

A composite image showing a wind turbine on the left and an offshore oil rig on the right, both silhouetted against a bright orange sunset sky. The sun is a large, glowing orb in the center. A white horizontal line with arrowheads at both ends runs across the middle of the image.

FINDING SYNERGY IN OFFSHORE ENERGY

RENÉ PETERS – TNO ENERGY

TNO innovation
for life

THE ROAD AHEAD IN OFFSHORE OIL AND GAS?

Lack of political support

Increasing cost

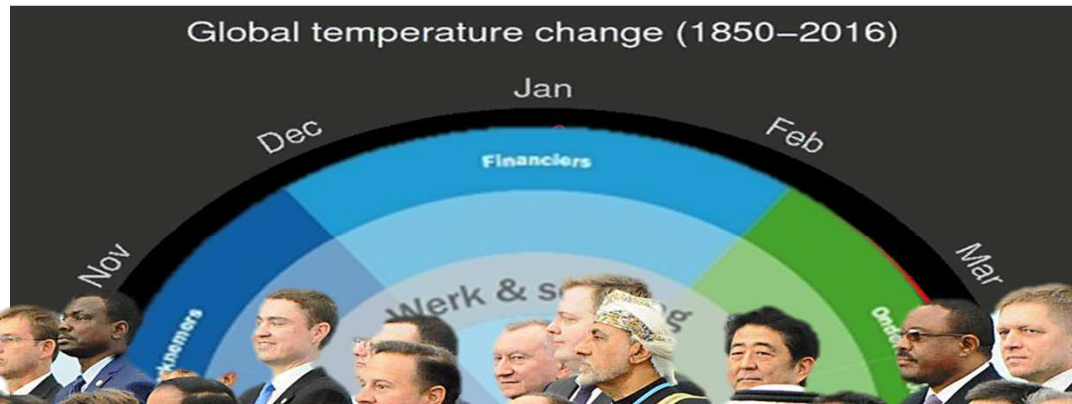
Climate change (GHG)

Emission regulation (NOx)

Licence to Operate

Low gas price

FIGHT CLIMATE CHANGE WITH CLIMATE AGREEMENTS



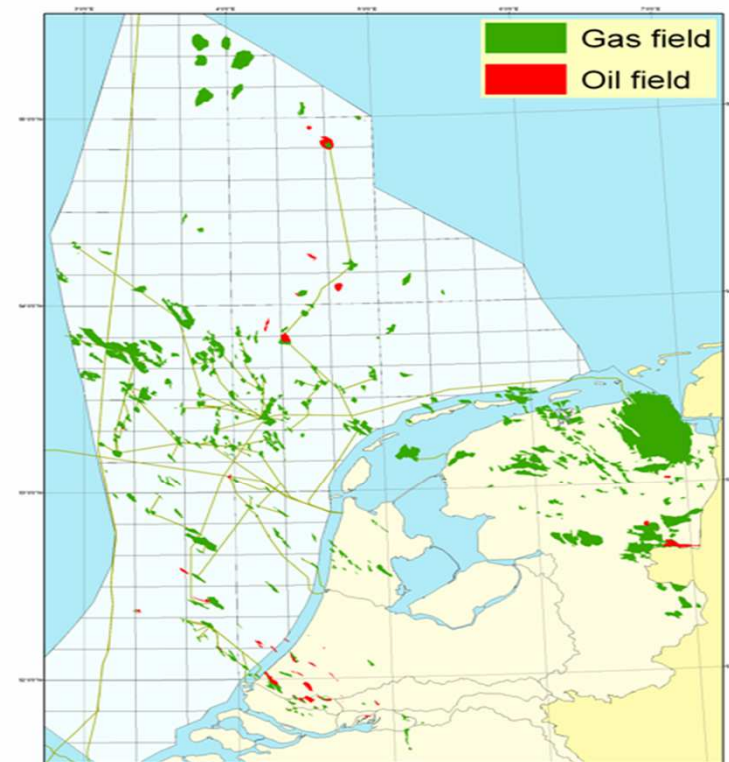
CURRENT STATUS ON NATURAL GAS IN NL (2016)

477 gas fields discovered (on- & offshore)

- 253 in production
- 4 converted to gas storage
- **110 depleted or seized production**
- 33 planned for production
- **77 “stranded fields”**
- 148 platforms on the Northsea

Current reserves: 891 BCM (25 jr)
Of which ~665 BCM still in Groningen
Onshore: 109 bcm
Offshore: 117 bcm

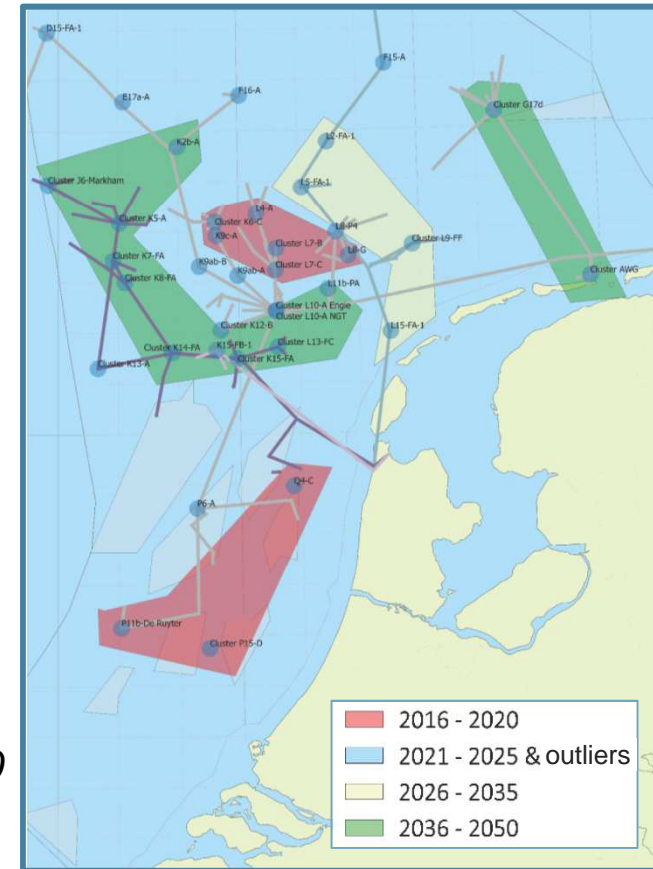
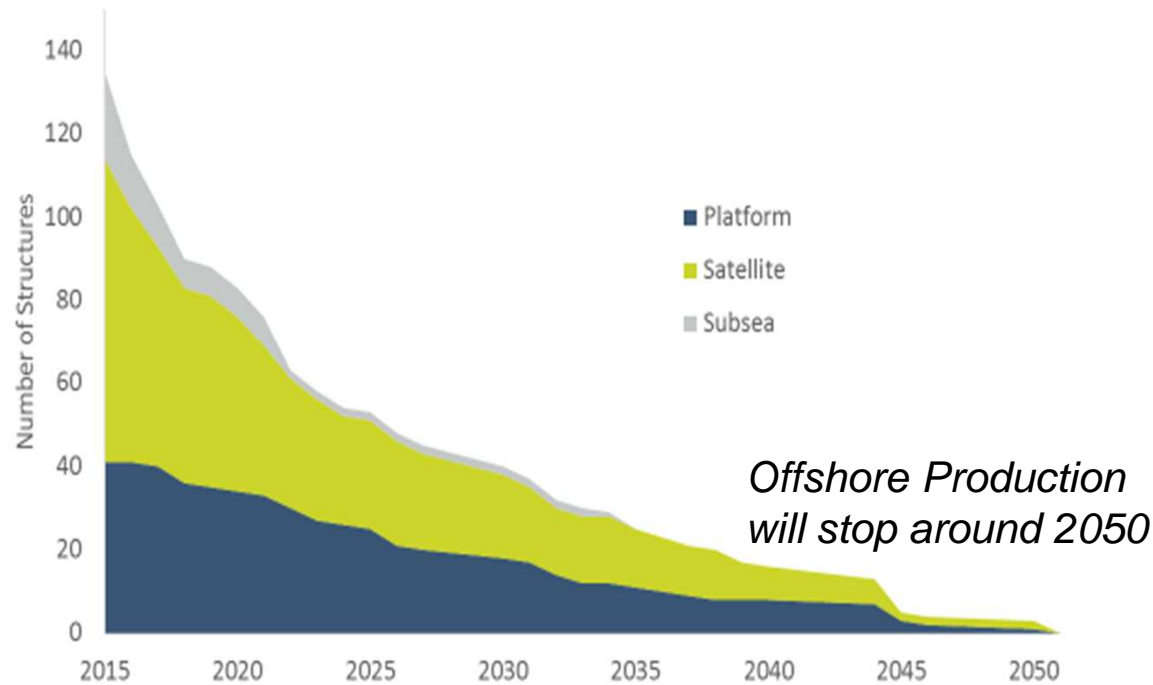
Infrastructure (platforms and pipelines) are at maximum and will decline from now on!



