Fall 2023

PHAZE BREAK

Wind | Solar

PROACTIVE COATINGS

Solutions for Ice Mitigation, Self Cleansing, and Heat Reduction

THE PROBLEM

The renewable Energy Sector faces a host of environmental issues that effect output and performance. We are addressing the following :

Accumulation, anchoring, and adhesion of ice to wind turbine blades poses significant risk and loss to owners and operators.

Headline:

“Icing costs wind turbine operators up to 80% of power production”

- Iowa State University

Excessive heat on solar panels decreases the capture of the sun's rays and reduces performance.

Headline:

“...depending on [solar panel] installed location, heat can reduce output efficiency by 10-25%.”

- Greentechrenewables

Layers of dirt, dust, and biologics on wind turbine blades decrease output and can effect the aerodynamics of the blades.

Headline:

“Accumulation of dust on solar panels...can reduce the output of photovoltaic panels by as much as 30 percent in just one month”

- MIT

OUR COATINGS

DESCRIPTION:

NEINICE provides icephobic and hydrophobic technology that maximizes ice shedding. It is compatible over most existing coating systems, providing protection from weather and UV exposure, thus dramatically extending the service life of the blades.

DESCRIPTION:

NEINHEAT works to reduce the surface and ground temperature of panels to keep energy output at optimum levels.

DESCRIPTION:

SUPER SLIP is a super hydrophobic coating that allows dirt, grime, and biologics to slide off turbine blades and solar panels and to maintain proper aerodynamic and energy absorption functions.

IN ACTION

With a focus on ice mitigation, rather than removal, Phazebreak is revolutionizing the toolset available to turbine operators.

By preventing auto shutdowns and shortening recovery periods, NEINICE can help operators rest easy knowing that their turbines can survive the negative impacts of winter.

Images taken from the same turbine

WITHOUT NEINICE

WITH NEINICE

PERFORMANCE

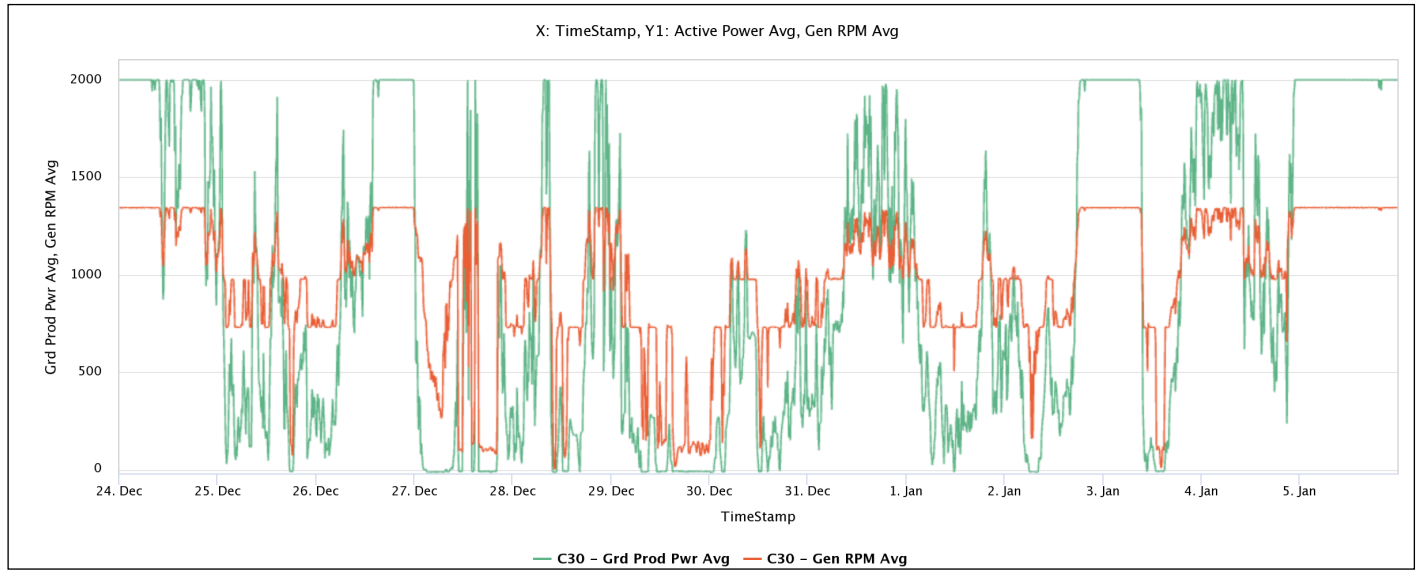
"Based on our field testing and evaluation we have decided to apply the Neinice coating at one of our projects. This project experiences multiple blade icing events per year and the cost/ benefit analysis resulted in a net benefit." - AES

