Northeast Wind Resource Center

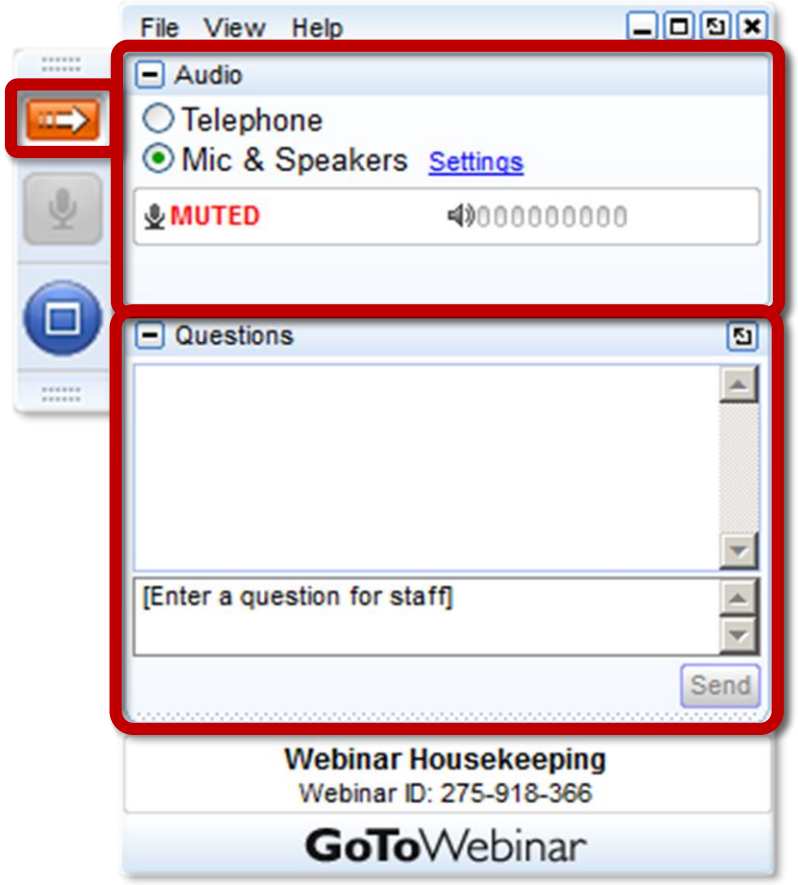
Offshore Wind Transmission:

Lessons from Germany and Regulatory Considerations for OSW Transmission in the U.S.

September 6, 2018

CleanEnergy States Alliance

Housekeeping



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The Northeast Wind Resource Center

The Northeast Wind Resource Center (NWRC) provides salient, unbiased information on offshore and land-based wind energy in the Northeastern United States. The NWRC serves the information needs of New England and New York for **land-based wind**, and that same region plus New Jersey in the case of **offshore wind**.

Published research, studies, and analyses associated with the issues impacting public acceptance of wind deployment are available in the NWRC **Resource Library**.

The Clean Energy States Alliance (CESA) manages the NWRC.

