



PowerEdge® Care

Leading edge protection

Safeguard the leading edge for life

PowerEdge® Care is an advanced leading edge protection solution for wind turbine blades, consisting of highly durable pre-casted shells custom fit to the blade geometry.

PowerEdge® Care is certified by DNV-GL and available for all Siemens turbines (SWT-2.3-82 and larger models) and select Gamesa turbines. PowerEdge® Care can also be applied on other equipment manufacturer (OEM) turbines upon request.

Siemens Gamesa offers PowerEdge® Care with warranty on wear, adhesion, and workmanship.

Benefits of PowerEdge® Care

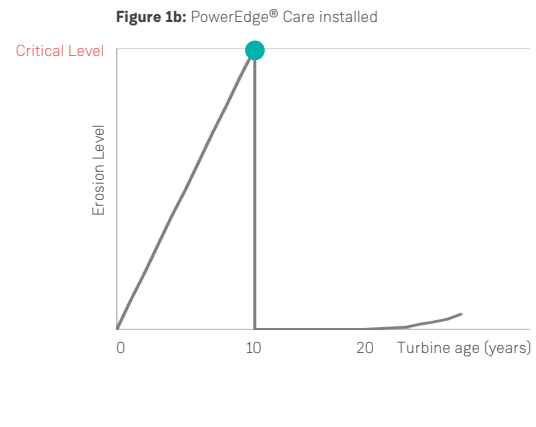
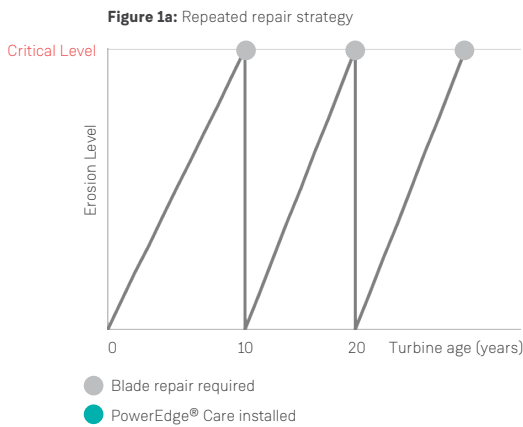
- Eliminates repeating repairs of the leading edge
- Power production upside compared to eroded blades
- Reduced turbine downtime
- Best-in-class leading edge protection solution
- Proven track record

Eliminates repeating repairs of the leading edge

Traditional blade maintenance strategies require repairs of the leading edge before the erosion reaches a critical damage level.

For certain wind turbines, repairs will need to be performed several times throughout the turbine's lifetime (Figure 1a). This approach can be avoided by installing a lifetime leading edge protection solution, like PowerEdge® Care (Figure 1b).

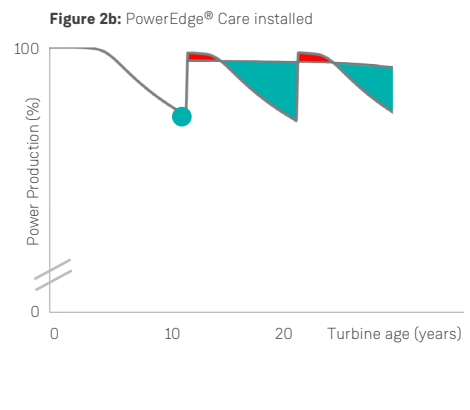
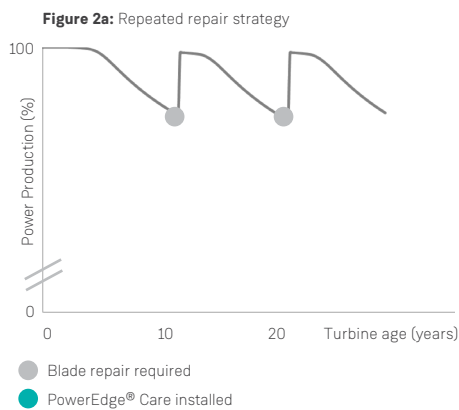
Siemens Gamesa's leading edge erosion tool simulates site-specific blade erosion development over time using your wind farm's environmental and operational conditions. The tool accurately predicts where and when erosion will occur on the blade, providing recommended timeframes to install PowerEdge® Care before erosion reaches critical levels.



