# Offshore grid development

October-23-2018

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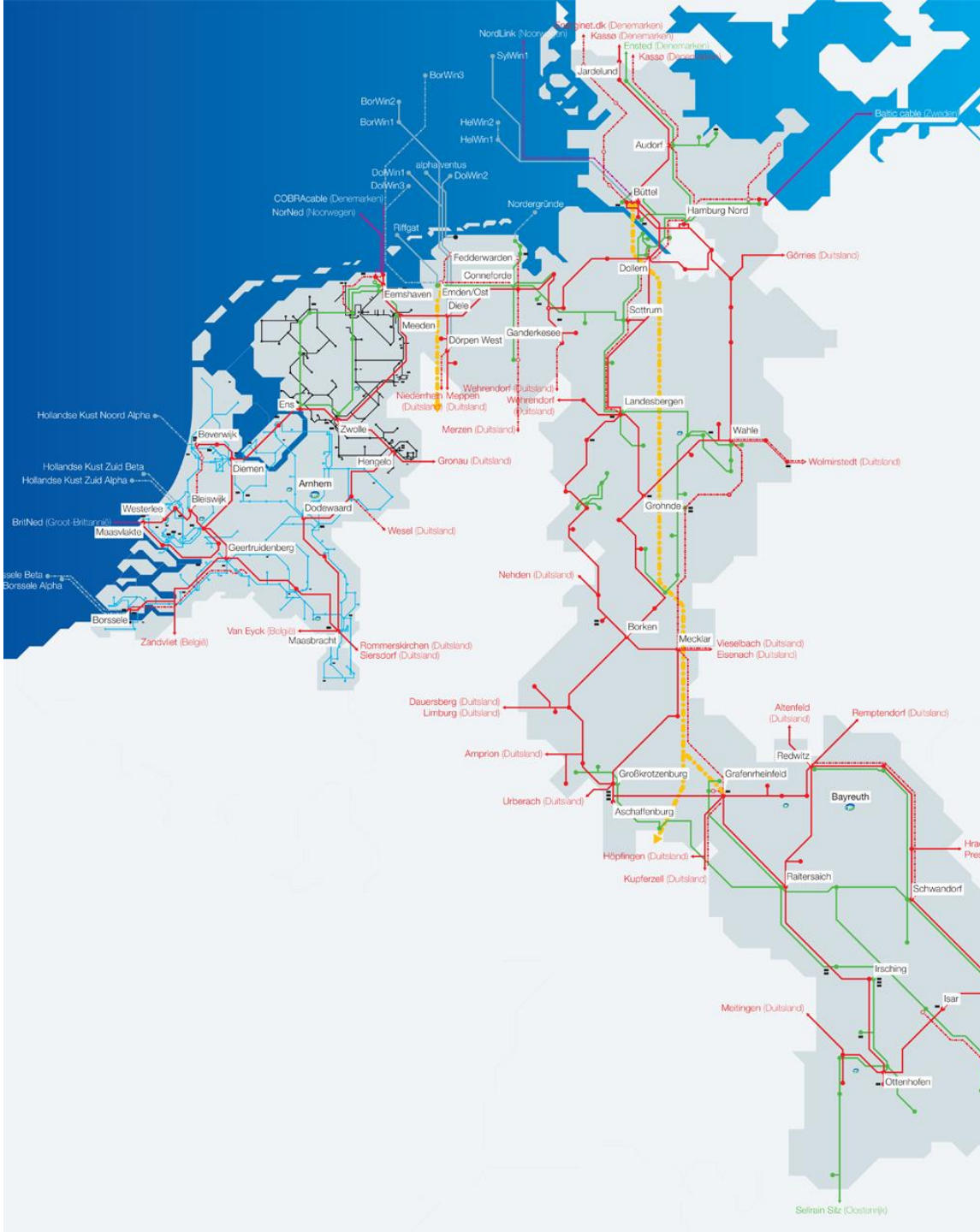
# TenneT at a glance

- Europe’s first cross-border grid operator for electricity
- Top five grid operator in Europe
- International offshore division
- 23.000 km high-voltage lines
- 4.700 km offshore cable
- 41 million end-users
- ~4.000 employees
- Asset base: EUR 20.4 bn
- 99,9986% security of supply



# Connecting offshore wind energy

Green electricity from the North Sea for 19 million households

## 10,400 MW in 2025 (GER)

**alpha ventus**
AC
66 km · 62 MW
Hagermarsch

**BorWin1**
DC
200 km · 400 MW
Diele

**BorWin2**
DC
200 km · 800 MW
Diele

**BorWin3**
DC
160 km · 900 MW
Emden/Ost

**DolWin1**
DC
165 km · 800 MW
Dörpen/West

**DolWin2**
DC
135 km · 916 MW
Dörpen/West

**DolWin3**
DC
160 km · 900 MW
Dörpen/West

**DolWin6**
DC
90 km · 900 MW
Emden/Ost

**SylWin1**
DC
205 km · 864 MW
Büttel

**HelWin1**
DC
130 km · 576 MW
Büttel

**HelWin2**
DC
130 km · 690 MW
Büttel

**Riffgat**
AC
80 km · 113 MW
Emden/Borssum

**Nordergründe**
AC
32 km · 111 MW
Inhausen

## 3,500 MW in 2023 (NL)

1. **Borssele Alpha**
   AC – 62 km – 700 MW – Borssele
   *Commissioning in 2019*
2. **Borssele Beta**
   AC – 69 km – 700 MW – Borssele
   *Commissioning in 2020*
3. **Hollandse Kust (south) Alpha**
   AC – 43 km – 700 MW – Maasvlakte
   *Commissioning in 2021*
4. **Hollandse Kust (south) Beta**
   AC – 34 km – 700 MW – Maasvlakte
   *Commissioning in 2022*
5. **Hollandse Kust (north)**
   AC –700 MW – cable route and landing location being investigated. *Commissioning in 2023*


