

Cost Reduction Potential in the Offshore Grid

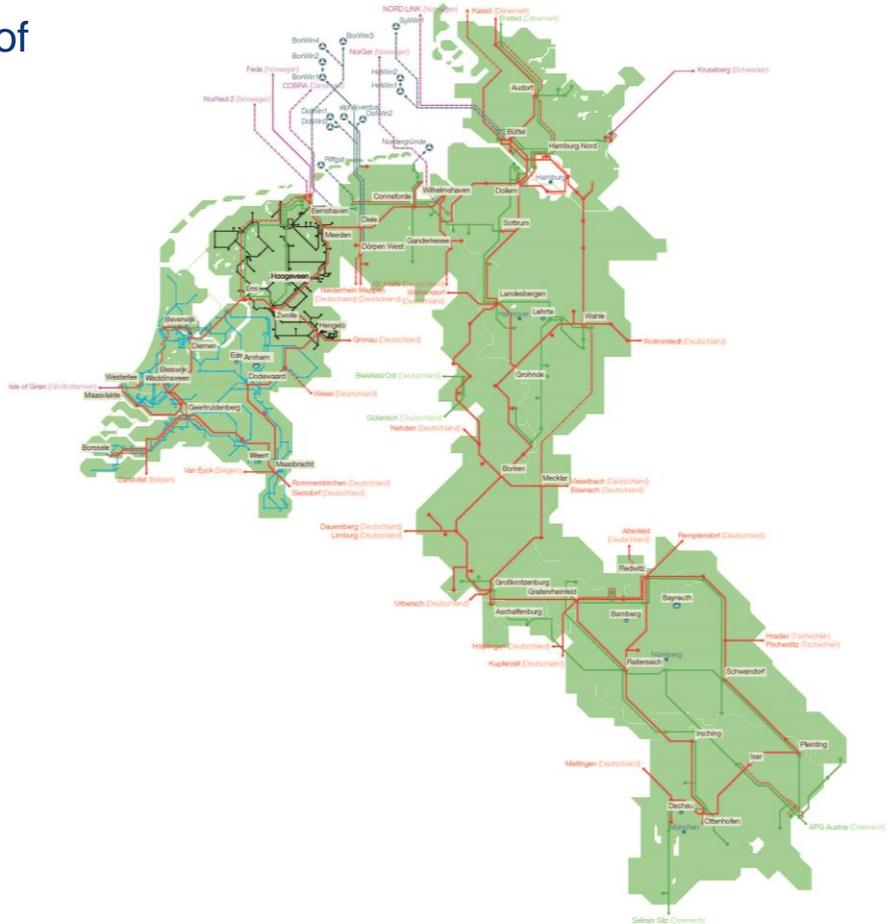


Dr. Markus Glatfeld, Managing Director, TenneT Offshore GmbH

TenneT – two TSOs, one company

Europe's first transnational TSO

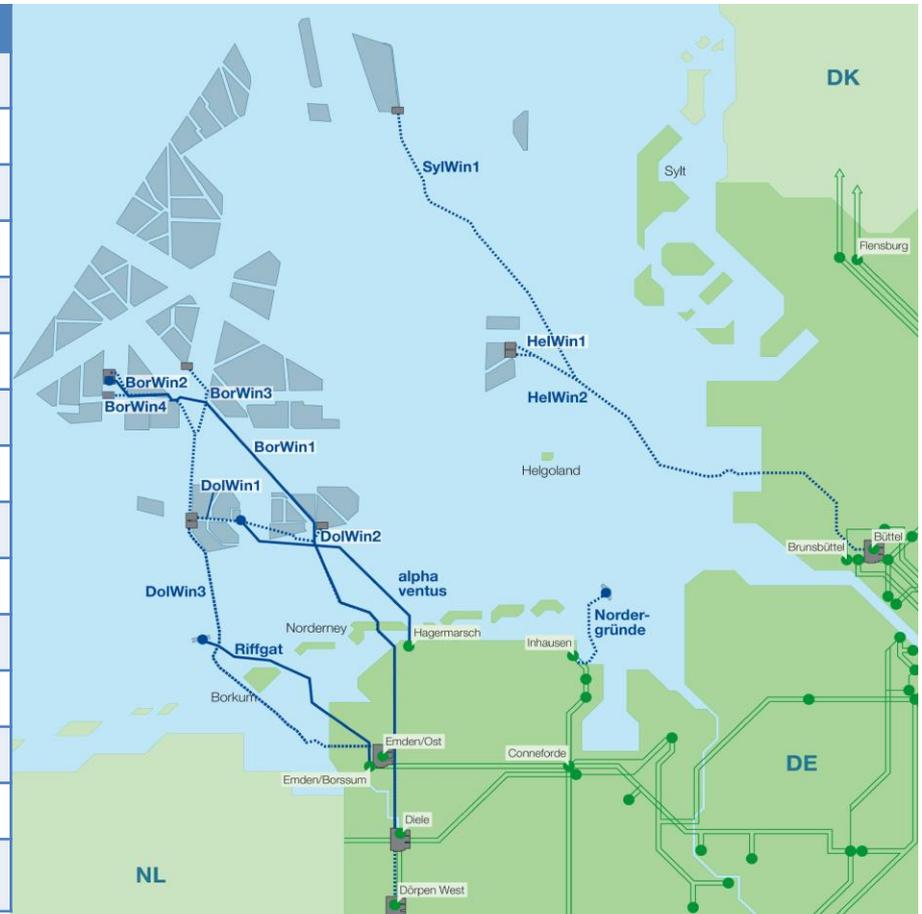
- Connections to 10 TSOs – in the center of the European electricity market
- 21.000 km of ehv- and hv-lines
- 2.2 bn. € turn over in 2013
- 2.600 employees secure the power supply for 36 m. people



