



WHEN TRUST MATTERS

Diagnosis of under-performing power plants using new SolarGEMINI

US PVPMC 2025

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13 May 2025

AGENDA

01

SolarGEMINI

02

NEW VERSION

03

CASE STUDY

04

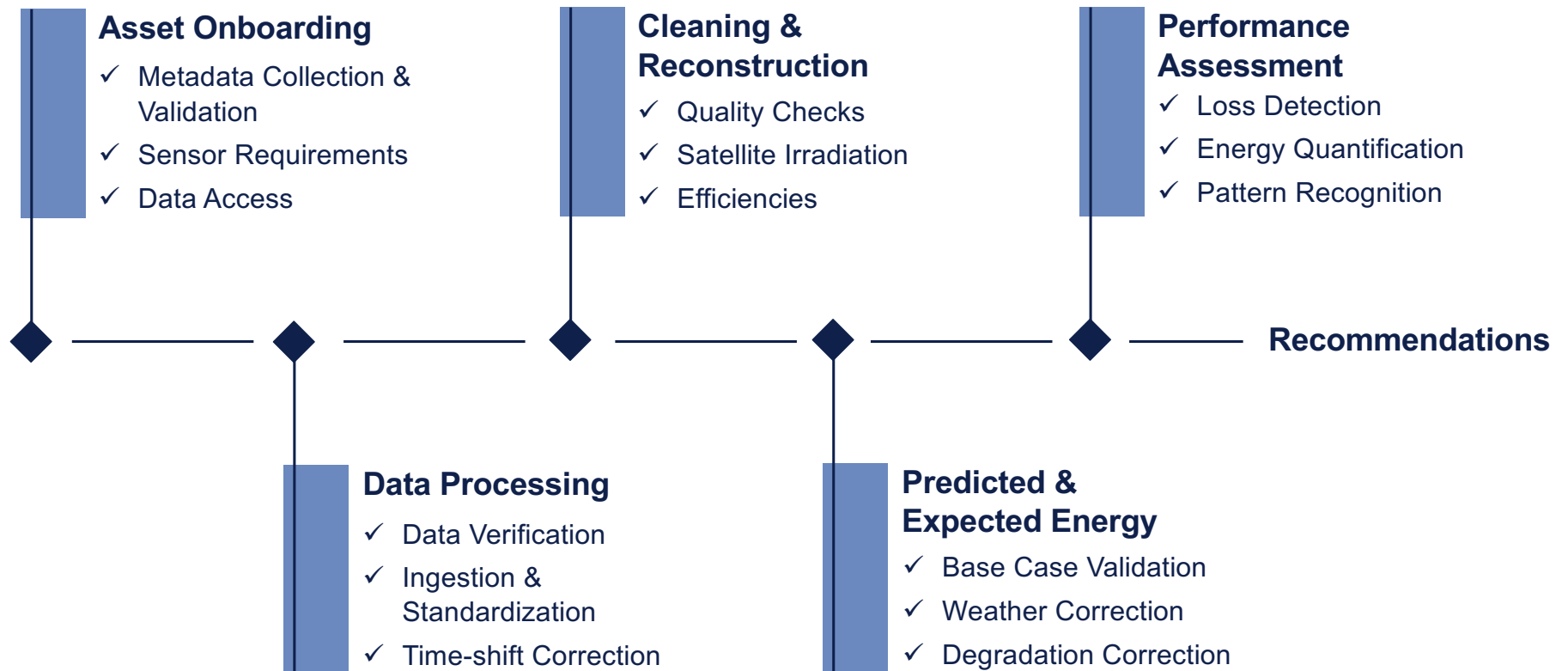
NEXT STEPS



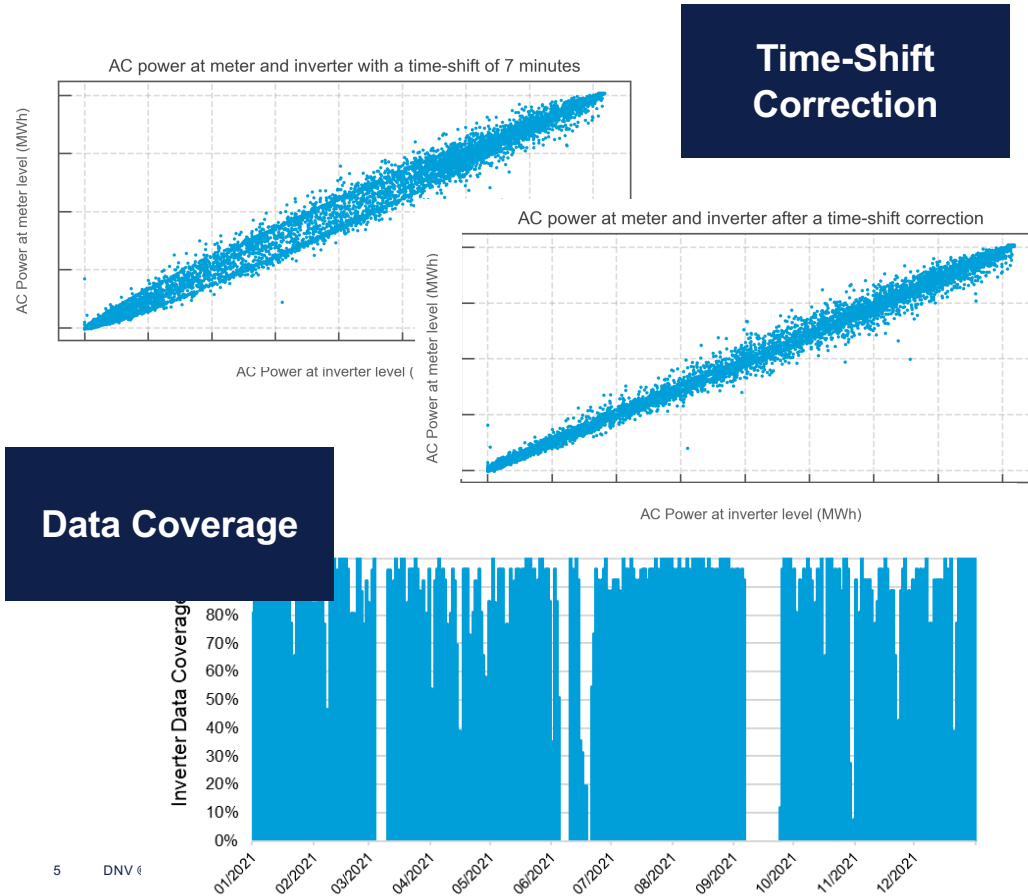
SolarGEMINI

01

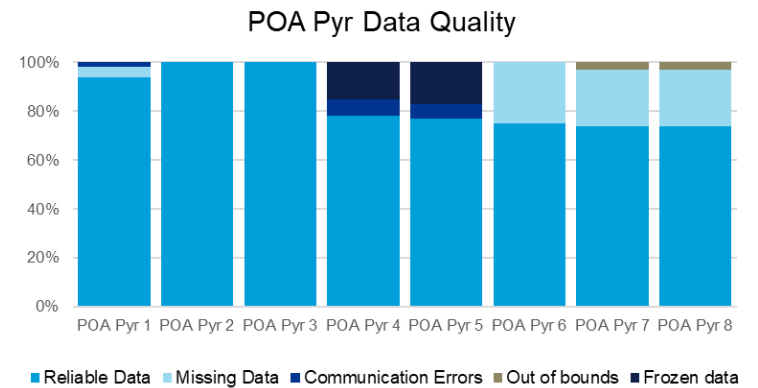