Northeast Wind Resource Center

www.northeastwindcenter.org

Panelists

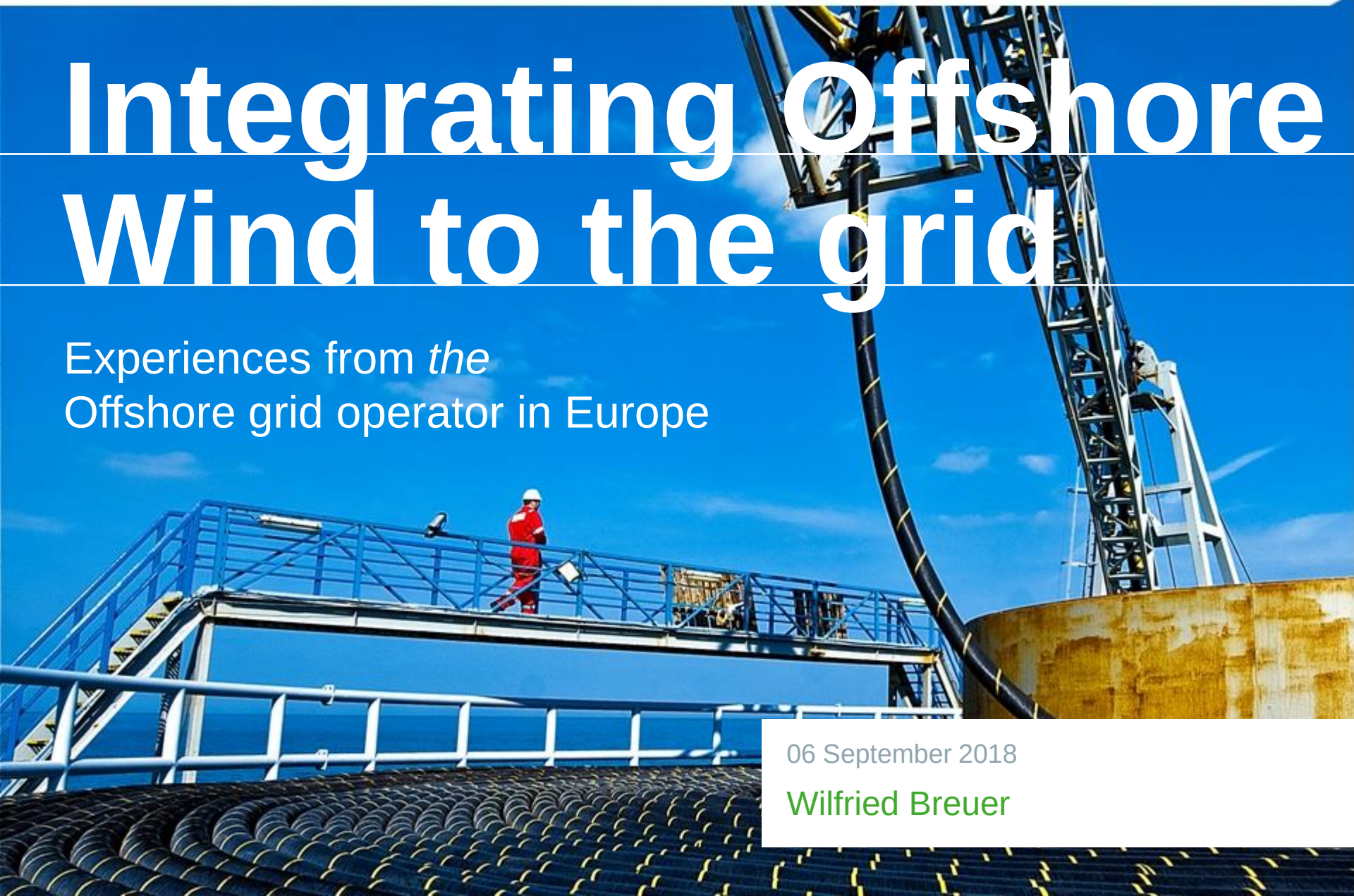
Wilfried Breuer
Member Executive Board, TenneT

