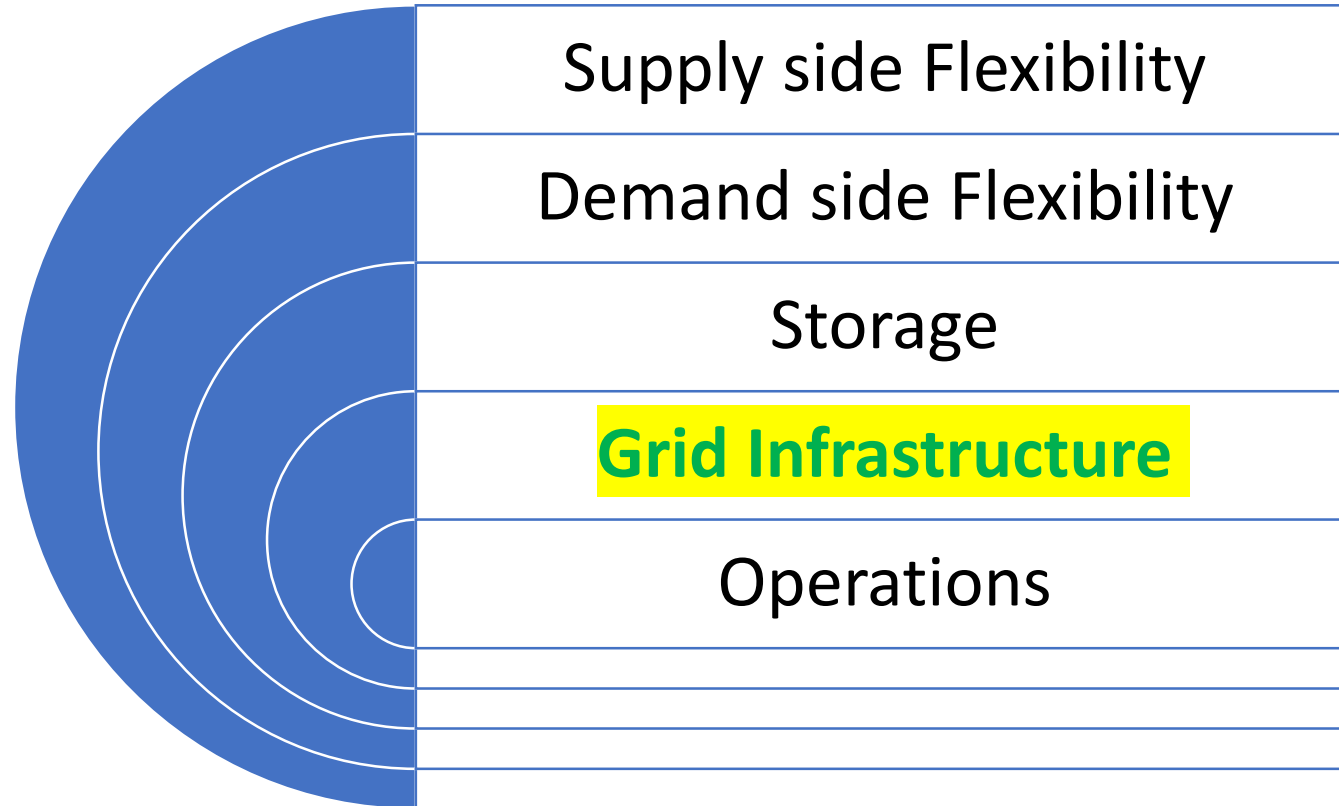


THEMATIC SESSION 4

Power System Flexibility

