

## Cooperation between TSO and DSOs to maintain system security

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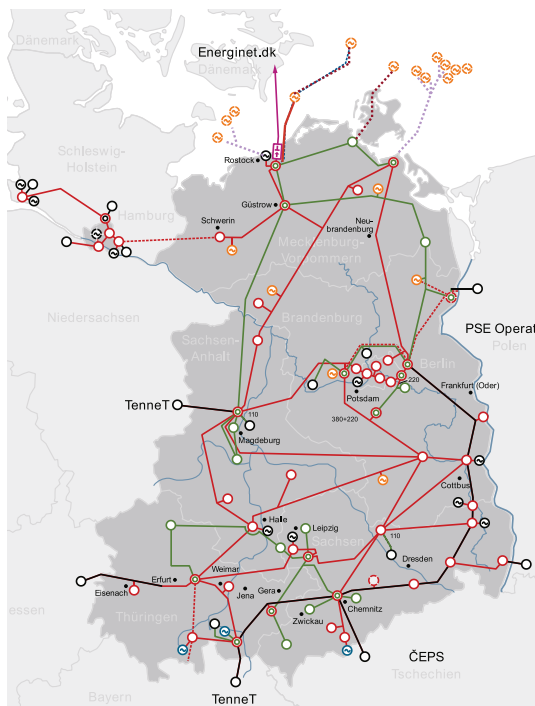


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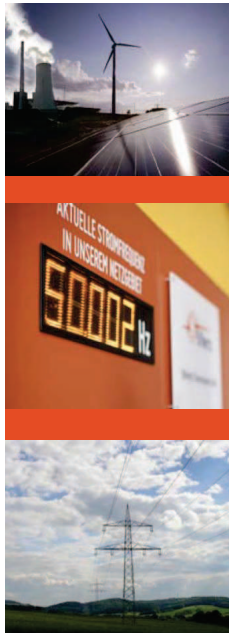
### 50Hertz at a glance

\*) end of 2011



	amount (related to DE)
area	109.360 km <sup>2</sup> (31%)
line length	9.840 km (28%)
Maximum load	ca. 15 GW (18%)
consumption	98 TWh (20%)
Installed capacity: - thereof renewable - thereof wind	ca. 37.400 MW (25%) 16.700* MW (31%) 11.550* MW (41%)
employees	ca. 700
Turnover - grid	6,9 Mrd. € 0,6 Mrd. €

## Tasks and responsibilities of TSOs



### Tasks of TSOs

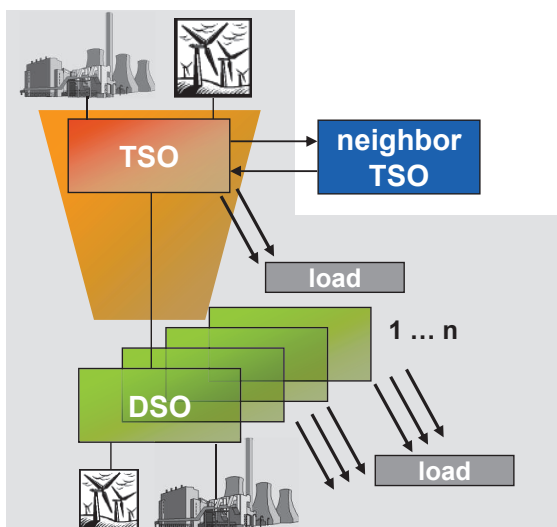
- grant non-discriminatory access to the grid
- Security of supply
  - frequency (50 Hz)
  - Voltage stability (400 kV)
  - grid utilization (n-1)
- grid extensions according to requirements

### Additional challenges

- Large scale integration of renewable sources
- pan-european market development / realization of the 3. EU internal electricity market regulation
- new technologies (SVC, HVDC, ...)
- managing and mastering congestions

**According to ACER Framework Guidelines, now and in the future TSOs are responsible for system security.**

## allocation of responsibilities between TSO and DSO



### allocation of responsibilities

- TSO is inter-area system operator and grants security of supply
- DSO is regional system operator and receives / offers local system services

