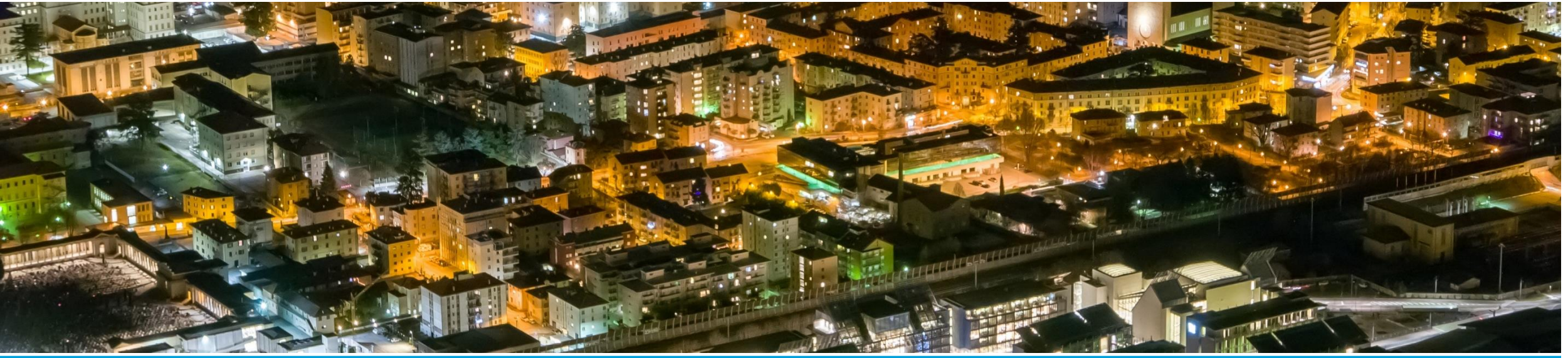


ENERGY

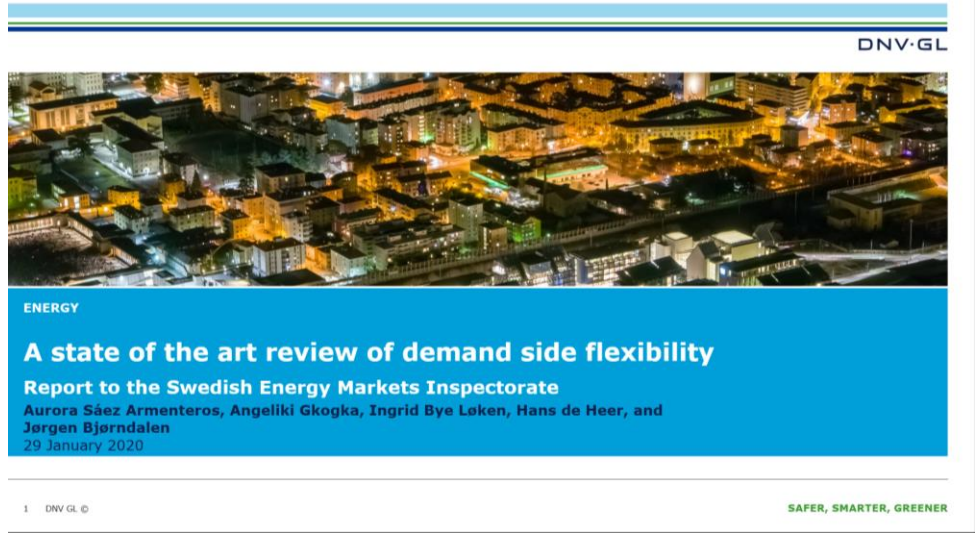
A state of the art review of demand side flexibility

