

Stakeholder consultation and nature inclusive design of the offshore grid



January-22-2019

Saskia Jaarsma

Contents



1. TenneT offshore
2. Stakeholder consultation
3. Offshore grid concept including offshore information systems
4. Nature Inclusive Design of the offshore grid
5. Key messages



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

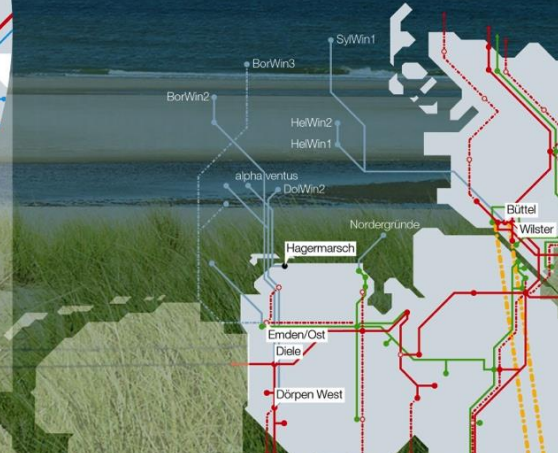
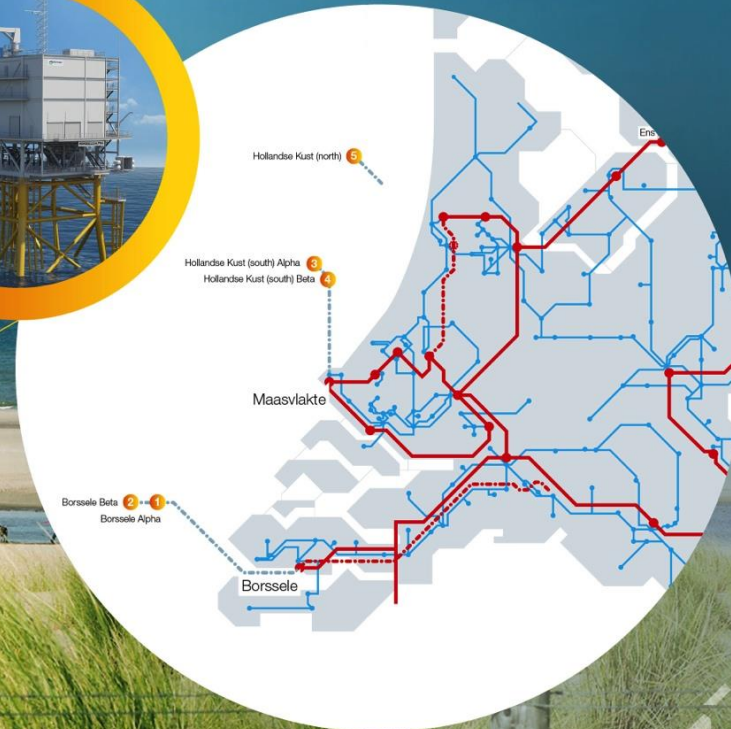
AC – 43 km – 700 MW – Maasvlakte
Commissioning in 2021

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



Need for long term policy

Three phase (parallel) development:

- | | | |
|-----------------------|------------|--|
| Short Term (to 2023) | NL: 3,5 GW | ➤ Currently under development (near shore) |
| Medium Term (to 2030) | NL: 6,1 GW | ➤ Use full potential near shore locations
➤ Prepare for large scale and international cooperation |
| Long Term (to 2050) | NL: >30 GW | ➤ North Sea Wind Power Hub
➤ Far-reaching international cooperation necessary |





