

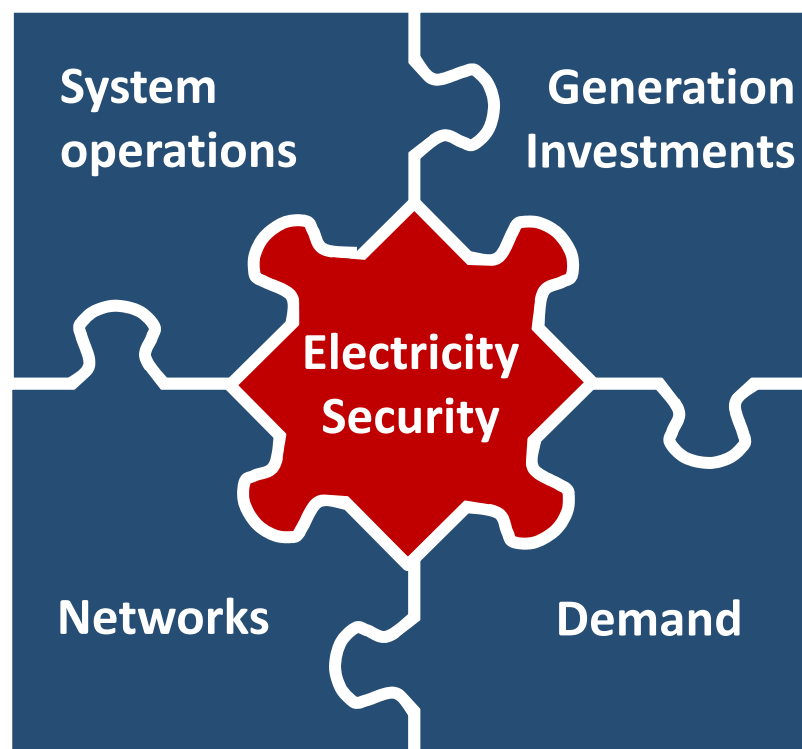
RE-POWERING ELECTRICITY MARKETS

Market Design and Regulation during the Energy Transition

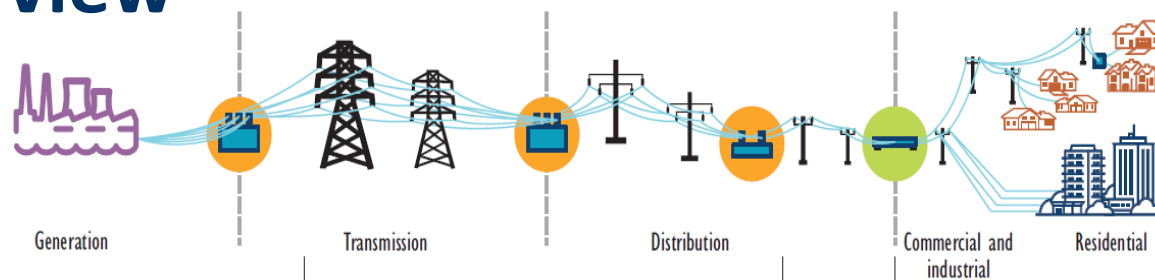
Book overview and emerging conclusions

ESAP Plenary Meeting
Paris, 7th July 2015

IEA work on electricity security, decarbonisation and market design



Book overview



1. Introduction and key issues
2. Low carbon generation investments
3. Short term markets
4. Reliability and resource adequacy
5. Capacity markets
6. Demand response
7. Transmission investments
8. Distribution network regulation
9. Retail pricing

