Smart Grids for renewable Energy Integration

Institutional and Energy Market Aspects

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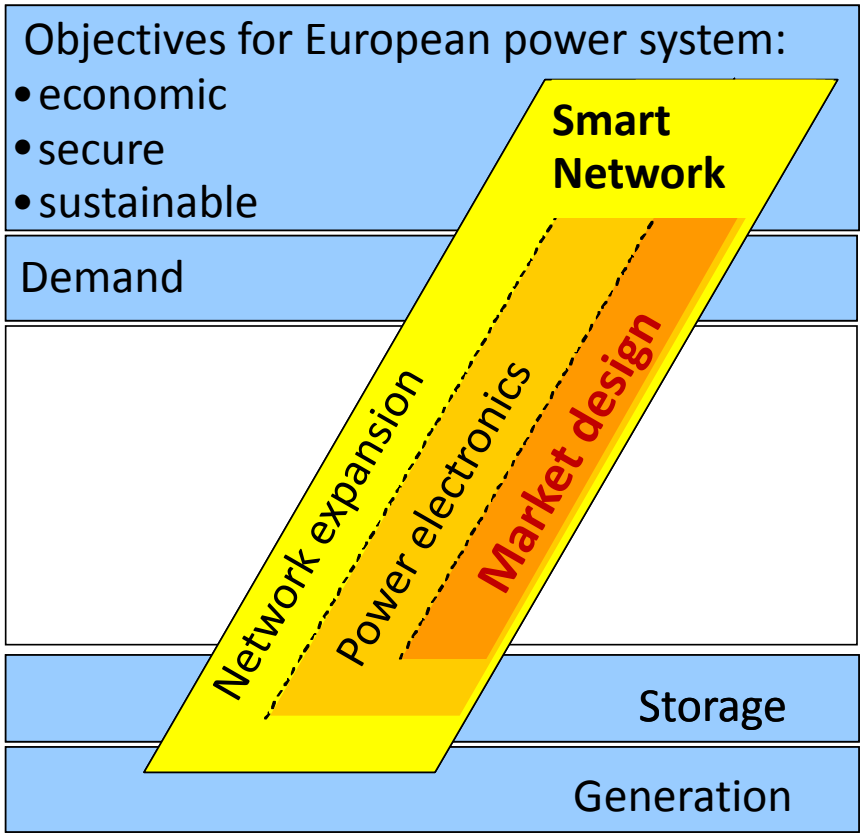
RE-Shaping
Shaping an effective and efficient European renewable energy market

Smart Grids for renewable Energy Integration

use grid across Europe effectively to lower costs and emissions

match physical reality to ensure continuity
- **for contracts**
- **for investments**
- **for innovation**



create transparency to decide on and communicate grid expansions

operate DC lines to support European market

shield RE projects from grid delays

Effective power market design necessary, not sufficient, to decarbonize power.

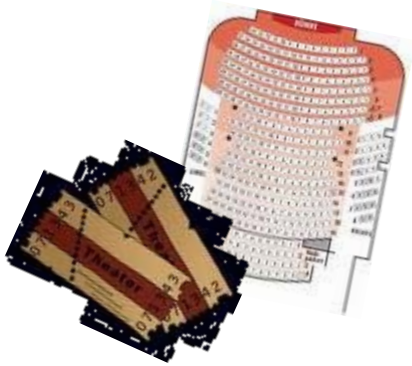
Is the current design open for renewables?