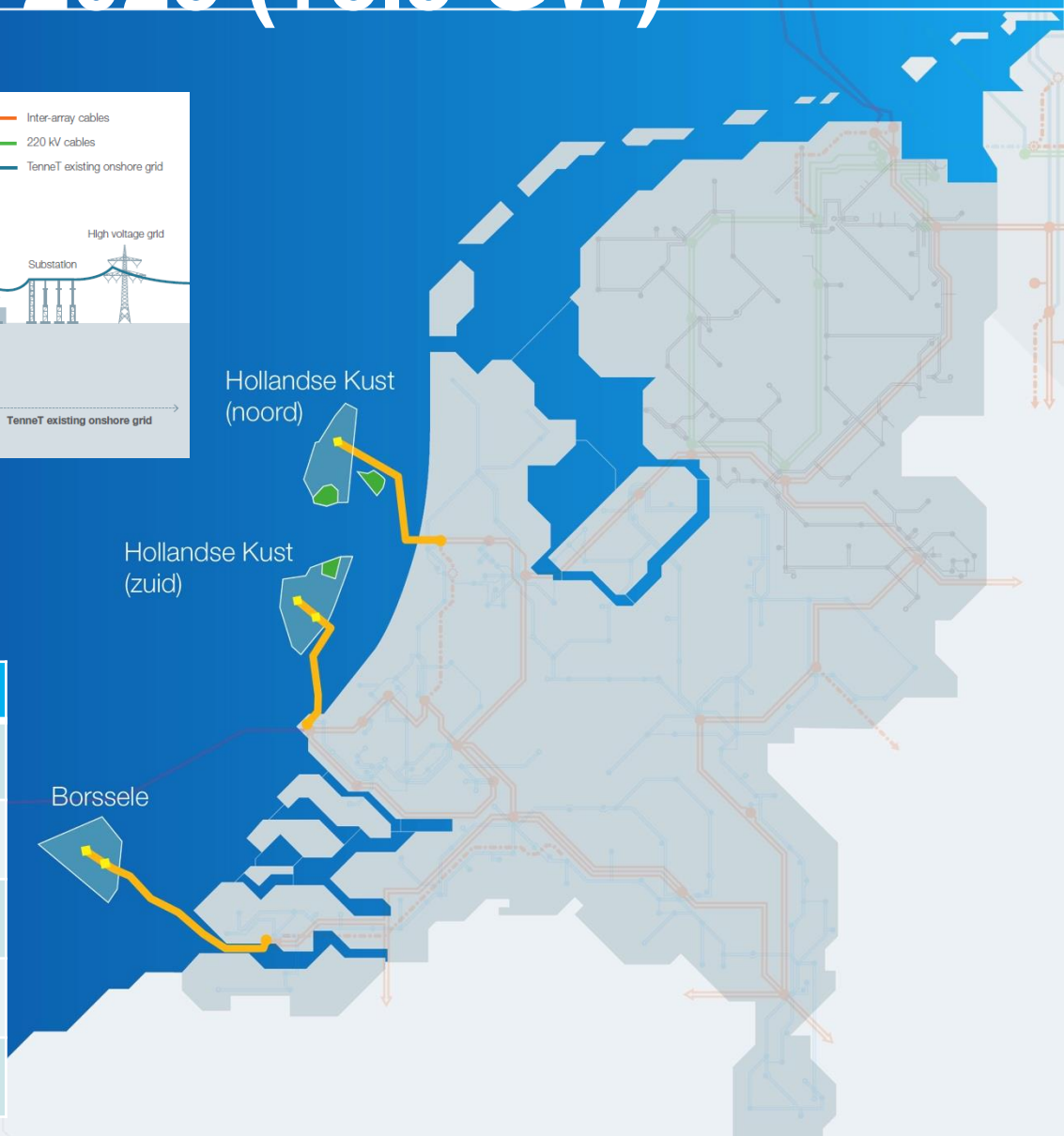
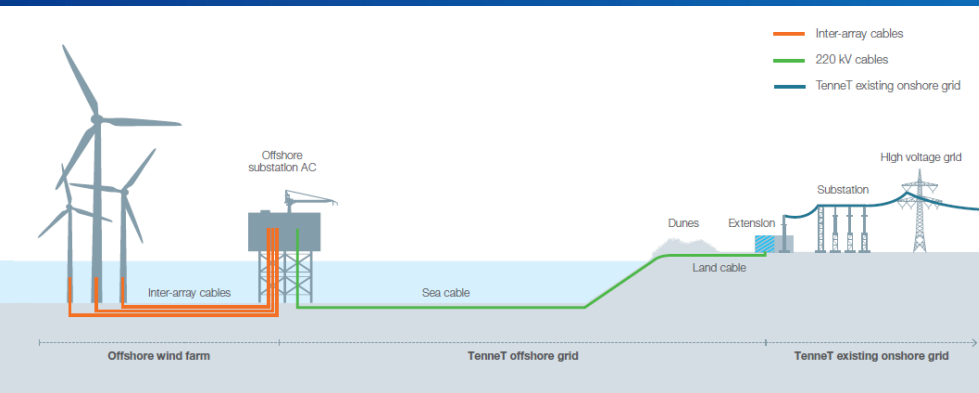
Basis: Energy Agreement



Over 40 Dutch organisations:

- Government, NGO's, industry, users
- Goal of 16% renewables by 2023
- Additional 3.500 MW offshore wind in 2023
- Condition: 40% savings for offshore wind (LCOE)
- TenneT builds offshore grid

Phase I: 2019 – 2023 (+3.5 GW)



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)

Cooperation is key



Early in the process, engagement of:

- Government (Ministries and governmental bodies)
- Wind developers
- NGO's
- Suppliers
- Local parties



Consultation process 2014-2016



- Aim: optimal grid design
- Pro-active engagement: Monthly expert meetings with offshore wind developers, supplier consultation, NGO cooperation
- Transparency: Online publication of papers



Consultation topics



Technical

- Voltage level
- # J tubes/bays
- Point of common coupling
- Acces to platform
- Operation of Bays
- Protection
- Implementation of RfG code
- SCADA
- Metering
- Overplanting
- Redundancy/availability

