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Case study

Tackling high cost for DC field monitoring and “invisible” underperformance

How advanced analytics helps to recover 15% of uncategorized losses.

PVPMC CYPRUS 2025

PRESENTED BY LSBP
30/10/2025



Lightsource bp – Who are we?

Lightsource bp is on a mission to become a **global leader** in onshore renewables.

(…)

We are a leading **developer**, **financier** and **operator** of **utility-scale renewable energy projects.**

(…)

We are growing at pace and scale**, going beyond business as usual, to act as an enabler of the energy transition**.



19

active markets



5.3GW

operational and under construction portfolio*



55GW+

development pipeline**



11.9GW

development track record

Safety
Integrity
Respect
Sustainability
Drive

* *Managing 4.6 GW (4.1 Owned assets), managing and operating 1.3GW.*

The challenge

Unexplained underperformance

- **Scalability** of solar means less granularity of data;
- **Diagnosis** of root causes and **resolution** becomes **more challenging**;
- **Performance dips**, resulting in financial losses;

Our case:

- *No consistent form of big-data analysis*
- *No string-level monitoring*
- *~15% power loss during high irradiance (2021–2025)*
- *Between $213k/year to $317k/year[1] revenue loss across the 3 sites*

The solution

- *Fault detection relying on advanced analytics, running automatically.*
- *Categorization enables targeted repairs.*
- *Root cause: inadequate fuses → tested replacements.*
- *Tracking using the new tools to ensure fast response and consistent diagnosis*

Results

- *Faster detection & improved repair efficiency since implementation.*
- *Root cause identified and proposed solution yielding strong results*
- ***Operational Gains:** Peak capacity at lower irradiance.*
- Sustained high yield & reduced recurrence of fuse faults (root cause).
- ***Economic Impact:***

Conservative scenario

Site 1 $42.9k–$59.8k/year;

Site 2 $57.7k–$81.5k/year.

Site 3 $90.3k-$93.8k/year;

Aggressive scenario:

Site 1 $83.8k–$90.4k/year;

Site 2 $110.2k–$126.4k/year.

Site 3 $110.8k–$113.2k/year.

[1] *conservative vs aggressive scenario; conservative scenario considers we recover only the gap to budget performance ratio; aggressive scenario considers we recover all detected DC losses.*

The challenge

Unexplained underperformance

Our case:

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Timeline

2022

Q1– *First intervention of DC health issues found by scheduled drone flight*

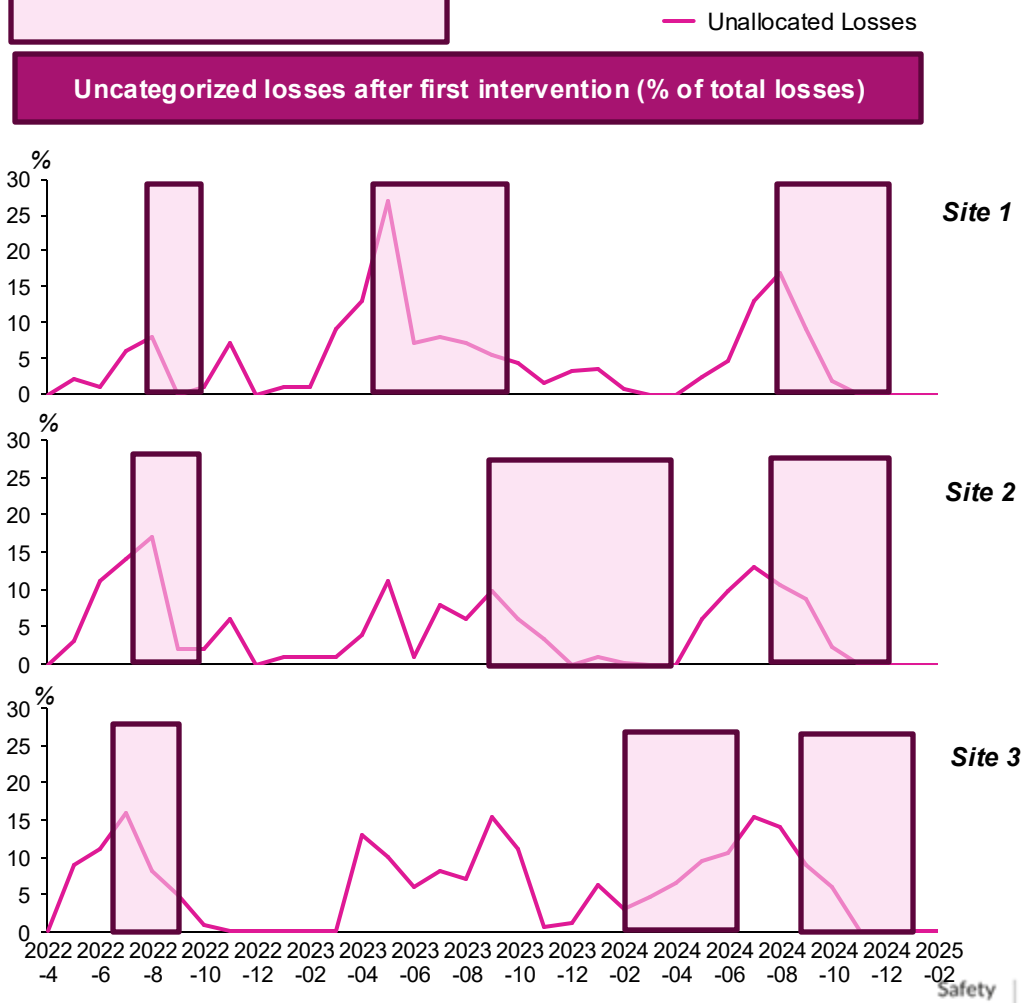
Q2 – *Resurging of uncategorised losses – missed due to inability to efficiently detect them –* ***conclusion that we must be suffering from other issues***