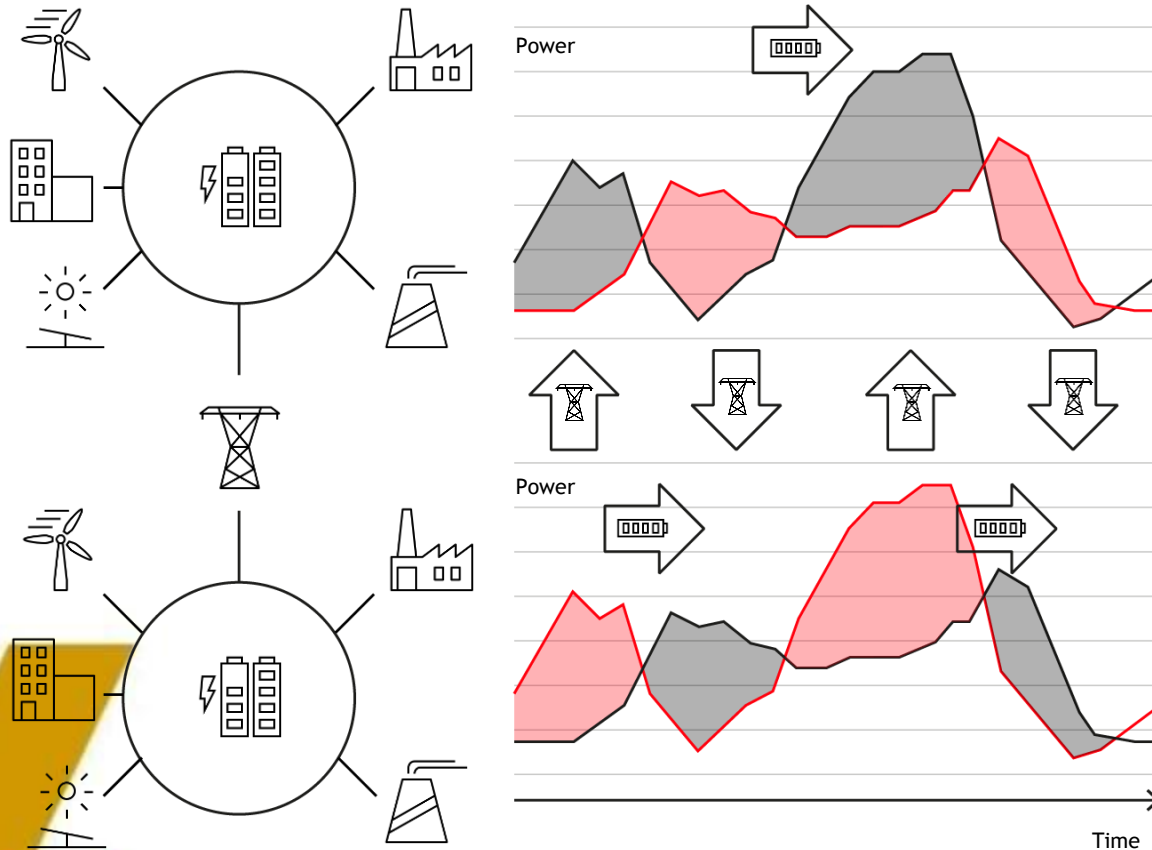
Speaker : *Saji S, Sr. VP, Hitachi Energy*

