

North Sea Energy

offshore
system
integration

Techno-economic
scenarios and
economic impact
of offshore energy
system integration
options at case
study areas

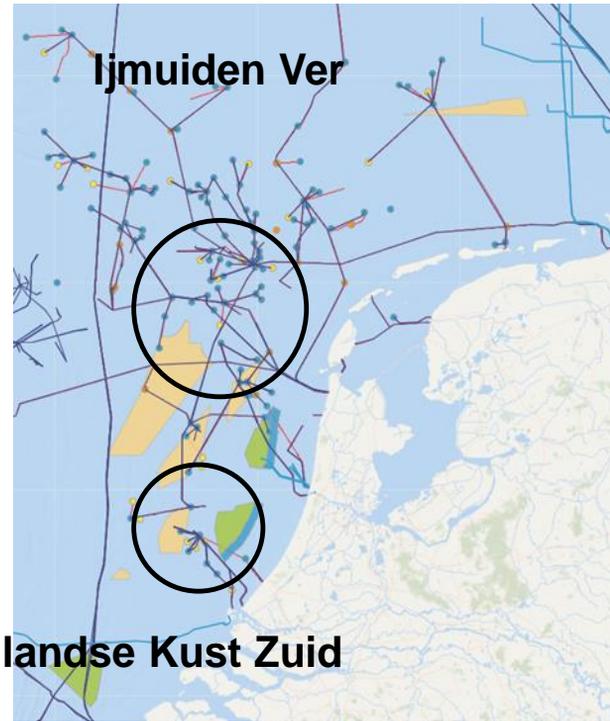
Leonie Beekman,
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Energy Coalition

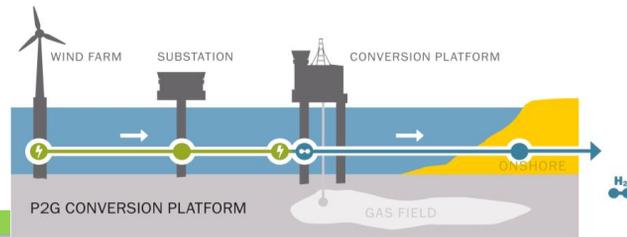
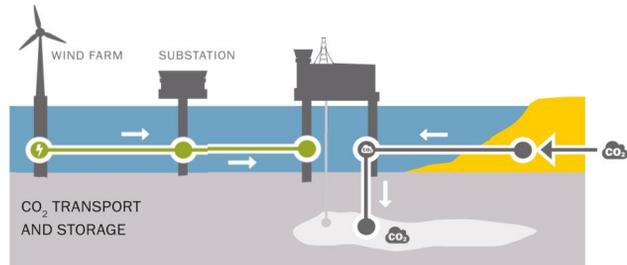
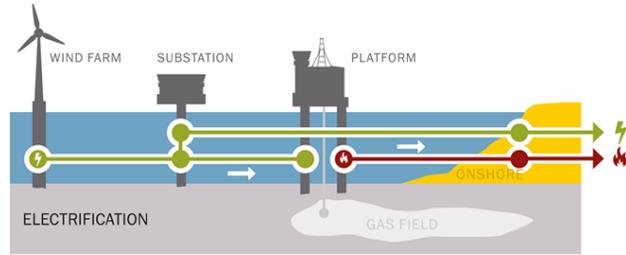
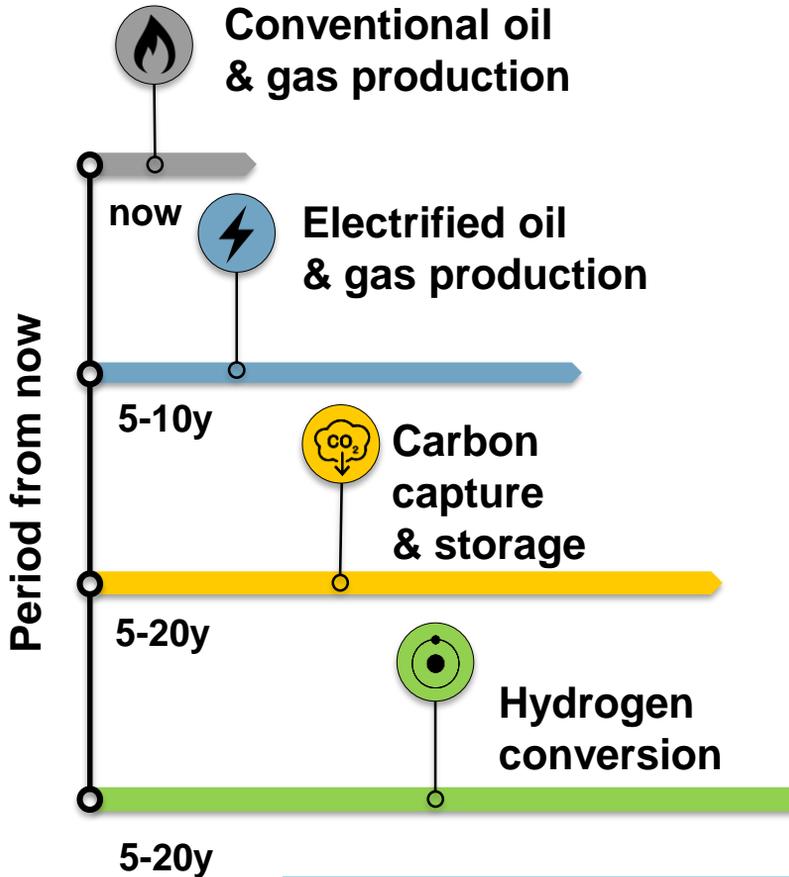
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The value and challenges of combining offshore system integration options

