



WHEN TRUST MATTERS

HVDC transmission for the grid integration of offshore wind

Nova Scotia Offshore Wind R&D Forum, November 18, 2024 - Halifax

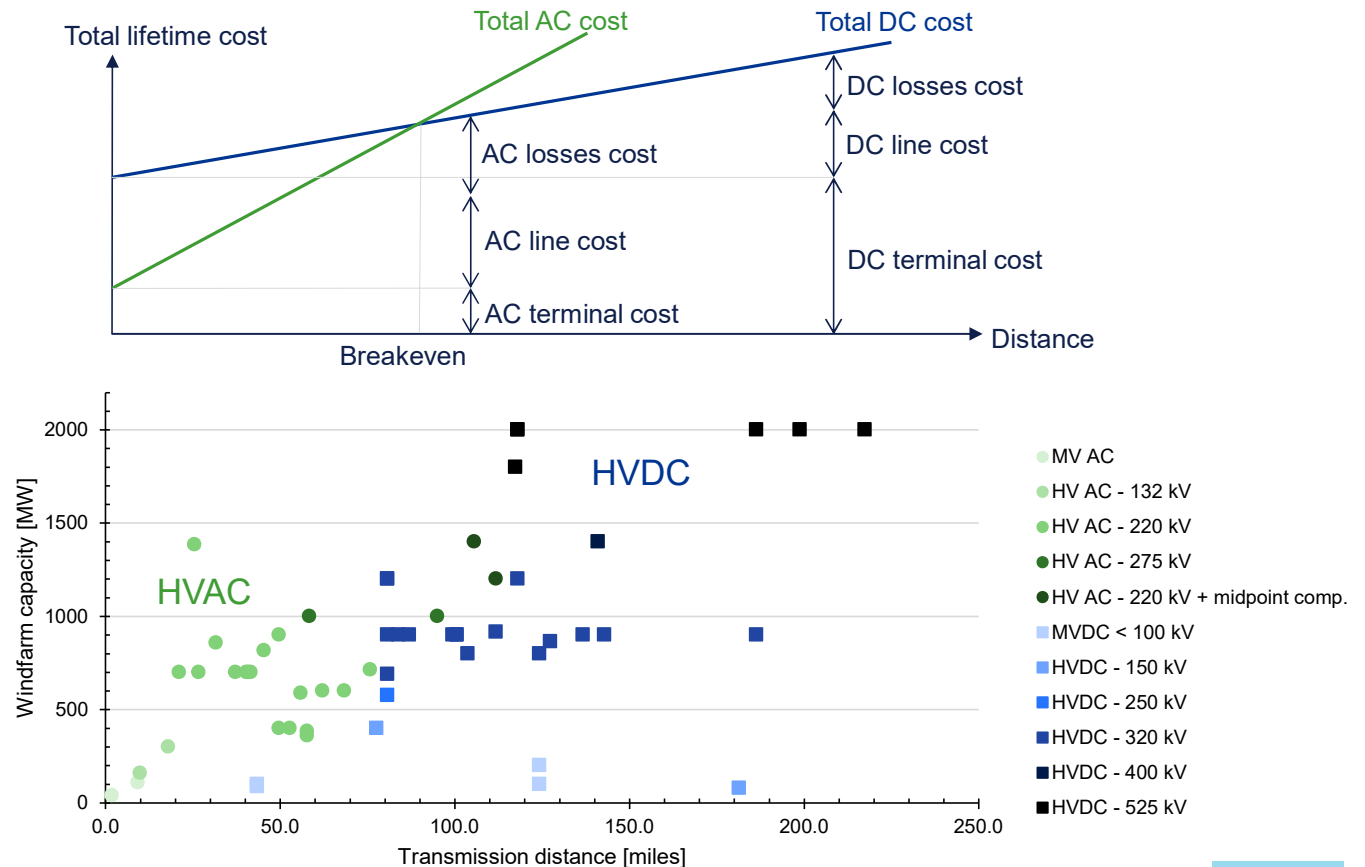
Offshore Wind: Grid Integration

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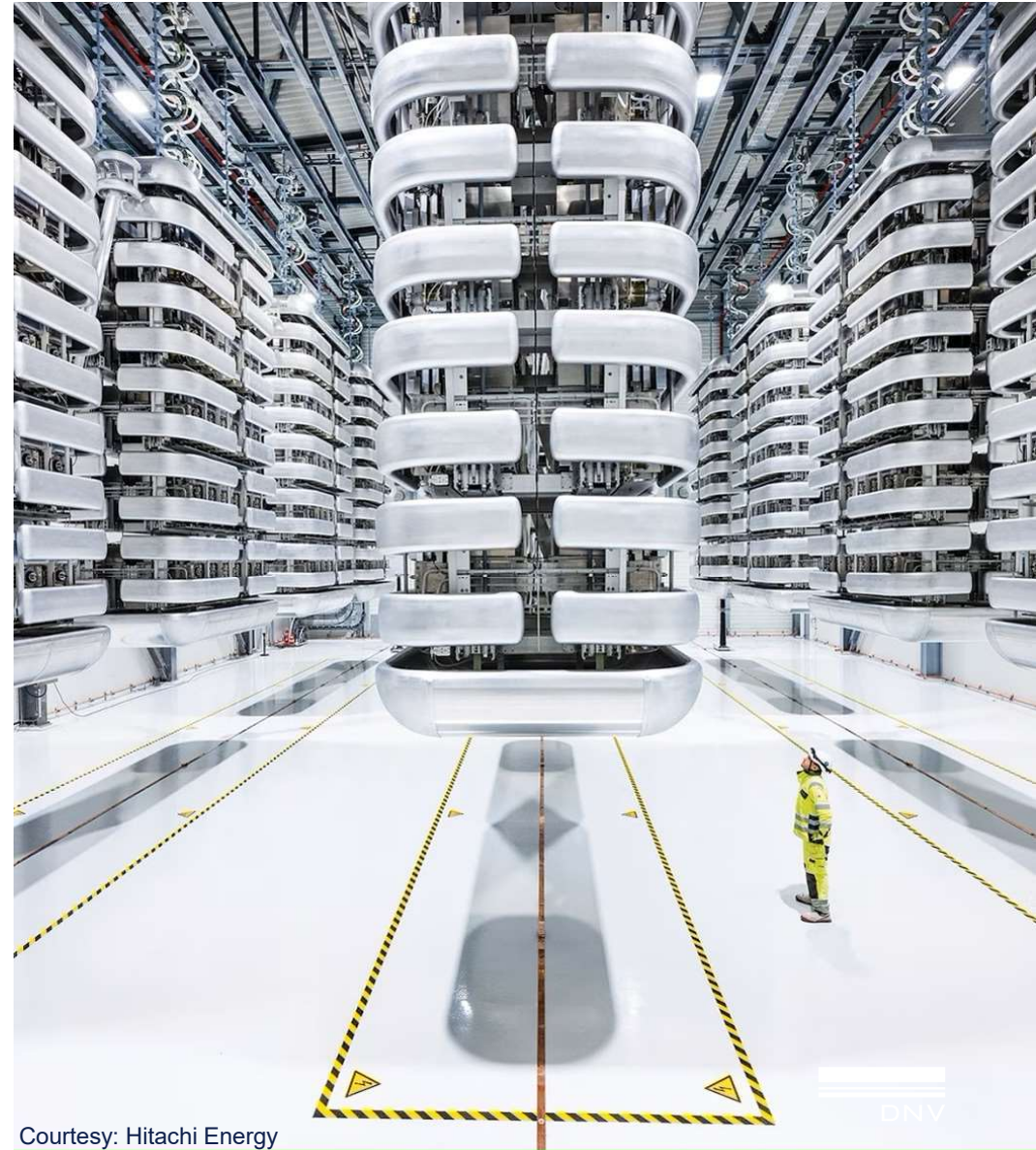
Choosing a transmission technology for offshore wind

- Access to offtake
 - Distance from shore
 - Distance from market
- Achieve lowest lifetime cost
 - CAPEX / OPEX
 - Availability
 - Losses
- Minimize number of cables to shore
- Smooth onshore grid integration