Power production upside compared to eroded blades

PowerEdge® Care has been aerodynamically designed for optimal turbine performance.

As leading edge erosion increases in severity over time, it may lead to an annual energy production impact (Figure 2a). PowerEdge® Care has a small annual energy production impact compared to a new blade, however this impact is both minor and stable over the lifetime of the turbine due to the aerodynamic design of the solution. Compared to the annual energy production impact of eroded blades, blades with PowerEdge® Care installed are expected to deliver an annual energy production upside of up to 1% over the remaining lifetime of the turbine (Figure 2b).



Reduced turbine downtime

PowerEdge® Care ensures minimal turbine downtime, both during and after installation.

- Field-optimized installation method
 - ✓ Shells are applied directly onto eroded blade surface
 - ✓ Adhesive is also used as filler and edge sealer
 - ✓ Minimal application process steps
- No repairs required prior to installing PowerEdge® Care, except for structural blade damage
- Fast adhesive curing time
- Lifetime leading edge protection solution - no maintenance or repairs for the remaining turbine lifetime
- PowerEdge® Care can be installed via rope access, cherry picker, or blade-climbing platform

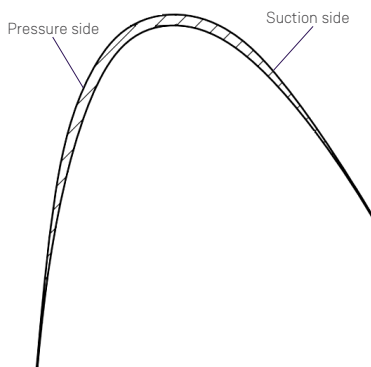


Best-In-Class Leading Edge protection solution

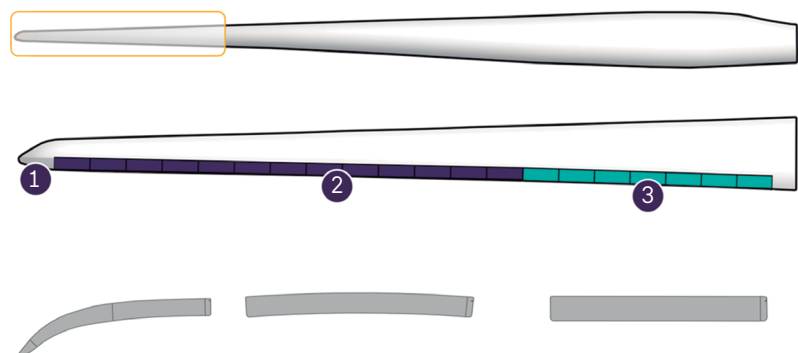
PowerEdge® Care has been thoroughly tested and validated - both in the laboratory and in the field.

It delivers a balanced approach that maximizes turbine performance while mitigating the need for leading edge repairs.

- **Superior durability**
 - ✓ Expected lifetime of 25+ years
- **Superior adhesive**
 - ✓ Superior adhesion strength
 - ✓ Extensive selection criteria including:
 - a. Adhesion strength & fatigue resistance
 - b. Processability & filling capability
 - c. EHS & chemical compatibility
- **Aerodynamically designed solution**
 - ✓ Customized shell geometry for optimal performance (annual energy production and noise)
 - ✓ Use of Vortex Generators with PowerEdge® Care avoids flow separation and ensures operation within turbine design limits



