

# Challenges to integrate large scale offshore wind in the grid

Challenges for the TSO's within a sustainable energy supply

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# project overview and status

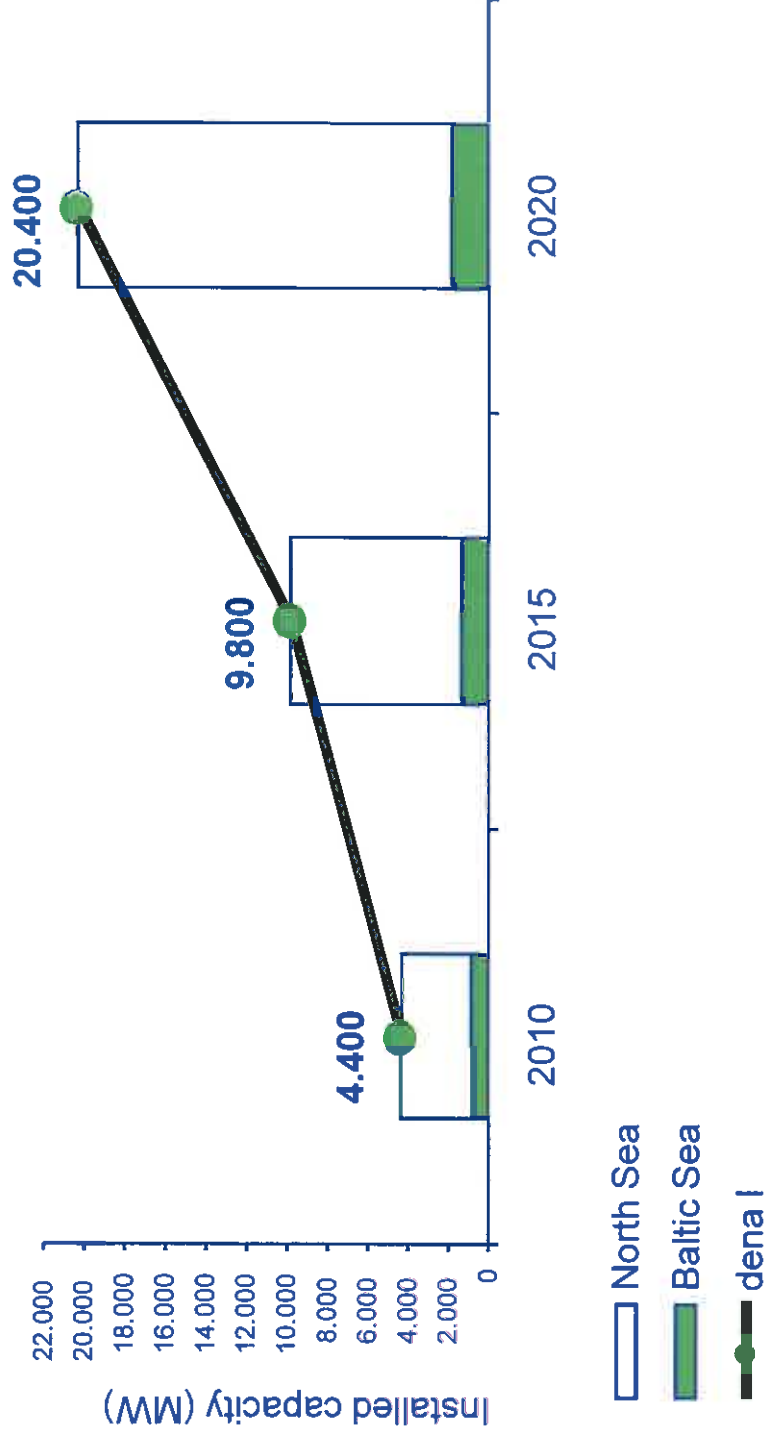
<b>awarded:</b>	
alpha ventus	60MW
BorWin1 (West)	400MW
BorWin2 (West)	800MW
DolWin1 (West)	800MW
HelWin1	576MW
Riffgat	108MW
SylWin1	864MW