From Data to Diagnosis



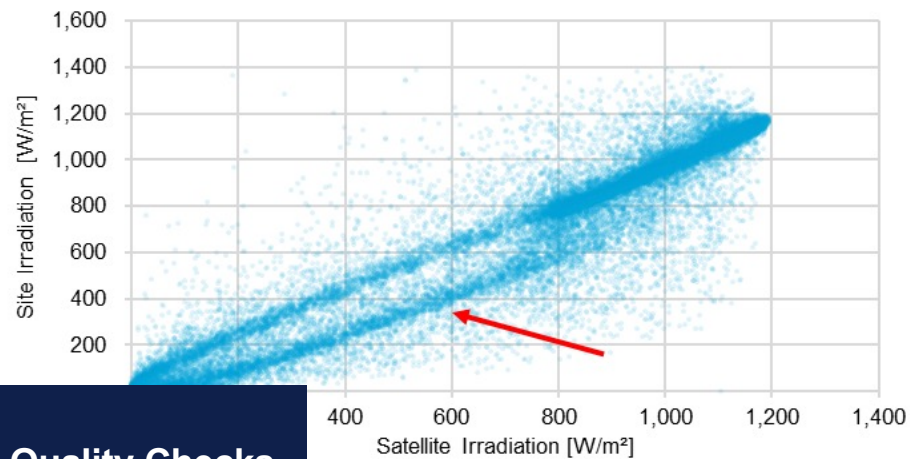
Operational Data



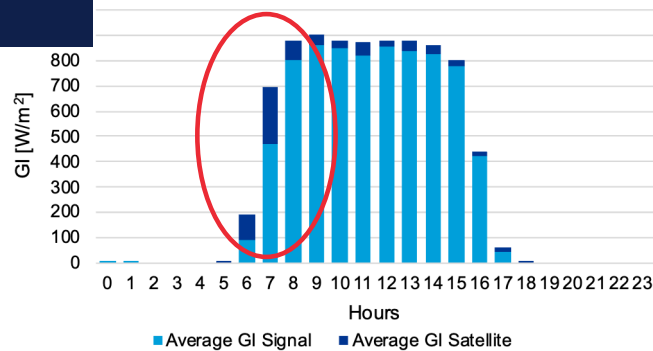
Quality Checks



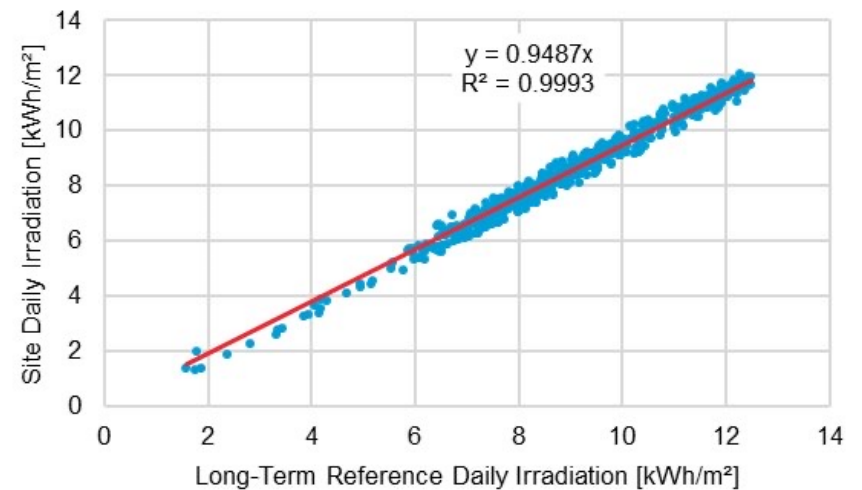
Operational Data



Quality Checks

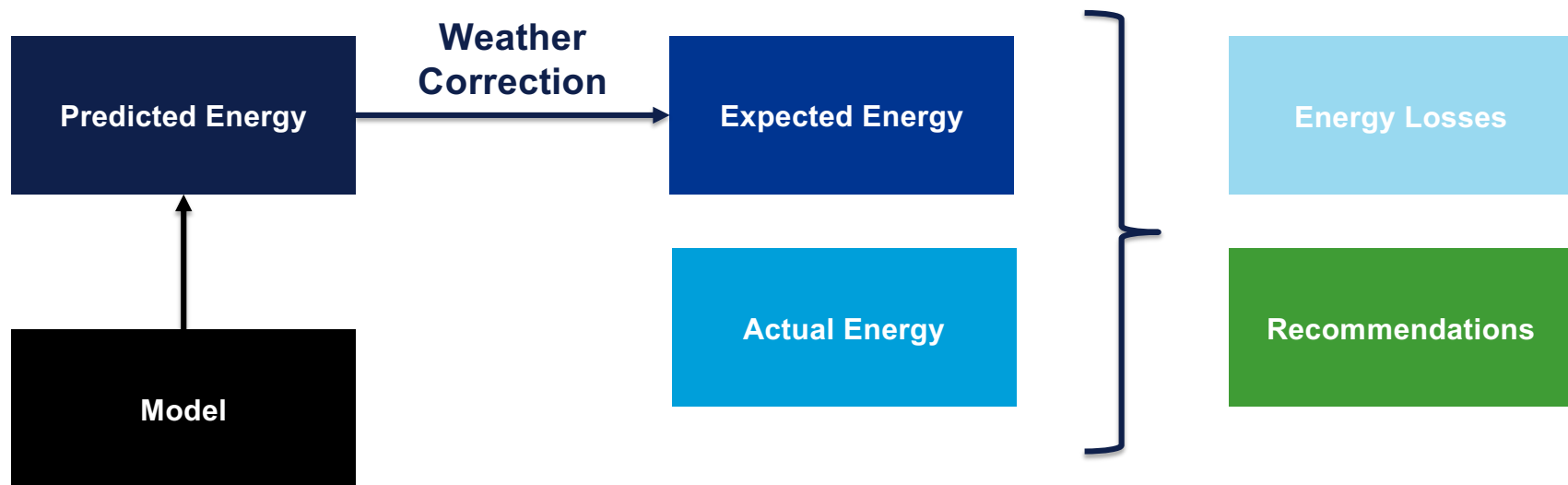


Satellite Correlation



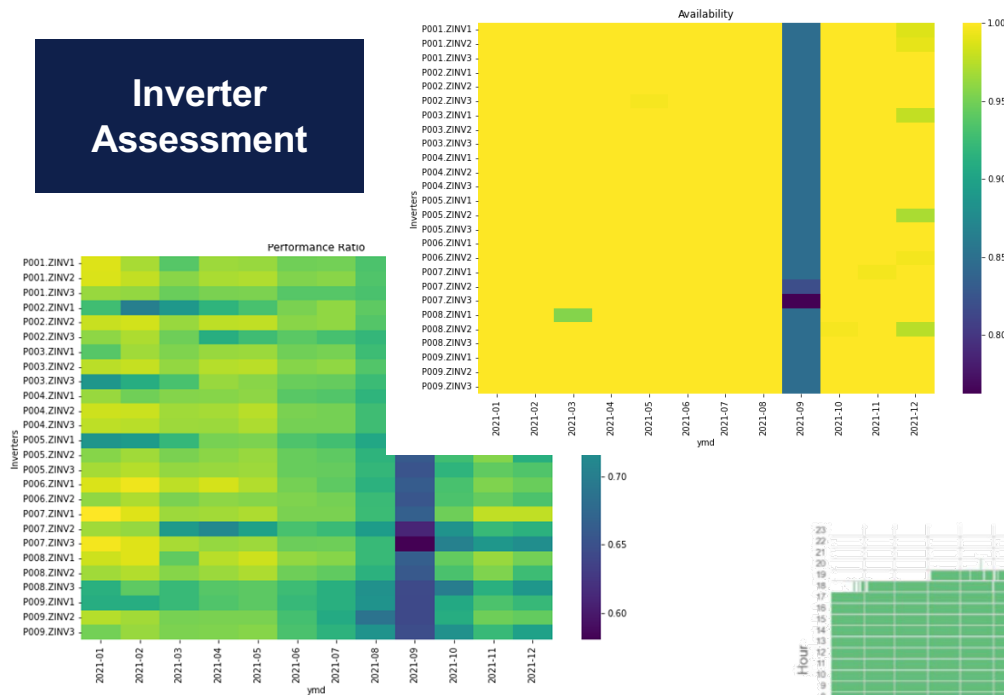
Underperformance Detection