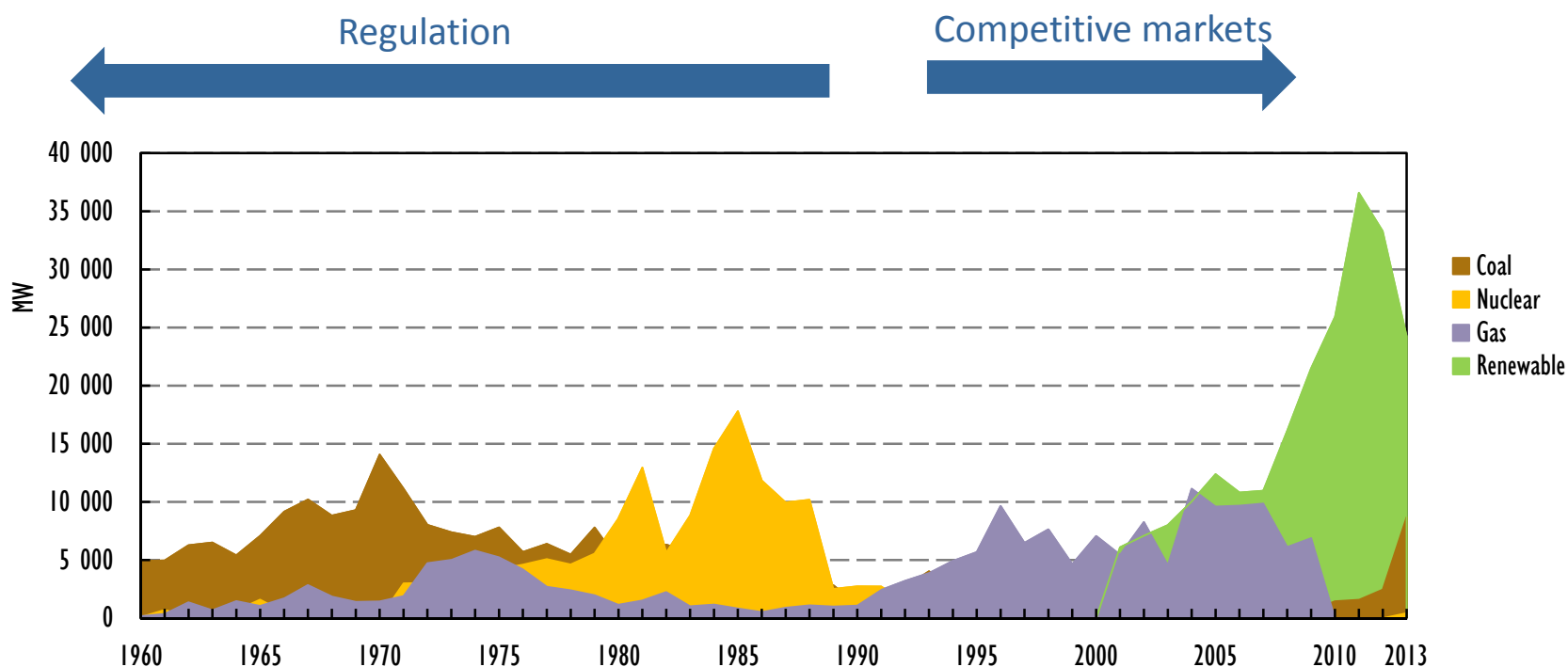
Decarbonisation of electricity sector

- **By 2050, the power sector has to become low-carbon**
 - Carbon pricing
 - Low carbon investments are capital intensive
- **Electricity restructuring took place in many countries**
 - Power purchase agreements, unbundling
 - Wholesale competition
 - Retail competition

Can we make market design fit for purpose for decarbonisation?

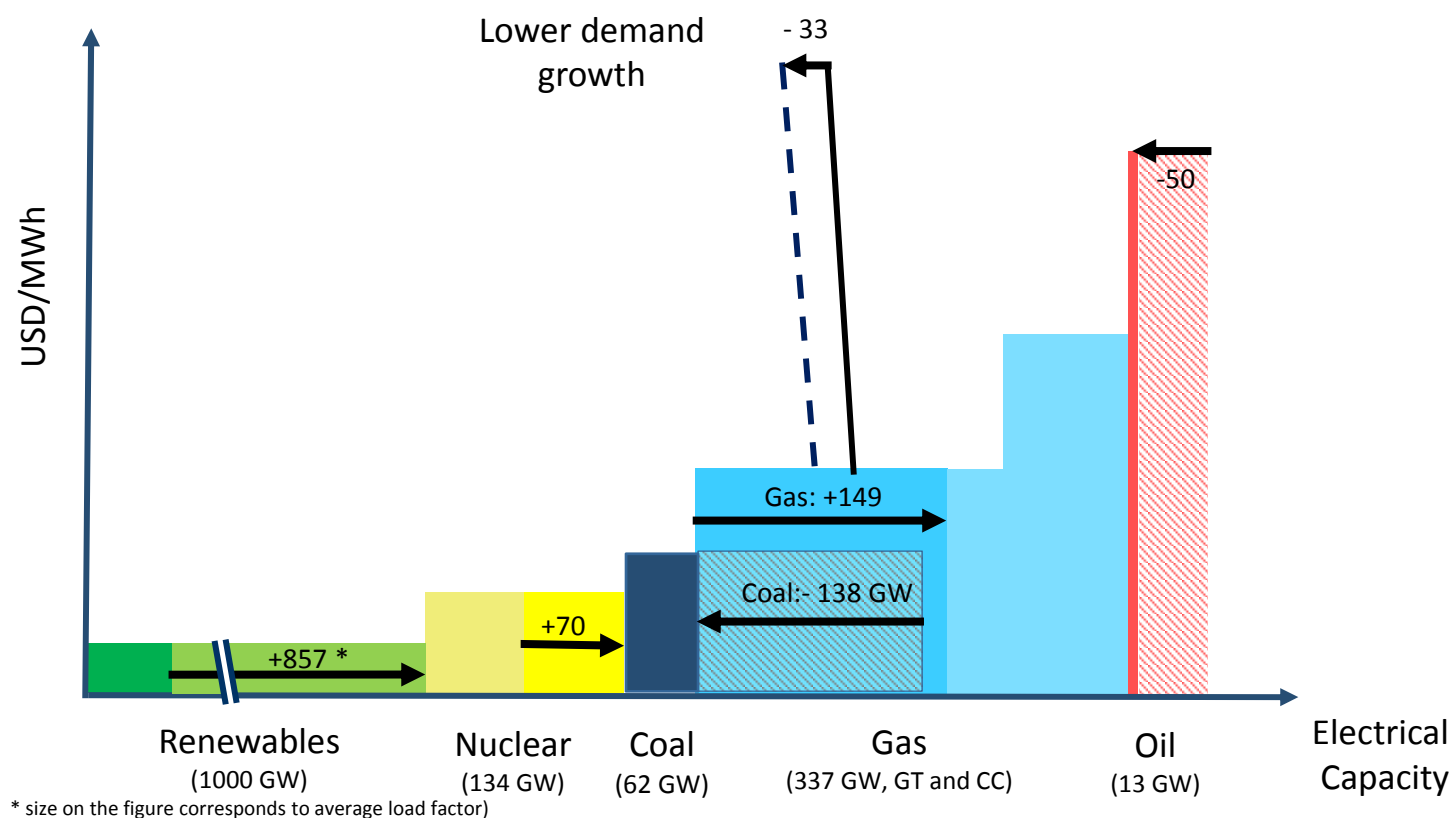
Generation mix still based on “regulated” investments