Source: NLOG.nl report 2015

DECOMMISSIONING OF OFFSHORE INFRASTRUCTURE

› In a business as usual scenario (EBN 2016)



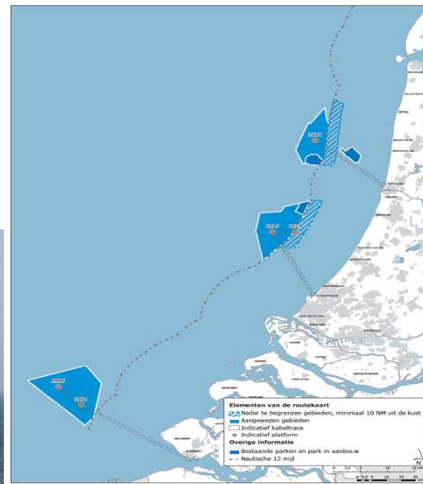
THE INDUSTRY IS PREPARING FOR DECOMMISSIONING

- › High societal cost (EBN, tax regulation)
- › Risk of Lock-out instead of Lock-in
- › Impact on ecology from removal?
- › End of life? (Economic or Technical)
- › Any future use?
- › Seeking for synergy?



DEVELOPMENT OF A NEW OFFSHORE ENERGY INFRASTRUCTURE

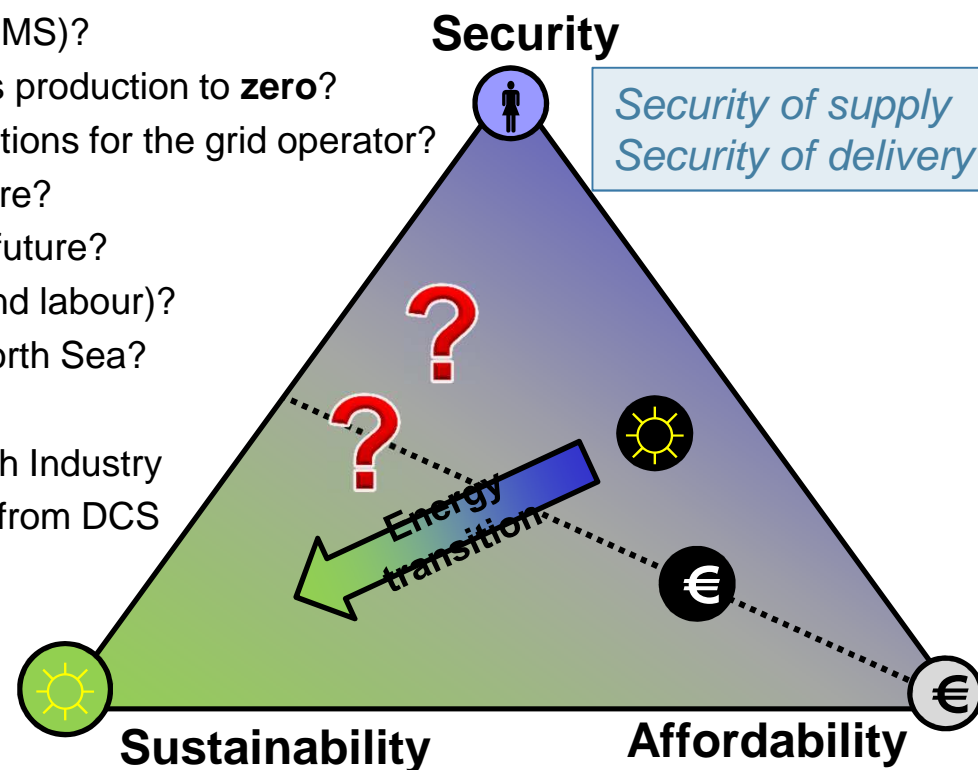
- › At high societal cost (offshore grid)
- › Spatial limitations
- › Grid connections onshore
- › Power balancing
- › 3.5 GW until 2023
- › Near shore
- › No plan after 2023



Wind farm transformer station

OUR COMMON CHALLENGE IN OFFSHORE ENERGY

- › Perform **better** than is imposed by legislation (BEMS)?
- › Reduce GHG emissions from offshore oil and gas production to **zero**?
- › Provide power **balancing** and energy **storage** options for the grid operator?
- › **Enable** the development of an electric grid offshore?
- › Create **space** for new offshore wind parks for the future?
- › Maintain our **economic value** to the society (€ and labour)?
- › Stimulate **biodiversity** and the **ecology** of the North Sea?
- › Maintain our **license to operate** in the North Sea
- › Create new **business opportunities** for the Dutch Industry
- › **Accelerate** the energy transition to clean energy from DCS