Q3 – *O&M heeds our call to investigate DC field again as we start spotting more underperformance*

2023

Q1 – *Unexplained underperformance resurges once more.*
Q2 – *We start using Advanced Analytics tools and got a more comprehensive understanding of the issue at hand*

O&M interventions
Focused on DC field, i.e. **replacing of fuses and fuse holders**



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The challenge

Unexplained underperformance

Timeline

2023

Q2 – *We start using Advanced Analytics tools and realise:*

DC Losses are strongly correlated with the unallocated losses, but that these fixes didn't last for long.

They occur very fast and result in an 8% relative performance loss in the CB, which is equivalent to a blown fuse.

Q3-Q4 2023

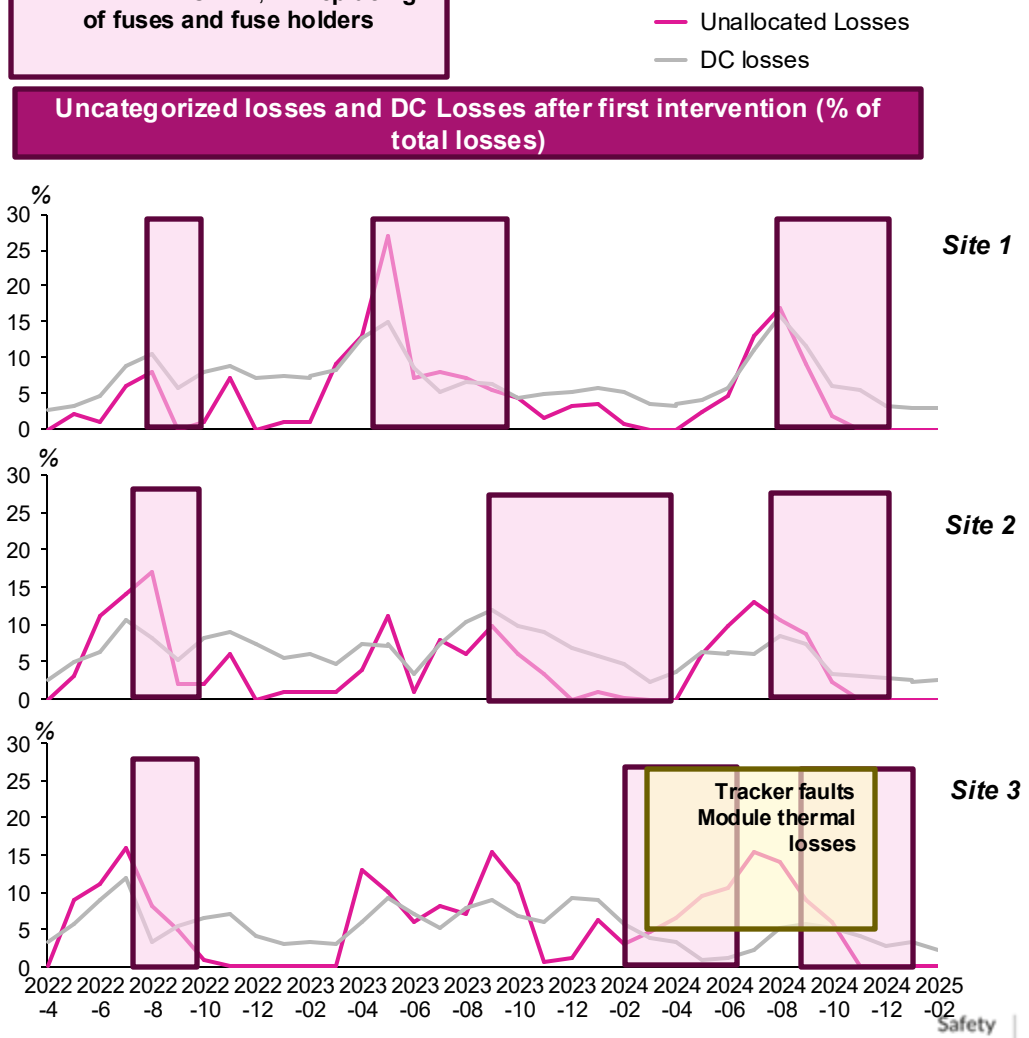
Solution: Replace Fuses!