# Phased development offshore wind

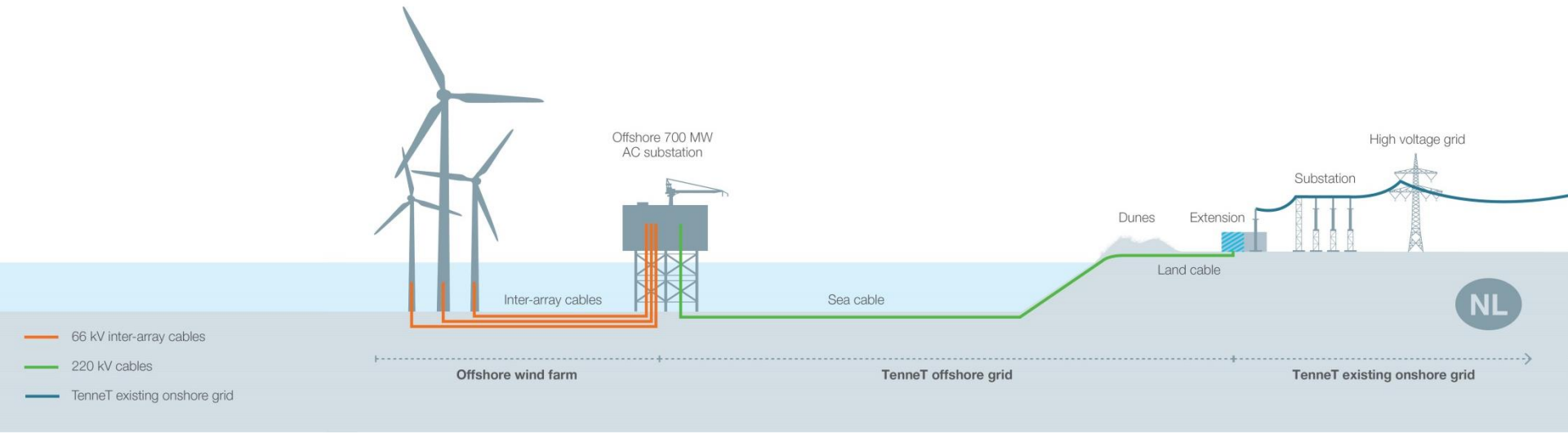
Three phase (parallel) development:

| | | |
|---|---|---|
| Short Term (to 2023) | 3,5 GW | ➢ Currently under development (near shore ) |
| Medium Term (to 2030) | 7 GW | ➢ Use full potential near shore locations<br>➢ Prepare for large scale and international cooperati |
| Long Term (to 2050) | 70 to 100 GW | ➢ North Sea Wind Power Hub<br>➢ International cooperation necessary |

# Phase I: 2019 – 2023

- 3.500 MW: 5 x 700 MW
- Standardised AC concept
- Lean design
- Lowest possible LCOE

