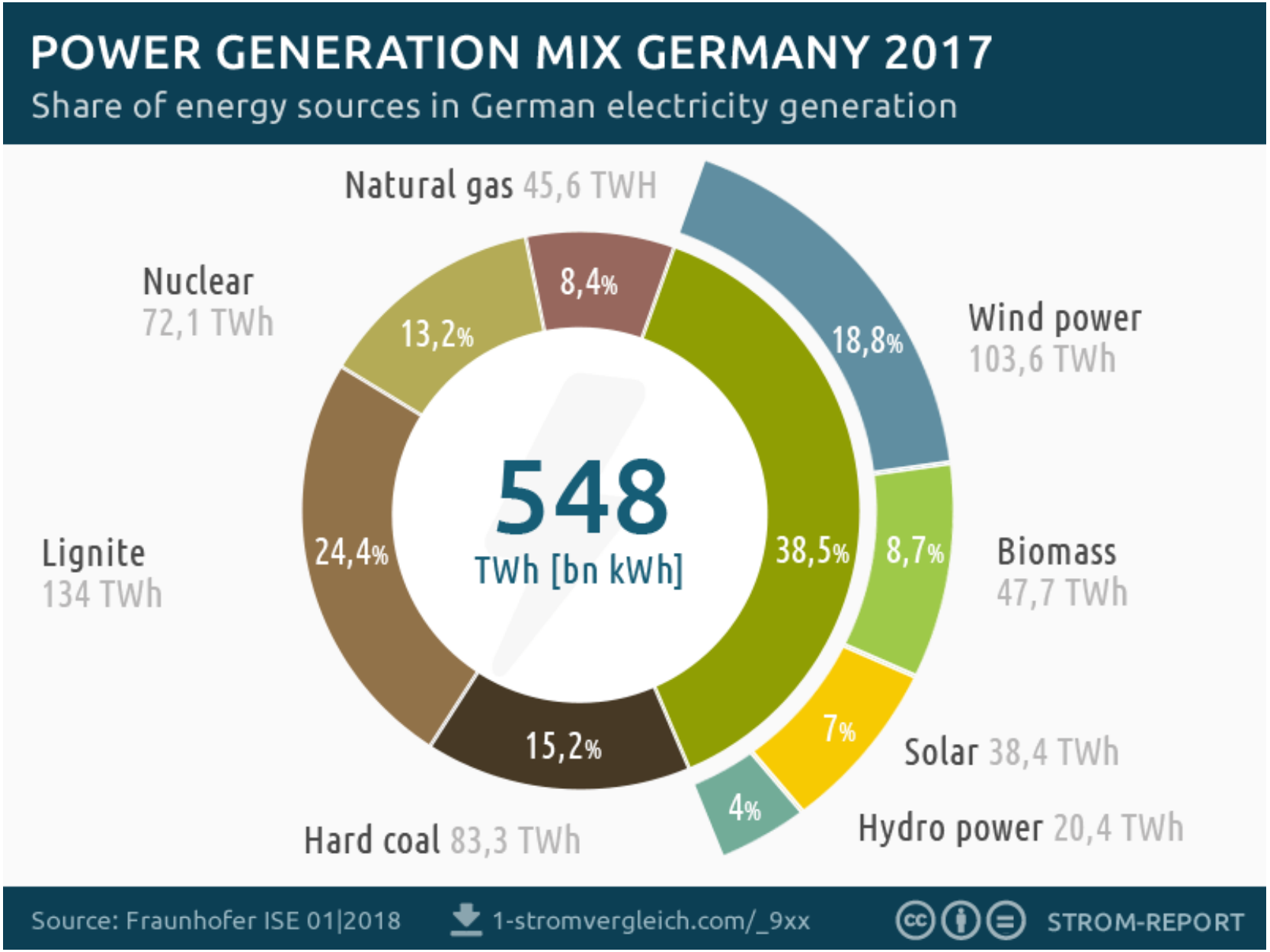

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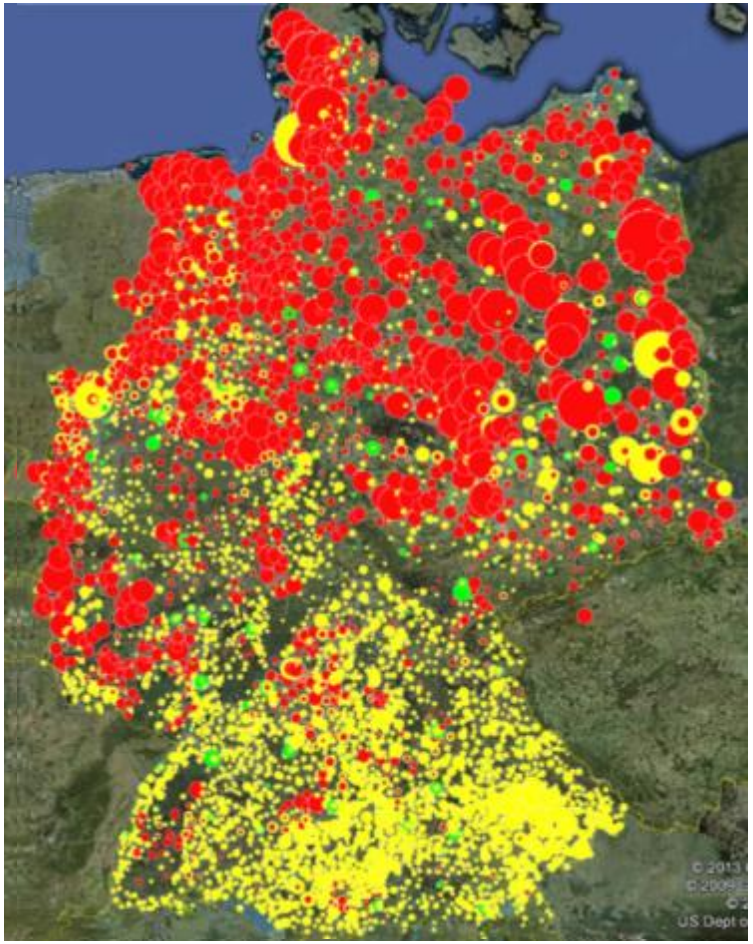
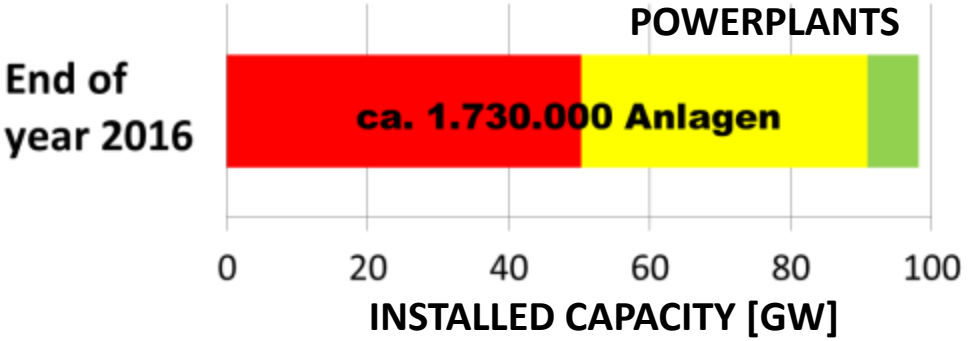
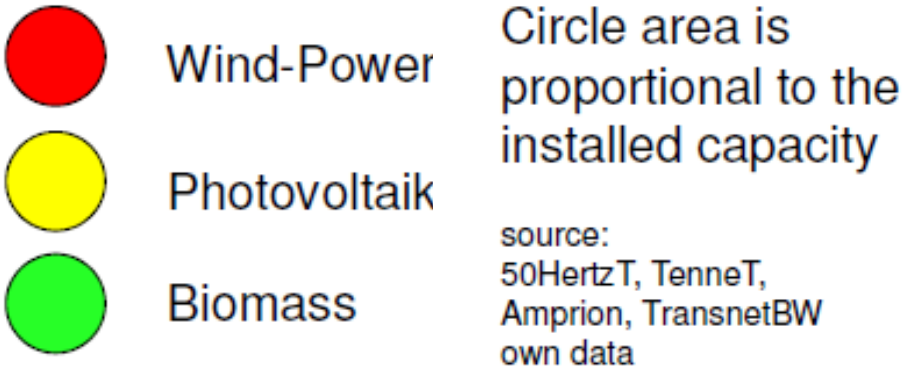
SO, LET´S TALK ABOUT GRIDS

Changing the Energy System -
Dezentral increase of renewabel energy







The Energy Market in Germany – **Facts and Figures.**

Status of market opening: 100%

No end-user price regulation

Market Structure:

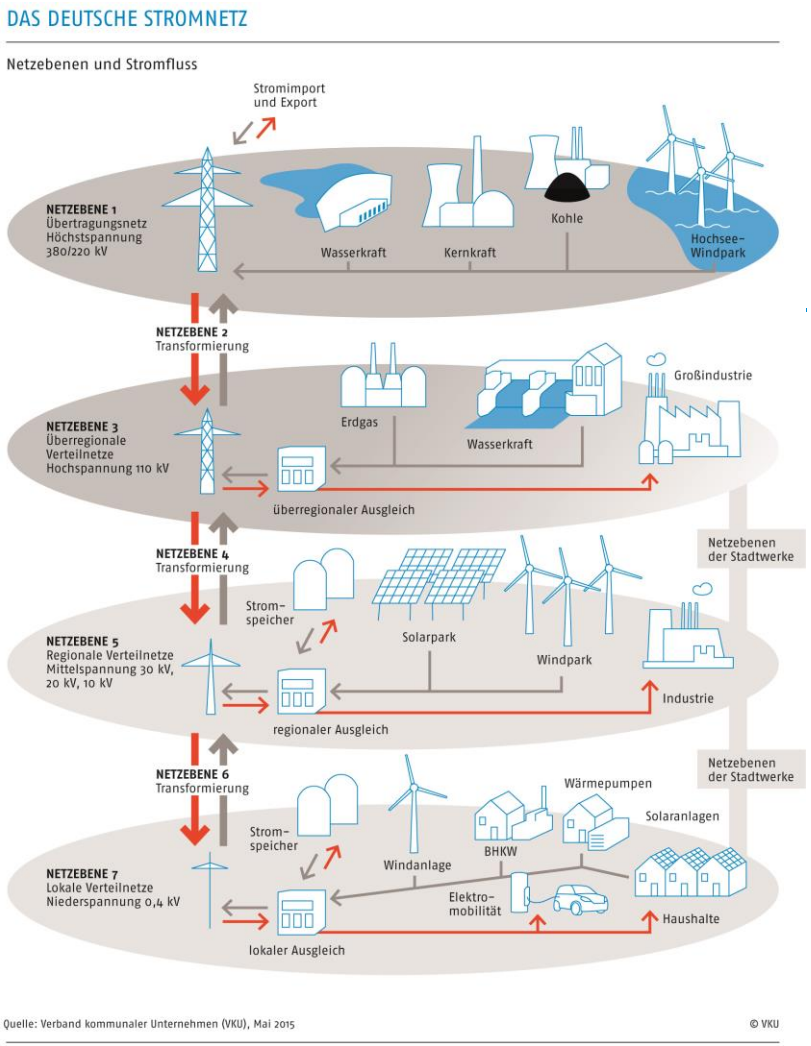
- 4 TSO Electricity / 16 TSO Gas, fully unbundled
- 879 DSOs Electricity / 715 DSOs Gas, all vertically integrated
- Numerous nationwide suppliers – integrated or independent

3.500 kWh/a average Consumption Household Consumer

Transmission and distribution of energy - **Network levels.**

Network level	Voltage level	Connected producers	Connected consumers
Transmission grid	220 – 380 kV (ultra-high voltage)	Large power plants > 100 MW	535, i.G. aluminum smelters, steel mills
Transmission grid	High-voltage DC transmission	No direct connection possible, since HVDC technology allows only "point-to-point" transmission	No direct connection possible
Distribution grid	60- 150 kV (high voltage)	Power plants 10 – 100 MW (gas, CHP)	Industrial consumers
Distribution grid	1 – 30 kV (medium voltage)	Power plants < 10 MW (CHP, wind, etc.)	Industrial consumers
Distribution grid	230 – 400 V (low voltage)	Small power plants (block heat and power plant, PV)	50 Mio., Trade and services, House-holds

Transformation of the energy system - **„From top down to bottum up“.**



Transmission grid:

Generation: 2022: nuclear phase-out

medium-term : lignite-powerplants

2030: about **18 Gigawatt** from renewables

Consumtion: **535 Metering points**

Distribution Grid:

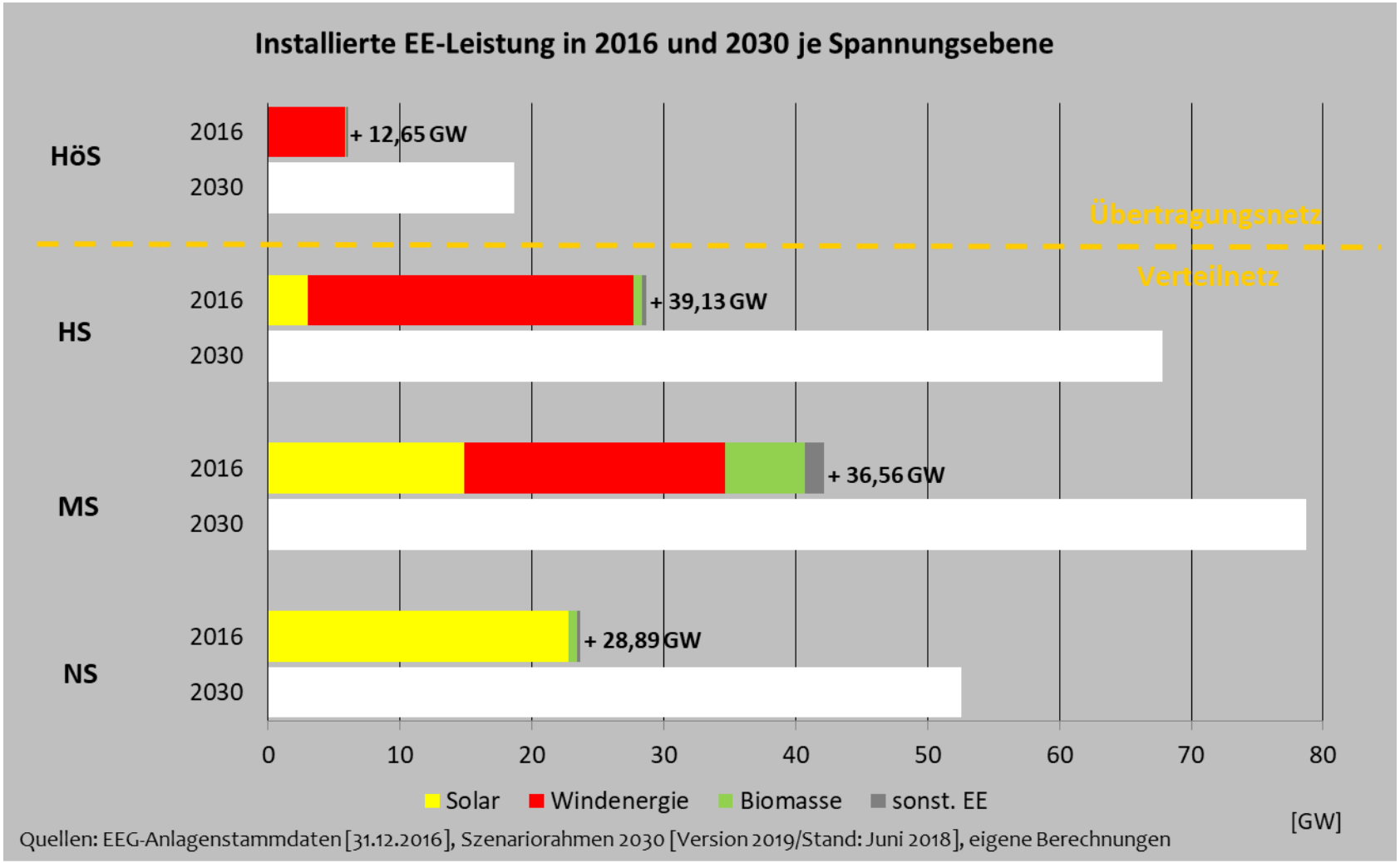
Generation : 2017: about 88 Gigawatt from REN