Q1-Q2 2024

Issues return on all sites

This was not the root cause. Re-strategize

O&M interventions
Focused on DC field, i.e. **replacing of fuses and fuse holders**



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The solution

Q3 2024

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Root Cause Analysis

Known evidence:

1) Failure Mode: Blown Fuses

2) Fixes were short-lived

3) Evidence of burnt fuse holders

Hypothesis:

1) The fuse holders are too packed, thus leading to mutual overheating.

2) The fuse rating is underestimated.
1 Fuse carries current of 2 strings

$$I_{nom} = 2 * (I_{SC} * 1.25 * 1.25) = 34.56\ A$$

Continuous current adjustment

Additional OCPD sizing factor

I_{nom} = 34.6 A > 32 A = Fuse Size



Solution 1 – Change to 40 Amp fuses

Key conclusions:

Size of fuse holder does not allow it
Max size = 85x10 mm

Too expensive** to replace **busbar**, it was cheaper to replace the **boxes.

Solution 2 – Different brand, same size:

On field experience of trusted technician, who recommended test in a single unit with new brand.

He had seen better behaviour and lower failure rates in other projects;

Low investment to pilot, we have the capability to track results

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Solution 2 – Different brand, same size

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Mersen 32A fuse



Littelfuse 32A fuse

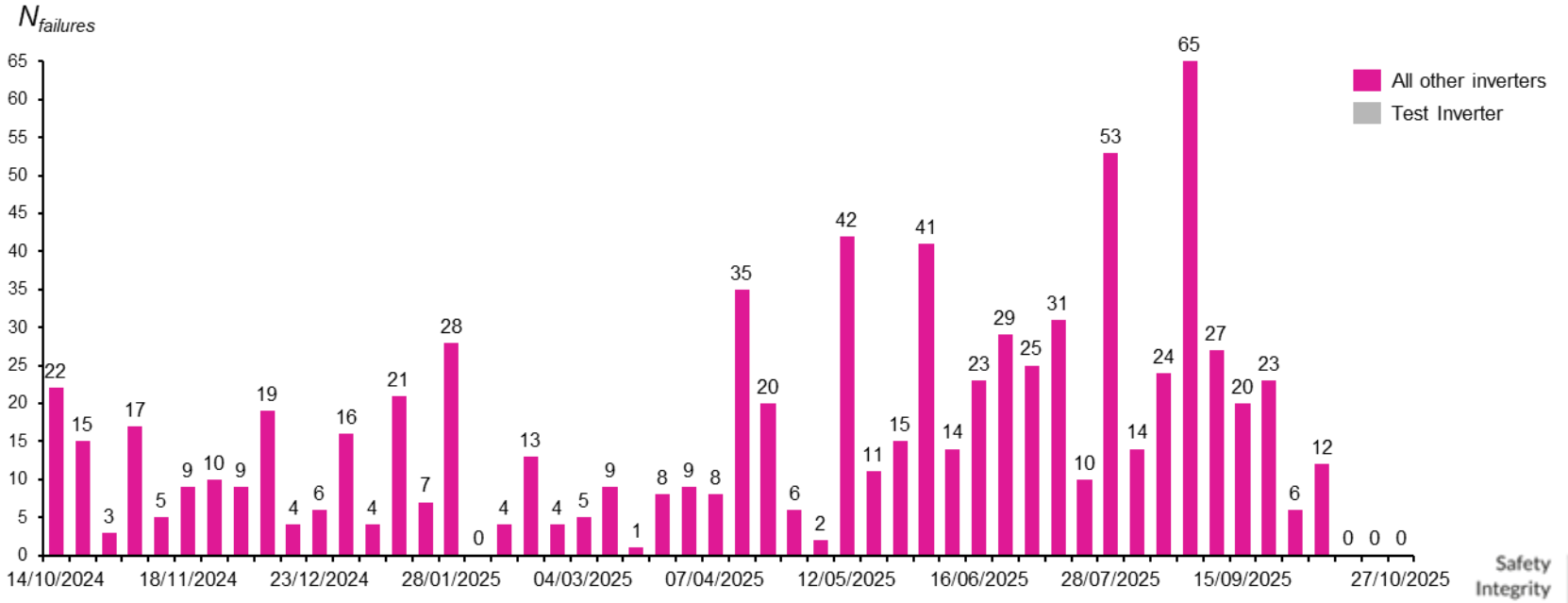


Since October 2024

- ✅ *No fuse failures on the test inverter*
- ⚠️ *804 fuse and fuse holder failures on all other 18 units, or ~45 failures per inverter*