VISION: FROM SEGREGATION TO INTEGRATION



COOPERATION IN THE
NORTH SEA REGION

SEARCHING FOR SYNERGIES

ALIGN DRIVERS FOR KEY STAKEHOLDERS

Offshore Wind



Society



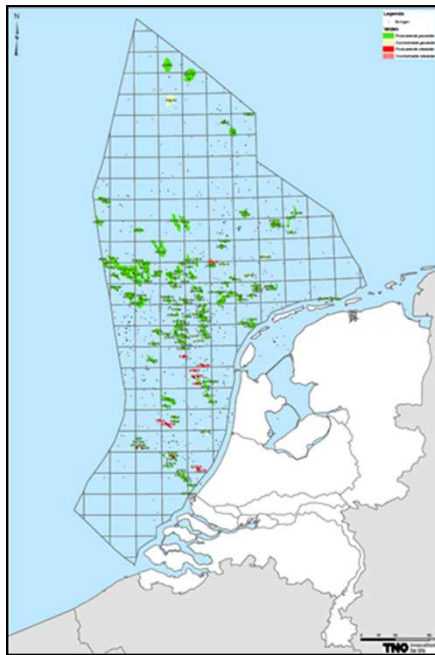
Offshore O&G

Cost reduction
Emission reduction
License to Operate
Efficient spatial use

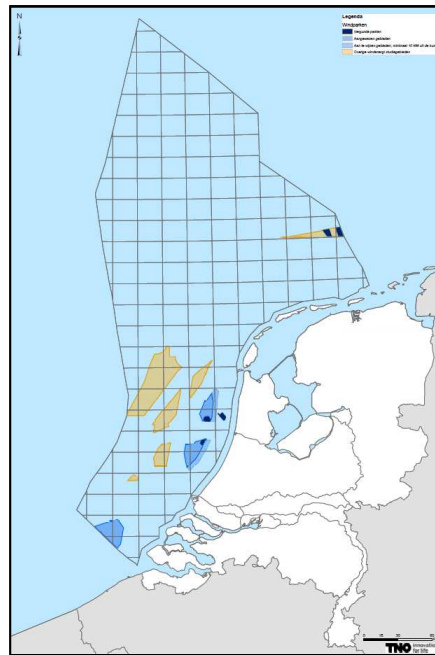
**SYSTEM INTEGRATION
OFFSHORE ENERGY**

Accelerated transition
Human Capital offshore
Stability offshore grid
Minimise societal costs

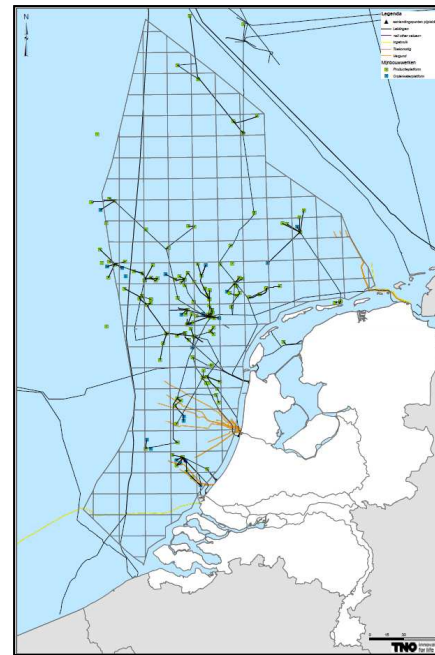
INTENSIVE USE NORTH SEA LEAVES LITTLE SPACE



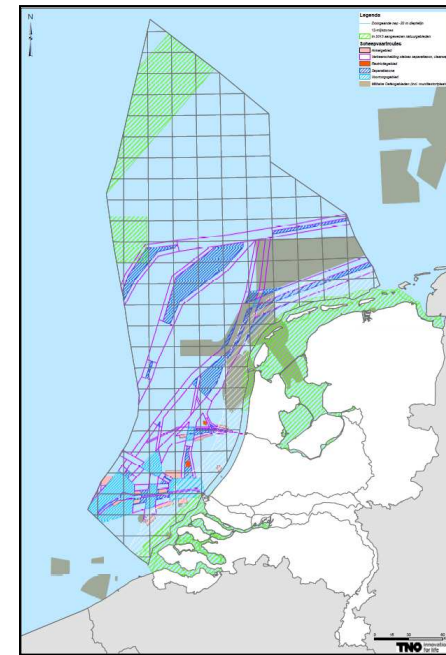
Offshore Oil & Gas



Offshore Wind



Offshore Infrastructure



Excluded zones

HIGH PUBLIC INTEREST, I.E. POLITICAL PRESSURE

AD NEDERLAND BUITENLAND SPORT SHOW REGIO MEER AD

PLANET ENERGIE

Oliebedrijven en TNO: gebruik booreilanden voor windparken op zee

David Bremmer 10-3-16 - 07:00

Aanbevelen Delen 98 Tweet G+ 0

BEWAAR ARTIKEL

GERELATEERD NIEUWS

- 'Afgedankt booreiland weer afzinken op de zeebodem'
- Dode en gewonden door storm op Noors boorplatform
- Derde windpark Noordzee draait officieel

NOS Nieuws Sport Uitzendingen

TELEBIJST AEX 305 km 21°

'Gebruik overbodige Noordzeeplatforms voor opslag windenergie'

© ZA 30 APRIL 18:34 BUITENLAND

Olie- en gasbedrijven moeten hun afgedankte Noordzeeplatforms niet opruimen, maar ze gebruiken om windenergie mee op te slaan. Onderzoeksinstituut TNO ziet daarin een duurzame oplossing voor de platforms die de komende jaren overbodig worden doordat de olie- en gasvelden leeg raken.

GESCHREVEN DOOR Heleen Ekker Redacteur

fd. Home Mijn nieuws Laatste nieuws Krant Beurs Meer 17.87

OPINIE

Oude infrastructuur Noordzee biedt nieuwe kansen

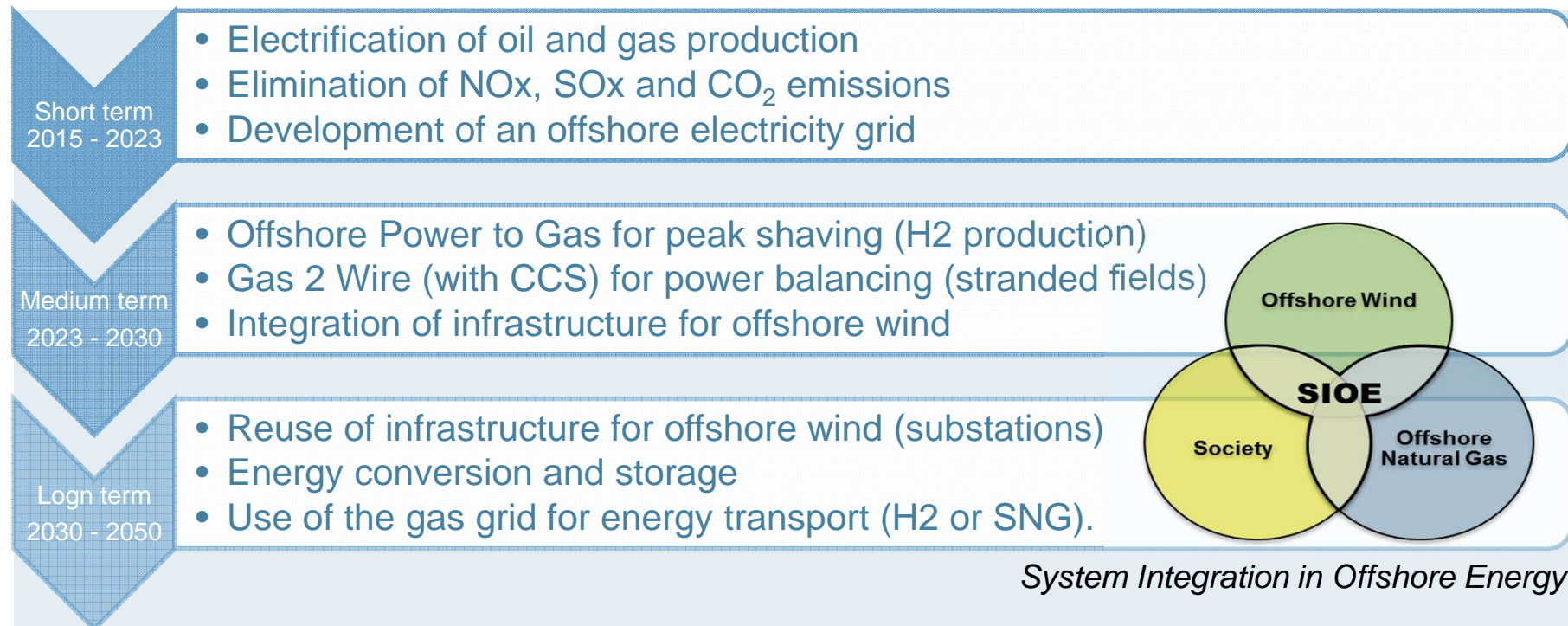
Rene Peters woensdag 16 maart 2016, 20:30