IEC 61724-3 Energy Evaluation Method



Underperformance Detection

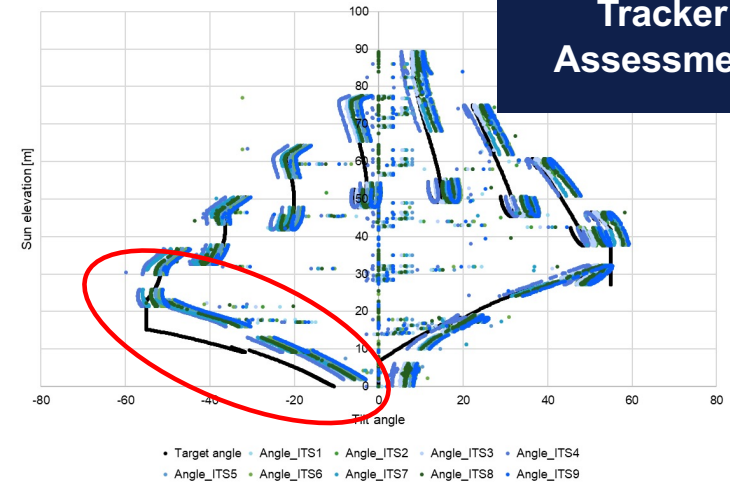
Inverter Assessment



Outages



Tracker Assessment





NEW VERSION

02

MPPT
Data Quality
Efficiency
Snow
String Analysis
Derating
Sub-hourly
Soiling
Shading
Root Cause Analysis
Pattern Detection
Tracker Misalignment
Model Accuracy
Clipping
Backtracking
Mismatch
Degradation
Underperformance
Cabling Losses
Curtailment
Outage
Stow Position
Expected Energy
Availability
Weather Correction

Enhanced Capabilities



Smarter Quality & Loss Detection

- Advanced data quality control
- Pattern and anomaly detection



Model Accuracy & Validation

- Improved expected energy validation
- Root-cause frameworks for underperformance