# Dutch offshore grid scheme

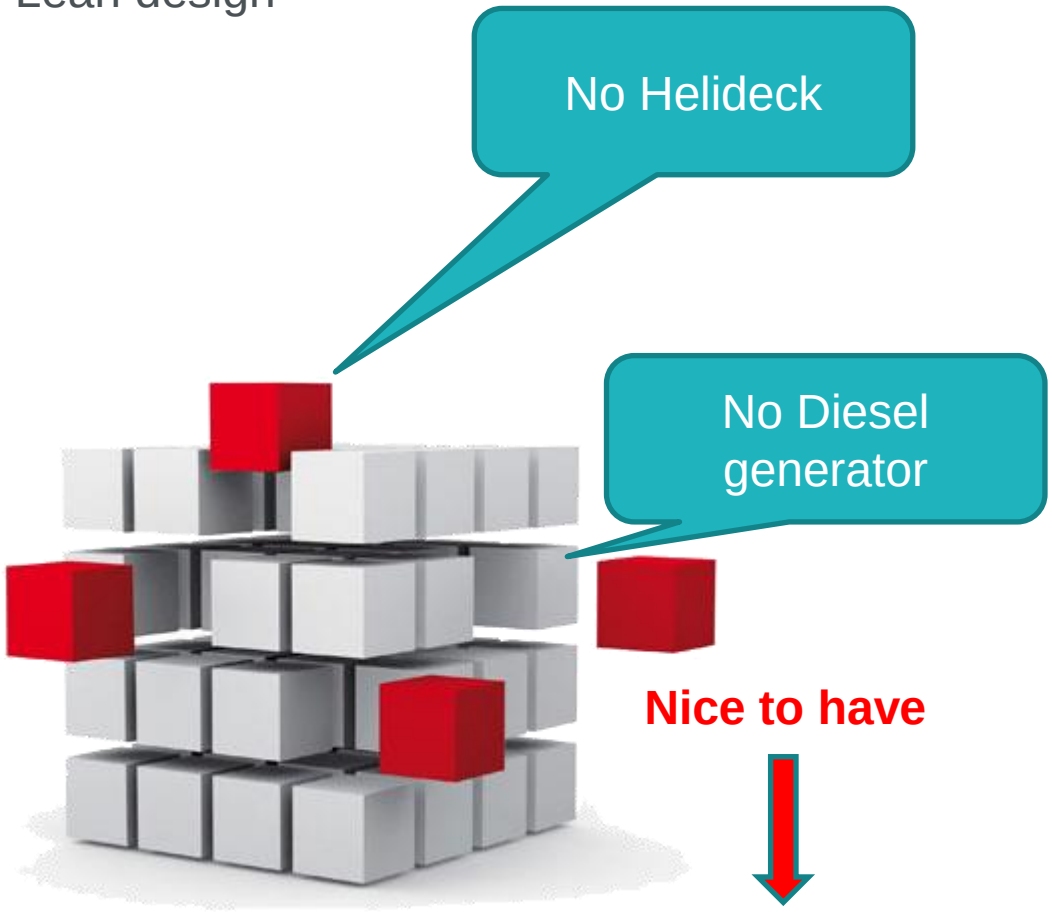


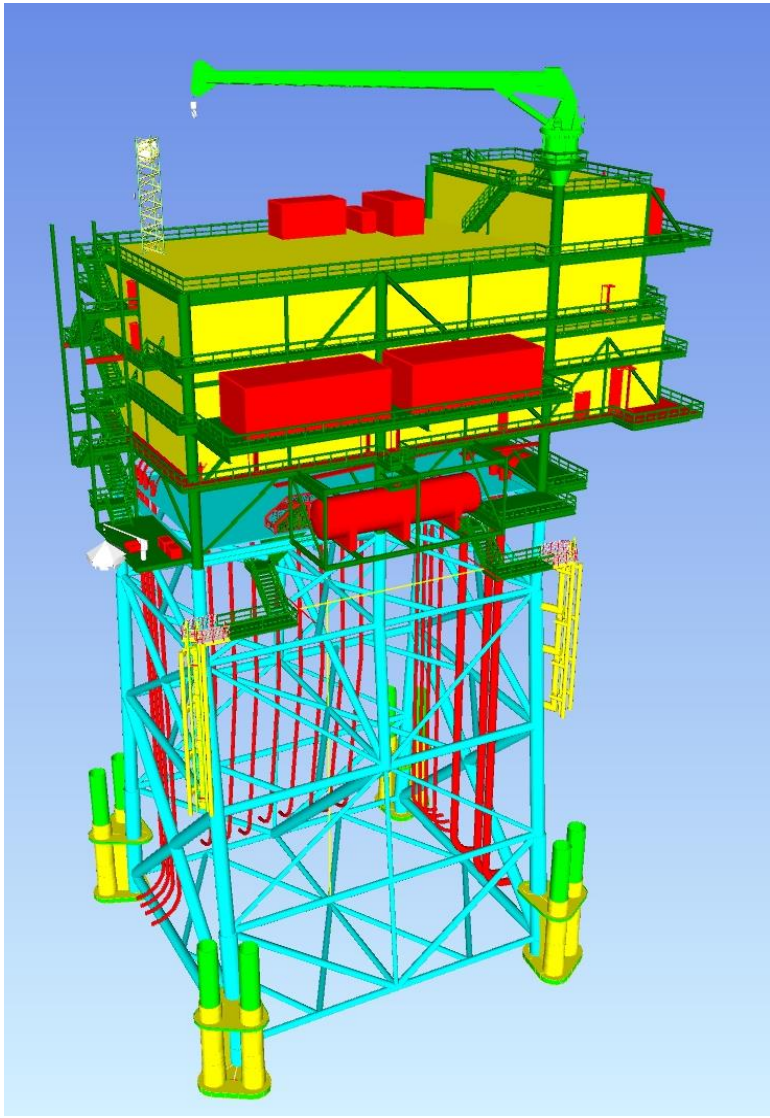

| Year | Capacity | Area |
|---|---|---|
| 2019 | 700 MW | Borssele |
| 2020 | 700 MW | Borssele |
| 2021 | 700 MW | Hollandse Kust (zuid) |
| 2022 | 700 MW | Hollandse Kust (zuid) |
| 2023 | 700 MW | Hollandse Kust (noord) |

- Export cable system: 220 kV, AC
- Standardisation, 5x 700 MW platform
- 66 kV cables
- Lean and mean (bundling)
- Development with market parties
- Minimal habitat disturbance