Legal

- Model agreements, including technical requirements
- Initial investment plan

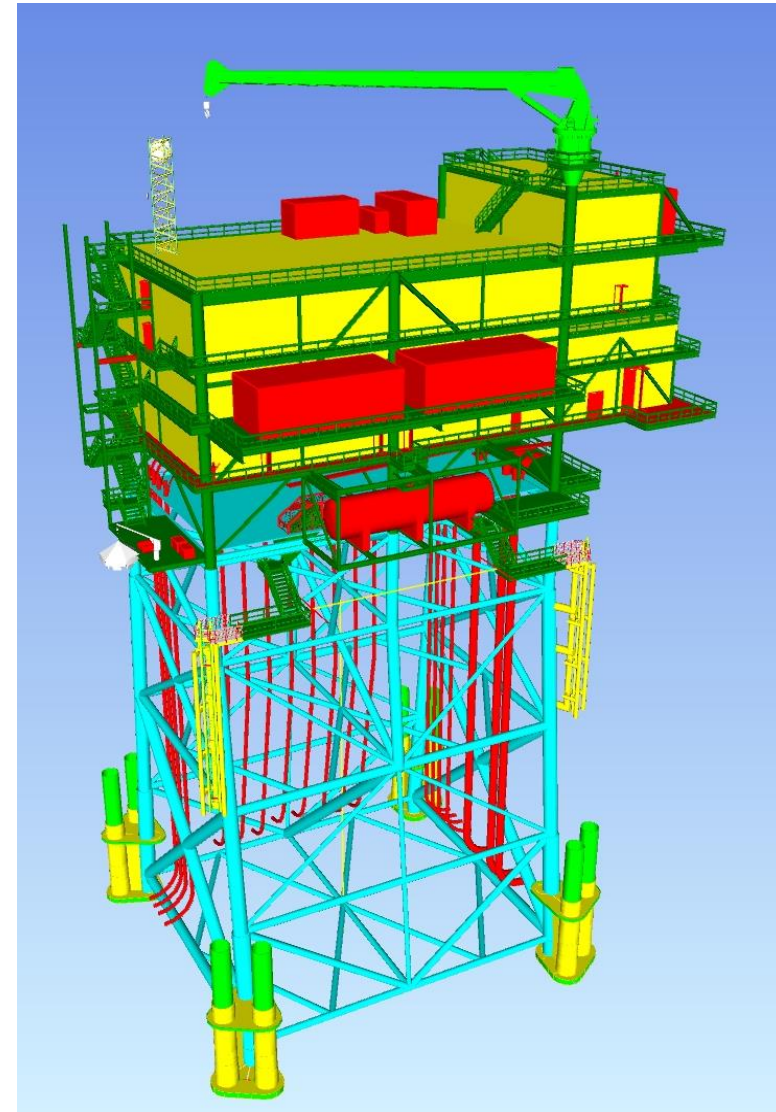
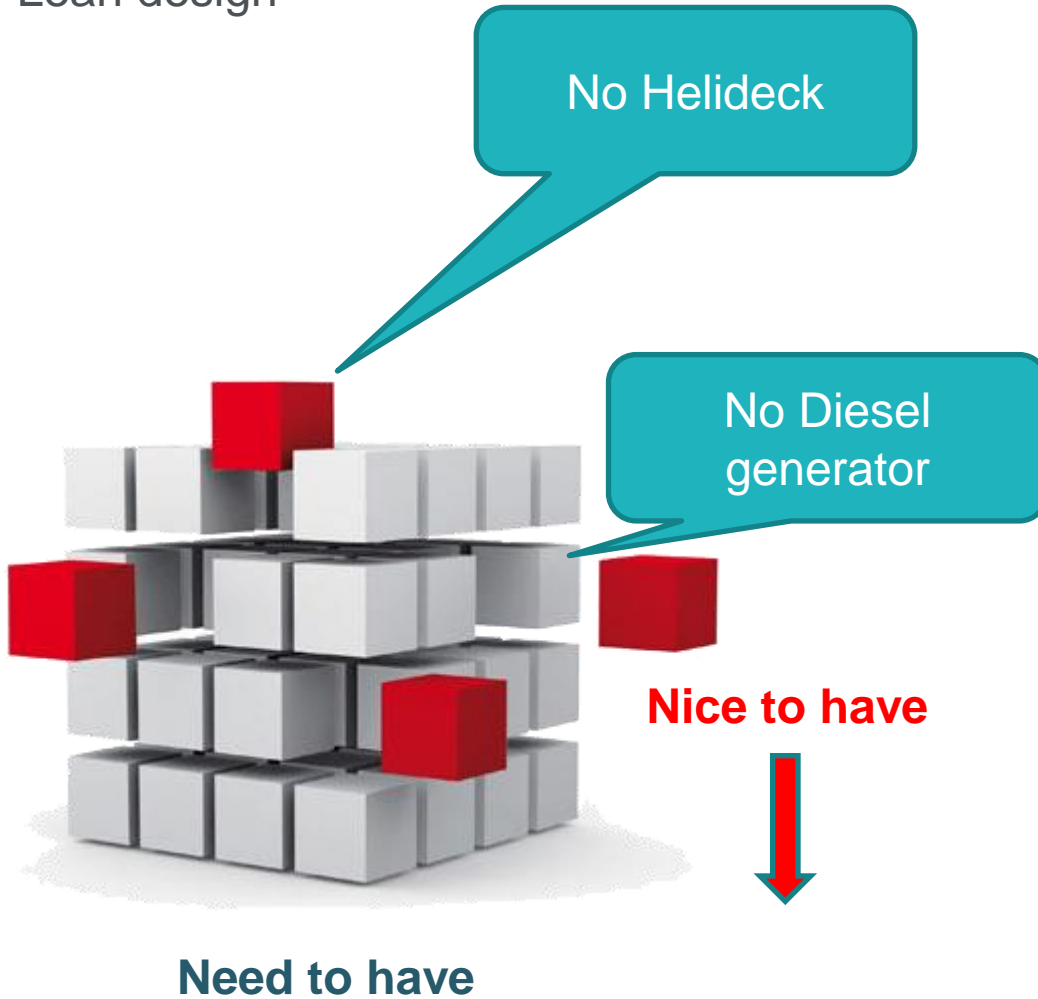
Planning

