Vindparktilkopling til offshore installasjonar

Harald G Svendsen

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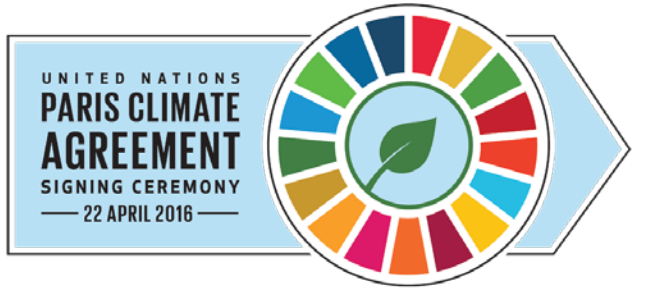
Motivasjon for elektrifisering med vind

- Store CO_2-utslepp frå olje- og gass-aktivitet (15 av 52 Mt CO2)
  - Må ned for at Noreg skal oppfylle klimamål
- Redusere drivstoff-forbruk, redusere vedlikehald av gassturbiner
- Kabel til land – fjernar offshore utslepp, men er dyrt
  - Og må kombinerast med ny fornybar for å unngå auka utslepp på land
- Offshore vind kopla til olje/gass-plattform er teknisk mogleg og økonomisk gunstig



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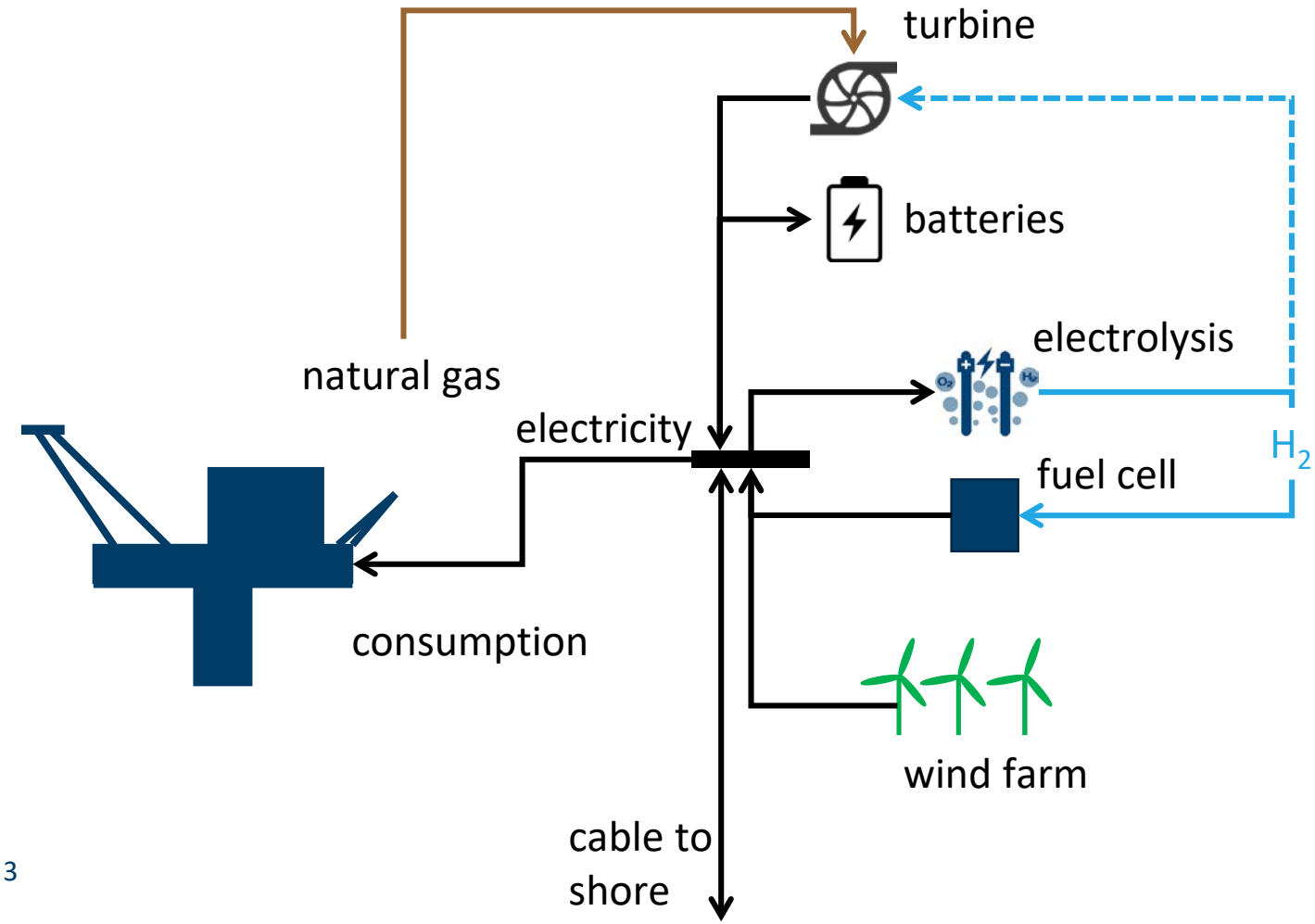
Elektrifisering