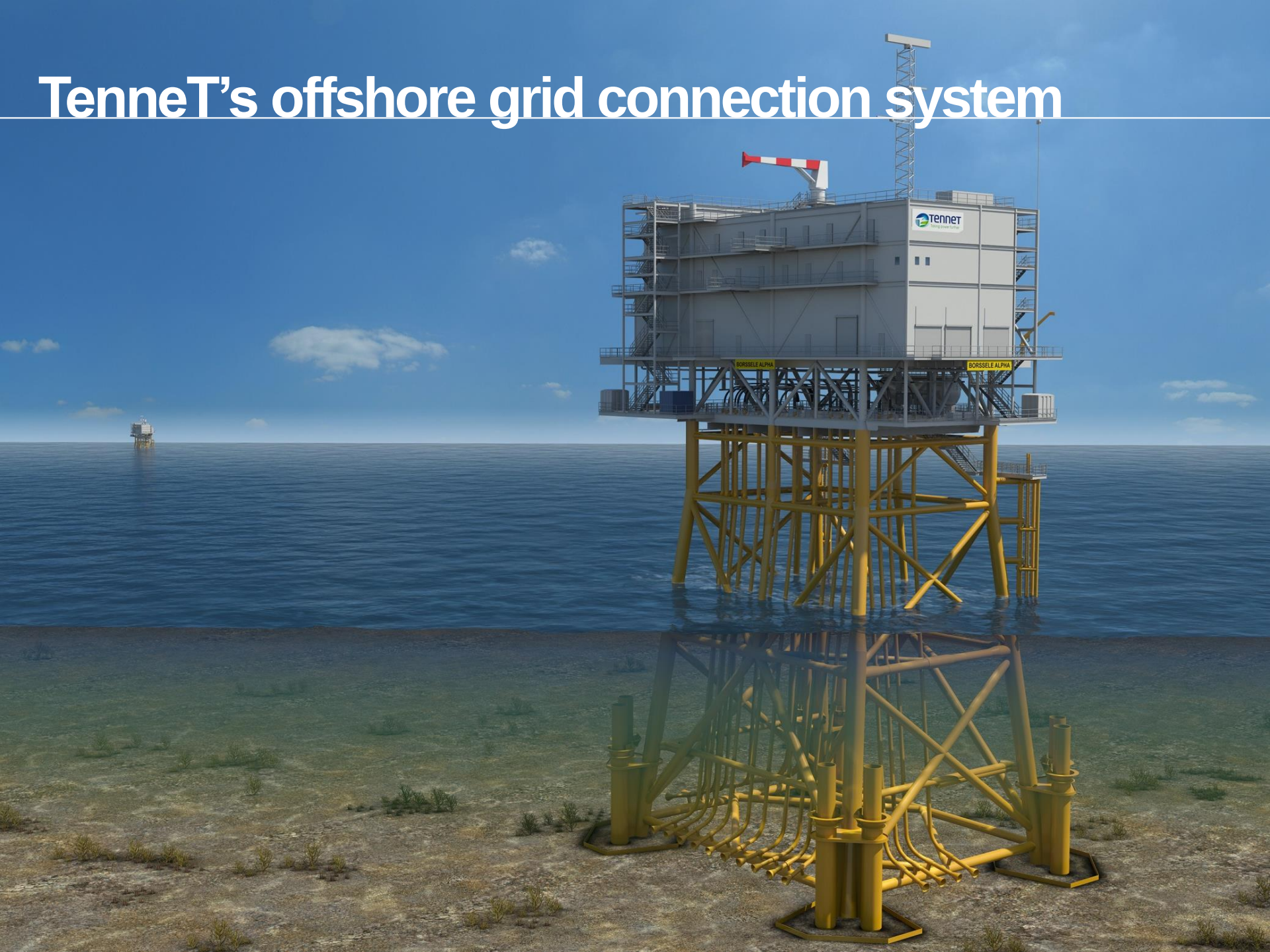
# AC Platform NL

Lean design

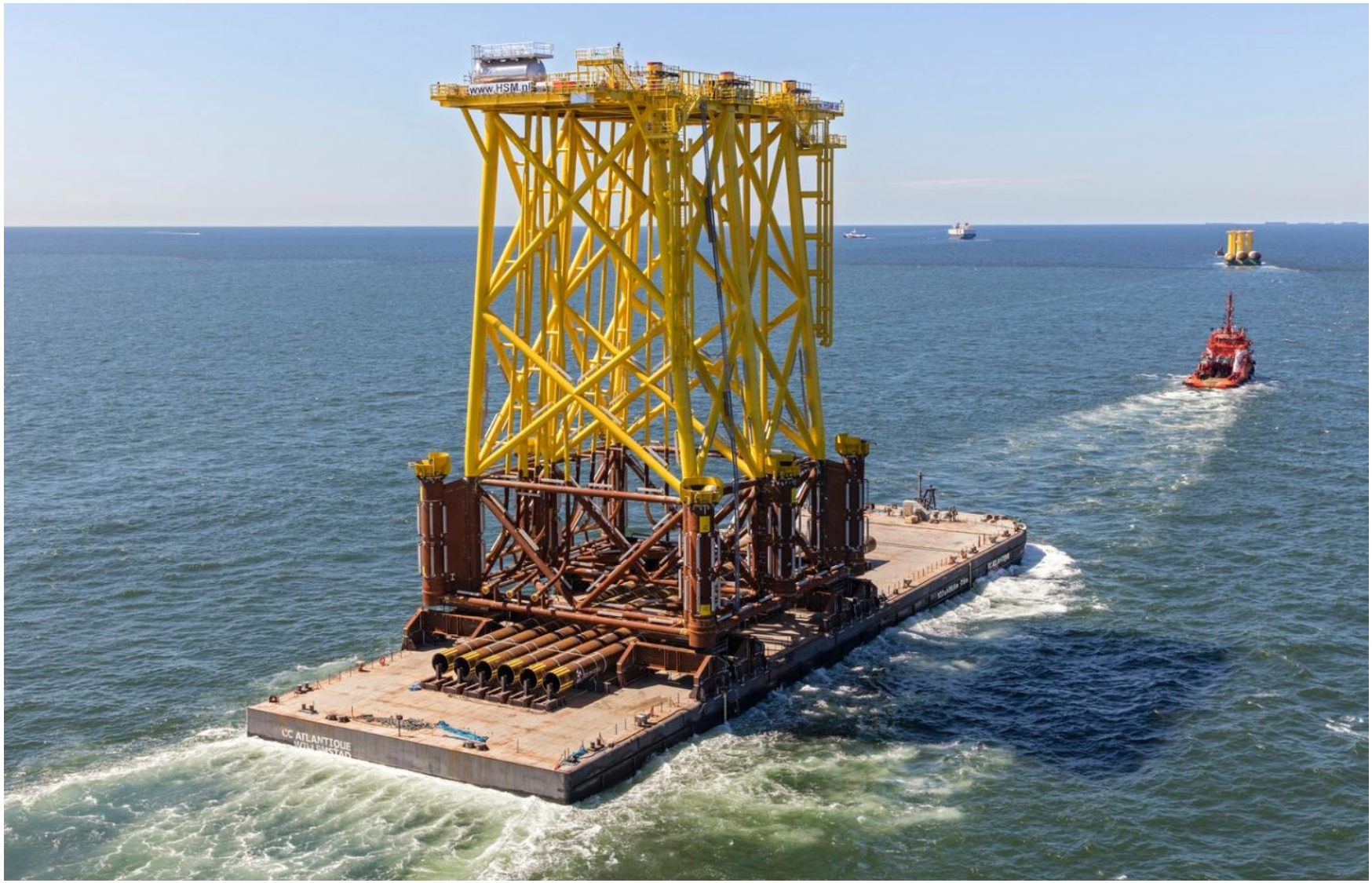


