















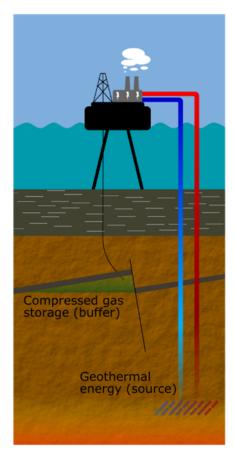




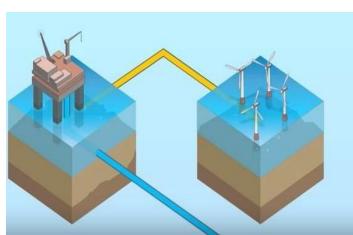


Options for prolong, reuse and repurpose of oil and gas assets

Electrification of platforms

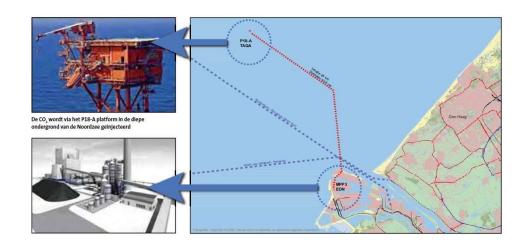


Geothermal energy





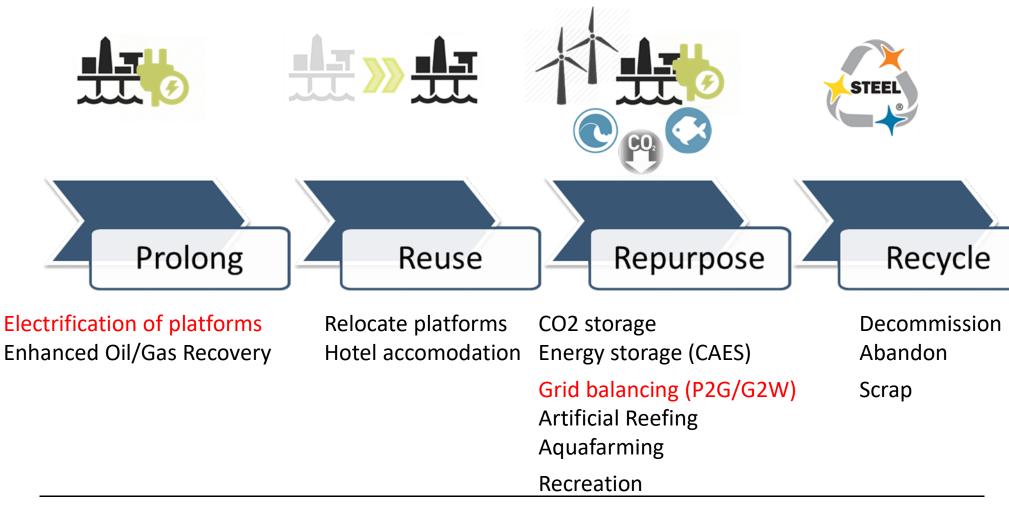
Offshore hotel and diving resort



CO2 storage

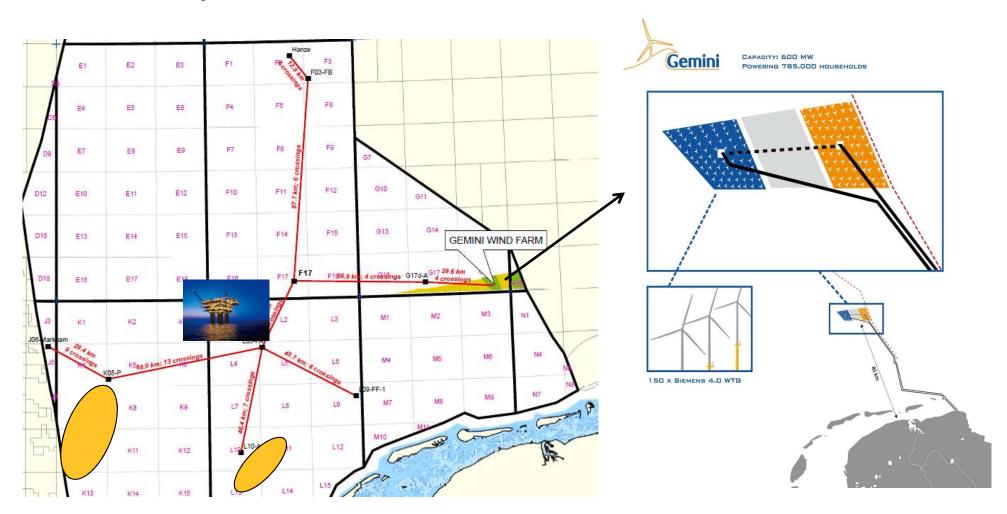


Options for system integration offshore wind and oil and gas assets





Offshore grid development connect wind farms to platforms Electrification of platforms to reduce emissions to zero en reduce OPEX

