Offshore Wind Energy in the Netherlands Workshop

8 June 2023

wind & water works

Programme

- Introduction & Roadmap 2023 (Sylvia Boer, Joost Vermeulen, Saskia Jaarsma)
- IJmuiden Ver sites Alpha & Beta
  - Update offshore grid (Saskia Jaarsma)
  - Update upcoming tenders: planning & site decisions (Simone van Sligter)
- Site characterisations (Matté Brijder)
- Offshore hydrogen (Laura Jansen)

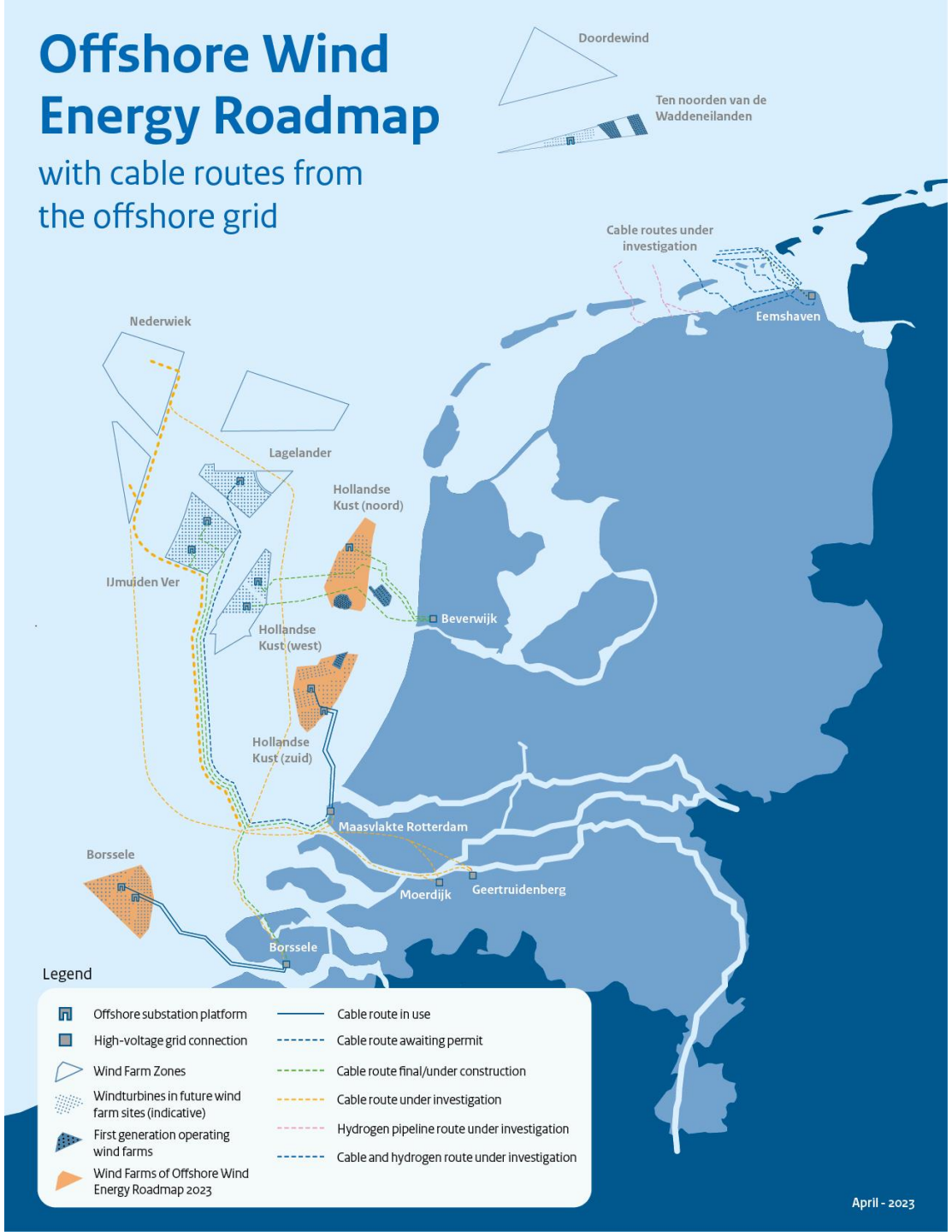
BREAK

- Oranje Wind Power II plans for Hollandse Kust (west) site VII (Rein de Wolff)
- Partial Review of the North Sea Programme and spatial integration of offshore mining and wind energy (Joost Vermeulen)
- International developments – policy update (Emelie de Wagt)
- International developments – offshore grid (Saskia Jaarsma)
- Quiz: Ecowende's plans for Hollandse Kust (west) site VI (Hermione van Zutphen)

Roadmap 2023

Saskia Jaarsma (TenneT)
Joost Vermeulen (Ministry of Economic Affairs and Climate Policy)

Roadmap 2023



Roadmap 2014-2023

31 March 2023 – Hollandse Kust (noord) Grid Ready

May 2023 – Beach event for local stakeholders and contractors

TenneT offshore at glance (2023)

Making clean wind energy from the North Sea a reality

10.6 GW
Combined transmission capacity of offshore grid connection systems

4
interconnectors

17 offshore
grid connections

29 TWh
transmission of offshore wind energy

total cable system length
~ 3,600 km

Length up to
205 km
per connection

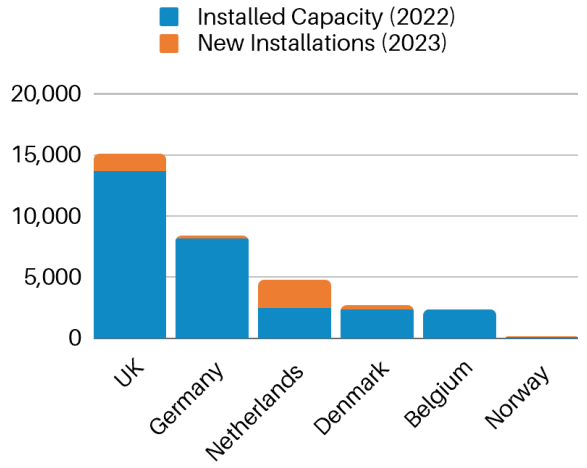
Dutch Offshore Wind Market Report

Key figures *(by end of 2023)*

4.7 GW
offshore wind capacity

15.8 %
expected share of offshore wind generation in total electricity consumption

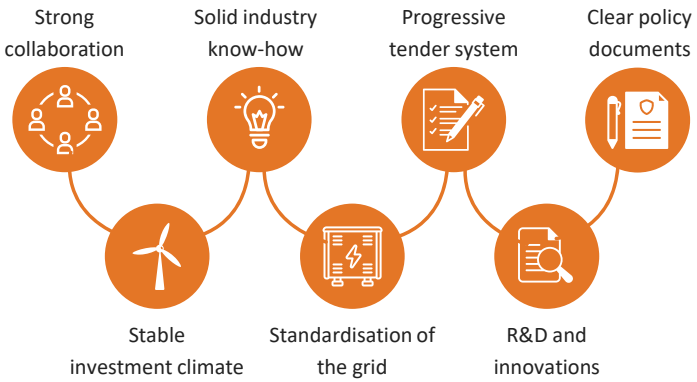
3,500 MW
offshore connection, in standardised concept of 700 MW per connection by TenneT



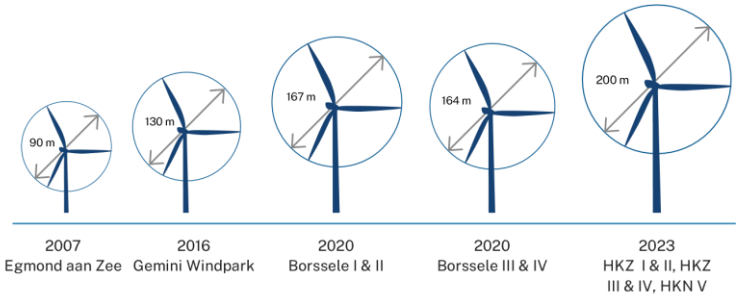
ACHIEVEMENTS

1. Pre-bid costs and risks for offshore wind developers significantly reduced thanks to implementation of a one-stop shop approach.
2. Cost saving of around €7 billion for Borssele, and the world's first zero-subsidy offshore wind farm – Hollandse Kust (zuid) Sites I & II.
3. Nature Inclusive Design – ecology-friendly measures integrated as a basic condition for offshore wind development.
4. The capacity of individual Dutch offshore wind farms increased seven fold, up from 110 MW for Egmond aan Zee in 2007 to 760 MW for Hollandse Kust (noord).
5. Connection costs for offshore wind farms have been reduced and development time for projects is down to just 3-4 years (from 7-10 years previously).

KEY DRIVERS



TURBINE DEVELOPMENT



Update: offshore grid IJmuiden Ver Alpha + Beta

Saskia Jaarsma
TenneT

Update IJmuiden Ver

Offshore documents (tennet.eu)

Facilitation through technological standards
Offshore grid expansion

We cannot achieve 40 GW by 2030 with linear growth alone: We need to significantly increase our transmission capacities**.**
By developing new standards for offshore grid connection systems, we lay the groundwork for **stepping up in offshore grid expansion.**

