



Demand Response

The Transition to Low-Carbon Power Systems and the role of Demand Response

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Electricity Security Challenges

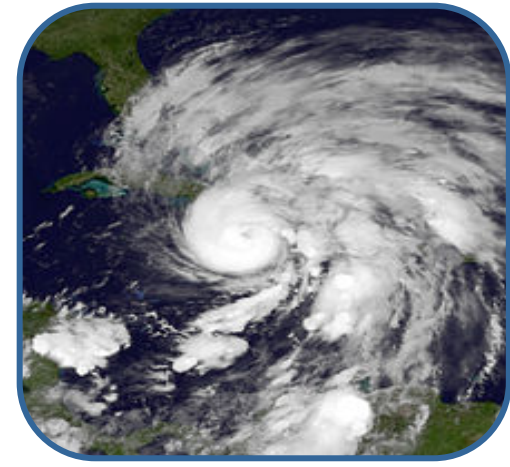
Aging infrastructure
(generation and networks)



Deployment of
renewable energy



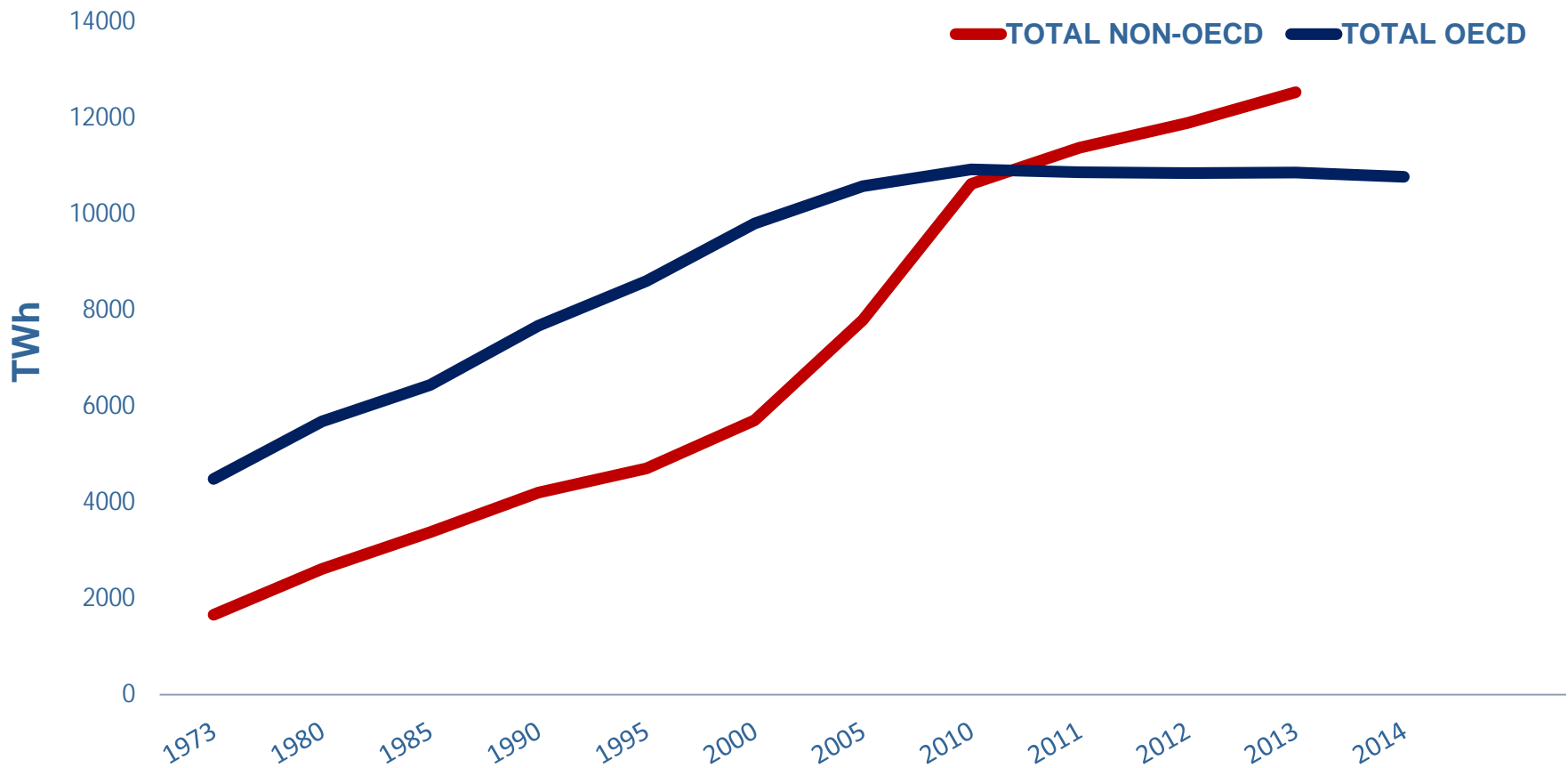
Resilience and
adaptation to climate change