**In tendering process:**

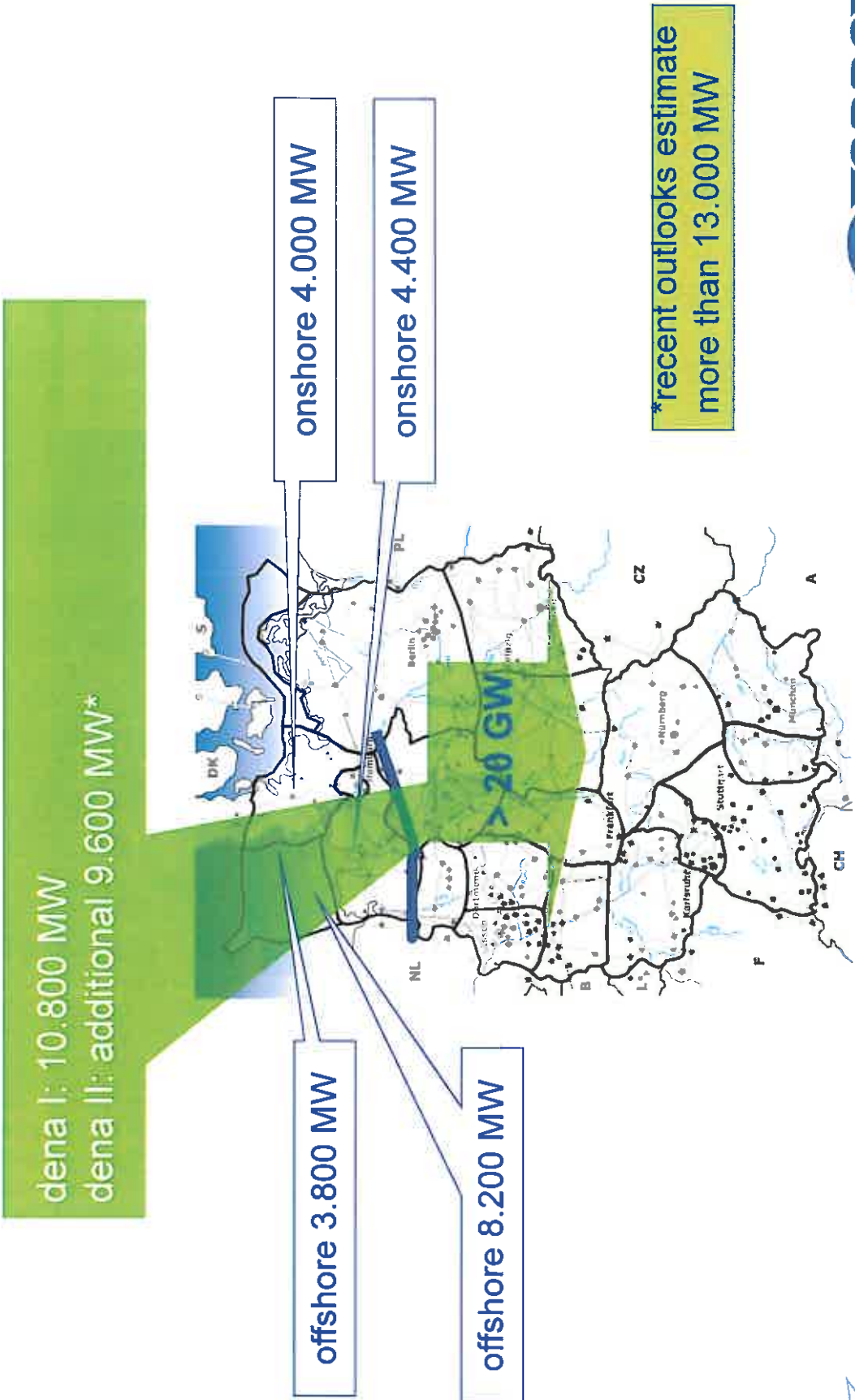
<b>DolWin2 (East)</b>	<b>~ 900MW</b>
<b>HelWin2</b>	<b>~ 330/690MW</b>