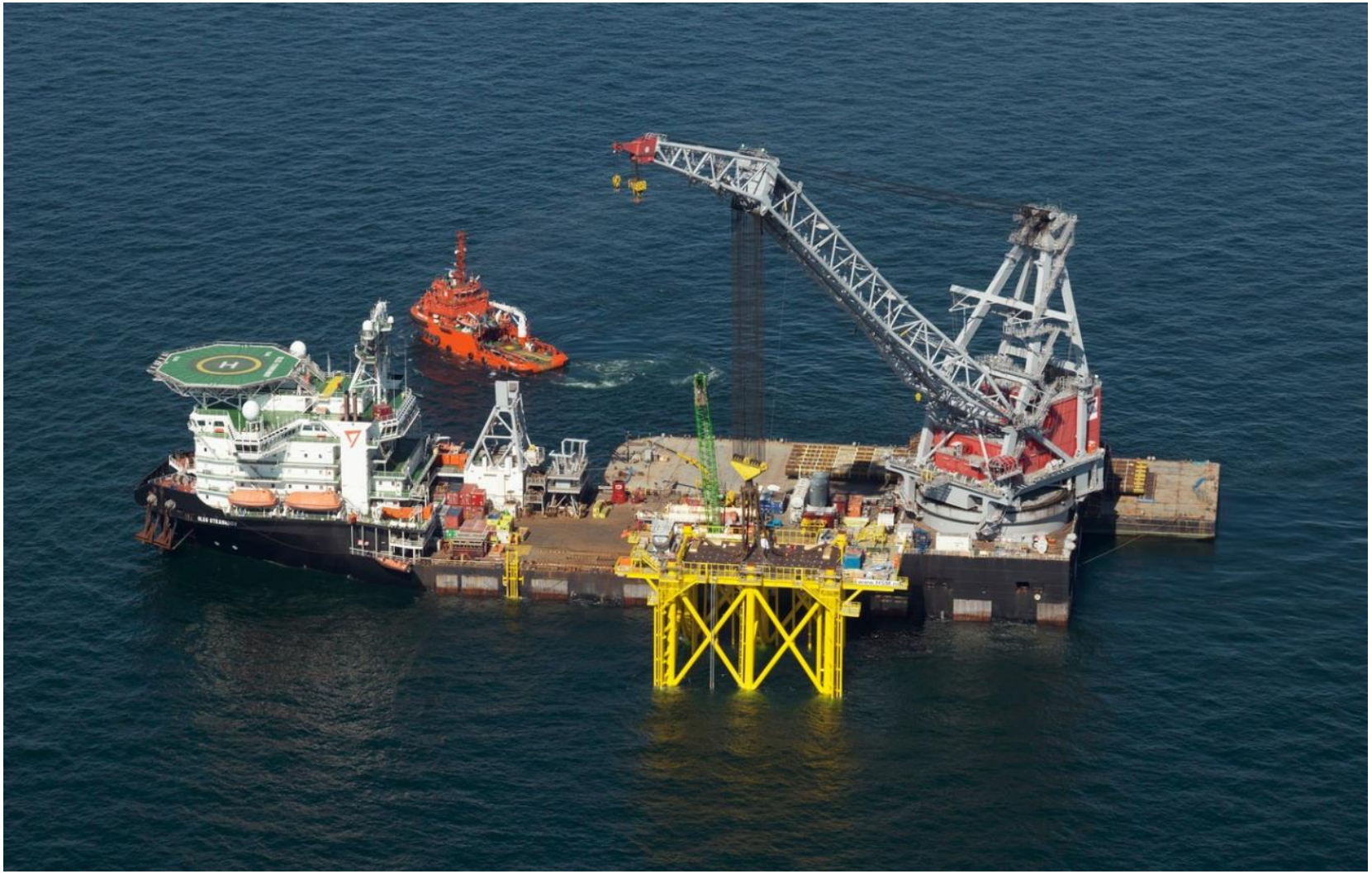
# TenneT’s offshore grid connection system