Mark Kalpin
Partner, Holland & Knight

Warren Leon
Executive Director, Clean Energy States Alliance

Integrating Offshore Wind to the grid

Experiences from *the*
Offshore grid operator in Europe



06 September 2018

Wilfried Breuer

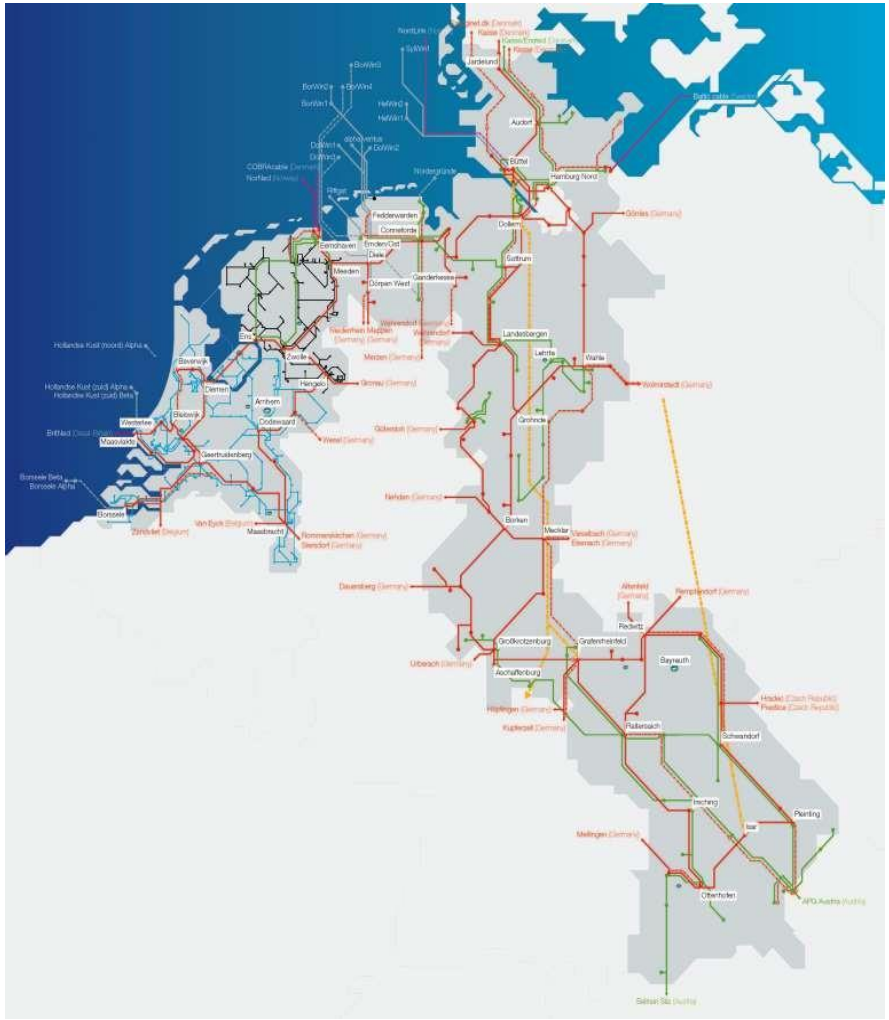
Agenda

1. Who is TenneT?
2. Experiences of the offshore pioneer
3. Outlook
4. Lessons learned

Two TSOs – One Company

Europe‘s first cross-border Transmission System Operator (TSO)

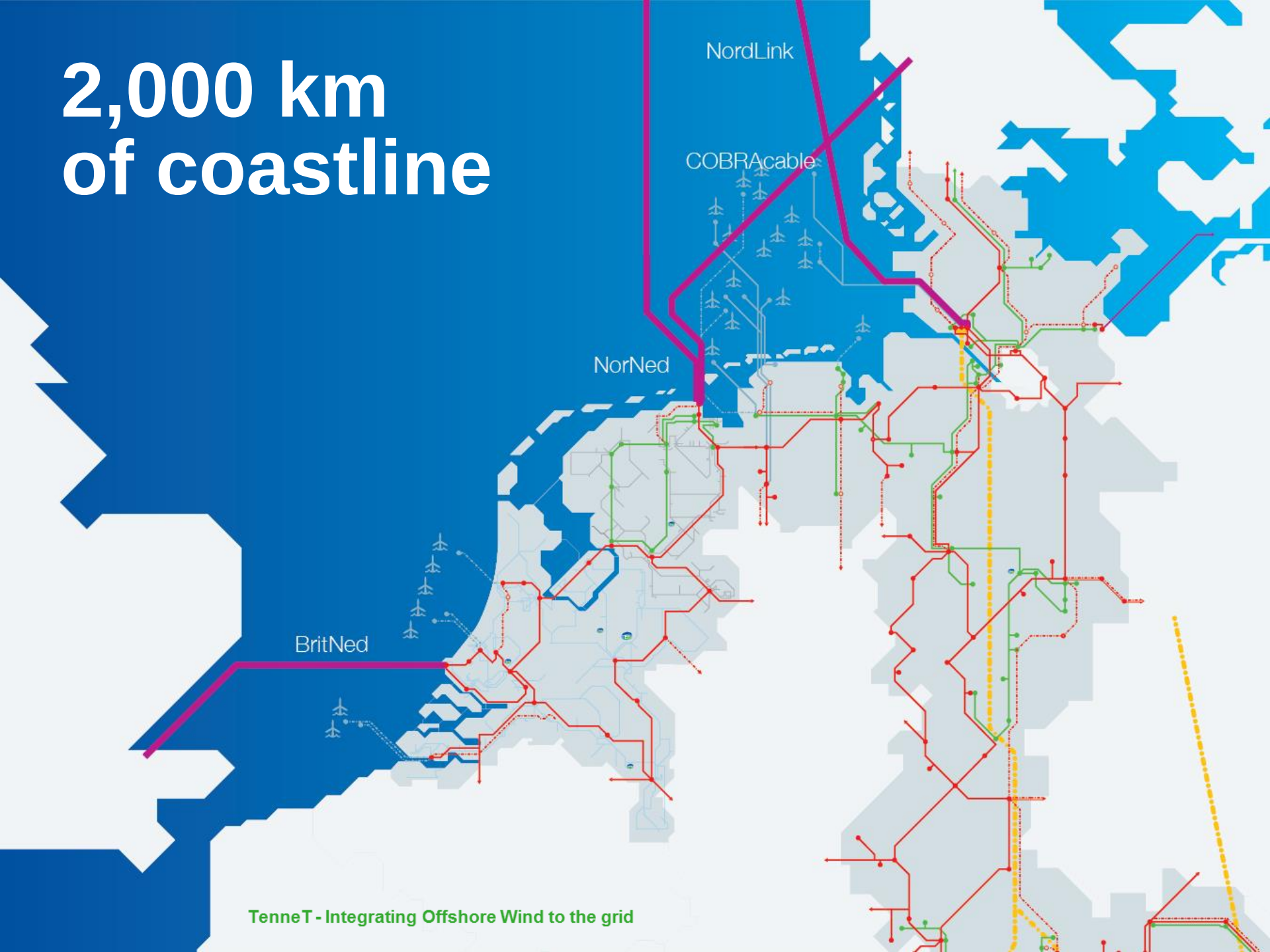
- We supply 41 million end users with electricity.
- Operation, maintenance and further development of (extra) high-voltage power grids in parts of Germany an the Netherlands.
- Statutory mandate for grid expansion and safe operation on- and offshore.



