



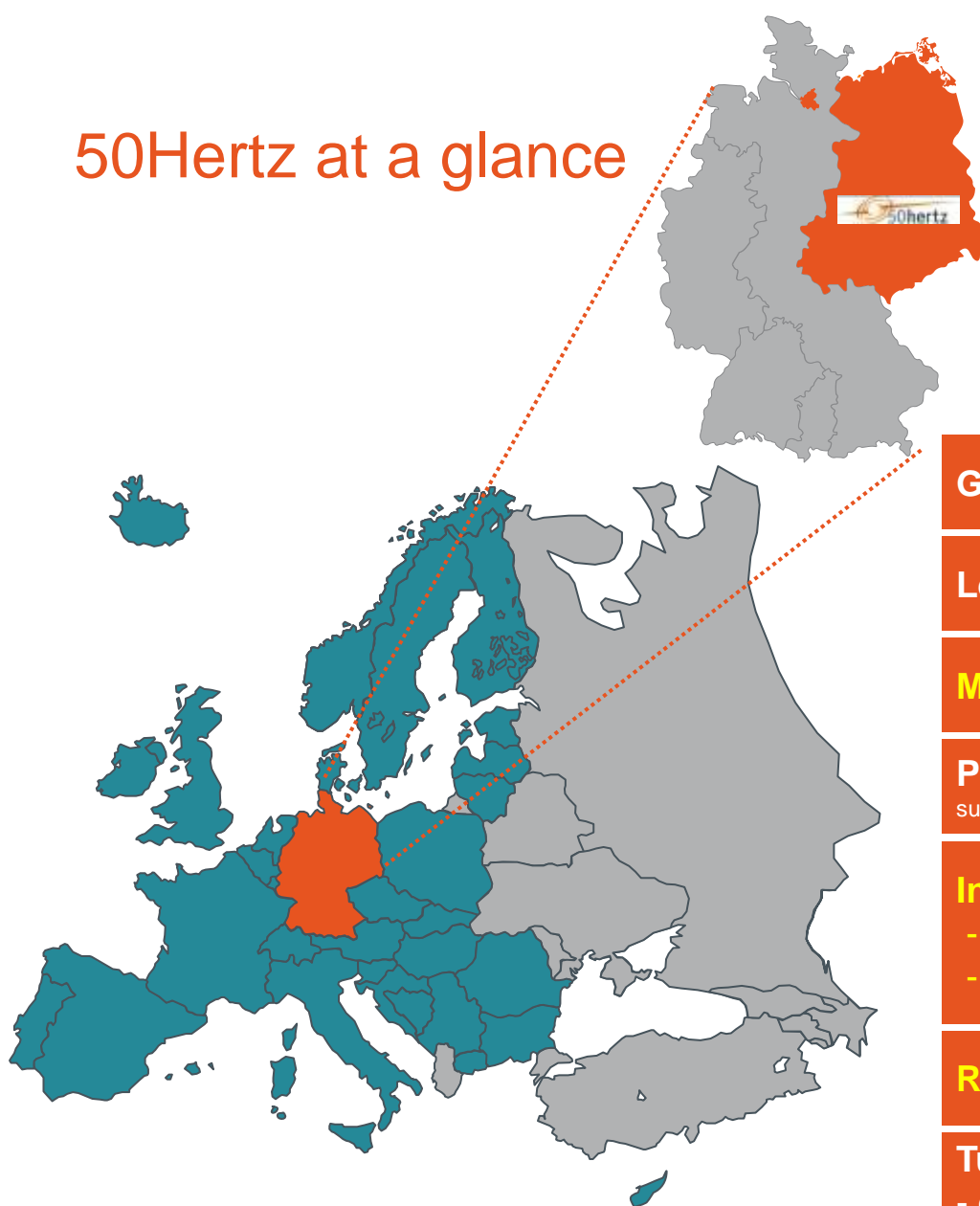
Cooperation of Transmission System Operators at the German – Polish Border

German – Polish Cooperation in the Energy Sector / Interconnections of European Importance

