

# Controlling Lightning Risk



ANDERS RØPKE  
[AR@WINDPOWERLAB.COM](mailto:AR@WINDPOWERLAB.COM)  
+45 3048 2448

 **WIND POWER LAB**  
 **Global Blade Experts**

ST. KONGENSGADE 58 D - 1264 COPENHAGEN K - DENMARK  
100 BISHOPSGATE - LONDON 4C2N 4AG - UNITED KINGDOM

[MBK@WINDPOWERLAB.COM](mailto:MBK@WINDPOWERLAB.COM)  
PHONE +45 31321006



It was a dark and stormy night...

  **WIND POWER LAB**  
  **Global Blade Experts**

ST. KONGENSGADE 58 D - 1264 COPENHAGEN K - DENMARK

100 BISHOPSGATE - LONDON 4C2N 4AG - UNITED KINGDOM

[MBK@WINDPOWERLAB.COM](mailto:MBK@WINDPOWERLAB.COM)

PHONE +45 31321006



It was a dark and stormy night...



 **WIND POWER LAB**  
 Global Blade Experts

ST. KONGENSGADE 58 D - 1264 COPENHAGEN K - DENMARK

100 BISHOPSGATE - LONDON 4C2N 4AG - UNITED KINGDOM

+45 31321006 - [MBK@WINDPOWERLAB.COM](mailto:MBK@WINDPOWERLAB.COM) - [WWW.WINDPOWERLAB.COM](http://WWW.WINDPOWERLAB.COM)

*Images: Lachlanc Ross and Matthew Paulson*



# Wind Turbine Blades

- ... are big, expensive and do fail
- ... are not in stock
- ... **get struck by lightning!**



# When a blade gets hit



FLASH OVER DAMAGE RELATED TO DAMAGED DOWN CONDUCTOR CABLE



SPLIT TRAILING EDGE



DELAMINATION



FLASH OVER DAMAGE



## Lightning related blade damages





# Cost and Business Interruption

**Left unattended these blade damage can progress**

- so what? It is expensive!
- For insurers
- For wind farm owners and operators
- All of us as we are relying on green electricity!

## Considerations

- Supply chain issues
- Insurability
- OPEX cost





# Increasing repair time

Detect in time	Early detection	Damage propagation
Cat 3 damage	2.6 days repair days	4.8 days repair days
Cat 4 damage	5.3 days repair days	9.2 days repair days
<b>Total</b>	<b>7.9 days repair days</b>	<b>14 days repair days</b>



TIME = PROGRESSION = COST



+€10,000

+€25,000

+€50,000

+€100,000

DAY 0

6 MONTHS

12 MONTHS

18 MONTHS





# Why this matters for insurers!



Lightning can strike early in the season, just after statutory blade inspections. **The damage it causes will not be seen within your blade damage reports and can go unreported for 12-18 months.**

- 0 months in. Time estimate for a repair:  
1-2 days- total cost of less than **€10k**.
- 6 months in - progression! 4-5 days of work! Both cost wise and risk wise. Still repairable, but **€25-€50k**.
- 12 months in - blade on the ground! Or repairing in 5-25 days.  
Cost increase to **€75-€150k**.



*What if* wind farm operators could reduce these  
**BLADE RELATED OPEX EXPENSES?**

*What if* insurance could reduce size of these  
**WIND TURBINE BLADE CLAIMS ?**





# Complication

Get lightning sensors on all turbines!

The positive side: know exactly when something got hit.

The negatives... It takes a huge investment in sensors for every turbine, in a business case with no room for this!

