



CLIMATE
POLICY
INITIATIVE



Smart power markets for Europe

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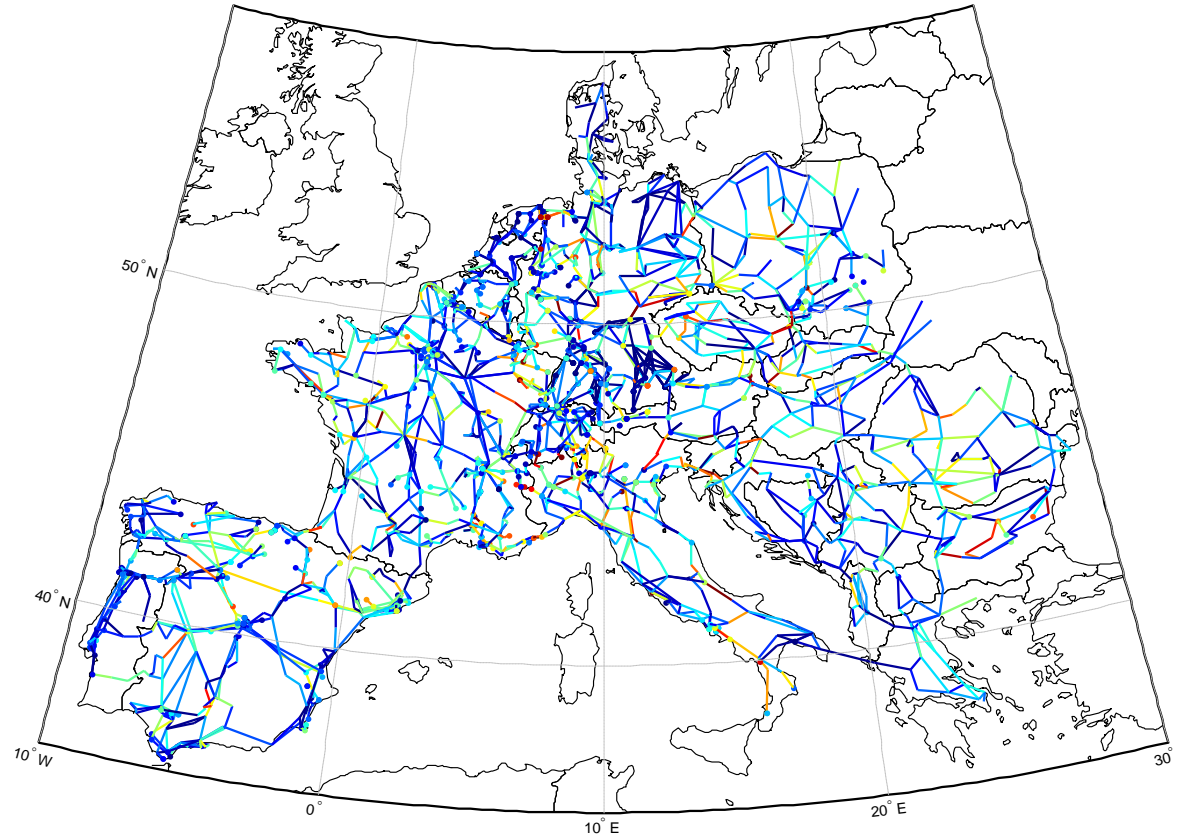
Smart power markets for Europe

EU Renewables Directive: 20% renewable in final energy by 2020. (Almost 200GWs new renewables connected to grid)

- Sharing of transmission capacity to limit grid needs & avoid connection delays
- Wind forecasts improve significantly intraday, but currently system-wide optimisation only in day-ahead market
- Investors in demand response, generation and grid (including off-shore and DC) need clarity and transparency for investment horizon