2030: about **199 Gigawatt** from REN

Consumtion : **50.300.000 metering points**; new consumers like elektro-mobiles, heatpumps and storage are increasing.

Bildquelle: VKU

Installed REN-Power in 2016 and 2030



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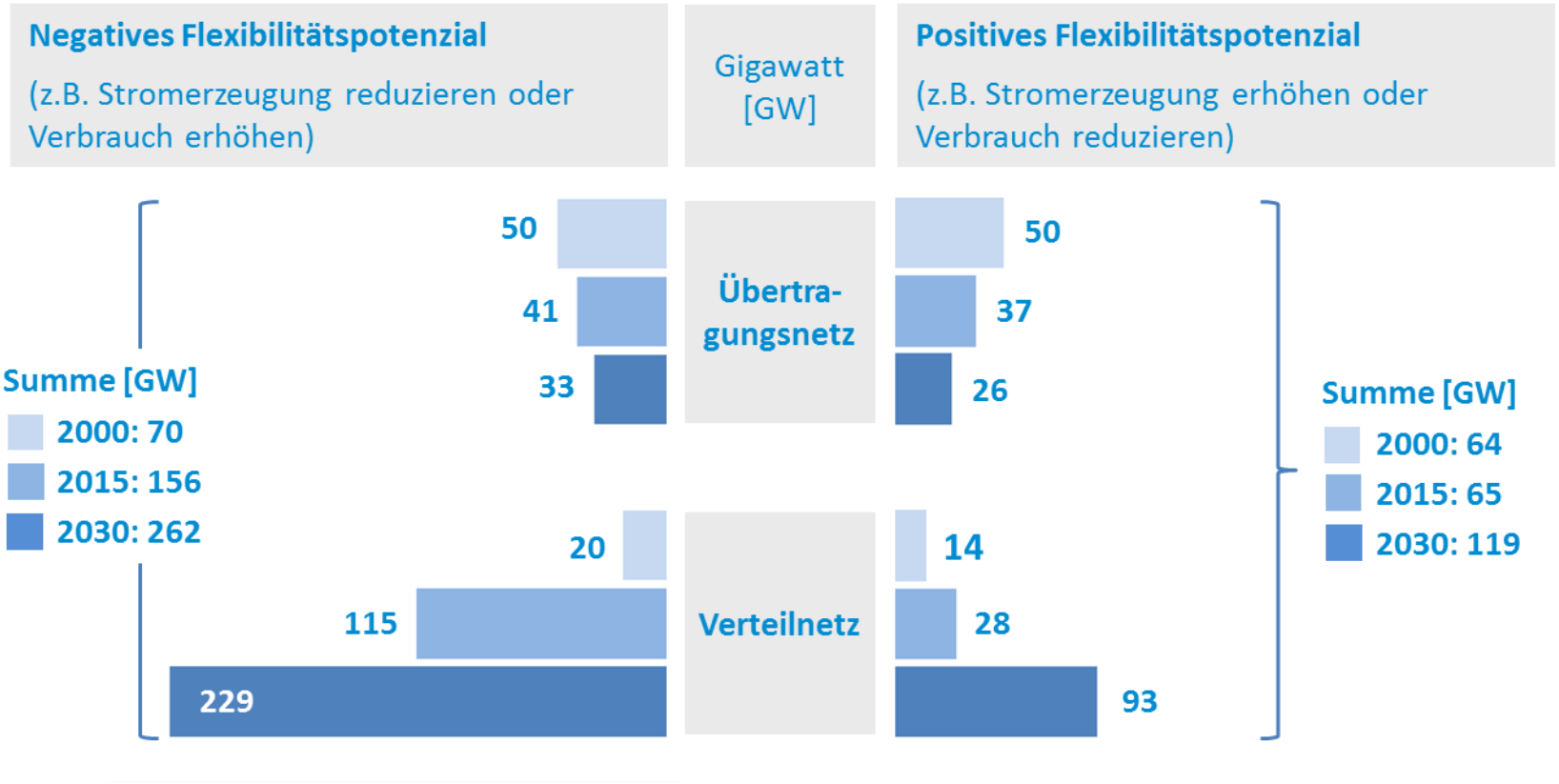
The „Engiewende“ is decentral:
Flexibility is shifting more and more in distribution grids.



