



Operation & Maintenance Best Practices

Data and Monitoring Requirements

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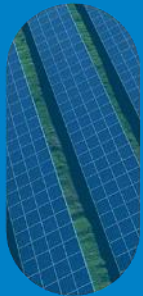
Operation & Maintenance
Best Practices



1. About QOS Energy
2. Why monitor PV plants?
3. Considerations
4. Selecting the right system
5. Monitoring for O&M



About QOS Energy





About QOS Energy

Independant Software Vendor

Harness Data Intelligence

#IIoT #CloudComputing #RenewablesAnalytics #DataScience

International presence

#Europe #India #Asia #Americas

Corporate Values

#Independence #Agility #Sustainability #Innovation #Quality Of Service



>1200

users

in 23

countries

7

renewable
energies

5000

renewable
assets

> 250

data exchange
methods

> 8 GW

monitored, analysed,
maintained, managed

Key Figures

About QOS Energy



International presence

List of our offices



HQ Nantes France

Germany Stuttgart

United-Kingdom / Ireland London

North America Portland & New York USA

India Mumbai

Asia Tokyo Japan





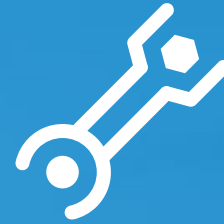
Aggregate Data

Get clean data from any plant, system or database



Transform Data Into Intelligence

Customize analytics for better decision



Increase Availability

Minimize downtimes & operating costs



Maximize Profitability

Involve all stakeholders to optimize asset performance



A Comprehensive Set of Functions



Monitor

Portfolios on one dashboard

Maintain

Efficiently to increase productivity



Analyse

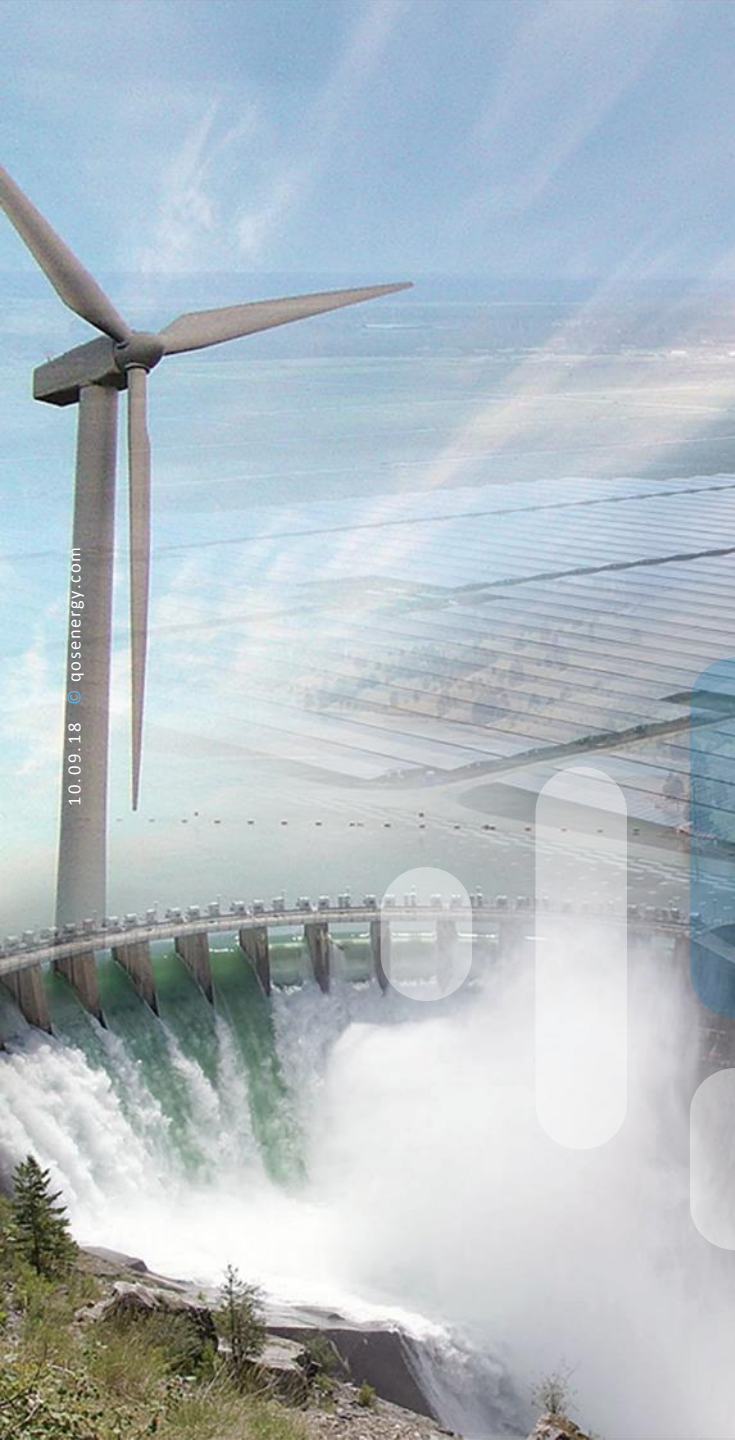
On the fly to optimise performance



Manage

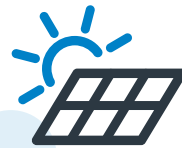
Assets, reporting & users





Multi-Energy & Hardware-Agnostic

QOS Energy Powers Qantum®



Solar



Wind



Hydro



Storage



Biomass



Quantum[®] architecture

10.09.18 © qosenergy.com



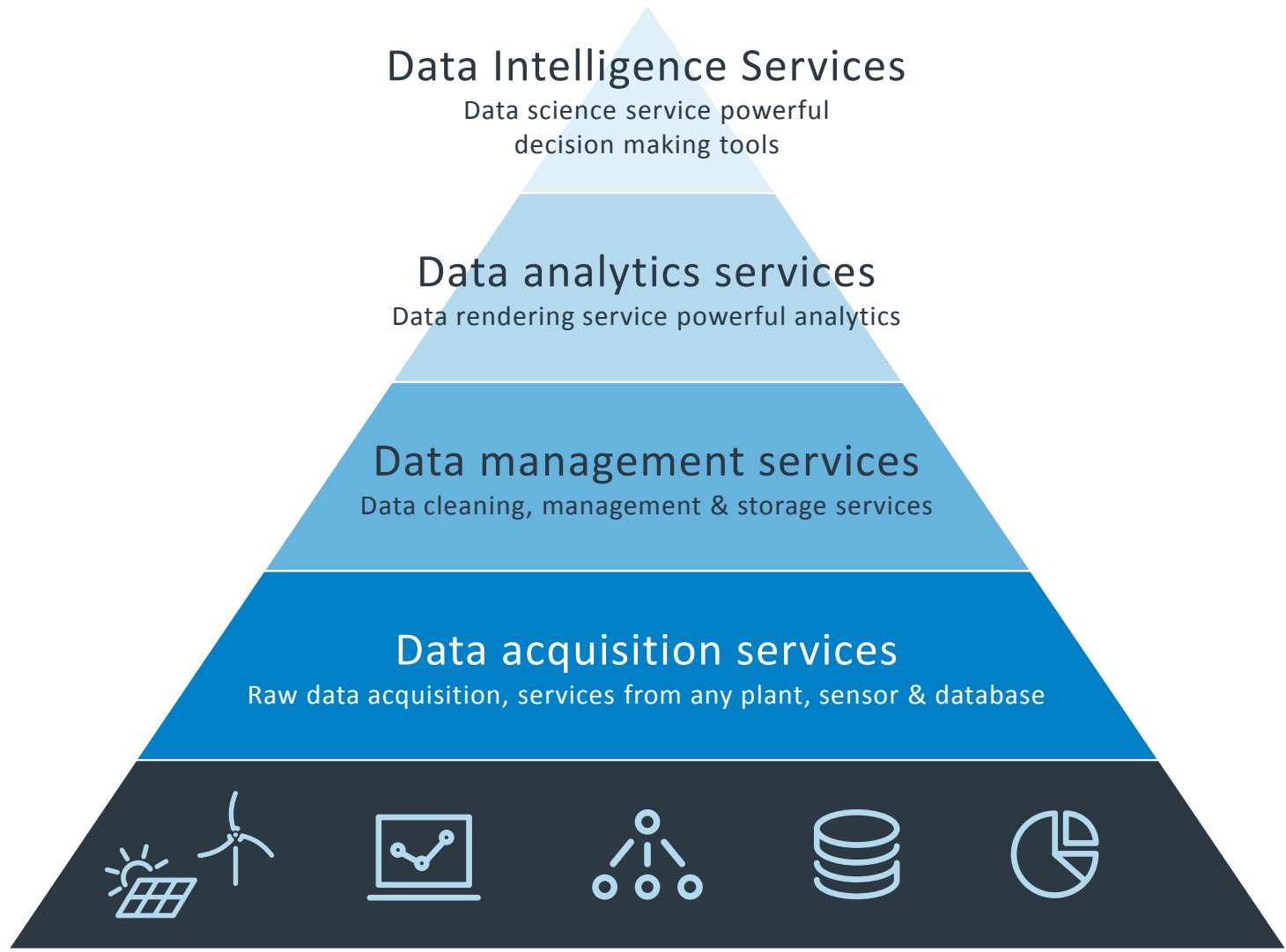
The All-in-One renewable cloud, Scalable, Flexible & Secure Architecture



Data Services

About Qantum®

QOS Energy has developed a comprehensive data processing expertise to provide immediate, reliable, accurate and insightful data-driven decision-making tools.