Capacity additions by technology, 1960-2013, OECD Europe



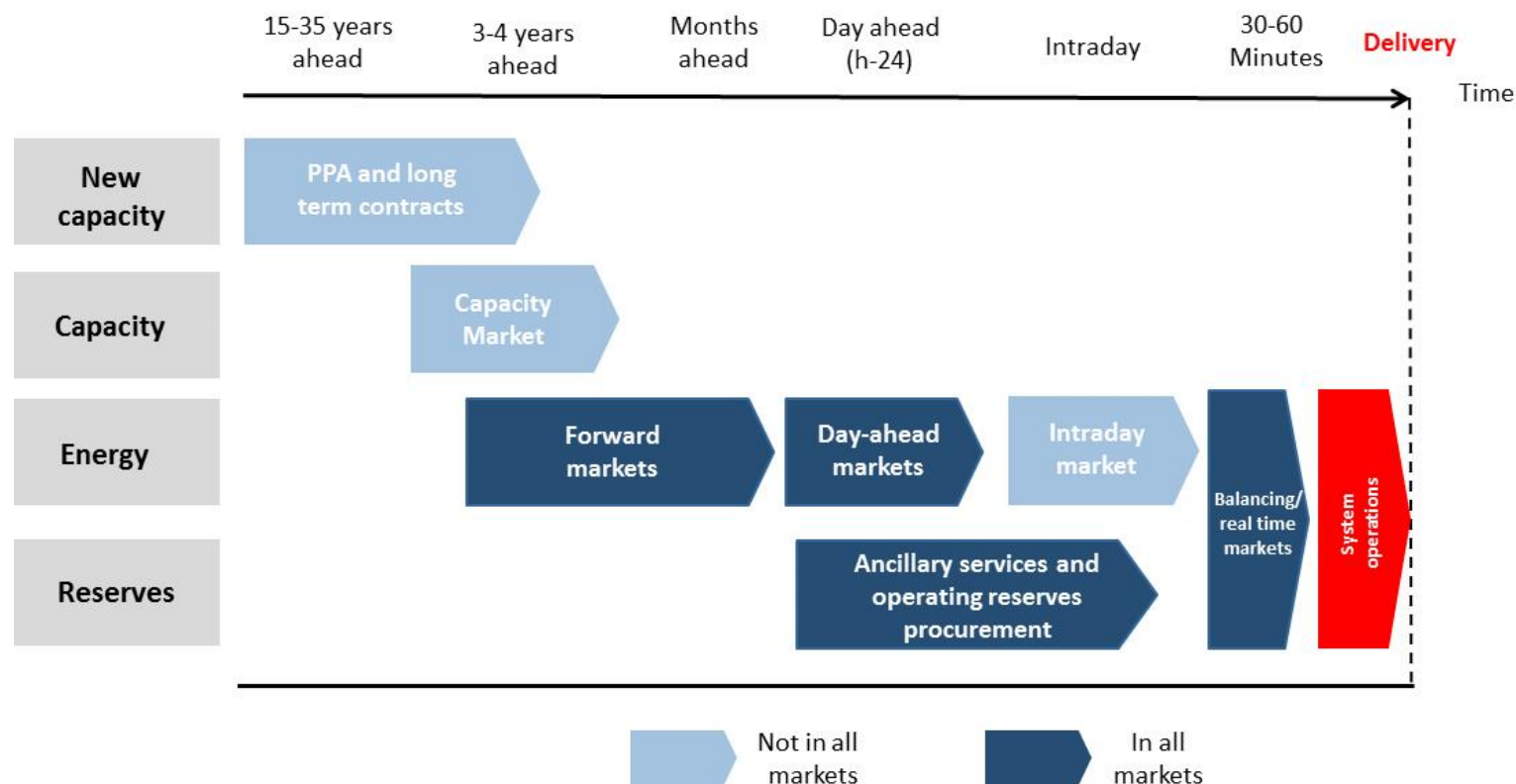
Decarbonisation of the merit-order

New capacity and coal retirement in the capacity mix, 450 scenario 2014-2040, in OECD Europe



Low carbon and gas capacity addition reach around 1400 GW over 2014-2040 in OECD Europe, of which 57% are renewables