Tekst Krant 4 ☆ 434



maandag 30 mei 2016

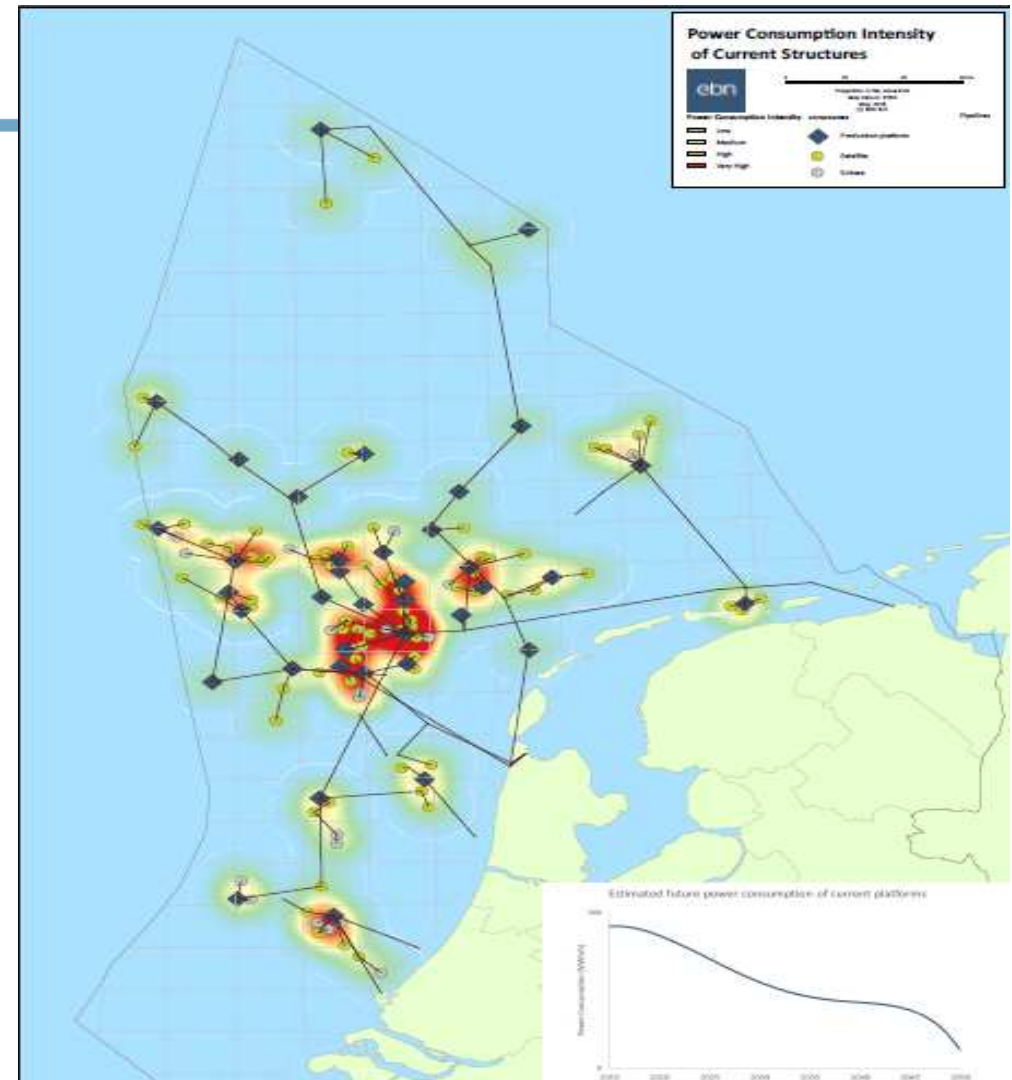
OPPORTUNITIES INTEGRATION OFFSHORE ENERGY



POWER CONSUMPTION OFFSHORE PLATFORMS

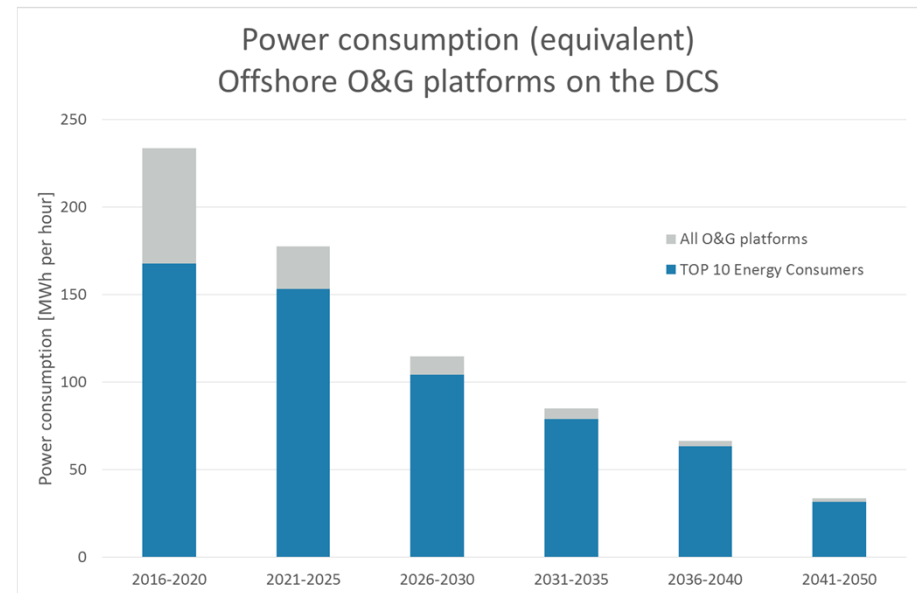
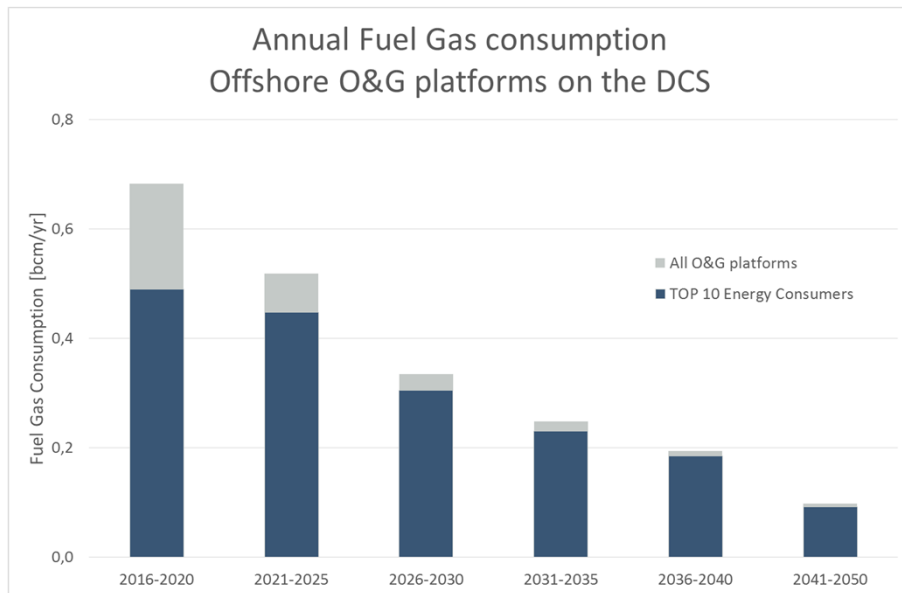
- › Hotspots of power use in central Northsea
- › Close to Ijmuiden-Ver future wind park
- › Potential for electrification offshore wind
- › Potential for energy balancing/conversion (P2G)
- › Potential for grid use for energy transport

