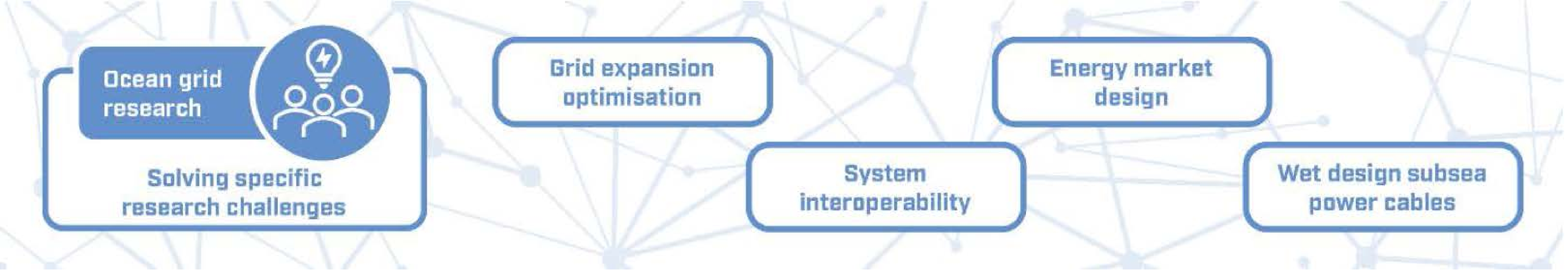

- **Ocean Grid Research** is an RCN funded R&D project aimed at creating **grid and system integration innovations for North Sea wind energy realisation.**
- Time-frame: 2022-2024
- R&D-partners: SINTEF Energi AS and NTNU
- Associated industry partners: Equinor, Agder energi, Aker offshore wind, Deep Wind Offshore, Hafslund Eco, Fred. Olsen Renewables, Aibel, Nexans, AkerSolutions, DNV, Benestad, ABB, Hitachi.

The **primary objective** of Ocean Grid Research is to accelerate the development of offshore energy systems with new knowledge and tools for grid expansion optimisation, energy market design, prevention and mitigation of system interoperability issues and wet design of subsea power cables. Moreover, the project will support the activities in the Ocean Grid with open research.

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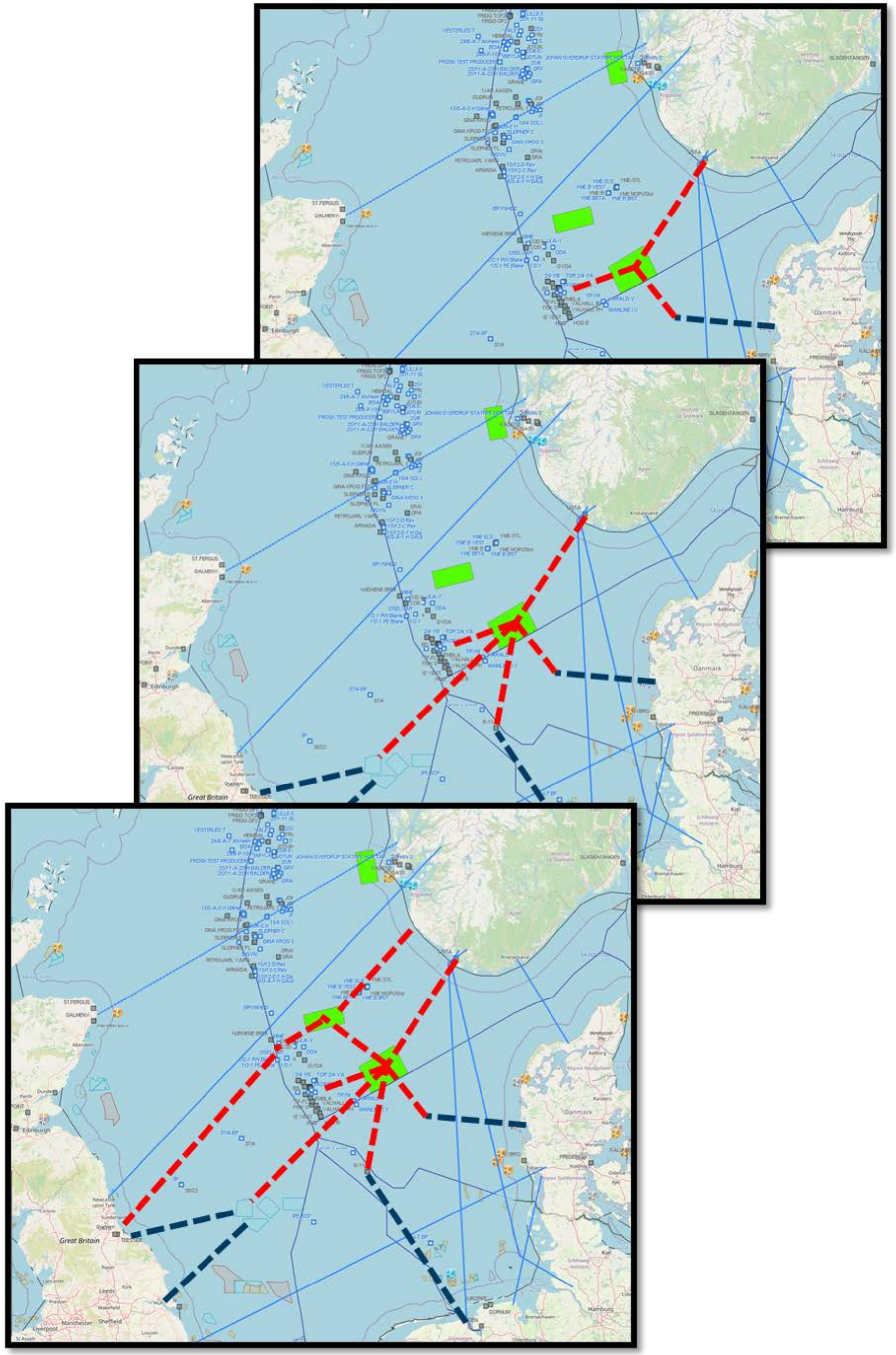
WP-1: Grid expansion optimization