Granularity & Depth of Analysis

- Sub-hourly insights
- Improved Loss Categorization



CASE STUDY

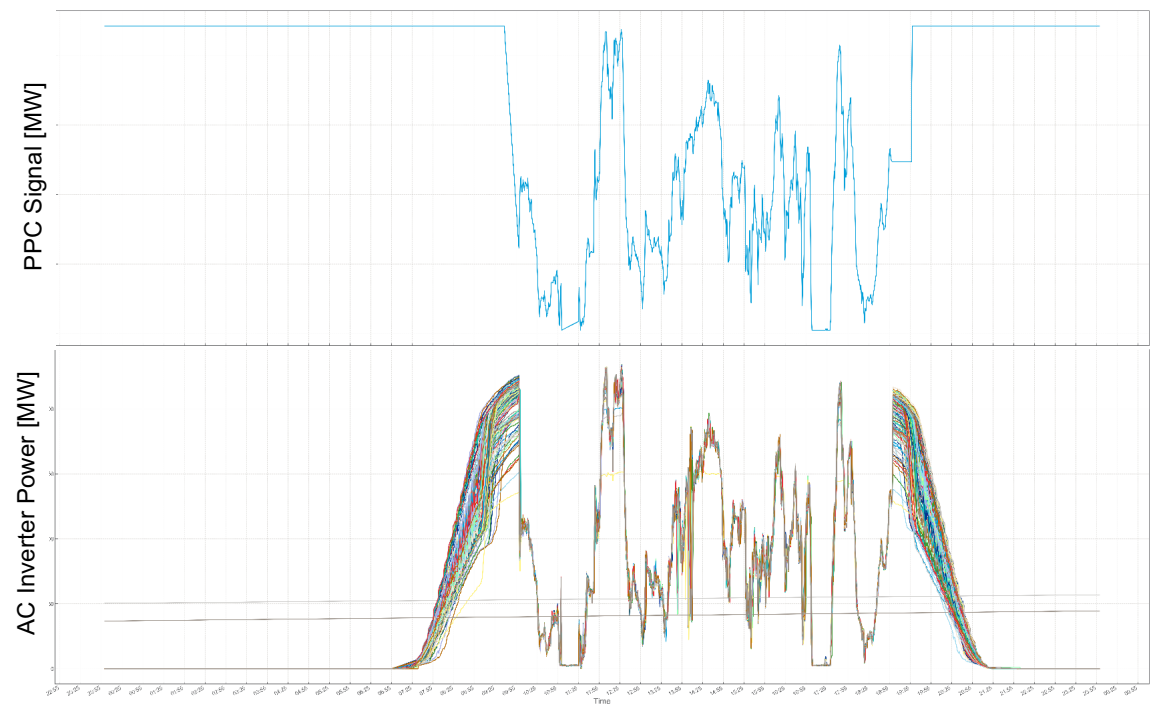
03

Case Study

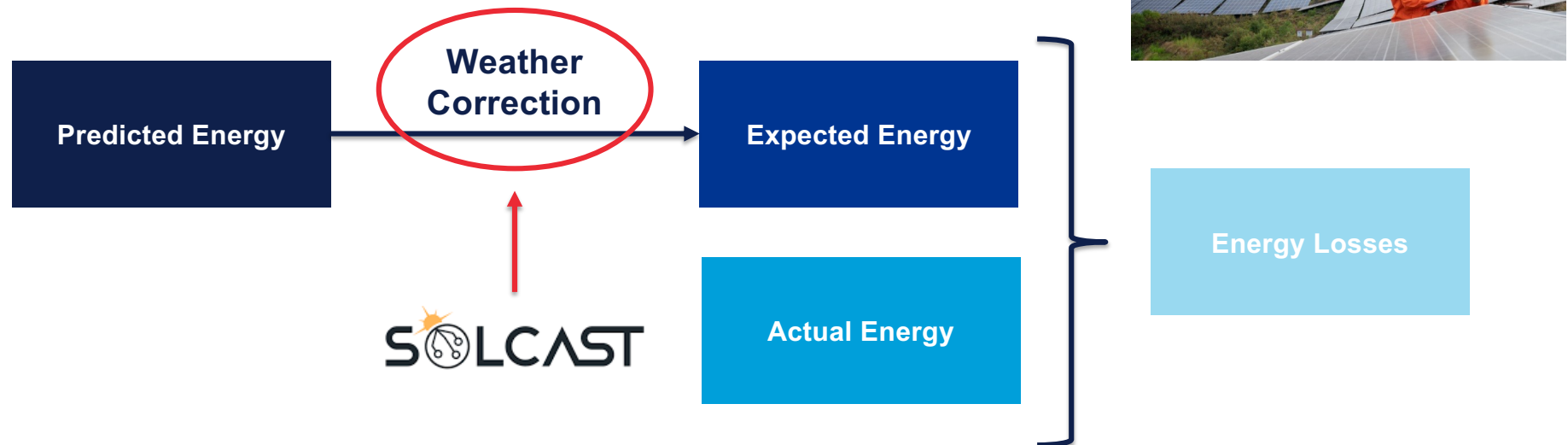
Plant Specifications

COD	2023