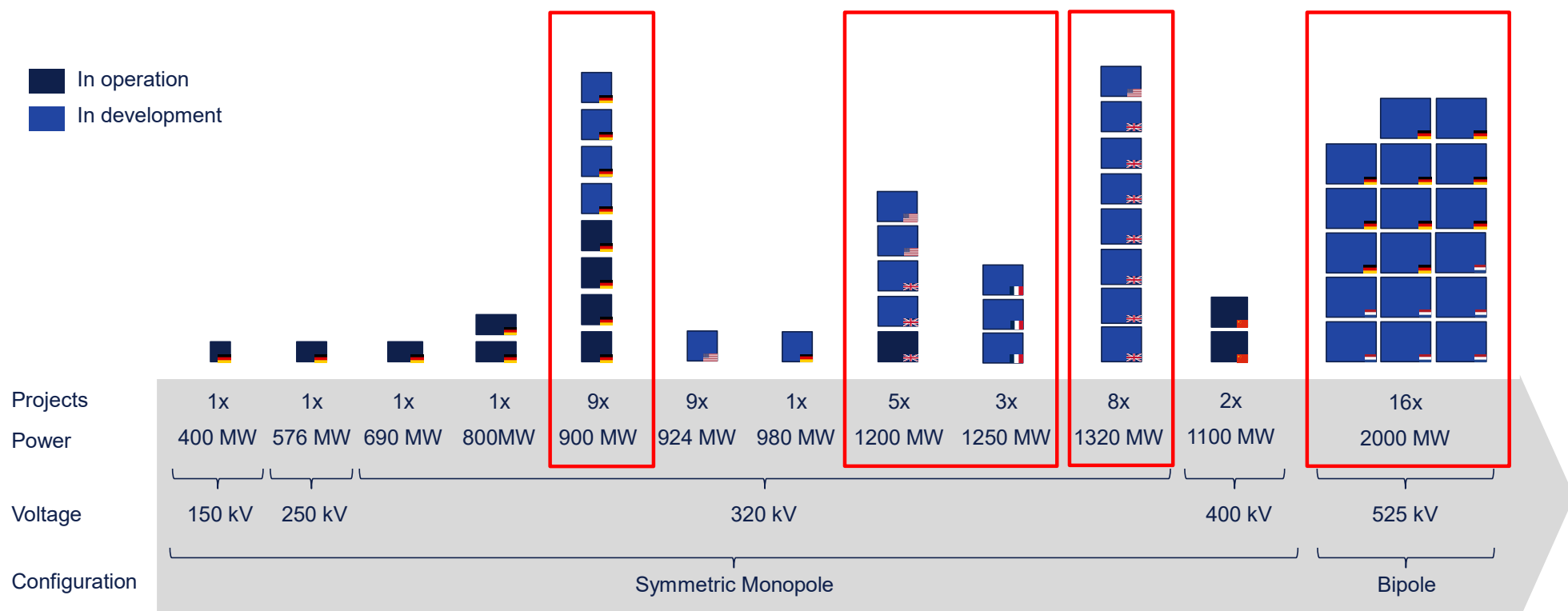
Why HVDC transmission?

- High voltage direct current
- Cost-effective and low-impact technology for high-capacity and long-distance transmission
- Fully controllable real & reactive power
- Grid integration of remote large-scale renewables
 - Hydro
 - Offshore wind
 - Solar
- Reinforcement of existing onshore grids
- Energy trade between countries / continents