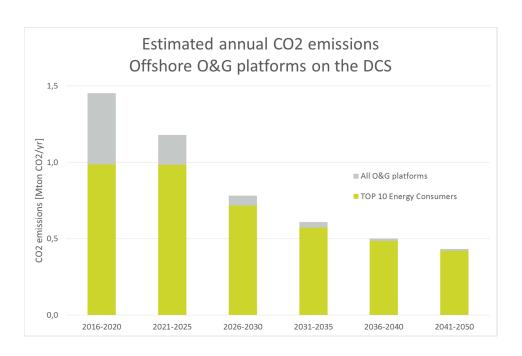


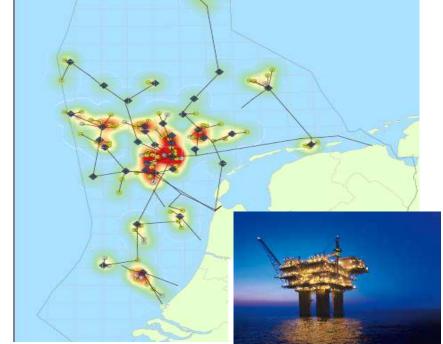


of Current Structures

Power consumption offshore platforms and CO2 emissions

10% of the platforms emit 70% of the GHG





Source:



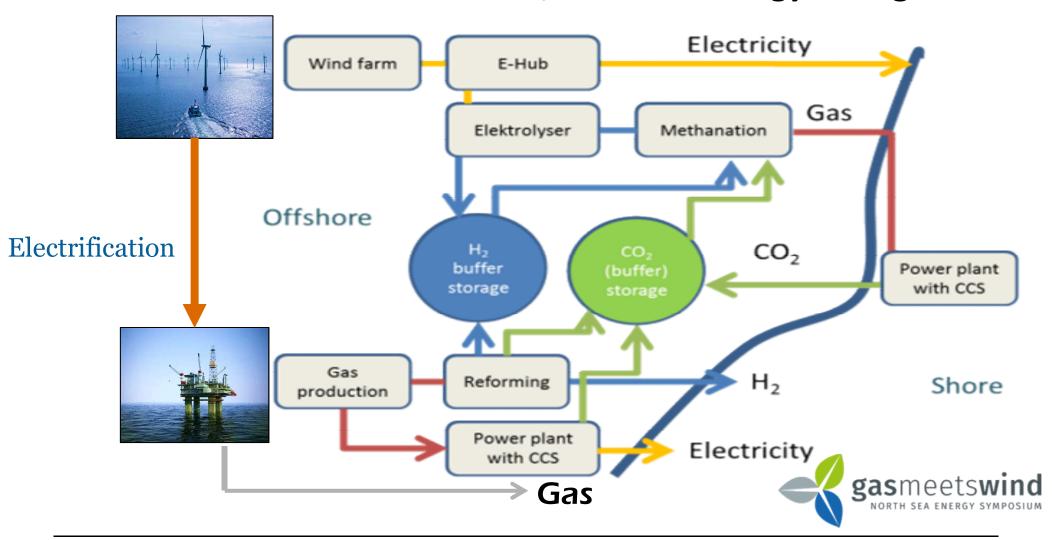








Future offshore clean energy system Power to Gas and Gas to Wire, CO2 and energy storage





Timeframe for opportunities to prolonge and reuse or repurpose offshore oil and gas assets

Short term 2015 - 2023

- Electrification of oil and gas production
- Elimination of NOx, SOx and CO₂ emissions
- · Development of an offshore electricity grid

Medium term 2023 - 2030

- Offshore Power to Gas for peak shaving (H2 production)
- Gas 2 Wire (with CCS) for power balancing (stranded fields)
- · Integration of infrastructure for offshore wind

Logn term 2030 - 2050

- Reuse of infrastructure for offshore wind (substations)
- Energy conversion and storage
- Use of the gas grid for energy transport (H2 or SNG).

System Integration in Offshore Energy





System Integration requires collaboration

June 15, 2016 "Gas meets Wind": 'Declaration of Coordination and Cooperation North Sea Region', by NOGEPA, NWEA, Natuur en Milieu, TenneT, TNO





June 6, 2016, EU Energy Council: North Sea Declaration: Regional coordination on offshore energy





How do you asses the value pool Prolonging life and Re-purpose of Oil and Gas Assets?

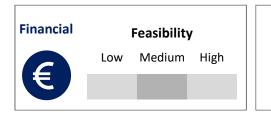
What are the options?

Identified sub-value pools

- Electrification
- Enhanced recovery of reserves
- Carbon storage
- Geothermal energy
- Power-to-gas
- Gas-to-wire
- Compressed air energy storage
- Artificial reefing
- Recreation

Additional sub-value pools

What is the biggest hurdle?



Technical		Feasibility	,	
707	Low	Medium	High	
Q.				

Sı &	upply chain market	1	Feasibility	,	
		Low	Medium	High	

Regulation		Feasibility	,
	Low	Medium	High

Who needs to do what tomorrow?

Who:	
What:	
Explanation:	

Who:	
What:	
Explanation:	

Who:	
What:	
Explanation:	

Voting 1:



what do you consider as the most <u>valuable</u> and realistic option for reuse of assets

- 1. Electrification
- 2. Enhanced recovery of reserves
- 3. Carbon storage
- 4. Geothermal energy
- Power-to-gas
- 6. Gas-to-wire
- 7. Compressed air energy storage
- 8. Artificial reefing
- 9. Recreation

Voting 2:



what do you consider as the most <u>exciting</u> and inspiring option for reuse of assets

- 1. Electrification
- 2. Enhanced recovery of reserves
- 3. Carbon storage
- 4. Geothermal energy
- Power-to-gas
- 6. Gas-to-wire
- 7. Compressed air energy storage
- 8. Artificial reefing
- 9. Recreation

Voting 3:



what do you consider as the biggest hurdle for realisation of the selection options?

- Financial
- Technical
- 3. Supply Chain / Market
- 4. Regulation

Select one of the proposed hurdles



Discussion:

- Specify the huldle that you have identified for the various options
- What is the next step that is needed to realise the options for reuse
 - What, who, when