



Overhead line monitoring

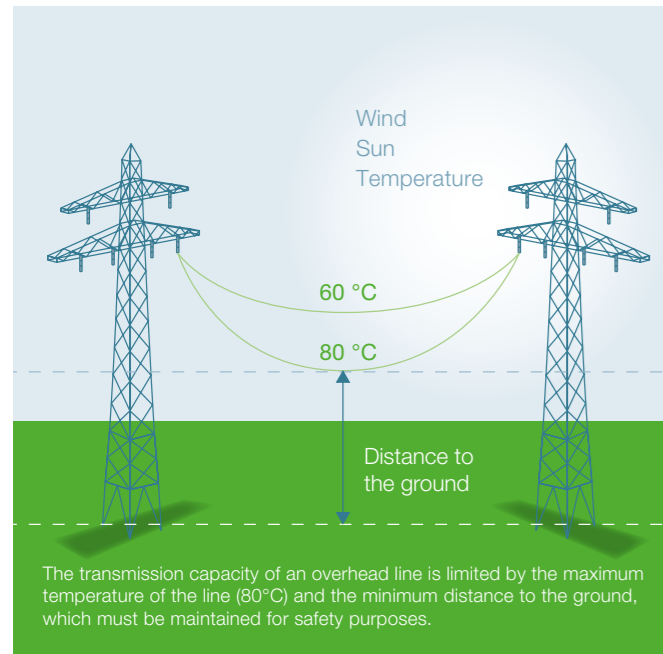
Optimum use of the transmission capacity of overhead power lines

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



Optimum use of the transmission capacity of overhead power lines



Using these meteorological data the network control centre calculates real-time the dynamic loadability of the high-voltage line. The calculated extra transmission capacity can then be used.

Although it all sounds fairly simple, this system requires complex calculations and expensive infrastructural modifications, especially in transformer substations. This is because all parts of the grid must be capable of withstanding the higher power loads. And the supply of electricity must not be jeopardised at any time while the necessary work is in progress. Consequently, only a small number of lines may be switched off simultaneously. It means the system can be introduced in the network only step-by-step and that it will take a considerable time before it is possible to monitor overhead lines in a large area.

TenneT TSO B.V.

Utrechtseweg 310, Arnhem
P.O. Box 718, 6800 AS Arnhem
The Netherlands

Telephone +31 (0)26 373 17 17

Fax +31 (0)26 373 13 59

E-mail servicecentrum@tennet.eu

Twitter @tennetsvc

www.tennet.eu

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Monitoring the transmission capacity of overhead power lines

TenneT is the first cross-border grid operator optimizing the overhead high-voltage lines (220/380 kV) by using a dynamic monitoring system. What makes the system special is that the network control centre calculates real-time the maximum loadability of the high-voltage lines, which is dependent upon the prevailing weather conditions. Meteorological data available online are used for this purpose.

Growing demand for transmission

The demand for transmission of large volumes of energy has increased sharply as a result of the growing supply of wind energy on land and the construction of new offshore wind farms. The transmission capacity of existing lines is insufficient at several places, including wind energy transmission from north to south Germany. It is extremely important for TenneT to carry out the planned expansion of the grid in the most environment-friendly and most efficient way possible. The company plans new lines only at places where the existing grid can no longer be optimised and strengthened.