Challenges for the power sector in OECD countries to maintain reliable, secure and sustainable electricity supply

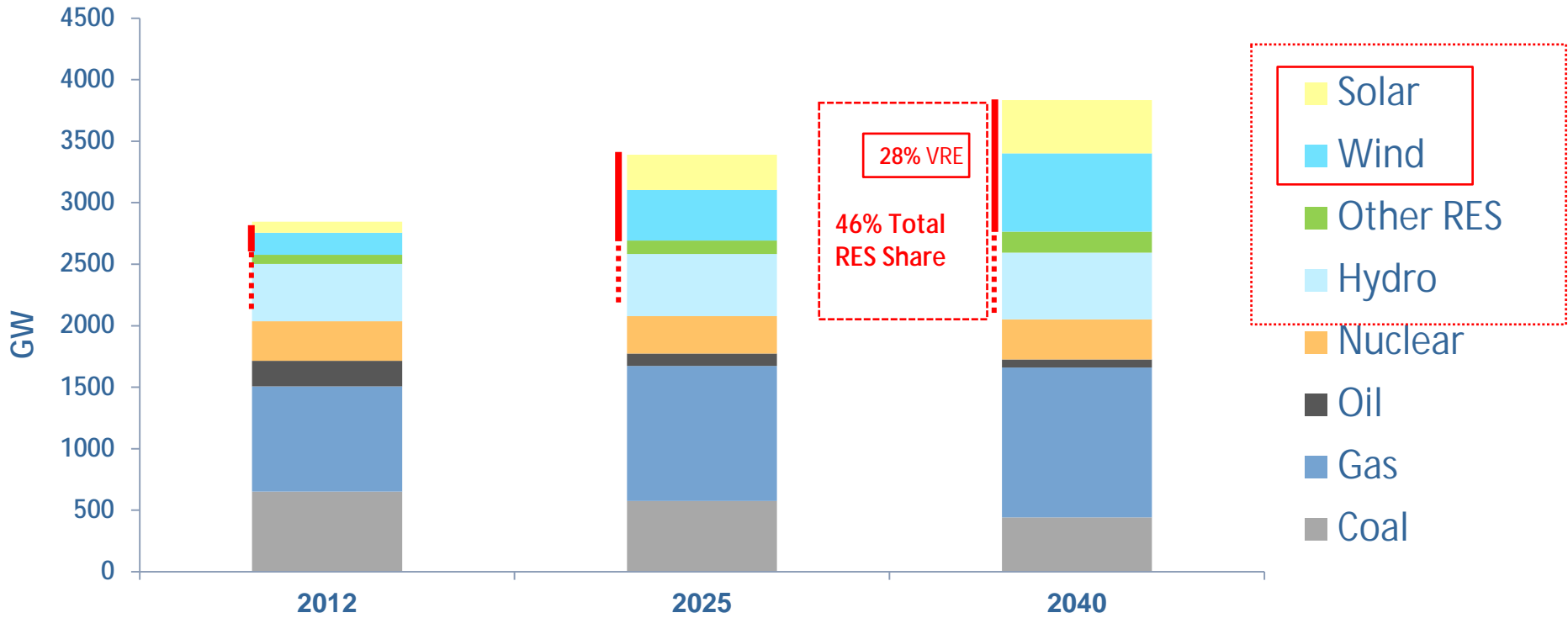
*IEA Electricity Security
(2011)*

Electricity demand



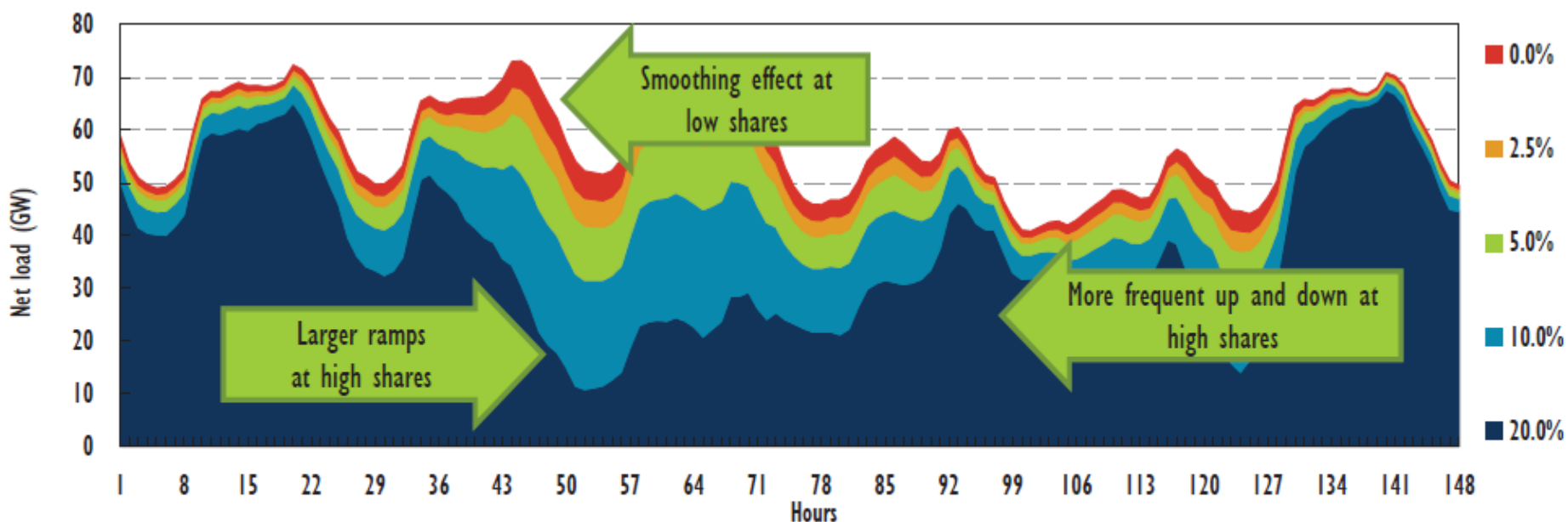
Energy Efficiency and Demand Response can contribute together to decarbonization

OECD Generation capacity



In 2040, 46% of total generation capacity in OECD will come from renewables.... 28% from variable ones

Demand response as a flexibility resource to integrate renewables



Notes: load data and wind power data are for Germany from 10 to 16 November 2010. Wind power generation is scaled, actual annual share being 7.3%; scaling may overestimate the impact of variability; for illustration only.