"Yes, ice does form on the coated blades. I believe this is by design. The coating promotes the ice to shed, especially while the turbines are able to operate. (Wind and operation are our friend). The advantage to the coated turbines is that we see them recover much faster than the uncoated." - NEXTERA

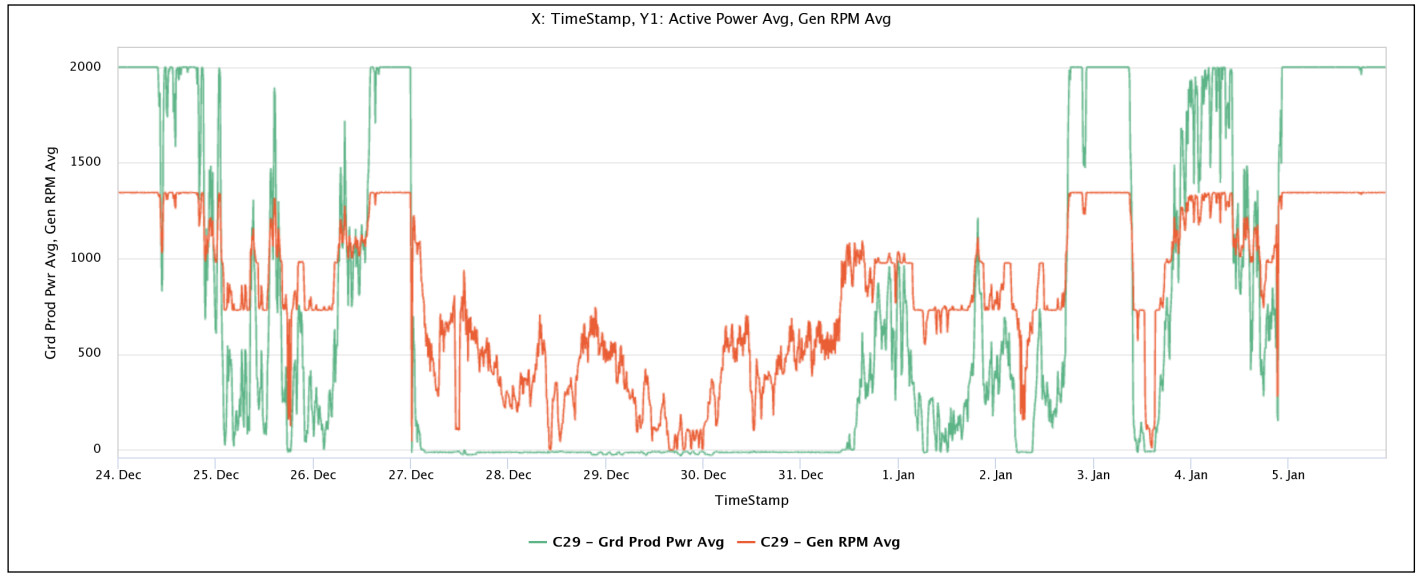
NEINICE FIELD PERFORMANCE

