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Webinar is powered by
3E

4 October 2023

10:00 am – 11:00 am | BST, London

11:00 am – 12:00 pm | CEST, Berlin

2:30 pm – 3:30 pm | IST, Delhi

pv magazine
webinars

Unlocking the power of advanced analytics: maximizing value in multi-GW utility-scale solar portfolios



Jonathan Gifford

Editor in chief
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3E




Parul Agrawal

AVP Digital Solutions
ReNew

Welcome!

Do you have any questions? ? 

Send them in via the Q&A tab.  We aim to answer as many as we can today!

You can also let us know of any tech problems there.

We are recording this webinar today. 

We'll let you know by email where to find it and the slide deck, so you can re-watch it at your convenience.  

Unlocking the power of advanced analytics

Maximizing value in multi-GW utility-scale solar portfolios

Parul Agrawal
Julien Deckx

04/10/2023

PV magazine webinar



1

3E introduction

3E in a few words

- 1 Strong trackable reputation**
 - ✓ Strong financial track record
 - ✓ Proven ability to raise capital
 - ✓ Proven ability to pay dividends
- 2 Global approach, local impact**
 - ✓ Proven ability to raise capital
 - ✓ Proven ability to pay dividends
 - ✓ Proven ability to raise capital
- 3 On top of industry innovation**
 - ✓ Proven ability to raise capital
 - ✓ Proven ability to pay dividends
 - ✓ Proven ability to raise capital
- 4 Strongly diversified**
 - ✓ Proven ability to raise capital
 - ✓ Proven ability to pay dividends
 - ✓ Proven ability to raise capital

Technology experts specialised in renewable energy since 1999

150+ experts

- Engineers
- Energy economists
- Market strategists
- Data scientists
- Meteorologists

5 spin-offs

- FLUIDR
- XANT
- Watson
- DUSG
- DataQ

90+ Gigawatt

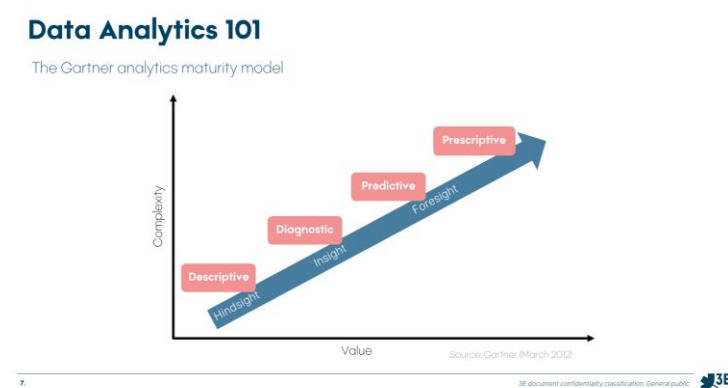
- Solar PV
- Wind onshore
- Wind offshore
- Storage
- Hydroization
- Grids & mini-grids

110+ countries

- Local knowledge
- On-site experience
- Grid code expertise
- Language spoken
- Track record

2

Advanced analytics: why & how



3

Case study

Case study

- Location: India
- Capacity (DC): >150 MWp
- Operational > 3 years
- Characteristics:
 - Single-axis trackers
 - Soiling
 - Spread over a large area



4

ReNew introduction

At a Glance... ReNew

- Our funding**
USD 8.1 bn raised in both equity and debt till date
- Our presence**
India's leading clean energy IPP
- Our contribution**
Presence in 18 states, 150+ sites pan India including utility scale wind, solar and hydro energy projects, and corporate PPA assets
+13.4 GW aggregate portfolio
- Our achievement**
Contributes **1.9%** to India's power capacity
Helps avoid **1.1%** of the emissions from the power sector
We are the only **Indian RE company** with more than **7.7 GW** commissioned capacity

5

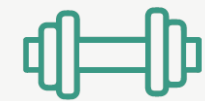
Advanced analytics at ReNew

ReNew Digital

- Objectives**
- Derive tangible business value
 - Embed digital and advanced analytics as new way of working
 - Driving a data first culture

ReNew

3E in a few words



1. Strong bankable reputation

- ✓ 20 years of track-record
- ✓ Recognised by major financial institutions world-wide
- ✓ References on industry key-investments



2. Global approach, local impact

- ✓ International best practices applied locally
- ✓ Business oriented experts
- ✓ Flexibility & pro-activeness up to the detail



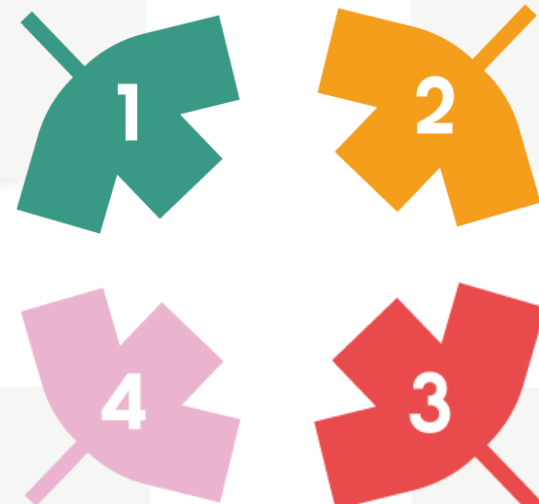
4. Driven by digitalisation

- ✓ Proprietary data pipelines for resource modelling
- ✓ Proprietary system modelling and optimisation algorithms
- ✓ Performance assessment automation using AI and machine learning



3. On top of industry innovation

- ✓ In-house research on resource & system modelling
- ✓ Validation programs on new technologies
- ✓ Collaboration with top research institutes since 20 years



Technology experts specialised in renewable energy since 1999

150+ experts

- Engineers
- Energy economists
- Market strategists
- Data scientists
- Meteorologists



5 spin-offs

- FLiDAR
- XANT
- Wattson
- DUSS
- DeltaQ



90+ Gigawatt

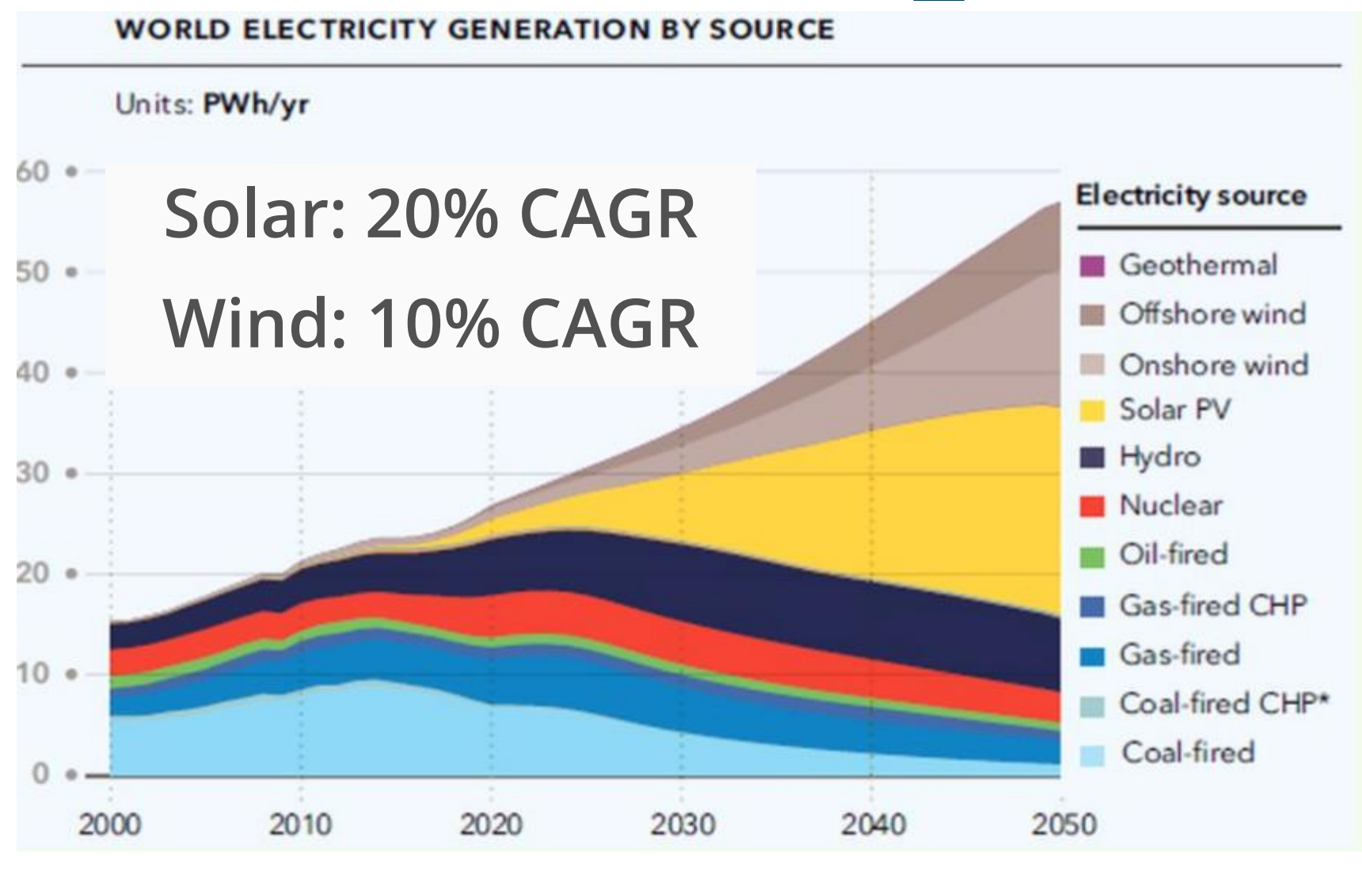
- Solar PV
- Wind onshore
- Wind offshore
- Storage
- Hybridization
- Grids & mini-grids

110+ countries

- Local knowledge
- Onsite experience
- Grid code expertise
- Language spoken
- Track record