Offshore grid connection projects

Current project overview

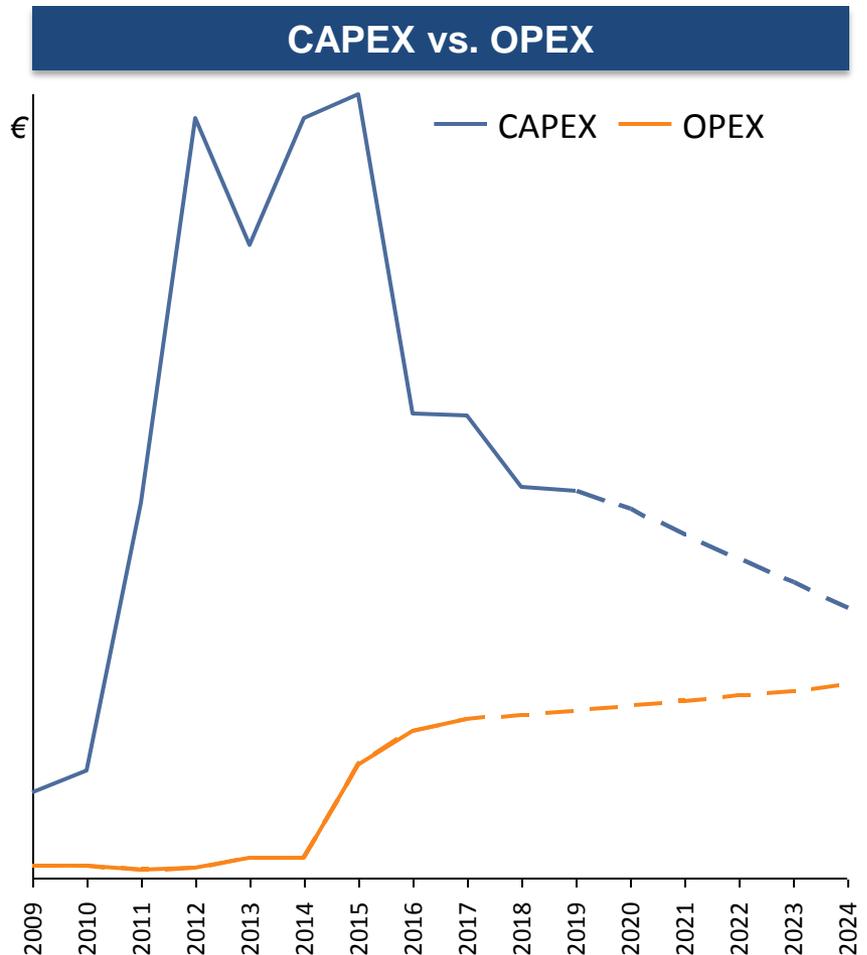
Project	Capacity (MW)	Commissioning
Operational		
alpha ventus	60	2009
BorWin 1	400	2010
Riffgat	108	2014
Under construction		
BorWin2	800	2015
BorWin3	900	2019
DolWin1	800	2014
DolWin2	900	2015
DolWin3	900	2017
HelWin1	576	2014
HelWin2	690	2015
SylWin1	864	2015
Nordergründe	111	2016
Σ	7.109	



