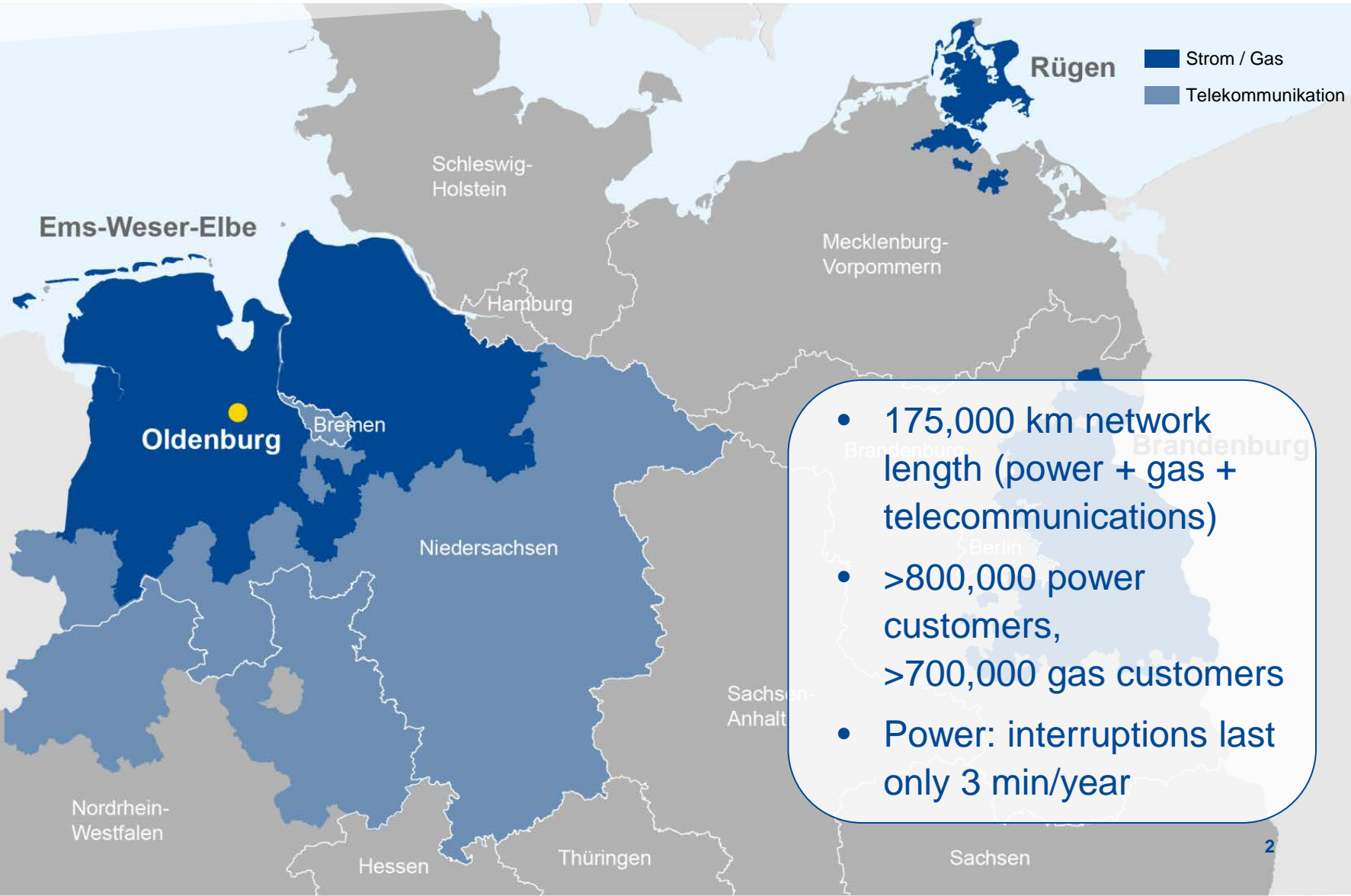


A child is climbing a rope net structure, which is a complex network of thick, dark ropes. The child is wearing a dark jacket and light-colored pants. The background is a bright, overcast sky. The rope net structure is the central focus of the image, with the child positioned in the upper right quadrant. The overall scene conveys a sense of challenge and flexibility.