<u>Standard løysing i dag</u>

Lokale gassturbinar
med låg verkningsgrad

Landstrøm
og vindpark, med felles kabel

Vindkraft og naturgass
inkludert batteri
(brukt som reserve, for å tillate nedstenging av gassturbin)

...og større energilager,
f.eks. hydrogen
(erstattar gassturbin?)

Karbonnøytralt drivstoff
til gassturbin

Ja takk, litt av alt?

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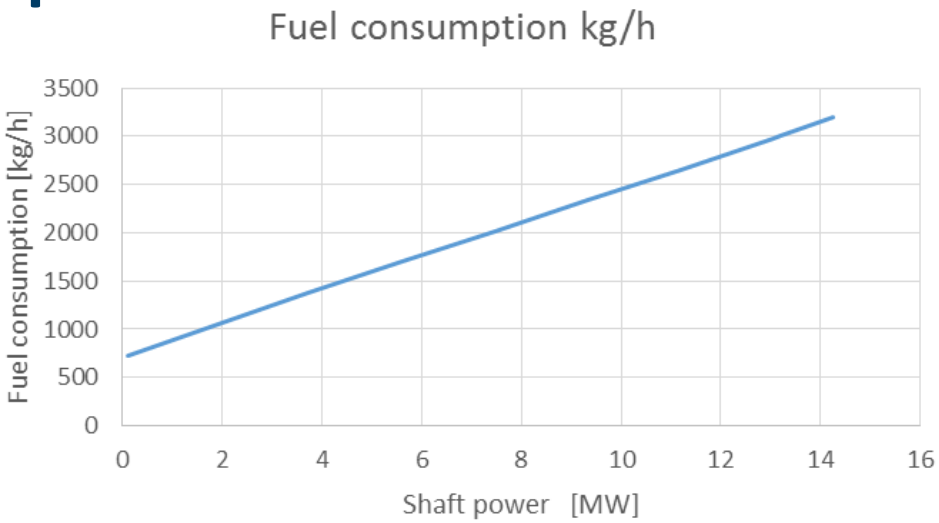
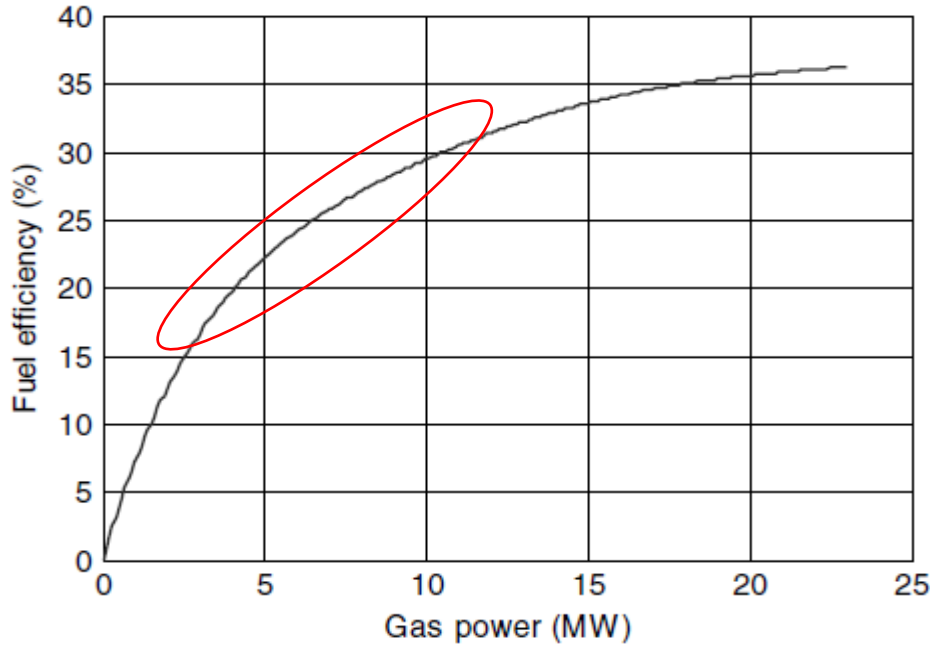
Viktige særtrekk for olje- og gassplattformar