Source:



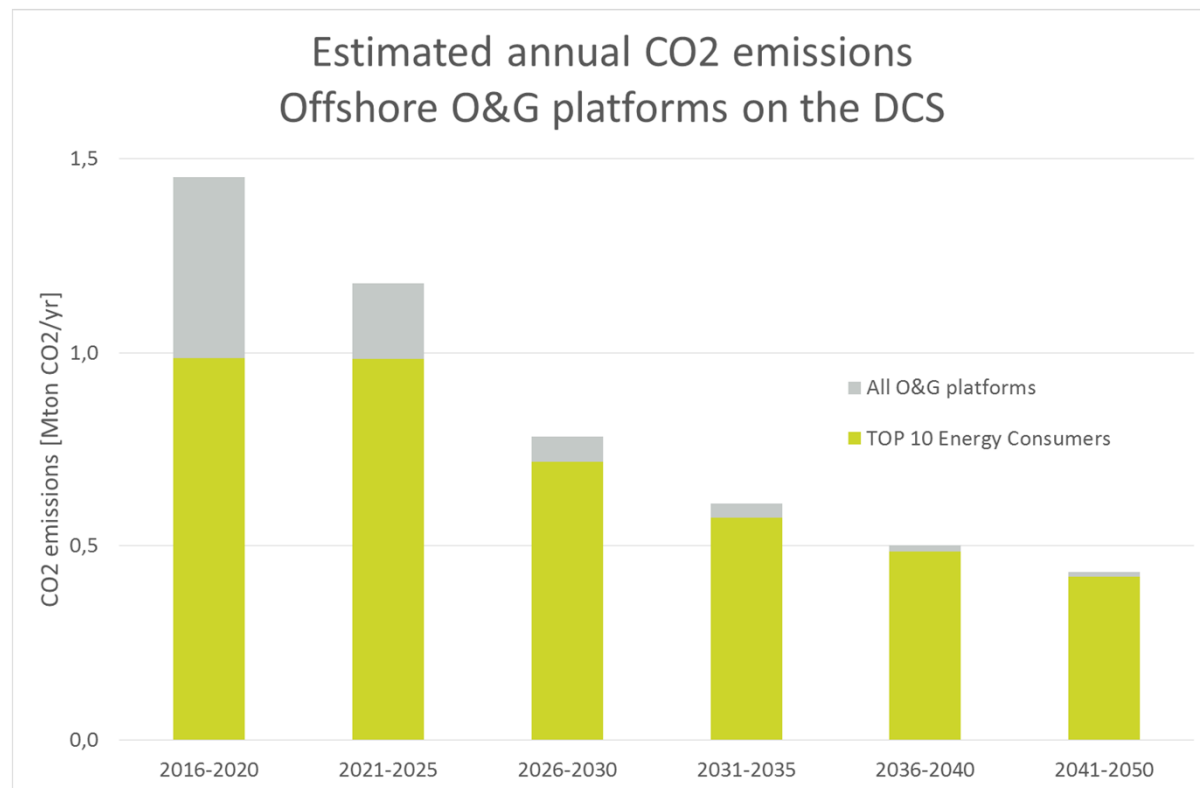
CURRENT USE OF FUEL GAS TO POWER PLATFORMS

› Offshore power use dominated by top 10 platforms



HUGE POTENTIAL FOR CO2 EMISSION REDUCTION

- › Top 10 platforms can realise 1 Mton/yr CO2 emission reduction
- › Equal to 3% of the NL target for 2023
- › Equal to ambitions ROAD CCS project
- › And produce 0.5 BCM/yr more gas to shore (3%)



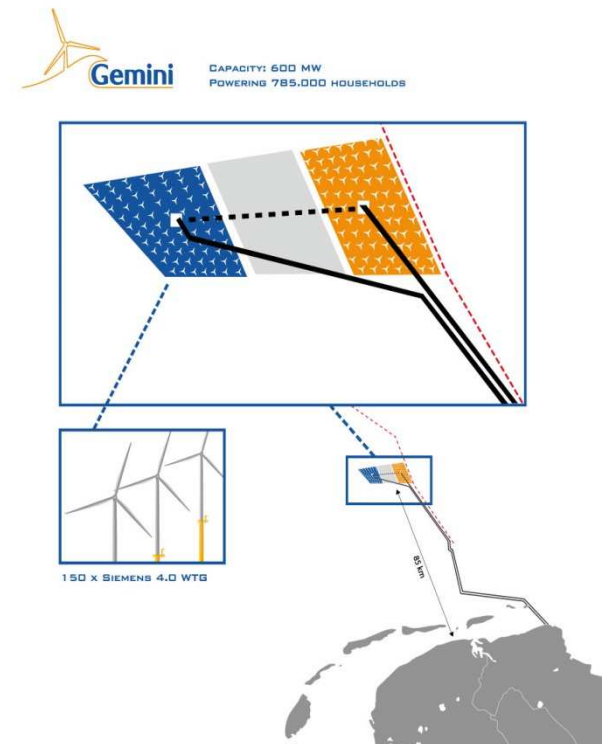
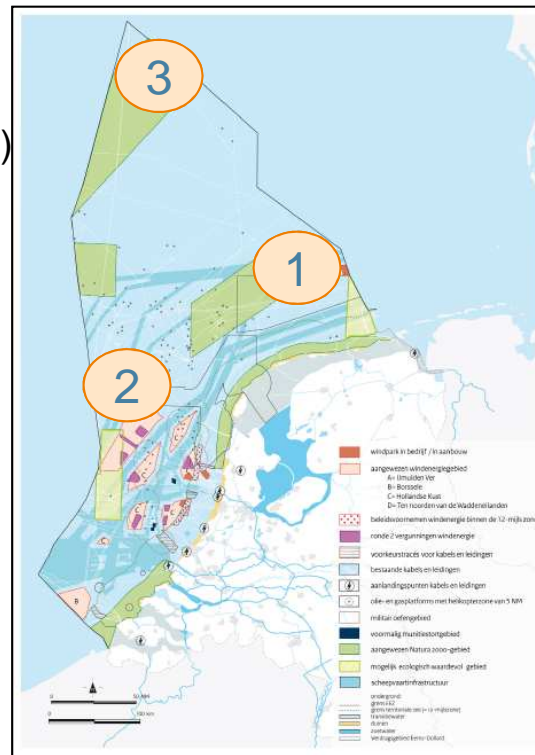
BEST OPPORTUNITIES FOR ELECTRIFICATION AND INTEGRATION