Capacity	Utility-Scale
Location	Europe
Regulation	Secondary Market
Data Available	Dec - June

Does frequency really
matter when quantifying
curtailment?



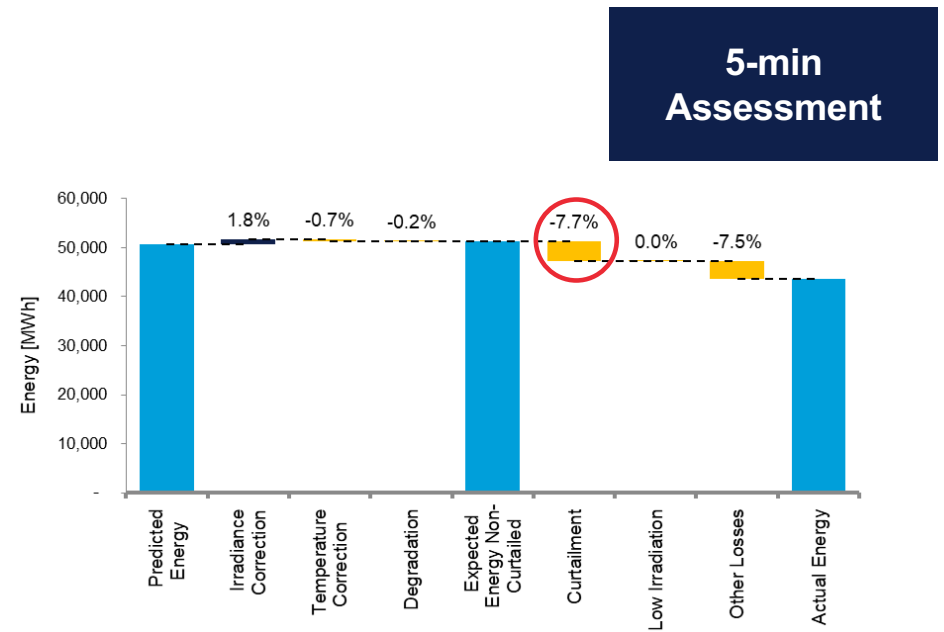
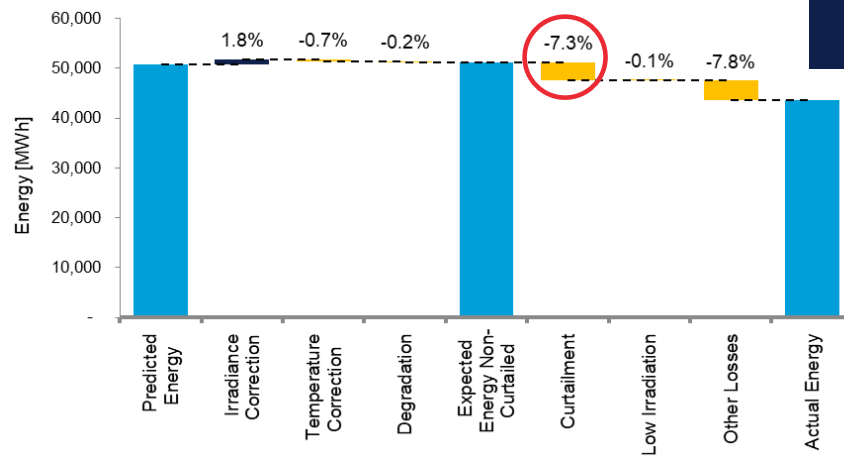
Case Study