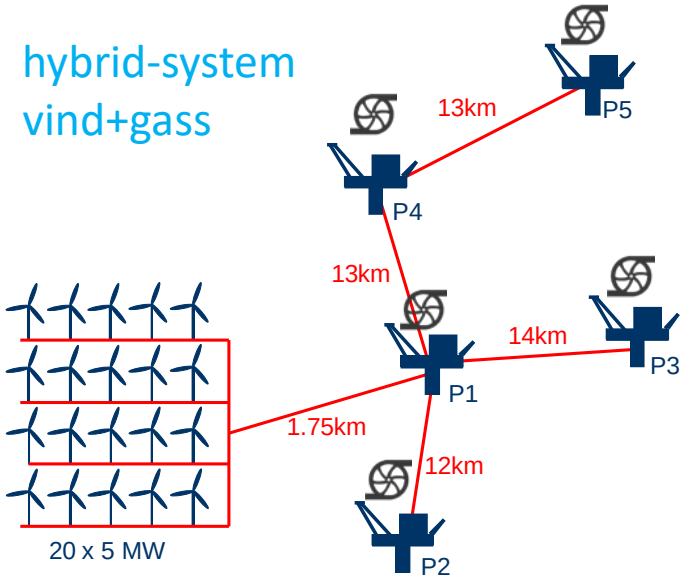
- Extreme requirements to availability of power
- Redundancy requirement implies running with more units than actually needed
  => Lower efficiency of gas turbines
- Cost of blackout is extreme
  => Difficult to introduce new, non-proven, solutions
- Wind turbines as well as single loads will have power rating comparable to gas turbine generators
  => Frequency and voltage transients may be a challenge

