AQSystem
Remote sensing technique

Wind Data in Cold Climate

-13 Years proof of reliable and robust technology

Vattenfall is one of Europe's largest producers and retailers of electricity and heat. The main markets are Sweden, Germany, the Netherlands, Denmark, and the UK. The Group has approximately 20,000 employees. The Parent Company, Vattenfall AB, is 100% owned by the Swedish state, and is headquartered in Solna, Sweden.

Vattenfall is a market leader in both onshore and offshore wind, with around 50 wind farms in operation across five countries.

Vattenfall was one of the first AQSystem partners in 2007 and has since grown the fleet up to 31 units. Based on the unit's performance, a lot of valuable input regarding the overall design of the products has been shared.

This was input to the design team developing the replacement product AQ510. Seven of the units were converted to AQ510 in 2017 and have been active since.

Out of the seven converted systems, five have been used extensively within projects and returned to the AQS calibration site between projects.

The strategy is to use the AQSystem calibration site before and after projects. There are met masts within the projects, but no in-situ calibration is performed. The AQ510 data is used for predicting wind potential at higher altitudes and adding independent measurement points within the projects. Projects use one to four AQ510s at each location.

All units are originally manufactured during 2010 and are upgraded to AQ510. The maintenance is performed by the Vattenfall service organization. Data for this report covers five units, 6 years, 5 projects, 4773 days of operation and 15 calibrations at the AQS test site.

The total project time for these five units is 13 years and during this period, 9 failures were recorded. Average repair time was 10 days and the average up time were recorded 98%. None of the failures required the system to be removed from site.

Data availability is an important parameter for wind resource assessment and results are consistent for the units regardless of project. The numbers are average data availability during the 4773 days (13 years) of operation.

50m	100 %	Range 99 – 100 %
100m	97 %	Range 95 – 98 %
150m	89 %	Range 81 – 92 %
200m	70 %	Range 62 – 88 %

The majority of the projects are in the northern part of Sweden and four measurements are north of the polar circle at remote locations.

Position	Days	@ 100m	Up time	MTBF
North Polar circle	1668 (36 %)	97 %	95 %	333 days
North of Sweden	2272 (48 %)	98 %	98 %	757 days
South of Sweden	739 (16 %)	98 %	98 %	739 days

The five units have been calibrated at AQS test site three times, each showing consistent results despite transport and deployment to different projects. The table below shows the robustness of the products and calibrations process, designed by DNV. The results refer to average deviations at 100m.

Unit	Calibration #1	Calibration #2	Calibration #3
System 1	0 %	-0,03 %	0,6 %
System 2	-0,2 %	-0,02 %	-0,2 %
System 3	-0,6 %	-0,8 %	-1,3 %
System 4	0,3 %	0,5 %	-0,6 %
System 5	-0,5 %	-0,6 %	- 1 %

Vattenfall Service has an extensive experience with service and maintenance of all types of wind related equipment and has been working with AQ Sodars since the AQ500 days.

"Working with AQ510, Vattenfall Service has noticed several improvements with hardware and software: less fuel consumption, less need for service, safety improvements and effective snow melting. The main issue with the new generation is that failures are so rare that this prevents the engineers from getting experienced."

– Jan-Åke Wallin, Project Manager, Vattenfall Service Nordic

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