The Renewable Energy Market is changing rapidly

Fast market growth



Consolidation



Digitalization



Changing market dynamics drive digitalization

3E SynaptiQ digital platform

20 GW
CONNECTED

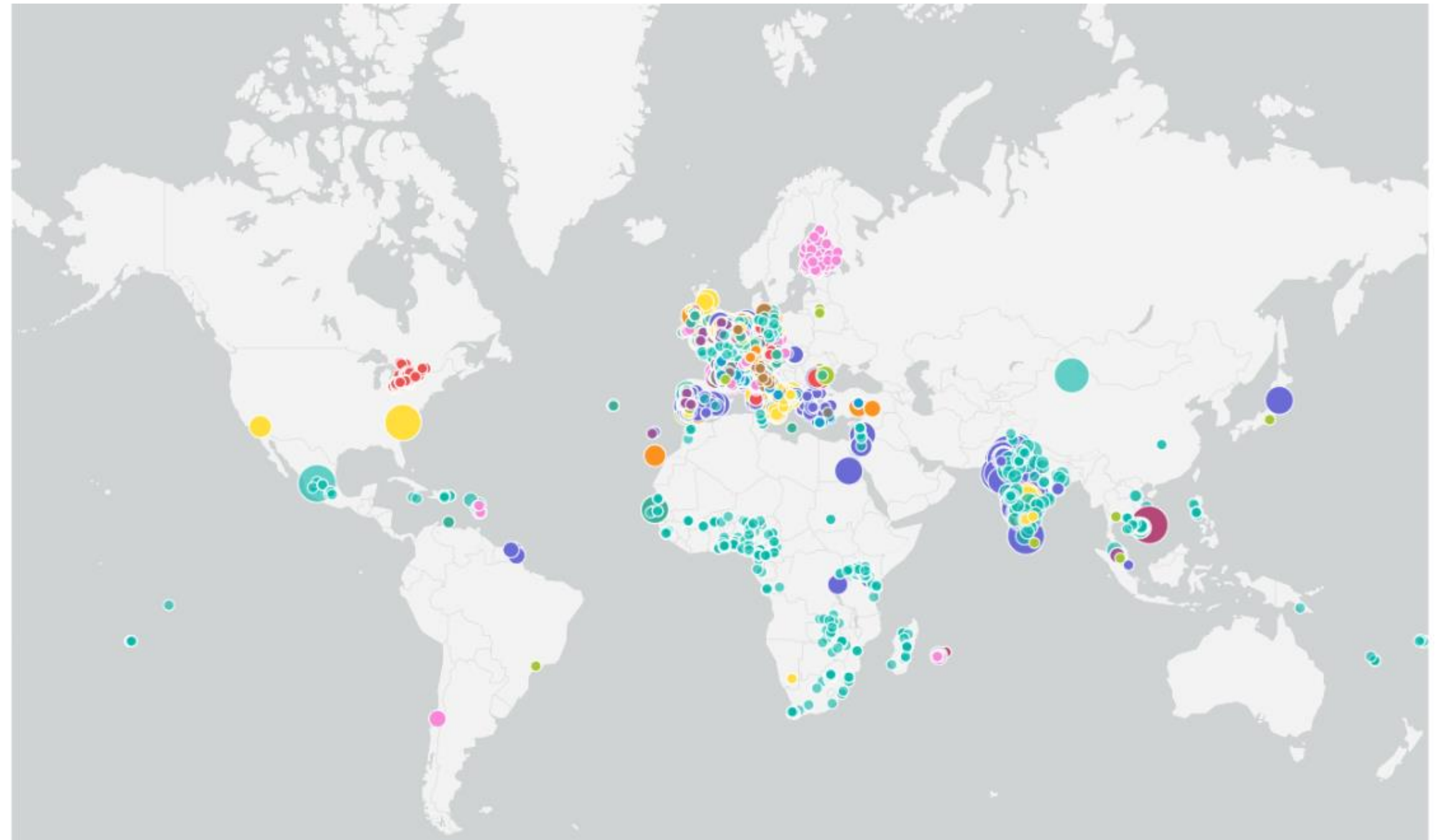
125
CLIENTS

20 GW
CONTRACTED

75
COUNTRIES

+ 12 000
SITES
C&I and Utility-scale

20 million
DEVICES



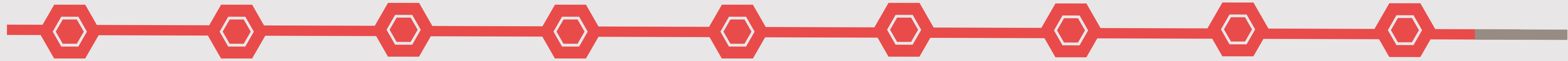
1999
3E foundation
as a spin-off
of IMEC

2010
Launch of our
digital journey

2014
Launch of
Solar Data
Services

2020
Surpassing
10 GW of
connected
assets

2021
Launch of
SynaptiQ Solar
Analytics



1999 - 2007
Organic
growth,
international
presence

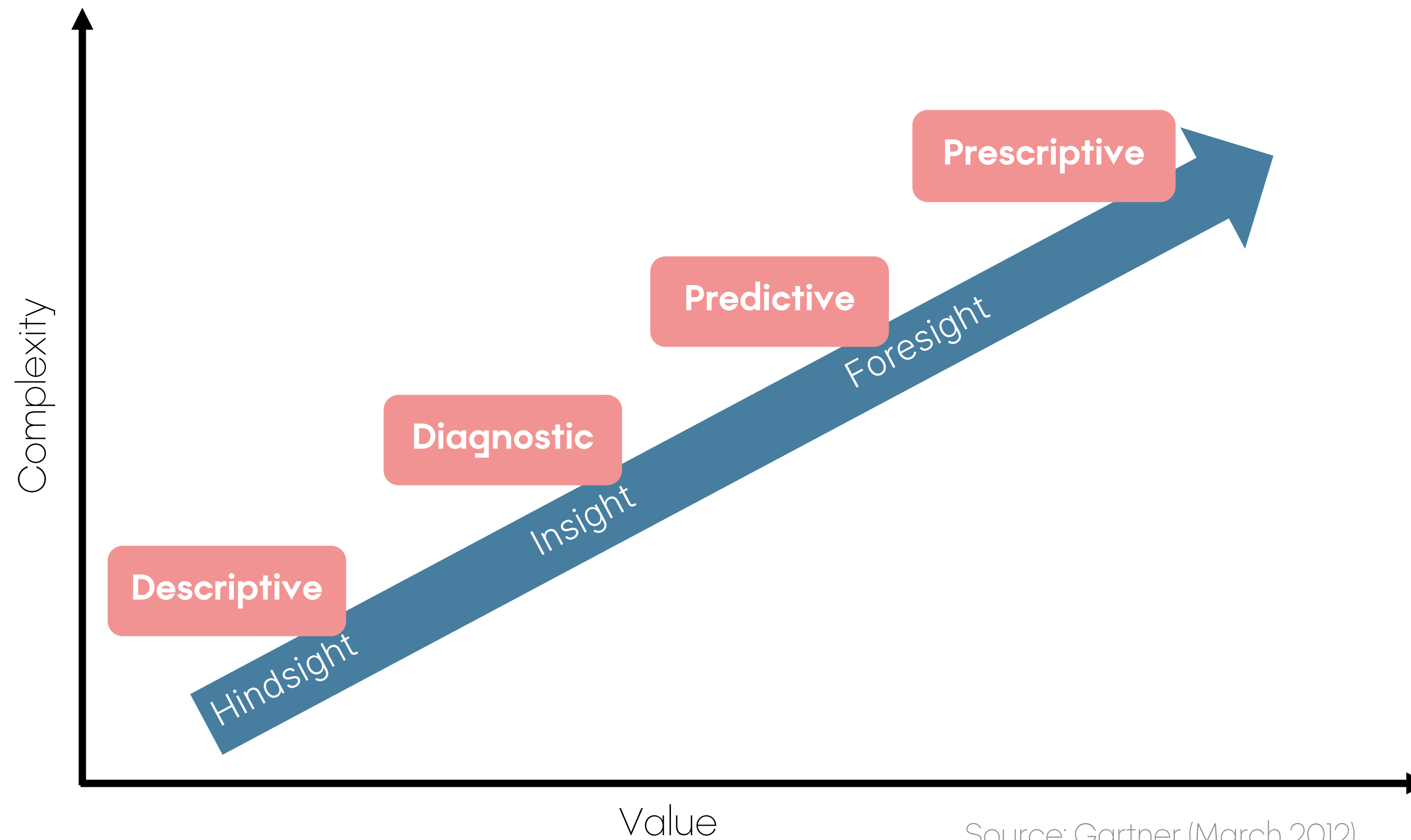
2012
Launch of our
digital twin
performance
model

2017
Launch of
Solar Analytics
& Sensor
Check

2021
Launch of
3E's digital
platform
SynaptiQ

Data Analytics 101

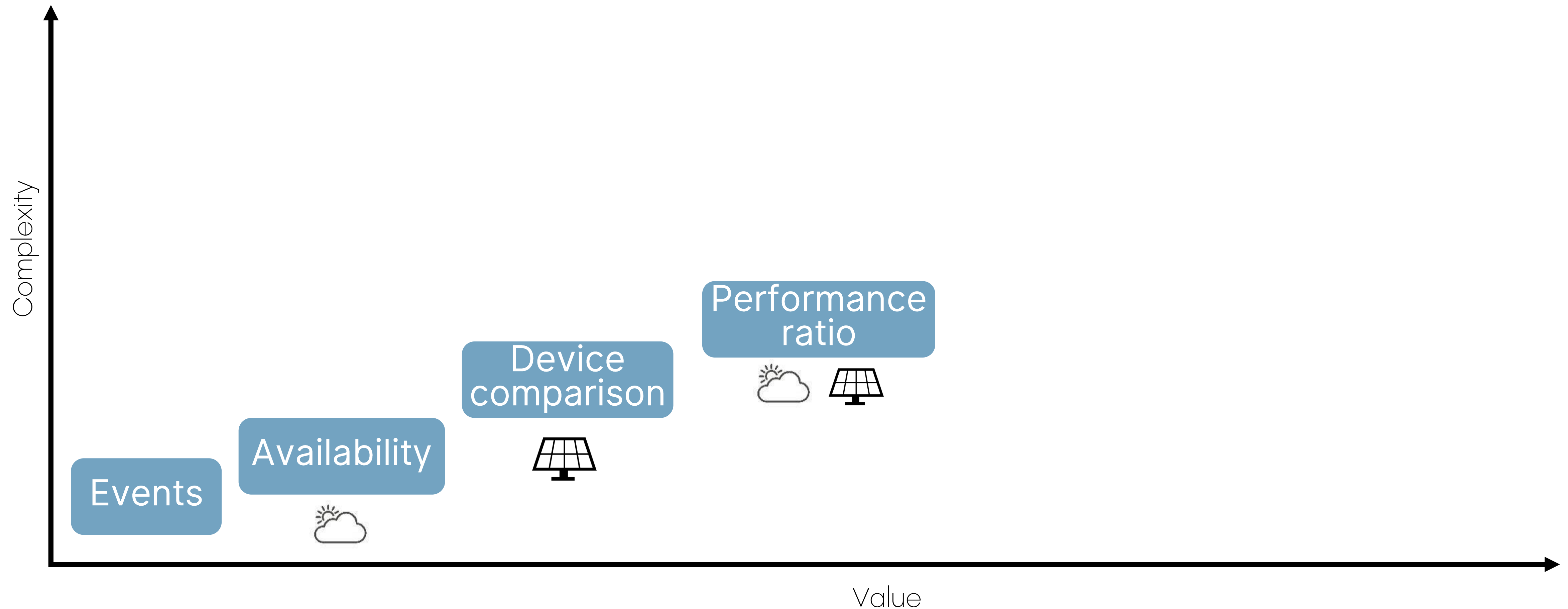
The Gartner analytics maturity model



Source: Gartner (March 2012)