While investments are expected to decrease, O&M costs will become more and more relevant

Current situation & prognosis

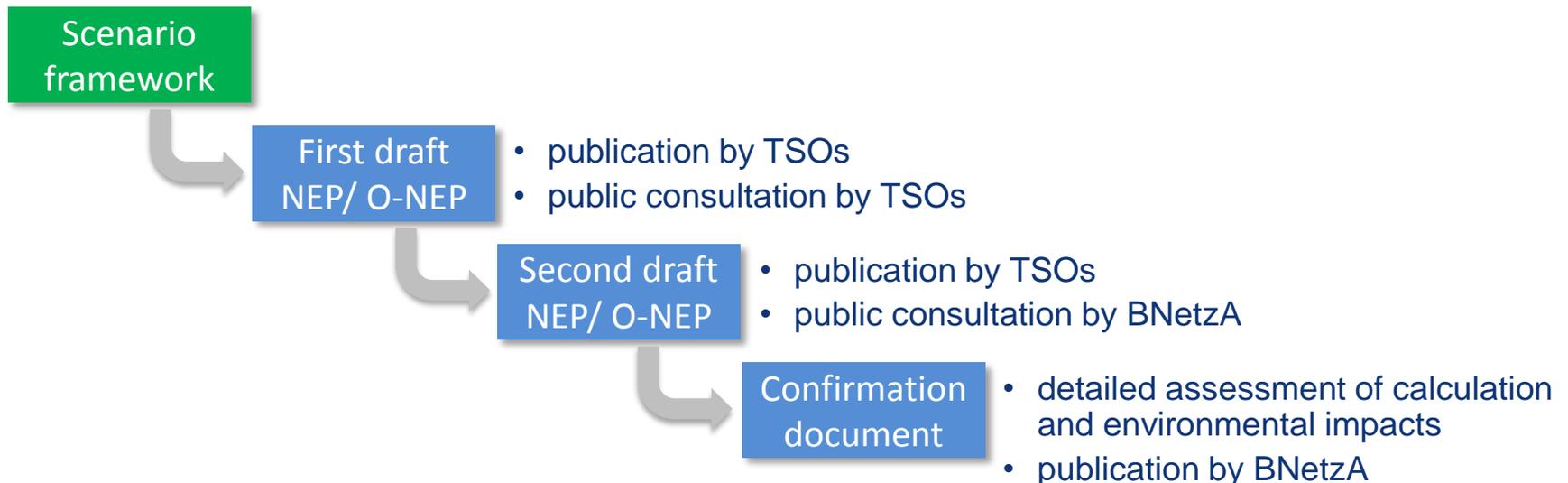
- TenneT is currently involved in more than 10 offshore grid connection projects in parallel.
- As a consequence, investment costs are currently at an all-time high.
- Following the TCO-approach, TenneT's main challenges are
 - managing the current project peak;
 - realizing cost reduction potential in the projects;
 - preparing for efficient O&M.



TenneT has significantly contributed to the establishment of a reasonable grid development

Implementation of O-NEP

- In 2011, TenneT urged the German government to establish new regulatory guidelines to guarantee for a sustainable grid development.
- As a consequence, the Offshore Grid Development Plan (O-NEP) was implemented.
- TenneT is involved in all stages of the O-NEP elaboration and in constant exchange with BNetzA.

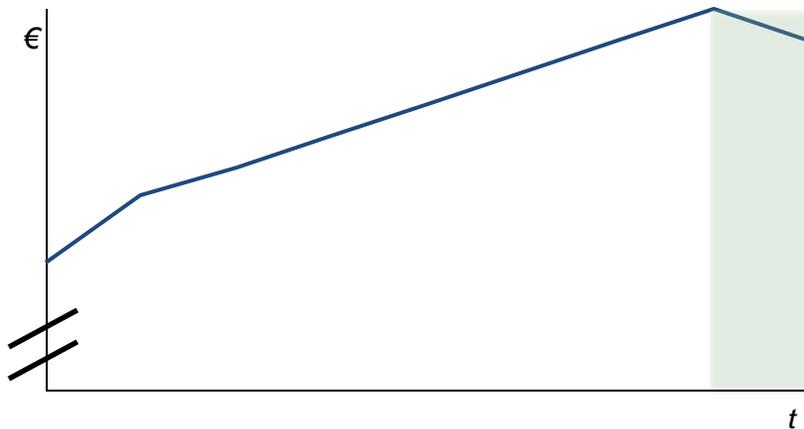


The multitude of projects tendered has caused market bottlenecks and increased prices

Consequences of unguided grid development

- Between 2007 – 2014, a total of 9 HVDC grid connection systems have been awarded.
- Initially, only ABB, Siemens and Alstom participated in the tenders.
- While the number of bidders stagnated, offer prices increased significantly.
- In order to foster competition, TenneT adapted its tender strategy in 2013.