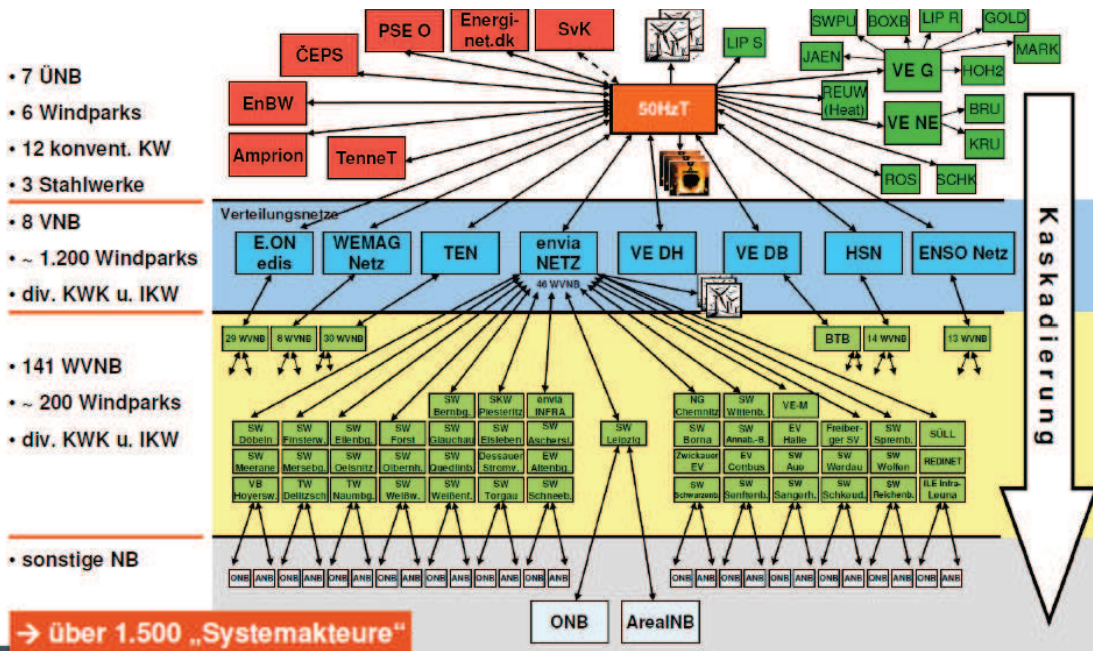
### Goals

- flexible information exchange using Smart-Grid ICT
- development of new and complex system services or products with positive effect on system security