Quelle: E-Bridge Consulting, Juni 2017

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Energy Supply in a constantly changing energy system

Changing structure of production

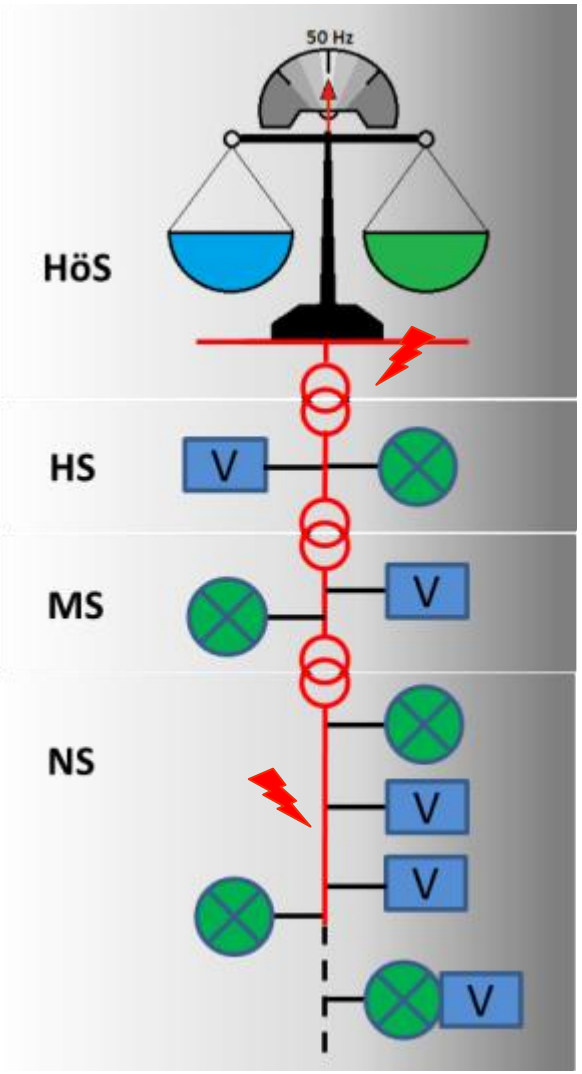
Big power plants are fading out in the next 5 years, many dezentral renewable producers are feeding In the distribution grids

.

Changin structure of consumption

The part of the consumption wich is volatile has to follow the voaltile generation

⇒ **Changing use of the system**
(storage, electromobility, micro-CHP, etc.)



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The DSOs take over more tasks and responsibilities

Significant trends and drivers in the energy sector

- Digitization of the energy sector
- Flexibilisation of production and consumption
- Decentralization of production

Core Tasks of DSO

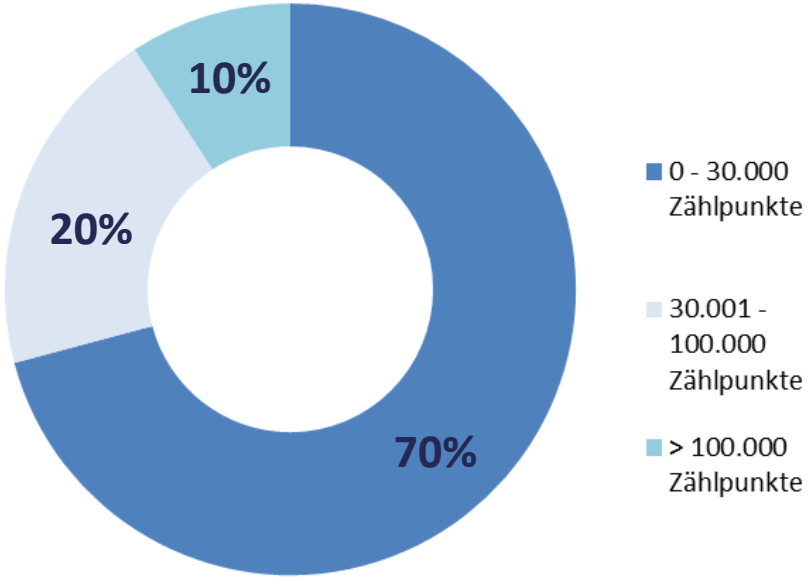
- Metering
- Grid connection and billing
- Demand-oriented network expansion
- Secure grid operation
- Contribution to system stability

Secure grid operation and sytem stability are the new core tasks of the DSO.