TenneT

- Approx. 23,000 km total grid length
- 462 substations
- Approx. 4,000 employees (internal and external)
- Revenues € 3.948 bn. in grid business

2,000 km of coastline



Legal framework

Germany

Since 2006, TenneT is legally obliged to connect the Offshore Wind generators in the German North Sea to the grid.

§ **17d EnWG (German Energy Industry Act)**

The Netherlands

In 2016, the Dutch government formally appointed TenneT as the responsible party for developing and operating the Dutch offshore grid connections.

Dutch Electricity and gas bill (STROOM)

Development of subsidies in the North Sea

2010	**Gemini** (Netherlands)	16,89
2012	**France Round 1** (France)	18,00
2014	**France Round 2** (France)	18,00
2015	**East Anglia One** (Great Britain)	16,20
2015	**Neart Na Gaoithe** (Great Britain)	15,40
2015	**Horns Rev 3** (Denmark)	10,30
2016	**Borssele I und II** (Netherlands)	7,27
2016	**Danish Near Shore (Versterhav)** (Denmark)	6,38
2016	**Borssele III und IV** (Netherlands)	5,45
2016	**Kriegers Flak** (Denmark)	5,00
2017	**Triton Knoll** (Great Britain)	8,52
2017	**Hornsea II** (Great Britain)	6,56
2017	**Moray Offshore Windfarm** (Great Britain)	6,56
2017	**Gode Wind 3** (Germany)	6,00
2017	**He Dreiht** (Germany)	0,00
2017	**Northern Energy OWP West** (Germany)	0,00
2017	**Borkum Riffgrund West 2** (Germany)	0,00
2018	**Hollandse Kust Zuid** (Netherlands)	0,00
2018	**Borkum Riffgrund West 1** (Germany)	0,00