Flexibility options – a distribution system operator perspective

Berlin, 24 September 2015
Dr. Sascha Schröder

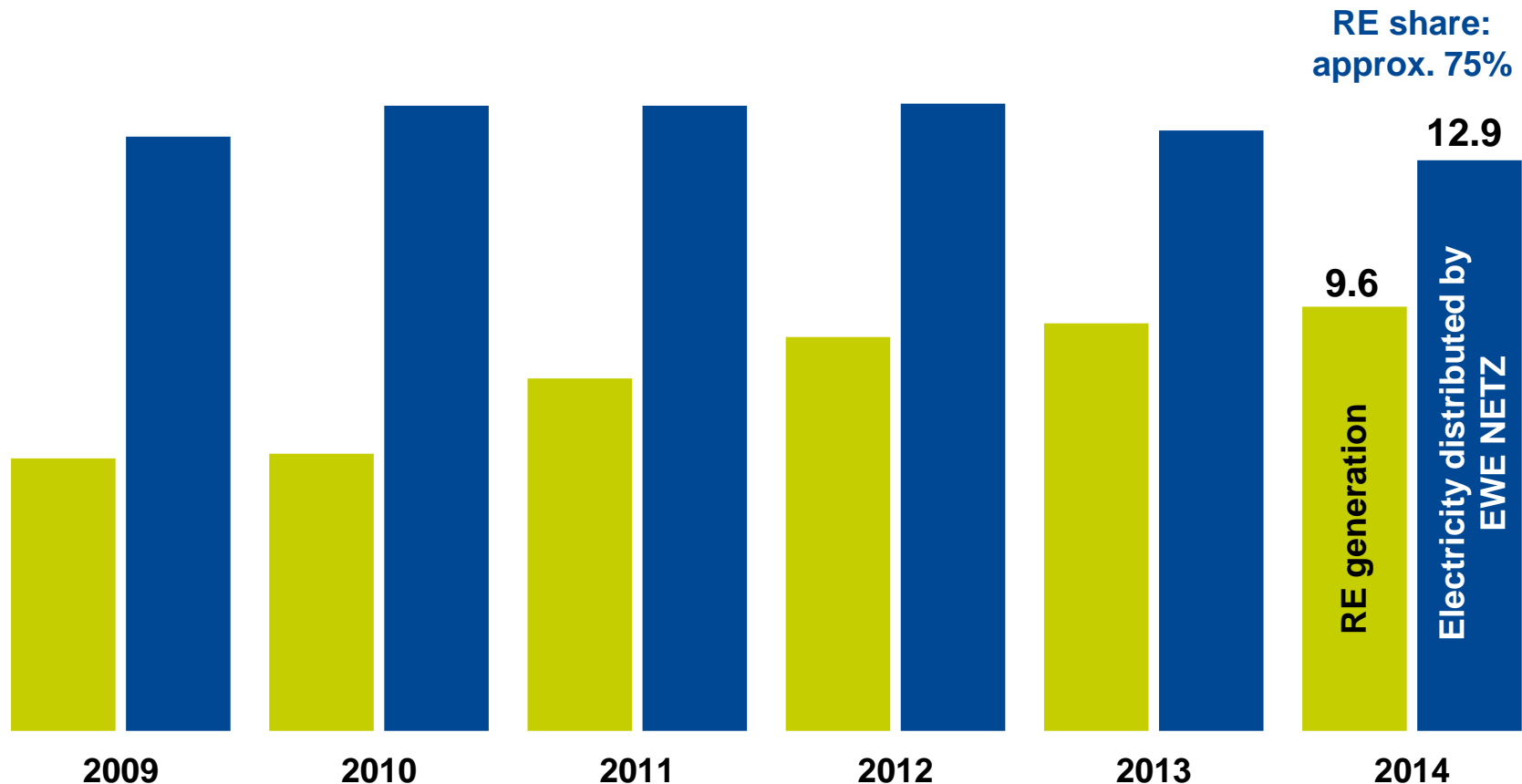
EWE NETZ: Caring for reliable and modern distribution grids



2014: 75% of distributed power generated by renewable generation within the region



TWh



Flexibility options



Demand-side management

Battery storage systems (different demonstration projects)

Controllable substations (installing 260 until 2016)

Curtailment of renewable generation

...

How would you dimension network capacity?