# Estimated amount of offshore wind energy

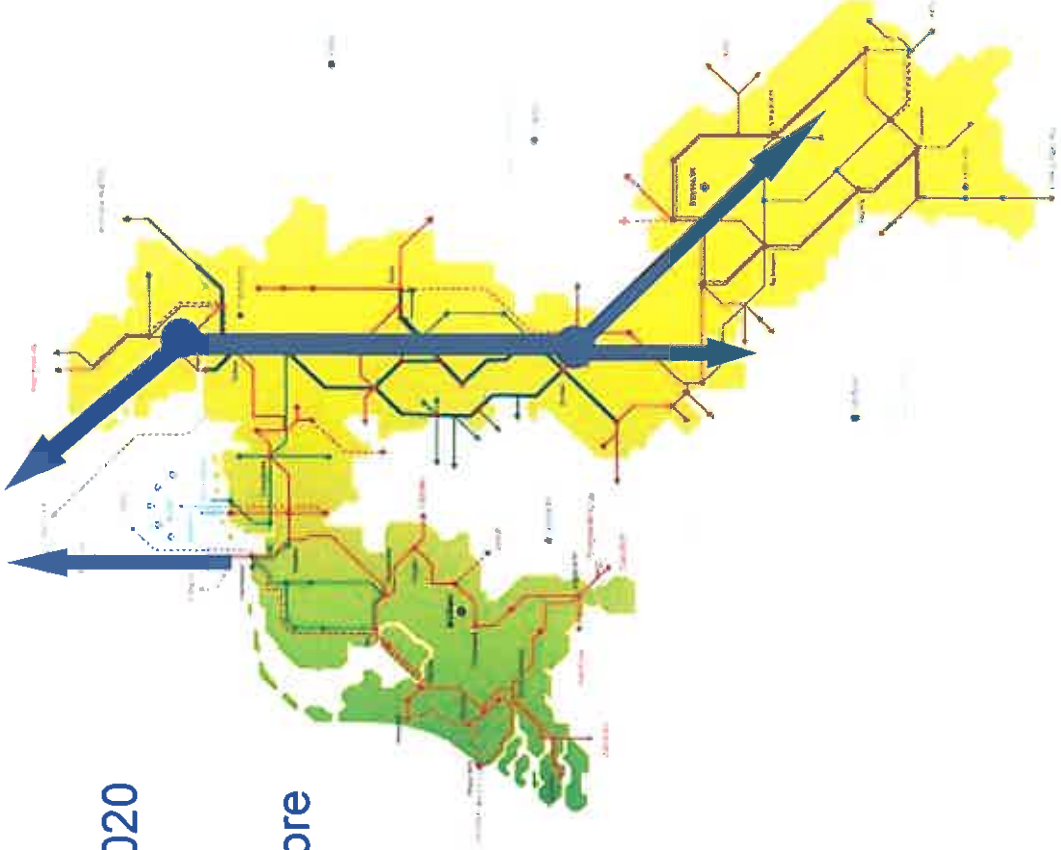


# Challenge I: 20 GW of wind power off- / onshore



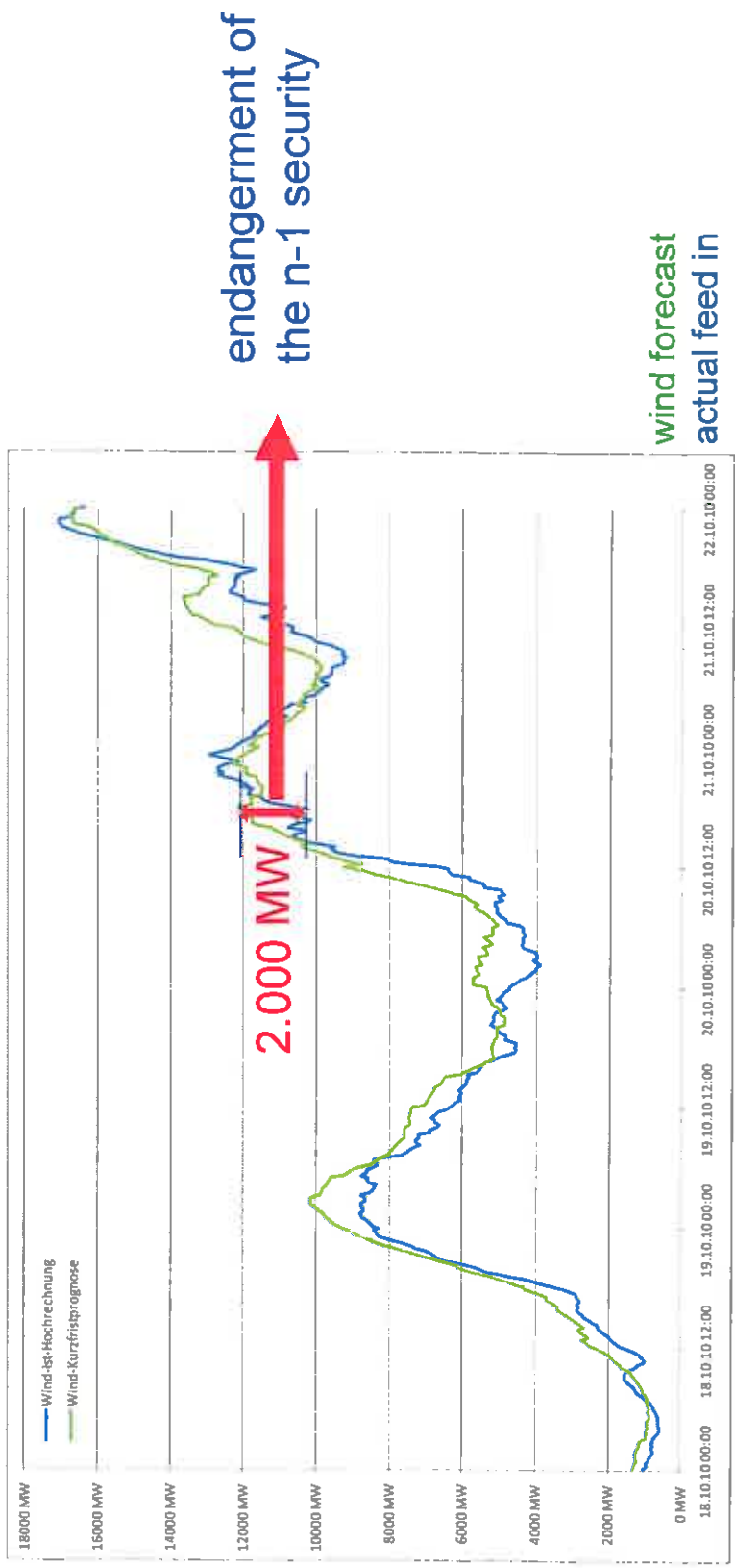
# TenneT's strategy: spread and store

- > 20.000 MW wind power until 2020
- We have to take 3 actions:
  - 380 kV connections onshore according to dena I & II
  - HVDC links to Scandinavia
  - HVDC Overlay grid onshore