Courtesy: Hitachi Energy

Capacity 'classes' have emerged for offshore wind HVDC connections



Reducing nr of cables to shore is important

8 x 250 MW AC

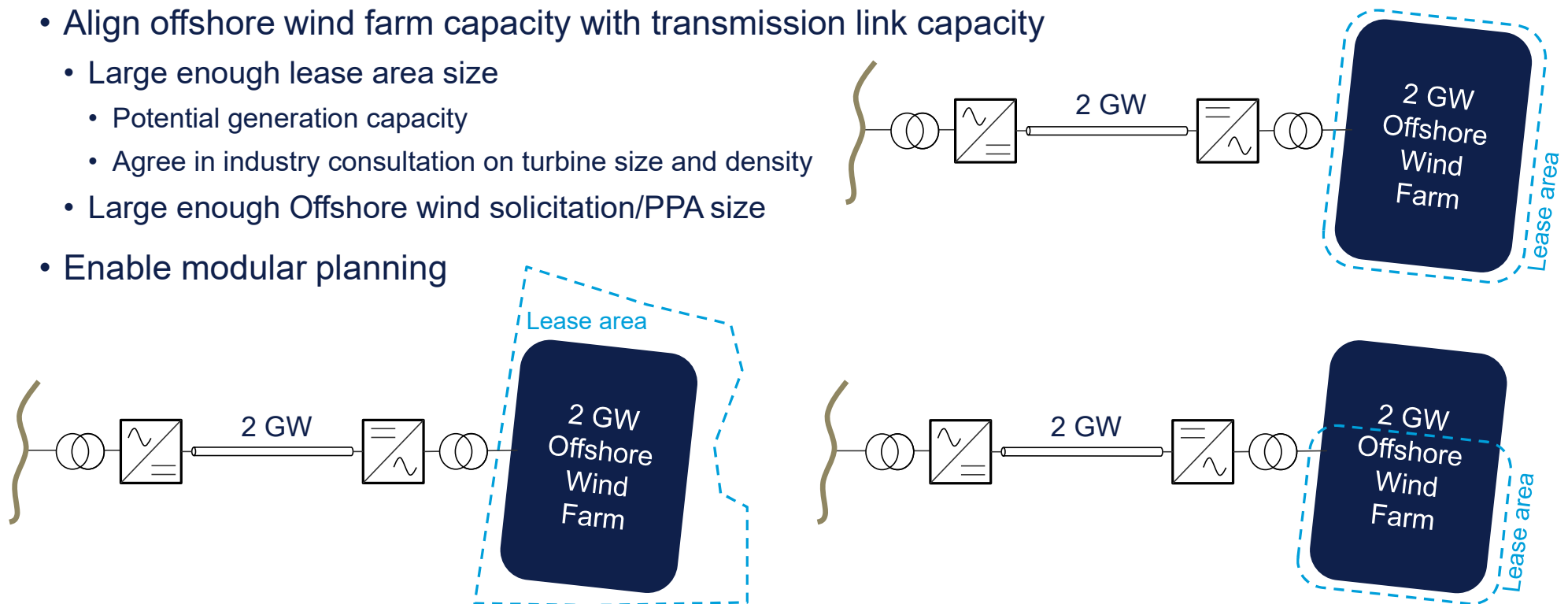


Coordinate offshore wind farm with transmission capacity → transmission led generation planning

- Align offshore wind farm capacity with transmission link capacity

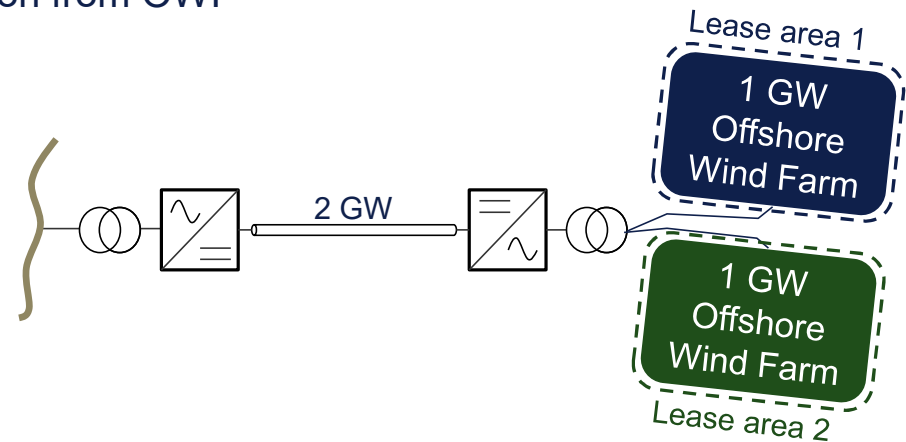
- Large enough lease area size
 - Potential generation capacity
 - Agree in industry consultation on turbine size and density
- Large enough Offshore wind solicitation/PPA size

- Enable modular planning



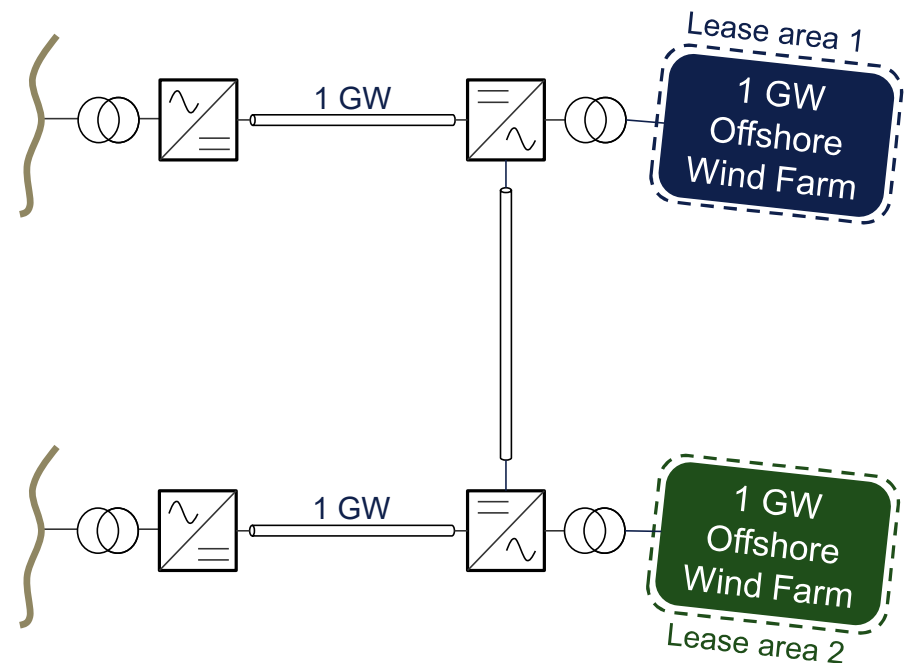
Coordinate offshore wind farm with transmission capacity → transmission led generation planning