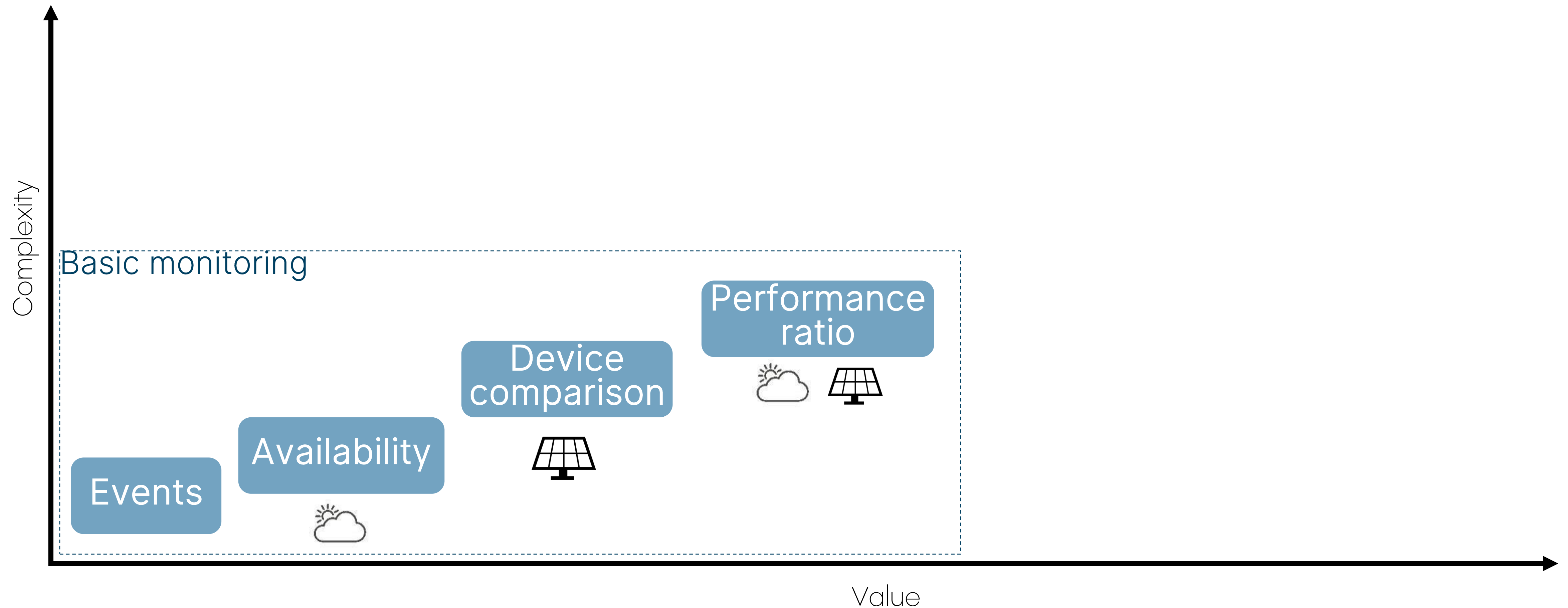
From firefighting to prevention

The analytics maturity model applied to asset performance management



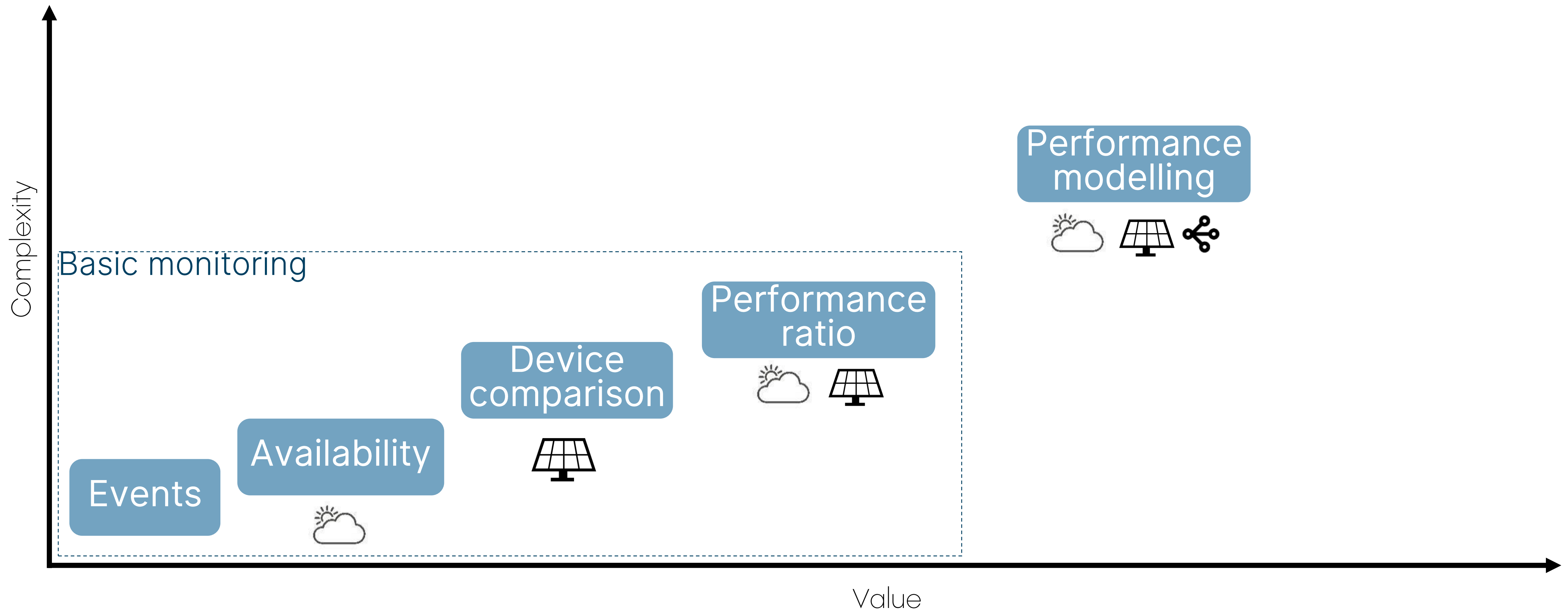
From firefighting to prevention

The analytics maturity model applied to asset performance management



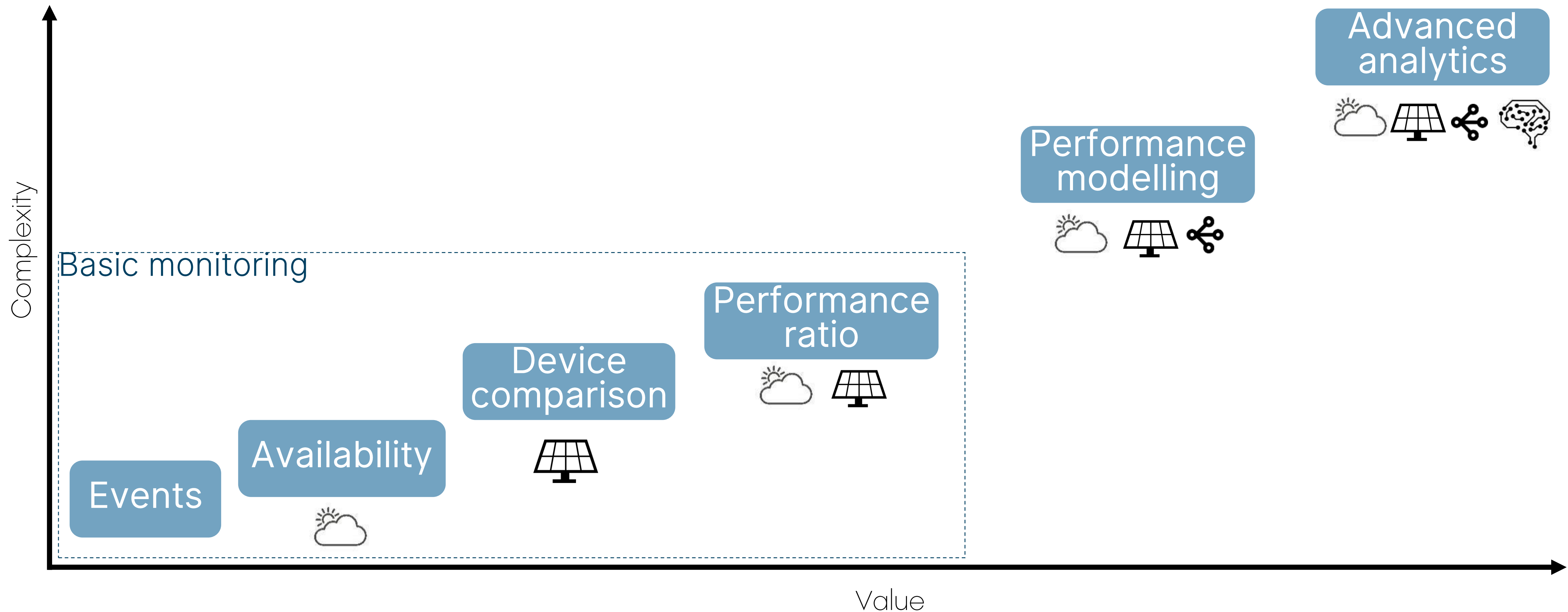
From firefighting to prevention

The analytics maturity model applied to asset performance management



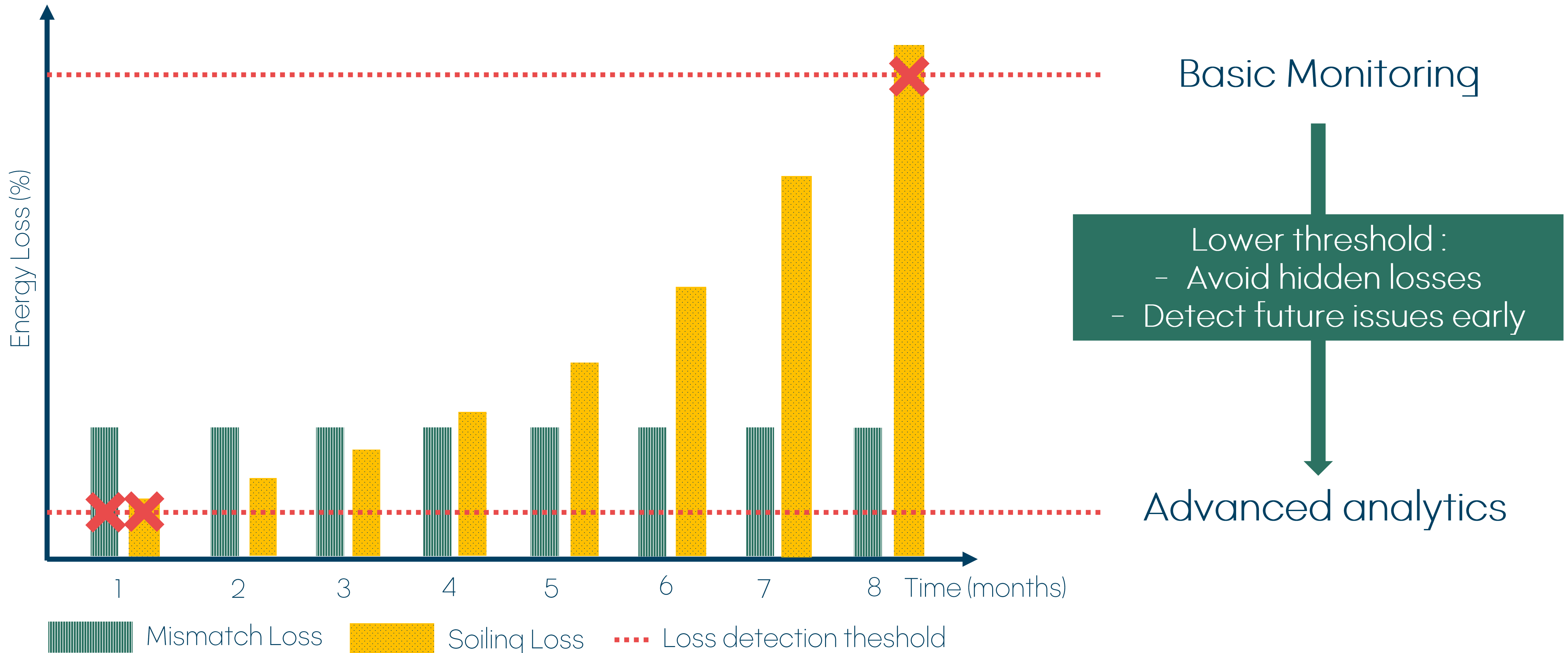
From firefighting to prevention

The analytics maturity model applied to asset performance management



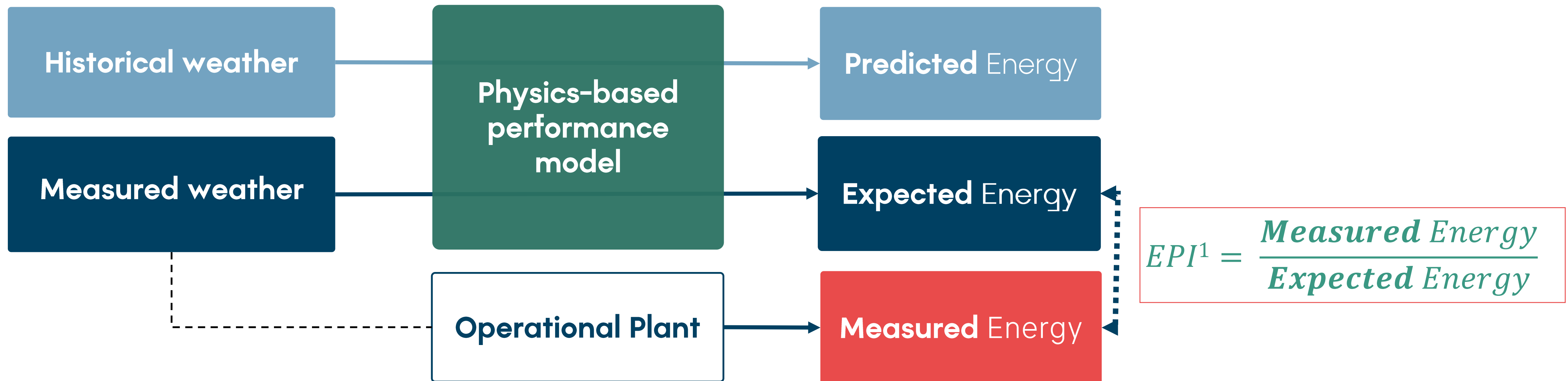
Value creation by more advanced tools

Higher precision → early detection → higher yield



Continuous performance evaluation in 3E SynaptiQ

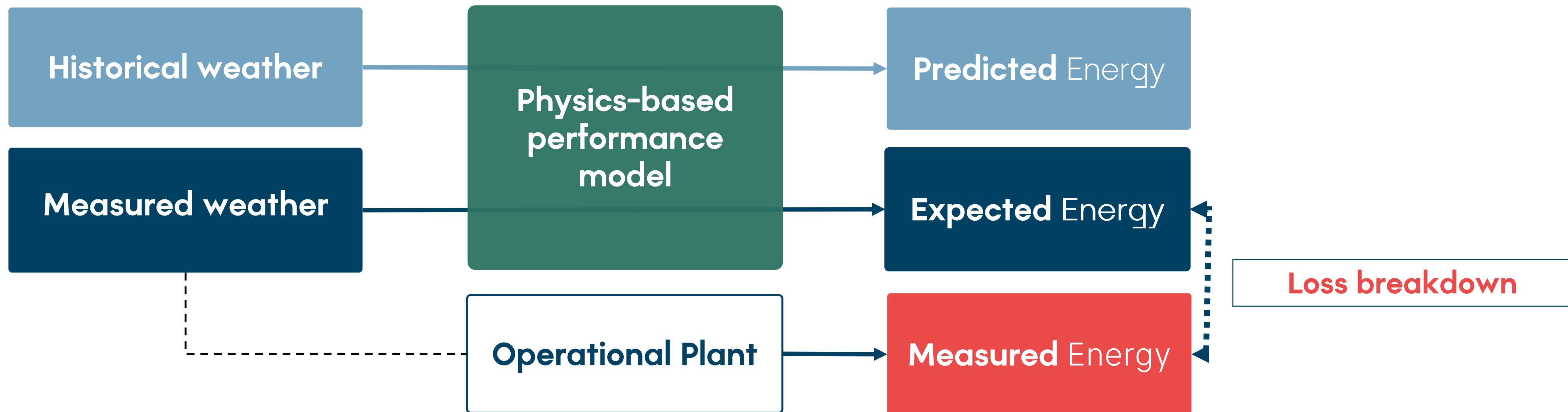
Methodology and terminology according to IEC TS 61724-3: 2016