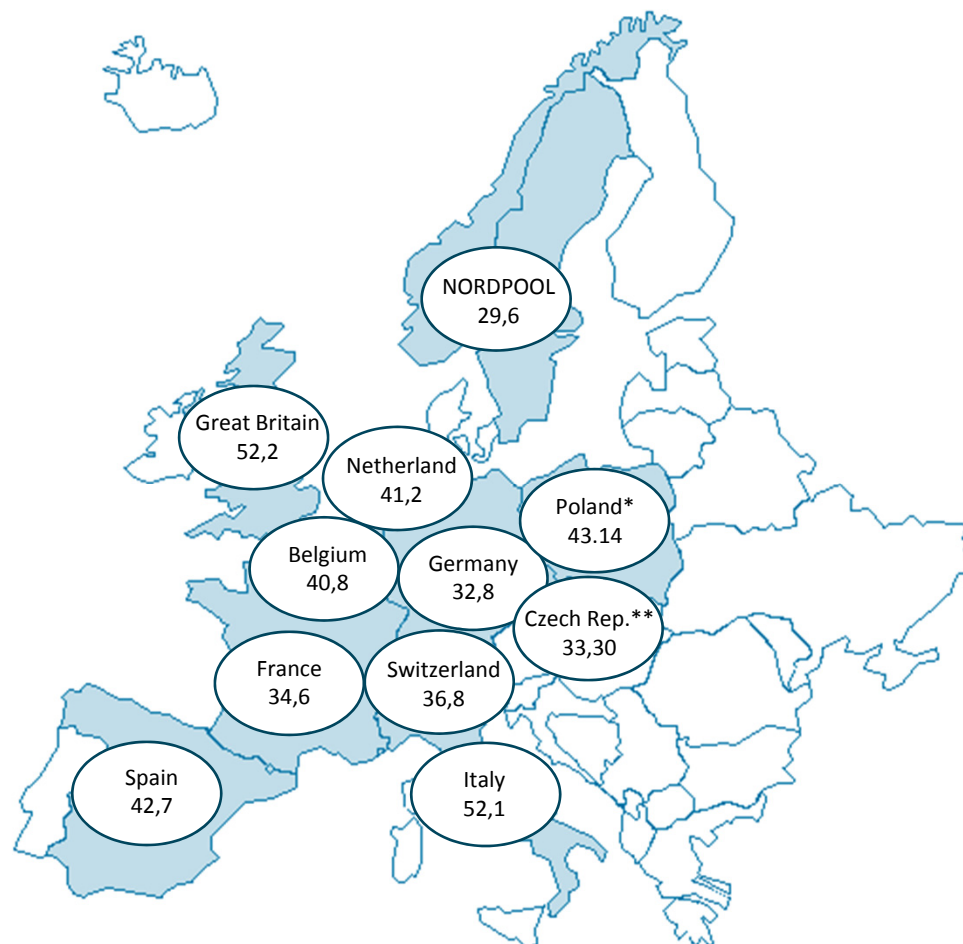
Electricity markets: short-term, medium-term and long-term markets



Short term markets (Day-ahead, Intraday and Real Time/Balancing) are the reference of all other markets

Low-carbon generation investments

Electric average Spot Prices in 2014, Europe (€/MWh)



- Low coal prices
- Low CO2 prices
- Excess capacity
- Demand decline

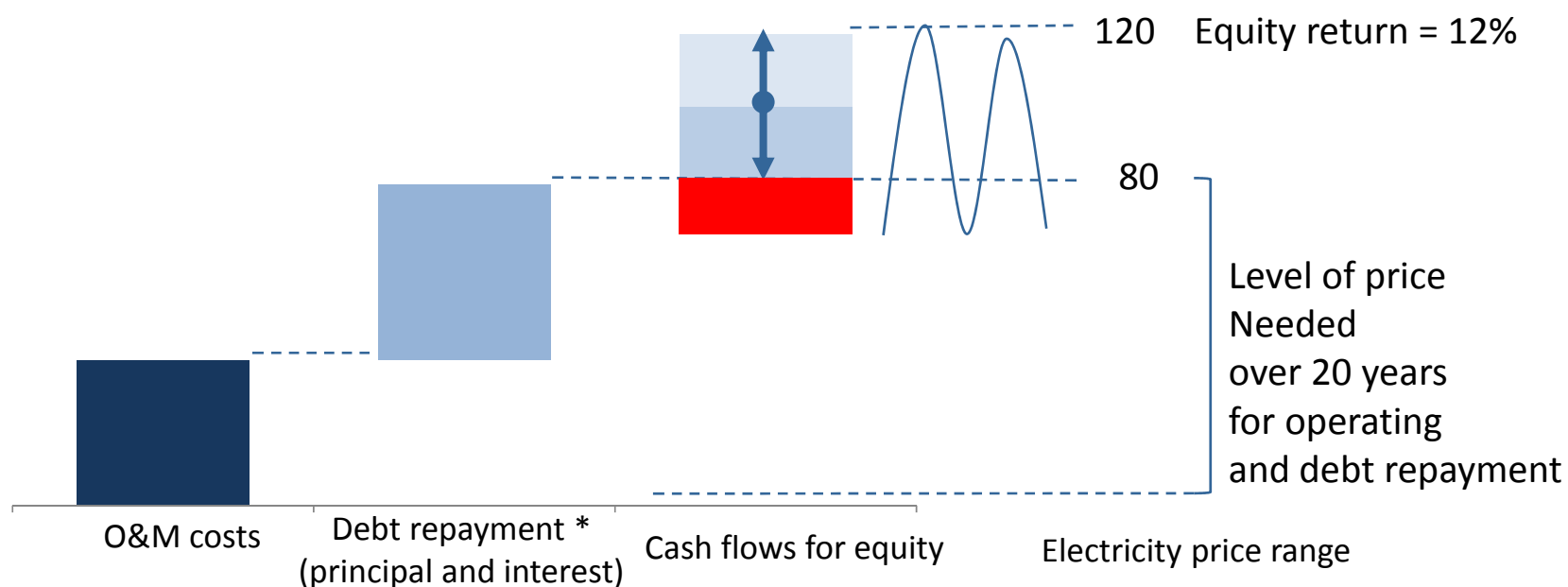
*Low wholesale prices
don't send signals to invest*

Source: 2015 RTE Réseau de transport d'électricité

* Polskie Sieci Elektroenergetyczne Operator (PSE) POLPX

**Power Exchange Central Europe, Market Comment Dec 2014

Market-based low carbon investments: what perspective?