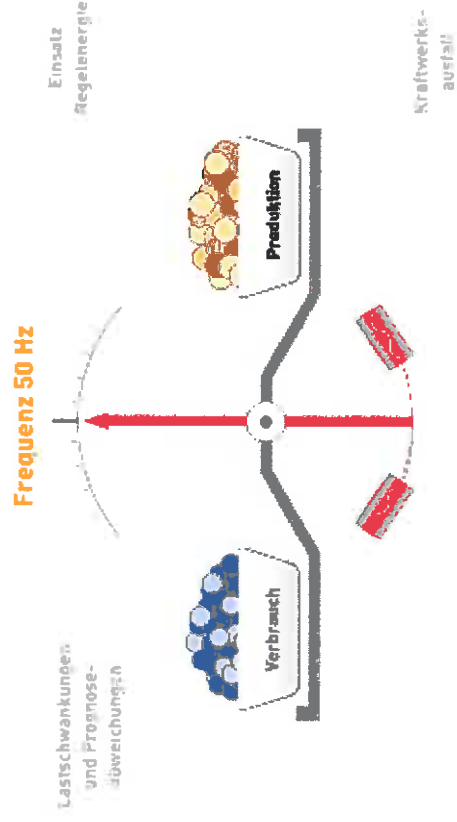
# Challenge II: forecast uncertainty

nationwide energy feed-in  
on the 19th of October 2010  
(installed capacity 26.300 MW)

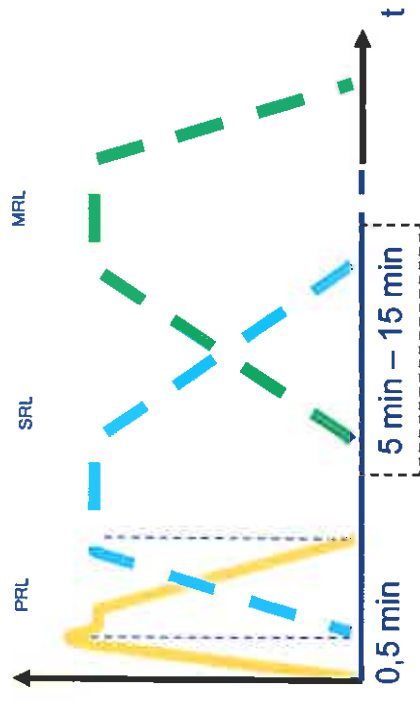


# Grid security requires enough balancing power

Discrepancy in prognosis is caused by: feed-in of renewable energy, power plant schedules, grid losses and load development



