

Vestas in Cold Climate

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The road to the universal turbine....

Vestas Standard
Turbine

Wind conditions
IEC class

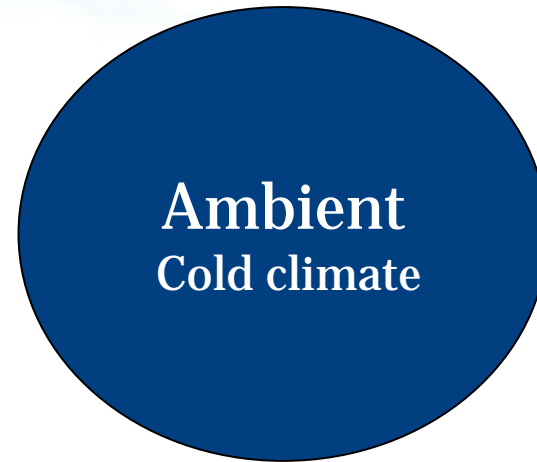
Size
Hub height,
Rotor

Ambient
Cold/Warm
Climate

.....

Electrical
Effect, grid code

Vestas in cold climate



3 identified areas

- # Low Temperature
- # Ice detection
- # Deice systems

Low temperature program

Turbine	Standard Operation	LT Operation	LT Survival
V52-850 kW	-20° to 30°	-30° to 30°	-40°
V80-2.0 MW	-20° to 30°	-30° to 30°	-40°
V90-1.8/2.0 MW*	-20° to 30°	-30° to 30°	-40°
V90-3.0 MW*	-20° to 40°	-30° to 40°	-40°

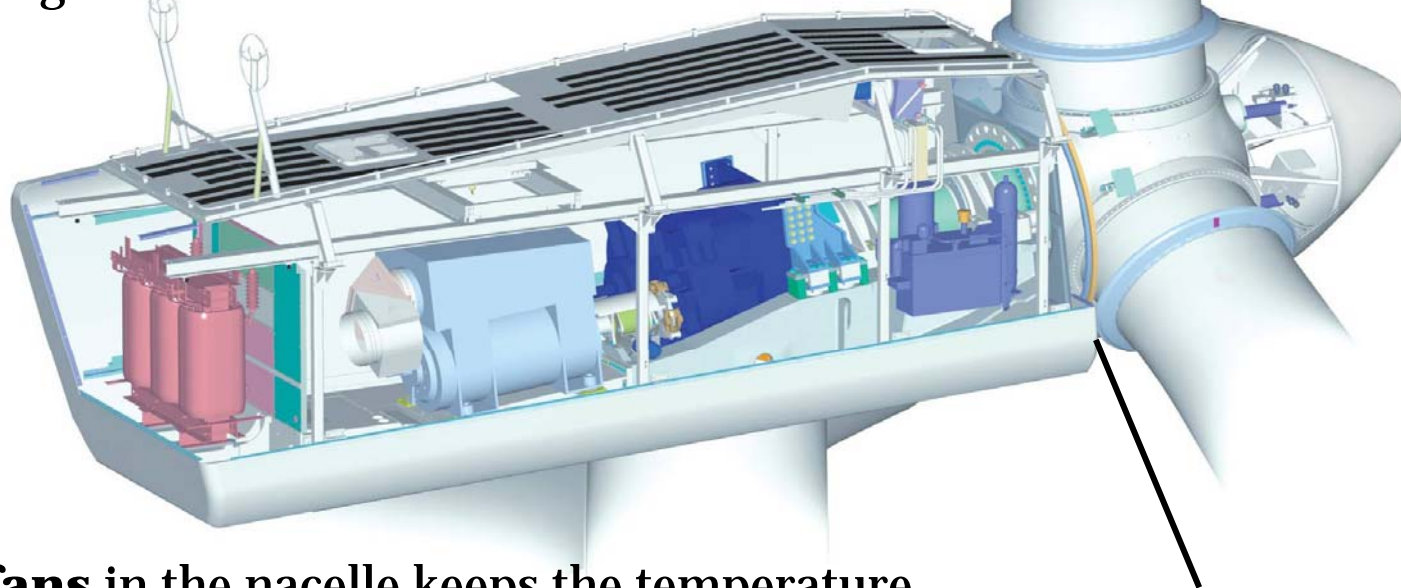
*Not released for sales

LT option for Vestas Turbines

During operation at low temperatures, flaps and curtain **close air inlet** opening to the nacelle.

Heating rods in oil tank and heating valve in valve block on the hydraulic power unit

Specially selected **lubricants** (gear oil and yaw grease) for LT operation



Three **fans** in the nacelle keeps the temperature above -20° during operation at ambient temperatures down to -30° .

Sealing between spinner and nacelle.

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Today's status - 3 identified areas



Ambient
Cold climate

Low Temperature

LT option for the V52 0,85 MW is available

LT option for the V80-2.0 MW is available

LT option for the V90-1.8/2.0 MW is released week 23 2008.

LT option for the V90-3.0 MW is released x 2008.

Ice detection

Ice detection system will be available as option in MW turbines late 2008

Deice systems

In progress, no status available, no estimated release date, no promises...

The logo features the word "Vestas" in a bold, italicized, blue sans-serif font. A registered trademark symbol (®) is positioned to the right of the text. The background of the top half of the slide is a light blue sky with soft, white clouds.

Vestas®

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