CLIMATE POLICY INITIATIVE
Karsten Neuhoff

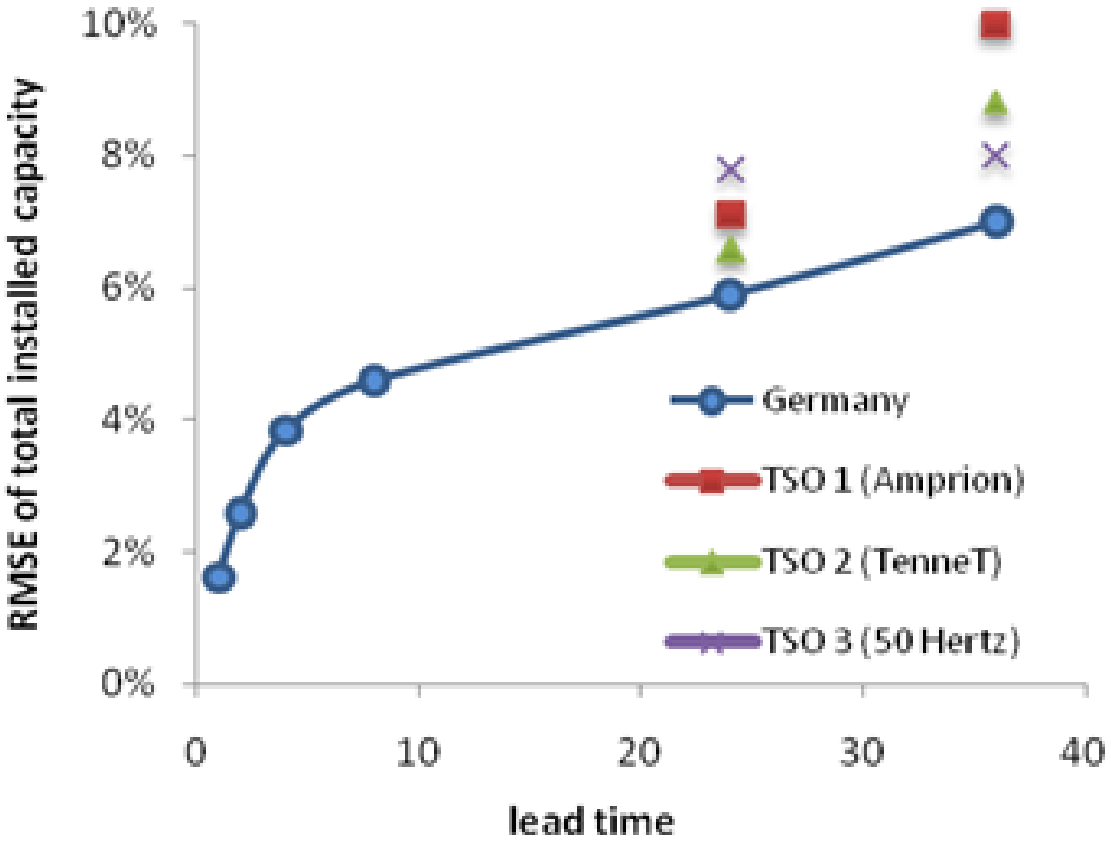
Report available at www.climatepolicyinitiative.org

RE-Shaping
Shaping an effective and efficient European renewable energy market
DIW BERLIN

The time to trade



Wind forecasts improve 4 hours before real time



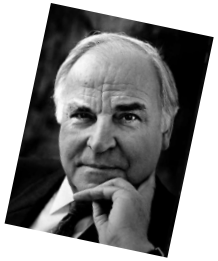
- Currently trading/transmission allocation focused day ahead
- Many power stations/grid can respond short time
- But power market design limits participation of actors