- Options for Increase in System Flexibility



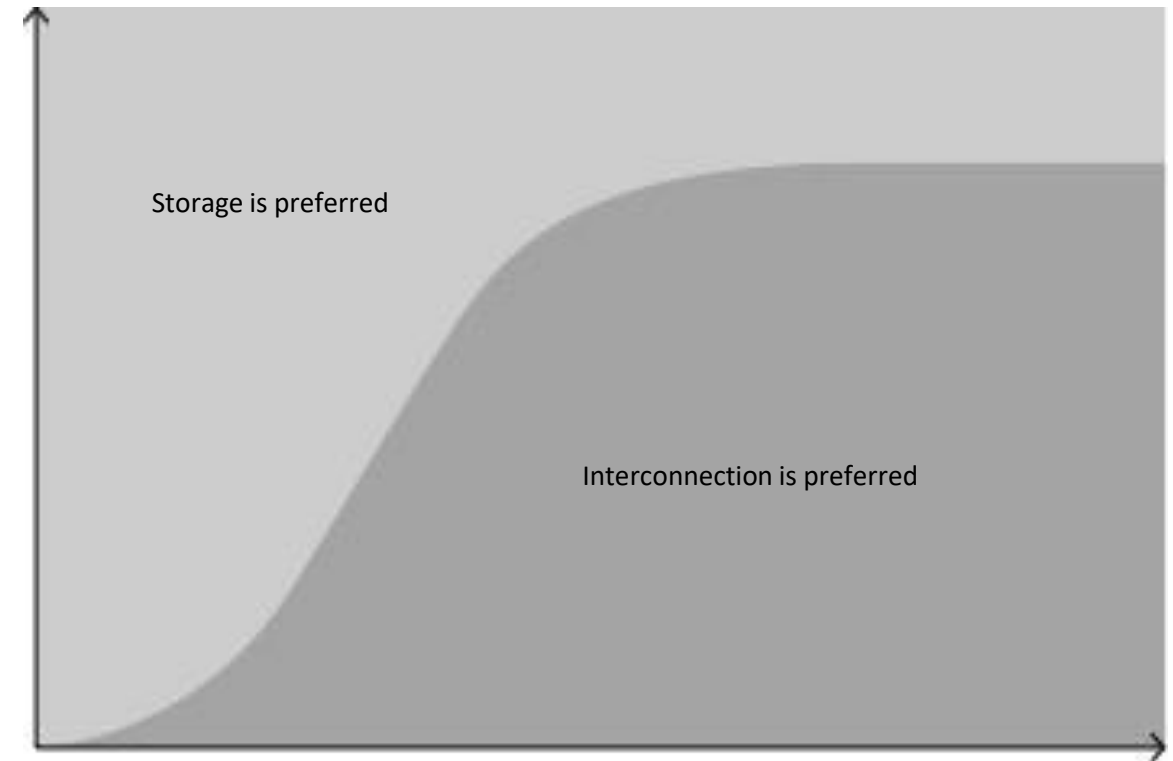
Hybrid solutions – DC transmission & Storage

- Storage within a region vs. Interconnecting two regions



Optimal Mix – Fraction of Storage vs. Interconnection

Ideal mix fraction



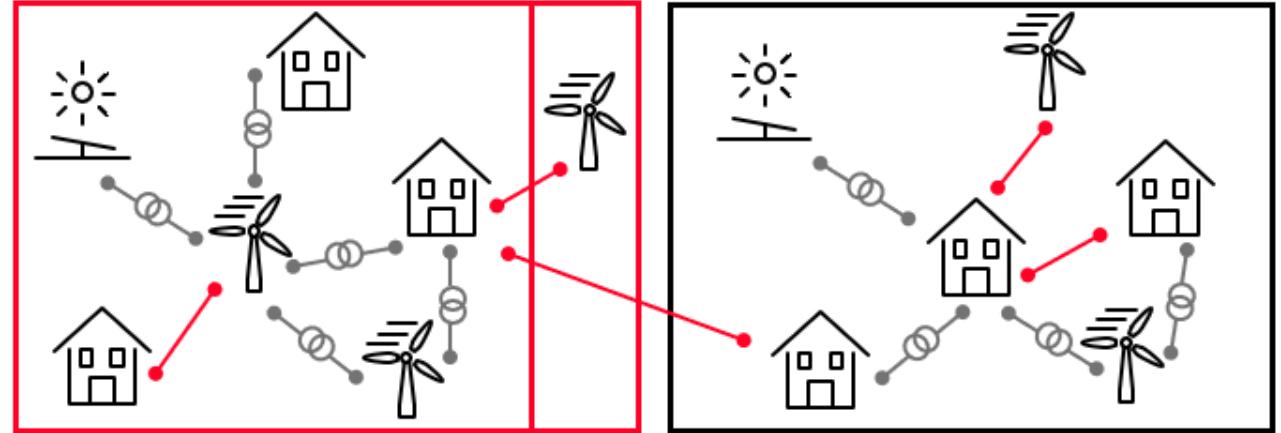
Spatial Price Difference between supply and demand