# Borssele – Status platform



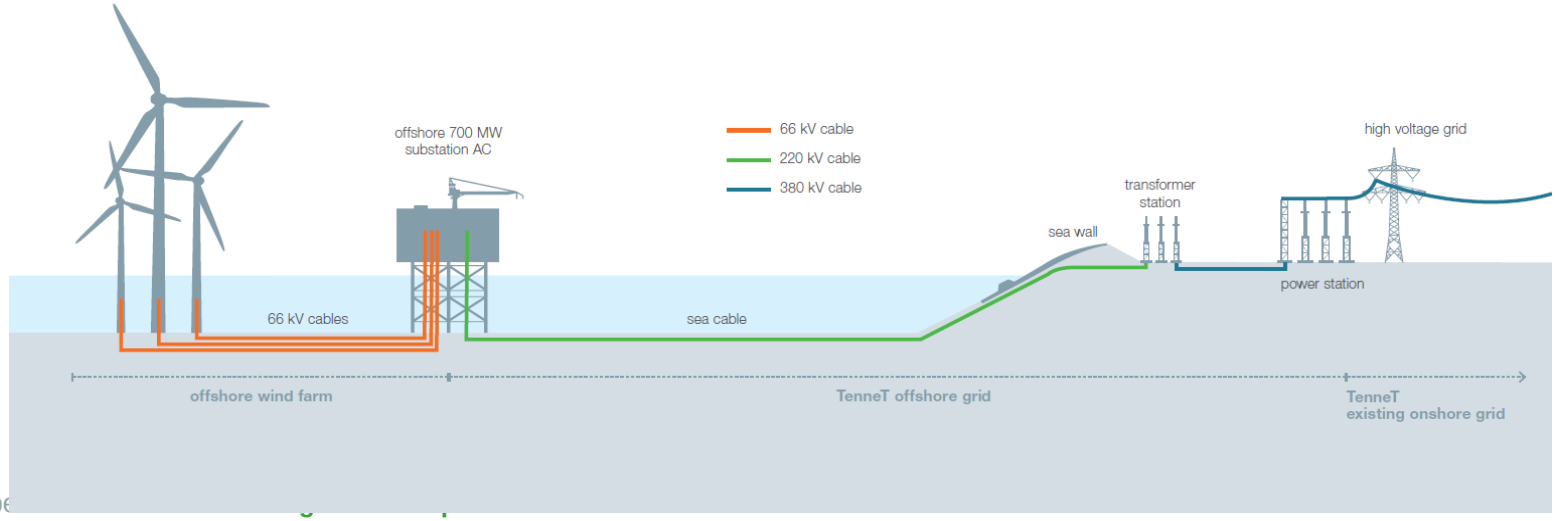
# Borssele – Status platform



# Borssele – Status landstation

# Net op zee Hollandse Kust (zuid)

- 2 x 700MW Hollandse Kust (zuid) Alpha and Beta
- The offshore grid connection ‘net op zee Hollandse Kust (zuid)’ is part of the *Rijkscoördinatieregeling* (RCR) (coordination licenses and spatial planning plan by Ministry of Economic Affairs and Climate Policy)
- Permits irrevocable
- Working plans seacable part of RCR

# Net op zee Hollandse Kust (zuid)

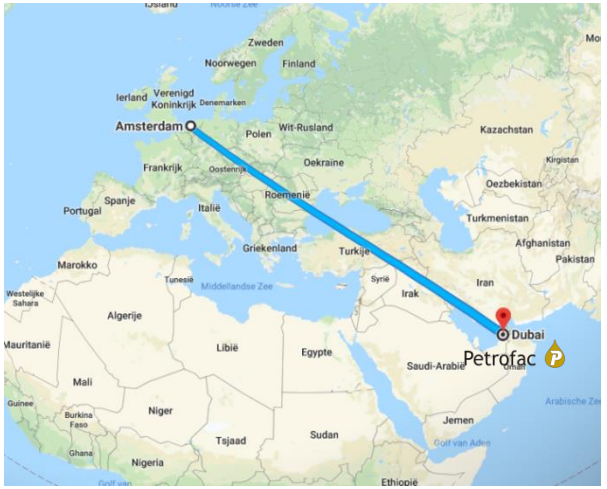
Project updates:

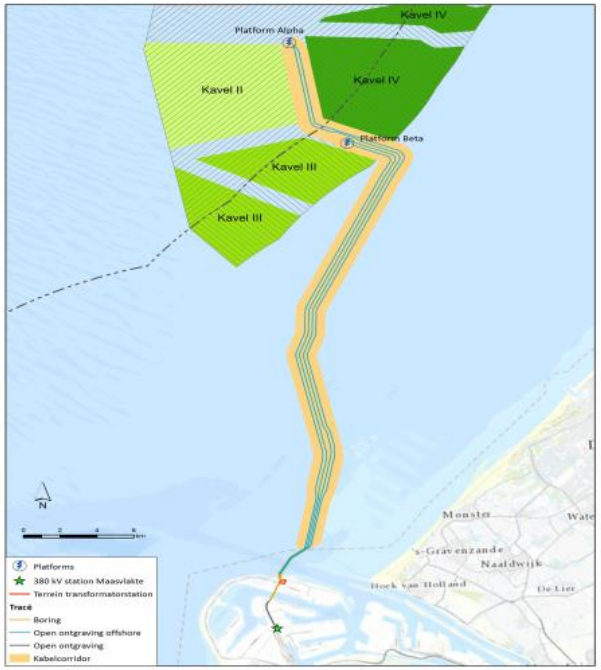
I. Substation contractor awarded. Petrofac from Dubai will construct substation Alpha with an option for Beta.