Distribution System Operator (DSO) in Germany
Regional oriented Structure.

- Over all 879 DSO – the predominant part works in regional, small structures
- Around 70 % of the DSO (603) supply each less then 30.000 connecting points (i.e. grid users)
- Around 10 % of the DSO (78) supply each more then 100.000 connecting points ans distribute around three quaters of the whole distributetd amount of energy

Size-Structure of the DSO (Connecting Points)

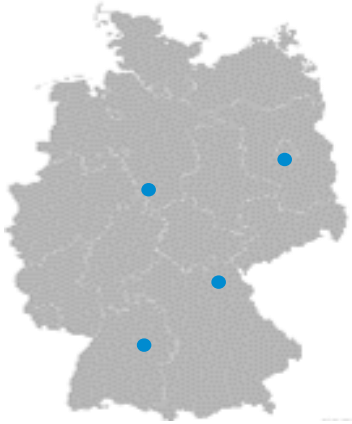


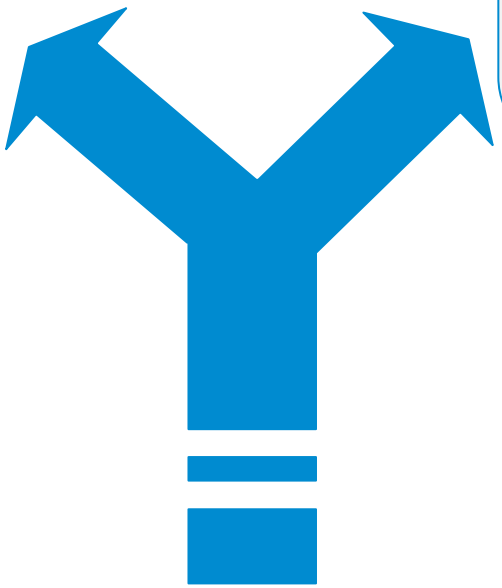
Quelle: BNetzA-Monitoringbericht 2016, S. 33

Politics is at a crossroad

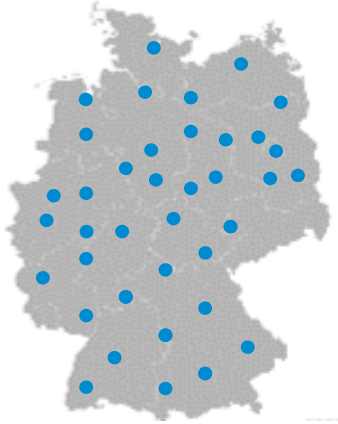
Ensuring system stability is the focus.

Centralisation
With the planned relocation of tasks to the TSOs, the policy takes a risk: unclear ownership structures, less security, creeping abolition of unbundling by "grid stability systems"





Decentralisation
The complexity of DSOs is an advantage: network security and system stability, security against cybercrime, high resilience through honeycomb structure, hybrid networks and sector coupling, regional anchoring

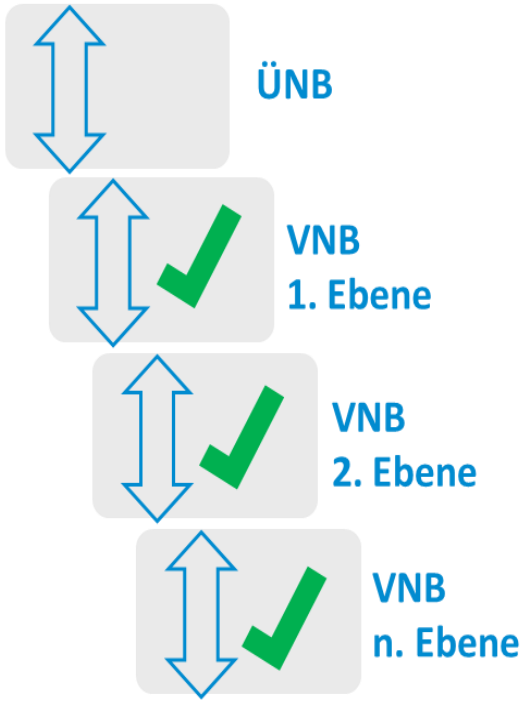


VKU-Study – A new quallity of cooperation
More system-responsibility for DSO.