- Uncertainties
- Risks
- Interdependancy

AC Platform NL

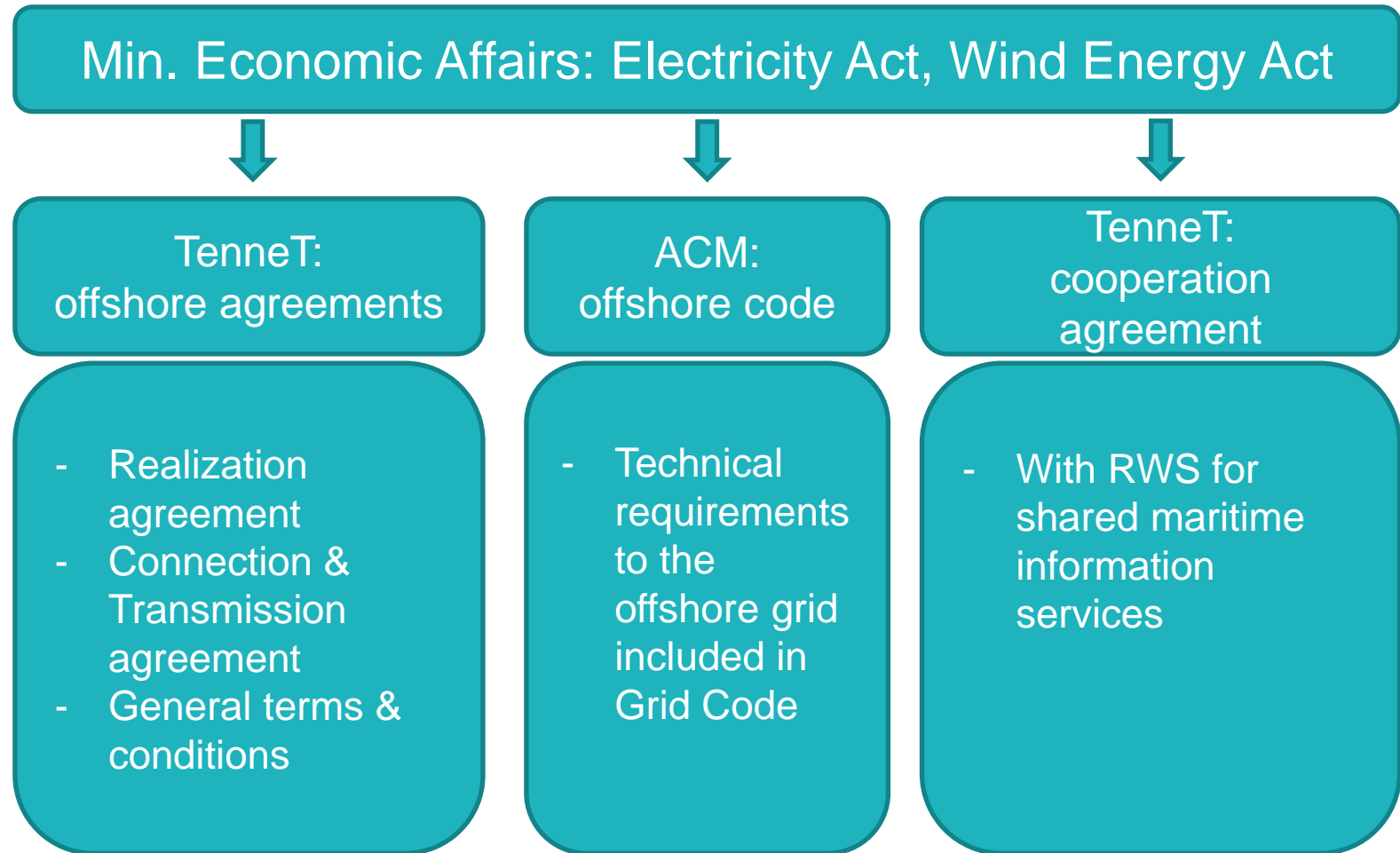


Lean design





TenneT's offshore legal framework

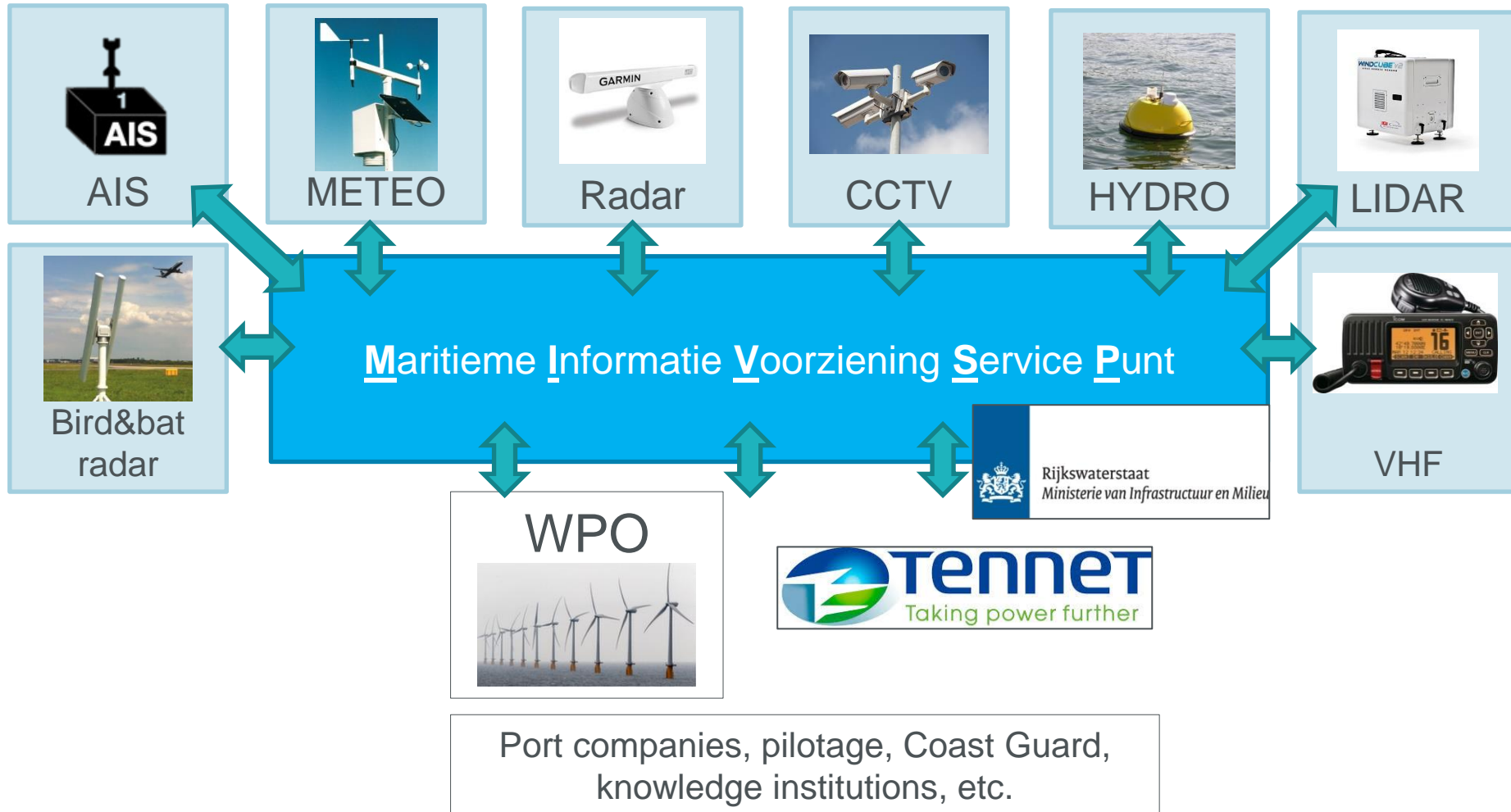


TenneT's offshore grid connection system

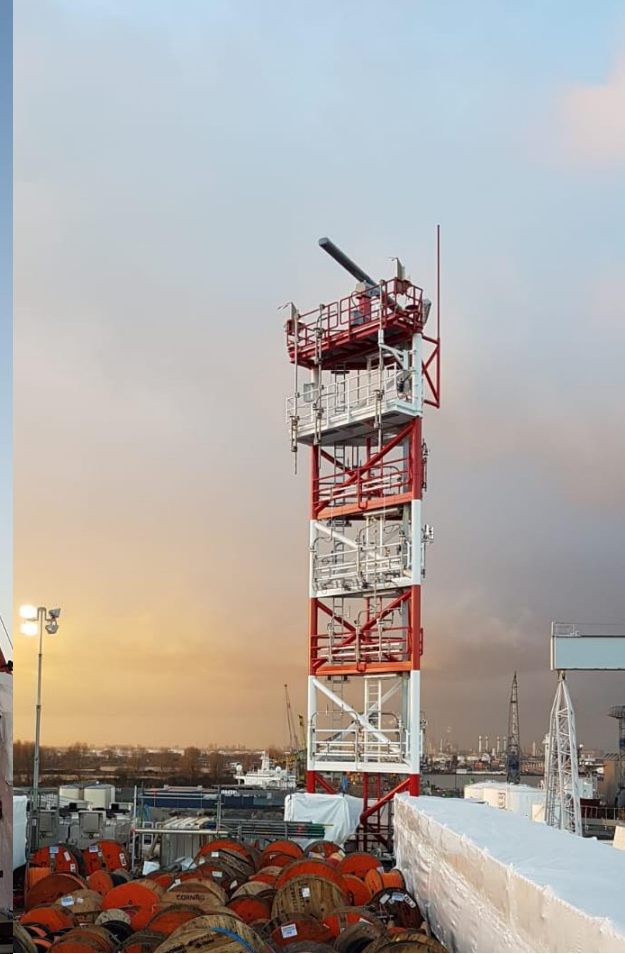
- Standardized 700 MW AC concept
- Lowest possible LCOE
- Lean & Mean design
- Delivery of 1 grid connection/year, structured approach: no stranded assets
- Minimal habitat disturbance
- MIVSP (RWS)



Shared information systems



MIVSP



January-22-2019

Stakeholder consultation and nature inclusive design of the offshore grid

Nature Inclusive Design of the offshore grid



Phase II: 2024 – 2030 (+6,1 GW)

- Additional 7,000 MW
- Energy Agenda (Dec '16)
- Coalition Agreement (Oct '17)
- Roadmap 2030 (March '18)

Operational	Capacity	Wind area	AC / DC
2024/2025	1,4 GW	Hollandse Kust (west)	AC
2026	0,7 GW	Ten noorden van de Waddeneilanden	AC
2027/2030	4,0 GW	IJmuiden Ver	DC

TenneT's CSR story



We strive to enhance the energy transition in a sustainable manner, leading the way in maximising our societal contribution and minimizing our impact as a TSO.



We contribute to society, creating maximum impact for **people** working for us and impacted by us.