Offshore connection, Germany:

Interconnector capacity = 100% of installed wind capacity

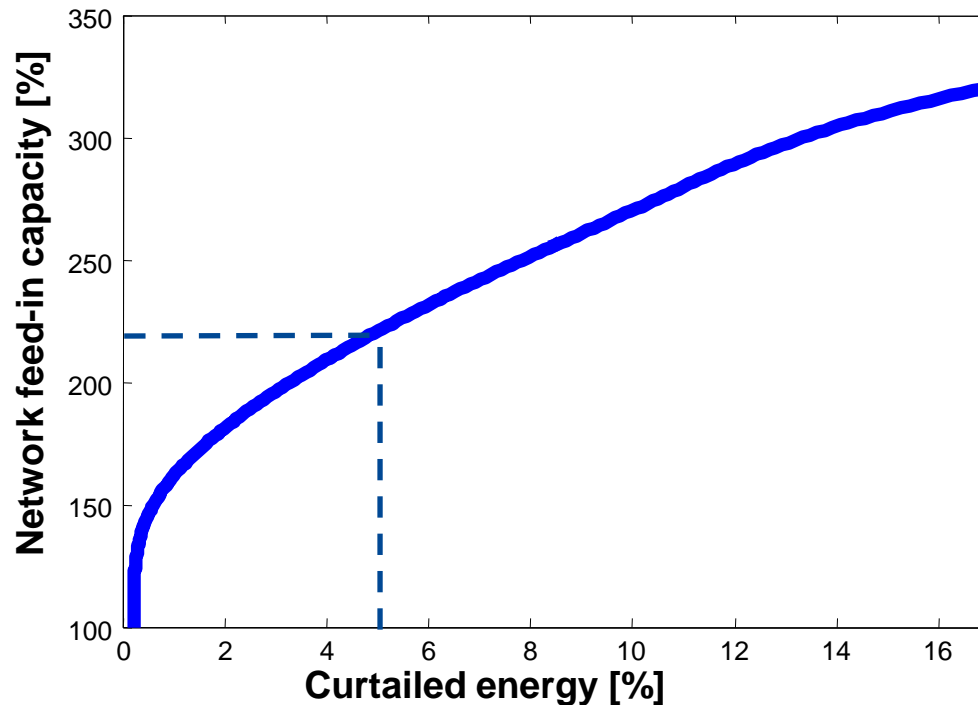
TSO ordering the interconnector

Offshore connection, United Kingdom (former regime):