Congested Lines are within and between EU Countries

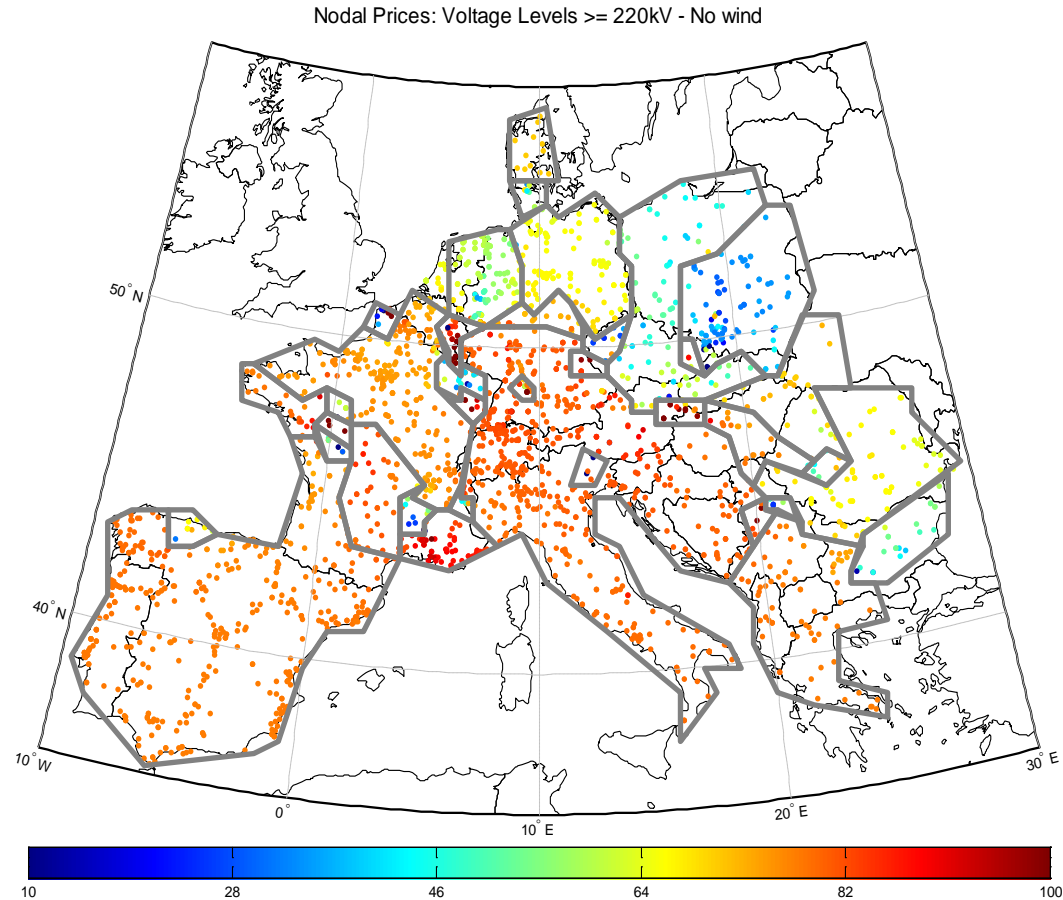


- Transmission not allocated within market – TSO have to buy back capacity
-> inefficient, costly and creates opportunities for gaming.
- TSO not informed about state of the European power system
 - make very conservative use of transmission lines
 - lack of information exchange main cause for black-outs