Price development for HVDC projects



Development of bidders



New tender system helps to reduce grid connection prices

Development of a tender strategy

Joint tender for entire system (before 2013)

Amount of potential bidders able to deliver all components – converter and cables – limited to just ABB, Siemens and Alstom.

The more projects the less capacities were available.

**little competition
&
scarce capacity**

Split tender in 2 lots (from 2013 onwards)

To assure more competition, TenneT introduced a split tender system :

- **Lot 1:** Onshore & Offshore Converter
- **Lot 2:** HVDC Cable

The new tender structure attracted significantly more bidders offering additional capacities.

**balanced market prices
&
sufficient capacity
&
reduced delivery times**

Extensive preparatory projects help to take the right decisions

Two phase approach for planning and construction

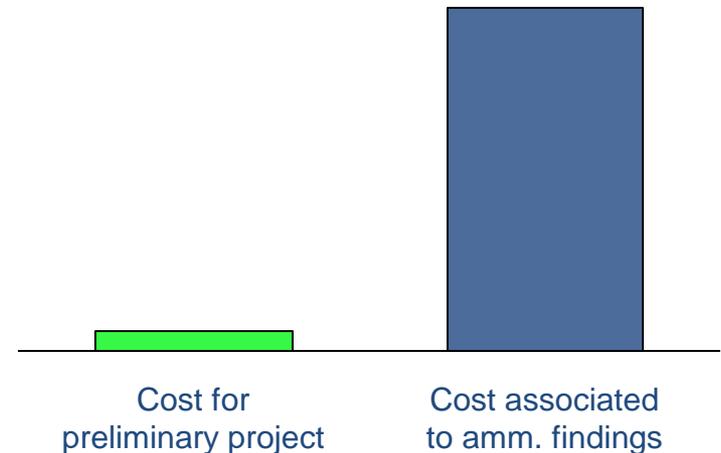
- TenneT's projects start with a preparatory project.
- While the core project covers the entire construction & commissioning up until the hand-over to operations (~ 5 years), preparatory projects (~2 years) include:
 - connection concept;
 - system technology concept;
 - tender strategy;
 - field explorations and expert assessments;
 - performance of surveys and
 - soil analyses.

The O-NEP provides sufficient planning security to take this time and guarantee for a thorough project preparation.

Riffgat is a prominent example for the necessity of detailed preparatory projects

Preparatory project example

- When TenneT took over the realization of the offshore grid connection Riffgat, a detailed magnetometer study revealed severe ammunition findings in the cable corridor.
- The realization of the windfarm was well-advanced, therefore TenneT could not influence the cable corridor at that stage in time.
- The ammunition clearance in the corridor caused a significant project delay and almost doubled the initial project budget.