Gert Schwarzbach, 50Hertz Transmission GmbH
Hannover Fair, 24 April 2017



50Hertz at a glance

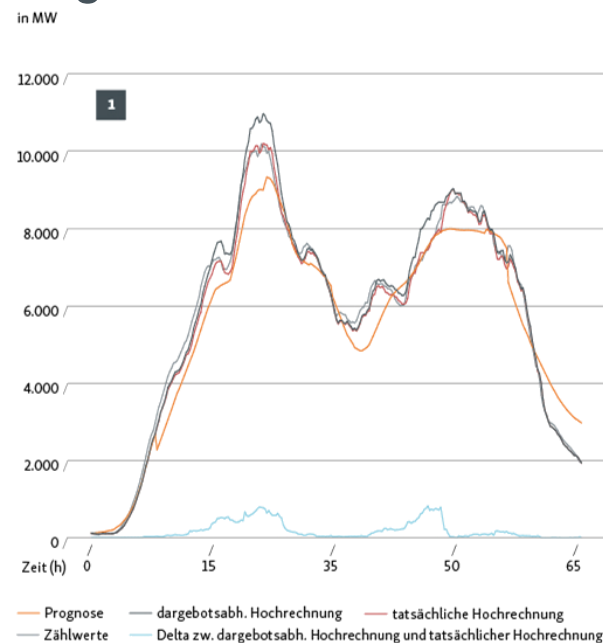
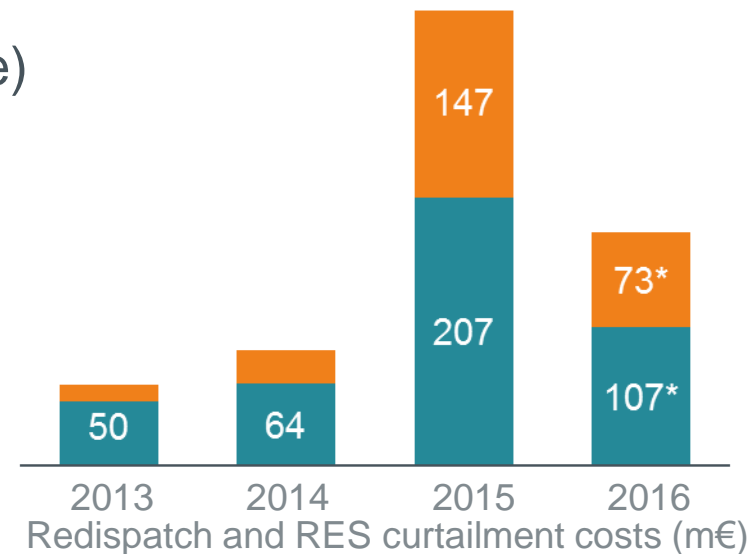


	2016	2010
Grid area	109.589 km ²	109.360 km ²
Length of lines	10.215 km	9.800 km
Max. Load	ca. 16 GW	ca. 17 GW
Power consumption (based on electricity supplied to end-consumers in acc. with the EEG)	~ 96 TWh	ca. 98 TWh
Installed capacity: - of which Renewables - of which Wind	51.686 MW * 28.435 MW * 17.129 MW *	38.354 MW 15.491 MW 11.318 MW
RES share in power consumption	47,8%	ca. 25%
Turnover - of which grid	9,5 Mrd. € 1,3 Mrd. €	5,6 Mrd. € 0,6 Mrd. €

Source: 50Hertz; As of 2016/12/31 - *preliminary figures – final figures will be available on 2017/08/31

Some Challenges of German “Energiewende” for a TSO

- Connection of RES to TSO+DSO grids (+ offshore)
- Balancing of feed-in increases and drops
- Secure system operation+ redispatch
- Grid extension (AC, HVDC)
- Transmission + storage (interconnectors)
- Market integration and market design changes

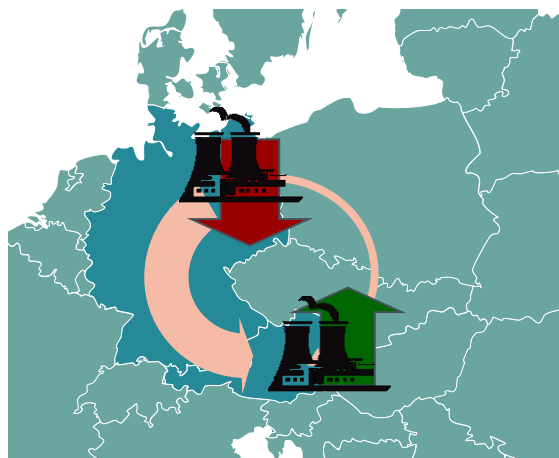


Wind energy feed-in (27.9. – 30.9.2016)

Maximum feed-in	13.398 MW
Minimum feed-in	25,2 MW
Strongest feed-in increase within a ¼ hour slot	2.130 MW
Strongest feed-in drop within a ¼ hour slot	-2.487 MW
Strongest feed-in difference Min. and Max. in one calendar day	8.382 MW

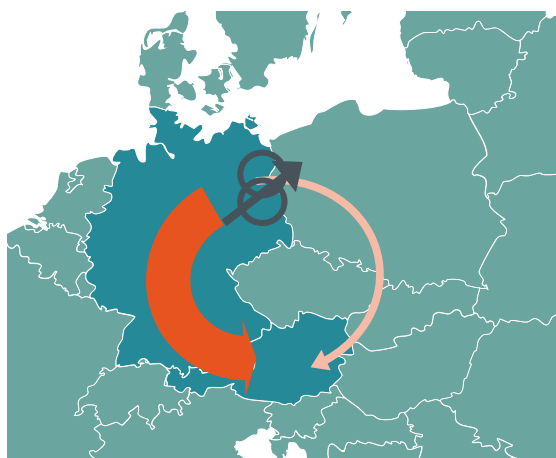
Counter-measures to master unplanned load flows through the grid

