FINDING SYNERGY IN OFFSHORE ENERGY

RENÉ PETERS – TNO ENERGY
THE ROAD AHEAD IN OFFSHORE OIL AND GAS?

- Low gas price
- Increasing cost
- Emission regulation (NOx)
- Lack of political support
- Climate change (GHG)
- Licence to Operate
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
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?
DECOMMISSIONING OF OFFSHORE INFRASTRUCTURE

- In a business as usual scenario (EBN 2016)

Offshore Production will stop around 2050
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 fo 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

Where should we get the power from?

How to balance peak power?

How can we accelerate the energy transition cost effectively and with societal acceptance?
ALIGN DRIVERS FOR KEY STAKEHOLDERS

Offshore Wind

Cost reduction
Emission reduction
License to Operate
Efficient spatial use

Offshore O&G

Accelerated transition
Human Capital offshore
Stability offshore grid
Minimise societal costs

Society

Bron: host-france.org
Bron: www.t-mobile.nl
Bron: www.nederlandmaritiem.com
INTENSIVE USE NORTH SEA LEAVES LITTLE SPACE

Offshore Oil & Gas
Offshore Wind
Offshore Infrastructure
Excluded zones
HIGH PUBLIC INTEREST, I.E. POLITICAL PRESSURE
OPPORTUNITIES INTEGRATION OFFSHORE ENERGY

**Short term 2015 - 2023**
- Electrification of oil and gas production
- Elimination of NOx, SOx and CO\textsubscript{2} emissions
- Development of an offshore electricity grid

**Medium term 2023 - 2030**
- Offshore Power to Gas for peak shaving (H\textsubscript{2} production)
- Gas 2 Wire (with CCS) for power balancing (stranded fields)
- Integration of infrastructure for offshore wind

**Long term 2030 - 2050**
- Reuse of infrastructure for offshore wind (substations)
- Energy conversion and storage
- Use of the gas grid for energy transport (H\textsubscript{2} or SNG).

System Integration in 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:

ebn  SIEMENS  TNO
CURRENT USE OF FUEL GAS TO POWER PLATFORMS

- Offshore power use dominated by top 10 platforms

Source EBN (2016)
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)
Re-use of offshore structures?

The benefits of system integration
connect future wind parks

Future P2G/G2W

Zero emission platforms

The benefits of system integration
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
- 2 MWel / 360 m³/h H₂
  - Alkaline electrolysis
  - H₂ injection in gas transportation pipeline

WindGas Hamburg
- 1.5 MWel / 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)
Balancing the offshore grid

Use the gas network for energy transport to shore

Produce H2 for direct use in transport or industry
LONG TERM OPTIONS FOR INTEGRATION OFFSHORE WIND AND GAS

Energy Island concept (TenneT)
Aqua farming

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

Tourist attractions
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
PARTIES CURRENTLY INVOLVED IN INITIATIVES RELATED TO NORTH SEA ENERGY
WIN(NING) + WIN(D) = WIN(ST)
MEDIA EXPOSURE

FD article March 2016

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