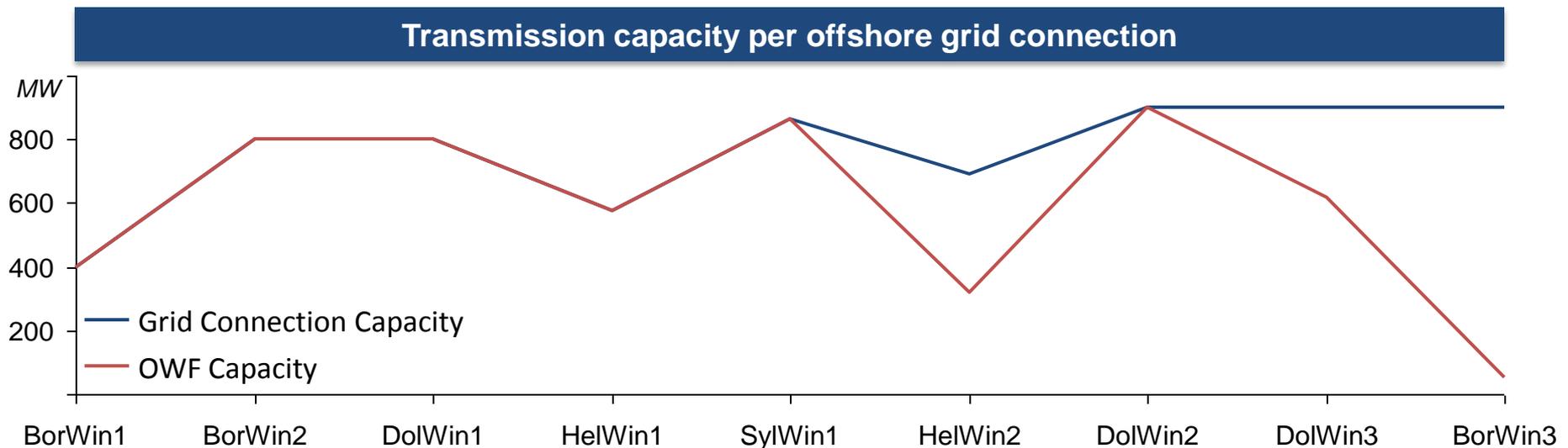


Clear benefit of thorough project preparation prior to construction.

TenneT has a close look on the advancement in the offshore technology

Making use of standardization

- Technological advancements in the past years have significantly contributed to a more standardized realization of offshore grid connections.
- As transmission capacity has only little impact on the overall price and TenneT longed for a capacity standardization (900 MW), recent projects are tendered independent of announced OWF capacity.



The multitude of projects allows for a variety of economies of scale to be realized

Selected economies of scale

While the involvement in a multitude of projects holds challenges, it also allows for economies of scale:

- **Frame Contracts**

The multitude of projects allows for a better usage of resources and „bulk buying“ conditions (i.e. for helicopter flights).

- **Standardization Concepts**

TenneT is engaged in the standardization of offshore components (i.e. AC-cables):

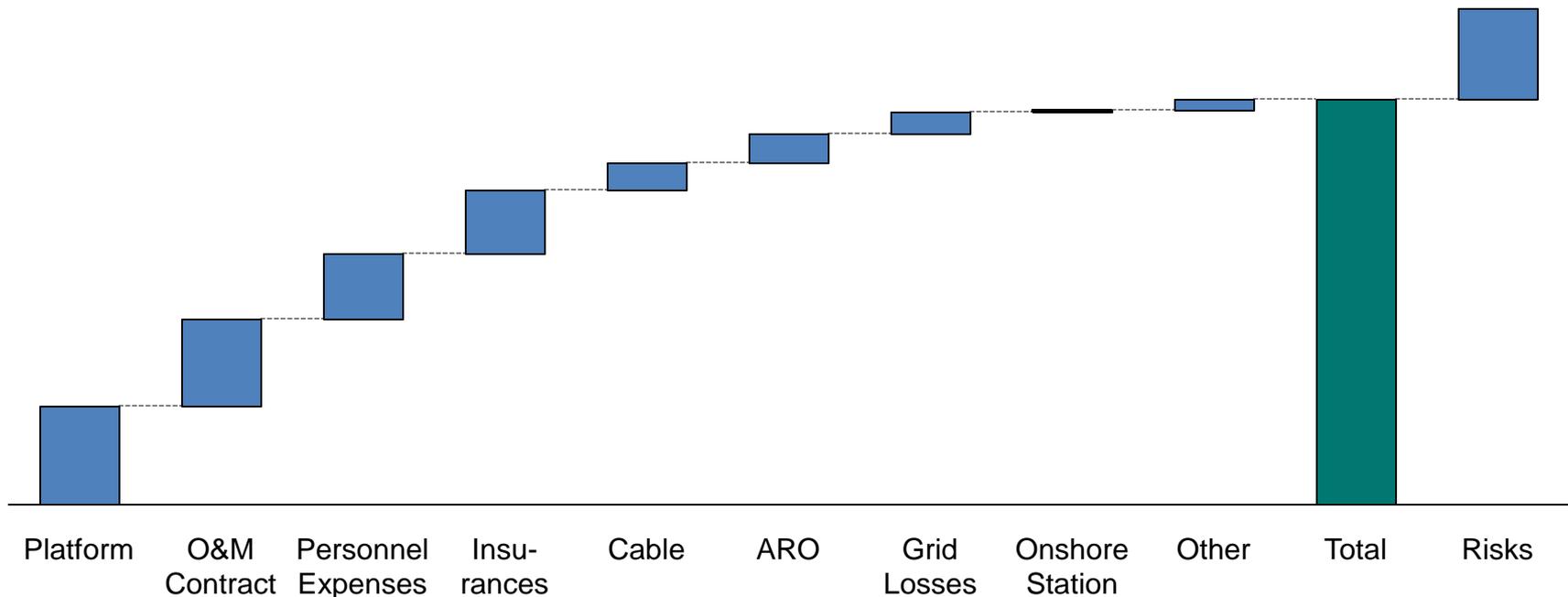
- less storage capacity of spare parts needed
- exchangeability of parts between projects possible