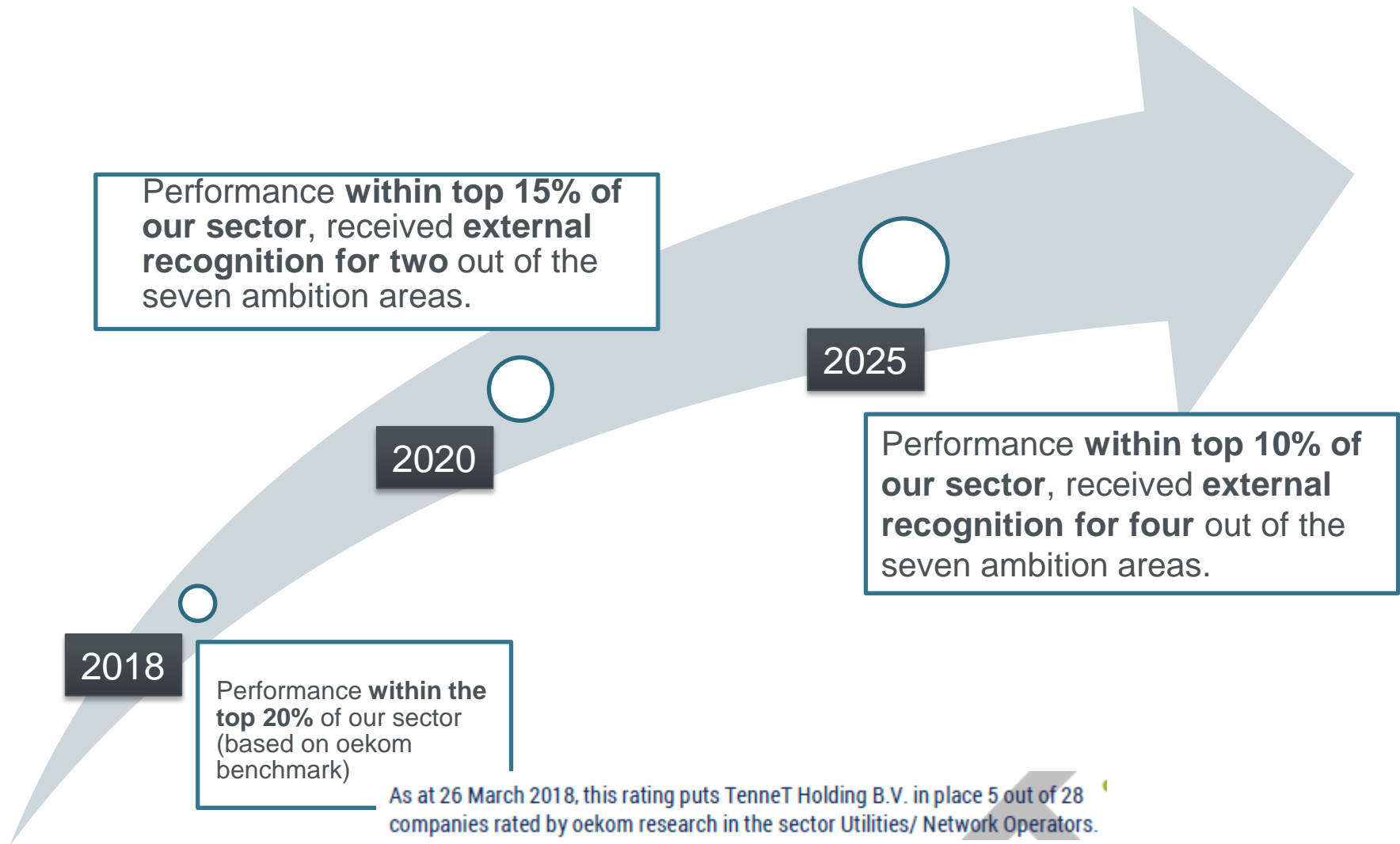


We commit to environment, avoiding, minimizing and compensating our impact on the **planet**



We strive for an adequate **return** on capital and an affordable cost of electricity supply for society.


TenneT's CSR ambition 2025





TenneT's promise



Our targets are set for our own operations, we include our ambitions in our work with suppliers & contractors.

	Ambition area	Description	Target
	Society	We address our stakeholders' concerns by living up to our values, i.e. being responsible, engaged and connected.	<i>To be developed in 2018</i>
	Diversity	We recognize diversity as a key contributor to our success as a high-performing organisation.	In 2023 <ul style="list-style-type: none"> • EB/SB 30% female • New management hires 22% female • TenneT population 22% female
	Safety	Safety is our number one priority in every activity that we undertake.	In 2020 LTIF < 1.0

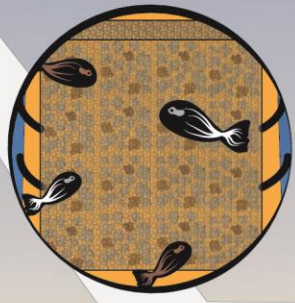
	Ambition area	Description	Target