¹Energy Performance Index

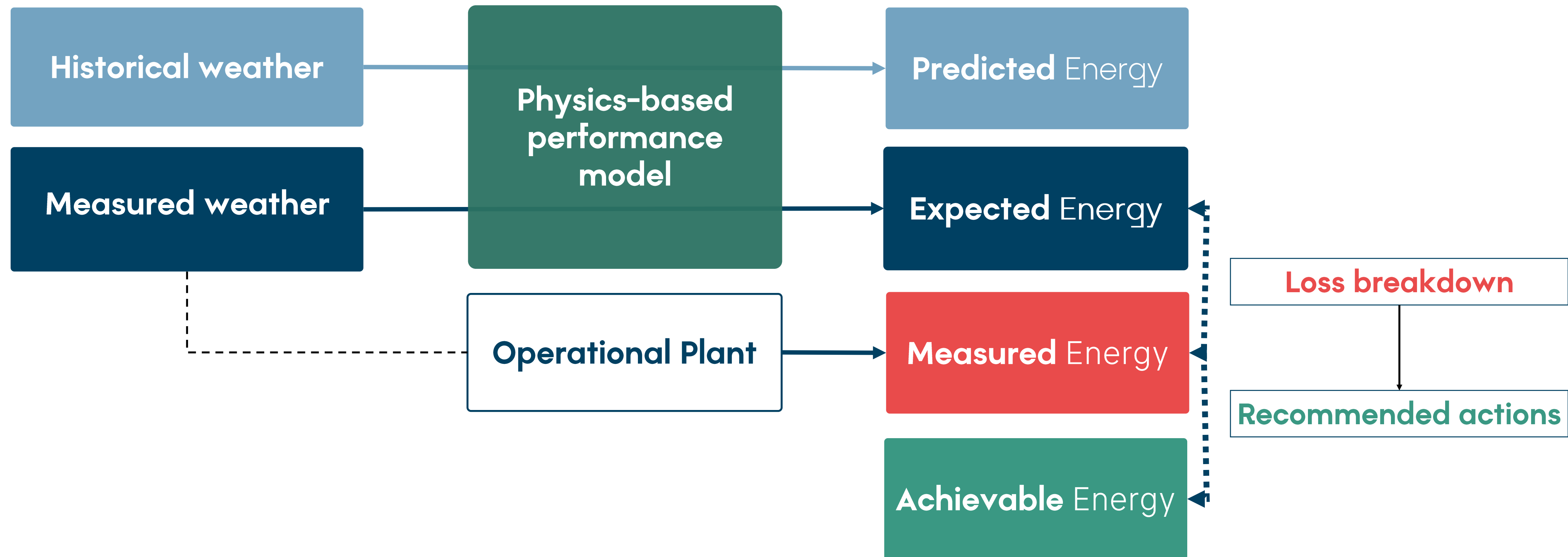
Advanced analytics in 3E SynaptiQ

From descriptive to prescriptive



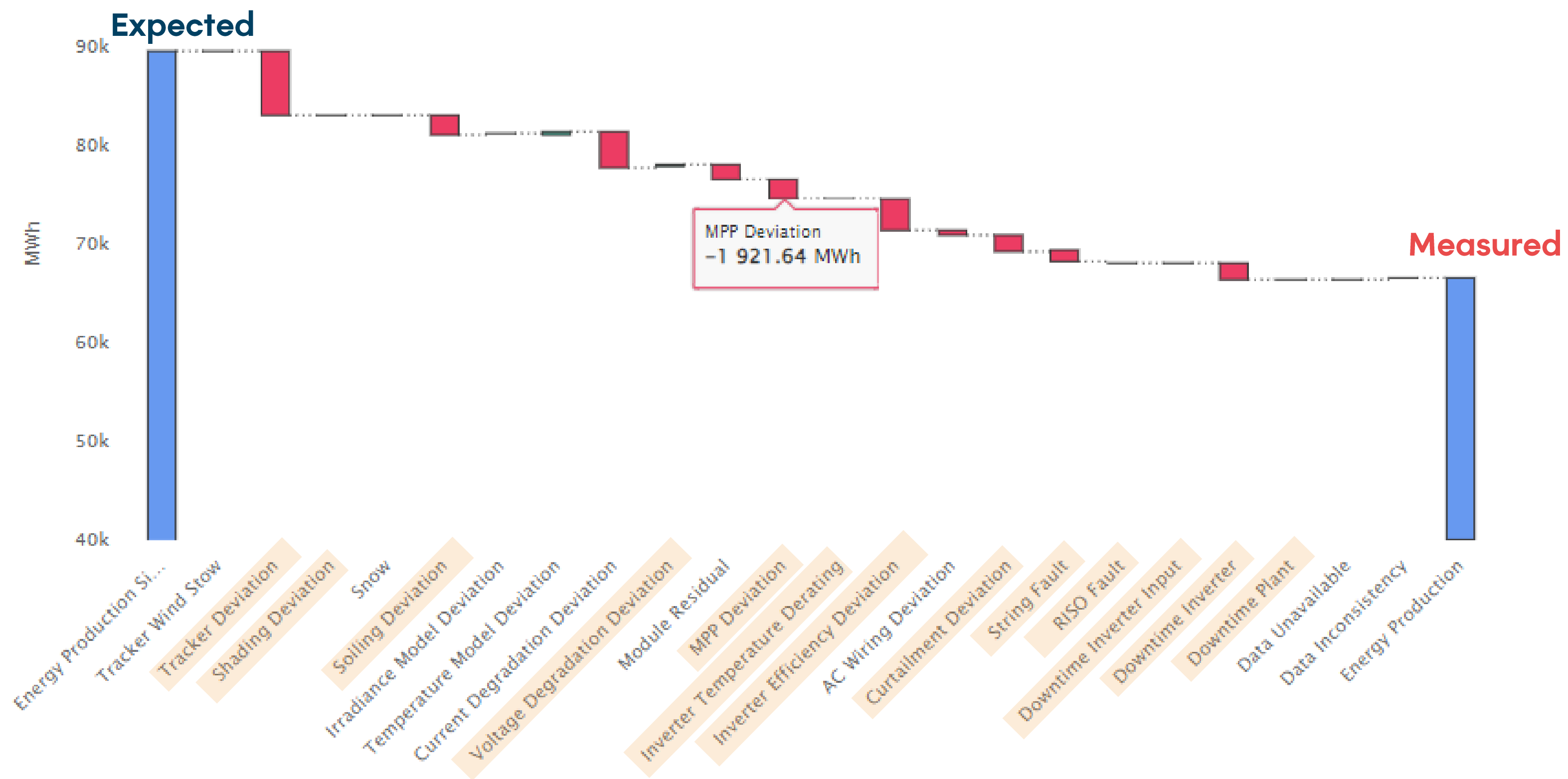
Advanced analytics in 3E SynaptiQ

From descriptive to prescriptive



SynaptiQ Solar Analytics loss breakdown

High granularity allows to identify recoverable losses <1%



(Potentially) recoverable

SynaptiQ Solar Analytics

Industry-leading solution for advanced analytics



Precise

Physics-based: most recoverable losses, from day 1

Built upon 20+ years of expertise & research projects



Validated

Real-world validation, e.g. with drone inspections