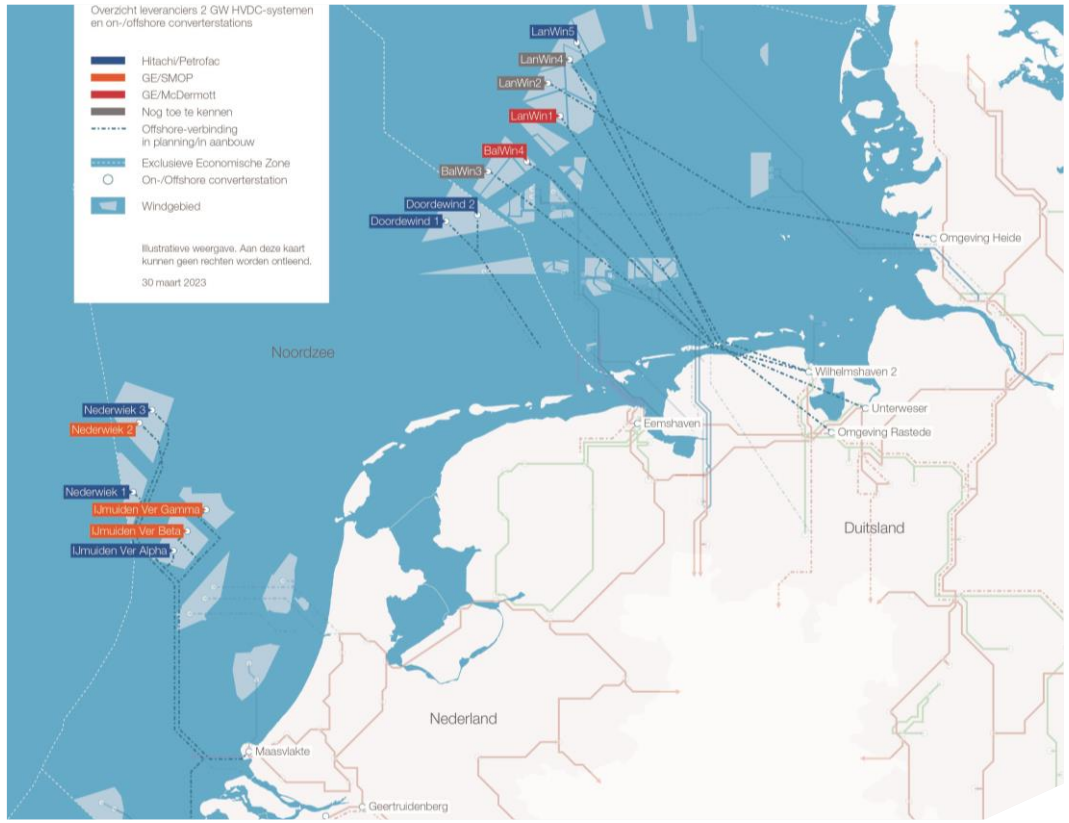
Starting at 700 MW AC to 400 MW DC to 900 MW DC, we are now at a whole new level: **Our new 2 GW high voltage direct current (HVDC) standard for offshore grid connection systems.**

Thinking ahead through partnership

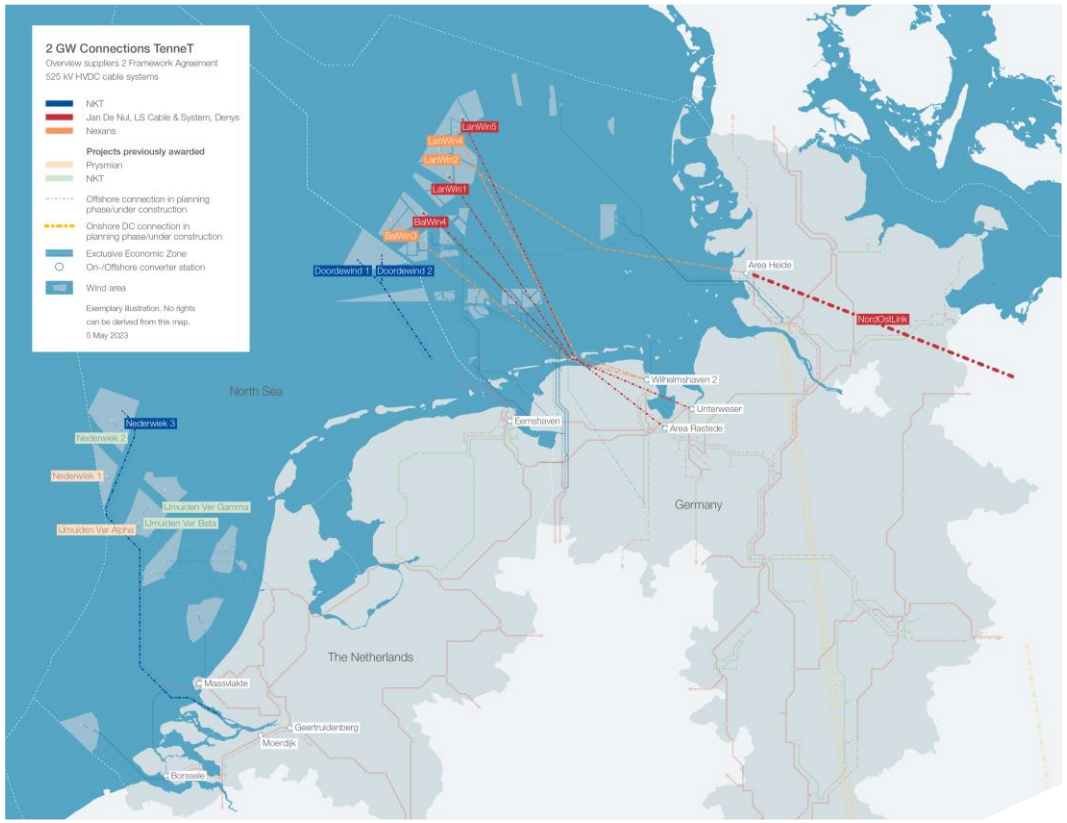
Across all levels

- **Communicate openly**
- **Act in mutual interest**
- **Share information and help the other party if possible**
- **Allow for improvement in a controlled manner**
- **Handle unforeseen events in the spirit of a partnership**
- **Think long-term in all activities**

2GW contractors announced - planning



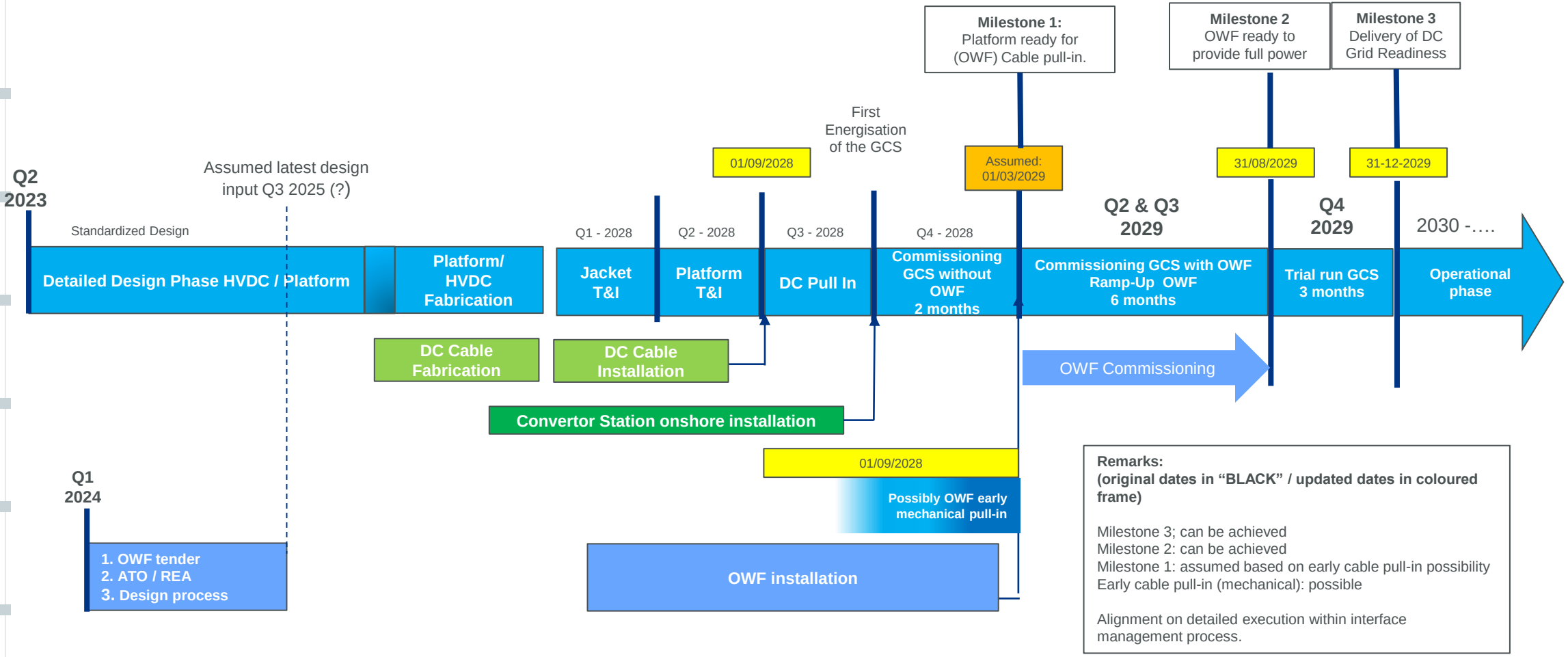
HVDC/Platforms Framework Cooperation Agreements



Cable Framework Cooperation Agreements

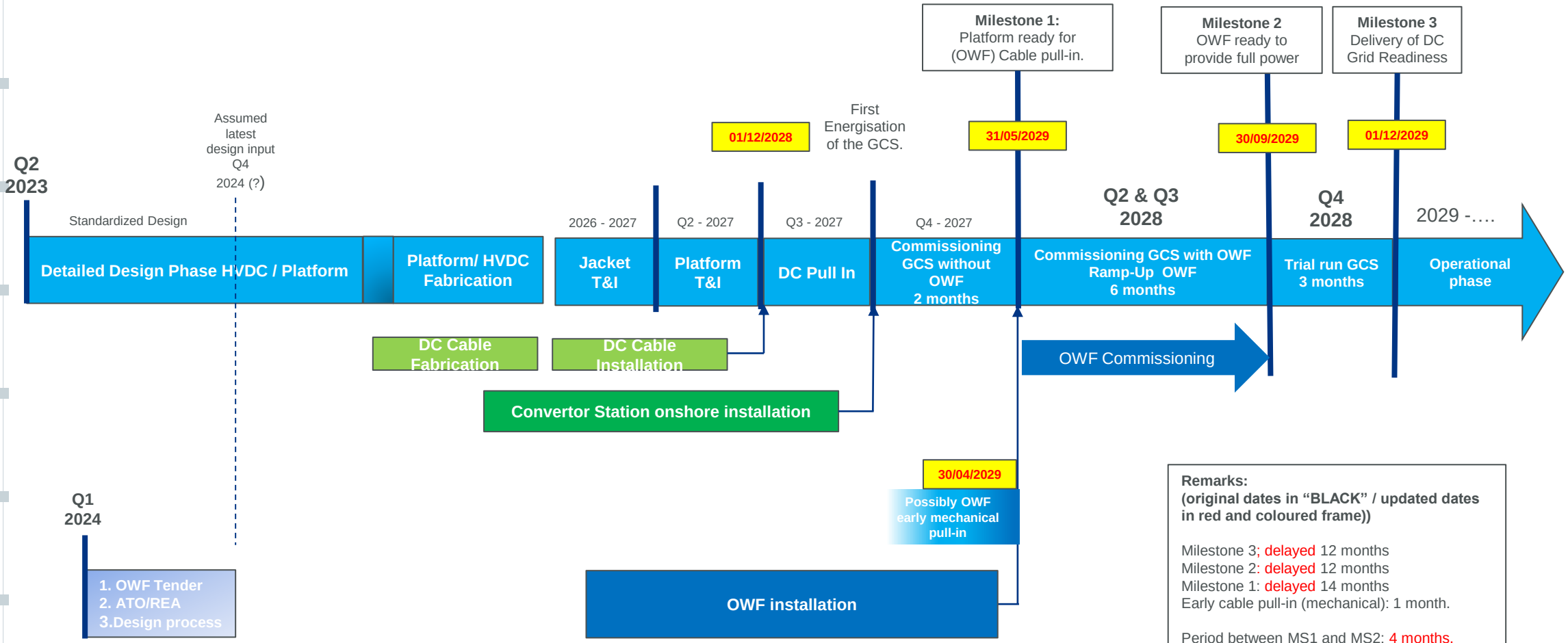
Updated master programme with regards to OWF

IJmuiden Ver Alpha (site Alpha)



Updated master programme with regards to OWF

IJmuiden Ver Beta (site Beta)



Remarks:
(original dates in "BLACK" / updated dates in red and coloured frame))

Milestone 3; delayed 12 months
Milestone 2: delayed 12 months
Milestone 1: delayed 14 months
Early cable pull-in (mechanical): 1 month.