Zones for zonal pricing do not match national borders

No wind

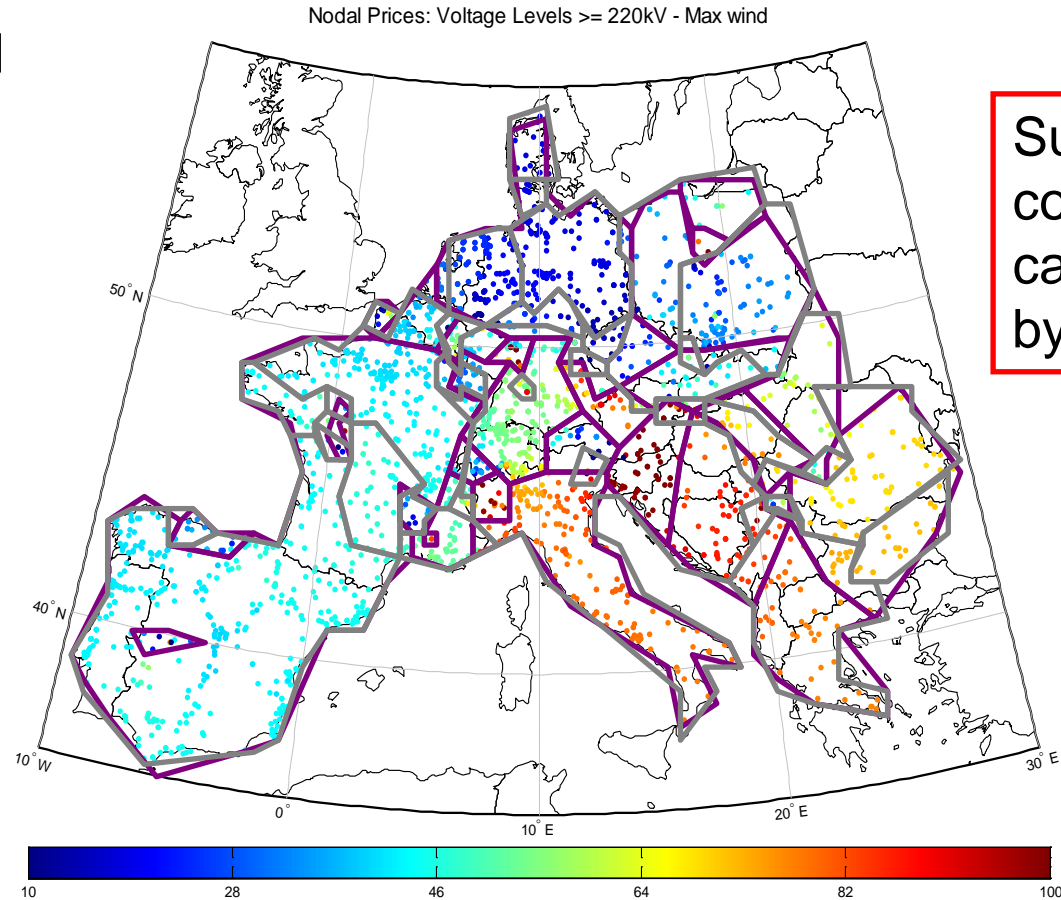


Source: Model results from the Intelligent Energy Europe project Re-shaping