Interconnections – getting stronger together

Synchronous grid

Same frequency and synchronous operation

- HVAC & HVDC connections
- Optimization through several options
- Peripheral expansion for connecting remote RES



Asynchronous grid

Different frequency or asynchronous operation

- Connection through HVDC links
- Controllability and flexibility
- Maintain resilience of AC grids



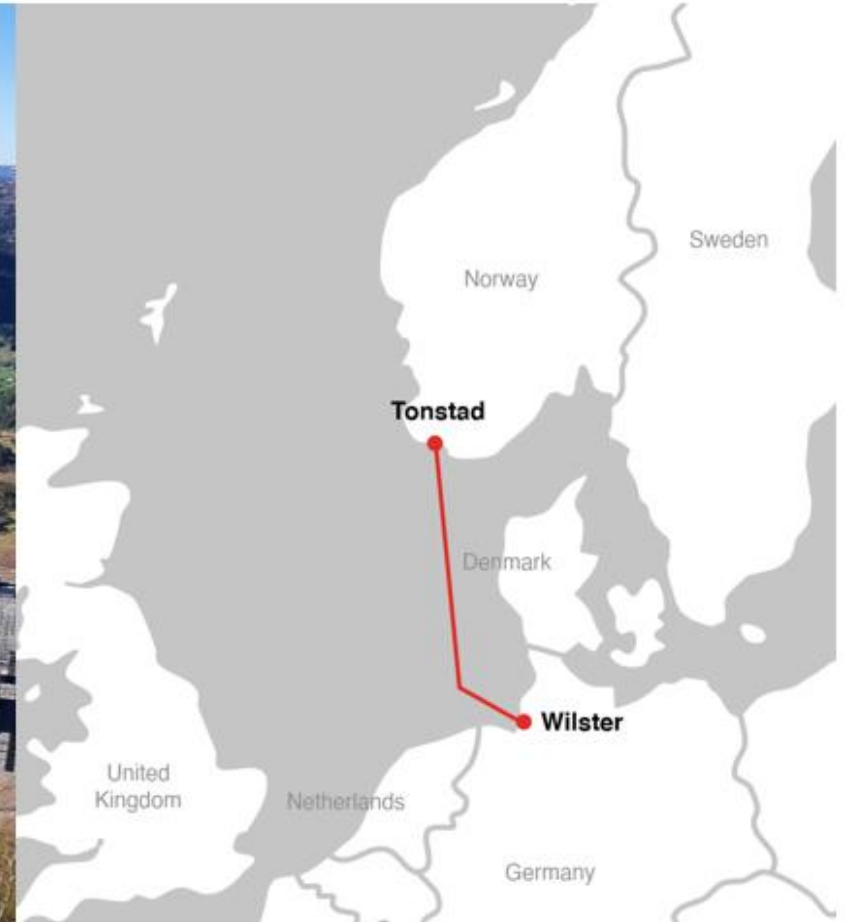
Wide Area Synchronous Grids

Strengthening and expansion of synchronous grid - Stronger than ever need to interconnect asynchronous grid

Case Study/Nord Link

Norway – Germany

Customer	Statnett/Tennet*
Customer needs	<ul style="list-style-type: none"> • Meet EU's target for CO2 reduction • Security of supply
Our response	<ul style="list-style-type: none"> • Two 1,400 MW, ± 525 kV HVDC Light® converter stations • 525 kV DC subsea and land MI cables for over 200 km of the route
Customer benefits	<ul style="list-style-type: none"> • Daily and seasonal fluctuations in power demand can be met by using the other country's renewable surplus power • Higher availability
Year	<ul style="list-style-type: none"> • 2020



Thank You

*For discussions/suggestions/queries email: www.indiasmartgrid.org
www.isgw.in*

[Links/References \(If any\)](#)

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