- Primary objective:
  - Develop optimisation models and open-source tool to identify optimal step-by-step offshore energy infrastructure buildout
- Methodology:
  - Optimisation: stochastic mixed-integer linear programming
  - Include hydrogen demand and hydrogen as alternative energy carrier
- Impact:
  - Reduced economic risk for infrastructure investments
  - Reduced costs of grid connection for offshore wind



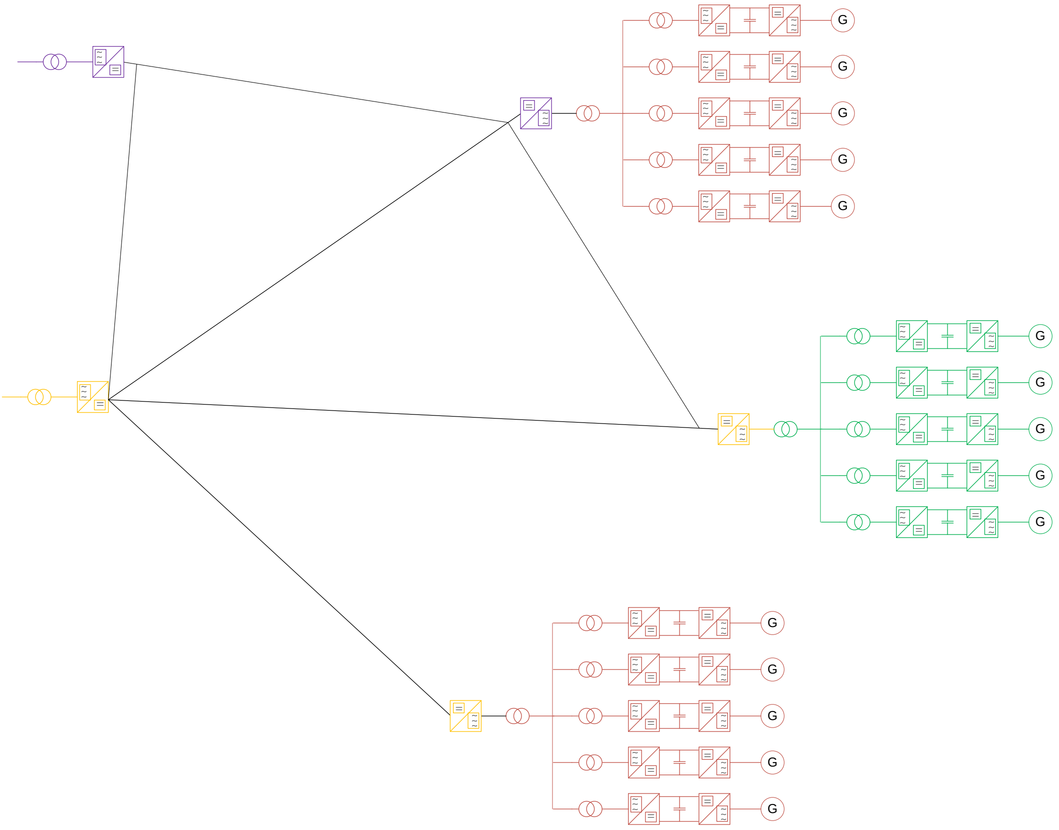
WP-2: Energy Market Design

- Primary objective:
  - Understanding **impact of market design** with regards to offshore wind energy profitability taking into account European demand and flexibility needs.
- Methodology:
  - Utilization of energy system modelling tools are central
  - Main modelling challenges.
    - Modelling representation of North Sea offshore price area
    - Modelling of power-hydrogen interaction
    - Modelling hydrogen markets and effects thereof
- Impact:
  - Optimal socio-economic design for off-shore renewable energy system will generate maximum social welfare

Source: Nordpool

WP-3: System Interoperability

- Primary objective:
  - Identify approaches to assess and ensure interoperability in a converter dominated offshore power system.
- Methodology:
  - Eigenvalue and impedance based analysis
  - application of model identification and black box modelling
  - time domain simulation and hardware in the loop testing.
- Impact:
  - Reduce the number of cases to be verified by time domain simulation by a factor 1/10 to 1/100.
  - Increase confidence in the applicability of grid forming converter solutions with respect to interoperability.



WP-4: Wet design subsea power cables

- Primary objective:
  - Develop reliable and long-life high voltage wet design subsea power cables by assessing the effect of water migration into high voltage insulation systems
- Methodology:
  - Detect and analyse ions and contaminations responsible for the water tree inception from cable screens
  - Measure diffusion rate of detected ions in semiconductive cable screen materials – ion diffusion rate models to be established
  - Effect of magnitude of electrical field on wet electrical ageing will be studied using cable models
  - Study new conductor screen materials
- Impact:
  - Knowledge required for development of new cost-effective and reliable high voltage subsea cables with wet design.