And zones with similar price change with wind output

Max wind



Suitable zones in congested network can change hour by hour



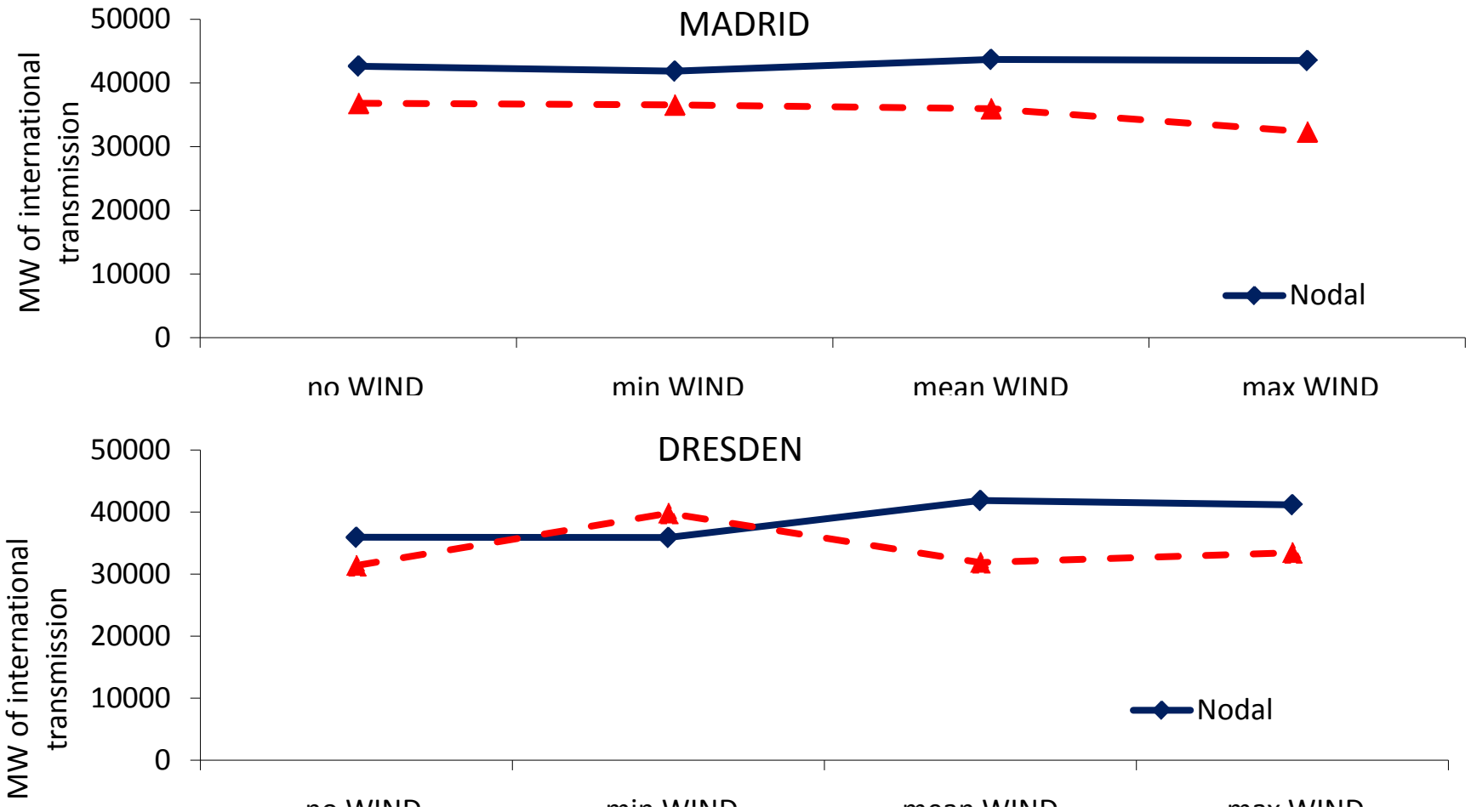
Evaluation of congestion-management approaches