Interconnector capacity = 90% of installed wind capacity

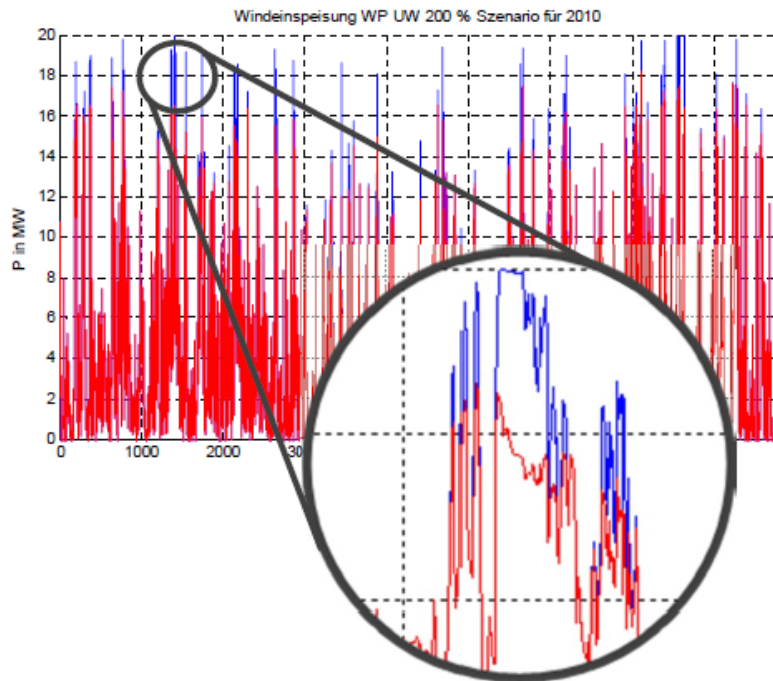
Wind farm ordering the interconnector

Generation curtailment and network feed-in capacity

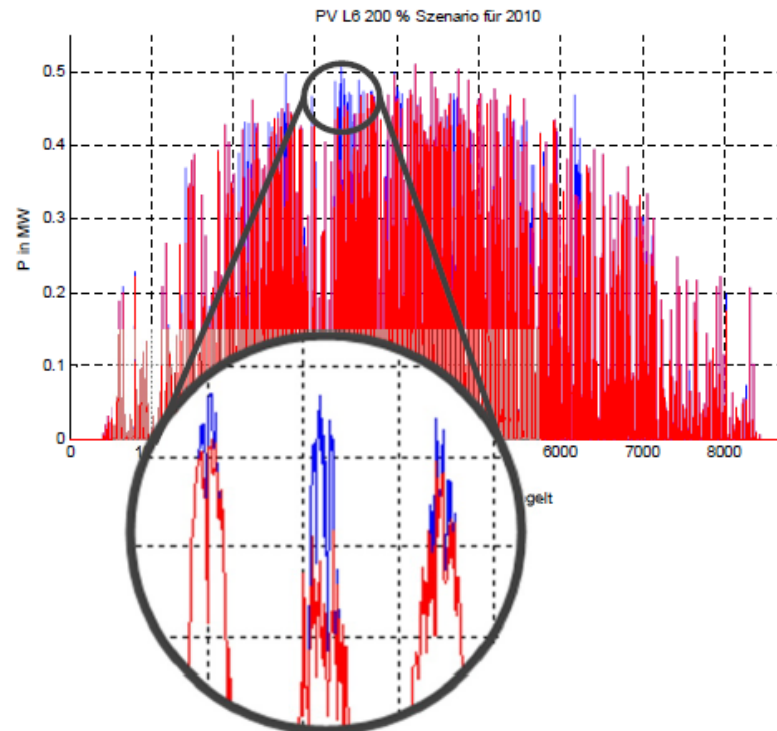


Curtailing 5% of annual generation allows doubling the feed-in capacity of the distribution grid!

Wind farm connected to a 20kV transformer



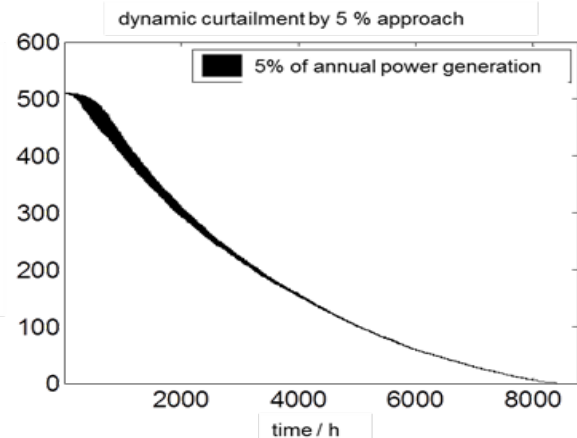
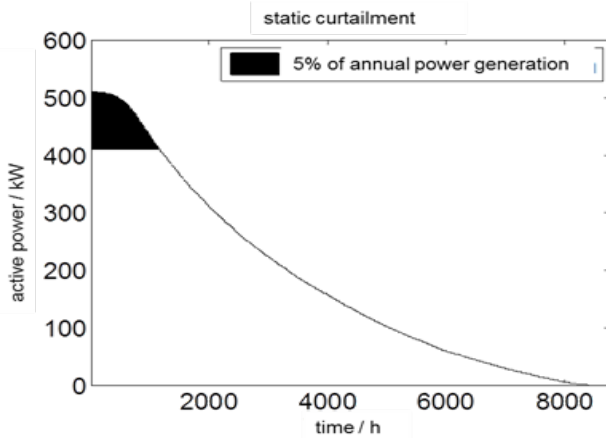
PV connected to the low voltage grid