Period between MS1 and MS2: 4 months.

Alignment on detailed execution within interface management process.

Changes compared to 700 MW AC model agreements

General Terms and Conditions

- No major changes compared to AC projects

Realizaton Agreement

- Updated delivery procedure in line with Development Framework
  - Milestone 1: platform ready for cable pull-in → electricity transport possible but transportation capacity not contractually guaranteed
  - Milestone 2: OWF ready to provide full power (2 GW)
  - Milestone 3: ISD grid connection system → transportation capacity contractually guaranteed and governmental compensation scheme applies
  - Until Milestone 3: Grid Connection System under care & custody of the Contractors

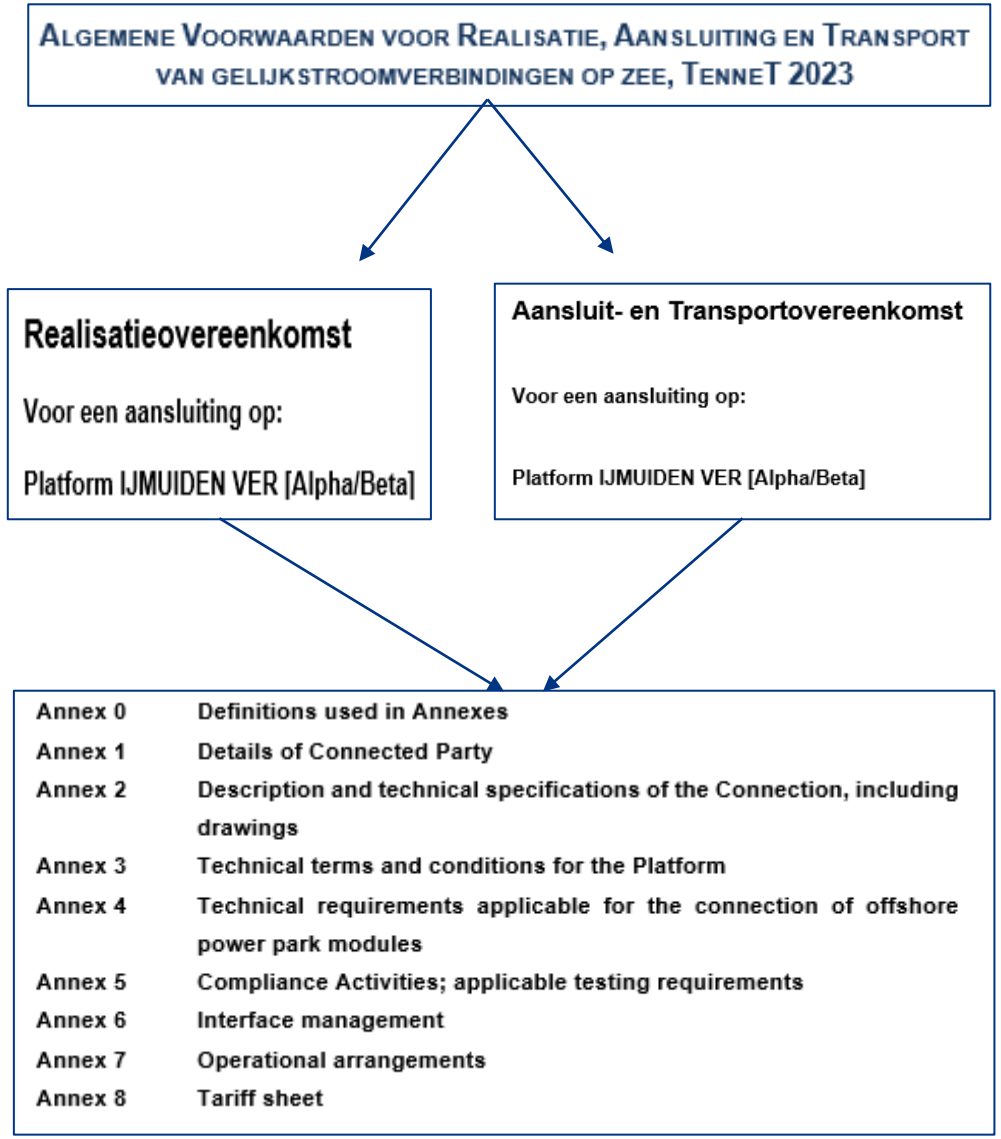
  Includes mutual reciprocal liabilities
  - TenneT liable towards OWF if platform not ready for cable pull-in at Milestone 1
  - OWF liable towards TenneT if wind farm not ready for full power at Milestone 2

Connection and Transmission Agreement

- No possibilities for transport above nominal capacity GCS (2 GW)

Technical annexes

- Full revision to take account of HVDC system in line with design principles consulted with OWFs in 2019 market consultation and requirements grid codes.



Update: OWF room

- Several requests from OWF developers regarding equipment in the rooms for Connected Party
- TenneT position:
  - Room size fixed, refer to Annex 3:
  - TenneT shall make available to the Connected Party:
  - *At the Platform: two rooms designated for the Connected Party ("Connected Party's room") of ± 55 m2 each, to install cabinets owned by the Connected Party. Following services are supplied by TenneT: CT/VT connections, Heating, Ventilation, Air Conditioning (HVAC), a redundant and uninterruptable power supply, fire detection and extinguishing.*
  - *At the Onshore Substation: two rooms of ± 28 m2 each, with following services supplied by TenneT: Heating, Ventilation, Air Conditioning (HVAC); redundant power supply, fire detection (no fire extinguishing).*
  - Type of equipment to be installed in the room: decision of Connected Party.

Summary milestones IJmuiden Ver

Project	Onshore Grid Connection Point	Milestone 1	Milestone 2	Milestone 3
		Platform ready for cable pull-in	Ready for Full Power	Grid Readiness
IJmuiden Ver Alpha	Borssele	01-03-2029	31-08-2029	31-12-2029
	Current dates in Development Framework	Q1 2029	Q3 2029	Q4 2029
IJmuiden Ver Beta	Maasvlakte	31-05-2029	30-09-2029	01-12-2029
	Current dates in Development Framework	Q1 2028	Q3 2028	Q4 2028

Next steps & Information updates

- Publications: Offshore documents (tennet.eu)
  - model agreements REA / CTA on TenneT website

- Questions: Until opening date tender: questions can be sent to netopzee@tennet.eu, continuous update of Q&A (anonymised) on website Offshore documents (tennet.eu)

- Directly after announcement of the winner of the wind tenders, exchange on REA/CTA agreements can start.

Update: Upcoming tenders IJmuiden Ver Alpha + Beta

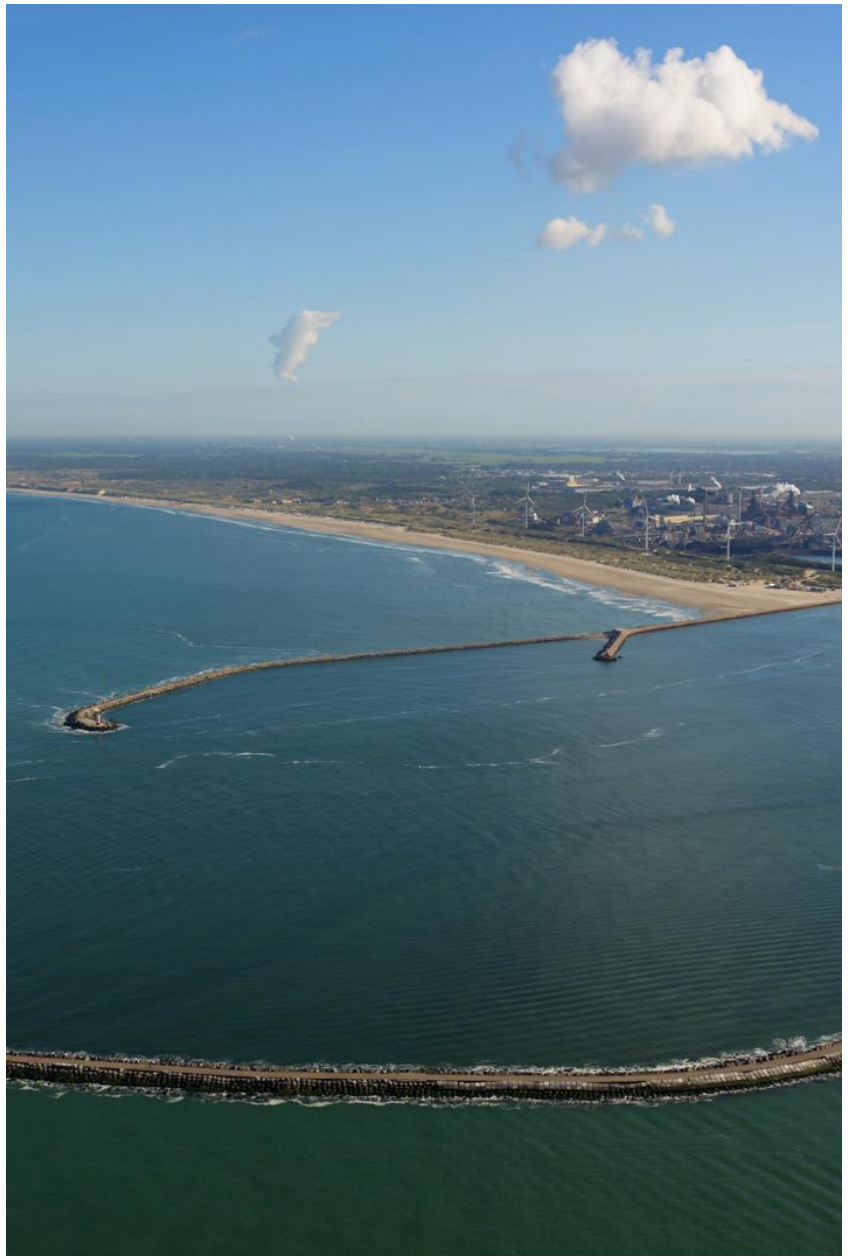
Simone van Sligter
Ministry of Economic Affairs and Climate Policy