**Due to TSO and DSO have to cooperate more intensely, responsibilities have to be clearly allocated.**

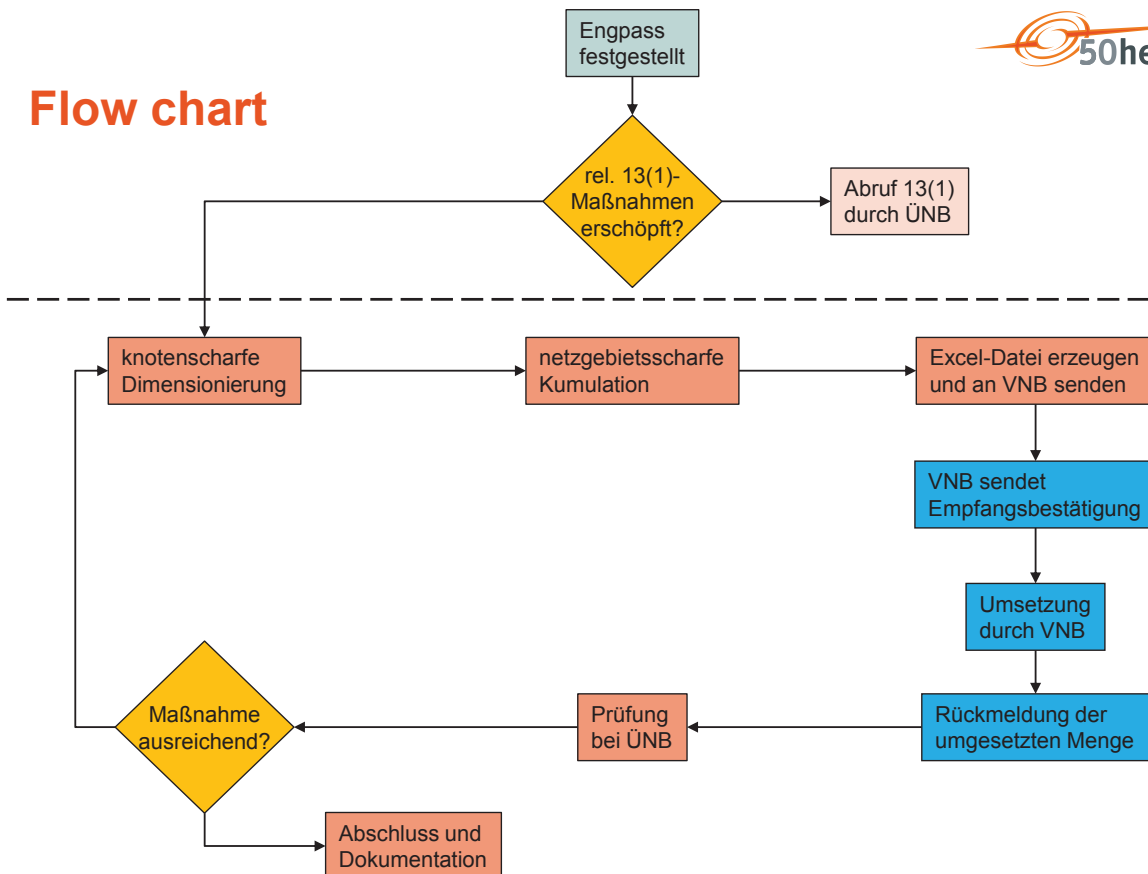


## Information exchange using a cascading system



The cascade is transparent and reduces obstacles during remedial actions

## Flow chart



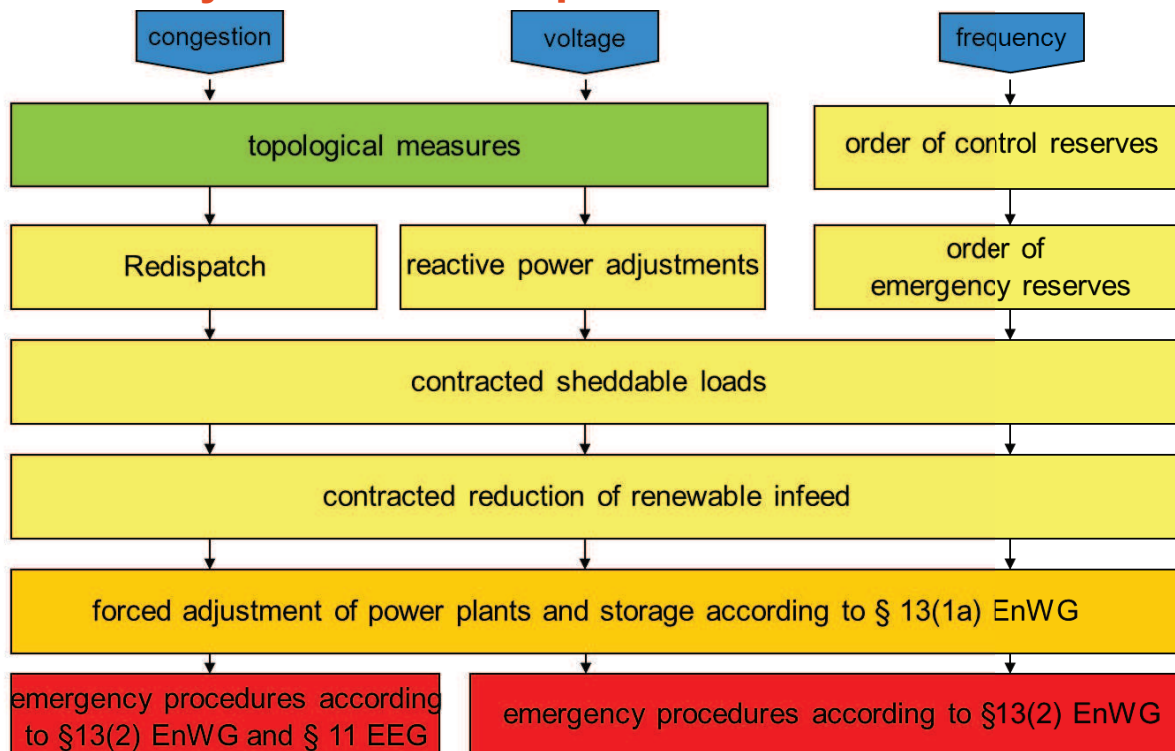
**Thank you for your attention.**

Questions?

