

Application Note

WindObserver monitoring at nuclear power plants in Sweden

Reference: AN0042

Introduction

A nuclear power plant is a thermal power station in which the heat source is a nuclear reactor. As is typical in all conventional thermal power stations the heat is used to generate steam, which drives a steam turbine connected to an electric generator that produces electricity. As of 23 April 2014, the International Atomic Energy Agency (IAEA) report there are 435 nuclear power reactors operating in 31 countries. Nuclear power plants are usually considered to be base load stations (covering the main power requirements), since fuel is a small part of the cost of production. Their operations and maintenance (O&M) and fuel costs are, along with hydropower stations, at the low end of the spectrum and make them suitable as base-load power suppliers.

Nuclear Power

The conversion to electrical energy takes place indirectly, as in conventional thermal power stations. The fission in a nuclear reactor heats the reactor coolant. The coolant may be water or gas or even liquid metal depending on the type of reactor. The reactor coolant then goes to a steam generator and heats water to produce steam.

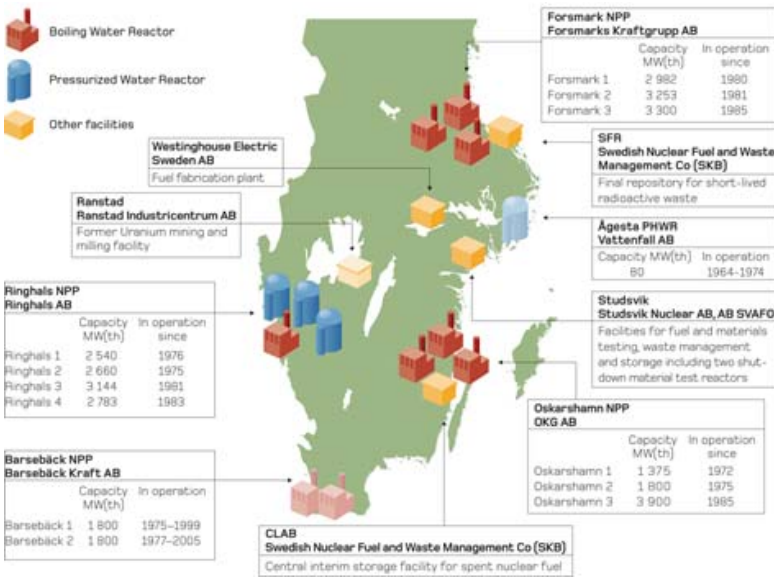
The pressurized steam is then usually fed to a multi-stage steam turbine. After the steam turbine has expanded and partially condensed the steam, the remaining vapour is condensed in a condenser.

The condenser is a heat exchanger which is connected to a secondary side such as a river or a cooling tower. The water is then pumped back into the steam generator and the cycle begins again. The water-steam cycle corresponds to the Rankine cycle.

Sweden & Nuclear Power

Sweden has three nuclear power plants producing electricity, which are indicated in the graphic to the right and WindObserver is used as part of the measurement system for monitoring the wind in the event of an accident at a nuclear power plant. These plants include Forsmark, Oskarhamn and Ringhals. The site Westinghousels is only a research and test centre in Västerås.

Barsebäck is an abandoned nuclear power station, which will be monitored for possible leakage for several years.



The WindMaster or WindObserver together with dispersion models will then form the basis to which parts of Sweden may need to evacuate if there is an issue at the station.

Installations



Above is a WindObserver installed in Sweden, however the WindMaster is also used at power stations in Norway and China to provide further detail with regard to atmospheric stability.

Why Gill?



Our anemometers are extensively chosen for safety critical projects requiring 2-axis (2-dimensional) wind measurement due to our reputation for high quality, easy installation due to multiple mounting / cable options and above all, for our solid-state construction, which offers huge advantages over other mechanical instruments as WindObserver (pictured on the right) requires virtually no regular maintenance. As our cost-effective, high quality stainless steel product, the 2-axis WindObserver offers up to 10Hz data output rate, whilst utilising our intelligent signal processing and adaptive gain control firmware to continue providing good quality data even under harsh conditions where other 2-axis anemometers fail. Whether measuring high wind speeds to 100m/s or at high altitudes up to 5000m or in extreme marine environments the WindObserver will provide an automatic quality message with every line of data output, giving confidence that data received is valid and can be trusted.



Our anemometers are also extensively chosen for projects requiring 3-axis (3-dimentional) wind measurement due to our reputation for high quality, easy installation with multiple mounting options and above all, for our solid-state construction, which offers huge advantages over other mechanical instruments as WindMaster (pictured on the right) requires virtually no regular maintenance. Our entry-level 3-axis WindMaster offers up to 20Hz data output rate (optional 32Hz), whilst also using our intelligent signal processing and adaptive gain control firmware to continue providing good quality data even under harsh conditions where other 3-axis anemometers fail or have to provide reduced performance. WindMaster also provides an automatic quality message, giving confidence that data received is valid and can be trusted.