Approach

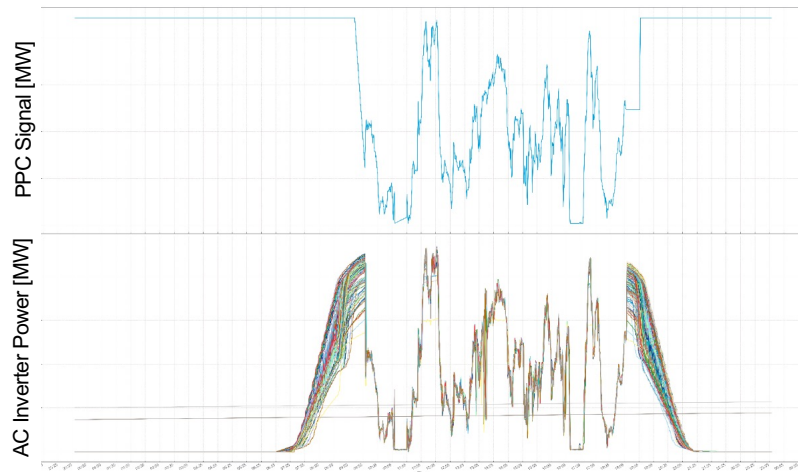
Compare 5-min vs hourly resolution
Standardize Irradiance and Temperature
Quantifying solely curtailment