Contents

1. **Recap of this project so far**

2. **Updated planning – IJmuiden Ver Alpha and Beta**
   - Tenders
   - Site decisions
   - Grid connection

3. **Additional request input**



Project highlights: IJmuiden Ver Alpha and Beta – 1/2

- Additional Roadmap 2030 – increased ambition

  approx. 21 GW of installed capacity

- IJmuiden Ver Alpha & Beta (both sites approx. 2 GW)

- Landing at Borssele (Alpha) and Maasvlakte (Beta)

- First wind farms in the Netherlands to be connected

  via direct current connections (HVDC)

Project highlights: IJmuiden Ver Alpha and Beta – 2/2

Comparative assessment with financial bid:

- Security of realization
- Contribution to the energy system
- Financial bid

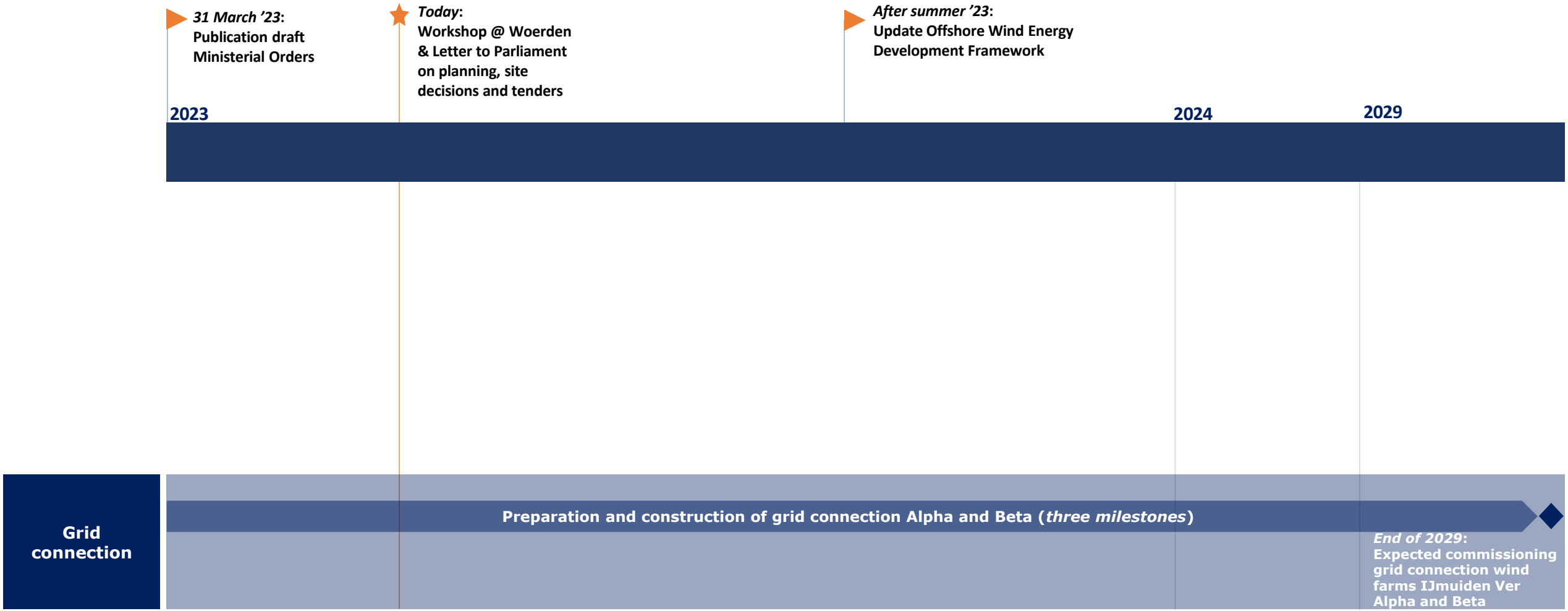
Additional criteria:

- Contribution of the wind farm to the ecosystem of the Dutch North Sea (*Alpha*)
- Contribution to integrating the wind farm into the Dutch energy system & measures that contribute to reducing harbour porpoise disturbance days (*Beta)*
- Level of compliance of the wind farm operator and the supply chain with the principles of the International Responsible Business Conduct (IRBC) (*Alpha and Beta*)
- Degree of circular construction and operation of the wind farm (*Alpha and Beta*)

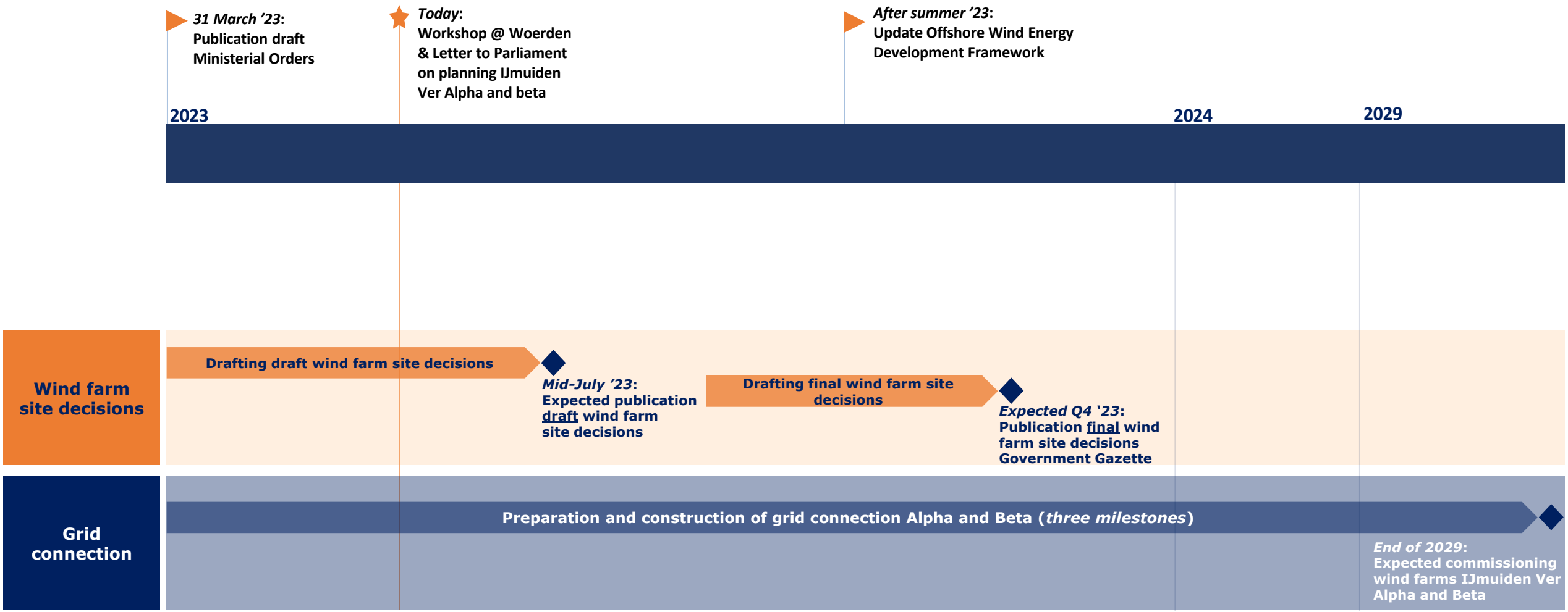
Draft Ministerial Orders:

- Published 31st March 2023 on RVO website
- Consultation period is closed

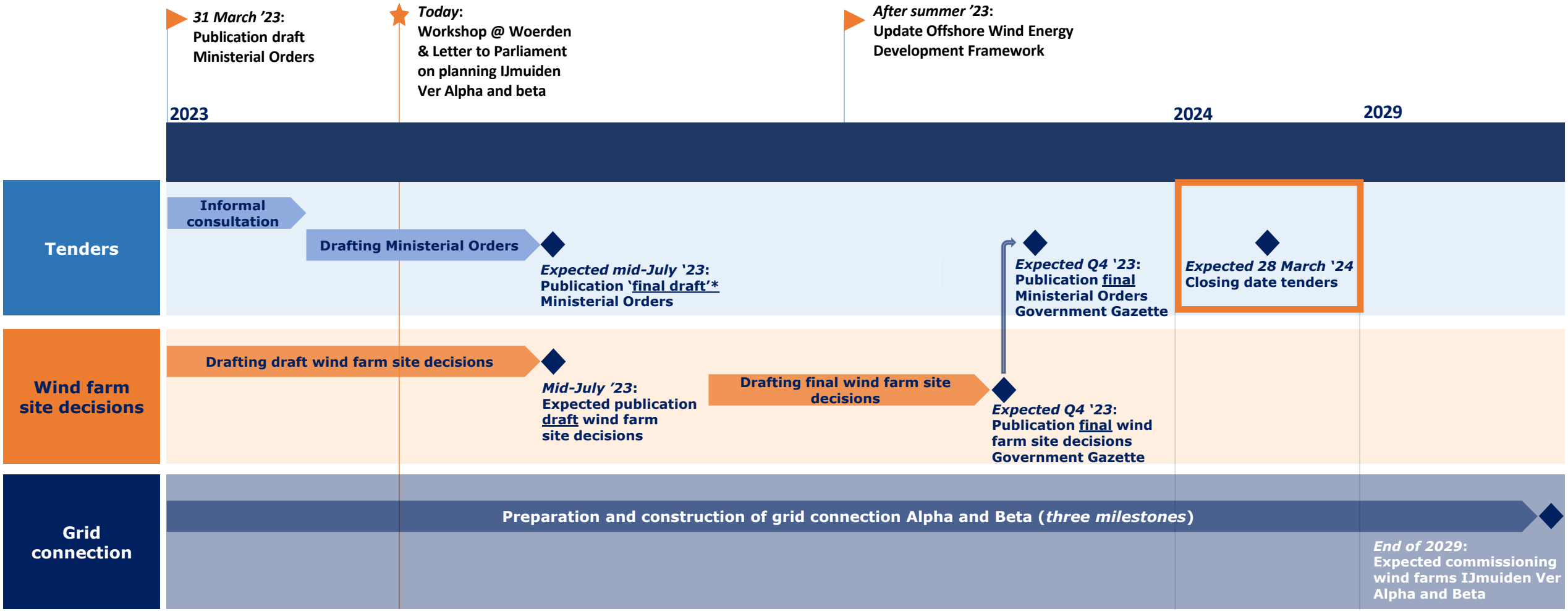
Expected planning: IJmuiden Ver *Alpha and Beta* – 1/3