Presentation of our report to the Swedish Energy Markets Inspectorate

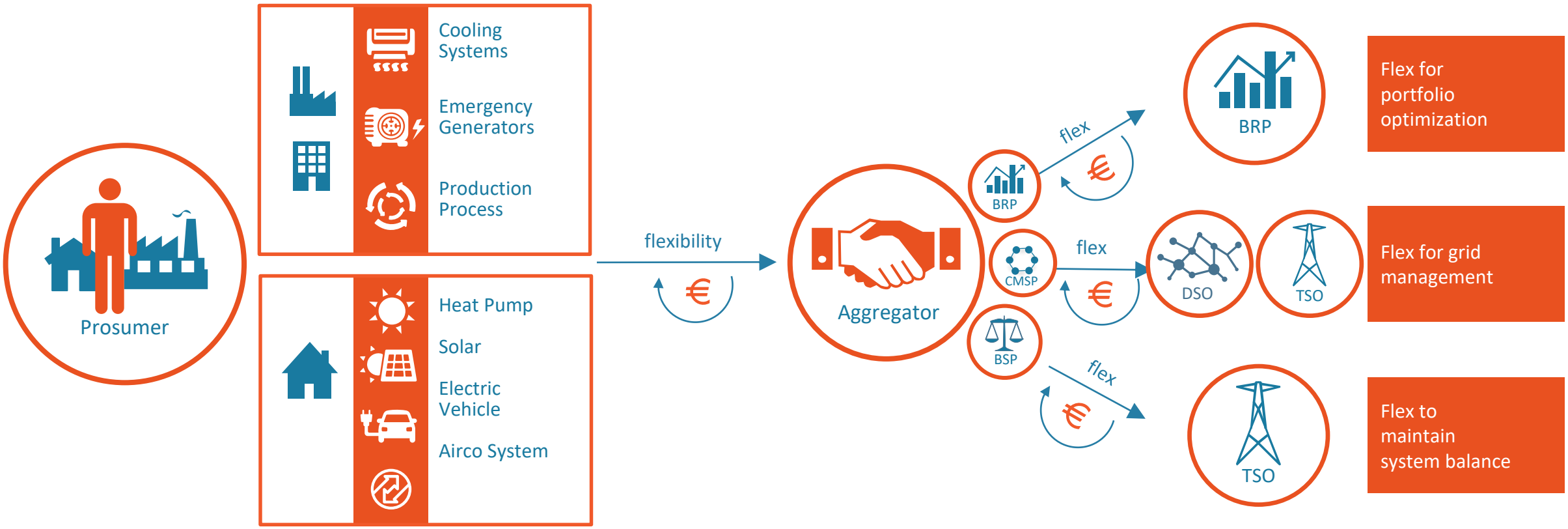