Electrification of Platforms

- › 1: ST - Gemini windpark (< 2020)
- › 2: MT - IJmuiden Ver (< 2025)
- › 3: LT – Doggers bank (< 2030)



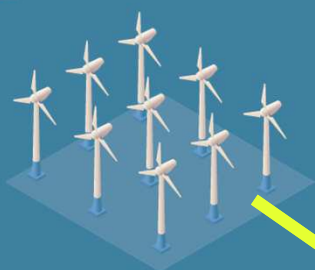
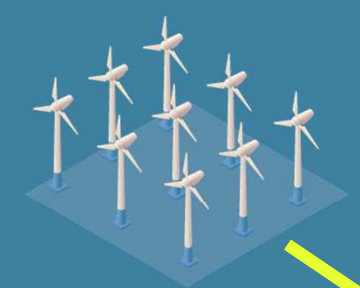
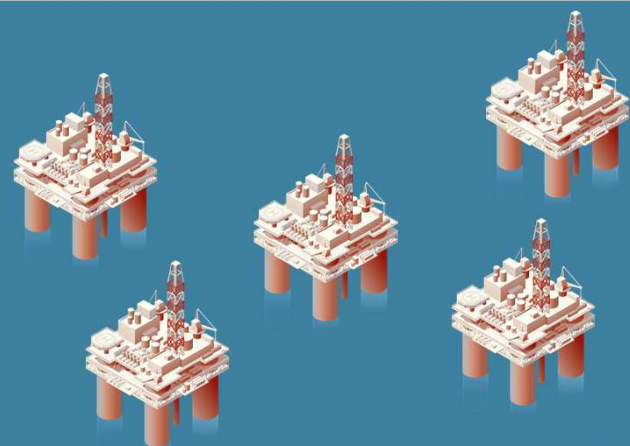
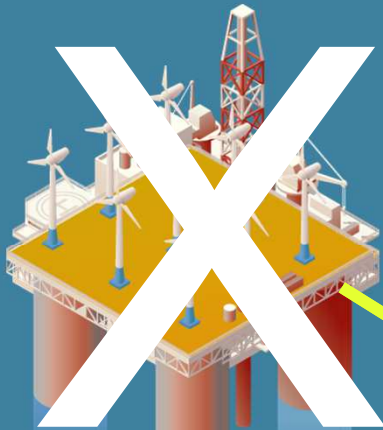
17 | System Integration Offshore Energy

