ELOGOW- electrification of oil and gas installations by offshore wind

Science meets industry, 25.10.2022

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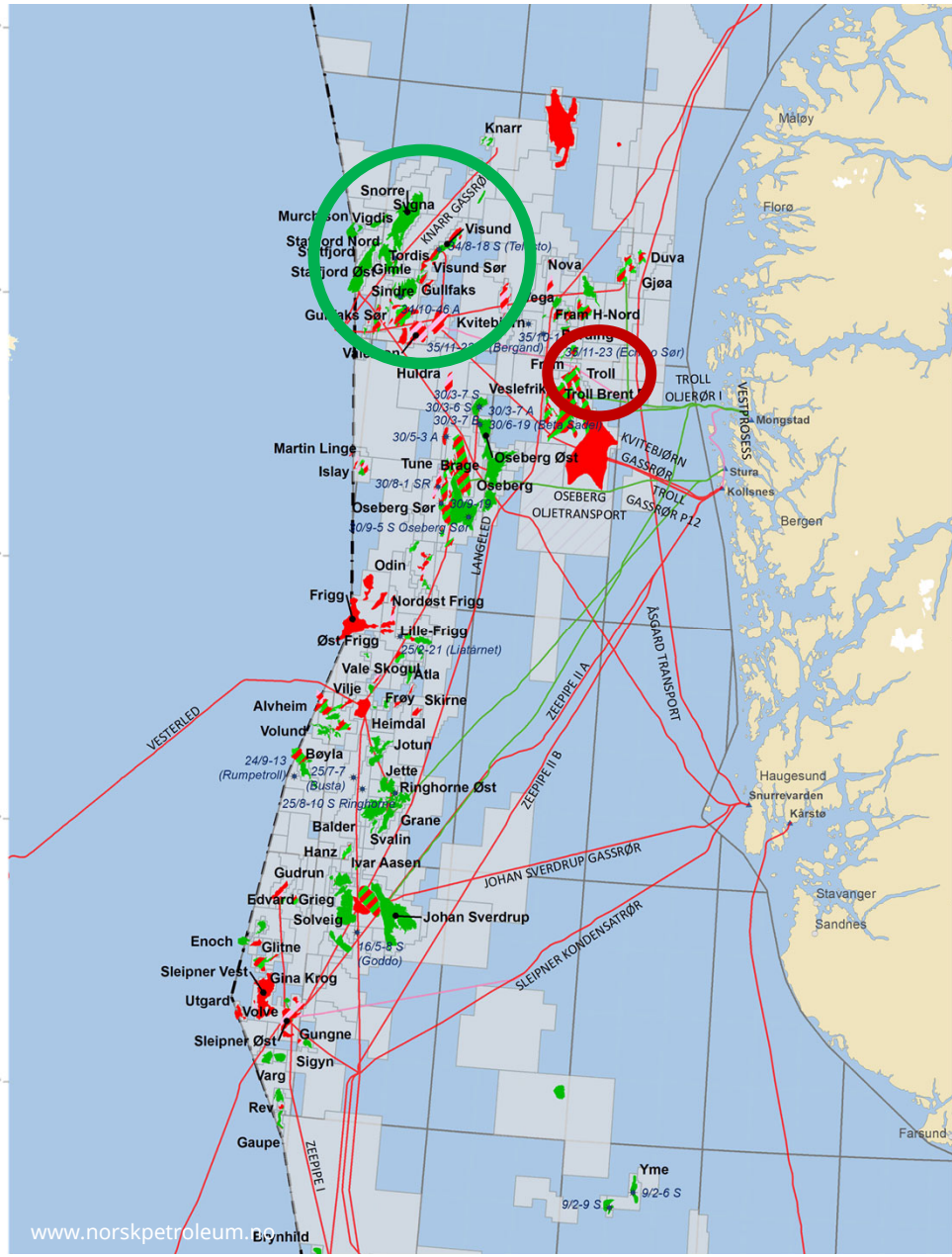
About ELOGOW

- Research project, funded by the Research Council of Norway
- Collaboration between research and industrial partners
  - IFE, NORCE, UiO, Equinor, ConocoPhillips, Aibel, Energy Valley
- 4-year project (2020-2024)
- Total budget: 16 MNOK (1.5 M€)