price in Euro cent per kW/h

Experiences of the offshore pioneer

TenneT‘s track record

Germany

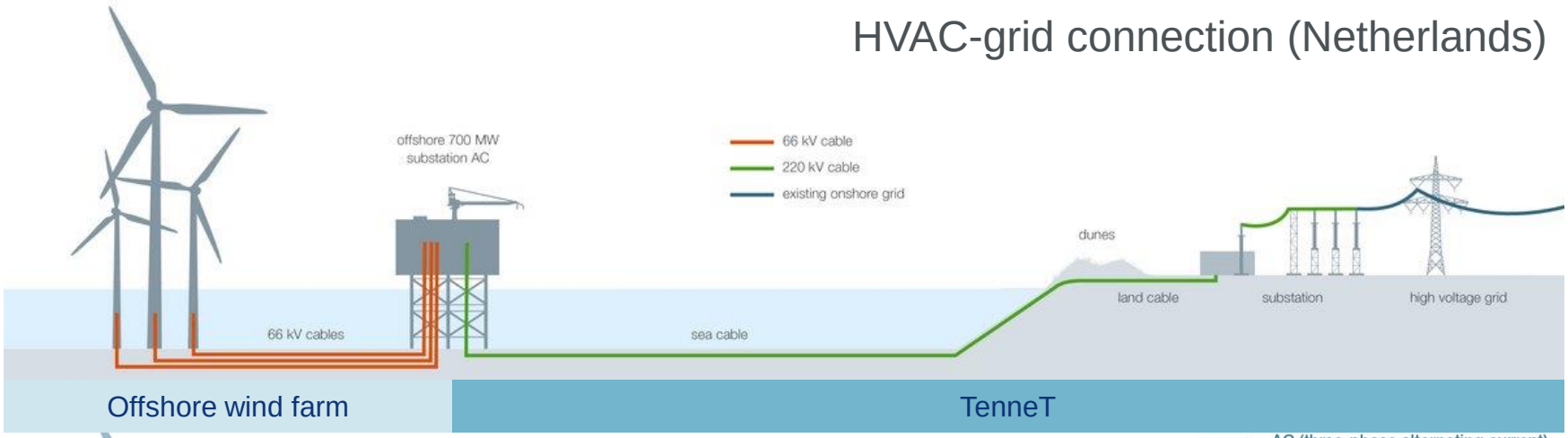
- 14 grid connections for Offshore Windfarms
- 11 HVDC connections, 3 AC connections
- 6.232 MW at present
- 8.032 MW until 2023
- NordLink: 1,400 MW (2020)

The Netherlands

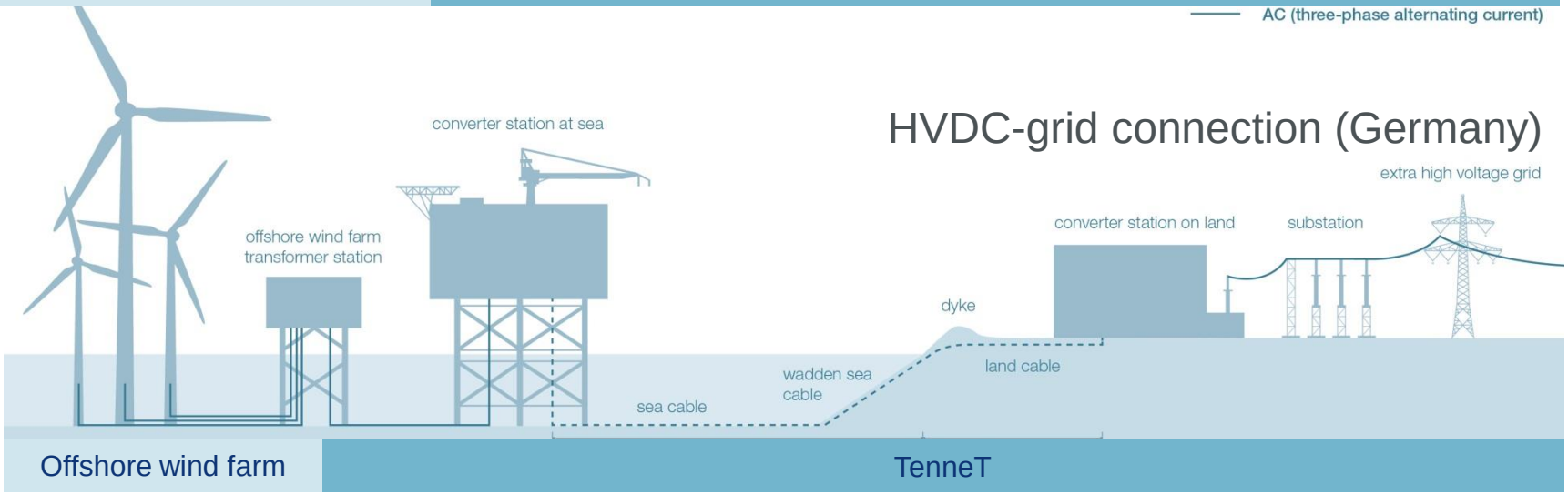
- 5 offshore grid connections
- 3.500 MW until 2023 (AC)
- additional 7 GW until 2030 (AC and HVDC)
- NorNed (2008): 700 MW
- BritNed (2011): 1,000 MW
- COBRA cable (2019): 700 MW