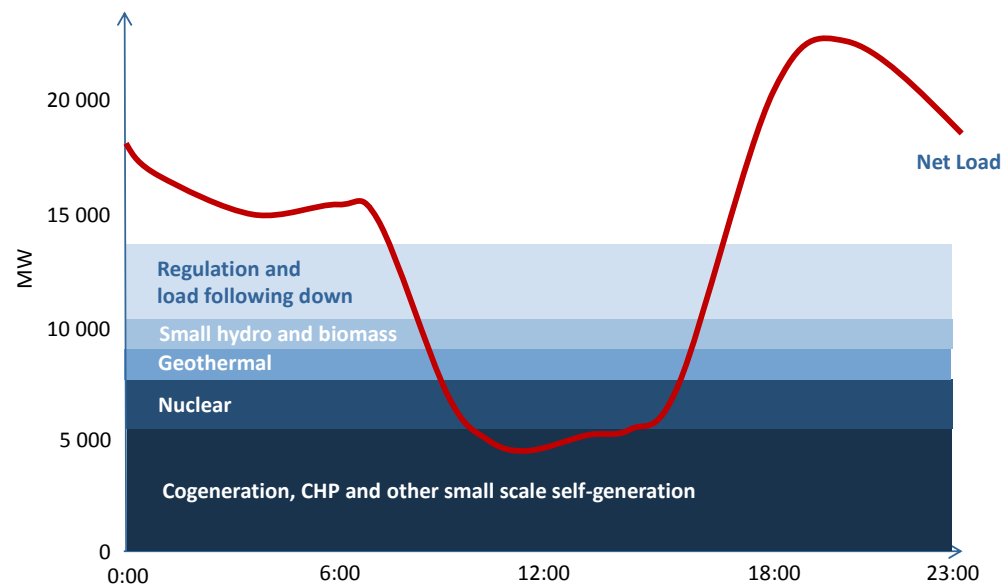
* Average over 20 years, assuming a project financed with 75% of debt and a cost of debt of 5%

The infrastructure financing puzzle consists in financing capital-intensive investment, in a context of long-term price uncertainty, at a low cost of capital to keep the energy transition affordable

As investments in wind and solar power continue, the design of short term markets must adapt

Over-generation

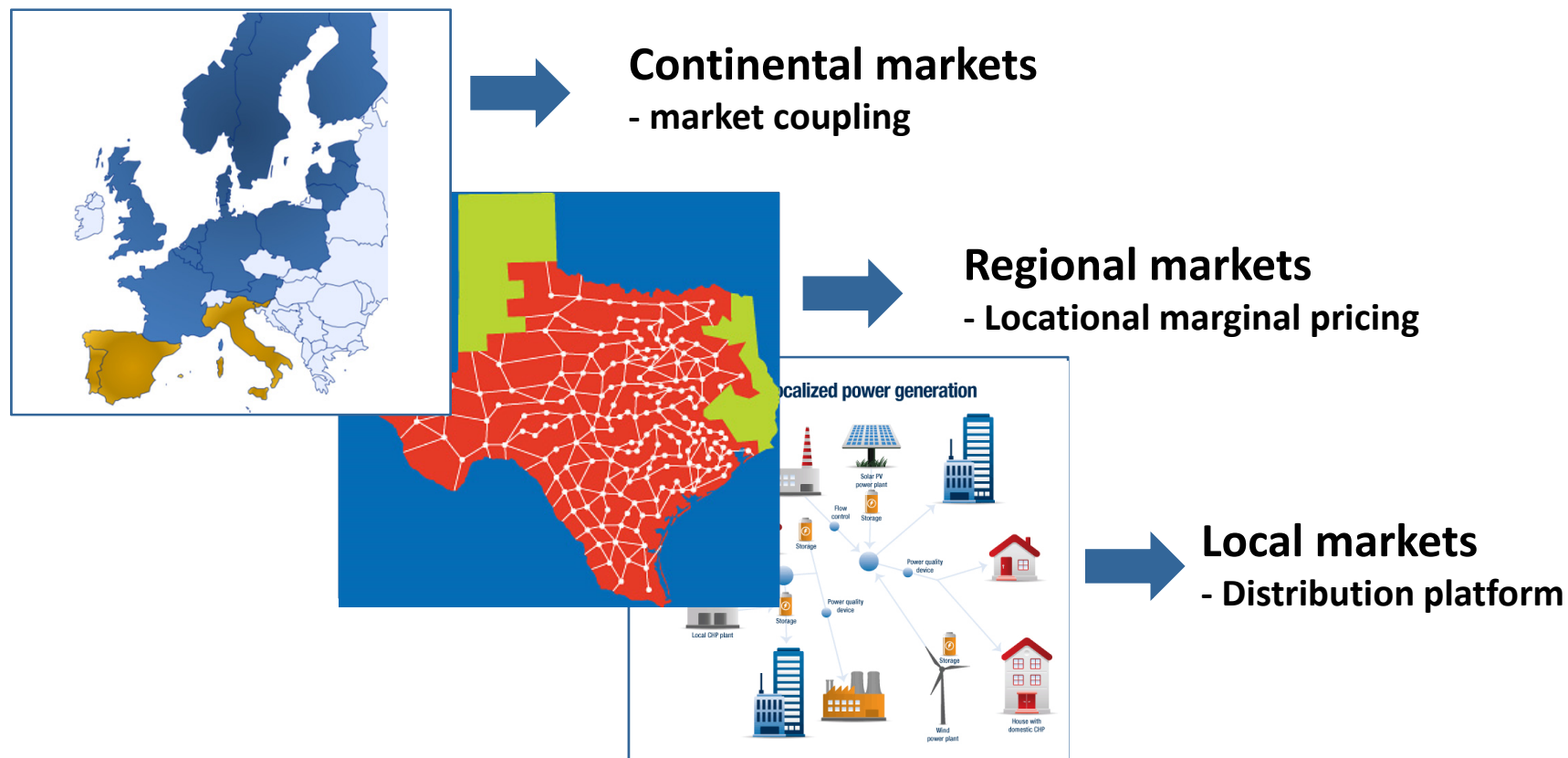
California ISO, Long-Term Procurement Proceeding Scenario,
24 March 2024



