



# Safeguard the leading edge for life!

Leading Edge Protection: PowerEdge™ Care

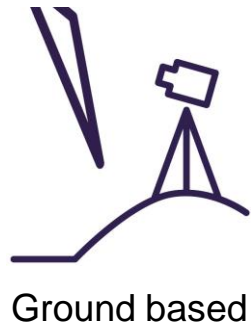
# Blade Integrity Management (BIM)

Born from experience: +1,000 SGRE inspections in 2017

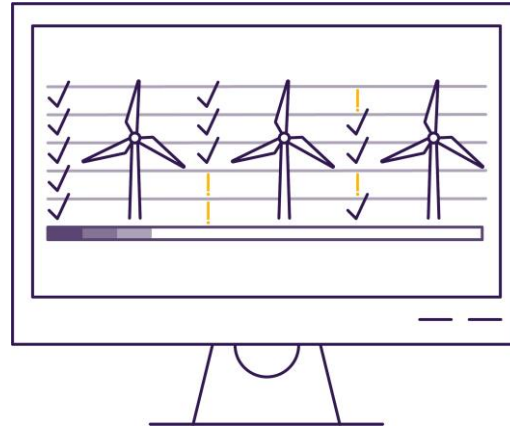
- Inspections

- Data storage and visualisation

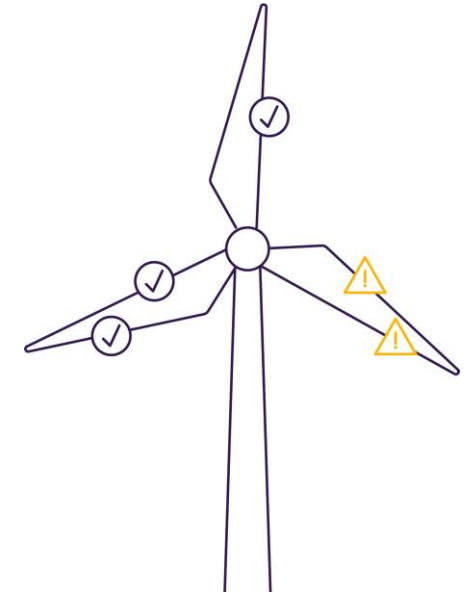
- Blade maintenance strategy



Data annotation



Calibrate erosion simulation models



BIM service program 1

BIM service program 2

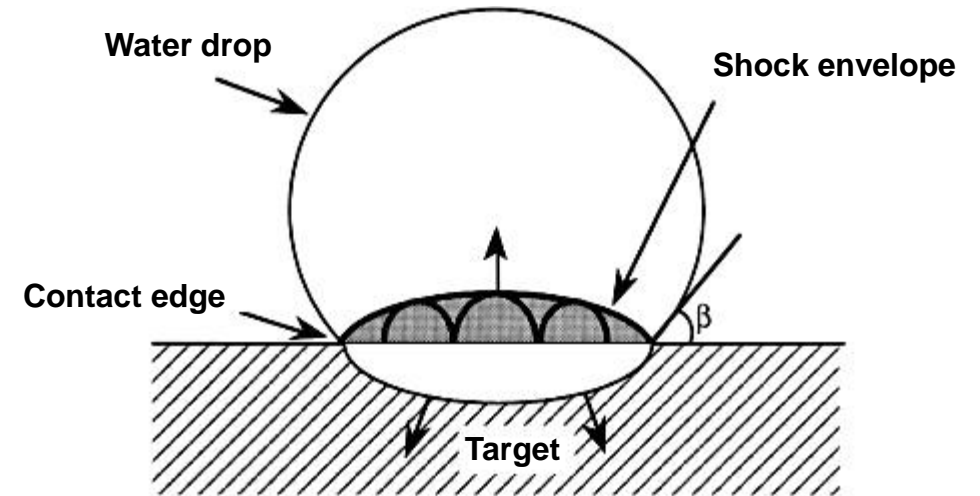
## Leading Edge Erosion

**Leading Edge Erosion** depends mainly on

- **Impact force**, which is proportional to
  - ✓ Rain drop size
  - ✓ Impact speed
- **Impact occurrence**, depending on the
  - ✓ annual rainfall

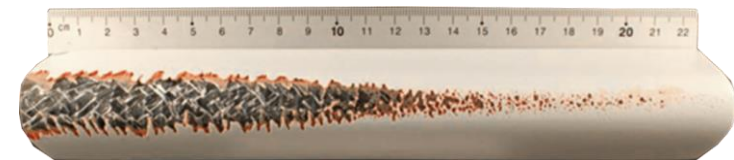
**Leading edge durability** depends mainly on

- Blade surface **erosion resistance**
- **Adhesion strength**



**Water hammer pressure**

"Erosion by liquid impact" by George Springer.



Example of results from a rain erosion test.