Potential risks make up a significant part of the expected O&M costs

Breakdown of O&M costs (exemplary)

- TenneT is still in the progress of gaining valuable experience regarding the operation & maintenance of offshore grid connections.
- The maritime cost items are hard to predict due to external risk factors like weather, charter rates and licensing requirements, which are very significant in relation to the basic campaign prices.

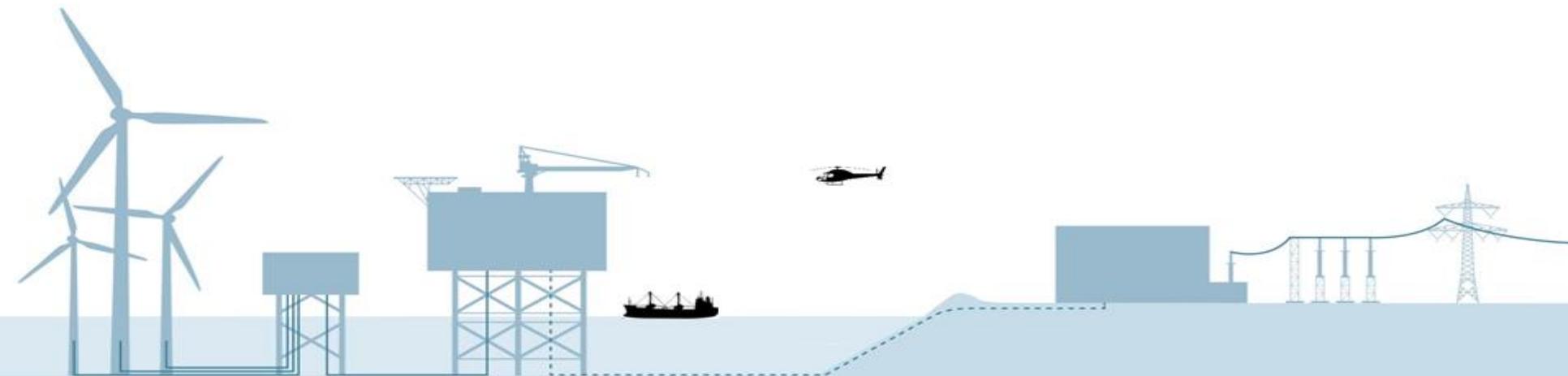


An “Operation & Maintenance” strategy shall help to sustainably reduce O&M costs

Overview of “O&M Strategy”

Most maintenance costs are non-electric and platform related.
In order to control these costs, TenneT...

- investigates cost saving potentials by price reduction for example through make-or-buy decisions or frame contracts;
- tries to challenge recommended maintenance or inspection intervals;
- works on technical alternatives like monitoring;
- evaluates possible cost reduction potentials regarding insurances.



TenneT is engaged in various projects to further increase the degree of utilization of the offshore grid

Project overview

- **Transmission Capacity Management (TCM)**

Development of algorithms to increase the utilization of transmission capacity with regard to thermal limitations.

- **Damage Reduction Concept**

Provision of a framework for damage reduction process and description of all available measures to avoid or reduce delays and outages:

- Providing a framework for damage reduction process
- Describing available measures to avoid or reduce delays and outages
- Evaluating and mitigating risks



Apart from the saving potential already realized, TenneT is looking for more cost reduction measures

Conclusion

- TenneT is currently involved in over 10 offshore grid connection projects. Due to the implementation of the O-NEP, the current peak of investment costs will decrease as of 2015.
- By adapting the tender strategy, conducting preparatory projects and defining an O&M strategy, TenneT has already implemented various cost reduction measures.
- Once TenneT has gained further experience in operating offshore grid connections, further cost reduction measures are planned to be realized.





TenneT is Europe's first cross-border grid operator for electricity. With approximately 21.000 kilometres of (Extra) High Voltage lines and 36 million end users in the Netherlands and Germany we rank among the top five grid operators in Europe. Our focus is to develop a north-west European energy market and to integrate renewable energy.
Taking power further