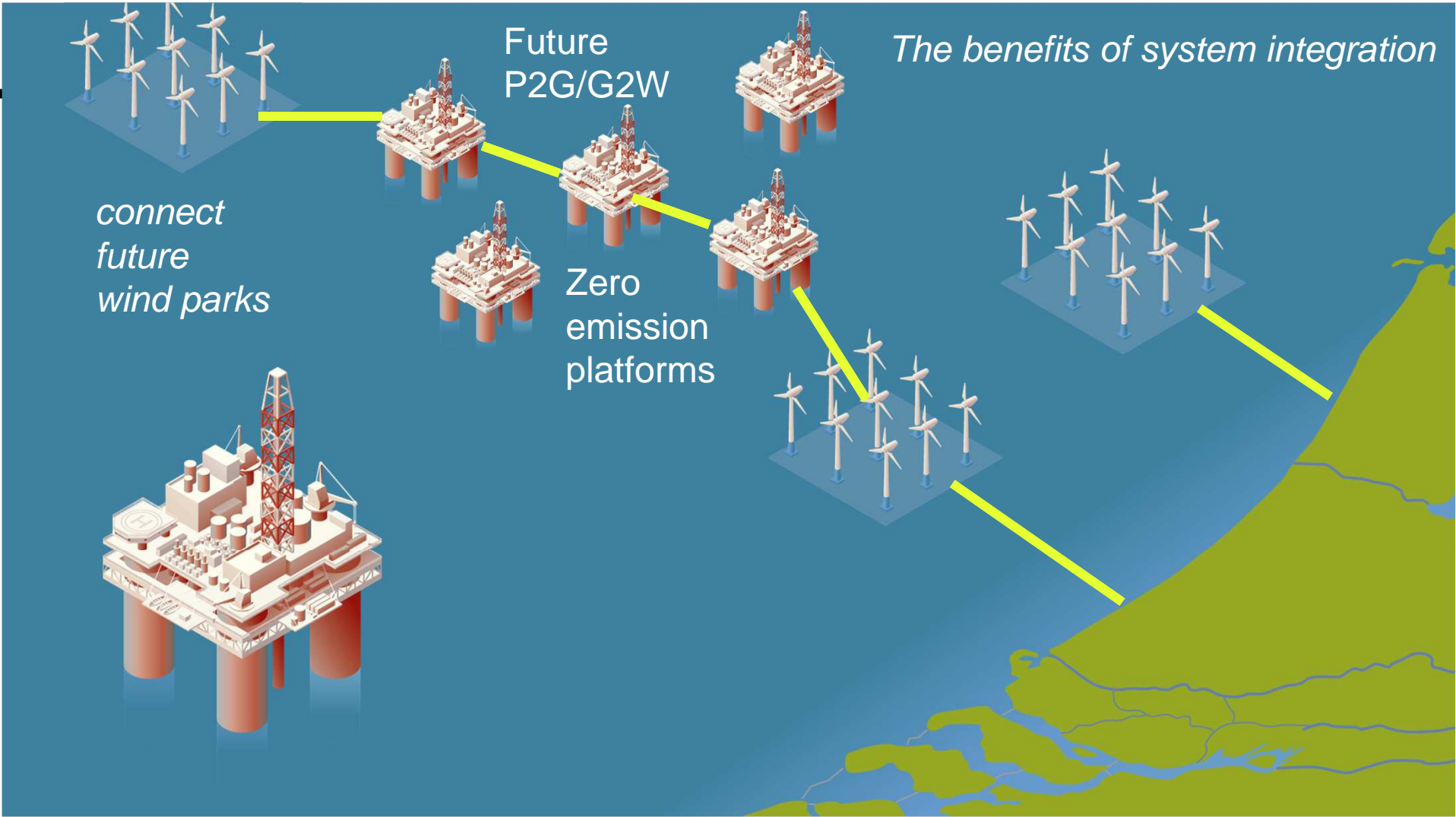


26 January 2016

The benefits of system integration

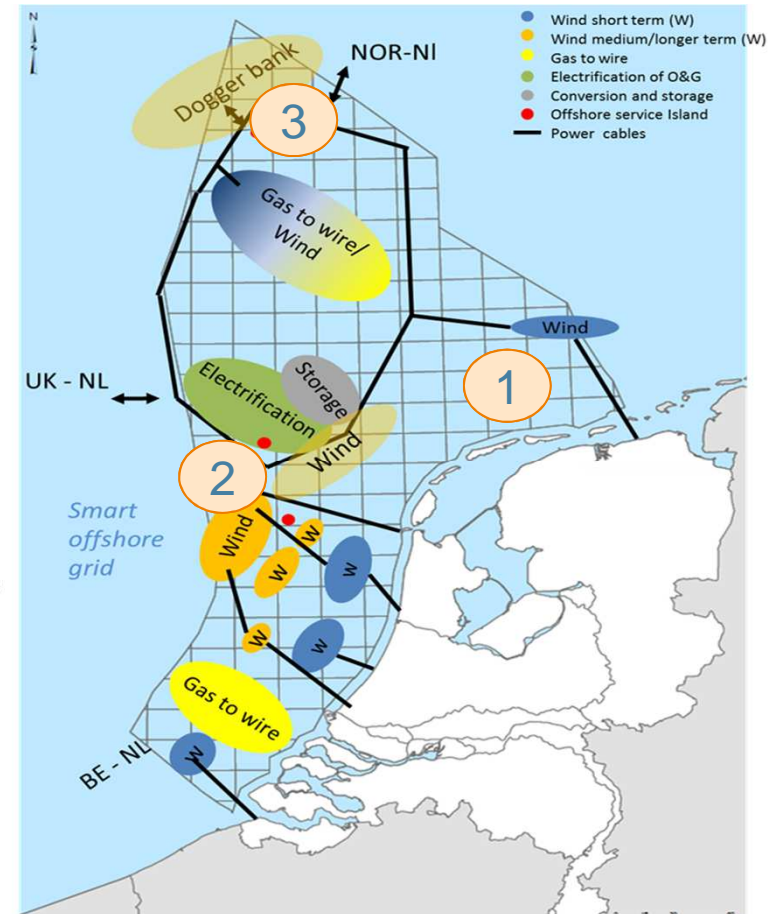
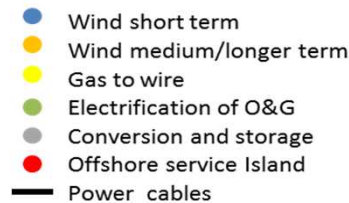
Re-use of offshore structures?





NORTHSEA ENERGY VISION

- › Electrification of the platform will enable the development of an offshore grid
- › After electrification the Northsea can be a clean energy source combining offshore wind and offshore gas.
- › The next step is use the gas and electricity grid for energy balancing and storage
- › On the long term infrastructure can be reused or integrated



CONVERT EXCESS POWER INTO HYDROGEN POWER TO GAS - DEMO PROJECTS GERMANY

WindGas Falkenhagen



in operation

- 2 MW_{el} / 360 m³/h H₂
Alkaline electrolysis
- H₂ injection in gas transportation pipeline

WindGas Hamburg



in operation

- 1.5 MW_{el} / 290 m³/h H₂
PEM electrolysis
- H₂ injection in gas distribution pipeline

Power to Gas

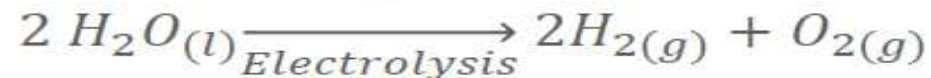
H₂

- › to store energy
- › to source H₂ network
- › as a product for chemical industry



Next step:

- › Power to methane
- › Power to methanol
- › Power to DME
- › Power to Ammonia

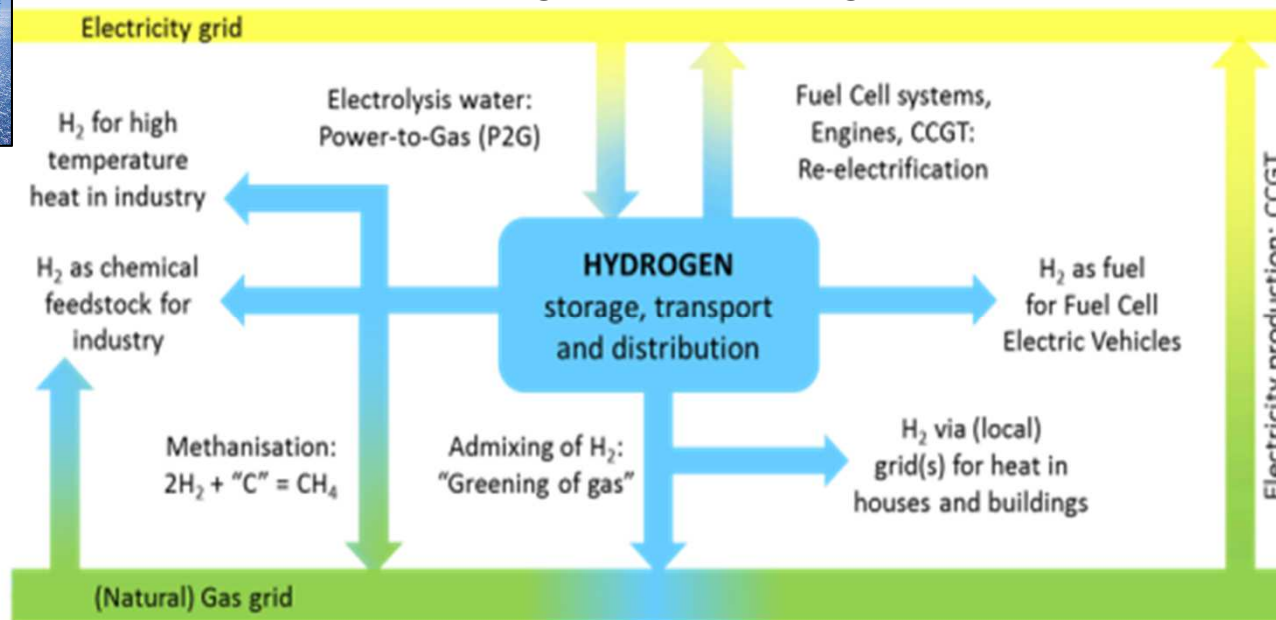


Source: Uniper (2016)

