



IESVE used to perform dynamic simulations of natural ventilation to dramatically reduce heat loads in transformer and machinery rooms in order to meet temperature targets.

# ISC: Innovative Engineering Natural Ventilation in Offshore Substations



**ISC: INNOVATIVE  
ENGINEERING**  
NATURAL VENTILATION IN  
OFFSHORE SUBSTATIONS

**SECTOR:** IESVE for Engineers

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**COUNTRY:** Denmark

[www.iesve.com](http://www.iesve.com)





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IN OFFSHORE  
SUBSTATIONS

ISC carried out detailed design on the following substations:

### Gode Wind 01 and 02

Capacity of respectively 332MW and 252MW, the Gode Wind I wind farm comprises an area of 66km<sup>2</sup> with 546MW turbines and the Gode Wind II wind farm comprises 66km<sup>2</sup> with 846 MW turbines. Both substations are scheduled to be installed in 2014.

Using the IESVE, calculations of natural ventilation were carried out for the transformer room and the machinery room, with the total heat load of 36.5 kW. The design of openings on the façade as well as openings on the rooftop was optimized. The scientifically accurate climate data for the actual location has been validated with the actual measurements near the station. All the temperature requirements have been met, including the monthly average of the hottest month below 30 °C.

### Northwind

Placed in the Belgian North Sea, the substation has a capacity of 216 MW and weighs 1200 tonnes. The substation was installed in 2013. The 14 km<sup>2</sup> wind farm comprises 72 wind turbines of each 3MW is placed 37 km from shore. Natural ventilation calculations have been undertaken for a transformer room with total heat load of 70 kW and a reactor room with total heat load of 19.4 kW. With the help of IESVE the necessary opening size has been calculated in order to meet the temperature requirements.

### Innogy Nordsee Ost

The topside is placed on a traditional 4 legged jacket in 23 m water approximately 51 km off the German coast. The substation has a capacity of 295.2 MW. The topside weighs 1600 tonnes. The wind farm comprises an area of 36 km<sup>2</sup> with 48 6.15 MW turbines. The substation is scheduled to be installed in 2014.

The topside is a classic design with 2 transformers and a helideck. Each transformer room has a heat load of 80 kW. Using the IESVE CFD module it was possible to document, that not only general temperature requirements in the room were met, but also temperature requirements at a particular height.

*"IESVE has several advantages in comparison to other simulation software. Its flexibility to import weather data from worldwide weather data providers, is important for a specific location of the substation in the middle of the sea. Performing dynamic simulations of natural ventilation are based on both the thermal and wind pressure thrust. Compatibility with CFD module makes it easy and fast to build up a CFD calculation in order to explore the temperatures in the space and on the surfaces. Finally, the good visualization of results makes it easier to communicate to the client."*

**Inese Nagla**  
ISC Consulting Engineers A/S

### KEY FACTS

- Temperature requirements met with natural ventilation
- Specific weather data
- Compatibility of dynamic and CFD calculations
- Clear visualisation for client



### PLEASE CONTACT

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