Source: CAISO

Market design must be adapted to integrate weather-dependent renewables efficiently while ensuring system security

Efficient markets are needed at all levels



Temporal and geographical resolution of energy prices has to be right

Reliability and adequacy remain regulated, rather than the outcome of markets

Existing framework:

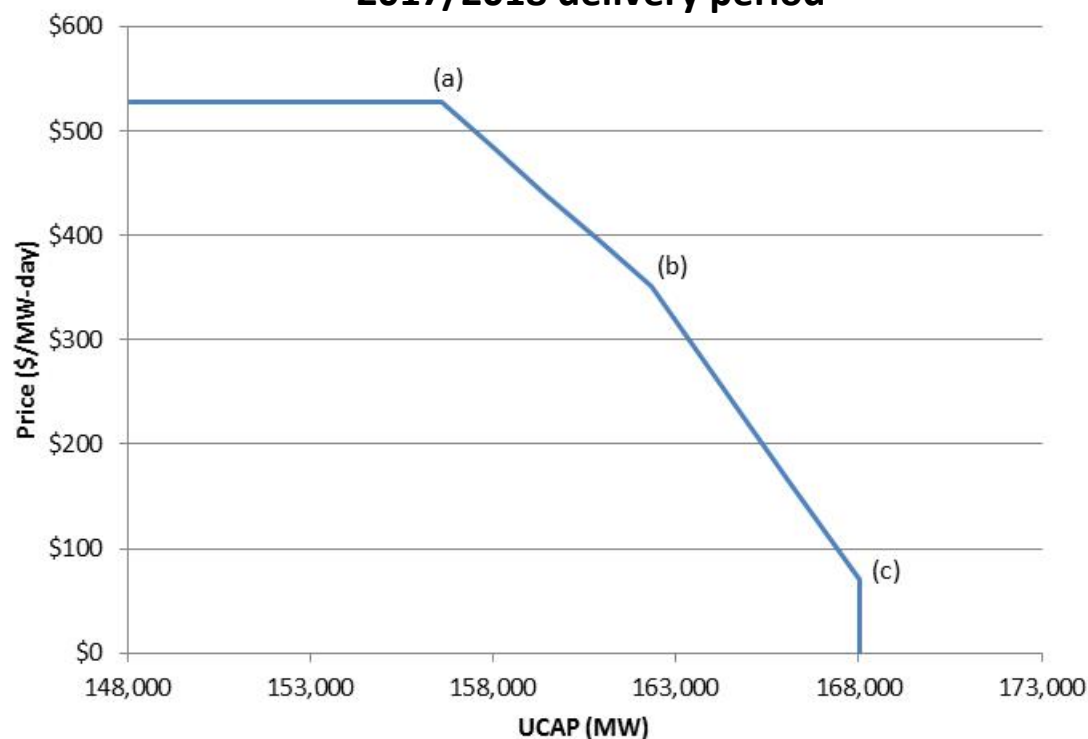
- Reliability standards
- Scarcity pricing
- Capacity markets

Key issues:

- Are markets efficient at pricing scarcity?
- Is regulatory intervention required?
 - to mitigate market power?
 - to price reliability on behalf of consumers?

