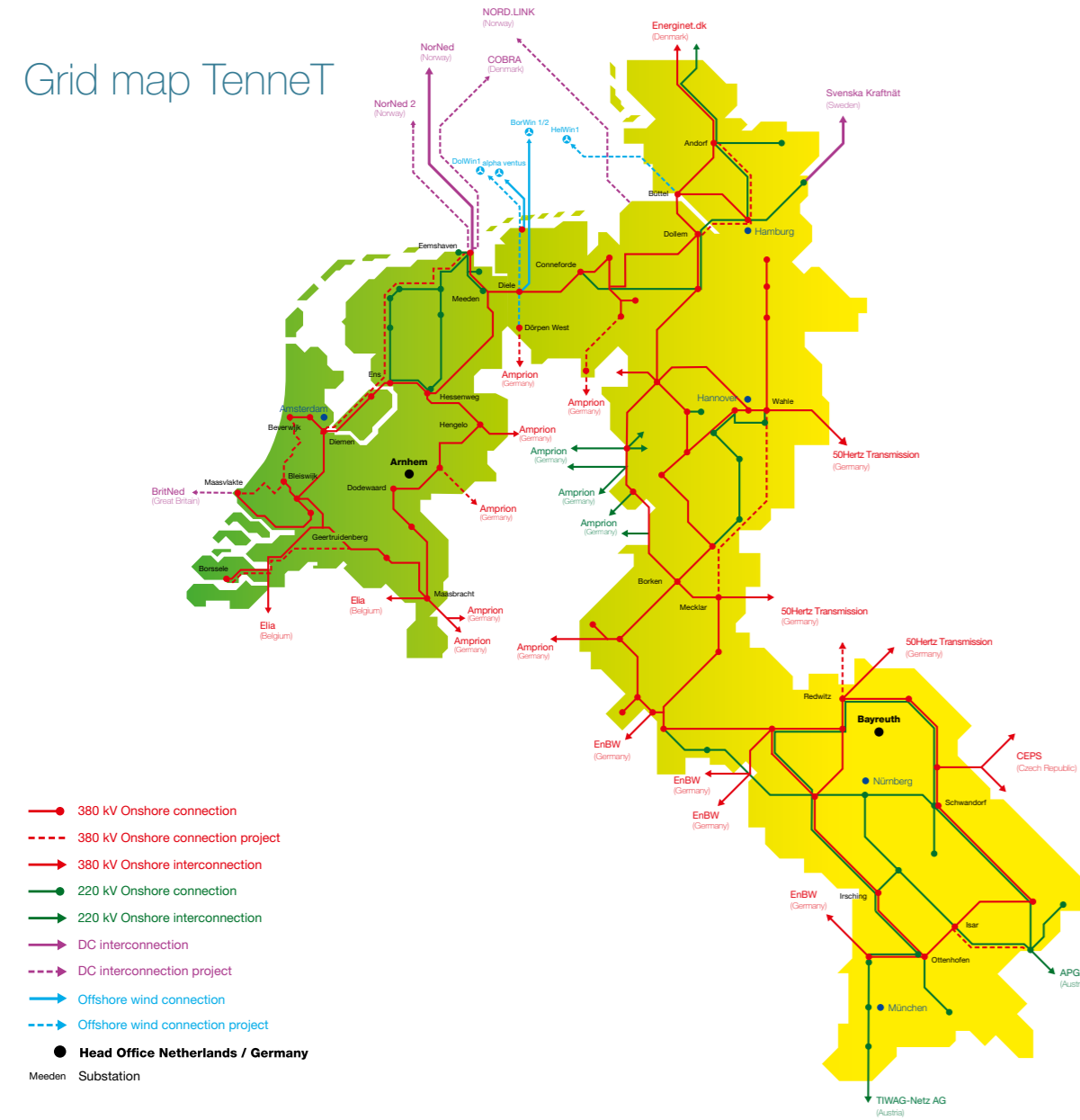


Grid map TenneT



Government decree

In mid-February 2010, the Dutch government approved the Minister of Economic Affairs' proposal to make TenneT responsible for the construction and management of the offshore transmission grid. A corresponding bill will be prepared in order to establish TenneT's responsibility for the offshore grid in Dutch law.

TenneT already underway

Pending the governmental decision, TenneT has been asked by the Minister of Economic Affairs to prepare itself as operator of the grid in the Dutch North Sea. Based on a number of analyses, TenneT concluded that it is well positioned to connect 6,000 MW of offshore wind capacity to the grid in the period until 2020. Though TenneT has already taken the first preparatory steps for connecting the wind farms to the Dutch transmission grid (in the towns of Borssele and IJmuiden), the company has not yet been formally commissioned to actually implement these plans. The collapse of the Dutch government in 2010 was one of the reasons that no decision has yet been made with regard to amending the Dutch Electricity Act. The installation of a solid infrastructure will take 10 till 15 years in total, meaning that steps must be taken now.