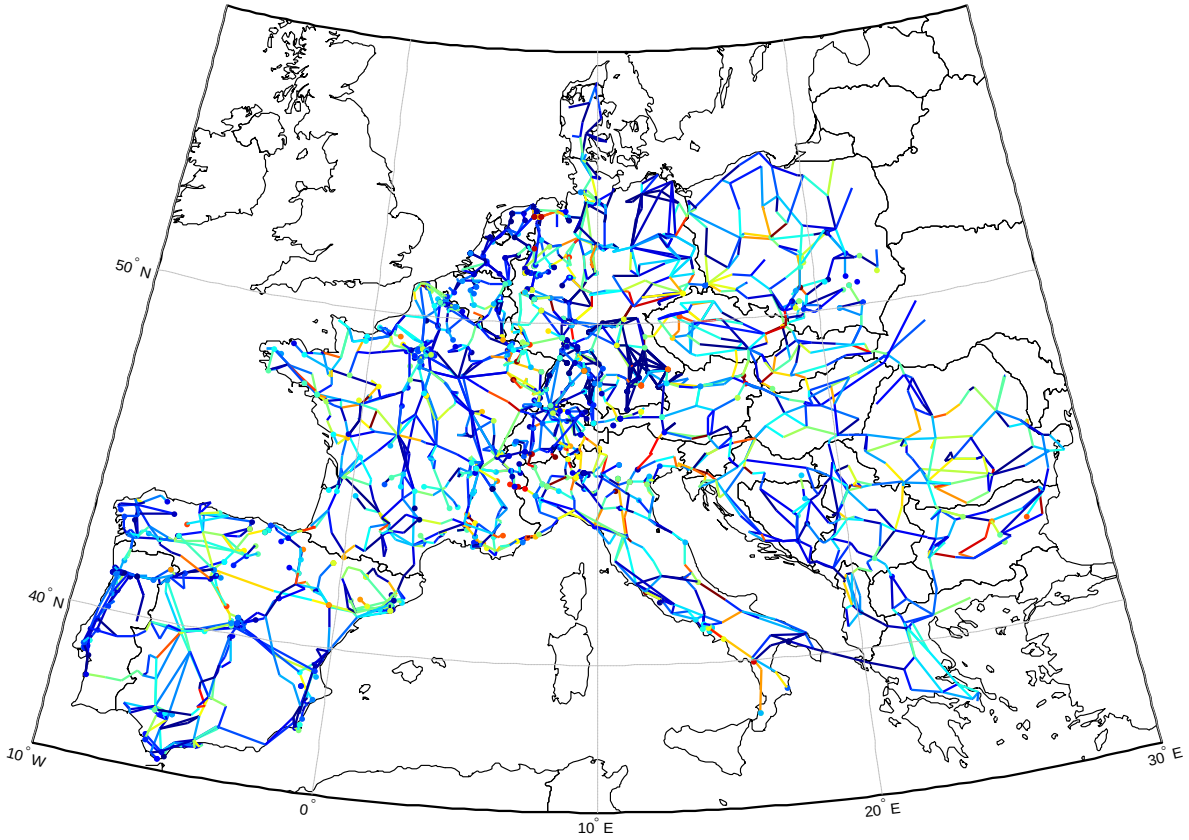
Combining products

	Dispatch adjusted during day	Balancing requirements / provision adjusted during day	Flexible use of individual power stations	International integration of intraday & balancing markets	Integration of demand side response services	Effective monitoring of market power possible
UK System				N/A		
German system		N/A				
Nordpool						
Spanish system				N/A		
Nodal pricing system						

Based on: Borggrefe and Neuhoff 2010: Balancing and Intraday Market Design – Options for wind integration