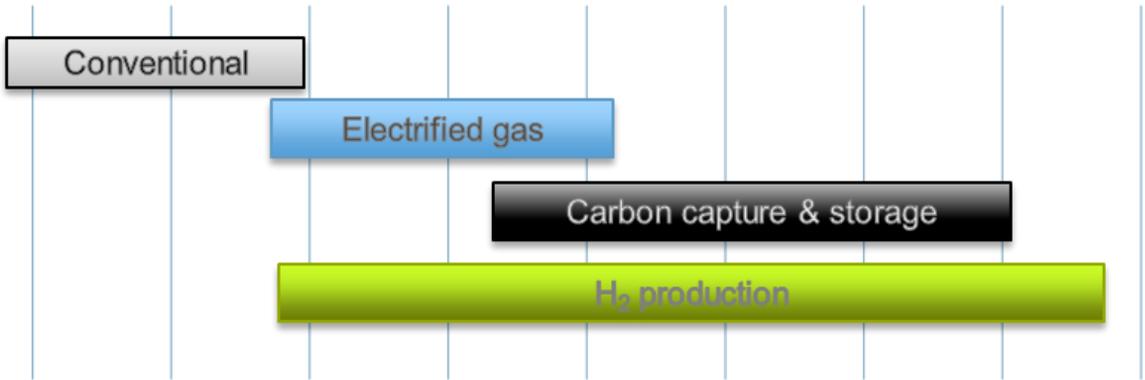
- Evaluating demonstration sites for system integration at Ijmuiden Ver and Hollandse Kust areas
- What are the techno-economics of future system integration scenarios at the those sites?
- Future scenarios combining electrification of gasplatforms, storage of CO₂ and production of hydrogen
 - What is the net present value for platform operators?
 - At which prices can we expect a business case?



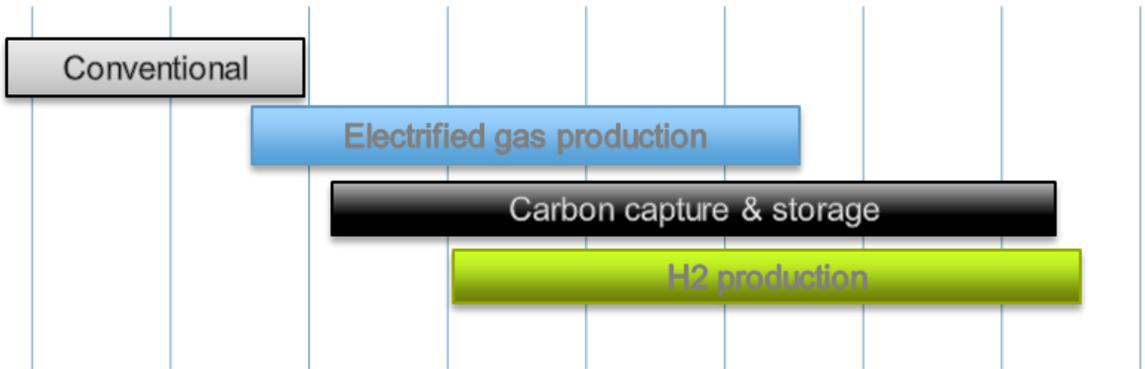
Future options for platforms in the North Sea



