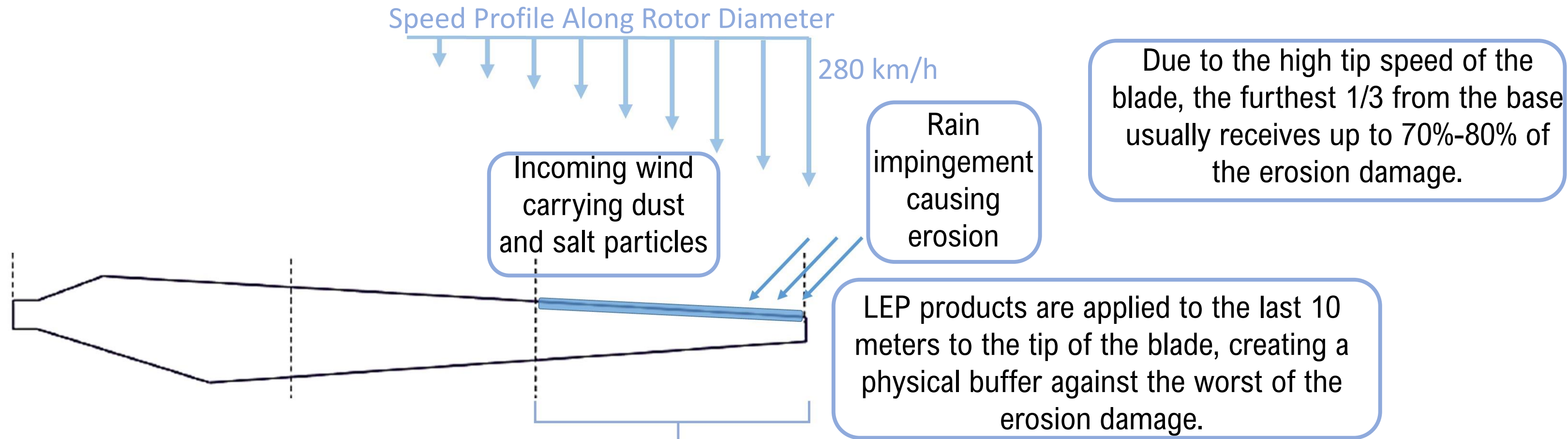


# LEADING EDGE PROTECTION

Majid Morshedizadeh, Jeremy Cadence, Marianne Rodgers

Exposure to environmental elements, high speeds (blade tip speed reaches over 280 km/h), and harsh conditions can damage the leading edges of wind turbine blades, compromising the blades' performance. WEICan examined the adhesion, resistance to erosion, and durability of several leading edge protection (LEP) products in a field test on the wind turbine blades in our Wind R&D Park.

## Why Leading Edge?



### Wind R&D Park Characteristics

Wind Capacity	10 MW
Number of Wind Turbines	5
Turbine Model	DeWind D9.2
PV Capacity	109 kW
PV Model	Jinko
PV Panels	187 Bifacial 85 Monofacial
Storage Capacity	223 kWh
Storage Rating	111.5 kW
Battery Model	Tesla Energy
Temperature Range	-30°C to +27°C
Topography	10 m cliffs and 300° ocean exposure

## Field Study of Blade Leading Edge Erosion



### Summer 2016 – Commencement of field study

- Observed damages: pitting, peeling, cracking, chipping, exposed fiberglass and dirt
- Applied 4 different products. The same product was applied to turbines 1 and 5.

### Physical inspection of the blades

- Photos taken both on the ground and using drones

### Site characteristics monitored

- Precipitation, icing, etc.

### Summer 2019

- Drone inspection revealed that four turbines experienced extensive leading edge damages. Those four turbines were repaired with the same LEP as used previously.

### Summer 2021

- Due to continued observation of damages, new silicon-based LEP coating applied to blade leading edges.

## Research Collaborations

### Energy Production Loss Estimation Due to Blade Erosion

In collaboration with National Renewable Energy Laboratory and Texas A&M University



### Erosion of Wind Turbine Blades

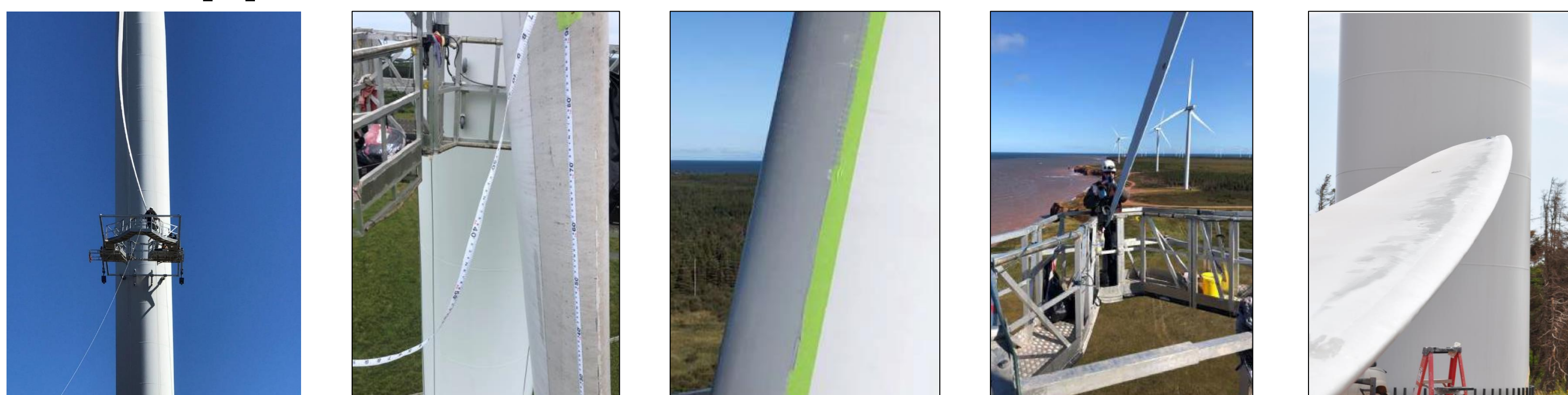
IEA Wind Task 46- Climatic conditions and Wind turbines operation with erosion



### Acoustic Monitoring of Blade Damage

Ping are developing a technology that will continuously monitor wind turbine blade damage using sound

## LEP Application



## Common Modes of Blade Erosion



Pitting



Delamination



Surface Cracking

### Contact

Marianne Rodgers, Ph.D.  
Scientific Director  
(902) 882-2746  
Marianne.Rodgers@weican.ca