Issuing multiple property rights



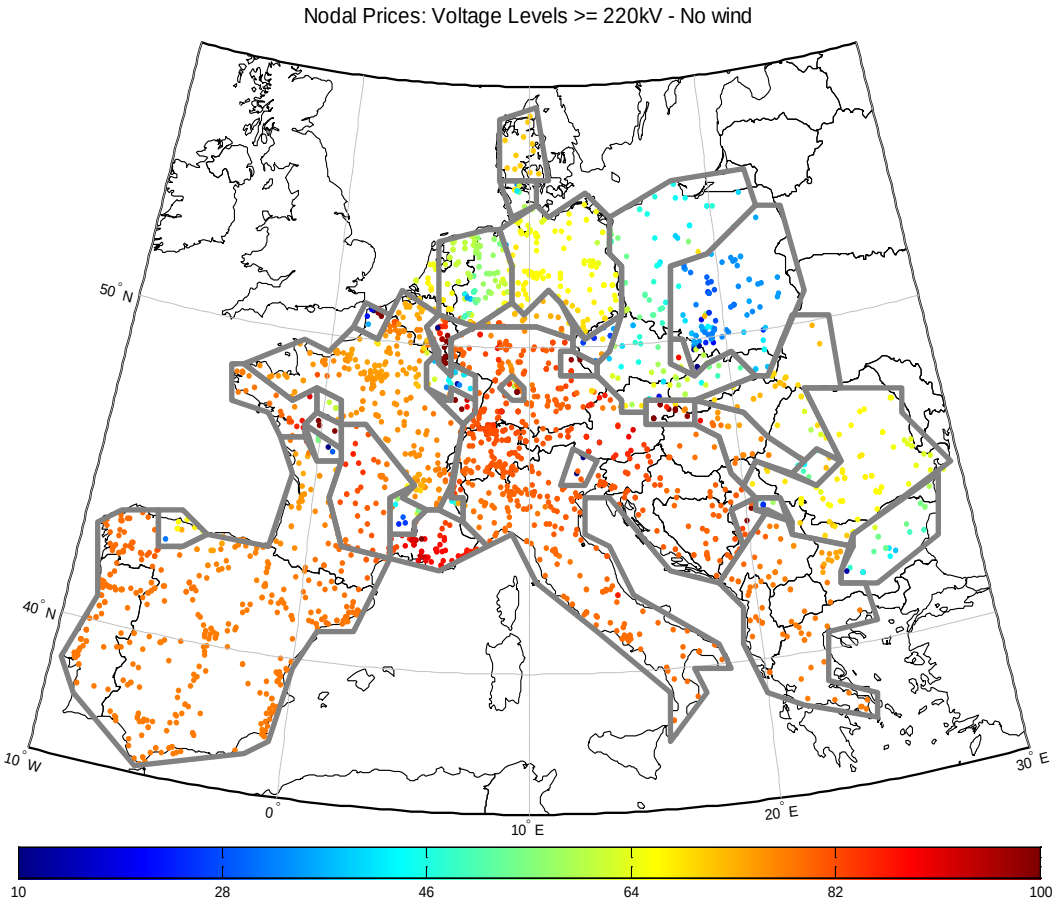


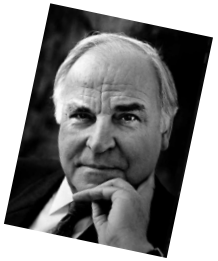
- Transmission not allocated within market – TSO have to buy back capacity

  -> inefficient, costly and creates opportunities for gaming.