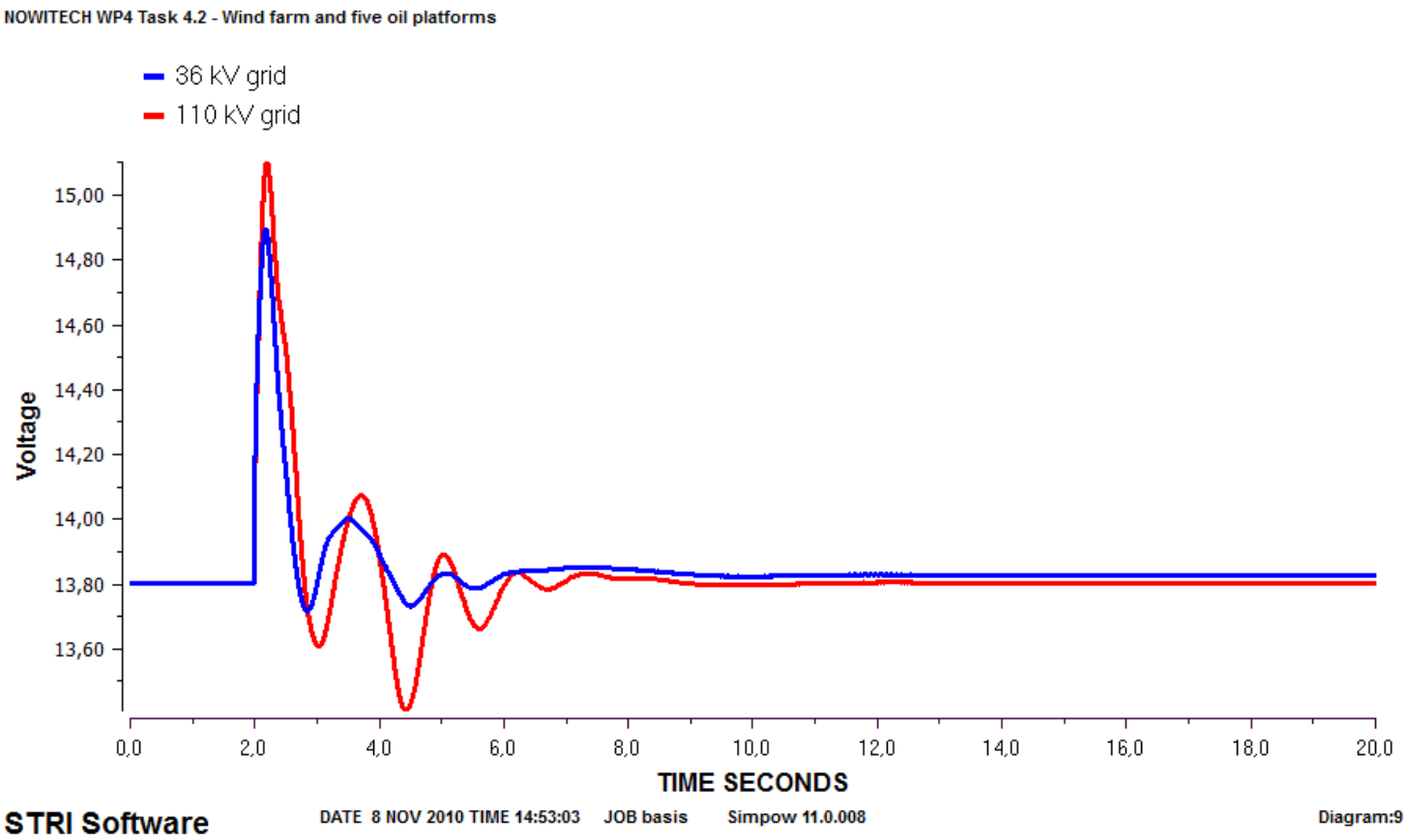




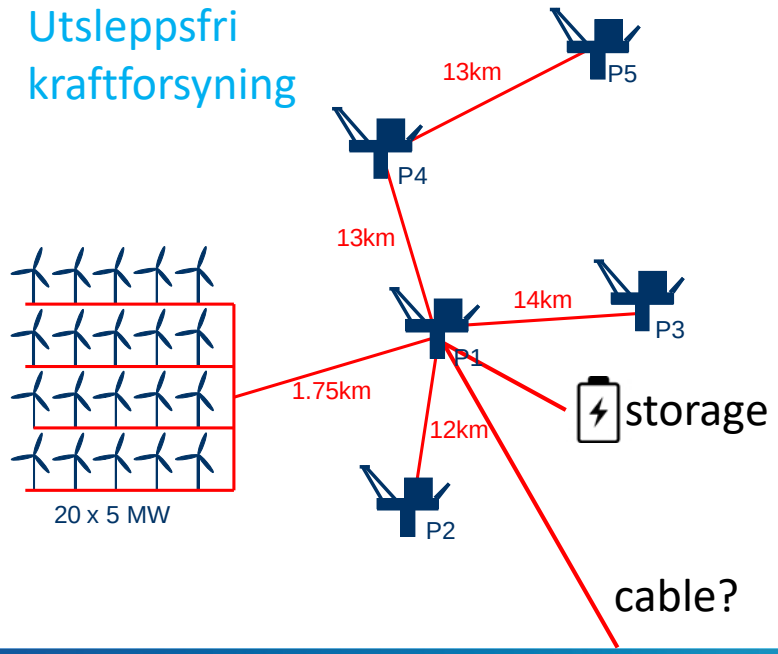
Frekvens- og spenningsstabilitet – eksempel

- Voltage transients following loss of 100 MW wind power
  - 36kV grid: +7.9%
  - 110kV grid: +9.4%





Stabilitet – utan gassturbinar

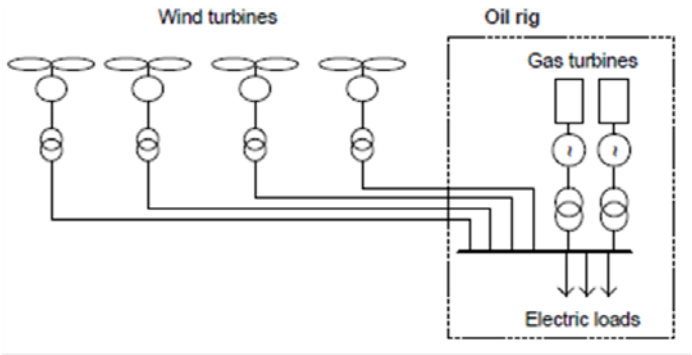


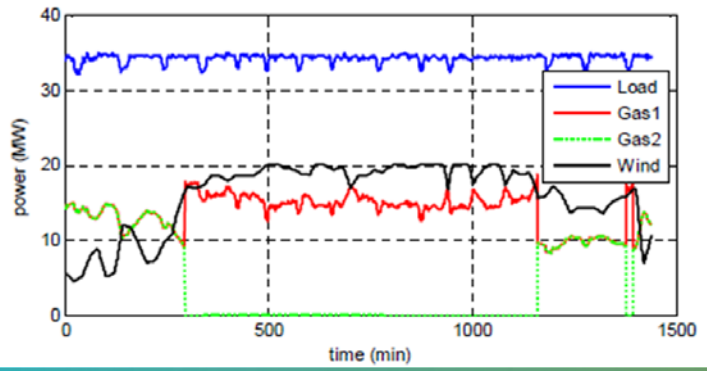
- mindre roterande masse
- stabilitet og spenningskvalitet avhengig av styring av kraftelektronikk
  - vindpark
  - batteri
  - hvdc-omformar (dersom dc-kabel)

Optimal driftsstrategi – Energi og CO_2

- Vind erstattar gass
- Slå av gassturbin ved tilstrekkeleg vind (redusere drift ved låg verkningsgrad)
  - Treng kanskje reserve på tomgang likevel?
  - Gode prognosar viktig – digitalisering...
- System med vind+gass: Opp til 40% reduksjon i CO_2