- **Tasks can only be fullfilled by DSOs because**
  - Raise potential through local knowledge: only DSO as the access network operator knows the local flexibility options
  - Efficiency of the network-related use of the flexibility options: only VNB as a network operator knows the mode of action (sensitivity) of the measures
  - Higher resilience of the energy system: honeycomb structure less vulnerable and quickly regenerating overall system
- **Clear assignment of task, responsibility and decision-making authority through the cascade principle**
- **Clear interfaces between network operators**

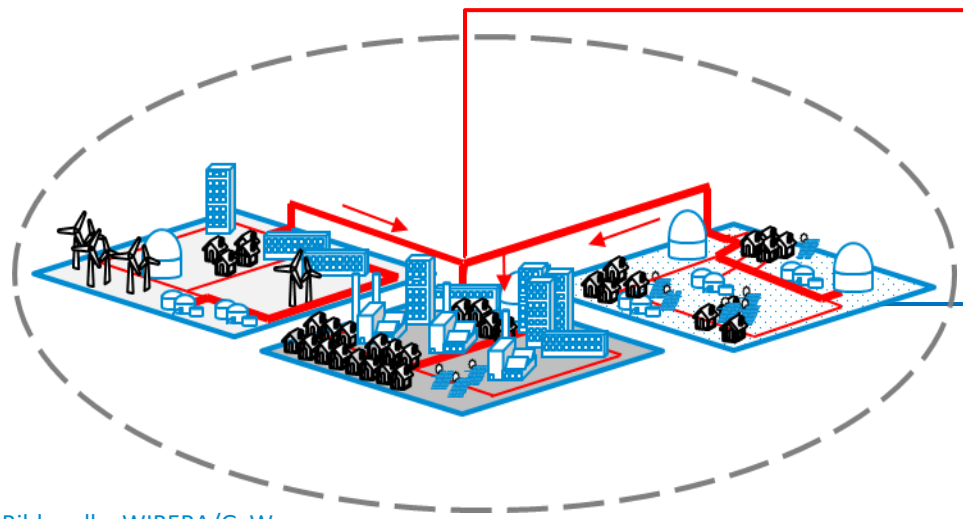
Systemsteuerung im dezentralen Energiesystem:

Kaskadenprinzip für Effizienz und Systemstabilität im dezentralen Energiesystem.



Cooperations as an option for action
Cooperation objectives and coordination tasks.

- Bundling of flexibility options for targeted use for network security and system stability
- Develop synergies
- Coordination of the use of flexibility within a regional cooperation



Bildquelle: WIBERA/GvW

Coordination for the cooperation:

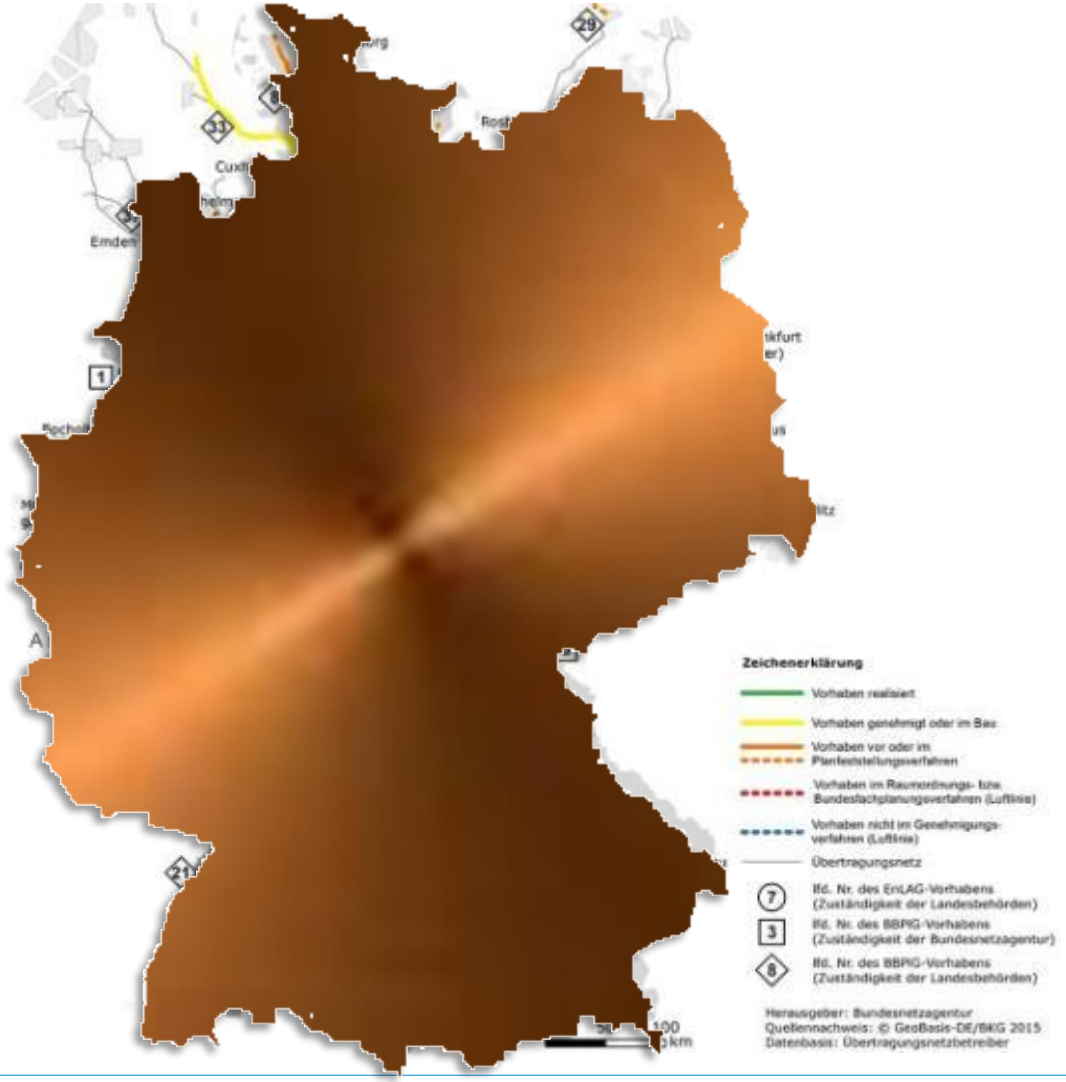
- Capture of basic data
- Evaluation of this data and specification of guidelines for the use of flexibility
- Acquisition and evaluation of the actual data