Continuous improvement based on connected plants



Robust

Continuous data integrity testing & recommendations

Based on digital twin and best-in-class irradiance data

Case study

- Location: India
- Capacity (DC): >150 MWp
- Operational > 3 years
- Characteristics:
 - Single-axis trackers
 - Soiling
 - Spread over a large area



Data challenges

- High amount of data
 - 100+ central inverters
 - 1000+ combiner boxes
 - 1000+ trackers
 - 25000+ strings
- Frequent data gaps
- Glitches and gaps in irradiation sensor data

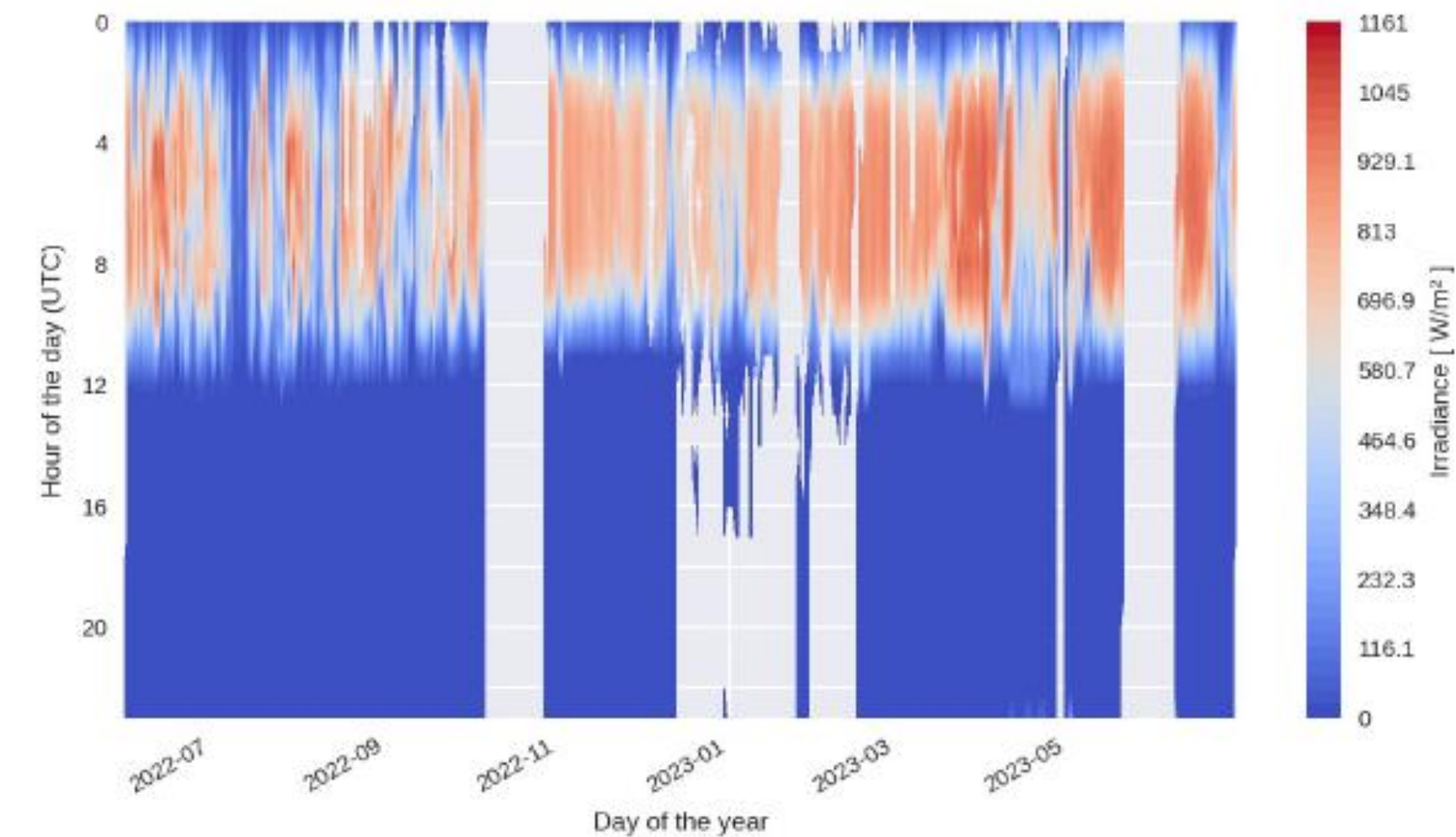
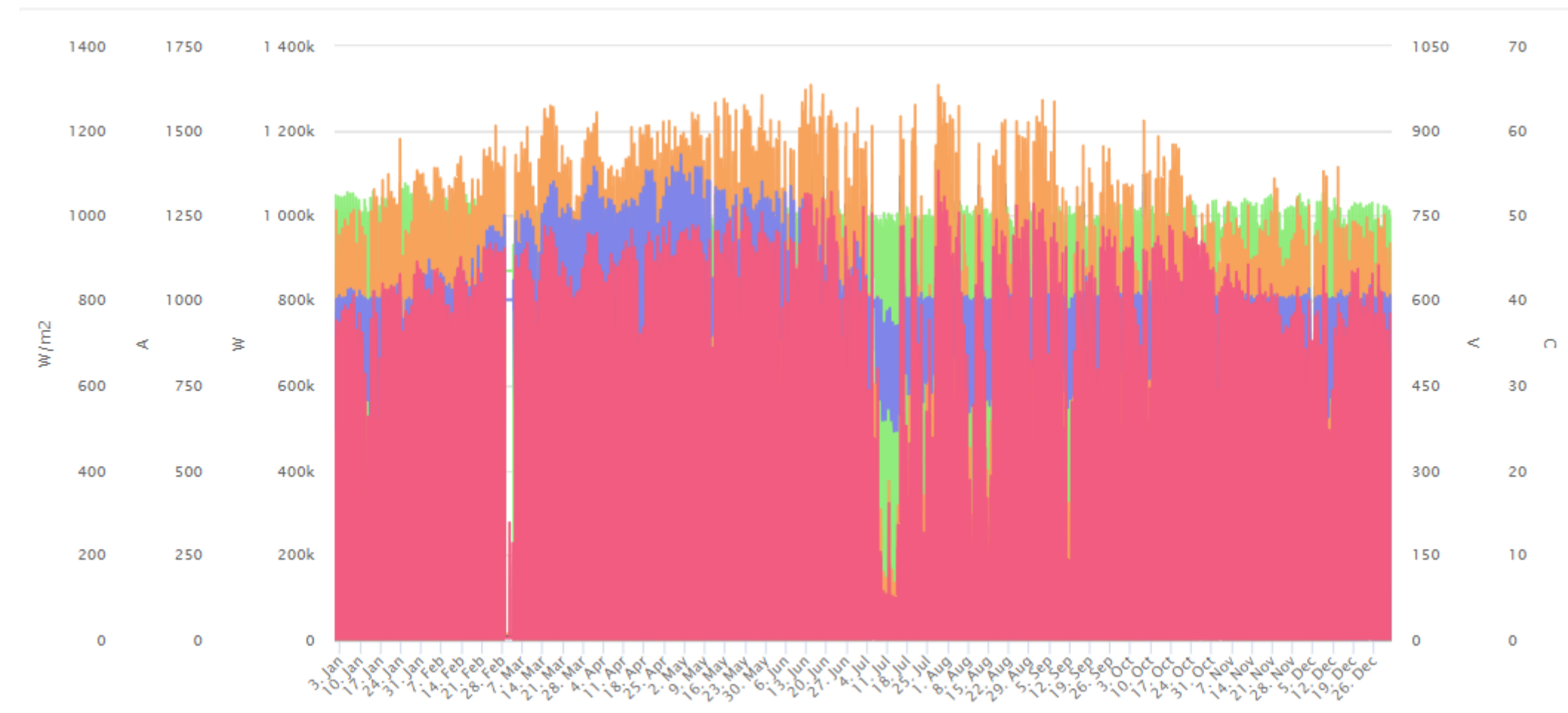
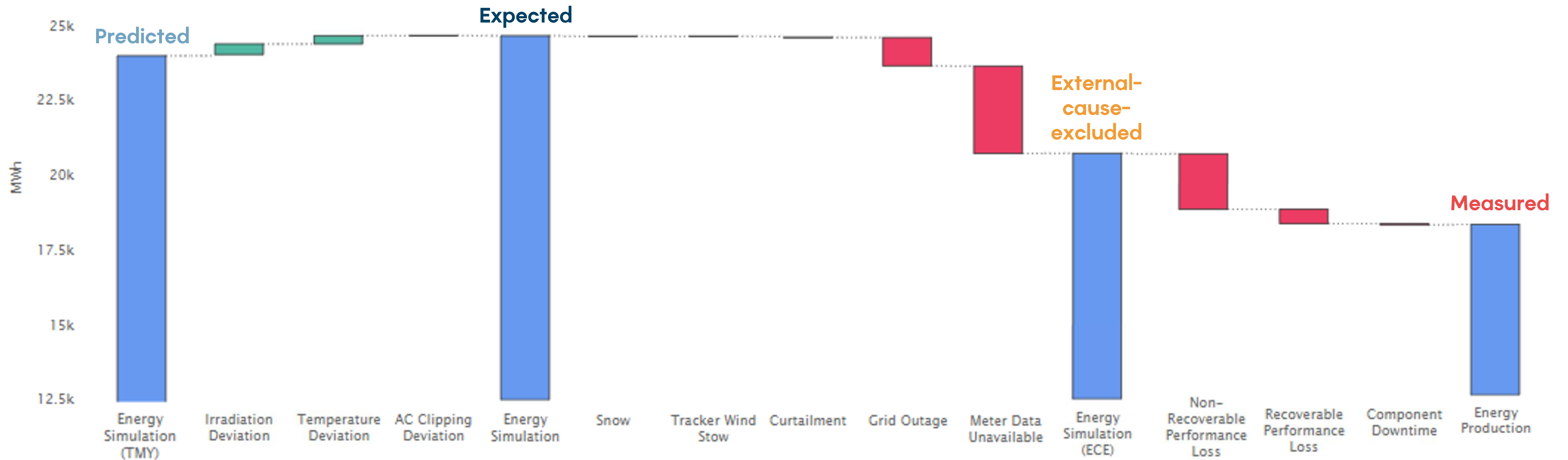