Green house gas emissions from Norwegian oil and gas extraction

- Oil & Gas extraction facilities on the Norwegian Continental Shelf contribute to ~27% of the total greenhouse gas emissions in Norway
  - ~66% of this due to gas turbines



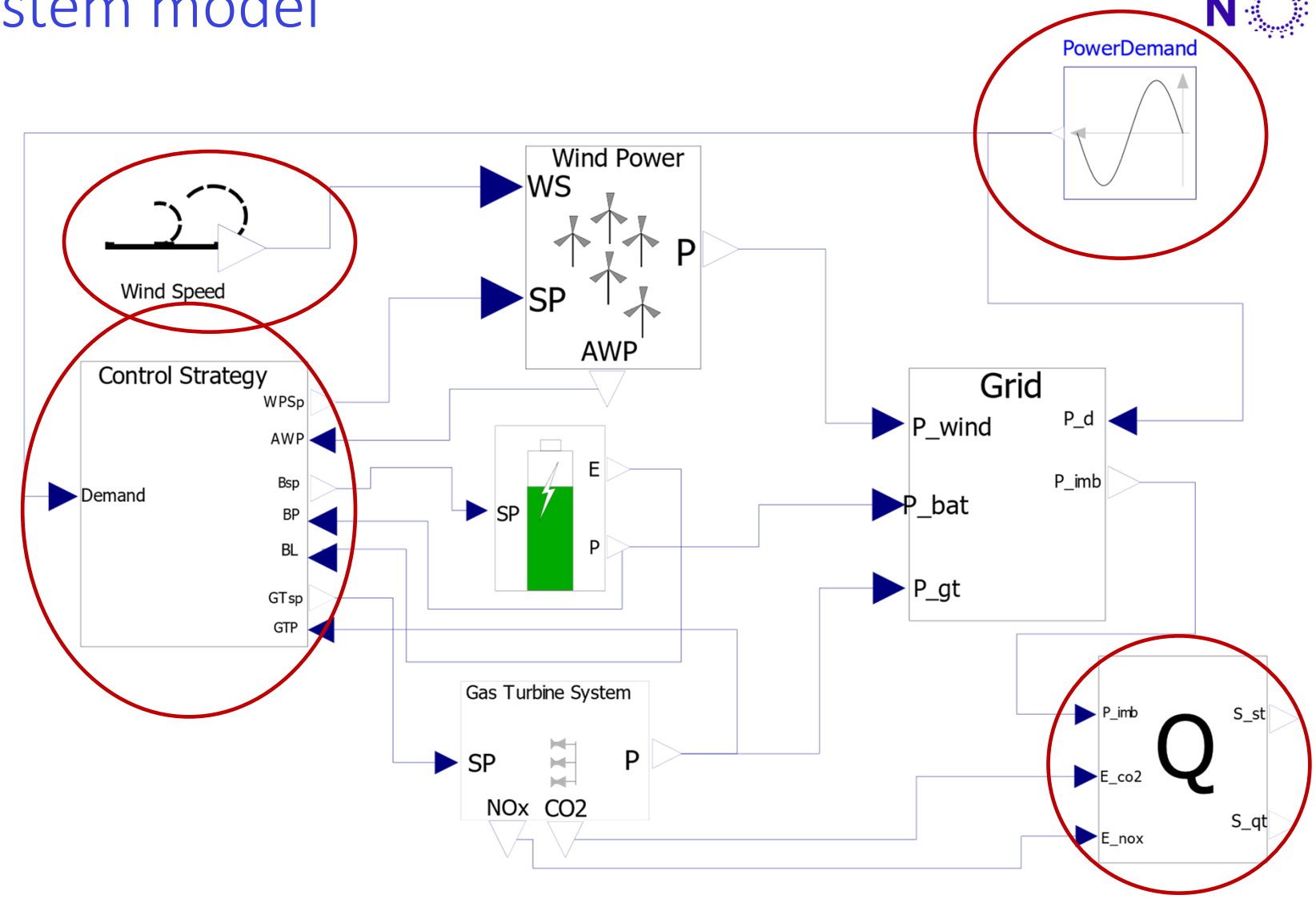
ELOGOW approach

- Gas turbines are optimized to run close to their maximum rated power. Kinsey et al (2019): CO_2 emissions at idle mode is only 30% lower than in full operational mode
- Can we reduce running gas turbines in idle mode. Ideally complete shut-down, start-up on the fly?
  - Use of energy storage (batteries) will give more time for a start-up on the fly, and ensure a steady, stable and responsive energy supply
- Approach:
  - Develop energy system model
  - Develop autonomous controller and energy management system
  - Propose concept designs of cost minimized systems for reduction of CO_2