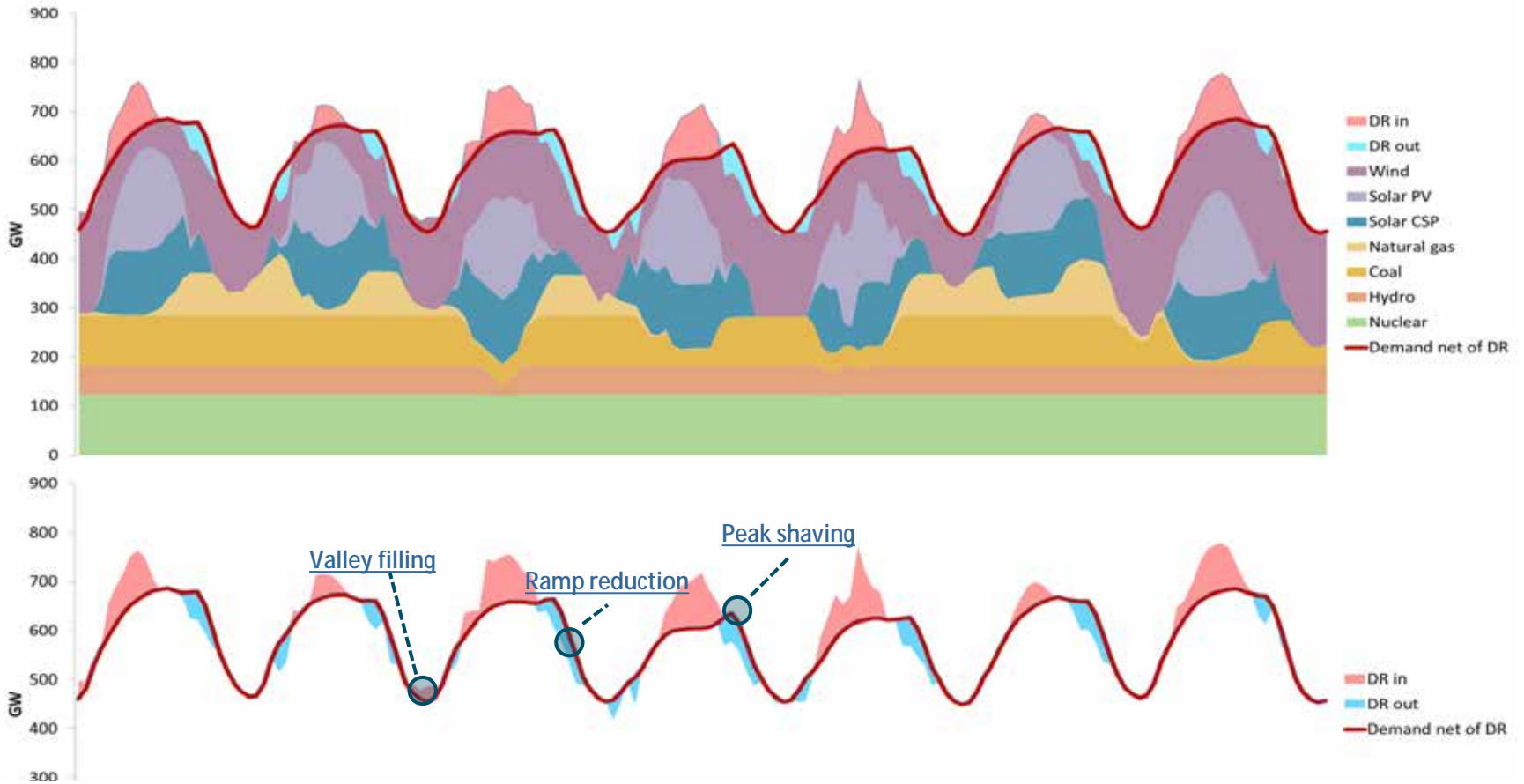
Variation in thermal unit load factor could be partly addressed by demand response

Market Design to address security of supply and decarbonization

	Markets	Regulation
Low-Carbon investments	<ul style="list-style-type: none"> • Full Market integration • Auctions 	<ul style="list-style-type: none"> • Carbon Price • Long term arrangements
Short term markets	<ul style="list-style-type: none"> • Locational pricing • Pricing in all SO actions • Dynamic electricity pricing • Demand response to scarcity prices • Demand response to over generation 	<ul style="list-style-type: none"> • Scarcity pricing rules • Reliability standards • Capacity markets • Subsidies
Reliability & adequacy		
Demand response		
Transmission investments	<ul style="list-style-type: none"> • Larger balancing areas • Merchant investments • Transmission ownership 	<ul style="list-style-type: none"> • Regional planning • Network cost allocation • Modernise regulation 2.0
Network regulation		
Retail pricing (total)	<ul style="list-style-type: none"> • Behind the meter resources 	<ul style="list-style-type: none"> • Taxation & surcharges