Figure 2: Carpet plot of raw sensor data.

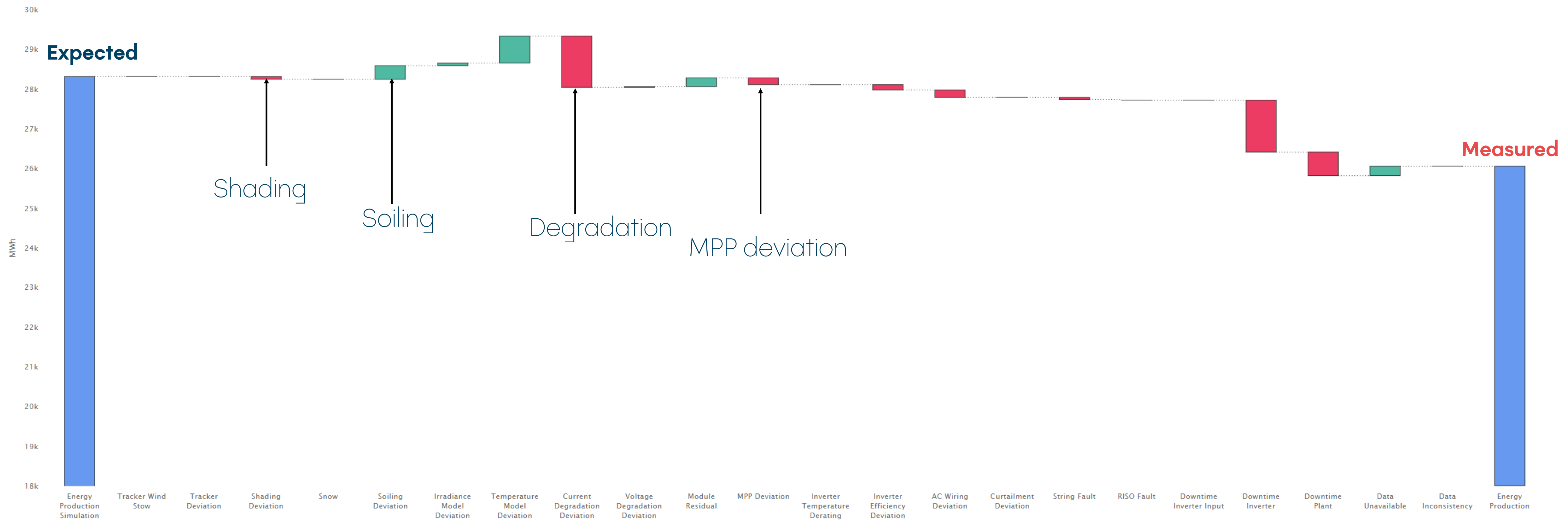
High-level loss breakdown

Finding out whether any actionable losses are observed



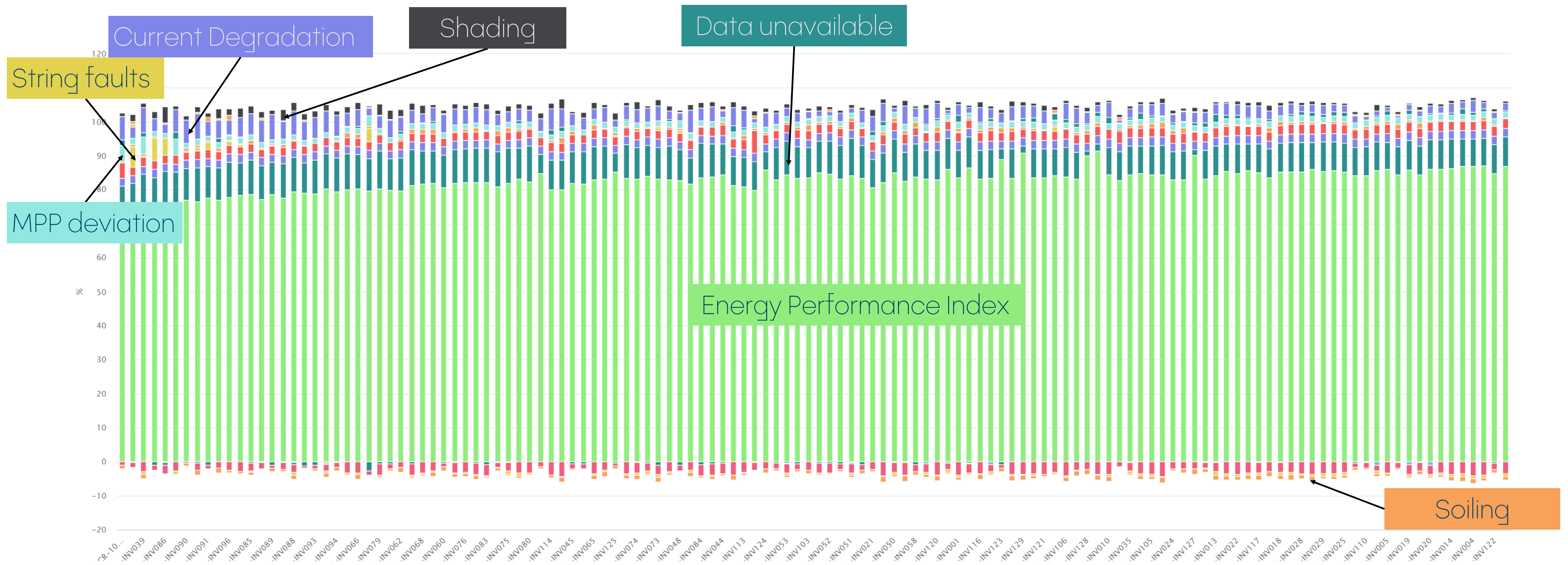
Detailed loss breakdown

Full analysis of gap between expected and measured energy



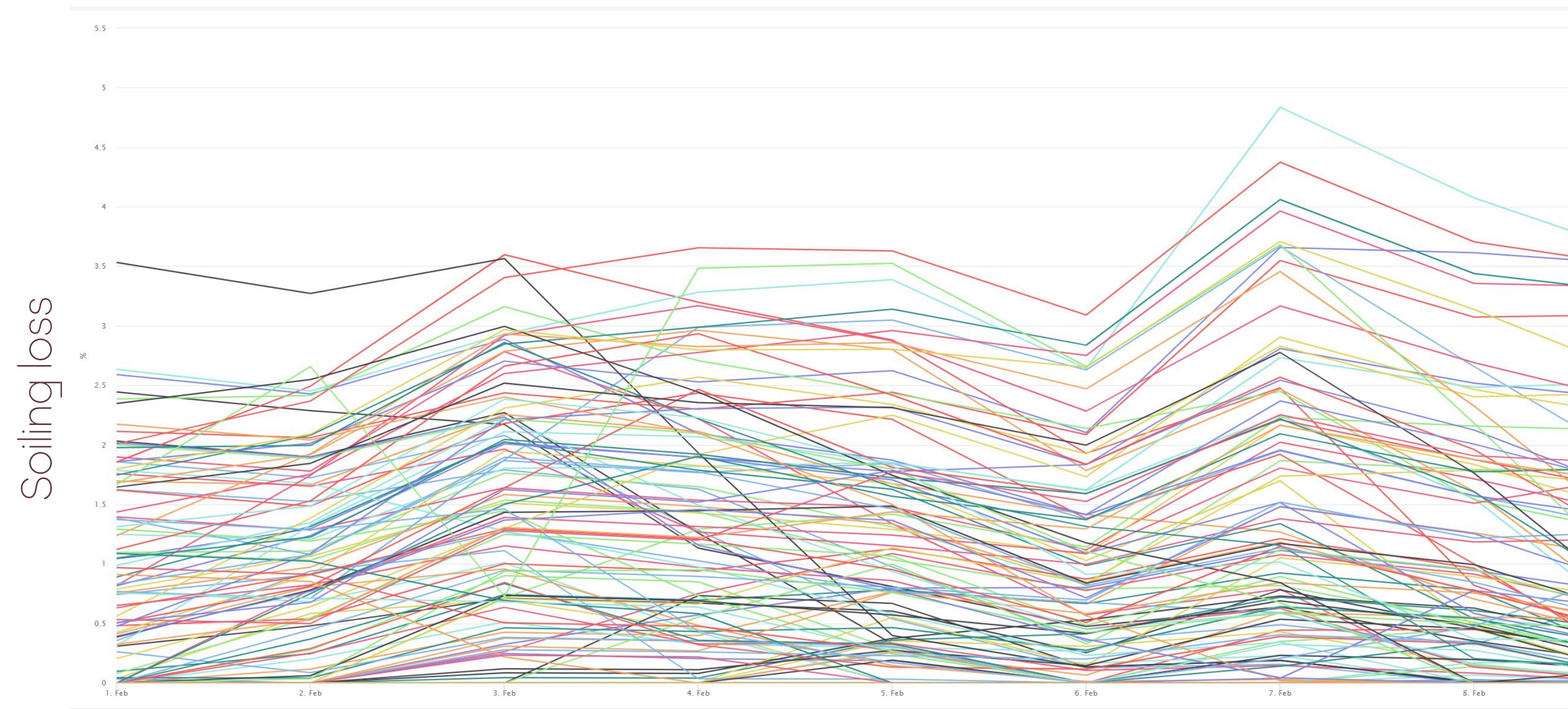
Performance per inverter

Sorted by increasing PR



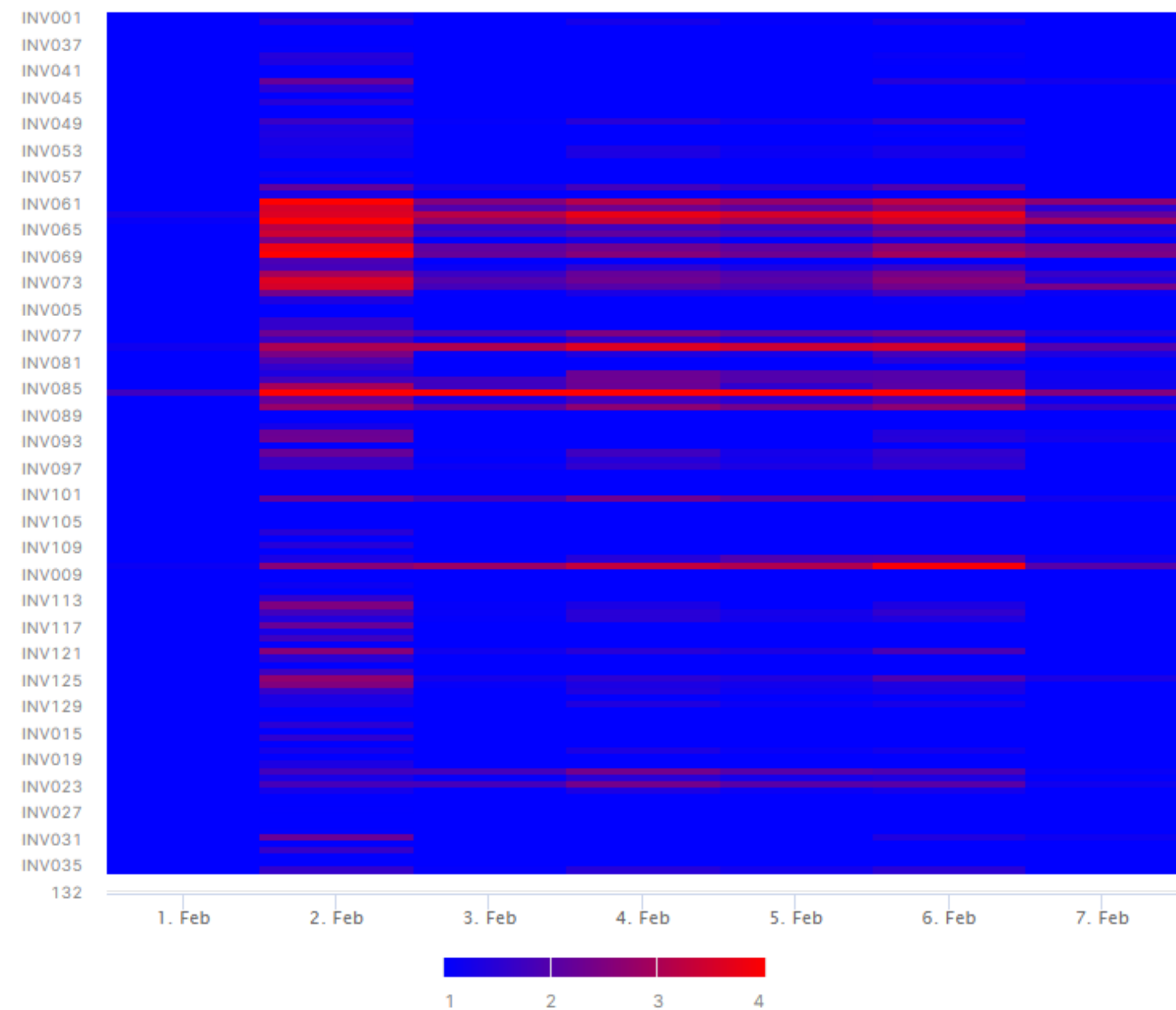
Soiling

Condition-based cleaning visible in data



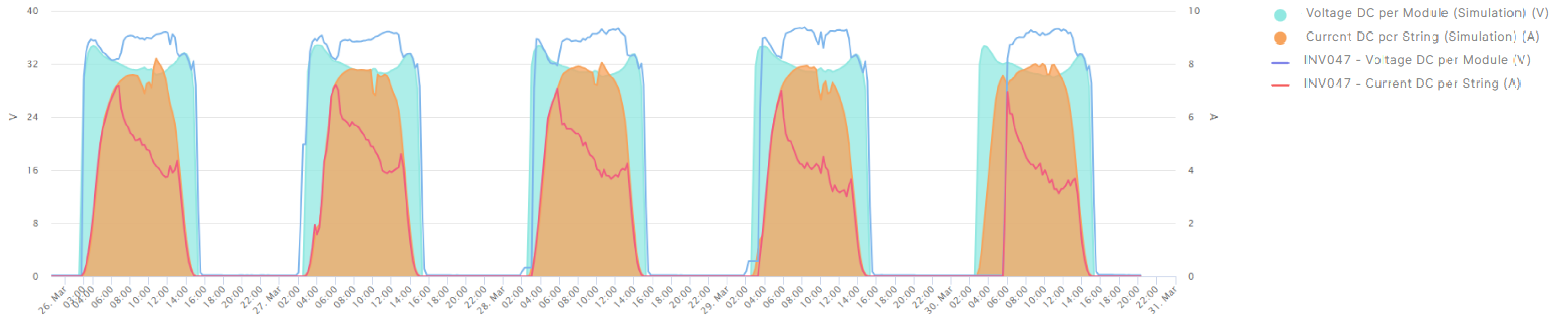
Shading

Tracker data unavailable – tracker breakdown detected as shading



MPP deviation

Caused by temperature derating



ReNew

Your Decarbonization Partner



At a Glance...



Our funding

USD 14 bn raised in both equity and debt till date

Our presence

Leading decarbonization solutions company

Presence in 18 states, 150+ sites pan India including utility-scale wind, solar and hydro energy projects, and corporate PPA assets ~13.7 GW aggregate portfolio

Our contribution

Contributes 1.9% to India's power capacity

Helps avoid 1.1% of the emissions from the power sector

Our achievement

One of the largest Indian RE Company to achieve 8.4 GW commissioned capacity

ReNew is a complete Decarbonization solutions provider

ReNew



Renewable Energy Generation

- With 150+ sites across the country and a total capacity of 13.7 GW projects (Solar, Wind, RTC) across India including commissioned and committed projects), we are one of the largest renewable energy IPP in the country



Green Hydrogen

- In Nov'22, ReNew signed a framework agreement with Egypt to set up a green hydrogen plant in the Suez Canal Economic Zone with an investment of \$8 bn



Energy Services

- ReNew is strategically positioned to undertake trading functions, manage the portfolio to ensure revenue maximization and carve out the strategy for the most optimal portfolio mix



Carbon Offsets

- ReNew aims to provide integrated solutions including dispatchable green power, support project development pipeline and other customized solutions to the varied set of off-takers