	Circular	Circularity is minimizing use of scarce materials, reusing materials and reducing waste in our operations.	<i>To be developed in 2018</i>
	Climate	Climate impact of our operations is our responsibility and we strive to reduce our impact	In 2025 climate neutral
	Nature	Our commitment to nature is to take our responsibility to minimise our impact and protect and improve local nature	In 2020 zero impact (nett) on nature

	Ambition area	Description	Target
	Profitability	Profitability and return on capital (how effective is TenneT in turning capital into profit) are important to remain attractive for capital providers in order to finance our business and anticipated growth..	Return on capital \geq regulatory determined return on capital (KPIs: return on invested capital (roic) en return on equity)

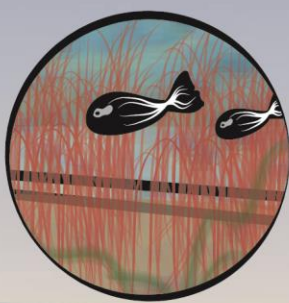
NID - Is it a 'must do' ?



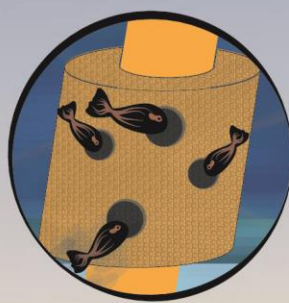
TenneT has certain requirements in its permits for building and operating the offshore grid.