Jørgen Bjørndalen
07 February 2020

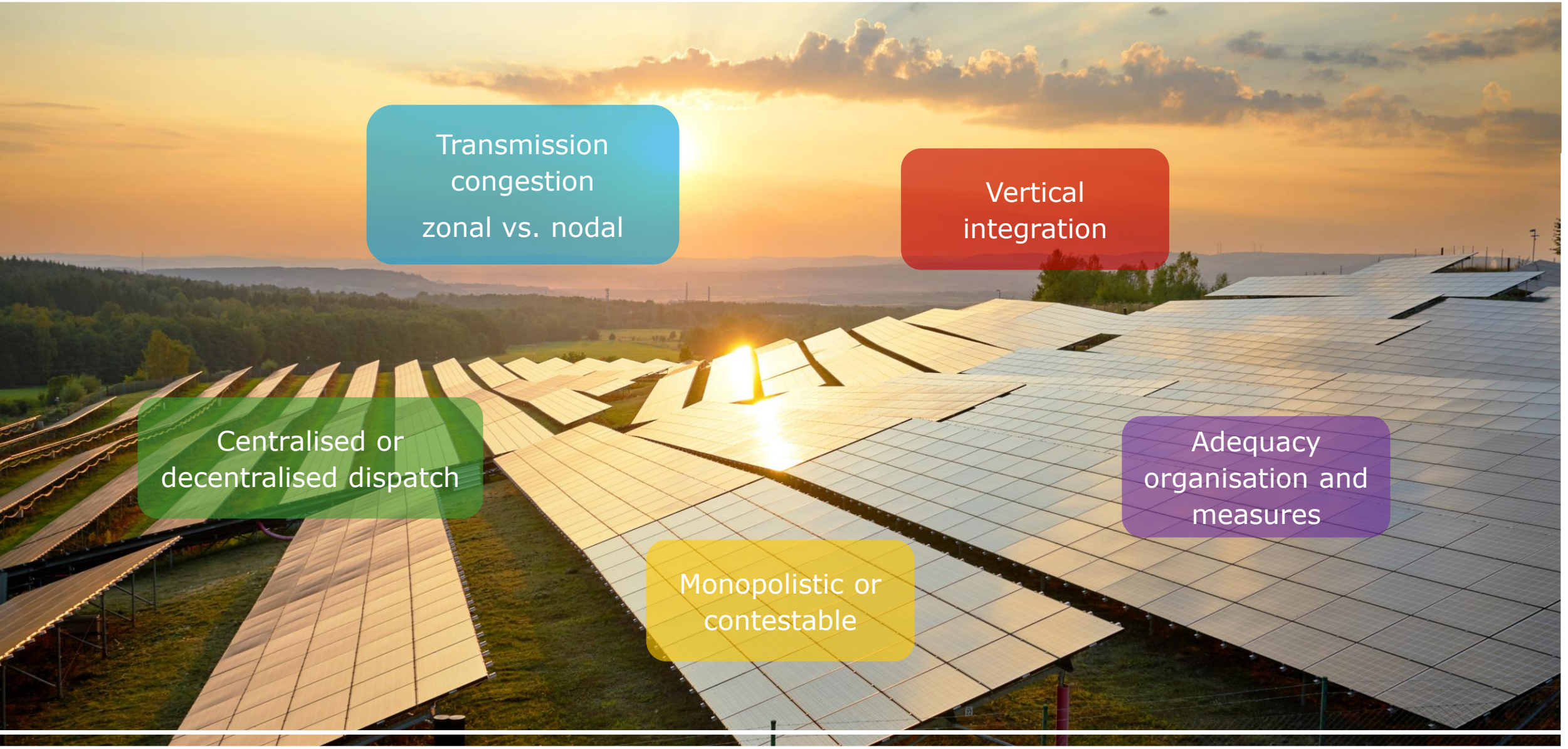