Case Study

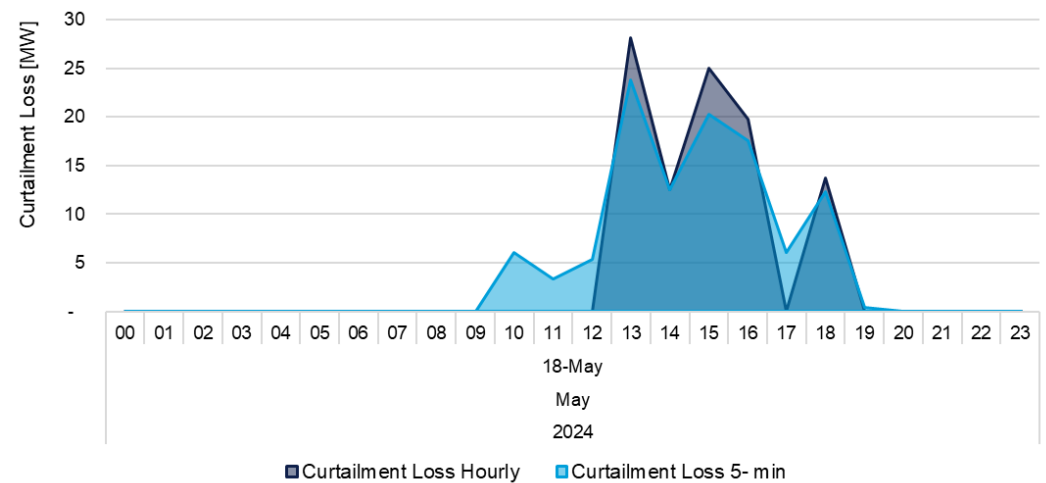


Curtailment underestimated by 0.4% over 6 months

Case Study



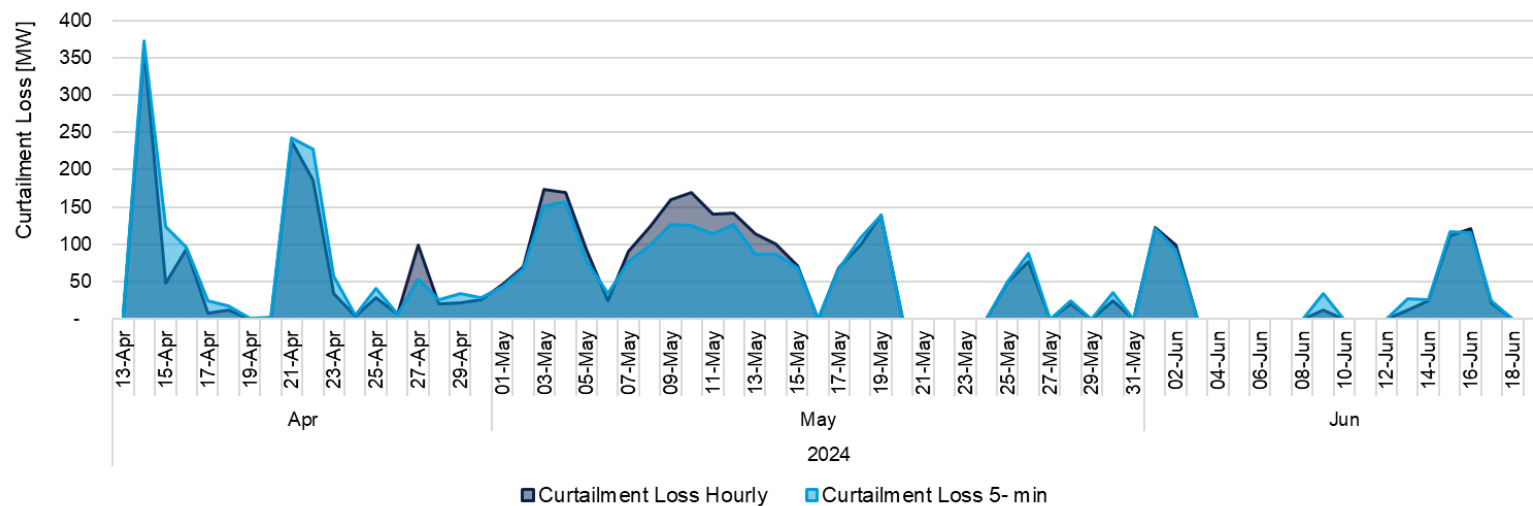
**Curtailment
underestimated by
8.8% on a specific day**



Case Study

Conclusions

- 5-minute resolution showed 7.7% curtailment loss, vs. 7.3% at hourly level — a 0.4% difference over 6 months.
- Sub-hourly resolution doesn't always increase the estimated loss — but it improves when and how accurately we quantify it.





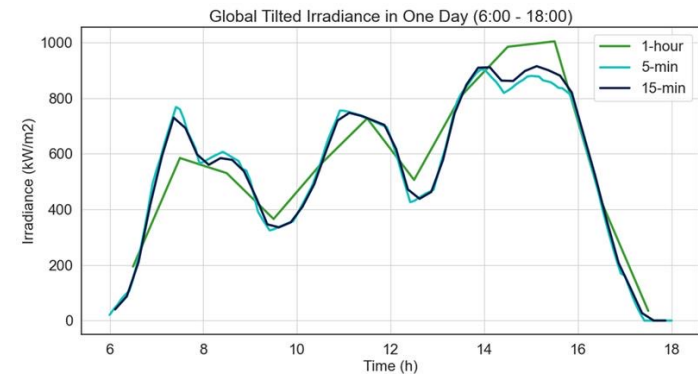
NEXT STEPS

04

Next Steps

Case Study

- Re-run analysis using raw (non-standardized) irradiance and temperature to capture full environmental variability.



Overall

- Extend study to other regulation types and plants.
- Leverage findings to refine loss models, contracts, and performance assessments.
- Integrate sub-hourly insights into SolarGEMINI's root-cause detection workflows.
- Incorporate this resolution-aware approach into contractual loss modeling and O&M decision support.

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Thank you for your attention

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