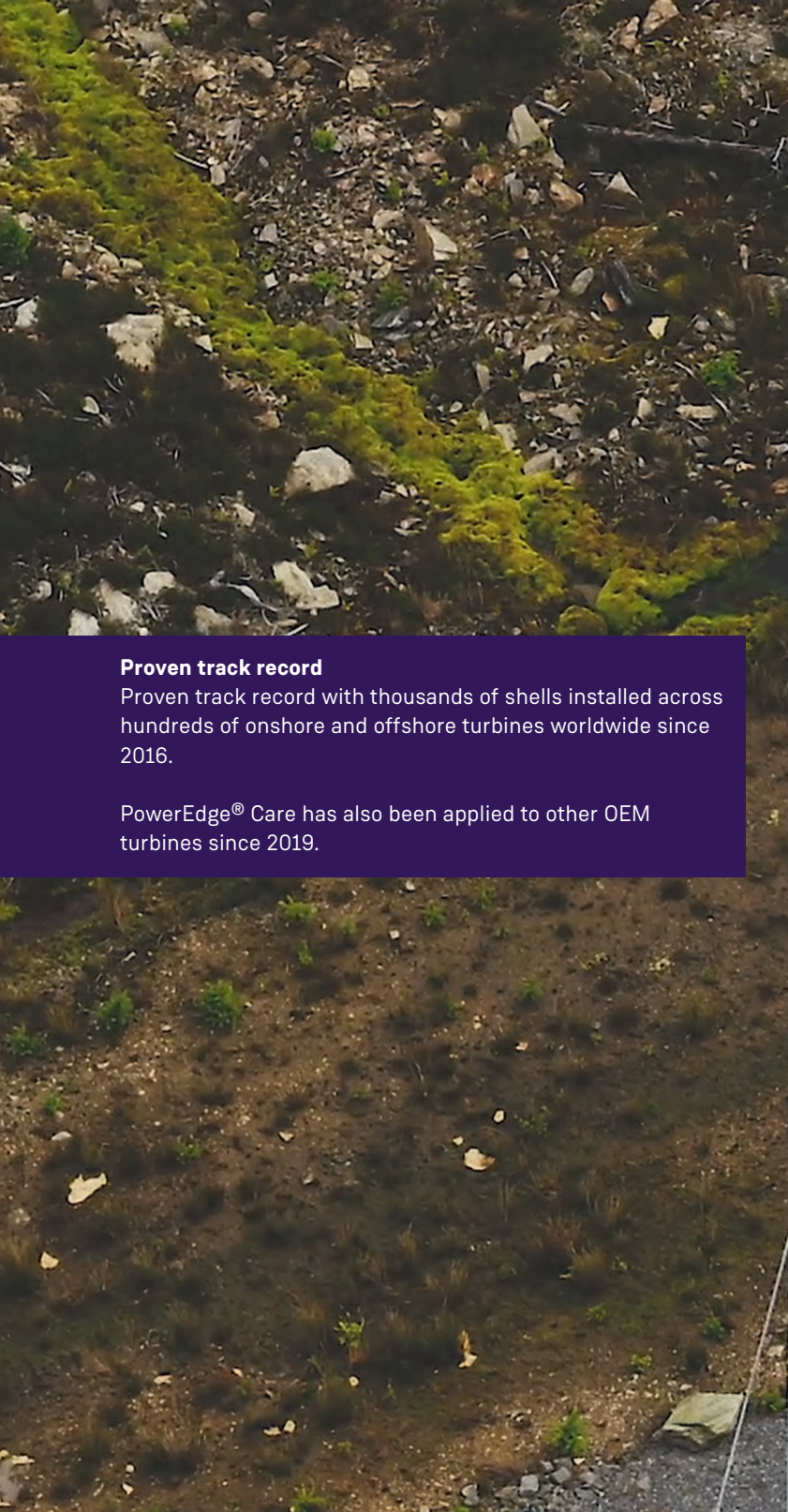
Typical cross section of a shell



1. Tip soft shell

2. Outer soft shells

3. Inner soft shells



Proven track record

Proven track record with thousands of shells installed across hundreds of onshore and offshore turbines worldwide since 2016.

PowerEdge® Care has also been applied to other OEM turbines since 2019.



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