- Share transmission between multiple wind farms
 - **Locations** – Close enough to connect to a common offshore converter
 - Deployment sequence / **schedule** – Close enough commercial operation dates to avoid unused HVDC link capacity for too long
 - Separate development and **ownership** of transmission from OWF



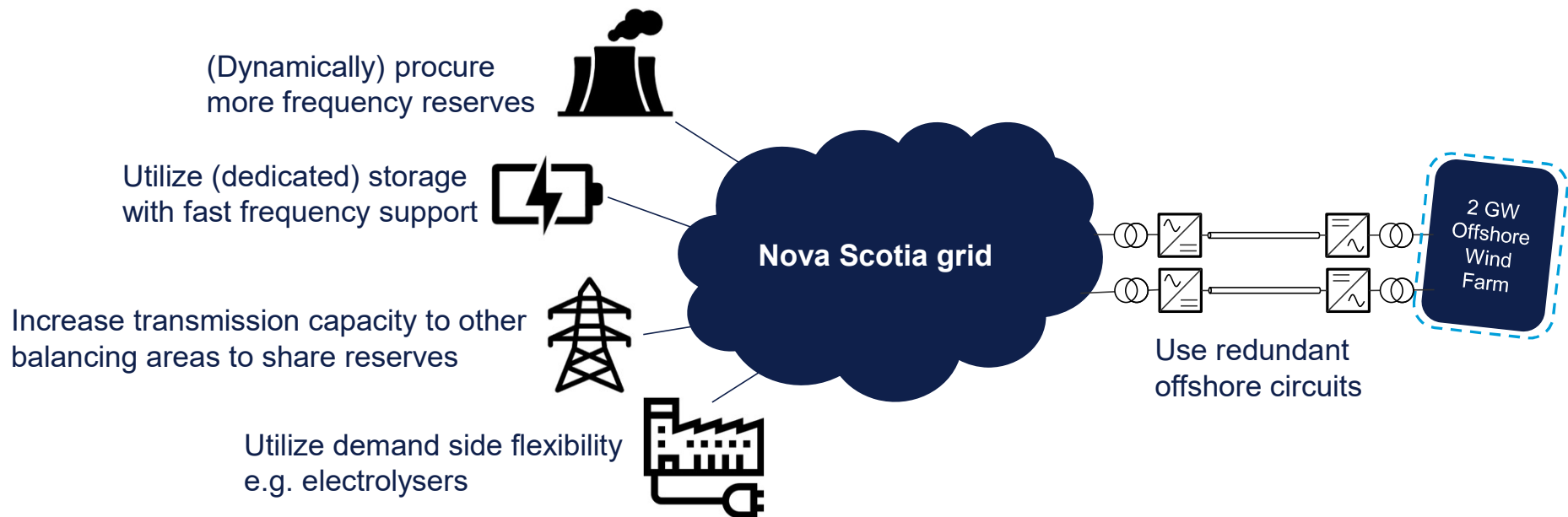
Coordinate offshore wind farm with transmission capacity → transmission led generation planning

- Networking options
 - Improve reliability and availability
 - Enable access to more diverse markets (US?)
 - Reinforce onshore grid
 - AC or DC?



Take measures to address MSSC limits

- Nova Scotia's grid must hold enough reserve and/or flexibility in the system to deal with a sudden HVDC system outage. HVDC technology capability exceeds **Most Severe Single Contingency** levels in regions which is currently ~250 MW in Nova Scotia



Final remarks

- Long lead time, plan ahead
- Investigate and implement best option to raise MSSC
- Select the most suitable governance model for offshore transmission

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Thank you!

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