



Operation With Ice (OWI)

Don't let your assets freeze

Operation with Ice (OWI) is a controller software feature based on intelligent pitch control that optimizes performance in icy conditions.

Accumulation of ice reduces aerodynamic performance, and ice on the blades can lead to the turbine stopping. Furthermore, some wind farm owners report a substantial loss in Annual Energy Production (AEP) due to icing.

When the measured power drops below a certain level or when the turbine is unable to cut in during windy conditions, and the ambient temperature is below 5°C (for Siemens and Gamesa technology) or 3°C (for Senvion technology), the OWI feature is activated:

- The rotational speed is increased in order to avoid stalling and to stabilize energy production (for Siemens and Gamesa technology)
- The blade pitch angles are adjusted to optimize aerodynamic performance and continue operation, preventing further ice accumulation (for Siemens, Gamesa and Senvion technologies)

Benefits

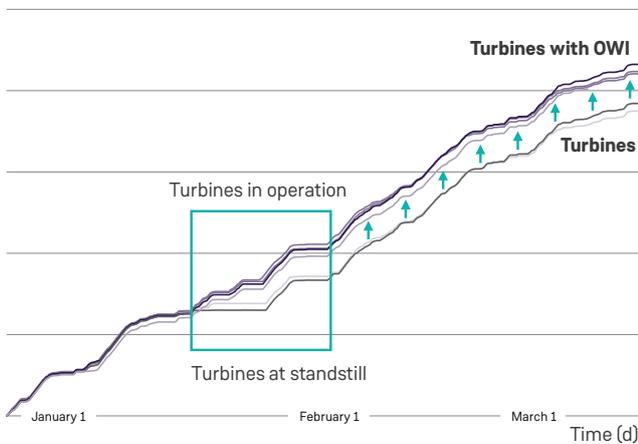
- Optimized performance for increased production under icy conditions
- Increased availability by reducing downtime due to ice
- Depending on site conditions and the turbine and blade type, OWI can potentially increase the AEP

Applicability

Siemens G2 and D3 platforms, Senvion MM and 3.XM platforms and the Gamesa 2.0 MW platform (G8X). Due to local legislation, OWI may not be used in Germany, Belgium and Austria.

Fig. 1: Example of a specific site in Scandinavia where an additional >200 MWh was achieved

Accumulated production (MWh)



- ✓ Optimized performance for increased production under icy conditions
- ✓ Increased availability by reducing downtime
- ✓ Possibility of remote installation

How does OWI optimize turbine operation?

OWI modifies the power curve (step 1*):

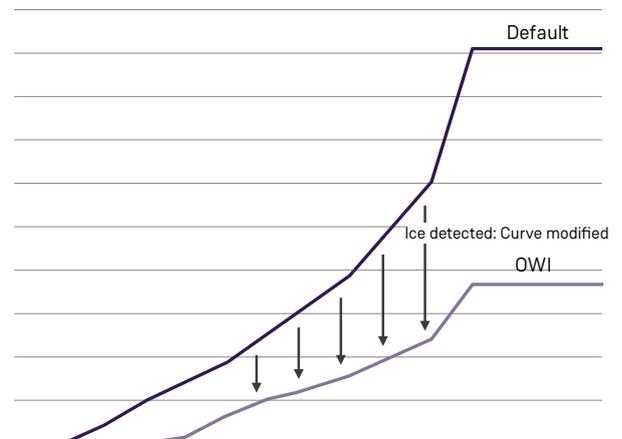
Slowly adjusting the power curve to recover rotational speed, with the aim to avoid stalling and to stabilize the power output.

OWI modifies the blade angles (step 2):

- Adjusting the blade angles to optimize aerodynamic performance and to increase production
- Continuing operation to prevent further ice accumulation and to reduce the likelihood of stalling

*Applicable only for Siemens and Gamesa technologies

Fig. 2: Speed power curve change – Active power (kW)



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