Capacity markets: a safety net supplementing energy markets

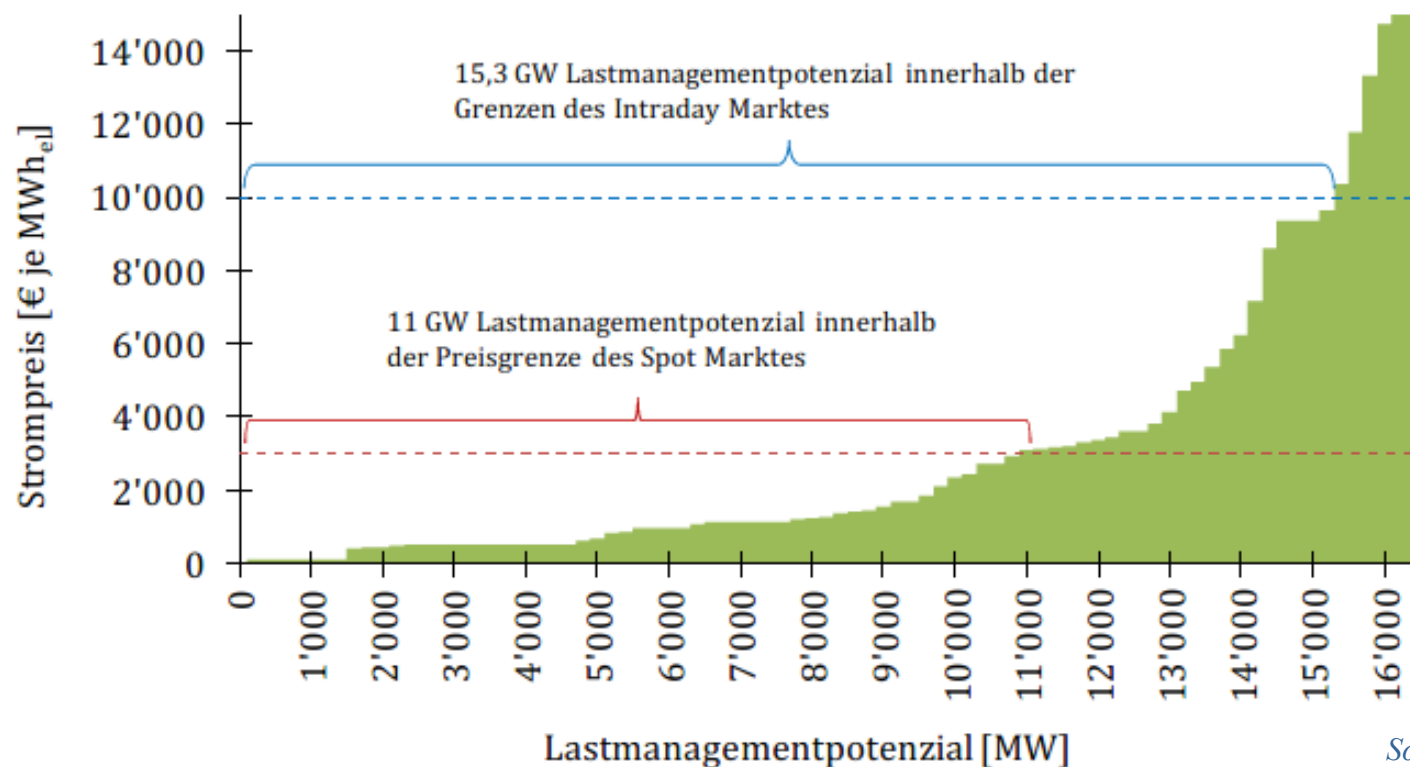
PJM Variable Resource Requirement curve for 2017/2018 delivery period



Defining capacity requirements put a huge responsibility on system operators or governments who tend to be conservative

Demand response: making dynamic pricing work

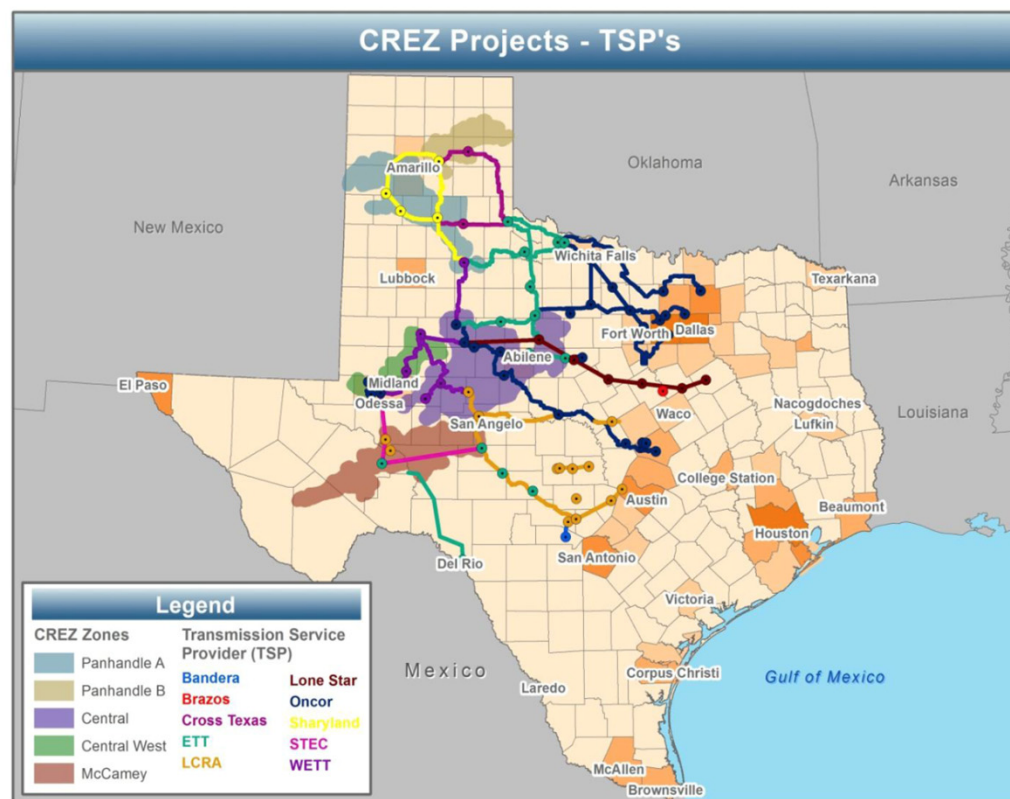
Demand response potential in Germany, 2014