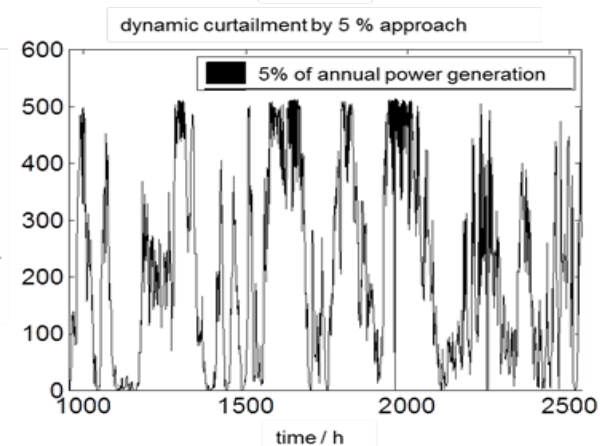
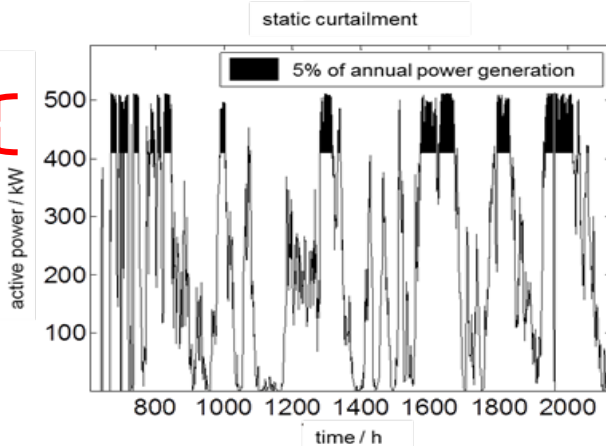
**Efficiency driver:
Moderate curtailment according to prevailing network status**

Dynamic vs. static curtailment

Removed strain

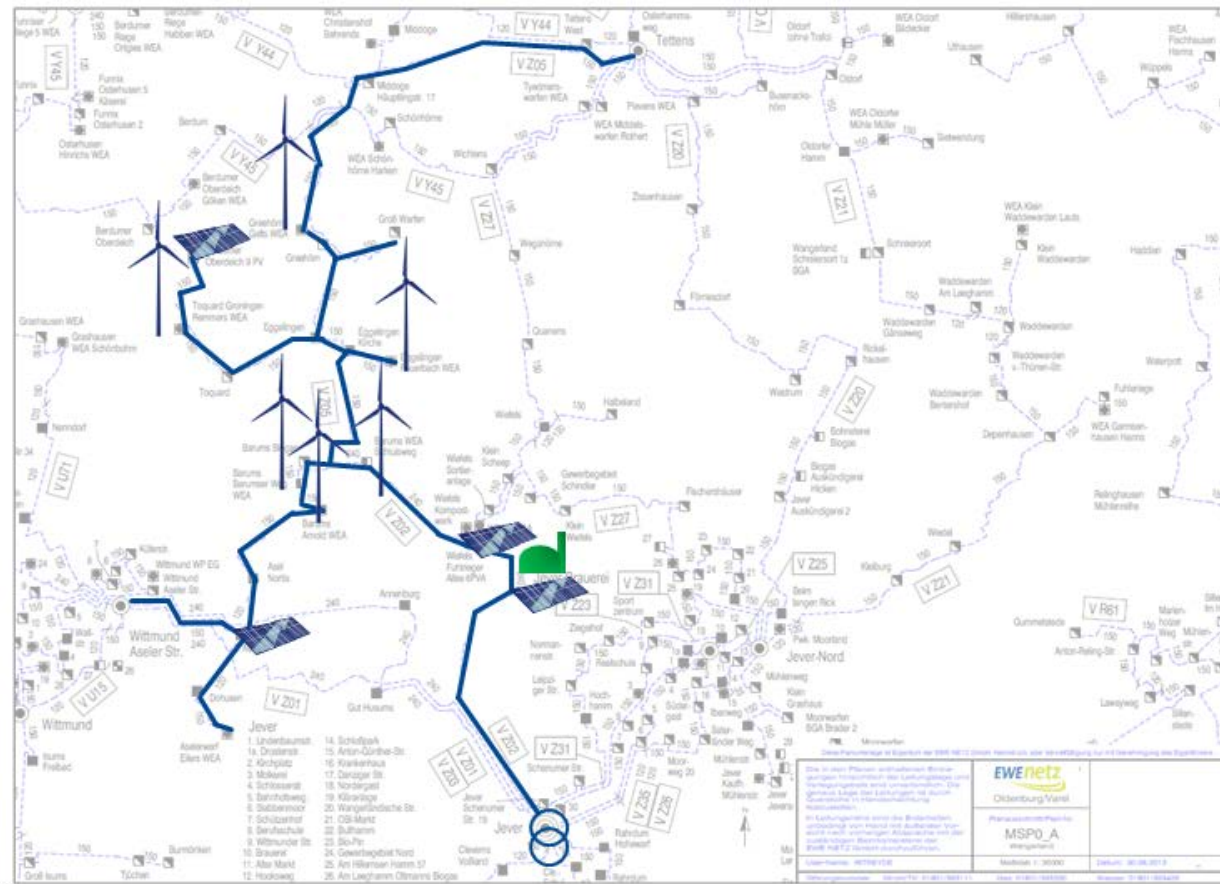


Removed strain



Dynamic curtailment has a far more beneficial effect for the network

5% demonstration site



➤ 11 decentral generation units, combination of wind / PV / biogas

enera demonstration project (application)