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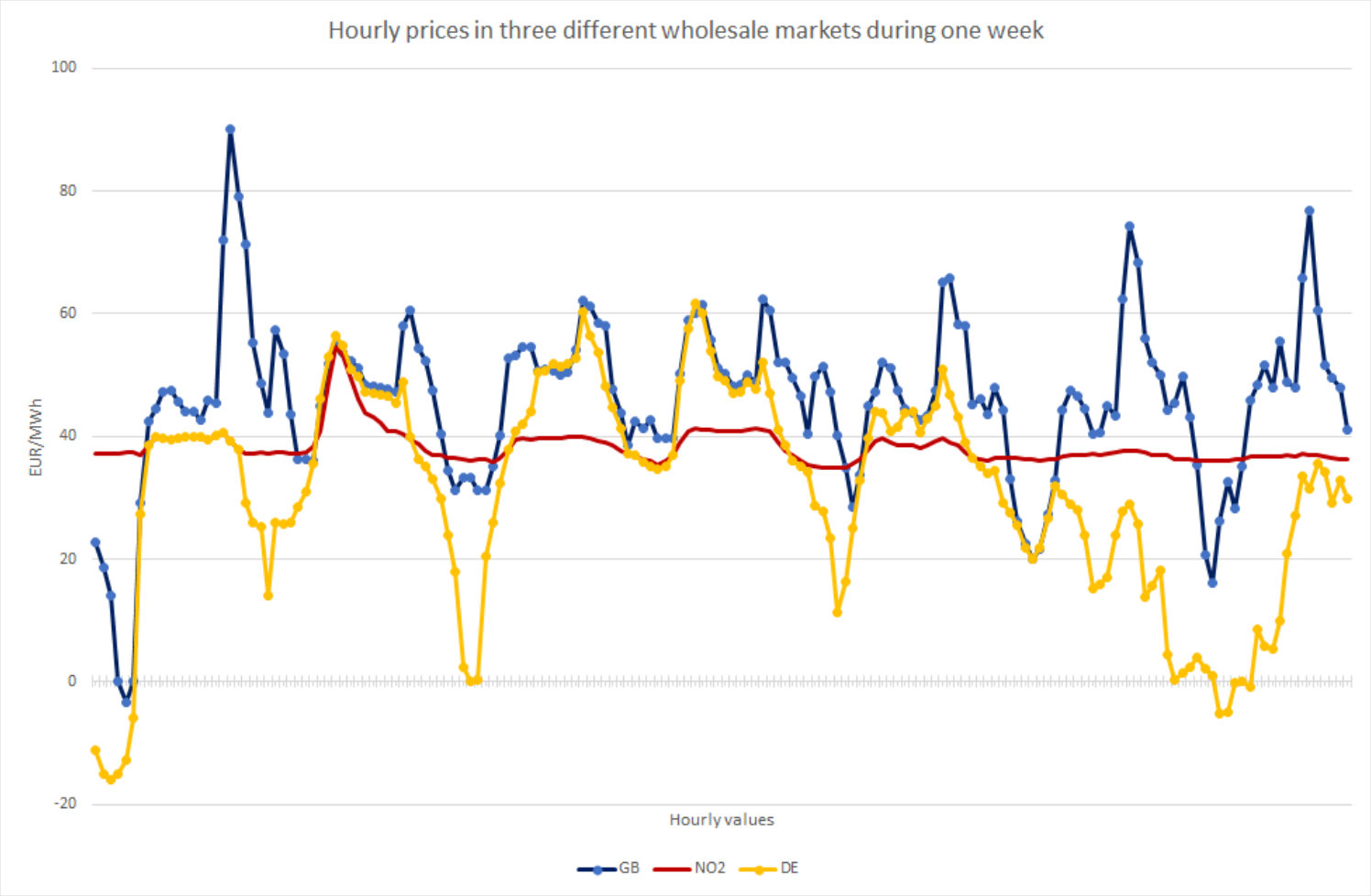