ReNew is Well-diversified across Multiple Businesses



Wind energy

- ReNew started its journey with a 25.2 MW wind plant in Gujarat and is now India's largest wind energy developer
- We have **6.4 GW** of operational & committed wind capacity



Solar energy

- ReNew's utility scale solar division began with the aim to replicate its success in the wind sector. Today, we are amongst the country's top developers with a proven track record of execution
- We have **7.2 GW** of operational & committed solar capacity



B2B

- ReNew Green Solutions (B2B) started its first distributed solar project in 2015 and has grown rapidly
- ReNew Green Solutions has a commissioned capacity of **2.06 GW** & committed capacity of **1.22 GW**

RenServ (ReNew's O&M Arm) – Utilizing Digital Capabilities



ReNew's Digital Transformation over time, has enabled RenServ to become a future-ready O&M service provider in the renewable energy industry.



- ✓ Diverse Portfolio
 - Managing ~ 5.5 GW AC Solar, Wind & Hydro installations across a spectrum of inverter & Wind turbine makes, module types.
- ✓ Equipment Expertise
 - Proficient in troubleshooting inverter & WTG-specific issues and optimizing their efficiency.
- ✓ Module Expertise
 - Comprehensive knowledge of various module technologies such as monocrystalline, polycrystalline, thin-film, and bifacial modules.
- ✓ Technical Competence
 - Skilled team capable of swift diagnosis and resolution of issues related to diverse equipment
- ✓ Data-Driven Insights
 - State of the art SCADA & Digital infrastructure to support data driven decisions
 - Leveraged data analytics to gain actionable insights into the performance of renewable assets
- ✓ Customized Solutions
 - Developed tailored O&M approaches for renewable assets, optimizing their performance based on individual characteristics.
- ✓ Adaptability & Quick Learning
 - Quickly adapted to changing technological advancements, responding effectively to changing project requirements.