OFFSHORE P2G AND G2W FOR POWER BALANCING



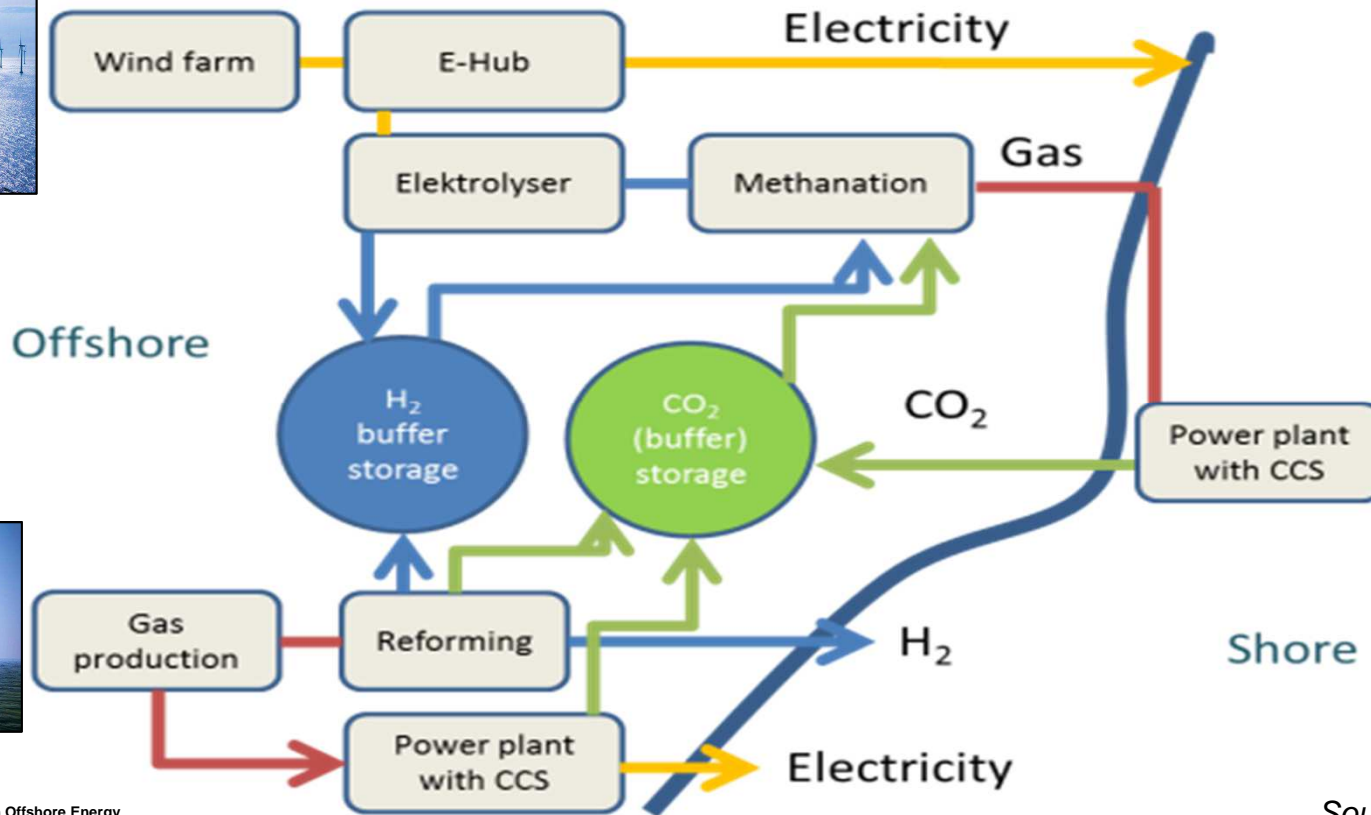
Balancing the offshore grid



Produce H₂ for direct use in transport or industry

Use the gas network for energy transport to shore

FUTURE OFFSHORE CLEAN ENERGY SYSTEM



LONG TERM OPTIONS FOR INTEGRATION OFFSHORE WIND AND GAS



Energy Island concept (TenneT)



FUTURE ENERGY CONCEPTS



Aqua farming

Creative ideas?
Contribute to the North Sea Energy Challenge:
See: www.northsea-energy-challenge.com

Tourist attractions



26 January 2016

Next step:

PROGRAM NORTHSEA ENERGY INNOVATION

- › Collaboration to grasp opportunities for synergy between offshore oil and gas and offshore wind
- › Multistakeholder involvement
- › Public Private Partnership – Topsector Energy, Industry, Academia, NGO
- › Coordinated by TKI Gas and TKI Wind
- › Collaboration of knowledge partners
- › Develop a vision on a future North Sea Clean Energy System
- › Realise innovations to make it happen
- › Start 2017



COOPERATION IN THE
NORTH SEA REGION

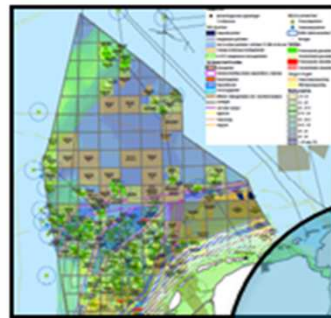
SEARCHING FOR SYNERGIES

INNOVATION PROGRAM FOCUS AREAS

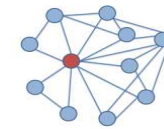
Strategic Spatial Planning
Spatial synergies
Scenario development
Restricted areas



Society and Governance
Human Capital
Public Participation
Regulations



Physical Network
Connections
Nodes
Services
Maintenance



Health, Safety & Environment
Health and Safety
Emissions and Environment



PARTIES CURRENTLY INVOLVED IN INITIATIVES RELATED TO NORTH SEA ENERGY



gasunie

NOGEPA

ENGIE



SIEMENS



NAM



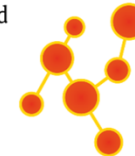
Nederlandse Wind Energie Associatie



Rijksdienst voor Ondernemend
Nederland



rijksuniversiteit
groningen



TOPSECTOR ENERGIE
Empowering the new economy



Oil & Gas
Reinvented Community
Initiated by: SIEMENS TNO

GUIDANCE FROM OFFSHORE ENERGY COORDINATION GROUP

	<p>Jo Peters</p> <ul style="list-style-type: none"> • Secr. General • Branch oil and gas
	<p>Hans Timmers</p> <ul style="list-style-type: none"> • director • Branch wind sector
	<p>Tjerk Wagenaar</p> <ul style="list-style-type: none"> • director • NGO
	<p>Paul de Krom</p> <ul style="list-style-type: none"> • CEO • Research and Technology Insitute
	<p>Mel Kroon</p> <ul style="list-style-type: none"> • CEO • Offshore grid operator
	<p>Niek Jan van Kesteren</p> <ul style="list-style-type: none"> • VNO - NCW







MANIFESTO

Declaration of Coordination and Cooperation in the North Sea region

If there is one area where the energy transition is visibly taking shape, it is the North Sea region. In the next decades fossil exploration and production will diminish, while renewable energy production is growing. In the short and medium term, fossil fuels and renewables will coexist for some time. With this in mind the offshore North Sea oil and gas operators on the Dutch continental shelf, the offshore wind sector and NGOs, have joined forces and declare that they will collaborate in order to contribute to a safe, sustainable, reliable and affordable energy system in balance with improving eco-systems. We believe that such joint effort will generate benefits for the society as a whole (People), the environment (Planet), as well as the operators involved (Profit).

Considering the North Sea region as an extensive source of energy, our joint efforts will be targeted at innovation to speed up the energy transition. In developing an integral long term vision (till 2050) and a call to action (till 2030) we include all North Sea stakeholders, such as companies, governments and the public in the surrounding countries, as well as parties with a stake in nature, agriculture, fishery, navigation, restoring the eco-system etc.

We agree that we will explore the possibilities of Coordination & Cooperation in the North Sea region, such as:

- **Aligning related initiatives** that have the potential to create synergy, e.g. the joint use of logistics and mobility and mutual understanding of data;
- **Joint innovation and research:** support of the development of the North Sea as a sustainable source of energy and, for that, cooperation with the Topsector Energy Innovation Programmes. Joint analysis of the potential of electrification of offshore platforms and of required safety areas around platforms. Innovation aimed at system-integration, power2gas, energy-storage, E-grid and improving ecosystems;
- **Joint Communication:** aimed at societal and political support that helps to harvest synergies;
- **Community building:** creating a broad council to share interests, expertise, products, data and logistics in support of the energy transition.

NOGEPA, NWEA, TENNET, TNO and Stichting Natuur & Milieu will form a steering committee to further investigate the possibilities. In order to realize a sustainable and integral result, the committee operates in close contact with the SRI (Social Responsible Innovation) Lab of the Dutch Topsector Energy in which the many stakeholders in the North Sea region will participate.

Signed June 15th 2016, Rotterdam

Hans Timmers, NWEA
Jo Peters, NOGEPA
Niek Jan van Kesteren
Paul de Krom, TNO
Mel Kroon, TENNET
Tjerk Wagenaar, Stichting Natuur en Milieu





WIN(NING) + WIN(D) = WIN(ST)

TNO innovation
for life

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MEDIA EXPOSURE



FD article March 2016



Opening NOS journaal 30 april 2016