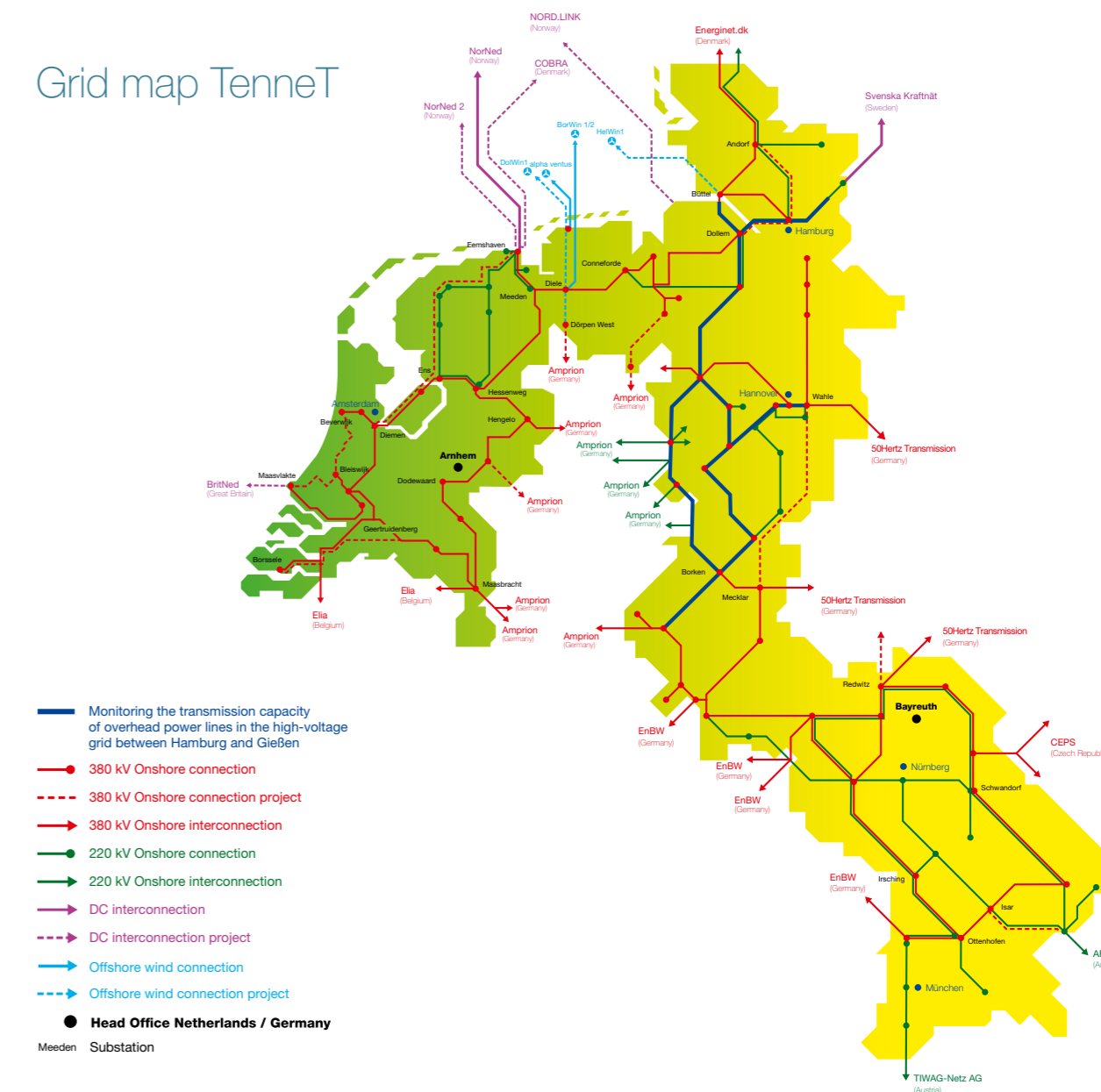
Monitoring overhead lines is the ideal solution for using unutilised weather-dependent transmission capacity of power lines because it optimises the use made of the transmission capacity of the existing grid infrastructure. This makes it possible to limit the

amount of grid expansion that is required. In short, monitoring the transmission capacity of overhead lines eases the burden on the environment by maximising the use made of existing capacity.

More electricity thanks to wind

The transmission capacity of overhead lines can be significantly increased – depending on the weather – by using this monitoring system. The distance from the line to the ground imposes a limit on the transmission capacity of an overhead line. The temperature of the line influences the distance because lines swell at higher temperatures. This makes them sag more and shortens the distance to the ground. But a certain safe distance must always be maintained. Therefore, every high-voltage line has a certain capacity limitation. When monitoring overhead lines, the weather stations record the current ambient temperature and wind strength at the line.

Grid map TenneT



A first in the German high-voltage grid

TenneT will introduce the monitoring system in its German high-voltage grid as soon as the test phase has been completed successfully. The system will be used for lines subjected to exceptionally heavy loads because of the feeding in of wind energy and intensive usage. More than 900 kilometres of high-voltage lines and 20 transformer substations are going to be made suitable for the new system. This operation will cost approximately EUR 55 million. But the investment will be worthwhile: when strong winds occur, it will be possible to increase the transmission capacity of lines in northern Germany by up to no less than 50%.

An additional advantage of the system is that the higher transmission capacity of wind-cooled high-voltage lines will become available precisely at a time when a bigger supply of wind energy pushes up the demand for transmission. Research is currently being carried out into the possibility of using the system in the Netherlands as well.