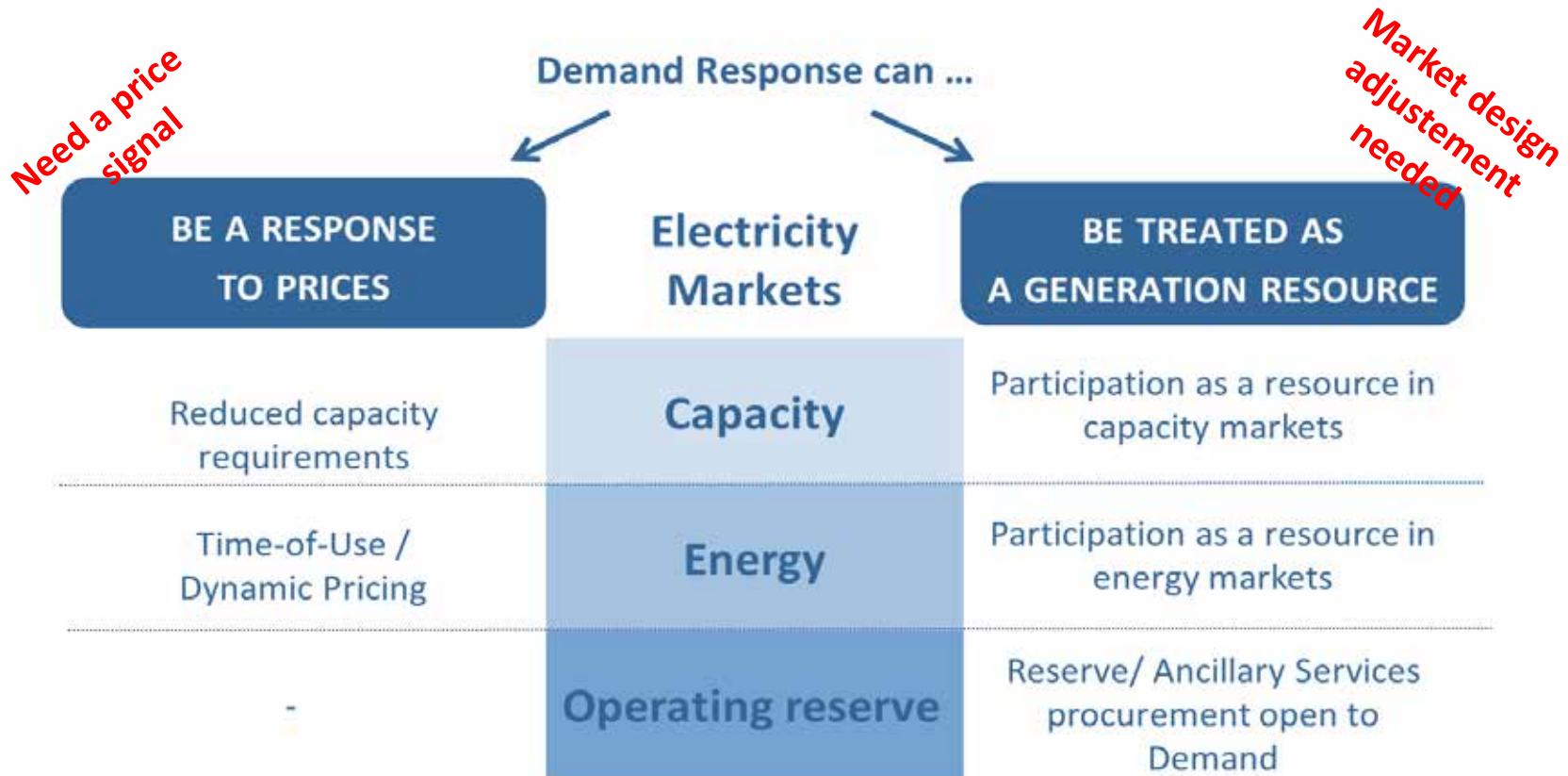
Market and regulatory framework to address the decarbonization challenges of the power system

Roles for demand response



The role of demand response is not limited to peak demand only. Steep ramping and over-generation can be also be addressed.

Market design and demand response



Dynamic pricing is the long-term target, but demand response can be treated as a generation resource to kick-start it in the short run