Scenario 1



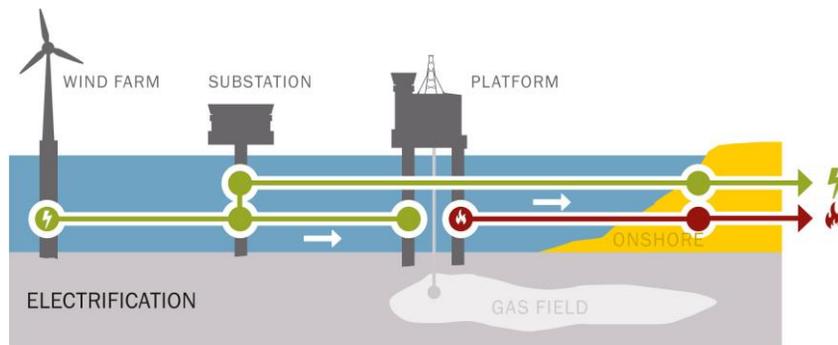
Scenario 2



2020 2025 2030 2035 2040 2045 2050 2055

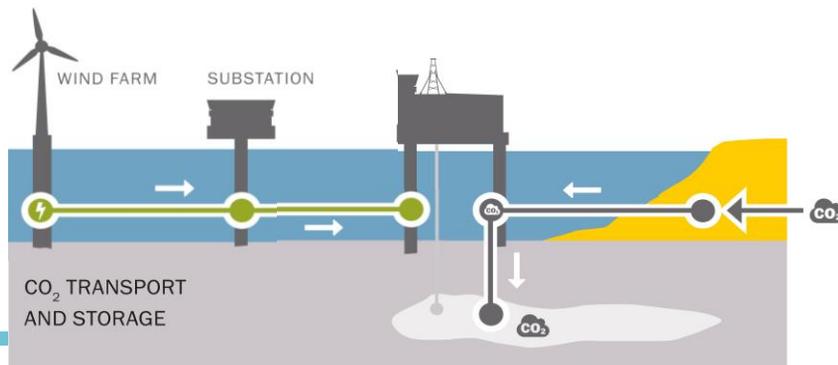
Electrification can be a sound investment:

- When savings on fuel gas and CO₂ emissions can compensate the high cable and platform conversion investments;
- When positive and sustained market incentives for CO₂ reduction are present;
- When natural gas production is extracted over a period that exceeds the payback time;
- When it is valued as a stepping stone for system integration options as CO₂ transport and storage, Power to gas and liquids, Gas to Wire and Energy storage
- When externalities such as reducing power infrastructure costs are internalized



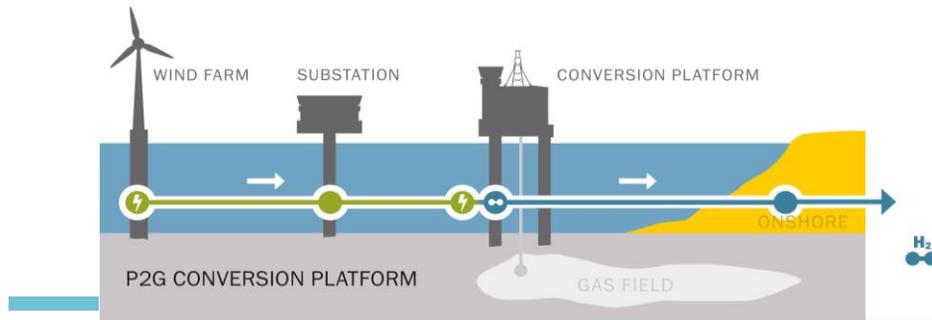
Transforming offshore gas assets into CO₂ storage and hub facilities proofs to be a sound business opportunity:

- Business case is break even if offshore operators receive a CO₂ transport and service fee towards 2 to 8 €/ton CO₂ being strongly depending on location specifications on volumes and distances
- When nearby depleted reservoirs offer sufficient storage capacity to store CO₂ over a long period;
- When existing wells and infrastructure (e.g. pipelines) can be reused, reducing investment requirements especially looking at large distance transport (e.g. to the K5 cluster).
- When externalities such as reducing power infrastructure costs are internalized



Offshore green hydrogen production is promising if it overcomes certain barriers:

- Business case strongly depends on the price to be received for the produced hydrogen; mainly determined by the average electricity price, the operating hours of the electrolyser as well as distance from shore to the offshore platform clusters;
- Business case is break even at **3 – 5** €/kg H₂, a challenge with current bulk grey hydrogen prices at 1-2 €/kg H₂;
- Platforms offer limited space and weight for large scale hydrogen production



Conclusions

- Platform electrification is a stepping stone for offshore Carbon Capture and Storage and Power-to-hydrogen
- The business models of gas operators are going to change
- Enhancing circularity of offshore assets improves the business case. The value of offshore system integration from offshore operator perspective lies in re-using the subsurface assets as much as possible
- Space, timing and coordination are key prerequisites for a sound business case
- Value of system integration lies in financial and societal benefits for multiple stakeholders and it collaboration is key to capture all value and get it going