Schematic of Offshore Grid Connections

HVAC-grid connection (Netherlands)

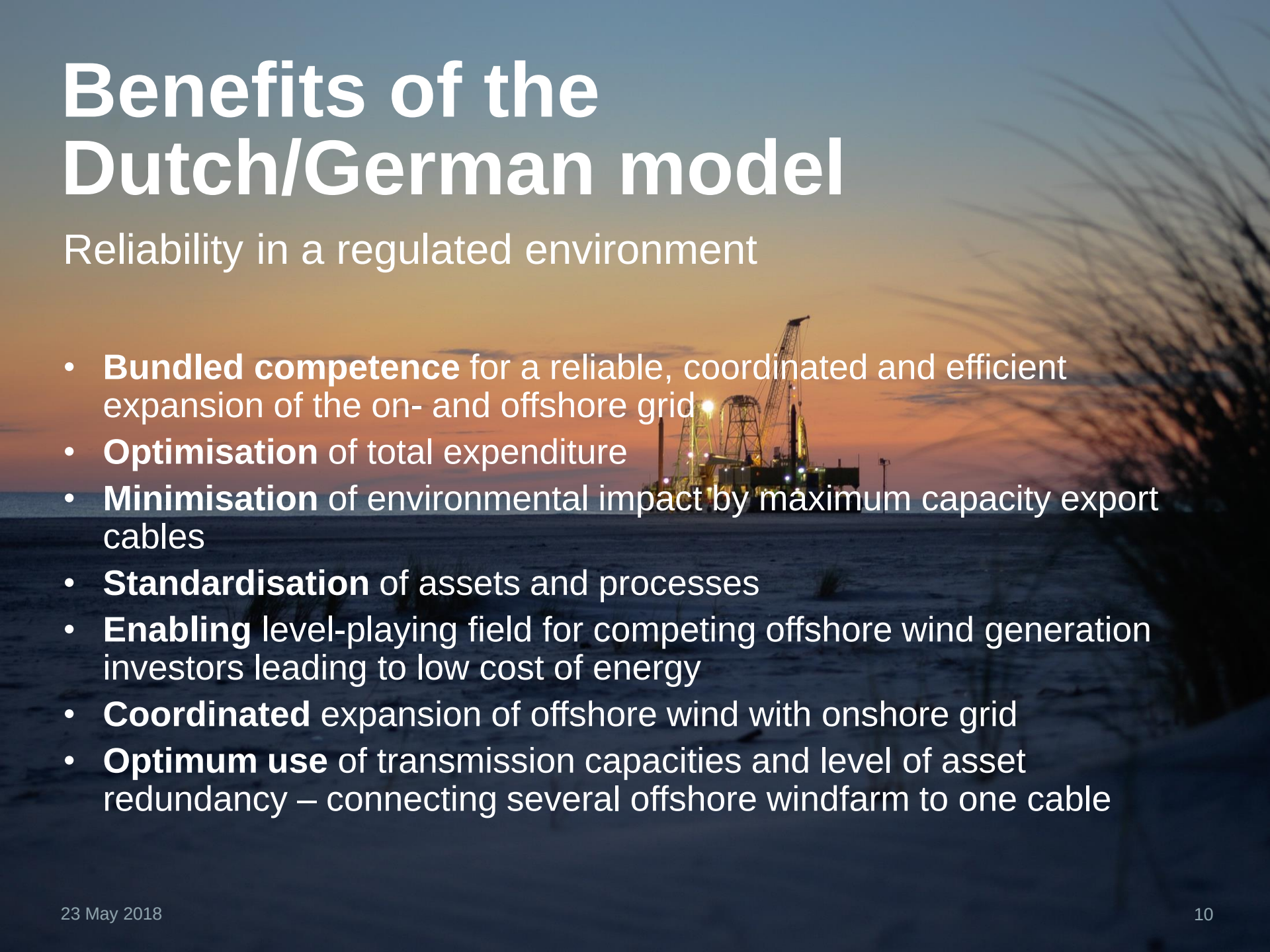


HVDC-grid connection (Germany)