I. Biohut (habitat)



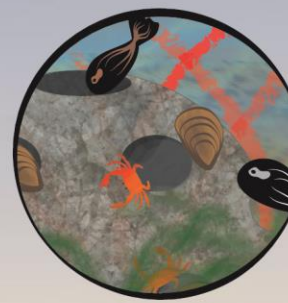
II. Frond mats (scour and cable protection)



III. Additional jacket sleeve with holes (habitat)



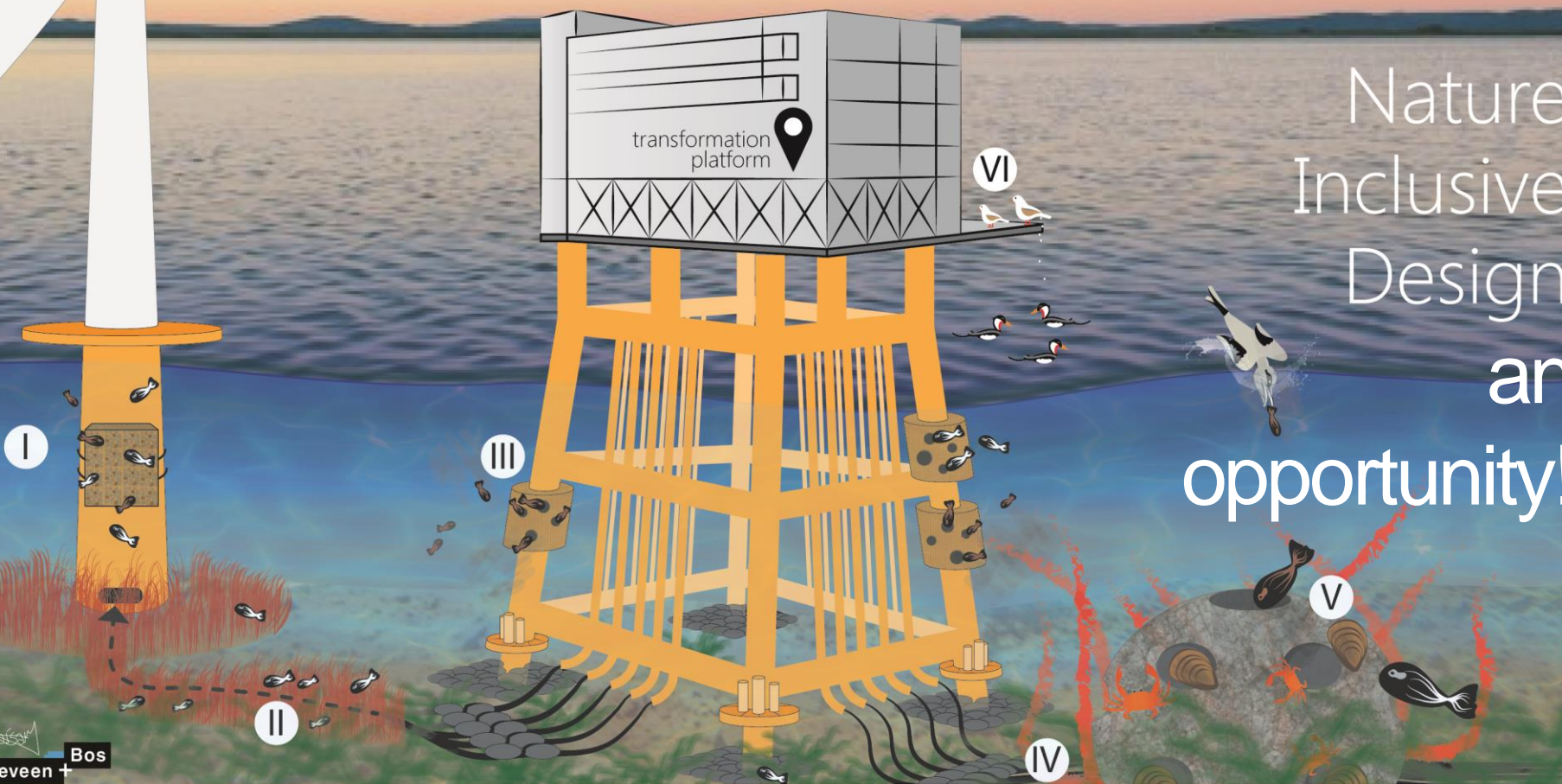
IV. Mesh net with rocks (scour and cable protection)



V. Reef ball (artificial reef)



VI. Resting platform (for birds)



Nature
Inclusive
Design
an
opportunity!

Disclaimer

Liability and copyright of TenneT

This PowerPoint presentation is offered to you by TenneT TSO B.V. ('TenneT'). The content of the presentation – including all texts, images and audio fragments – is protected by copyright laws. No part of the content of the PowerPoint presentation may be copied, unless TenneT has expressly offered possibilities to do so, and no changes whatsoever may be made to the content. TenneT endeavours to ensure the provision of correct and up-to-date information, but makes no representations regarding correctness, accuracy or completeness.

TenneT declines any and all liability for any (alleged) damage arising from this PowerPoint presentation and for any consequences of activities undertaken on the strength of data or information contained therein.



www.tennet.eu

TenneT is a leading European electricity transmission system operator (TSO) with its main activities in the Netherlands and Germany. With approximately 22,000 kilometres of high-voltage connections we ensure a secure supply of electricity to 41 million end-users.

Taking power further