Re-dispatch („virtual PST“)



- Reduces system-security-relevant flows
- The challenge is to grant efficiency and cost effectiveness
- Pilot 2013, Operation 2014-16

Phase shifters (physical PST)



- Reduces system-security-relevant flows
- Requires major investments
- Commissioning 2016-18(20)

Grid extension



- Grants security of the whole electricity system
- Paves the way for an integrated European market

Short-term

Mid-term

Long-term

PST in substations Mikulowa and Vierraden



Gradual PST installation in Vierraden substation

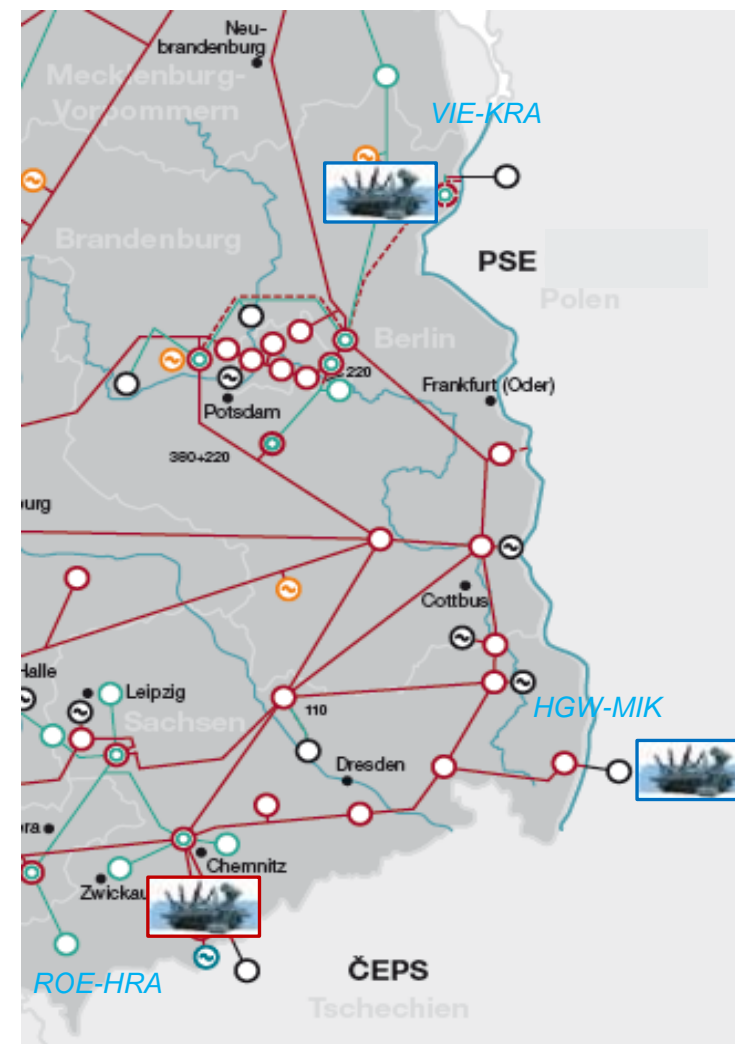
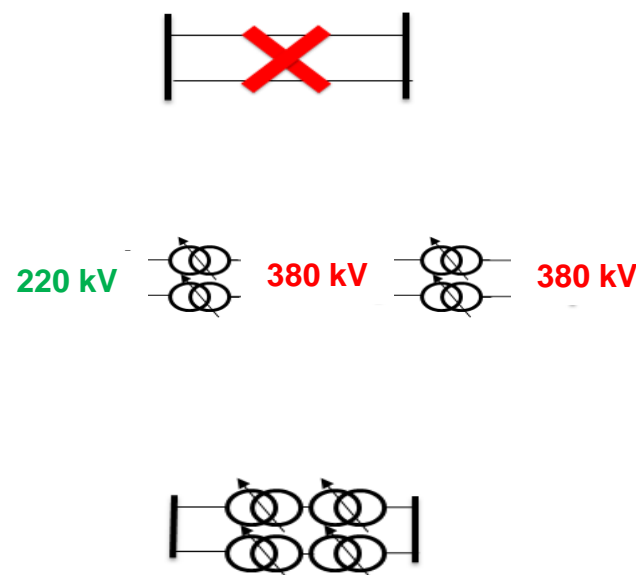
1. Temporary disconnection of VIE-KRA interconnection after commissioning PST in Mikułowa substation (06/2016)

2. Re-connection of VIE-KRA interconnector on 380 kV with 2 PST and 2 380/220 kV transformers connected to 220 kV (2018)

3. Final mode of PST operation with 4 PST units connected to 380 kV grid (upgraded Uckermark line, ≥2020)

Example of good cooperation:

29.04.-10.05.2017 maintenance of Dolna Odra power plant supported by temporary re-connection of VIE substation to Krajnik substation (220 kV) in order to secure system operation in Northwest of Poland



Thank you for your attention!

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