Operation with Ice

SIEMENS Gamesa
RENEWABLE ENERGY

What are the challenges of operating in icy conditions?

Accumulation of ice reduces aerodynamic performance.

Ice on the blades can lead to the turbine stalling.

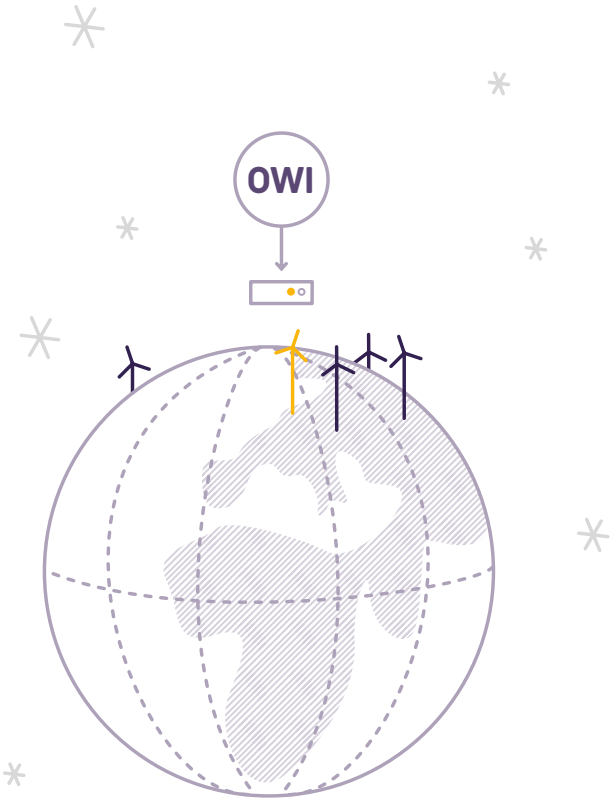
Some wind farm owners report a substantial AEP loss due to icing.

What is Operation with Ice?

Operation with Ice (OWI) is a controller software for turbines that optimizes performance in icy conditions

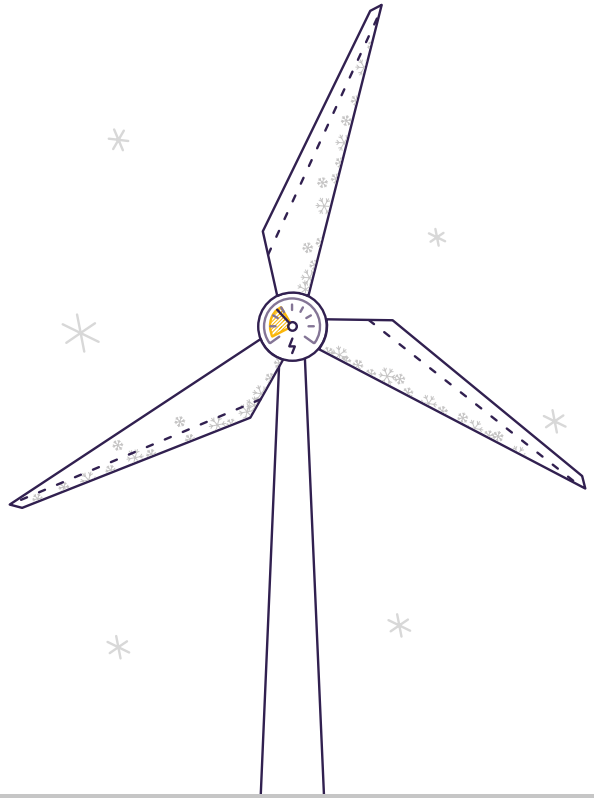
- Specially designed operation mode for turbines in cold regions
- Early sensing of ice accumulation through detection of power loss
- Facilitated cut-in and reduced likelihood of stalling through recovery of rotor speed
- Intelligent pitch control according to ice build-up to optimize performance

Click here to watch the animation online



How does OWI work?

- Once the measured power drops below a certain level, the OWI software is activated
- OWI adjusts the power curve to recover rotational speed and stabilizes the power output through detection of power loss
- It modifies the blade angles to optimize aerodynamic performance
- The continued operation prevents further ice accumulation and reduces the likelihood of stalling



What does the software do?

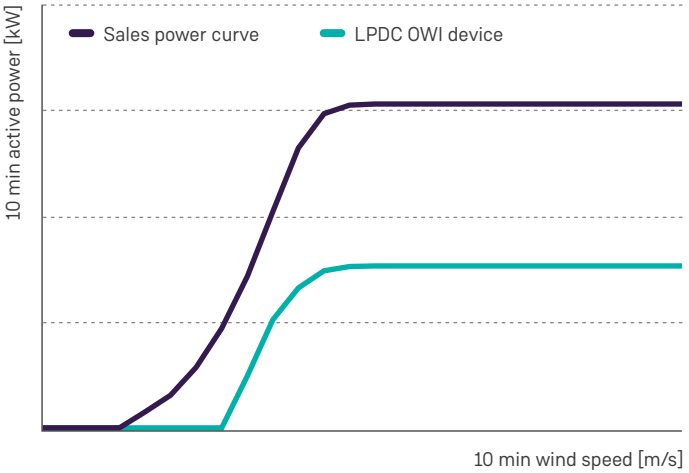
Low power detection curve (LPDC) ice detector

- Ice build-up on the blades reduces power production and degrades the power curve
- OWI is activated once the measured power drops below the level of the LPDC

No cut-in ice detector

- Indicates there is enough wind for the turbine to produce power, but the turbine is unable to cut in, connect to the grid, and produce power
- Reasonable to assume that this is caused by ice accumulation

Low power detection curve



How does OWI optimize turbine operation?

OWI modifies the power curve (step 1)

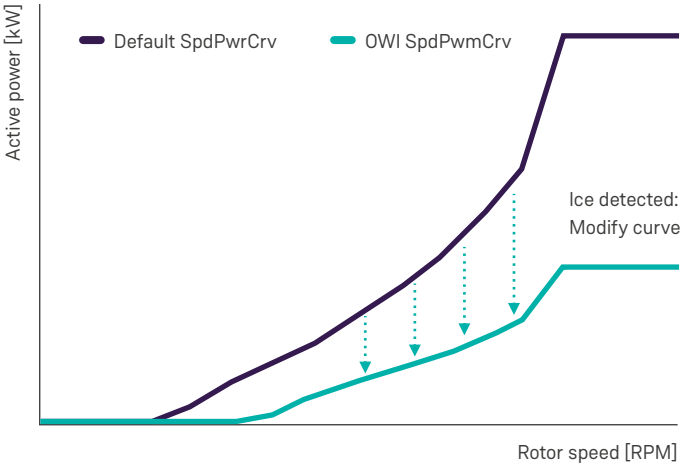
- Slowly adjusting the power curve to recover rotational speed to avoid stalling and stabilize the power output

OWI modifies the blade angles (step 2)

- Adjusting the blade angles to optimize aerodynamic performance and increase production

Continued operation prevents further ice accumulation and reduces the likelihood of stalling

Speed power curve change



Why is Operation with Ice of benefit?

Optimizes performance for more power

Increases availability by reducing downtime

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