# Electricity systems can cope with large-scale wind power

February 23 2009

Research by TU Delft, Netherlands, proves that Dutch power stations are able to cope at any time in the future with variations in demand for electricity and supply of wind power, as long as use is made of up-to-date wind forecasts. PhD candidate Bart Ummels also demonstrates that there is no need for energy storage facilities. Ummels will receive his PhD on this topic on Thursday 26 February.

Wind is variable and can only partially be predicted. The large-scale use of wind power in the electricity system is therefore tricky. PhD candidate Bart Ummels MSc. investigated the consequences of using a substantial amount of wind power within the Dutch electricity system. He used simulation models, such as those developed by Dutch transmission system operator TenneT, to pinpoint potential problems (and solutions).

His results indicate that wind power requires greater flexibility from existing power stations. Sometimes larger reserves are needed, but more frequently power stations will have to decrease production in order to make room for wind-generated power. It is therefore essential to continually recalculate the commitment of power stations using the latest wind forecasts. This reduces potential forecast errors and enables wind power to be integrated more efficiently.

Ummels looked at wind power up to 12 GW, 8 GW of which at sea, which is enough to meet about one third of the Netherlands' demand for electricity. Dutch power stations are able to cope at any time in the

future with variations in demand for electricity and supply of wind power, as long as use is made of up-to-date, improved wind forecasts. It is TenneT's task to integrate large-scale wind power into the electricity grid. Lex Hartman, TenneT's Director of Corporate Development: "in a joint effort, TU Delft and TenneT further developed the simulation model that can be used to study the integration of large-scale wind power. The results show that in the Netherlands we can integrate between 4 GW and 10 GW into the grid without needing any additional measures.

## Surpluses

Ummels: 'Instead of the common question 'What do we do when the wind isn't blowing?', the more relevant question is 'Where do we put all the electricity if it is very windy at night?'. This is because, for instance, a coal-fired power station cannot simply be turned off. One solution is provided by the international trade in electricity, because other countries often can use the surplus. Moreover, a broadening of the 'opening hours' of the international electricity market benefits wind power. At the moment, utilities determine one day ahead how much electricity they intend to purchase or sell abroad. Wind power can be better used if the time difference between the trade and the wind forecast is smaller.'

## No energy storage

Ummels' research also demonstrates that energy storage is not required. The results indicate that the international electricity market is a promising and cheaper solution for the use of wind power.

Making power stations more flexible is also better than storage. The use of heating boilers, for instance, means that combined heat and power plants operate more flexibly, which can consequently free up capacity

for wind power at night.

The use of wind power in the Dutch electricity system could lead to a reduction in production costs of EUR1.5 billion annually and a reduction in CO2 emissions of 19 million tons a year.

Source: Delft University of Technology