## What is PowerEdge™ Care?

- Thoroughly tested and optimized leading edge protection from SGRE
- Optimized application method, as the liquid adhesive is directly applied on the eroded blade and is also used as the filler and edge sealer
- No repairs of the eroded leading edge are required, on the exception of structural damages
- Optimized shell and sealing design leading to minimal aerodynamic impact

## Why is it of benefit?

- Provides a lifetime solution to leading edge erosion and thereby removes the need for future repairs to the leading edge
- A long term AEP gain is expected compared to eroded blades without PowerEdge™ Care
- Minimizes the WTG downtime due to leading edge repairs

## Where and how is it installed?

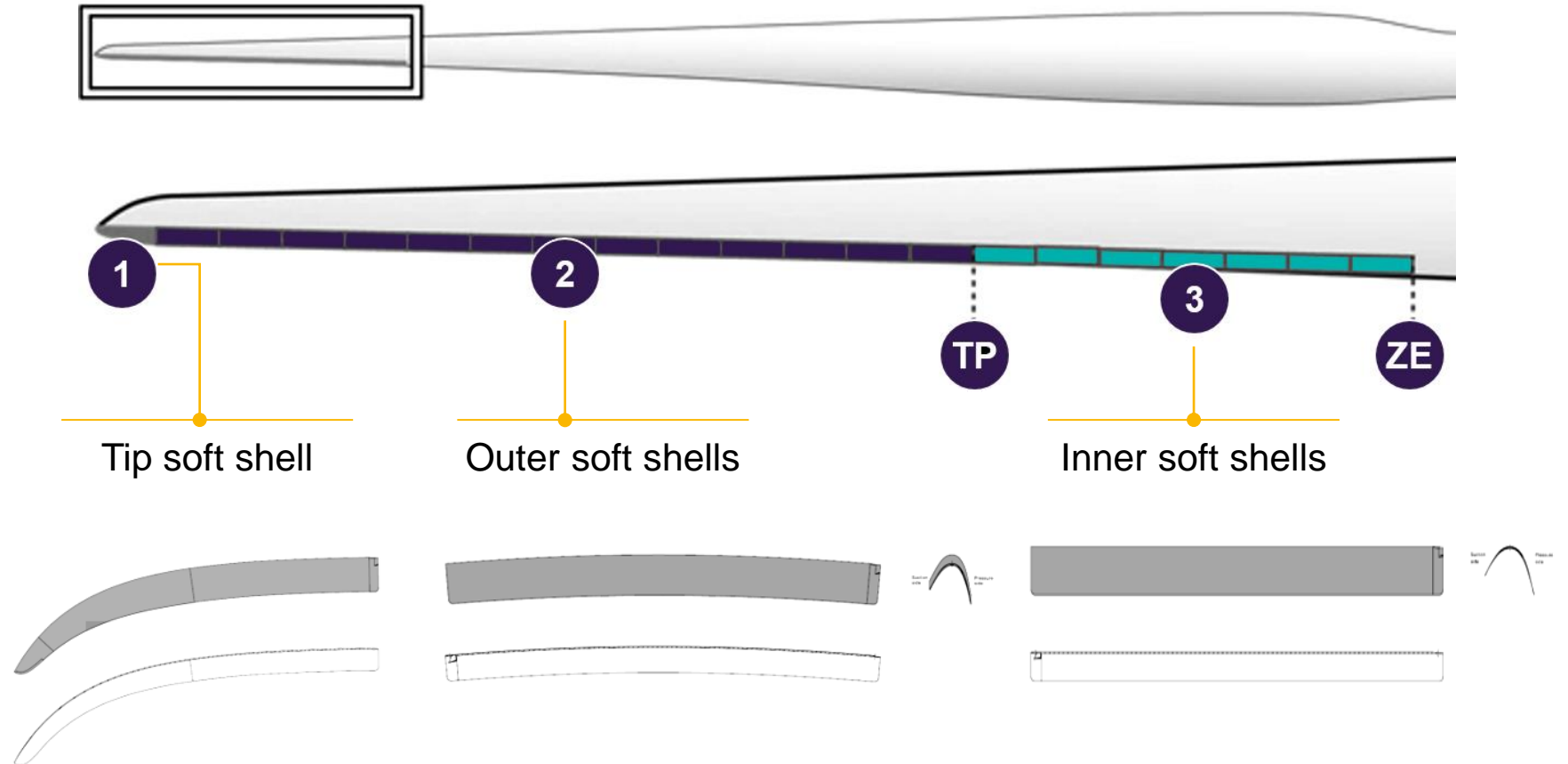
- Available for all SGRE blades today and for oOEMs after request
- The PowerEdge™ Care solution is installed on-site by rope technicians
- The length of LEP is case dependent

## Technical Details

### The PowerEdge™ Care shells are:

- 1 meter in length
- blade position and type specific
- designed to last 25+ years in an offshore environment
- designed for minimal AEP and noise impact

Configuration of tip, outer and inner shells



## Installation

LCOE optimized leading edge protection

### WTG lifetime durability through

- superior erosion resistance and adhesive strength
- Extensive testing (weathering, aging, different substrates, etc)

### Cost & Quality effective adhesive application through

- Simple & superior application method
- Liquid adhesive is used as a filler and glue
- No repairs are needed to the leading edge (except for structural damages)
- Extensive track record (1000+ shells installed)

### Limited weather downtime through

- ~6 m of shells can be applied in a day
- Broad weather conditions
- Fast adhesive curing time



## Operational Status

### PowerEdge™ Care operational experience and future growth

- PowerEdge™ Care has been running on 20+ offshore WTG's for 1-2.5 years. To date, 1000+ shells have been installed
- In 2018 the upgrade has been sold on 5+ sites, onshore and offshore, including customers who are also purchasing a jack-up based solution on other wind farms
- Currently being offered/discussed with 25+ projects world wide
- Commercial launch as off-the-shelf solution since October 2018



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Thank you

For more details, please contact your regional SGRE office!