Expected planning: IJmuiden Ver *Alpha and Beta* – 2/3



Expected planning: IJmuiden Ver *Alpha and Beta* – 3/3



*** Please be aware that these 'final-draft' Ministerial Orders may be subject to change and are only final when it is published in the Netherlands Government Gazette. We do not foresee another round of consultations after the three rounds of consultations that we have had so far. In case you spot real mistakes or have questions for the QandA, please let us know.**

Additional request input

- The draft timeline of the grid connection Alpha and Beta is open for questions and comments from interested parties **until 19th of June 12:00**
- Especially interested in input about the feasibility of the different milestones
- You can submit questions and comments by email to netopzee@tennet.eu & woz@rvo.nl – stating the relevant grid connection Alpha and/or Beta
- Please find:
  - The **draft timeline** in presentation TenneT (Saskia Jaarsma)
  - Letter to Parliament

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Questions?

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Site characterisations

Matté Brijder
RVO

IJmuiden Ver sites Alpha-Beta - Permit tenders Q1 2024

Site characterisation result	Webinar
Geophysical Survey	23 May
Intermediate Integrated Groundmodel/GIR	15 June
Geotechnical Survey	25 May
Morphological and scour study	1 June
Metocean assessment feas. level	28 September
Floating Lidar Metocean campaign	21 September
Monthly reports May 2022-March 2023	

Results expected:

- Final IGM/GIR (all data included)
- Metocean assessment design level
- Metocean campaign 12 months data — Q4 2023

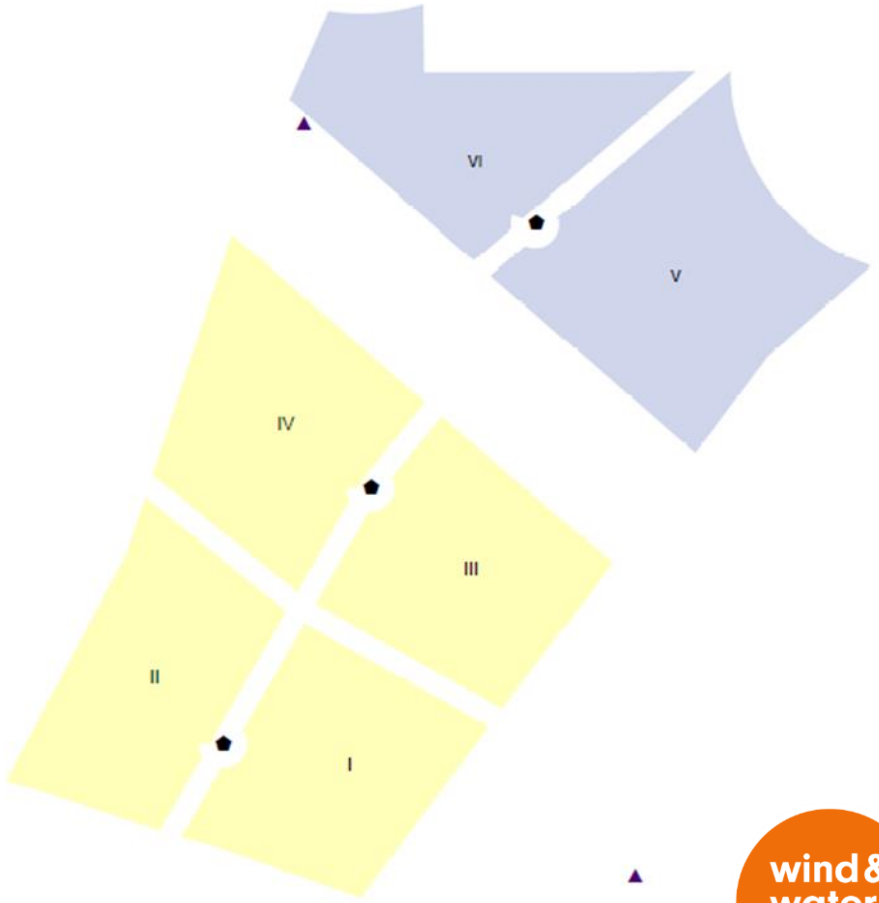
IJmuiden Ver site Gamma - Permit tender Q2 2025

Results:

- Morphological and scour study
- Geophysical survey
- Metocean assessment feas. level
- Floating Lidar Metocean campaign –
  Monthly data & report May 2022-March 2023

Results expected:

Metocean assessment design level	
Geotechnical survey and lab test results	Q2 2024
Integrated groundmodel and GIR	Q3 2024
Floating Lidar Metocean campaign	2022-2024



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Nederwiek I - Permit tender Q2 2025

Results expected:

> Geophysical survey	Q4 2023
> Morphological study	Q3 2024
> Geotechnical survey and lab test results	Q3 2024
> Integrated Groundmodel and GIR	Q4 2024
> Metocean assessment design level	Q3 24/Q4 25
> Floating Lidar Metocean campaign	2022-2024

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Nederwiek II-III - Permit tender 2026

- Geophysical survey ongoing
- Geotechnical survey final decision tender
- Integrated Groundmodel and GIR tender phase
- Metocean assessment design level Q3 24/Q4 25
- Floating Lidar Metocean campaign 2022-2024

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What’s next (on procurement)?

Q2 2023

- Groundmodel Nederwiek Noord and HKW VIII
- Geophysical survey Doordewind
- Certification Nederwiek

Q3/Q4 2023

- Morphological and scour study Nederwiek
- Client representatives GT Nederwiek Noord
- Client representatives GP Doordewind
- Metocean campaigns Search areas
- Geotechnical survey Doordewind

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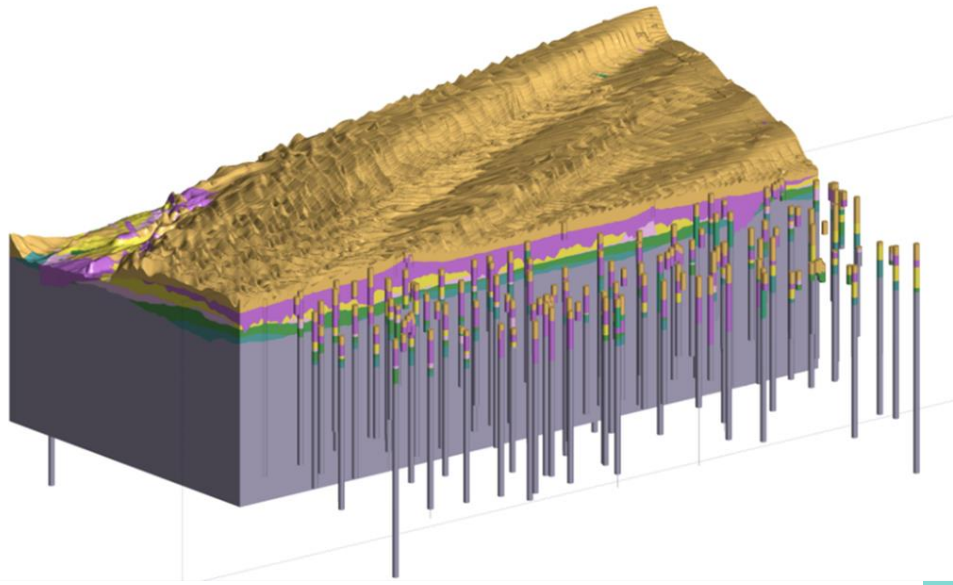
Webinars IJmuiden Ver



Integrated Ground Model 15 June 2023

2 parts:

- Presentation of the principal features of the Integrated Ground Model
- Presentation of key geotechnical parameters