International dimensions

The integration of wind energy does not only relate to the Dutch and German grids. In view of the similar ambitions of neighbouring (North Sea) countries, an integrated European approach is essential. By investing in and working on creating the best possible infrastructure in the Netherlands and Germany, TenneT is actively contributing to the sustainability of the European energy market as a whole.

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 Northwest European energy market and to integrate renewable energy.

Taking power further

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November 2010



Offshore energy

TenneT brings energy from sea to land



TenneT brings energy from sea to land

As a cross-border Transmission System Operator, TenneT is gearing itself towards the future and is working hard to facilitate system and market integration, guarantee the security of supply, and integrate sustainable energy sources in Europe. TenneT is also a major player in the offshore electricity market. It uses technological innovations in its projects and invests in the infrastructure needed to bring sustainably generated energy from sea to land in order to reach its consumers.

More and more European countries are realising that the sea is an important resource for generating electricity. To achieve European climate objectives, renewable energy sources such as offshore wind energy must be integrated on a large scale across Europe. TenneT has broad experience in the fields of offshore wind energy, wind forecasts, the balancing of grid fluctuations, and sea cable interconnections. TenneT can use this knowledge and experience to develop and construct robust transmission grids on the North Sea. TenneT facilitates the transition to a sustainable energy supply, thereby contributing to a stable and sustainable European energy market.

Offshore wind energy in Germany

Due to the implementation of the German act to speed up infrastructure planning procedures ('Infrastrukturplanungsbeschleunigungsgesetz'), TenneT has the instruction to develop and manage grid connections to offshore wind farms in its German transmission grid area since December 2006. TenneT Offshore, a subsidiary within the TenneT Group, is responsible for this specific task. Acting on behalf of TenneT, TenneT Offshore takes care of the design, planning, construction and management of offshore connections to onshore grid connection points, while TenneT itself is responsible for managing the offshore grid.

The first offshore wind farm connection

In spring 2009, the first offshore wind farm connection was completed. The alpha ventus offshore wind farm was connected to the onshore electricity grid via a 110 Kilovolt

BorWin1 the world's longest direct current connection from land to sea

alternating current connection. The wind farm is located about 45 kilometres north of the German island of Borkum. The route stretches some 70 kilometres from the offshore wind farm to the supply point in the transformer substation. The wind farm, consisting of twelve turbines, has been in operation since April 2010.

Connecting via 'sockets at sea'

To connect remote offshore wind farms (still in the planning stages) to the grid in the most environmentally-friendly and efficient way possible, direct current transmission systems are the preferred choice for transmitting electricity, considering the long distances on the North Sea and the large transmission capacities required. A transformer substation is being constructed on an offshore platform. Here the electricity produced by the wind turbines is converted into direct current and subsequently transmitted via a high-voltage direct current (HVDC) connection over sea and land to the nearest supply point in an onshore transformer substation. This substation then converts the direct current back into alternating current and supplies it to the grid.

Longest direct current connection in the world

At 200 kilometres in length, TenneT's BorWin1 project is the world's longest (and the company's first) direct current connection between an offshore wind farm and the high-voltage grid. The wind farm, located 125 kilometres from the coast, utilises a grid connection which has sufficient capacity to supply large volumes of wind energy to the electricity grid. This cable connection comprises 125 kilometres of offshore cable and 75 kilometres of onshore cable from the platform to the transformer substation in Diele (near the city of Papenburg).



An empty conduit on the German island of Norderney is used for laying cables. In addition to the cables for the alpha ventus offshore wind farm, the direct current cable for BorWin1 was installed in this conduit, which is located underground. In the future, the conduit will also be used to house cables connecting other offshore wind farms to the grid, leaving only the horizontal boreholes to be constructed on Norderney. A new converter substation was constructed in Diele in parallel to this. This is where the offshore-generated electricity is converted back into alternating current and supplied to the German high-voltage grid.

Grid connection projects

TenneT is currently working on the development of additional grid connections for offshore wind farms through its BorWin2, DolWin1 and HelWin1 projects. Other projects are in preparation, including plans for the construction of new converter substations in the municipalities of Dörpen and Büttel as supply points. This consists an investment of billions. Furthermore, the required legal procedures for establishing the offshore routes to their respective supply points have been set in motion.

Offshore wind energy in the Netherlands

The Dutch government has set a target to produce 6,000 MW (megawatt) of offshore wind energy by 2020. Connecting this 6,000 MW of offshore wind energy will have a considerable influence on the TenneT-operated Dutch electricity grid. Investments in the grid are essential for achieving these sustainability objectives. This is why TenneT wishes to invest in projects such as the installation of an offshore high-voltage grid, a practice that belongs to the core business of TenneT, as well as being part of its commitment to society.

Dutch subsidy scheme

In 2008, the Dutch Ministry of Economic Affairs introduced Stimulerend Duurzame Energieproductie, a subsidy scheme for the promotion of projects involving sustainable energy sources. The scheme financially supports these projects, in that compensation is offered for electricity generated by sustainable sources and supplied back to the grid. The subsidy scheme for offshore wind energy will continue until 2020 and is divided into three phases. Whether TenneT will be involved in phase 3 is upon the Dutch government to decide.