Tasks of the individual DSOs within the cooperation

- Installation and operation of the sensors
- Control / use of flexibility

The Fairytale of the „Copperplate“…….

An assumption one should not make.



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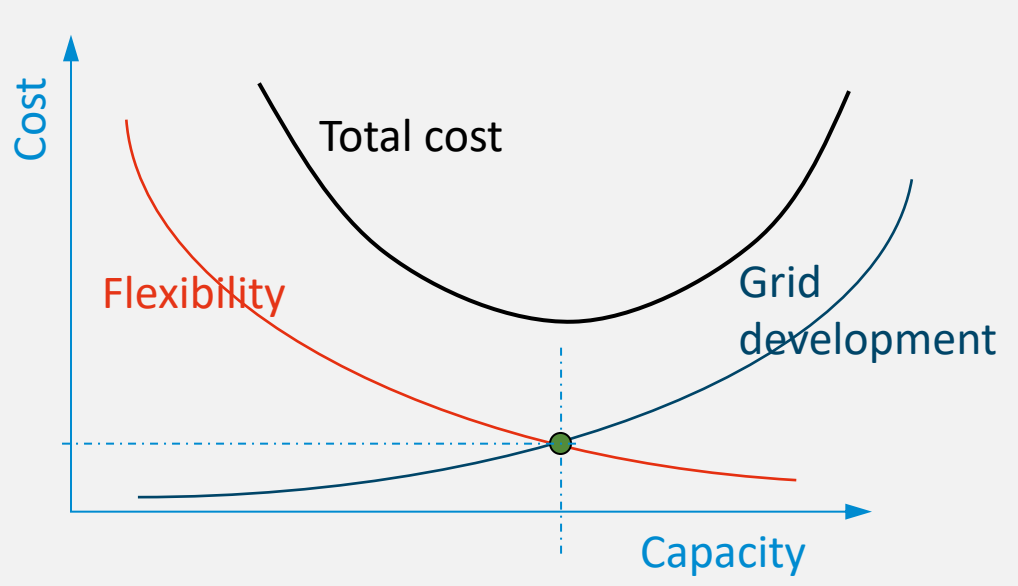
The Energy Supply System of the Future
Preliminary Conclusions

- Decarbonization the energy sector
- Temporarily (high) overlap or rather deficit of eletricity demand
- Changing network usage causes network congestion (physikal), but: network expansion for every possible (rare) case of grid usage is inefficient.
- **Generation = consumption!**

⇒ **The task is the efficient management of congestions**

⇒ **Framework has to fit for a overall optimisation**



Challenges of the current German energy system

Security of supply:

- No full cost calcualtion for power plants out of the current market-design (Energy-Only-Market – **EOM)**
- Missing marginal returns due to decreasing operation hours of power **plants in force**
- Insufficient incentives for investment in **new power generation units**
- Little incentives for investment/use of **storage facilities** and **DSM**-measures

Network infrastructure:

- Comprehensive necessity for **extension** and **investment**, especially with respect to **distribution networks**
- Insufficient compensation for the **implementation of intelligent networks**
- Insufficient **investment conditions** within the **regulation system** for distribution system operators

Thank you for your attention

Rainer Stock
Bereichsleiter Netzwirtschaft

Verband kommunaler Unternehmen e.V.
Invalidenstraße 91
10115 Berlin
Fon +49 30 58580–190
Fax + 49 30 58580–101

www.vku.de
stock@vku.de

VERBAND KOMMUNALER UNTERNEHMEN e.V.