II. Offshore cable awarded to Van Oord & Hellenic cables. (2x220 kV & 66 kV interlink cable).

III. HDD sea Defense awarded to LMR drilling.

IV. UXO Certifier awarded to RPS, Contractor UXO campaign to be announced shortly.



# Net op zee Hollandse Kust (zuid) specific information by TenneT

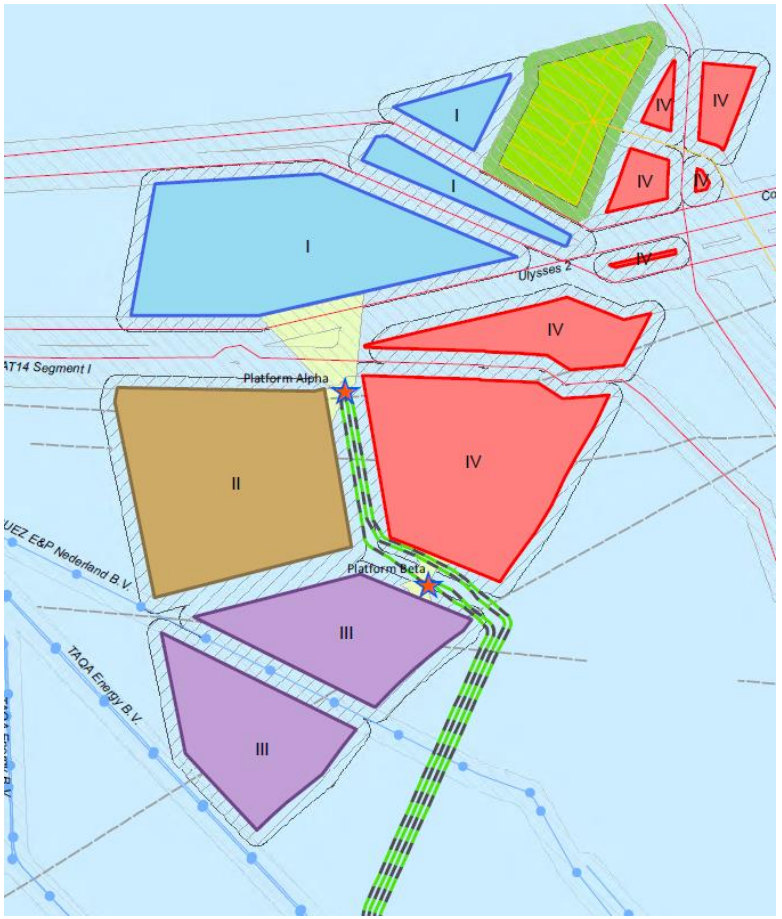
TenneT will publish the following information:

- Model Realization agreement
- Model Connection & Transmission agreement
- General terms & conditions

- Model cable crossing agreement
- Model proximity agreement

- Update overplanting

- Q&A file (anonimised format)



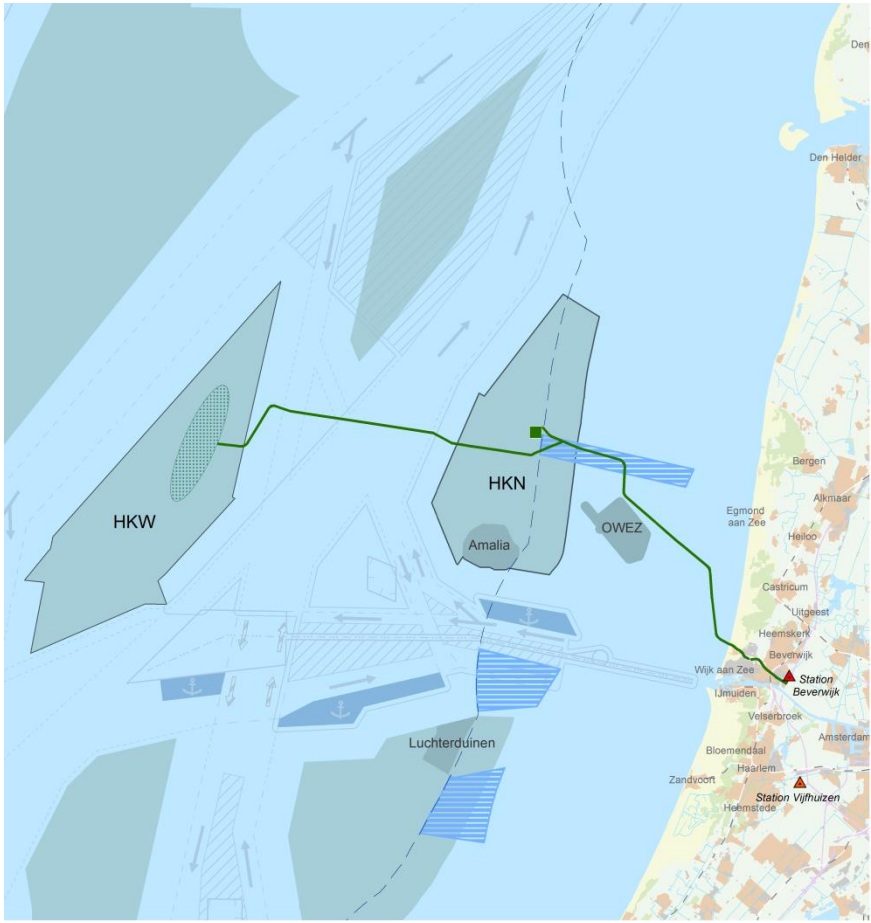

https://www.tennet.eu/our-grid/offshore-projects-netherlands/net-op-zee-hollandse-kust-zuid/

# Net op zee Hollandse Kust (noord) and (west Alpha)

- 2 x 700 MW
- The offshore grid connection ‘net op zee Hollandse Kust (noord) and (west Alpha)’ is part of the *Rijkscoördinatieregeling* (RCR) → coordination licenses and spatial planning plan by Ministry of Economic Affairs and Climate Policy
- Decision preferred route alternative: April 2018.