Capacity markets have been a decisive element for demand response in PJM

Demand Side Participation in Capacity Market

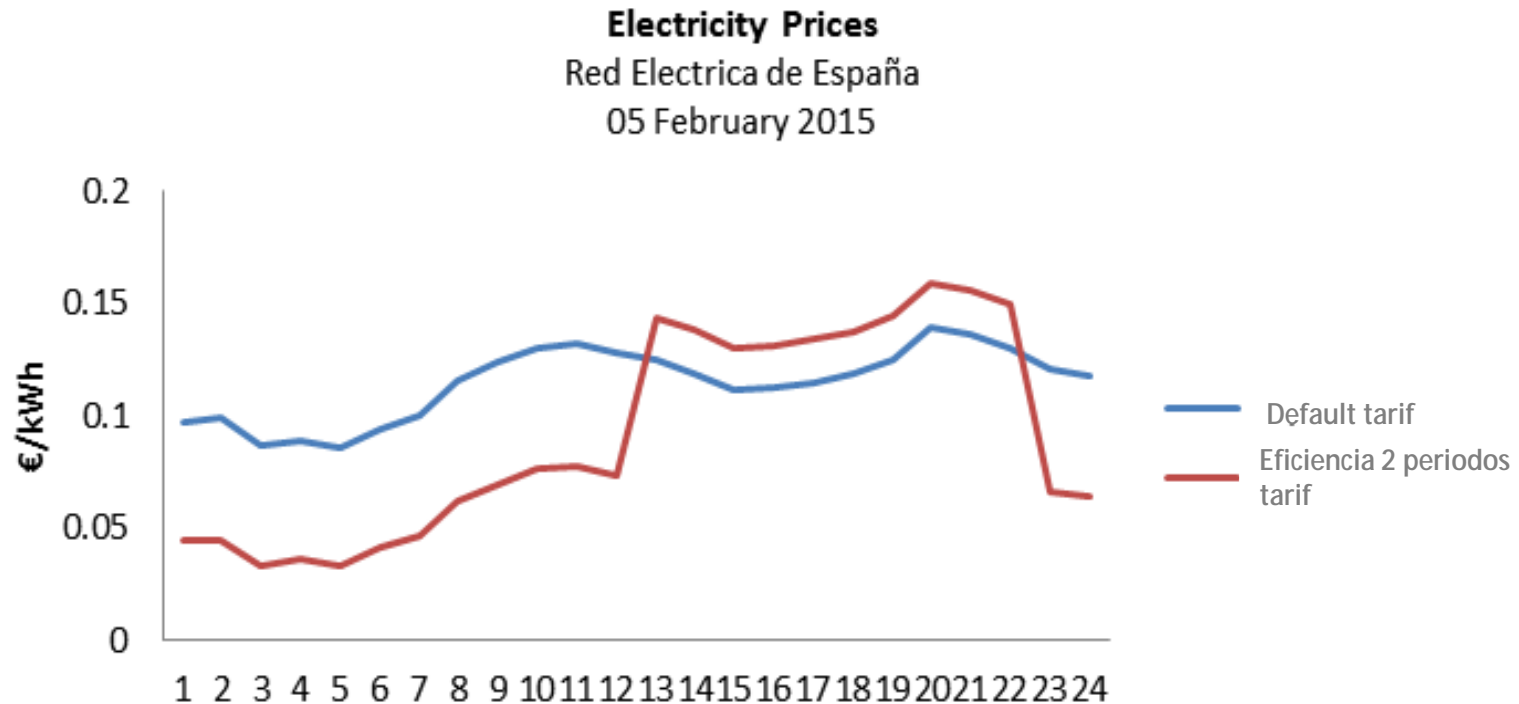


Challenges

- ∅ Product definition
- ∅ Baseline definition
- ∅ Double payment

Source: PJM The Evolution of Demand Response in the PJM Wholesale Market, 2014

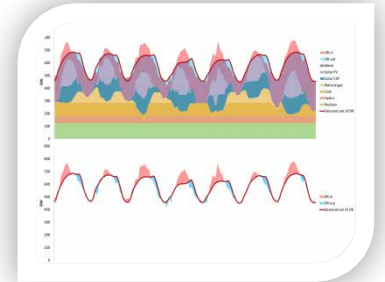
Empowering the consumer with dynamic pricing



Long-term solution with direct exposure to wholesale market prices variation... Automation and dynamic will be prices needed

Conclusions

n In addition of addressing peak demand, DR can support the **integration** of a large share of variable **renewables**. DR has a role to play in the decarbonization of the power system.



n **Market design** will have to be adapted to integrate DR as a **response to prices** or as a **generation resource**. Demand elasticity in response to price variation will require the right retail market. DR could be a generation resource to kick-start in the short term.



n **Automation** technologies carry the promise of a large-scale deployment of demand response. Consequently, **data privacy** and security will be increasingly important to safeguard consumer confidence.



Further readings

IEA Electricity Security WebPage

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

IEA « Re-Powering Electricity Markets »
forthcoming in 2016

Thank you for your attention.

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