Metocean campaign 21 September 2023

Metocean assessment 28 September 2023

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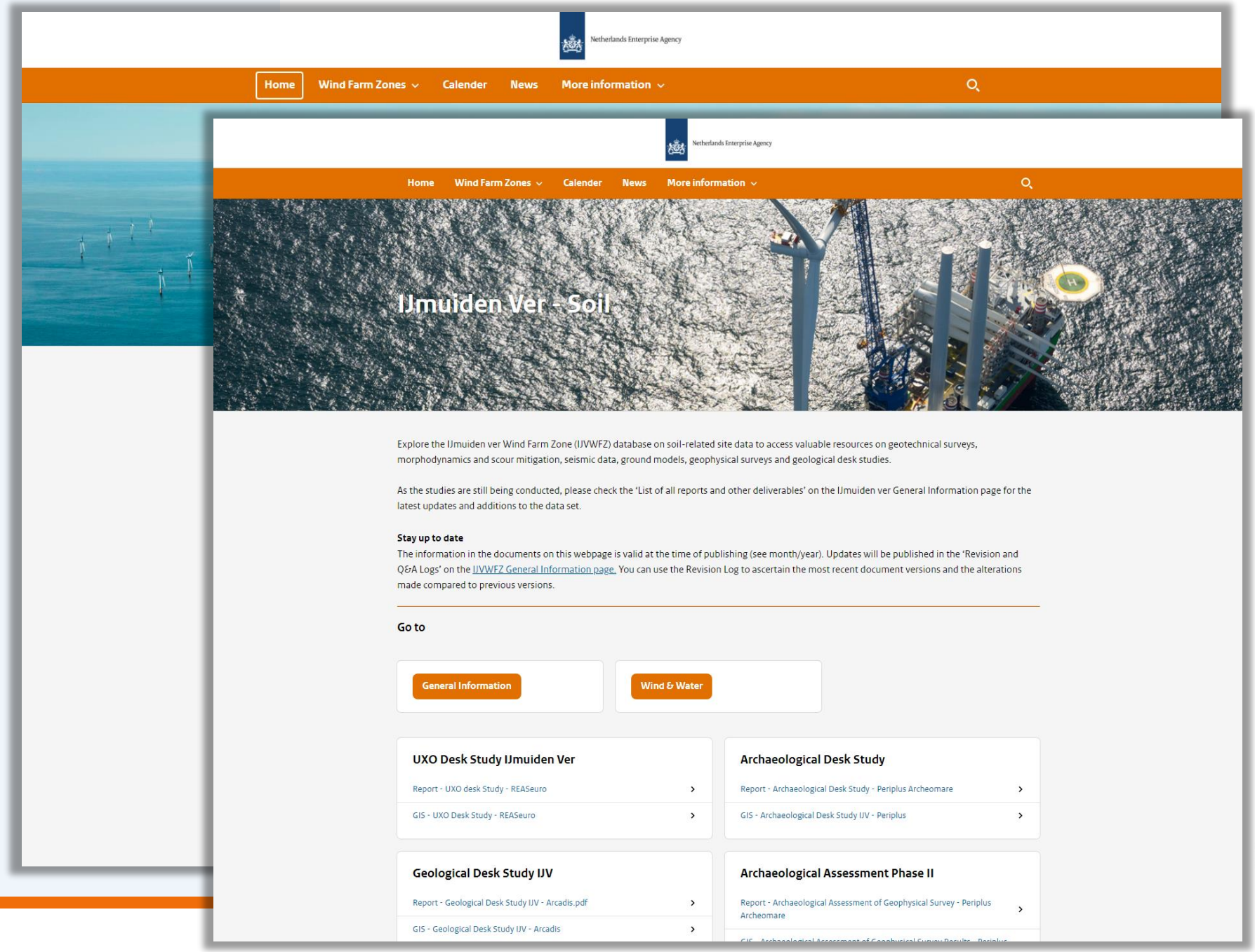
Website



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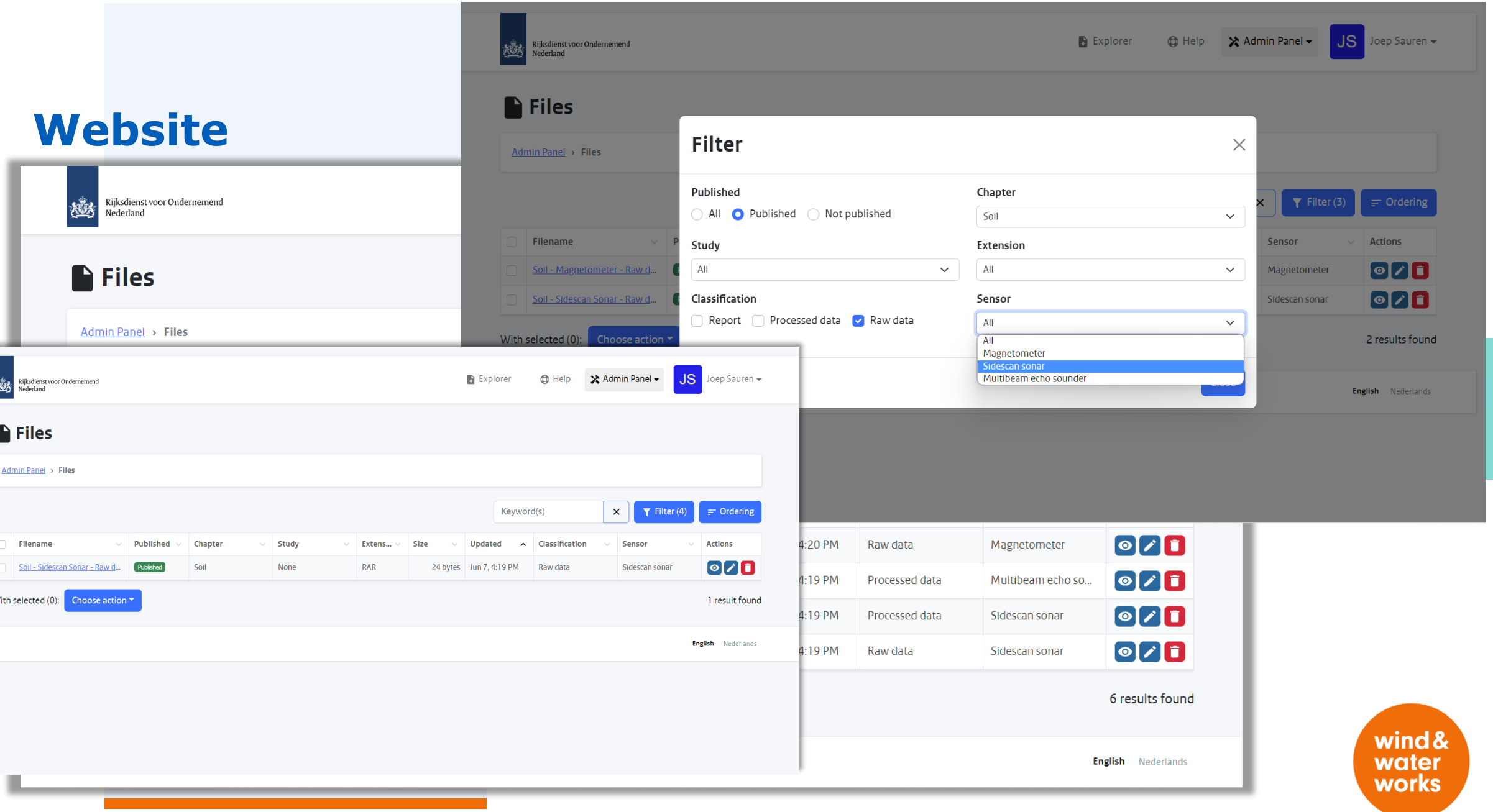
Website



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Offshore hydrogen

Laura Jansen
Ministry of Economic Affairs and Climate Policy


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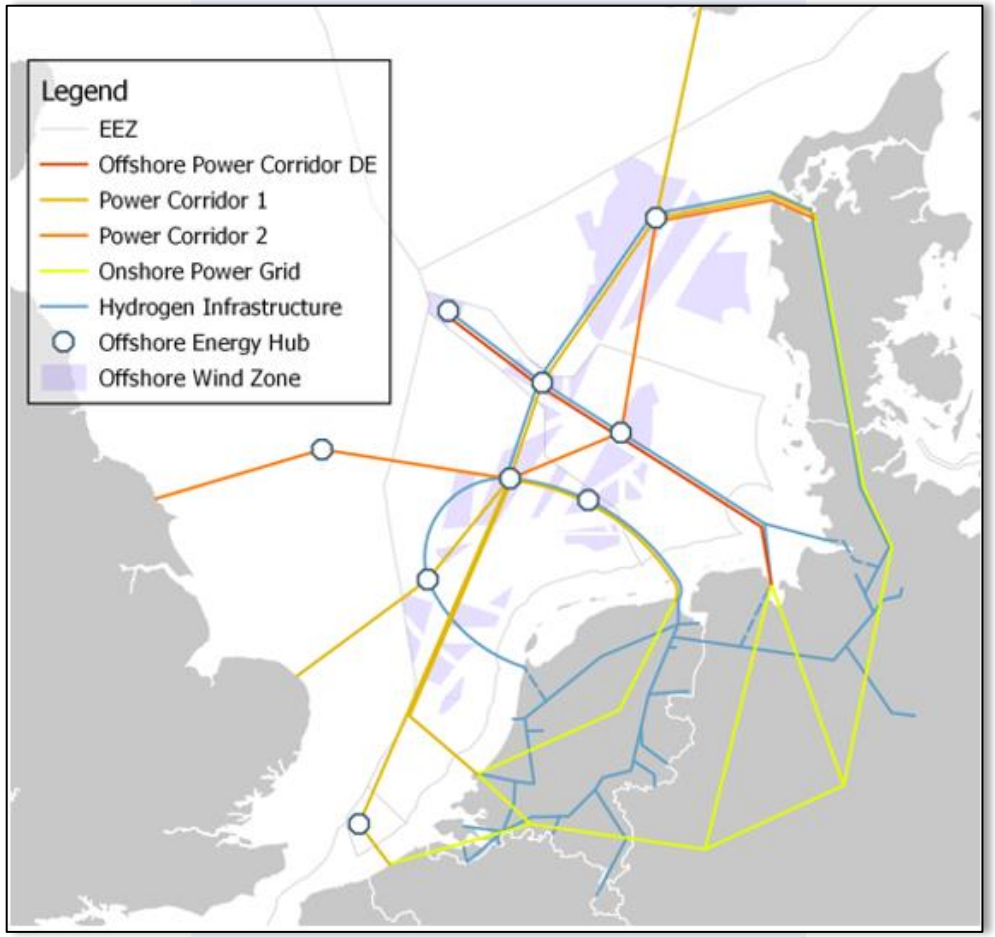
Prepare for the future