ReNew Digital



Objectives



Derive tangible business value

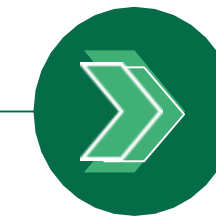


Embed digital and advanced analytics as new way of working



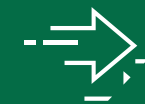
Driving a data first culture

Before



After

Approach



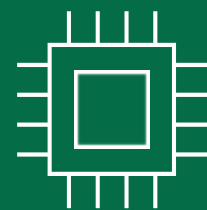
Focus on 'running the assets'
Decisions based on conventional operations RCA and SOPs

Process



Limited sustainable actions taken to improve asset performance

Technology



Limited mechanism to track and perform computations on operational data coming from wind and solar site

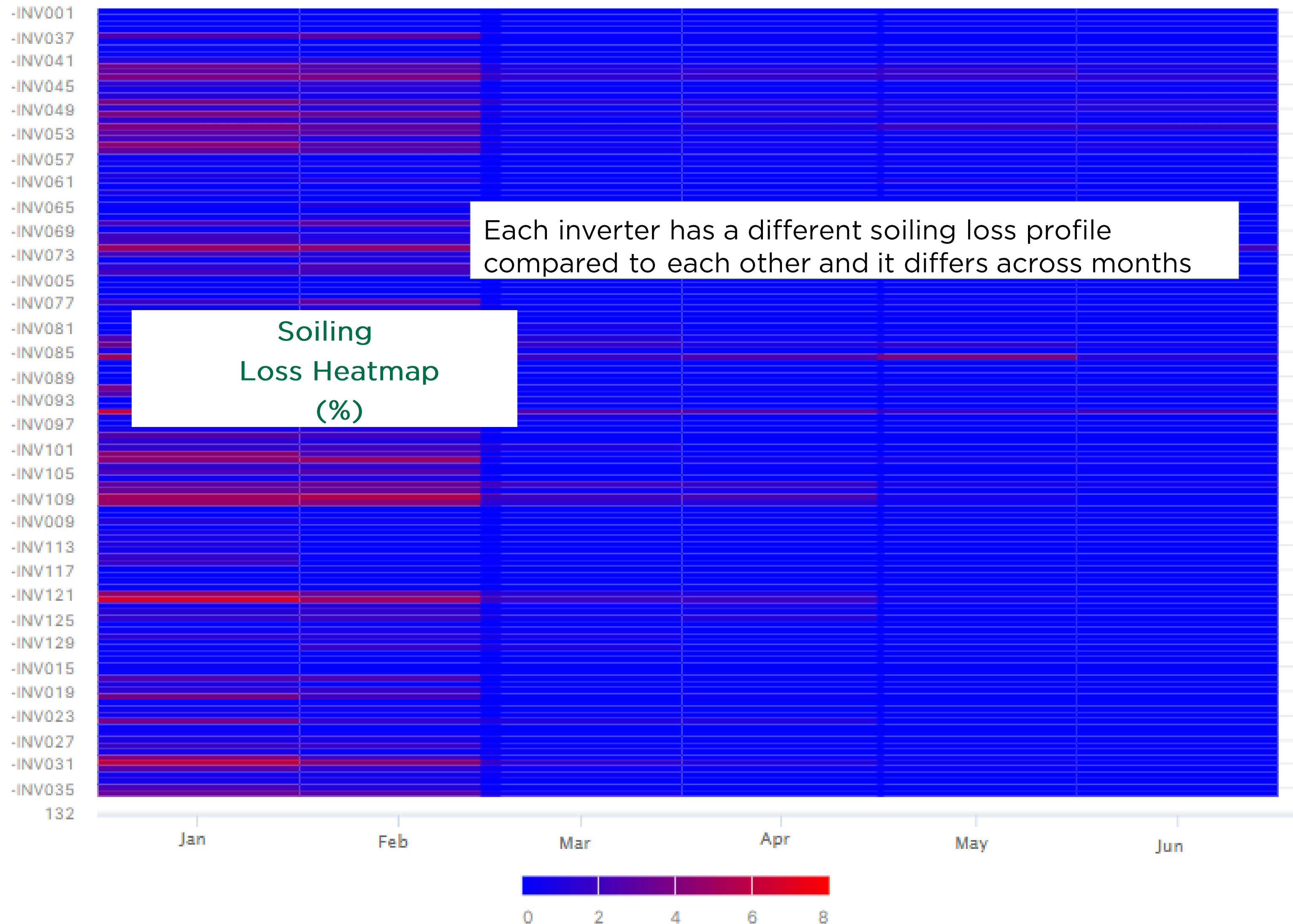
Focus on 'performance optimization' by minimizing downtime, maintenance costs via predictive and preventive maintenance

Granular data based decision making

Multiple use cases for sustained asset yield and availability that can be scaled-up across sites

3E SynaptiQ as standardized platform for analyzing real time asset performance across 70+ sites

Condition-based solar module cleaning



Problems addressed

- Soiling rate across sites differ by 2-2.5% due to several factors including temperature, humidity, rains and cleaning
- In the same site, every inverter has a unique soiling profile which is based on many factors such as proximity to roads/boundary, number of modules per string etc.
- Further, soiling profile for the same inverter is different across months
- Thus a fixed frequency cleaning schedule can NEVER be most optimum

Condition-based solar module cleaning



Description

- Moving away from schedule-based module cleaning to a **condition-based cleaning model** that depends on the data on dust deposited
- Soiling is assessed based on advanced analytics for each individual inverter
- Proprietary optimization based on business parameters: cleaning costs, generation losses, curtailment, ...

Condition-based module cleaning - Impact



- Real time monitoring of 70+ sites across the country
- Shifts in ways of working
 - Site managers are now able to pre-plan resources based on soiling
 - Moving away from frequency- based cleaning to maintenance based on indicators from digital dashboards
 - Net loss due to non - adherence to model output clearly showcased on a daily level as a KPI for site managers
- **Simple actionable dashboards** for site managers for daily prioritized cleaning action at site and planning of resources.
- **Optimized cleaning cost**
- **Reduction in soiling loss**

Shading Detection



Problems addressed

- Early identification of shading losses due to tracker issues or vegetation

Description

- Flags String Combiner box or String monitoring box depending upon the structure of the site for any shadow detected.

Impact

- Increase in energy yield
- Reduction in time for identification & correction of underperformance of assets
- Increase in site employee efficiency in shadow rectification activities
- Site managers are now able to pre-plan resources based on monthly model prediction

MPPT deviation model



Problems addressed

- To identify and locate the inverters that are underperforming due to MPPT related issues.

Description

- Expected MPP voltage and current modelled every 15 minutes
- Deviation from MPP detected, factoring in known other losses

Impact

- Detect string mismatch
- Detect unknown temperature derating
- Detect other issues with voltage

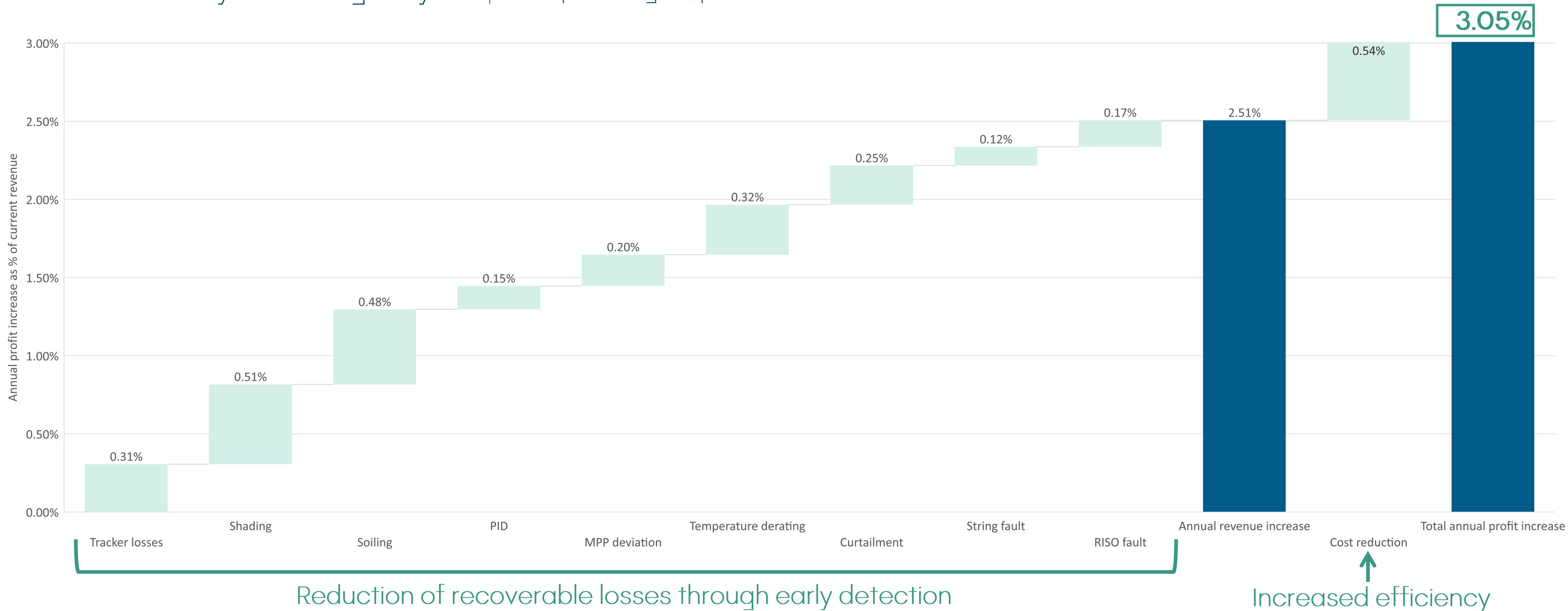
Conclusions



- Digitalisation transformed the way ReNew operates
- Advanced analytics provide tangible business value on several use cases
 - Condition-based module cleaning
 - Early detection of shading
 - Detection of MPPT deviation and others
- **Impact**
 - Real time monitoring of 3+ GWs across 70+ sites distributed across the country
 - Transformed the culture of the organization - data backed decisions
 - Increase in site employee efficiency
 - 1-1.5% increase of energy yield
- **Enablers**
 - Strong buy-in from leadership
 - Systematic P&L calculation for digitalization
 - Effective processes and change management

Advanced analytics improve your profits

Increase your margin by **3%pt** (depending on portfolio details)



Advanced analytics improve your profits

Increase your margin by **3%pt** (depending on portfolio details)



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webinars

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Q&A



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Parul Agrawal

AVP Digital Solutions
ReNew

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[Vertical agrivoltaics to reduce PV curtailment, increase water efficiency](#)

by Emiliano Bellini



Most-read online!

[Panasonic introduces half-cut HJT residential solar modules](#)

by Ryan Kennedy



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Thursday, 5 October 2023

1:00 pm – 2:00 pm EDT, New York City
7:00 pm – 8:00 pm CEST, Berlin

Tuesday, 10 October 2023

3:00 pm – 4:00 pm BST, London
4:00 pm – 5:00 pm CEST, Berlin

Many more to come!

**A manufacturer
guide to
complying with
US module
import laws**

**Powerful data in
PV project
development**

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Registration, downloads & recordings are also be found there.



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US

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Jonathan Gifford

Editor in chief
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