	(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



Simulation of nodal versus zonal pricing

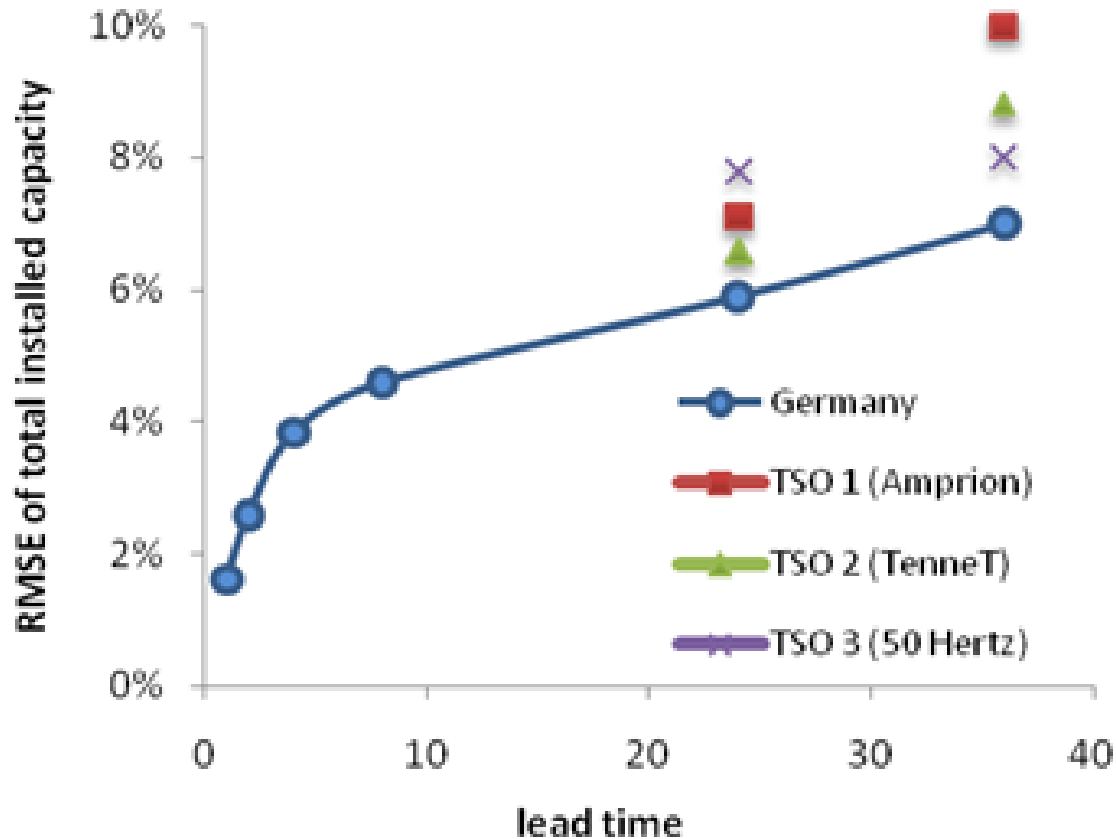


Annual savings 0.8-2 billion Euros from better system operation



Dealing with uncertainty from wind




























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



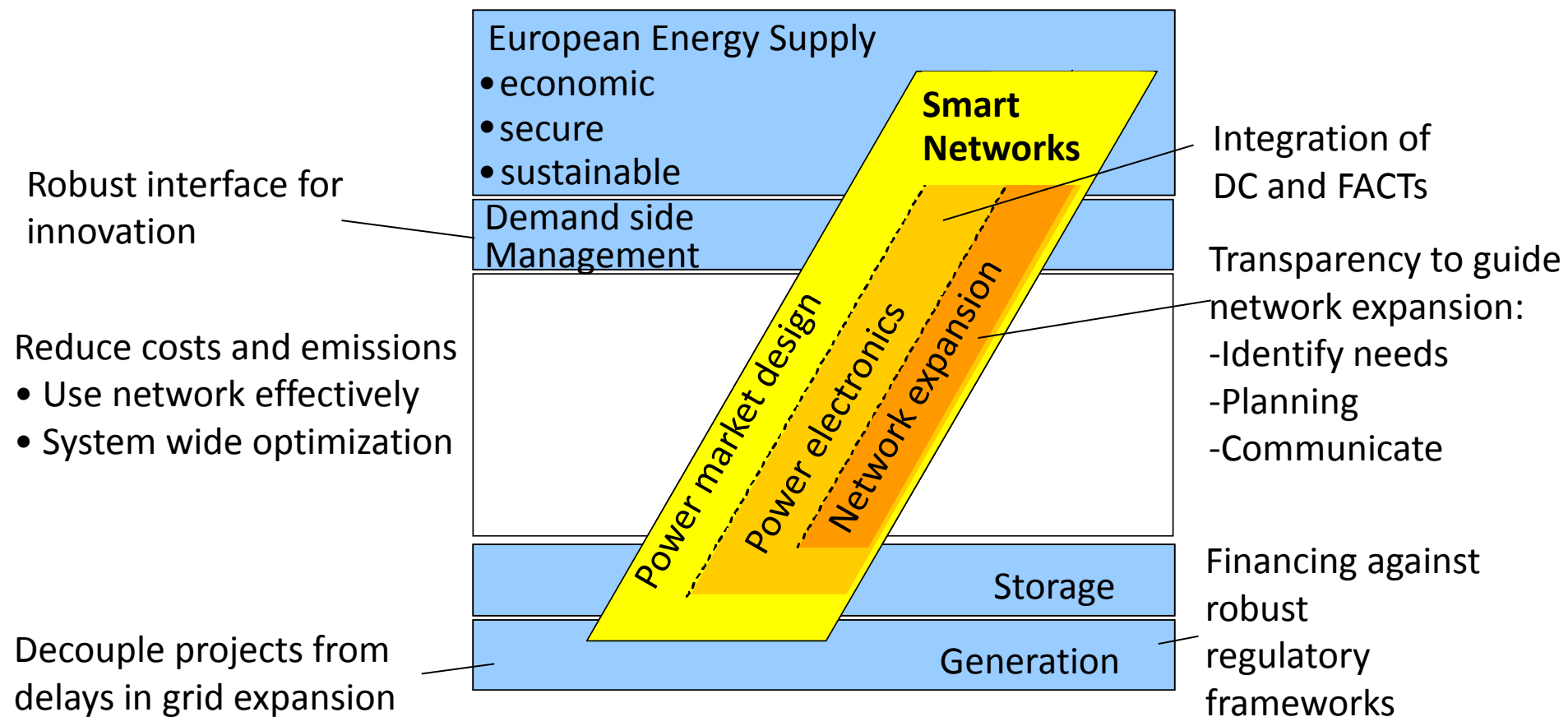
Evaluation of balancing & intraday market performance

	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: Borggreve and Neuhoff 2010: Balancing and Intraday Market Design – Options for wind integration



The benefits of an effective European Power Market



Nodal pricing is a well established and effective power market design.
Effective power market design necessary, NOT sufficient for large-scale renewables integration.