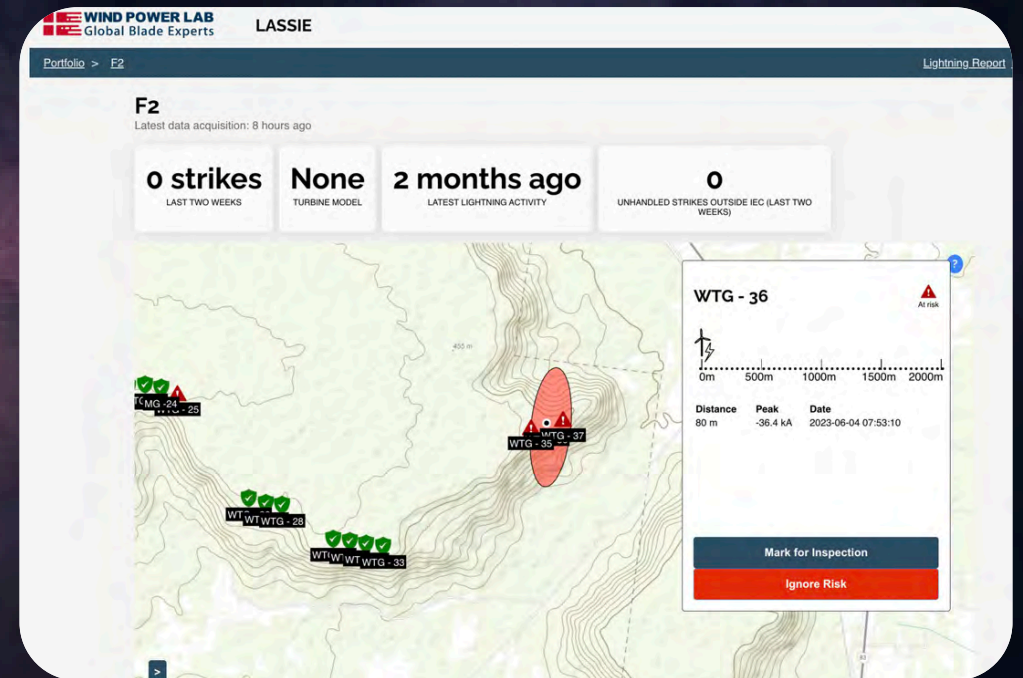
*What do we need do instead?*



# Solution



1. Get low-cost lightning surveillance capabilities without installing sensors
2. Find lightning damages before they progress
3. Save repair cost and limit BI



# You get insights to act on:



**WIND POWER LAB**  
Global Blade Experts

LASSIE

Portfolio > F2 Lightning Report

**F2**  
Latest data acquisition: 8 hours ago

**0 strikes**  
LAST TWO WEEKS

**None**  
TURBINE MODEL

**2 months ago**  
LATEST LIGHTNING ACTIVITY

**0**  
UNHANDLED STRIKES OUTSIDE IEC (LAST TWO WEEKS)

**WTG - 36** At risk

0m 500m 1000m 1500m 2000m

Distance	Peak	Date
80 m	-36.4 kA	2023-06-04 07:53:10

Mark for Inspection
Ignore Risk

**F2 Last 365 days**

**513**  
TOTAL STRIKES

**3**  
NO. OUTSIDE IEC 2010

**26**  
TURBINES

**21.1**  
AVG STRIKES WITHIN 2KM PR TURBINE

**Theoretical risk overview**

**20.7**  
THEORETICAL EXPECTED ATTACHMENTS

**19**  
TURBINES WITH NO LIGHTNING ACTIVITY

**7**  
TURBINES WITH MORE THAN 1 STRIKE

**Turbines with most lightning activity**

Turbine	Theoretical Attachment Count	<500m
WTG - 25	3	6
WTG - 35	1.8	5
WTG - 33	1.6	3
WTG - 46	1.3	5
WTG - 22	1.3	4
WTG - 28	1	2
WTG - 49	1	2
WTG - 42	1	1