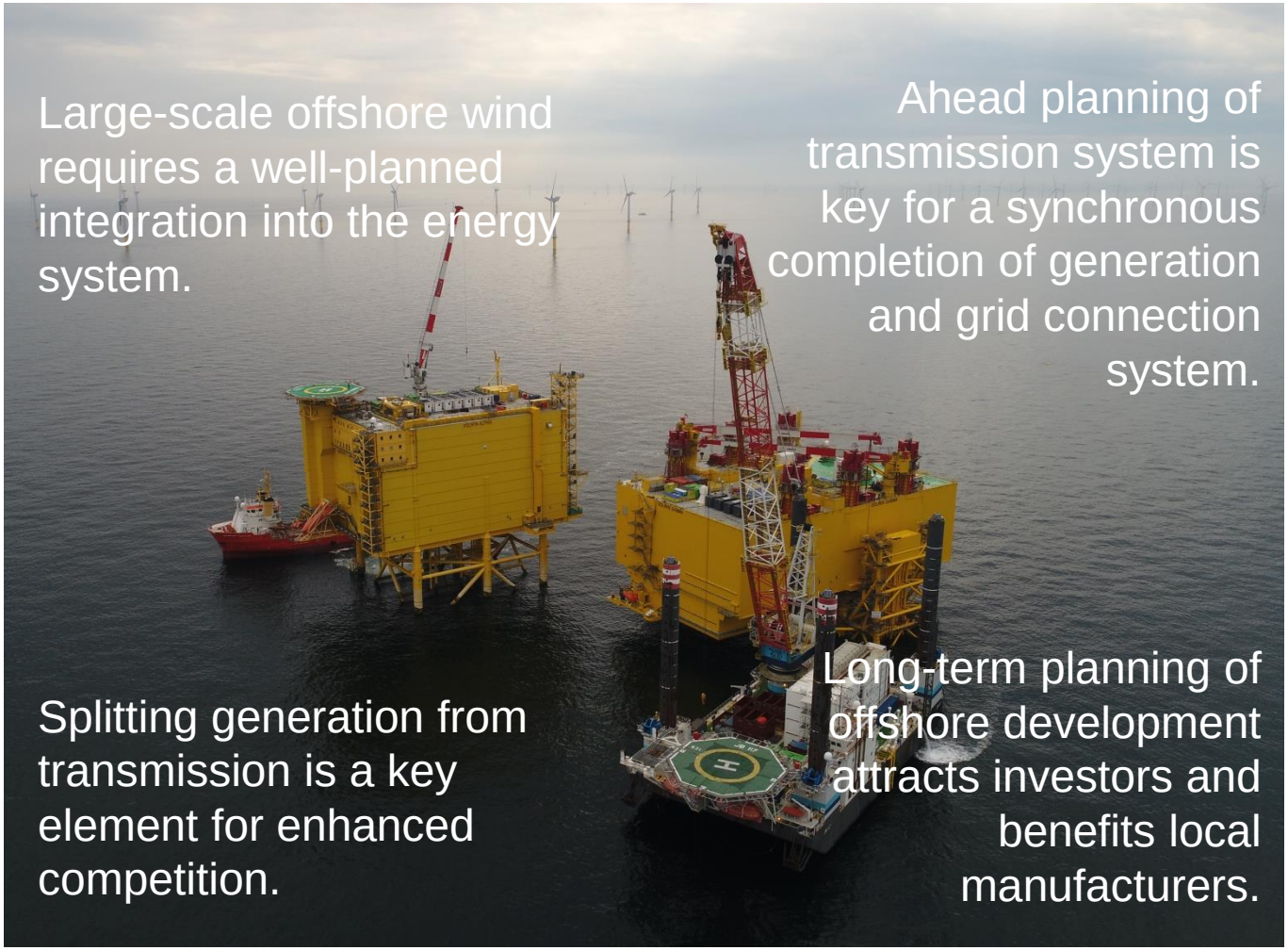
Benefits of the Dutch/German model

Reliability in a regulated environment



- **Bundled competence** for a reliable, coordinated and efficient expansion of the on- and offshore grid
- **Optimisation** of total expenditure
- **Minimisation** of environmental impact by maximum capacity export cables
- **Standardisation** of assets and processes
- **Enabling** level-playing field for competing offshore wind generation investors leading to low cost of energy
- **Coordinated** expansion of offshore wind with onshore grid
- **Optimum use** of transmission capacities and level of asset redundancy – connecting several offshore windfarm to one cable