Zones for zonal pricing do not match national borders

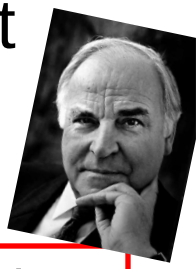
No wind



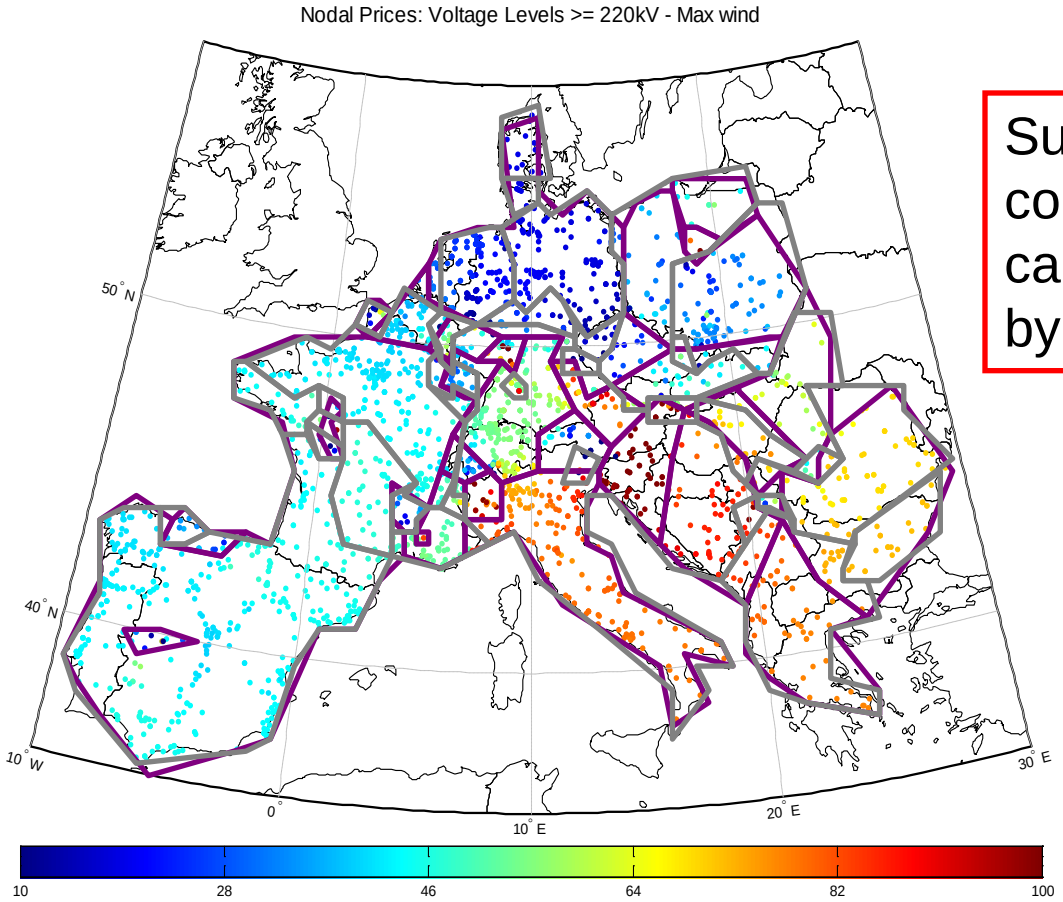


Source: Model results from the Intelligent Energy Europe project Re-shaping

And zones with similar price change with wind output



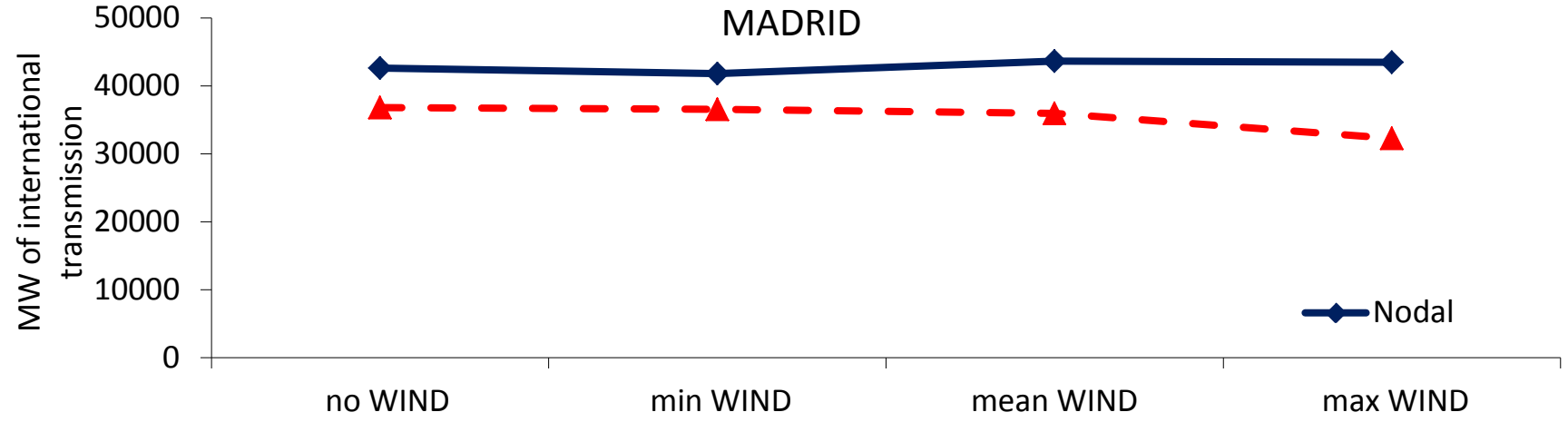
Max wind

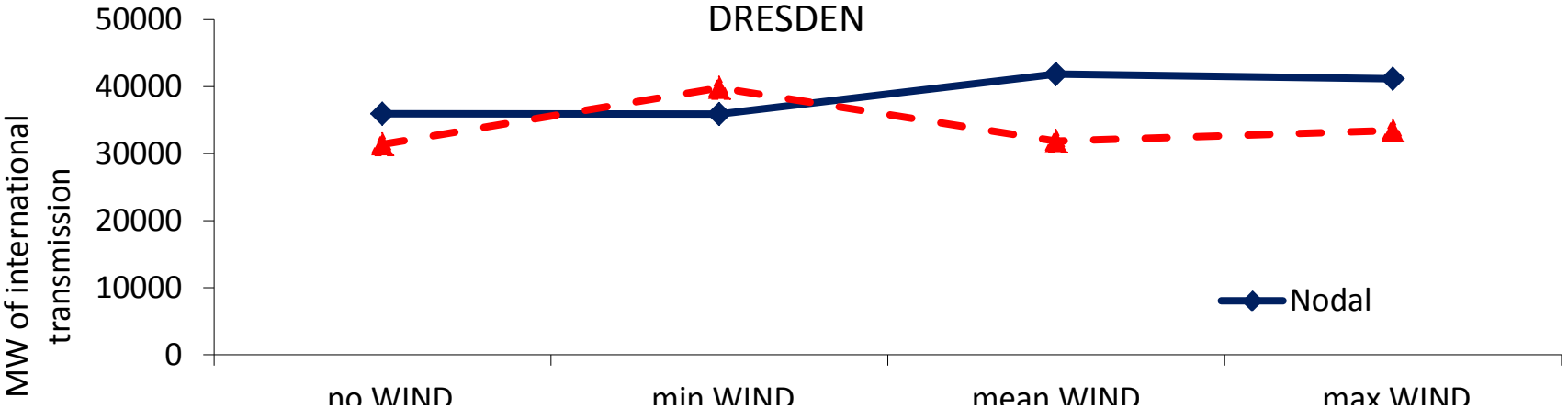


Suitable zones in congested network can change hour by hour

Source: Model results from the Intelligent Energy Europe project Re-shaping

Constraining flexibility





Annual savings 0.8-2 billion Euros from better system operation

Evaluation of congestion-management approaches

	(i) Integration with domestic congestion management	(ii) Joint allocation of international transmission rights	(iii) Integration with day ahead energy market	(iv) Integration with intraday/ balancing market	(v) Transparency of congestion management