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## mandatory escalation steps of remedial actions

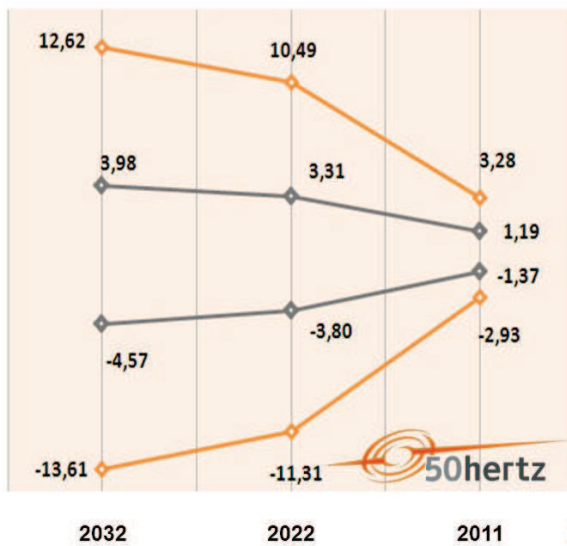




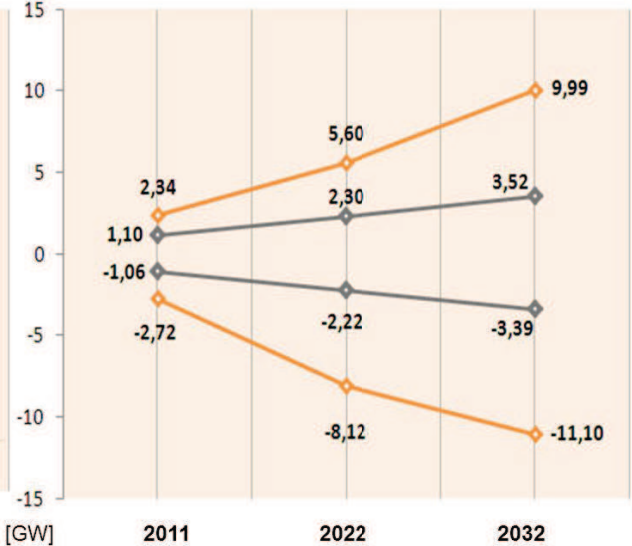


## Maximum Power Ramps in German Electricity System

Maximum power ramps caused by German PV power \*



Maximum power ramps caused by German wind power \*\*



\* Installed German PV power for 2011 was 19,47 GW (source: "Stammdatenbank" of the four TSO's)

\*\* Installed German wind power for 2011 was 28,82 GW (source: IWES "Windenergiereport Deutschland 2011")

In 2022 and 2032 the data of the installed power as well as the 1 hour ramps can be found in "Leitszenario (B)" of the NEP (source: plan for the development of the German transmission grid: "Netzentwicklungsplan 2012"). The ¼ hour ramps for the years 2022 and 2032 are linearly extrapolated by using the maximal ramps per ¼ hour of 2011 (source: feed-in data of the four German TSO's).



## Inter-operator communication in the Smart Grid I



### challenges

- increasing amount of volatile renewable generation
- decreased installed capacity in transmission systems
- increasing risk of violations of system security
- installed capacity in underlying distribution systems has to be used to support the TSO

### Integration of DSOs and market participants

- information exchange between players gets more and more important
- DSOs are needed to offer reliable Informationen on system condition → Ampel reicht nicht aus
  - avoid competitive measures
  - inform on own potentials to avoid obstacles
  - transparent and non-discriminatory application of remedial actions

**Smart Grid is based on fast and reliable information exchange between all players**