Lessons learned from European offshore wind



REGULATORY CONSIDERATIONS FOR OFFSHORE WIND TRANSMISSION IN THE UNITED STATES

CLEAN ENERGY GROUP / NORTHEAST WIND RESOURCES CENTER
Offshore Wind Transmission Webinar
September 6, 2018

Mark C. Kalpin, Partner
Holland & Knight LLP

KEY CONSIDERATIONS

- »Ownership Structure / Mechanisms
- »Cost Recovery
- »Allocation of Capacity / Open Access
- »RTO Interconnection Process
- »Coordination of Permitting / Construction
- »Allocation of Risk & Impact on Financing

GENERATOR LEAD LINE

- Current Model in State OSW Procurements
- Bundled PPA Rates, based on Delivery of Energy
  - Low EDC risk, but potential for low transparency
- FERC Order 807[1]: 5-Year Safe Harbor until Open Access
- RTO Interconnection: Seamless for Developer
- Ability to Coordinate Permitting / Construction
  - BOEM easement as part of Lease
  - Coordinated SAP, COP and NEPA review
  - Coordinated permitting / determination of cost & need

1 *Open Access and Priority Rights on Interconnection Customer's Interconnection Facilities*, Order No. 807, 150 FERC ¶61,211 (2015), *reh'g denied*, 153 FERC ¶ 61,047 (2015)

MERCHANT OWNERSHIP

- Currently Not Part of State Procurements
- Cost-Based, Participant-Funded Rate Recovery
- Allocation of Capacity
  - FERC's *Chinook*[2] Four Factor Analysis and *Final Policy Statement on the Allocation of Capacity*[3] prior to OATT
- RTO Interconnection as an ETU: A New Wrinkle?
- Coordination of Permitting / Construction
  - Location, tie-in process, and points of receipt
  - Separate BOEM Right-of-Way and GAP: NEPA Review?
  - Separate permitting / determination of cost & need?
  - Coordination of In-Service Dates *not* a trivial issue

2 The four factors are: (1) justness and reasonableness of rates; (2) the potential for undue discrimination; (3) the potential for undue preference, including affiliate preference; and (4) regional reliability and operational efficiency requirements. *Chinook Power Transmission, LLC, et al.*, 126 FERC ¶ 61,134, at P. 37 (2009).

3 *Allocation of Capacity on New Merchant Transmission Projects and New, Cost Based, Participant Fund Transmission Projects*, 142 FERC ¶ 61,038 (2013)

TRANSCO OWNERSHIP

- Beneficial Model that is Difficult to Implement
- Cost Recovery and Capacity Allocation
  - "Socialized" Cost Recovery through RTO OATT
    - Either RTO Regional Transmission Plan or FERC Order 1000 "Public Policy Projects" Process[4]
    - Initial FPA Section 205 / 219 rate filings at FERC
  - RTO OATT fully applicable
- Coordination of Initial Permitting / Construction
  - Location, tie-in process, and points of receipt
  - Separate BOEM ROW and General Activities Plan
  - Separate NEPA review and State permitting processes
  - Coordination of In-Service Dates *not* a trivial issue

4 *Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities*, Order No. 1000, 76 FR 49842 (Aug. 11, 2011), FERC Stats. & Regs. ¶ 31,323 (2011), *order on reh'g*, Order No. 1000-A, 139 FERC ¶ 61,132 (2012), *order on reh'g and clarification*, Order No. 1000-B, 141 FERC ¶ 61,044 (2012)

ALLOCATION OF RISKS / IMPACT ON FINANCING

- **Generator Lead Line**
  - Developer Takes All Risk
  - RESULT: *Improves Ability for Project Financing*
- **Merchant Ownership**
  - Who are Counter-Parties, and Who bears Risk?
  - *RESULT: Creates Challenges for Project Financing*
- **Transco Model**
  - Most Risks Ultimately are Socialized
  - *RESULT: Likely Facilitates Project Financing*

QUESTIONS?

Mark C. Kalpin

Partner, Holland & Knight LLP

Phone 617.305.2076 (o) | 617.835.7020 (m)

mark.kalpin@hklaw.com

www.hklaw.com/Mark-Kalpin/

Thank you for attending our webinar

Warren Leon
Executive Director, Clean Energy States Alliance
warren@cleanegroup.org

Northeast Wind Resource Center: www.northeastwindcenter.org

DOE Wind Exchange: https://windexchange.energy.gov/