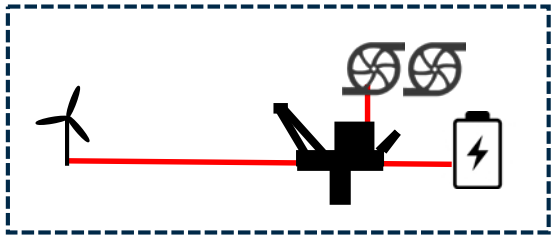
Eksempel:

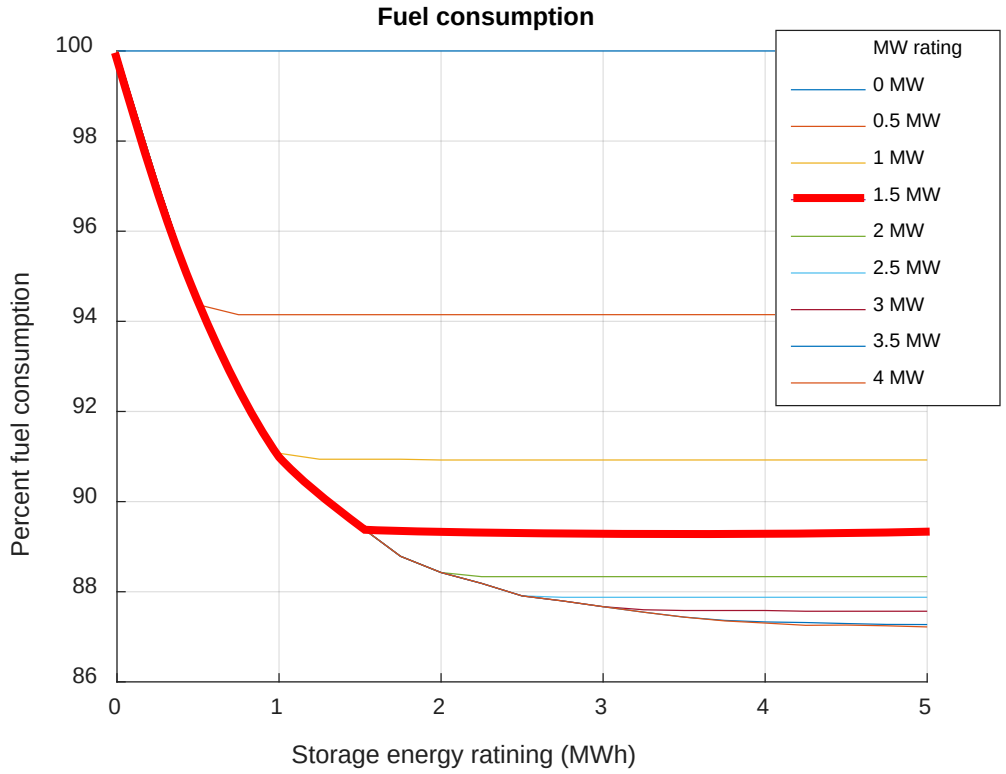




Batteri

- Battery can supply power while standby gas turbine starts in case of sudden loss or reduction in wind power production
  => Reduced risk for blackout
- A running backup is not needed
  => Increased fuel saving
  => Less wear and tear