# To discover these in time:



FLASH OVER DAMAGE RELATED TO DAMAGED DOWN CONDUCTOR CABLE



SPLIT TRAILING EDGE



DELAMINATION



FLASH OVER DAMAGE



Repair before progressing into expensive repairs or catastrophic blade claims



# ROI?



€ 10,000

+€25,000

+€50,000

+€100,000

DAY 0

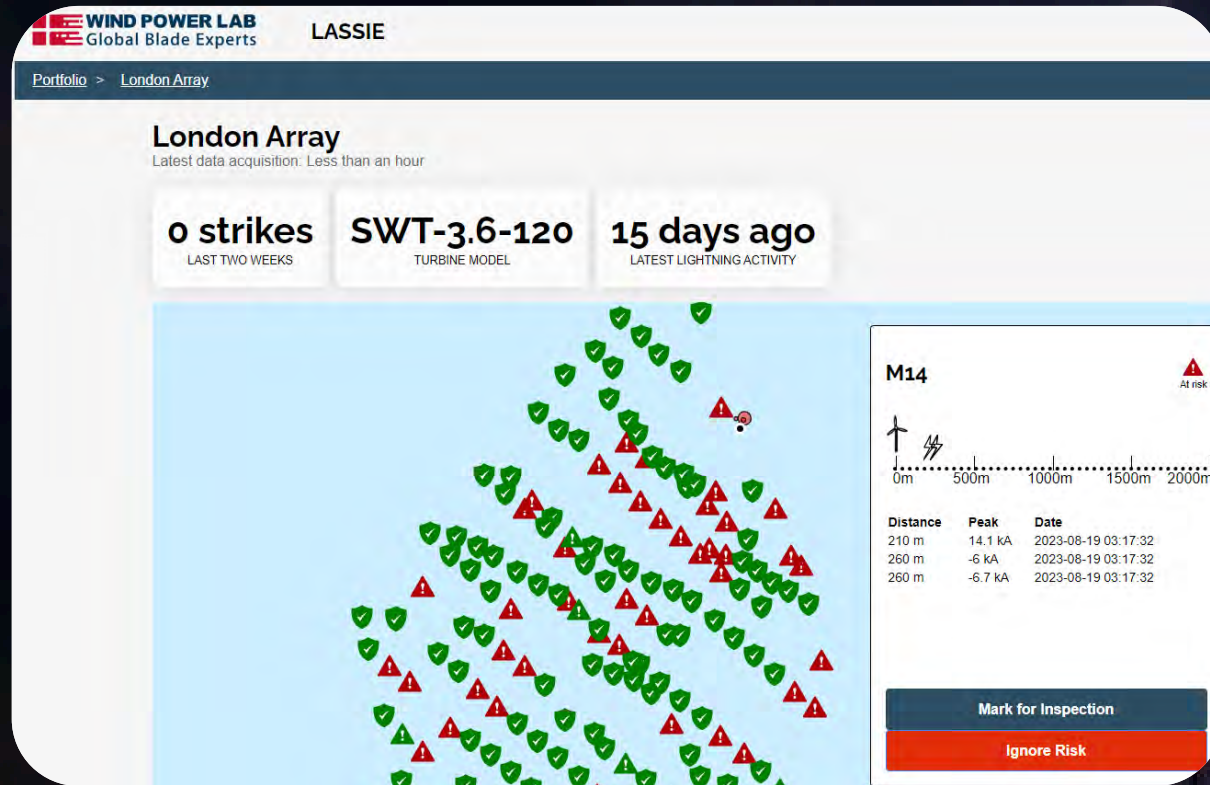
6 MONTHS

12 MONTHS

18 MONTHS



# LASSIE for Owners and Operators



## Owners & Operators

- challenge service providers to verify nothing has happened to your asset, based on in field insights
- challenge warranty
- become prudent operators

ROI: saving OPEX cost and keeping assets insurable



# LASSIE for Risk Engineers and Brokers!



**WIND POWER LAB**  
Global Blade Experts

LASSIE

Portfolio > Gwyn y Môr

Turbine Model: [input]  
Turbine Status: [input]  
Peak current range: [slider] min max  
Distance: 502 m [slider]  
 Only show most probable strike  
 Only show without comment

Selected turbines:

Comment or note: [input]