ELOGOW research topics

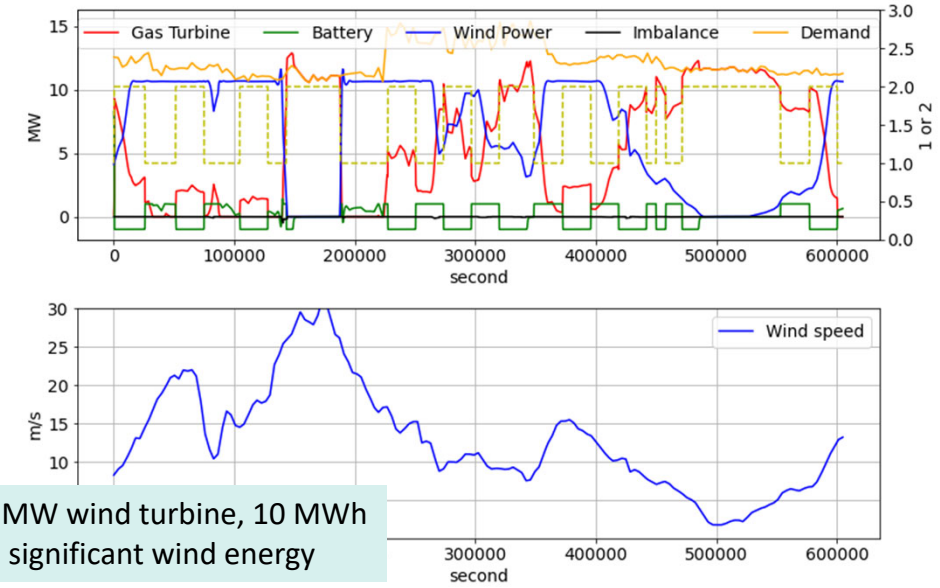
- Design of substructure containing battery storage
- Battery system design and characterization
- Short term predictive models for wind and wind energy production
- Modelling of the energy system

System model

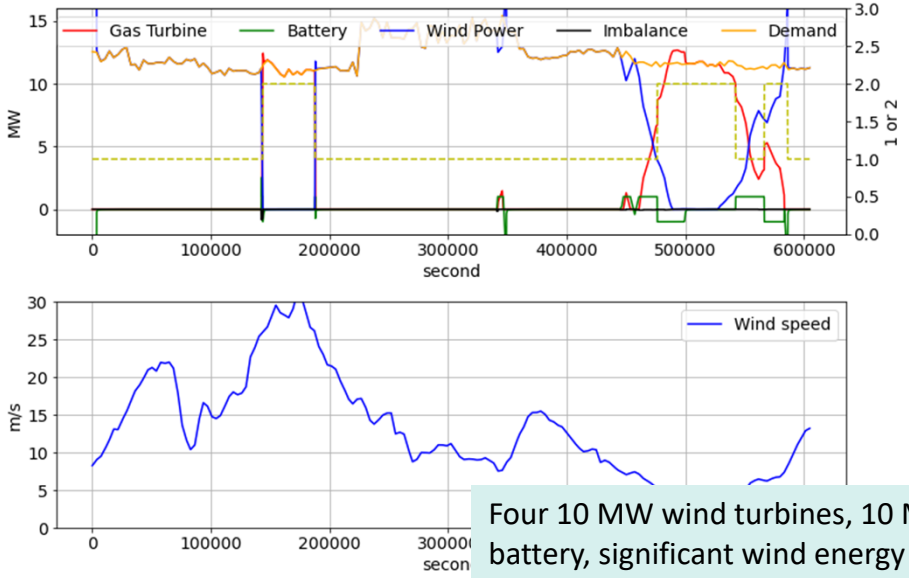


Energy system simulations

- Design and evaluate strategies / policies for how to manage the energy system
- Decisions:
  - Operation: when to start the gas turbines, how should we use the batteries
  - Design: number of wind turbines, battery capacity