At the start of October 2025, we proceeded with the replacement of all fuses with Littelfuse. Fuse holders will be replaced next week, w.c. Nov 3rd.

No fuse failures have been registered since replacement started



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Results – For the sites

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🛠️ ***Root cause identified and proposed solution yielding strong results.***

Root cause is known and has been mitigated to a considerable extent

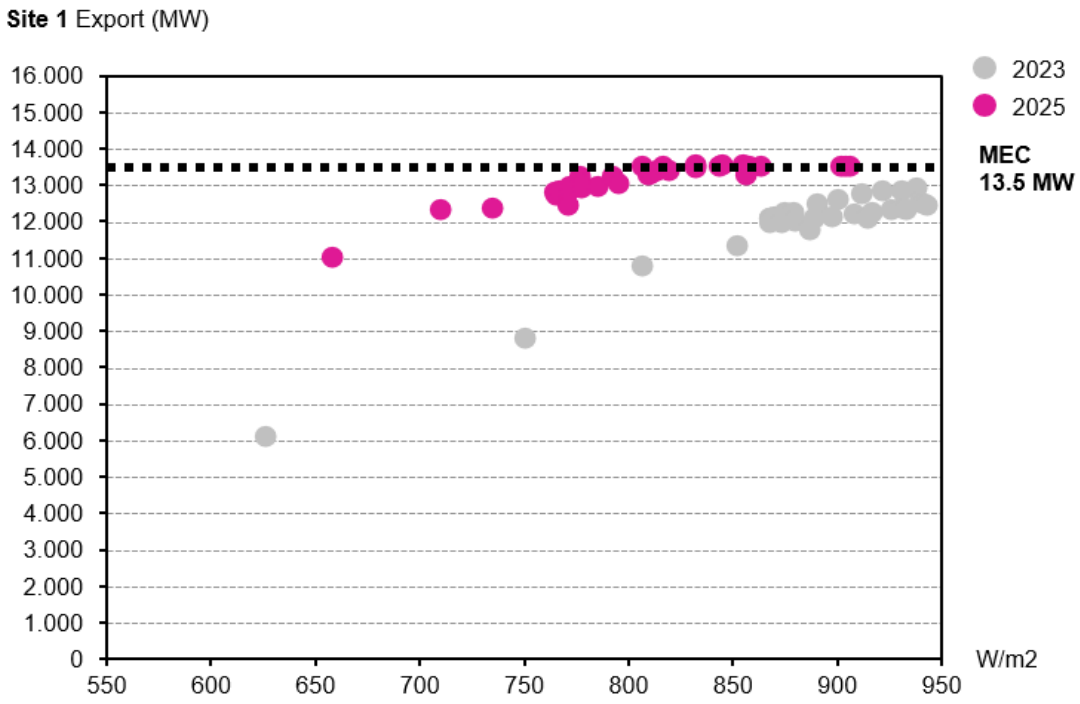
✅ ***Operational Gains: Peak capacity at lower irradiance.***

As shown in graph, the potential to reach peak capacity is present when issues were temporarily corrected

📈 **Sustained high yield & reduced recurrence of fuse faults (root cause).**

New solution is expected to be robust enough to greatly impact the sites' state from the near past

💵 ***Economic Impact:***



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Results – for LSbp

LSbp in 2025

- *Reactive (and fast) at first, proactive after*
- *Leverages well its resources*
- *Great understanding of the fleet*
- ***Still learning and improving***

VS

LSbp in 2021

- *Reactive and slow in doing so.*
- *Inefficient and unsure, but capable.*
- *Limited understanding*
- *Still learning*

What changed?

- *More data-driven, quality of data is paramount.*
- *Automatization allowing expansion of capabilities.*
- *Democratization of data.*
- *Strong relationships and partnerships*

⏱ *Fast response to events*

🛠 Improved quality of *service*

📈 Sustained high yield

✅ *Operational Gains*

💵 *Strong Economic Impact*

For all our fleet

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Thank you for your attention

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Sustainability
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