Battery power rating

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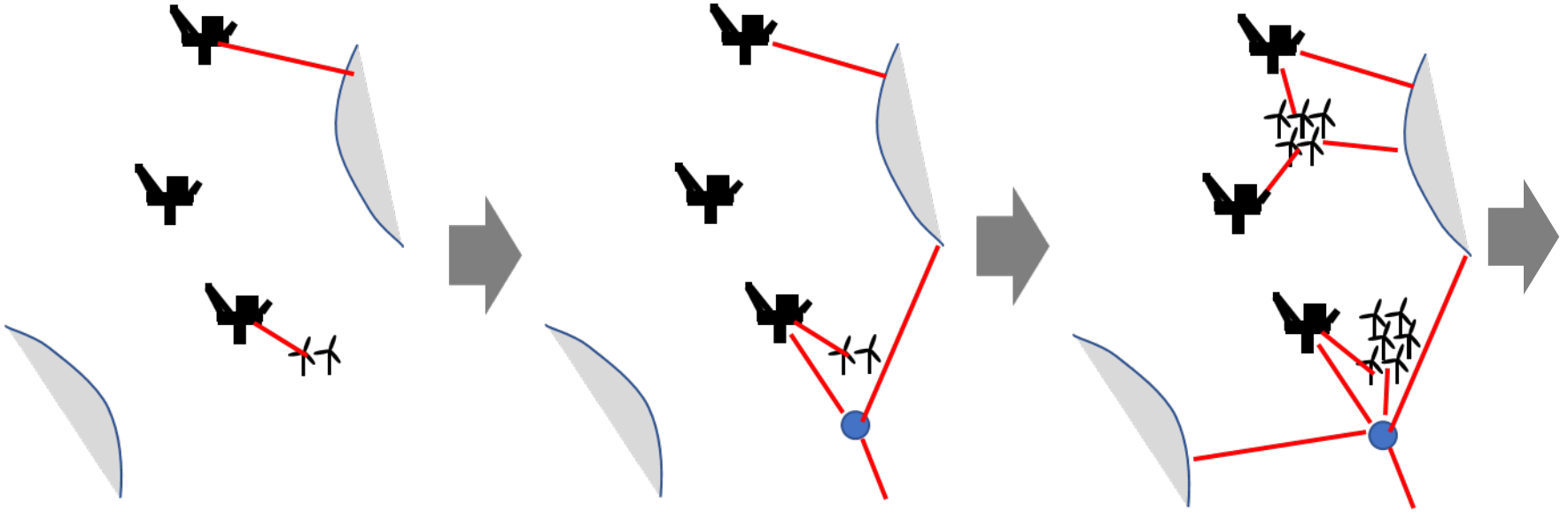
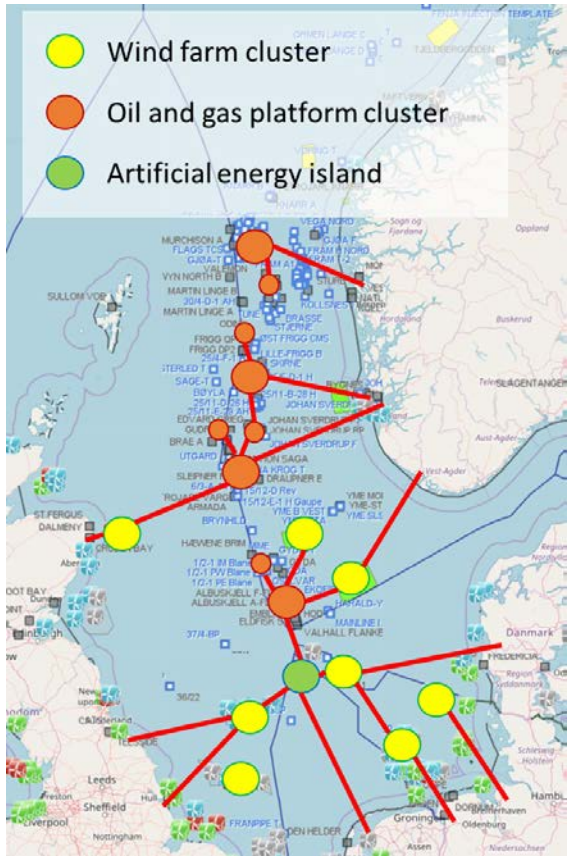
Elektrisk nett – eitt steg om gongen





Optimale investeringar her og no – som tek omsyn til at ulike ting kan skje framover i tid (stokastisk nett-optimalisering)

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LowEmission

Research Centre for a Low Emission Petroleum Industry on the Norwegian Continental Shelf

søknad levert oktober 2018

Vision

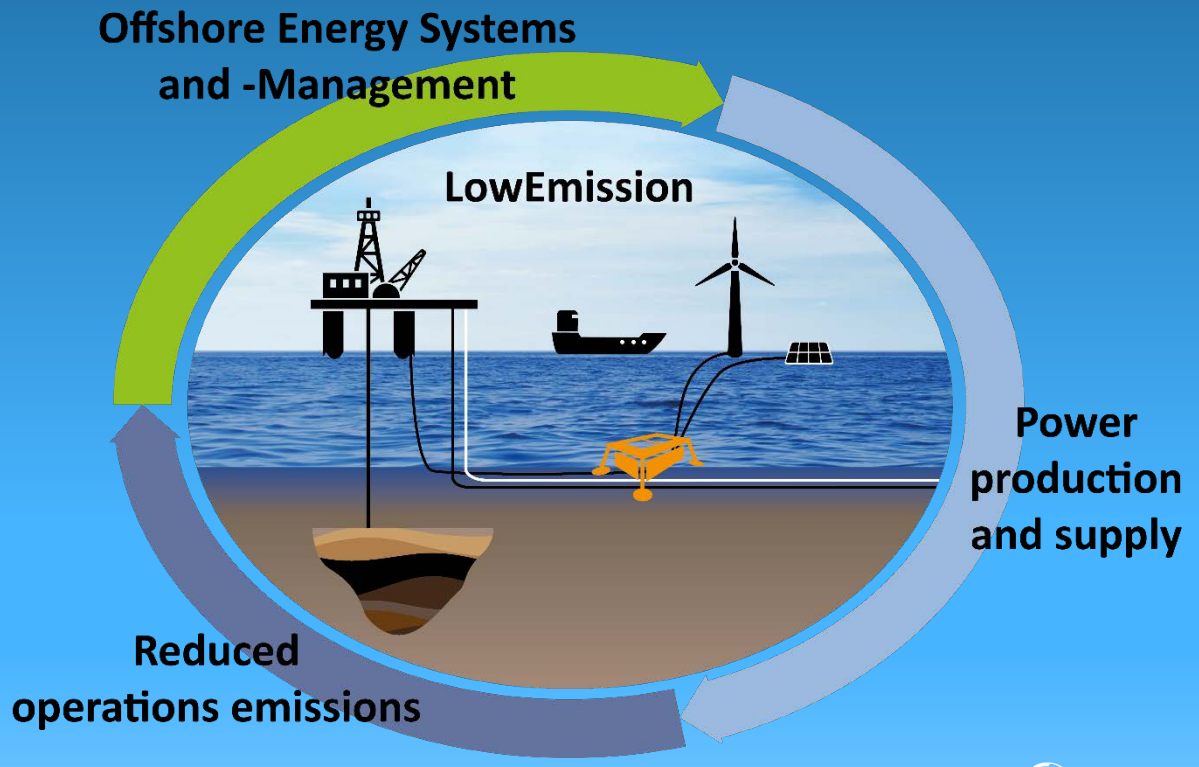
Move towards Zero Emission Oil and Gas Production