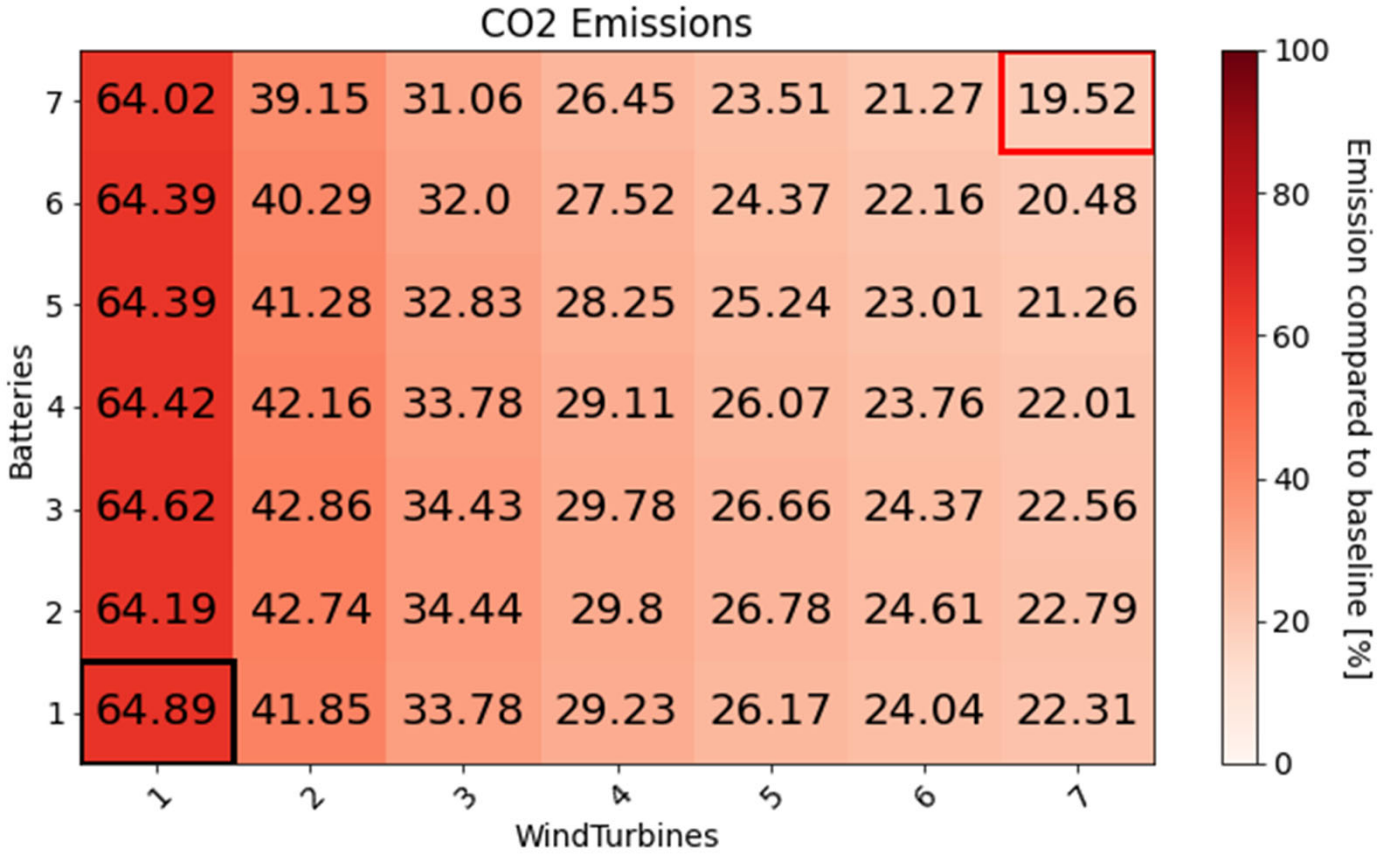


One 10 MW wind turbine, 10 MWh battery, significant wind energy



Four 10 MW wind turbines, 10 MWh battery, significant wind energy

Ensemble results (preliminary)



Summary

- Good wind conditions in the North Sea can be exploited to reduce climate gas emissions from O&G production
- Variability in wind conditions can be dealt with by using energy buffers
  - Gas turbines can be run in complete shut-down/start-up on the fly mode
  - Simulations indicate reductions in CO2 emissions by 35-80% depending on the number of wind turbines and number of batteries
- The energy system simulator will be used to evaluate different energy management policies