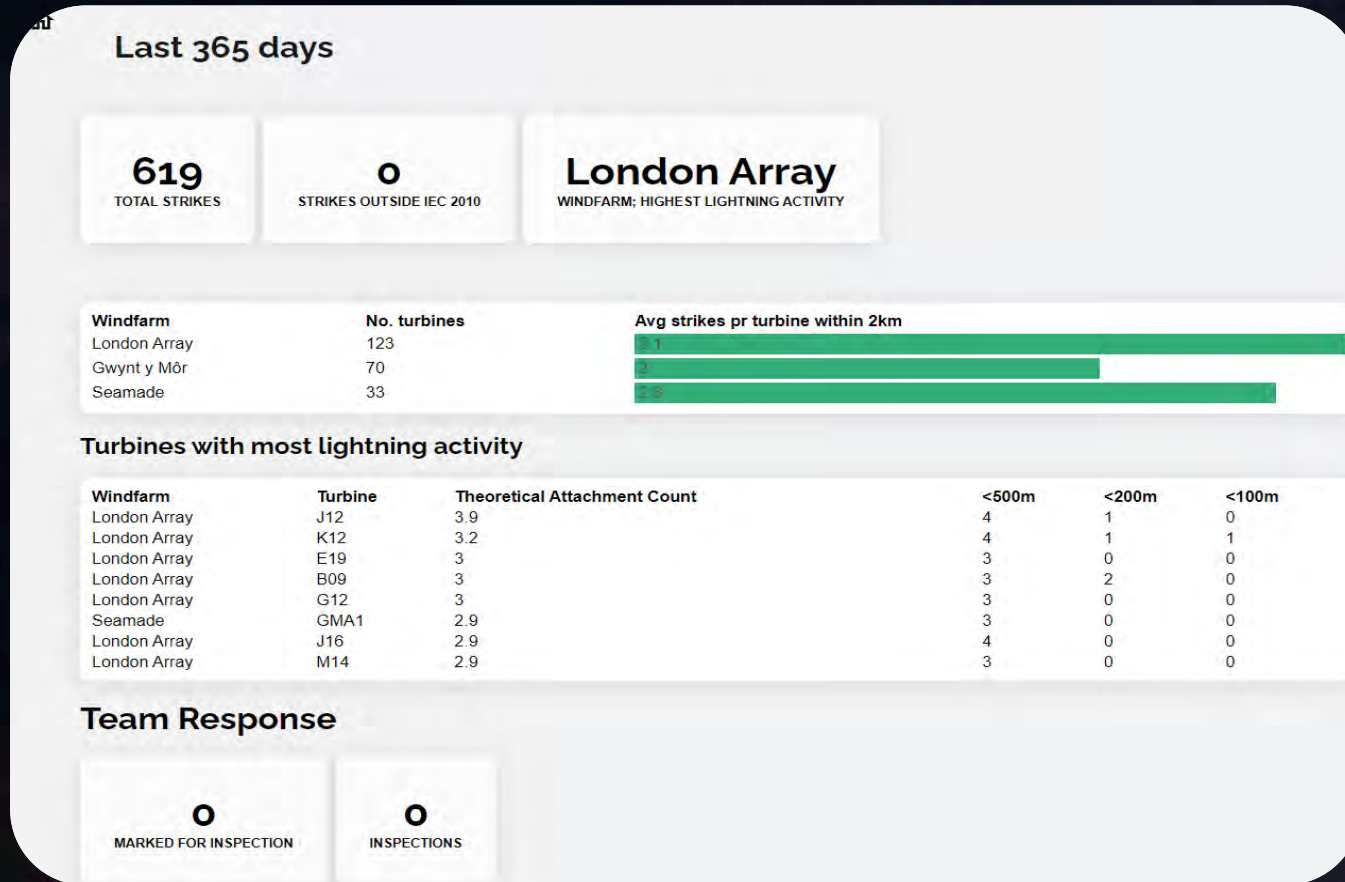
Selected	Name	Model	Comment	Overall probability	Closest lightning	Outside cert
<input type="checkbox"/>	T093	SWT-3.6-107		100 %	110 m	Show less -
			<b>Distance Major axis</b>	<b>Peak current</b>	<b>Hit probability</b>	<b>Timestamp</b>
			110 m 70 m	13.1 kA	100 %	2023-06-18 18:31:36.726
			110 m 200 m	-5.7 kA	94 %	2023-06-18 18:31:36.726
<input type="checkbox"/>	T092	SWT-3.6-107		100 %	30 m	Show more +
<input type="checkbox"/>	T036	SWT-3.6-107		100 %	70 m	Show more +
<input type="checkbox"/>	T048	SWT-3.6-107		100 %	290 m	Show more +
<input type="checkbox"/>	T160	SWT-3.6-107		100 %	260 m	Show more +
<input type="checkbox"/>	T071	SWT-3.6-107		100 %	110 m	Show more +
<input type="checkbox"/>	T083	SWT-3.6-107		100 %	190 m	Show more +
<input type="checkbox"/>	T054	SWT-3.6-107		100 %	210 m	Show more +
<input type="checkbox"/>	T121	SWT-3.6-107		100 %	280 m	Show more +
<input type="checkbox"/>	T150	SWT-3.6-107		100 %	270 m	Show more +
<input type="checkbox"/>	T053	SWT-3.6-107		100 %	320 m	Show more +
<input type="checkbox"/>	T065	SWT-3.6-107		100 %	360 m	Show more +
<input type="checkbox"/>	T100	SWT-3.6-107		99 %	330 m	Show more +
<input type="checkbox"/>	T057	SWT-3.6-107		98 %	170 m	Show more +
<input type="checkbox"/>	T005	SWT-3.6-107		98 %	300 m	Show more +
<input type="checkbox"/>	T061	SWT-3.6-107		97 %	100 m	Show more +

## Brokers & Risk Engineers!

- True asset risk with respect to lightning, show the real risk as part of broking processes

- this is what your clients should have in place to control lightning risk, without being forced into installing expensive sensors

# LASSIE for Underwriters!



## Underwriters!

- this is your real traffic light validating if this potential client has their lightning risk under control

ROI: quality risk on policy

# True unforeseen events



The IEC standard LPL 1 requirements are expected to be handled by wind turbine blade lightning protection systems as per design  
- if not, this is “just” yet another insurance case

This should be challenged – every time – with data and track record

**Insurance is for unforeseen events like unexpected lightning damages**





Turn *blade nightmares* into *dream insurance clients*!