Bilateral transmission rights auction	No	No	No	No	No
Joint multi-country auction of NTC rights	No	Yes	No	No	No
Multi-region day-ahead market coupling (zonal pricing)	No (only at zonal level)	Possible	Yes	No	No
Nodal pricing	Yes	Yes	Yes	Possible	Yes

Source: Congestion Management in European Power Networks: Criteria to Assess the Available Options, Neuhoff, Hobbs, Newbery

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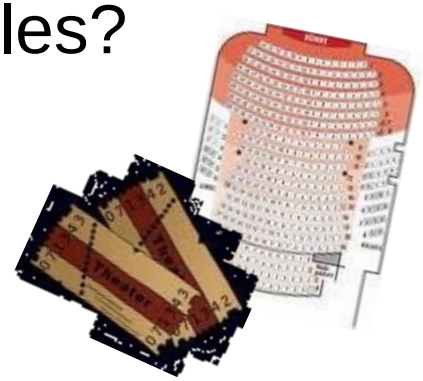
Is the current design open for renewables?



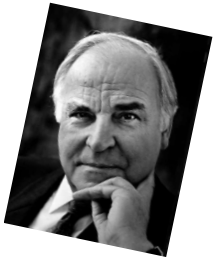
Its all about Time

- Align auction time frames with forecast quality

- Create a joint auction for linked energy products

and space

- Use market to allocate access to scarce transmission (and compensate / hedge with financial transmission contracts)



- Unlock flexibility of network with nodal pricing

and obviously system security

- ISO to host information and responsibility