Mission

Promote development and implementation of low emissions technologies with 40 % reduction in emissions for existing fields & move towards 2050 goal of zero emissions for future fields, and thereby improve Competitiveness of Norwegian oil & gas industry

About the Centre

- Led by SINTEF, NTNU strategic partner
- Petrocentre (funded by RCN and Industry)
- Budget 30 M/year for 8 years:
- Time period: 2019-2027



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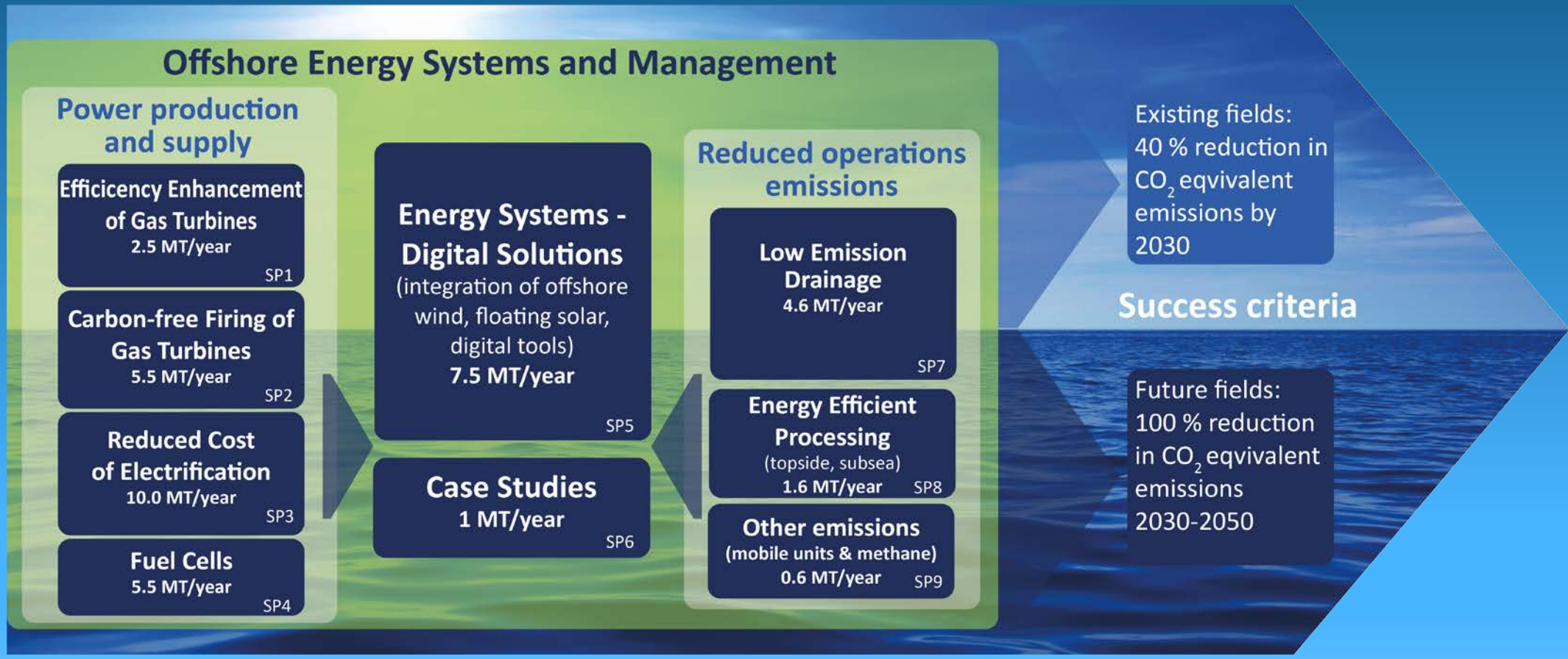
Proposed research topics