USEF's flexibility value chain shows how demand side flexibility can be sold on different markets and products through explicit mechanisms




Transmission congestion
zonal vs. nodal
Vertical integration
Centralised or decentralised dispatch
Adequacy organisation and measures
Monopolistic or contestable

Other key indicators – describing the market



- Generation mix
- Volatility of prices
- Degree of electrification
- Generation or network capacity constraints
- Retail tariff structure
- Load curve



Key drivers: economic or technical characteristics and/or climate policy

Energy mix

Energy adequacy

Fast growth in demand

Grid stability or adequacy

Breaking up monopolies or oligopolies

Demand side participation can be high despite the general market design



Please get in touch for further discussions about demand side flexibility and how it can be mobilised and activated!

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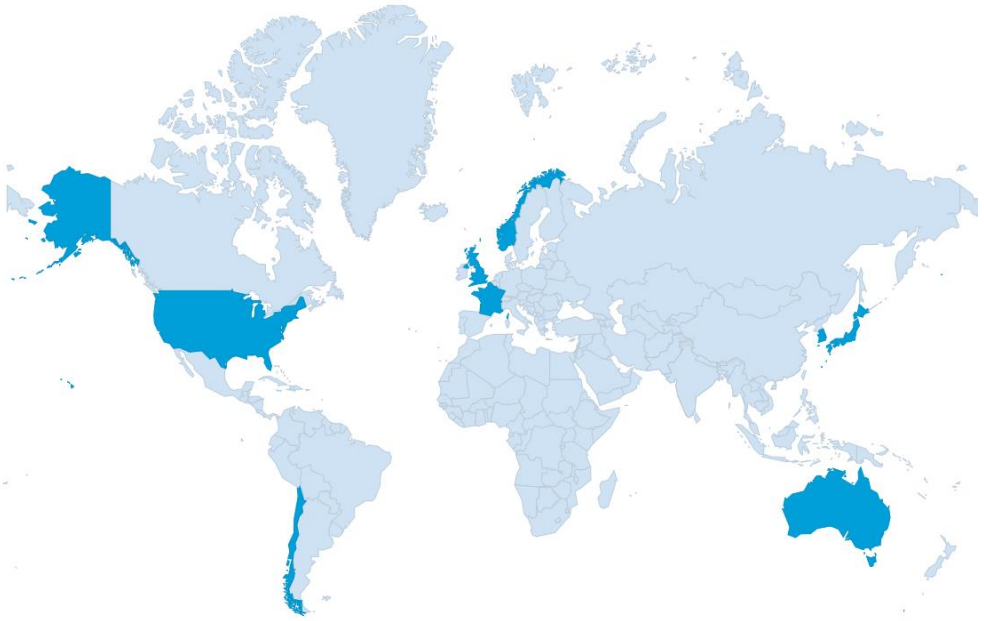
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Market design parameters and demand side activity

The analysis include 9 examples of how demand-side flexibility works in practice. The examples represent different regions worldwide, as well as different market design and different fundamental features and challenges in the electricity sectors. The table below outlines our impression about the demand side activity and some key market design parameters per case.

	Demand side activity*	Wholesale market	Dispatch	Transmission constraint management
Norway	Low	Contestable	Decentralised	Zonal prices
Japan	Medium	Contestable	Centralised	Zonal prices
South Korea	High	Monopolistic	Centralised	Zonal prices
Australia	Medium	Contestable	Centralised	Zonal prices
Great Britain	High	Contestable	Decentralised	Zonal price
France	High	Contestable	Decentralised	Zonal price
California	High	Contestable	Centralised	Nodal prices
Texas	Medium	Contestable	Centralised	Nodal prices
Chile	Low	Contestable	Centralised	Nodal prices



*Note: This is a subjective comment, based on our general impression of the level of participation of demand side resources, as compared to our impression of the potential.

Electricity system indicators and demand side activity

The analysis include 9 examples of how demand-side flexibility works in practice. The examples represent different regions worldwide, as well as different market design and different fundamental features and challenges in the electricity sectors. The table below outlines our impression about the demand side activity and some key electricity system parameters per case.

	Demand side activity*	Price volatility	Capacity issues	Retail tariffs	Energy sources
Norway	Low	Low	No	Volumetric	Hydropower
Japan	Medium	Low	Yes (Fukushima)	Volumetric	Coal and gas
South Korea	High	Low	Yes	Volumetric	Coal, gas and nuclear
Australia	Medium	High	Yes (peaks)	Volumetric	Coal and gas
Great Britain	High	High	No	Volumetric	Gas, nuclear, wind and PV
France	High	Low	Yes (peaks)	Volumetric	Nuclear, hydro
California	High	High	Yes (peaks)	Volumetric	Gas, hydro, wind and PV
Texas	Medium	High	Yes (peaks)	Volumetric	Gas, coal and wind
Chile	Low	Low	Yes (grid)	Volumetric	Coal, hydro and gas

- The characteristics in the table to the left are rough summaries of key observations per country

*Note: This is a subjective comment, based on our general impression of the level of participation of demand side resources, as compared to our impression of the potential.