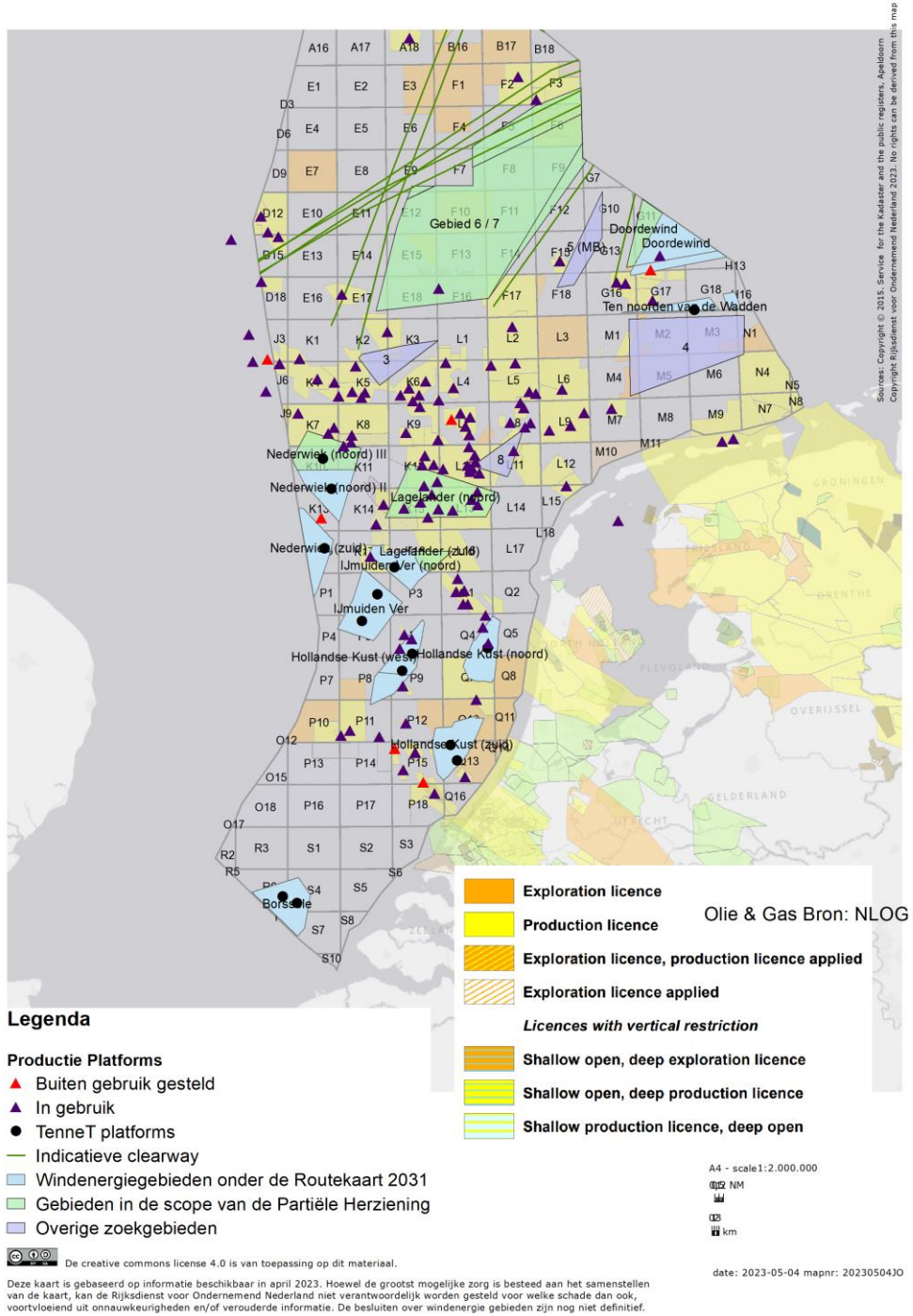
- **What**: *targets in National Energy System Plan*
- **Where**: wind areas in *Partial Review North Sea Program 2022-2027*
- **How**: *hubs in Energy Infrastructure Plan North Sea 2050*
- **Connect**: *landfall (H2 and electrons) in VAWOZ and PAWOZ*
- **Prepare:**
  - Research
  - Innovation
  - Offshore hydrogen demos
  - Ecology and safety
  - Legal and policy framework

Planned demonstration projects

	Demo 1	Demo 2
What	<100 MW	+/- 500 MW
How	Elektrolyser 'add on' to existing or planned windfarm	'New' windfarm + elektrolyser
Infrastructure	T.b.d.	Same pipeline as future, large-scale H2-transport
When	Tender: T.b.d. Operational: 2026-2028	Tender: T.b.d. Operational: 2031
Where	T.b.d.	Preferred location: Ten Noorden van de Waddeneilanden (TNW)

Partial Review of the North Sea Programme and spatial integration of offshore mining and wind energy

Joost Vermeulen
Ministry of Economic Affairs and Climate Policy


Gebied 6 / 7
Doordewind
Doordewind
5 (MB)
Ten noorden van de Wadden
4
3
8
Nederwiek (noord) III
Nederwiek (noord) II
Nederwiek (zuid)
Lageland
Lageland (noord)
Lageland (zuid)
IJmuiden Ver (noord)
IJmuiden Ver
Hollandse Kust (west)
Hollandse Kust (noord)
Hollandse Kust (zuid)
Borssele
Olie & Gas Bron: NLOG
Exploration licence
Production licence
Exploration licence, production licence applied
Exploration licence applied
Licences with vertical restriction
Shallow open, deep exploration licence
Shallow open, deep production licence
Shallow production licence, deep open
Legenda
Productie Platforms
Buiten gebruik gesteld
In gebruik
TenneT platforms
Indicatieve clearway
Windenergiegebieden onder de Routekaart 2031
Gebieden in de scope van de Partiële Herziening
Overige zoekgebieden
A4 - scale1:2.000.000
NM
km
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date: 2023-05-04 mapnr: 20230504JO
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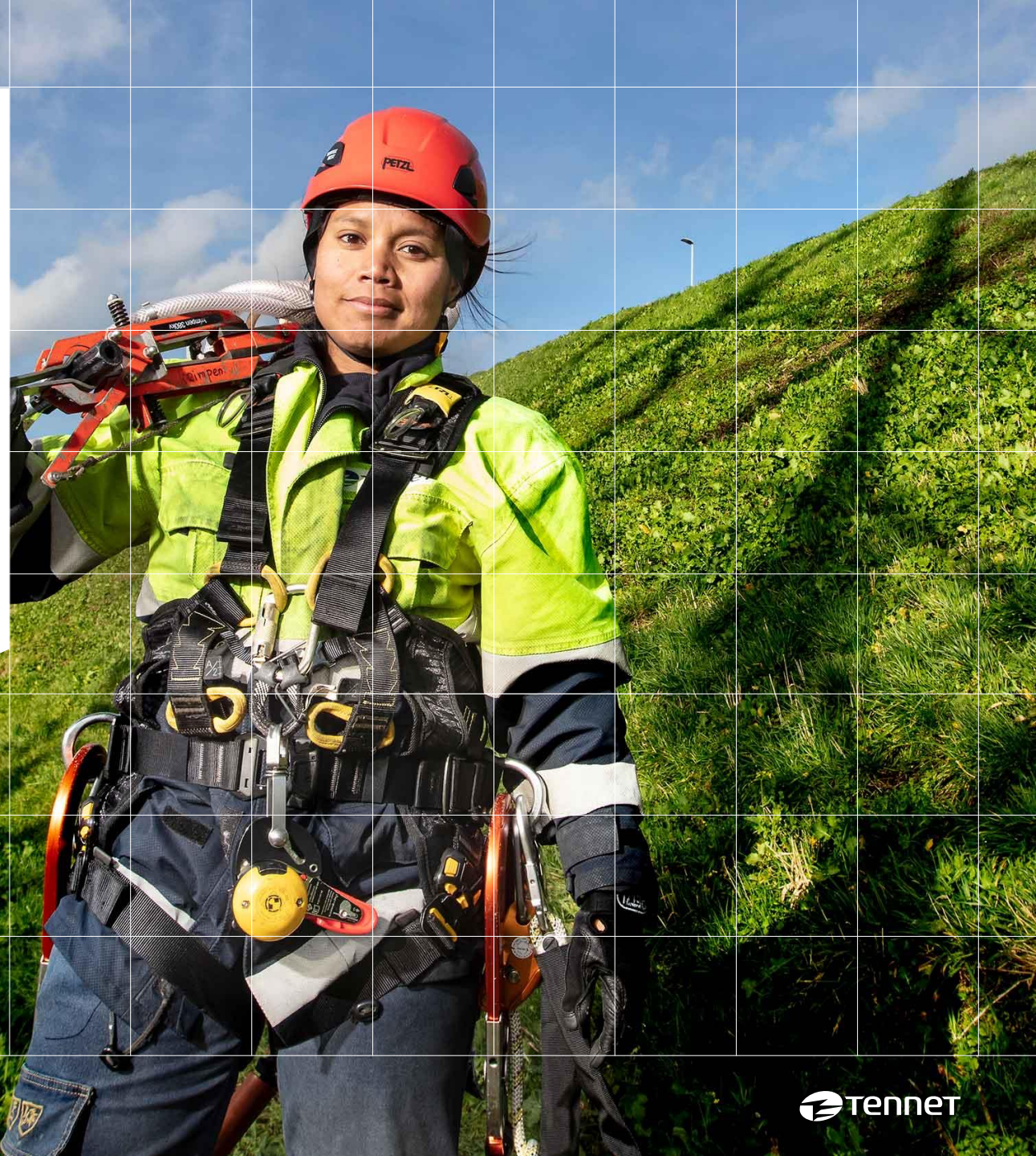
International developments – policy update

Emelie de Wagt
Ministry of Economic Affairs and Climate Policy

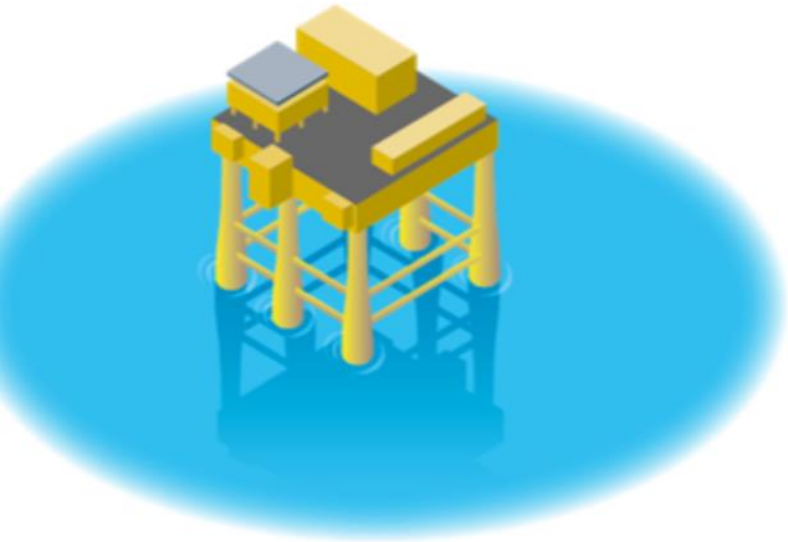
International developments – offshore grid