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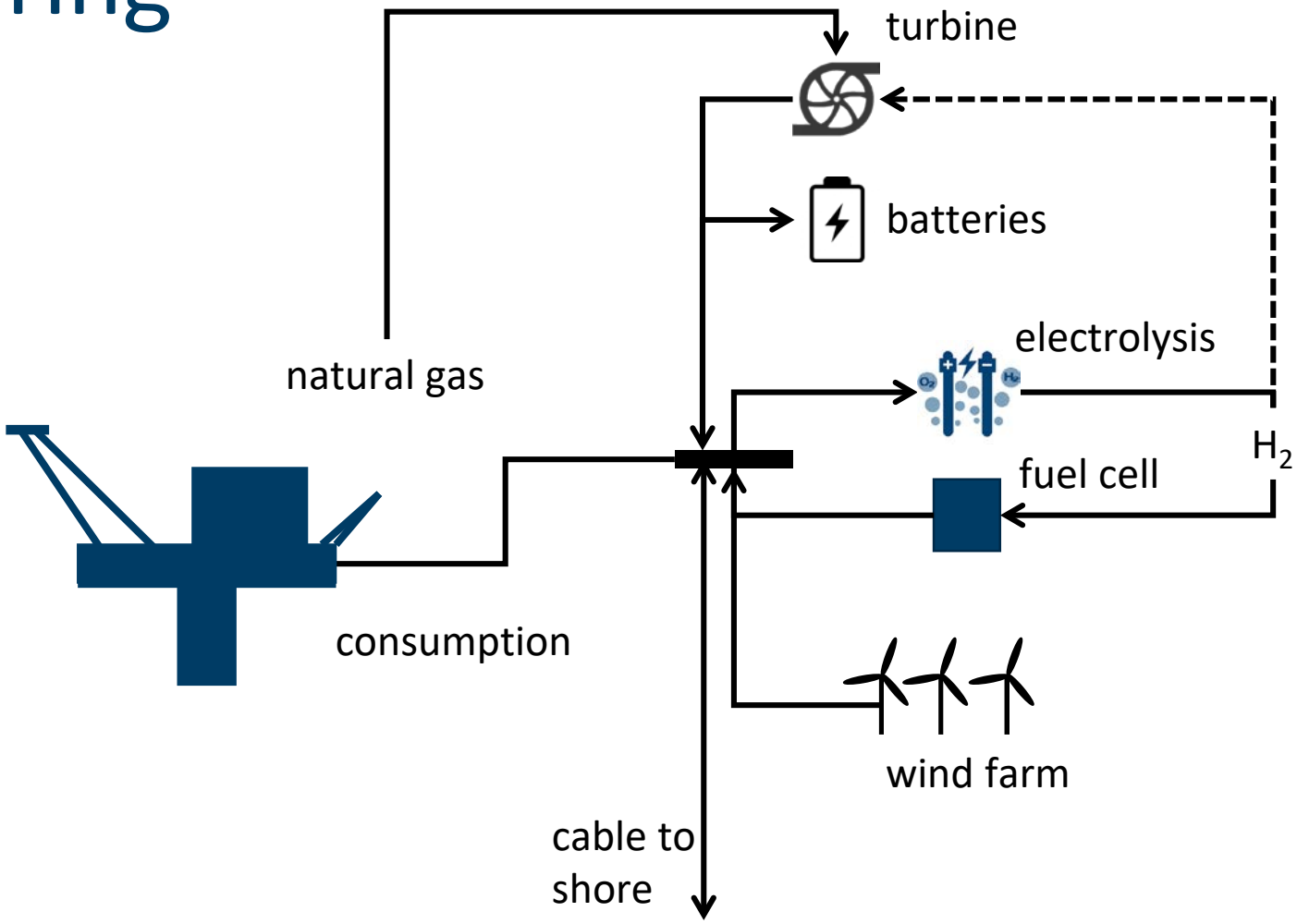
Teknologi for et bedre samfunn

Elektrifisering



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tema

1. Motivasjon: Klimamål, CO2, drivstoffkostnad
2. Elektrifisering: Landstrøm vs isolert system (gass->strøm+ny fornybar produksjon)
3. Energi og CO2: Vind+gass / vind+gass+batteri / +kabel
4. Stabilitet (meir kraftelektronikk, mindre roterande masse)
5. Energilager
6. Nordsjønett
7. Lavutslippssenter
8. Oppsummering: potensialet (CO2)