Grid Production Average, General RPM Average

Coated Turbine



Uncoated Turbine



PERFORMANCE

TEST RESULTS PREVIEW

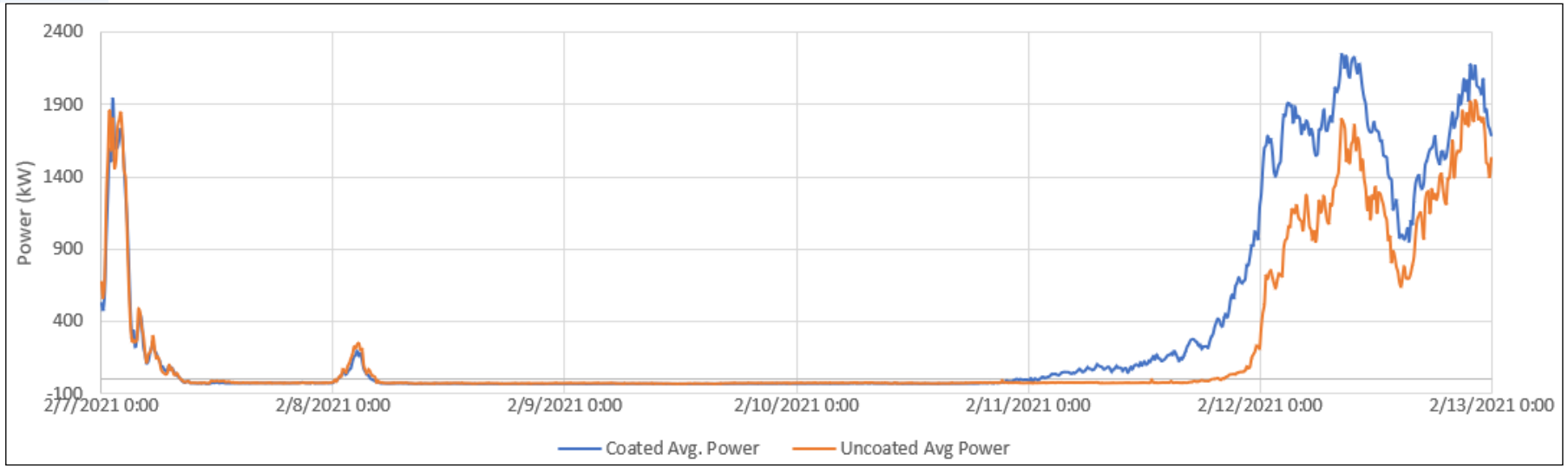
During a 4 day icing event in the winter of 2020-2021 in Oklahoma, wind turbines that were coated with NEINICE experienced a 109% performance improvement compared to uncoated turbines. Recovery time was also significantly faster.