Covering 4 counties:

2.665 km²

200.000 households

390.000 inhabitants

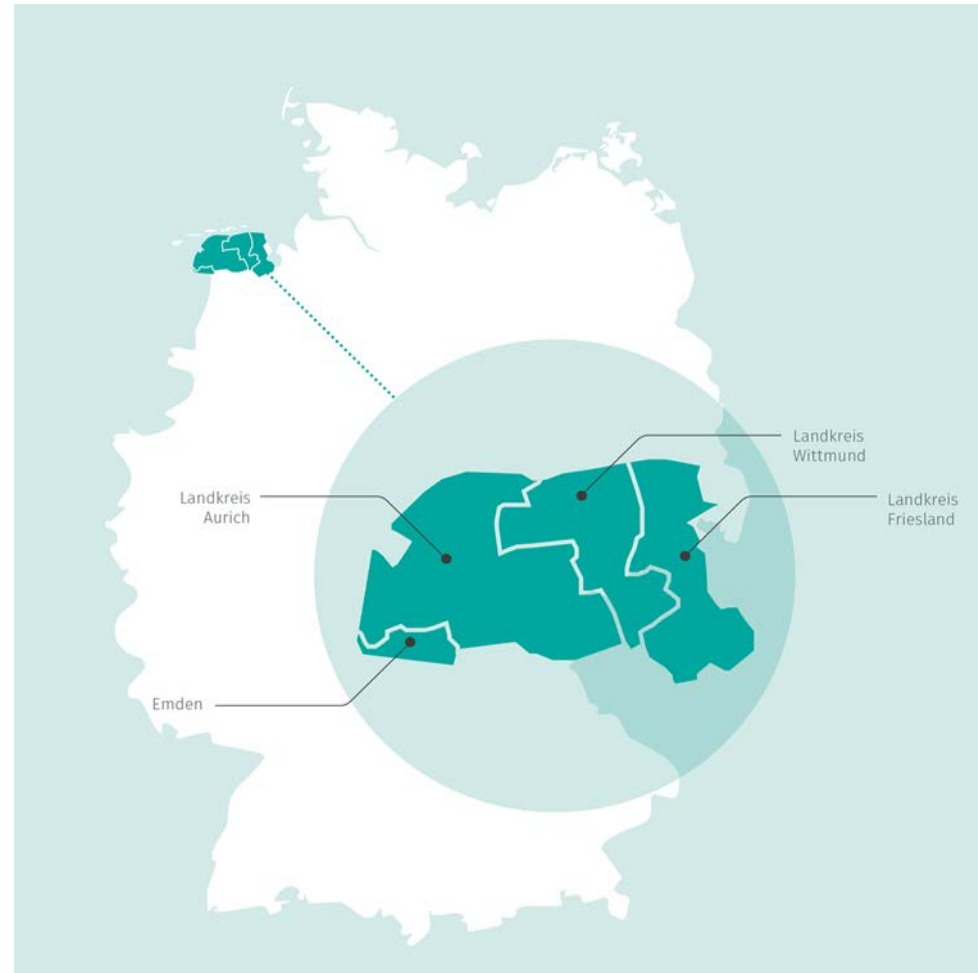
1,75 GW installed RE capacity

1,50 GW installed wind capacity

170% RE generation/consumption

200 Mill. Euro

Inter alia: 40.000 smart meters



Conclusions

- Short-term: 5% dynamic curtailment allows massive RE investment without raising network charges!
- Dynamic curtailment in general superior to static curtailment
- Technical feasibility of 5% dynamic curtailment has been proven in small demonstration project
- Next step: large-scale wind integration demonstration project *enera*
- Complements to curtailment: controllable substations, battery storage systems, ...



Thank you for your attention!

Dr. Sascha Schröder

EWE NETZ GmbH

Cloppenburger Str. 302

26133 Oldenburg

[sascha.schroeder\[at\]ewe-netz.de](mailto:sascha.schroeder@ewe-netz.de)

www.ewe-netz.de

EWEnetz