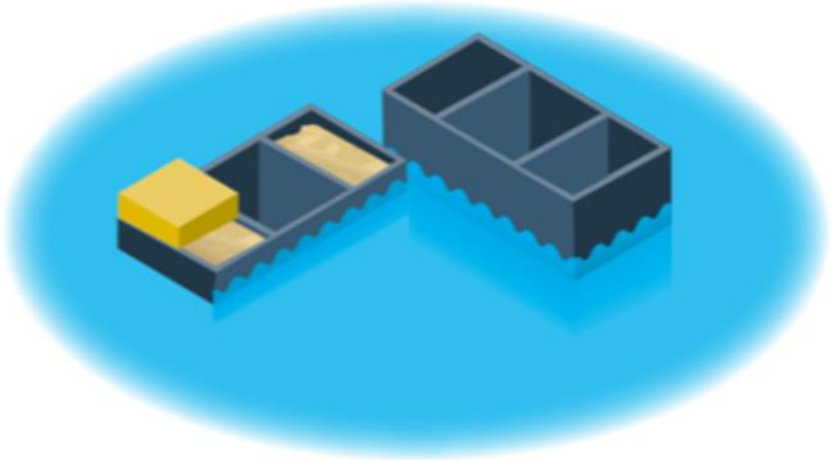
Saskia Jaarsma
TenneT

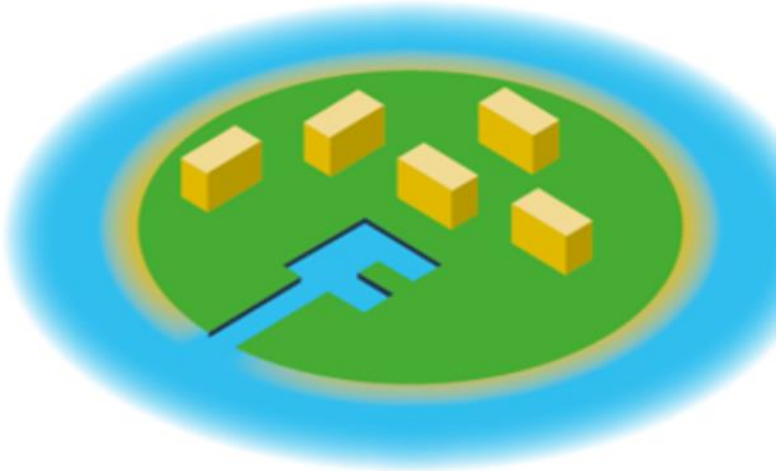
Target grid & offshore hub development



Towards a meshed offshore grid with energy hubs
Hub functions and lay outs







Collect

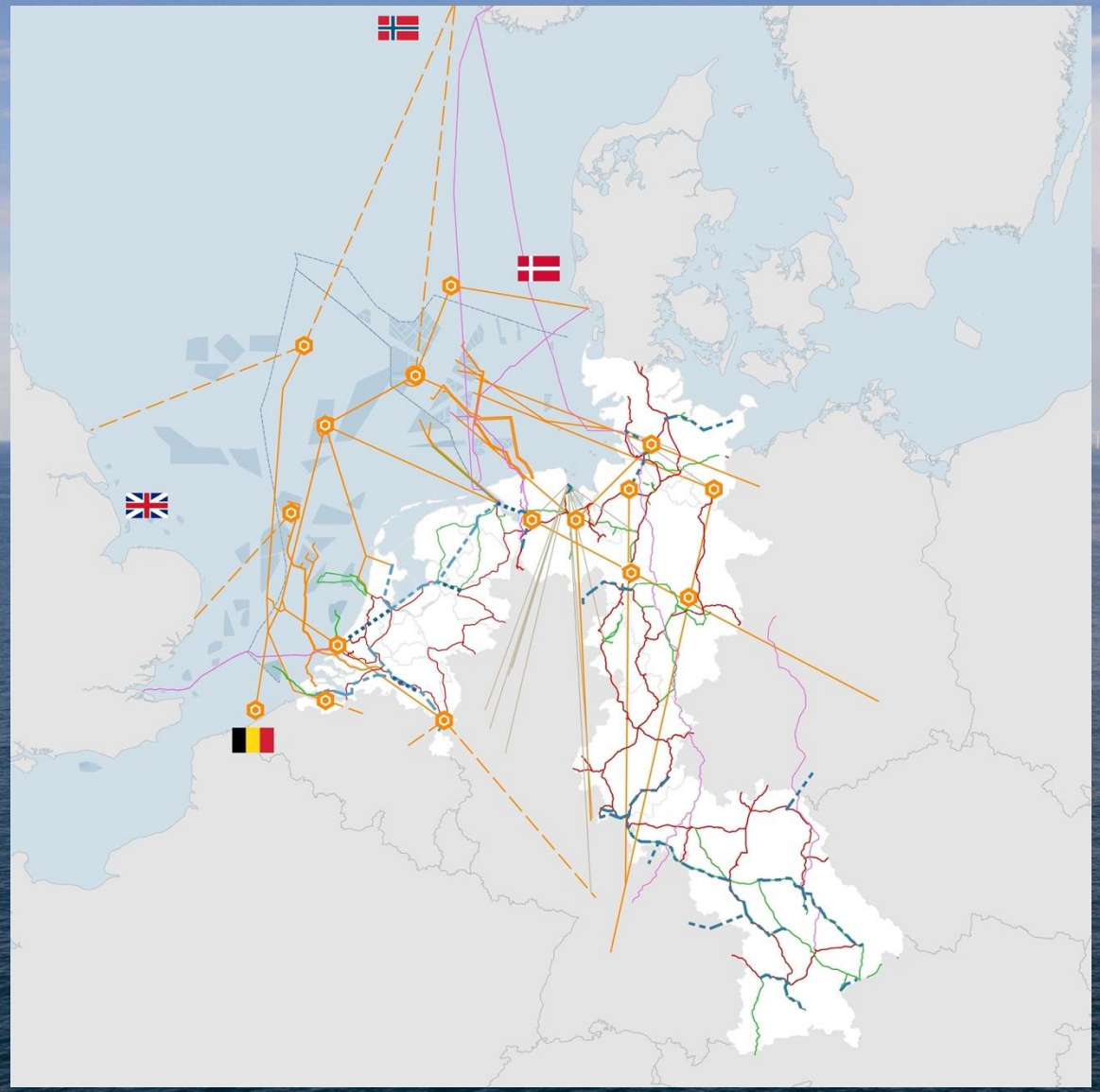
Connect

Convert

An energy hub is an offshore energy node that performs at least two of three functions:

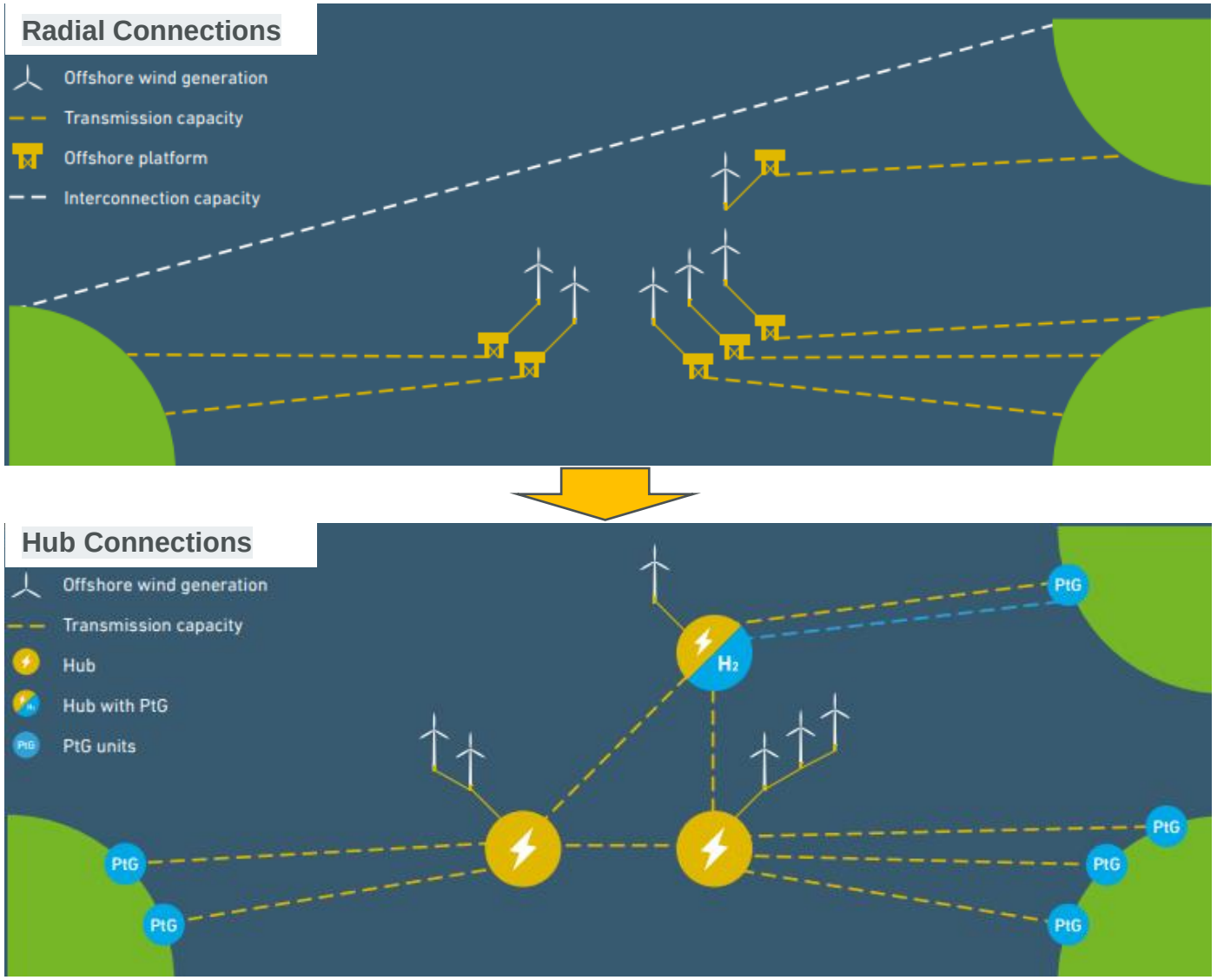
- Collecting energy, e.g. from different wind area's
- Connecting offshore grids in different countries (hybrid interconnectors) and/or wind areas (interlink)
- Converting energy, e.g. between electricity and energy carriers such as hydrogen

Target Grid



Towards a meshed offshore grid with energy hubs

From radial connections to hubs



Questions & final remarks

- Presentations and Q&A’s will be published on offshorewind.rvo.nl
- Questions? woz@rvo.nl

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