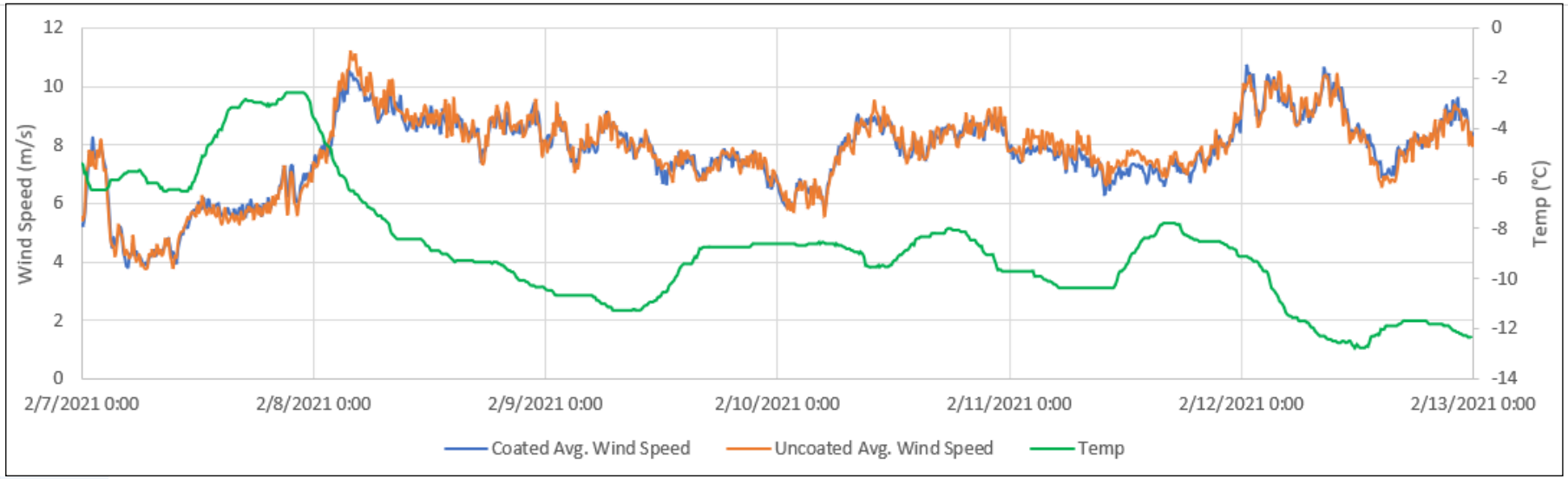
HIGHLIGHT

109% Improvement between coated and uncoated blades

NEINICE FIELD PERFORMANCE

PROVIDED BY OPERATOR





PERFORMANCE

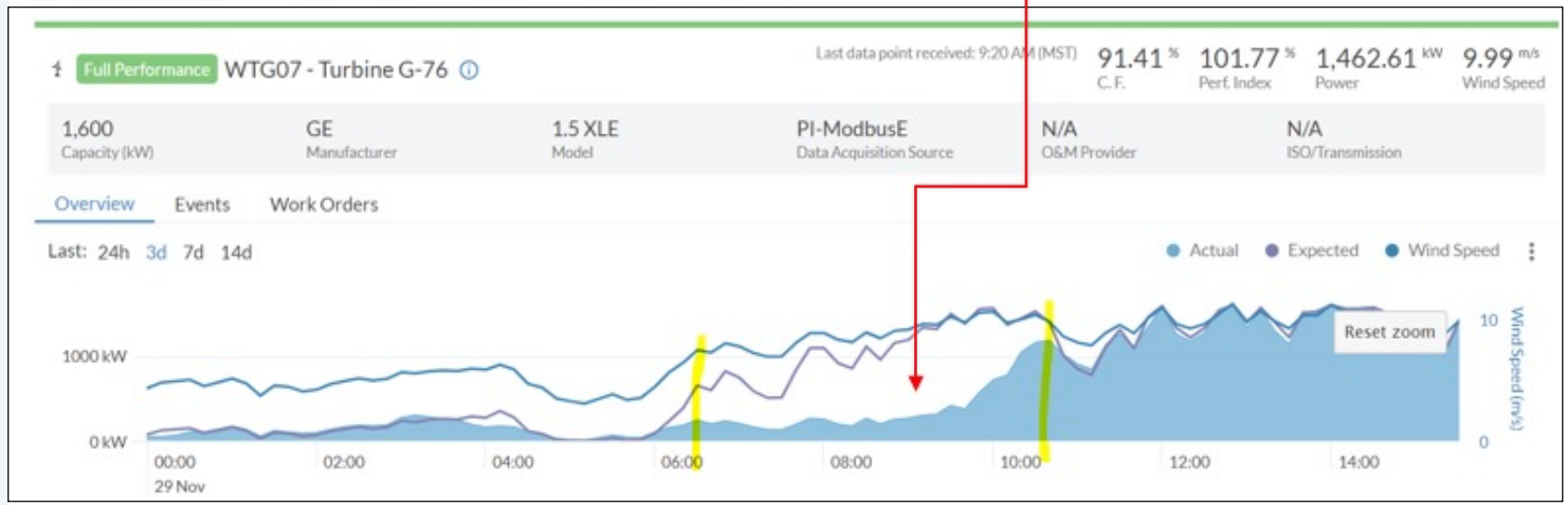
A comparison of coated turbines with NEINICE and uncoated turbines in Idaho shows that the turbine on the bottom is realizing its maximum potential by reaching the top line of the graph and filling in the performance section after recovering from a serious ice event.

The top turbine fails to recover its potential until long after the event is over.