Preferred alternative:

- Cable route through municipalities of Heemskerk, Beverwijk and Velsen
- Land cables: underground
- 220kV/380 kV land station at Tata Steel (ground acquisition by TenneT)



# Net op zee Hollandse Kust (noord) and (west Alpha)

RCR procedure update:

I. Consultation period for draft decisions (‘Inpassingsplan’, permits, EIA): 9 November until 20 December 2018
II. Public information evenings on 20 and 27 November 2018
III. Appeal period for the final decisions is expected in Q2 2019. Only parties that have submitted a position paper earlier in the process (see I.) may submit an appeal.

Tender:

- ITT for land station, sea and land cables and offshore platforms: 2019
- Awards expected in Q1 2020
- Start of construction activities is foreseen from 2020

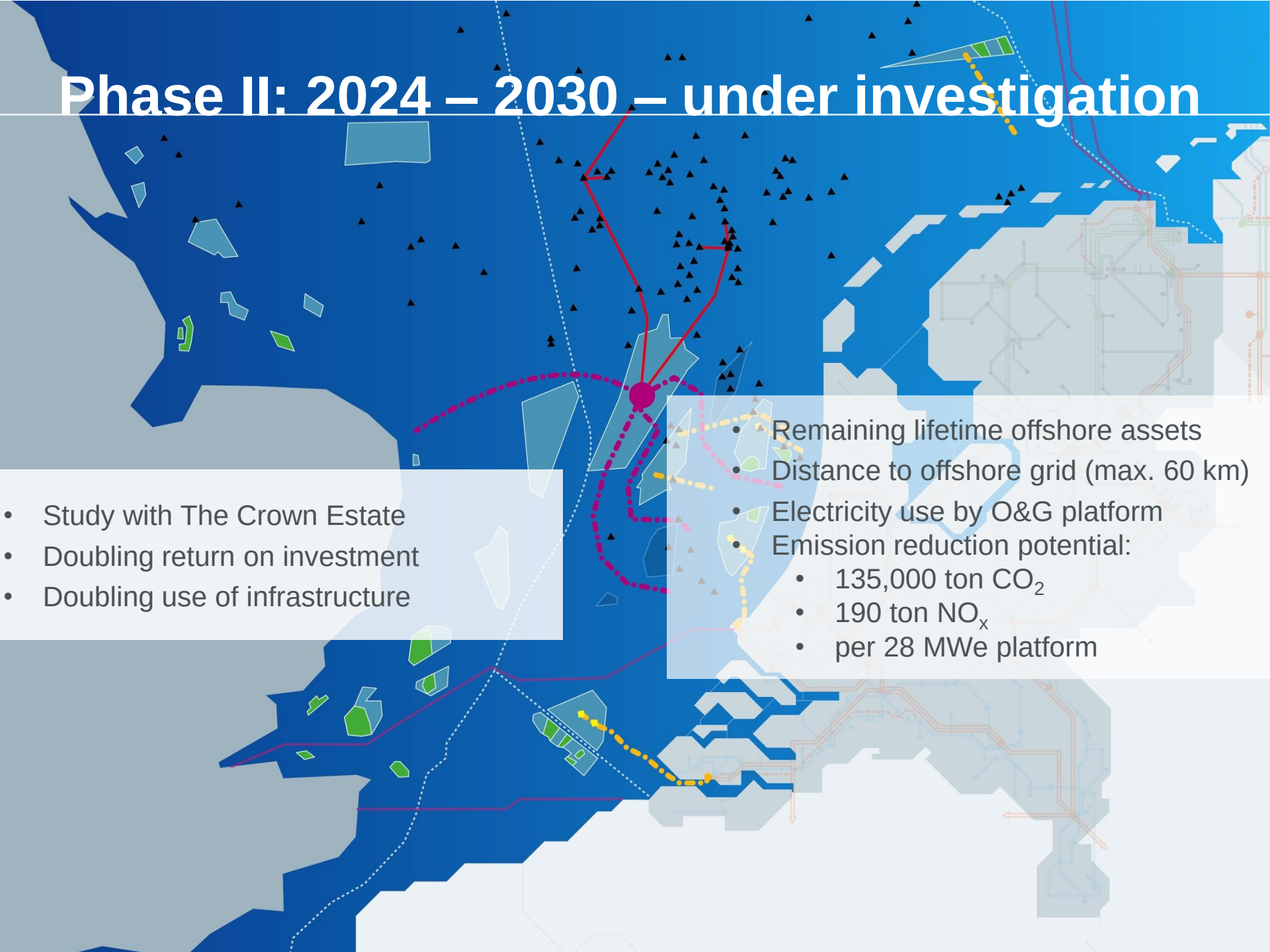
# Phase II: 2024 - 2030

## Routekaart 2030

- Additional 7 GW
- 700 MW AC grid connection system
- New: DC grid connection system
- Windconnector
- Connecting existing oil and gas
- Island solutions
- Transport capacity onshore grid

IJmuiden Ver

# Phase II: 2024 – 2030 – under investigation



- Study with The Crown Estate
- Doubling return on investment
- Doubling use of infrastructure

- Remaining lifetime offshore assets
- Distance to offshore grid (max. 60 km)
- Electricity use by O&G platform
- Emission reduction potential:
  - 135,000 ton $CO_2$
  - 190 ton $NO_x$
  - per 28 MWe platform

# Offshore Wind energy in the Netherlands

- Questions?
- Please feel free to contact us via netopzee(at)tennet.eu

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