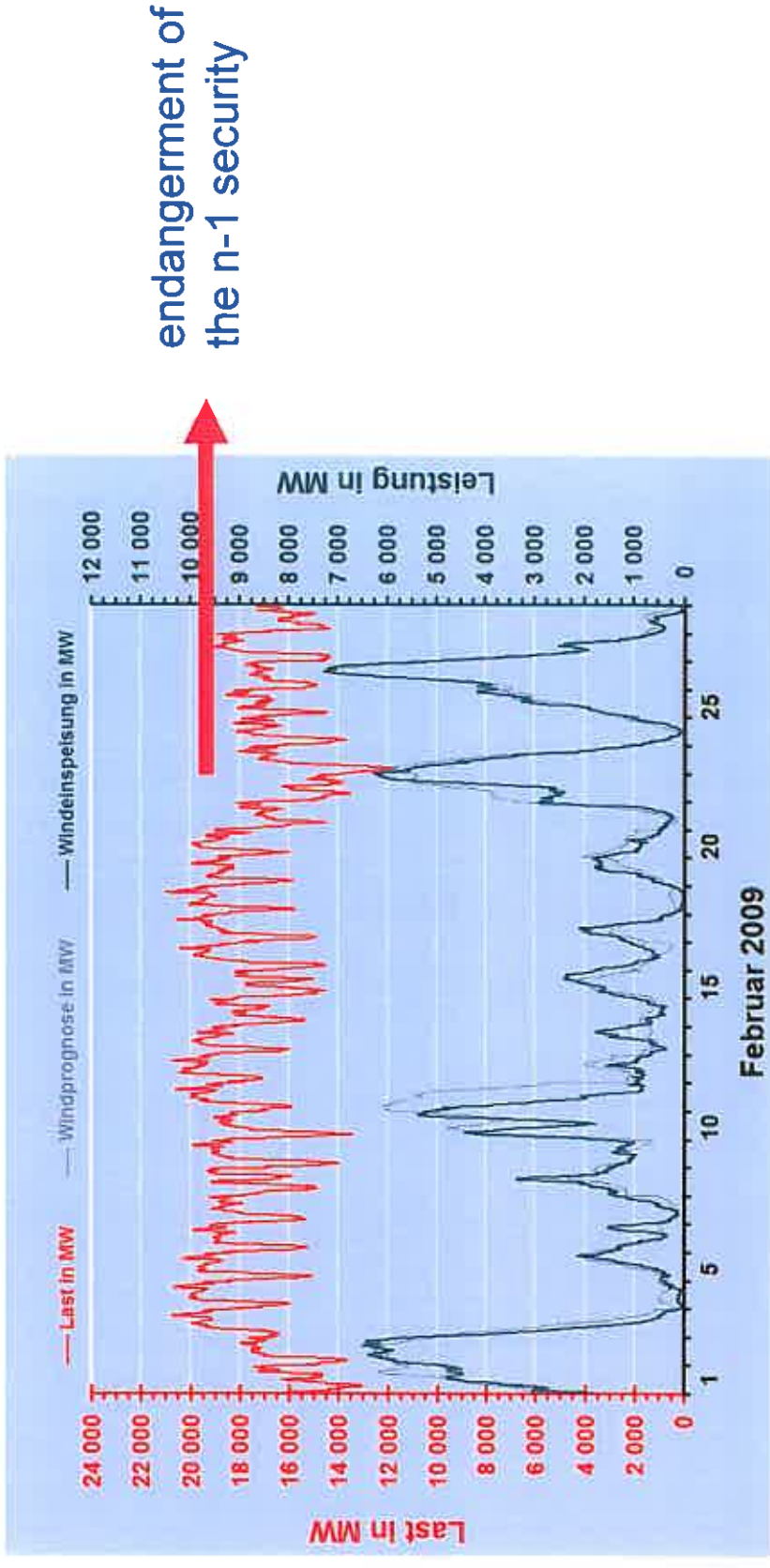
## 3 different kinds of balancing power



**Conventional generation driven out of the market – lack of services to maintain system stability**



# Challenge III: Volatility



- adjust day-ahead-capacity at all CWE-borders
- Cross-border redispatch measures: for 48 hrs. ~1450 MW





# The risk of a black out is substantial



Interferences of the network control to secure grid stability

days	interferences
2003	2
2004	14
2005	51
2006	105
2007	185
2008	144
2009	156
2010	161
2011*	42

\*during the moratorium 18.03.2011 – 01.05.2011



# Challenge IV: Investments and planning

- To avoid „stranded investments“ the grid extension offshore is planned according to each individual project
- The risk of pre-financing and acceptance of cost by the BNetzA has to be taken alone by the responsible TSO
- Funding an offshore grid connection is difficult due to high investments
- The scheduled construction period of three years is too short for these large-scale projects. The planning, approval procedure and construction take five to ten years.
- The acceleration of the onshore grid extension is still essential



# What do we need for those projects?

- **Development of a broad consensus about the necessity of grid extension and acceptance**
  - Agreement on energy generation scenario
  - Acceptance of the necessity of grid extension projects
  - Information and education initiatives to improve the acceptance of new projects
- **Support for improved regulatory frame**
  - Full coverage of capital costs
  - Risk adequate ROE to raise debt & equity at capital market
  - Inclusion of R&D costs
- **Support for the acceleration of procedures**
  - Legally predetermined line corridors
  - Standardized planning guidelines
  - Faster procedures for lines which are of top priority and of public interest
- **Legislative adjustments**
  - Allow renewables to provide ancillary services



TenneT is Europe's first cross-border grid operator for electricity. With approximately 20,000 kilometres of (Extra) High Voltage lines and 35 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.

[www.tennet.eu](http://www.tennet.eu)



# alpha ventus & BorWin1