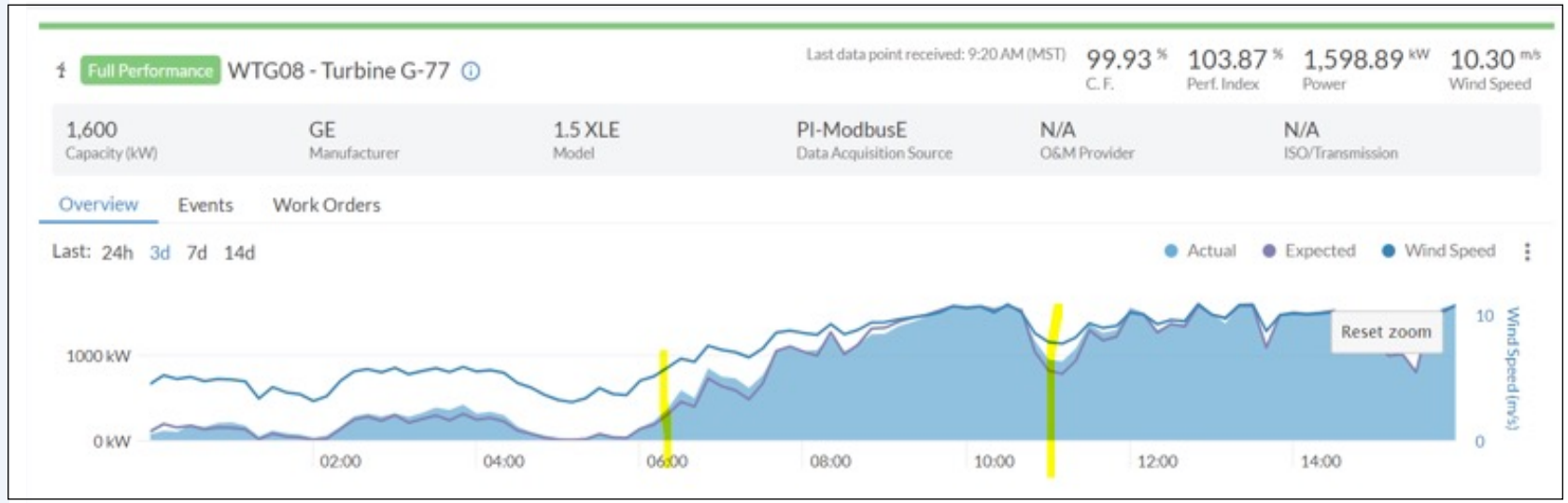
NEINICE FIELD PERFORMANCE

PROVIDED BY OPERATOR

Uncoated Turbine



Coated Turbine



THE COMPETITION

Current Options are Reactive

Integrated Blade Heating

Current Market Cost:
~ **$50,000** per Turbine
Adds significant weight and requires additional power to operate the heating elements.

Blade Vibration Unit

Current Market Cost:
~ **$30,000** per Turbine
Vibration to blades can cause alignment issues over time.

Third Party Ice Removal

Current Market Cost:
$2,000 per hour
No control over ice throw.
Requires weekly / monthly maintenance.

NEINICE

Proactive

Average coating cost per turbine : $2,800
3-5 Year Coating Efficacy

Competitive Advantage

Time

NEINICE allows turbines to quickly recover from icing events, thus producing increased operating time and output.

Revenue

Wind farms operating during severe ice events are able to take advantage of surge energy pricing.

Safety

Reduced ice build-up significantly lowers the risk of ice throw.

Cost Savings

Case Study

Event Date: February 2022
Location: Midwest - USA

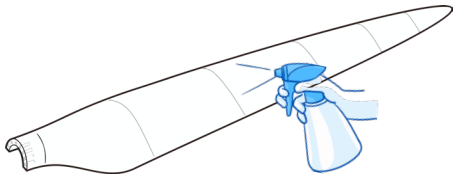
Total Turbines	**5**
Duration of Event (Hours)	**144**
Est. $mW/h	**$199**
AVERAGE mW/h Increase	**0.109**
Event Total mW/h Increase	**15.696**

Event Revenue Increase Per Turbine:
$3,123.50

Event Revenue Increase All Turbines:
$15,617.52

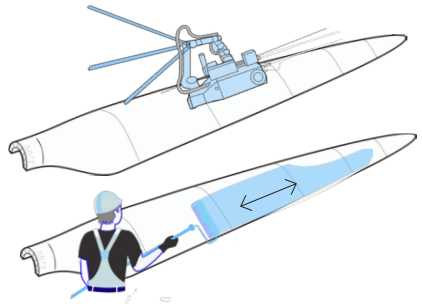
APPLICATION

How its applied :



Step 1. Clean

Step 2. Mix



Step 3. apply

Partners :

AERONES

BLADE PLATFORMS

rope partner

GOLIATH GR REACH

Suspendem

Methods :

ROBOTICS

PLATFORM

ROPE ACCESS

GROUND CREW

THE TEAM

Mariza Browning

CEO

Don Browning

V.P., Operations

Dave Rupp

V.P., Global Sales

Max Cantu-Lima

Creative Director

Aaron Dupuis

Director of Marketing