Source: r2b (2014):
lead study electricity market, BMWi

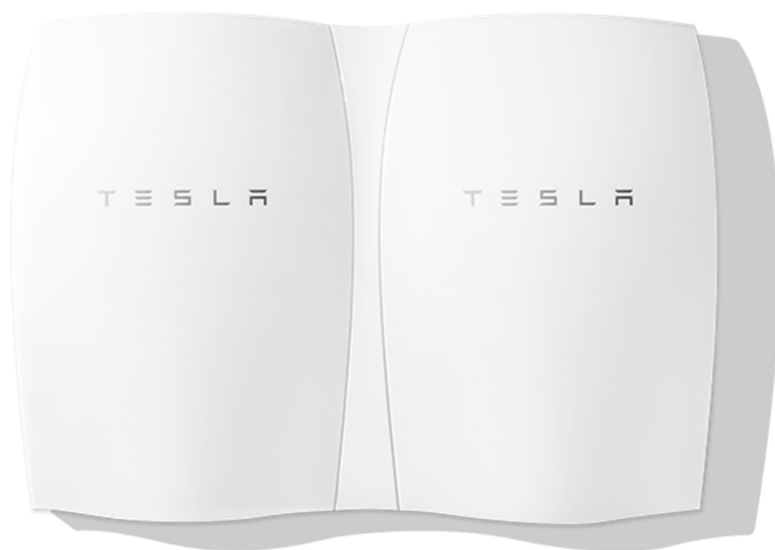
Demand response potential can be huge but remains largely untapped because current benefits are small and dispersed, transaction costs are high

Transmission and interconnectors are the backbone of well-functioning electricity markets



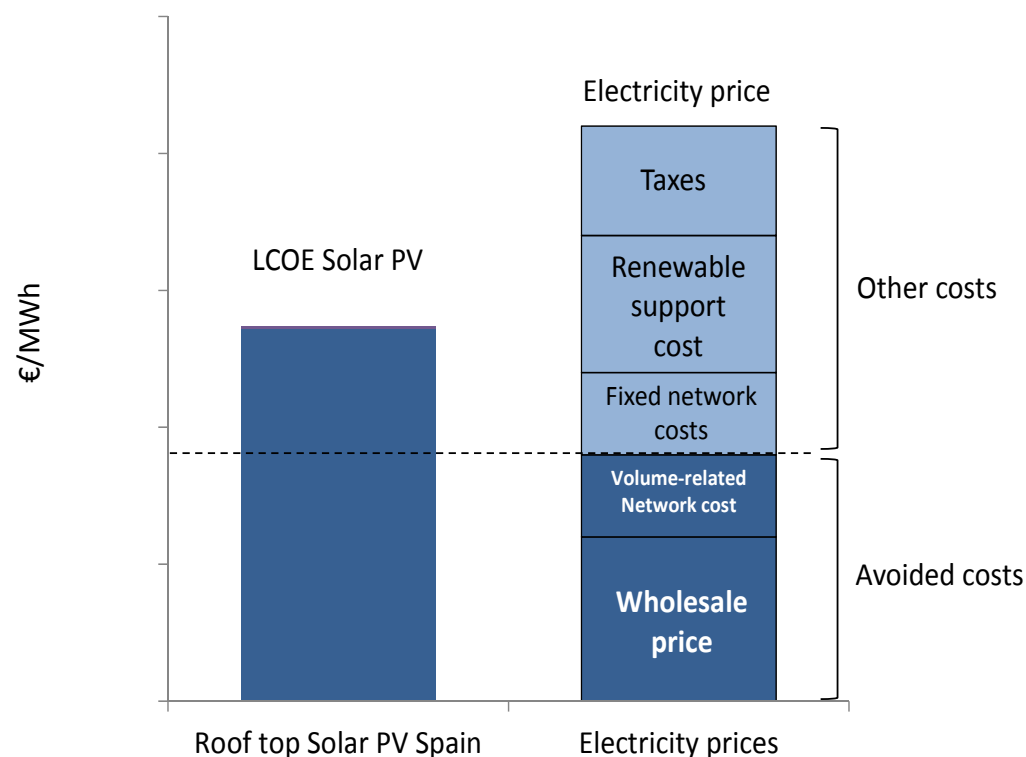
Today, decarbonisation requires more, not less, network

Behind the meter resources: threat or opportunity for the distribution network and power markets?



***Distributed generation and self-consumption:
a niche market or a major disruption?***

Reforming retail pricing is urgent to incentivize the efficient deployment of distributed resources



Consumers have alternative to grid electricity and their demand becomes elastic to prices

A Power pact for the transition of power markets

- **Need to RE-POWER markets**
- **Aligning markets and policies increasingly complex**
- **Likely to require a lot of regulation and policy measures**
- **Coming Soon: IEA book on market design**



Thank you

<http://www.iea.org/topics/electricity/>