End-to-End Security

About Qantum®



DATA ACQUISITION
& EXCHANGE

DATA STORAGE
& PROCESSING

DATA
VISUALISATION
& ACCESS

DATA RISK
& THREAT MANAGEMENT

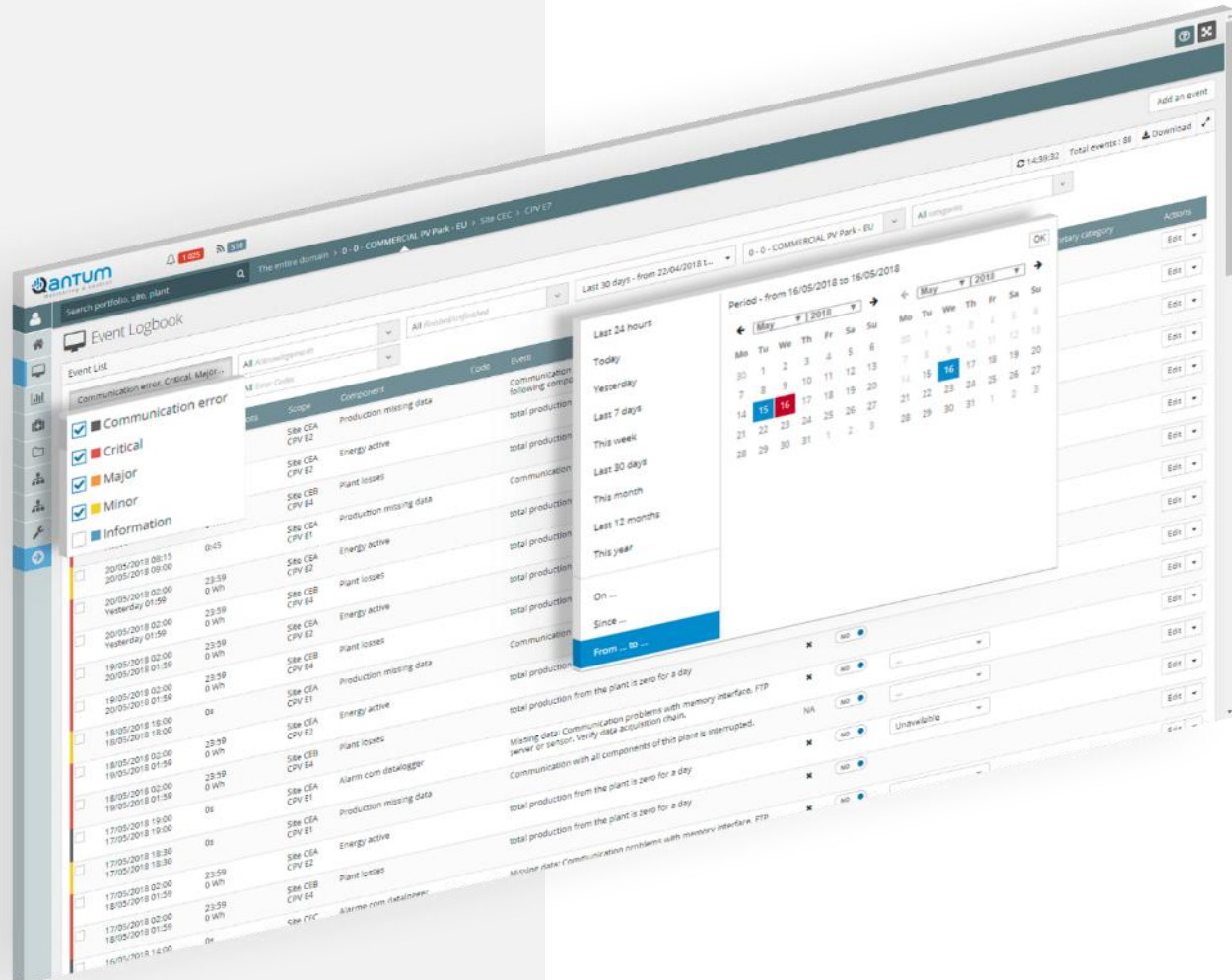




Monitor

- Revenues & KPIs
- Multiple plants
- Real-time
- Portfolio aggregation
- Direct marketing





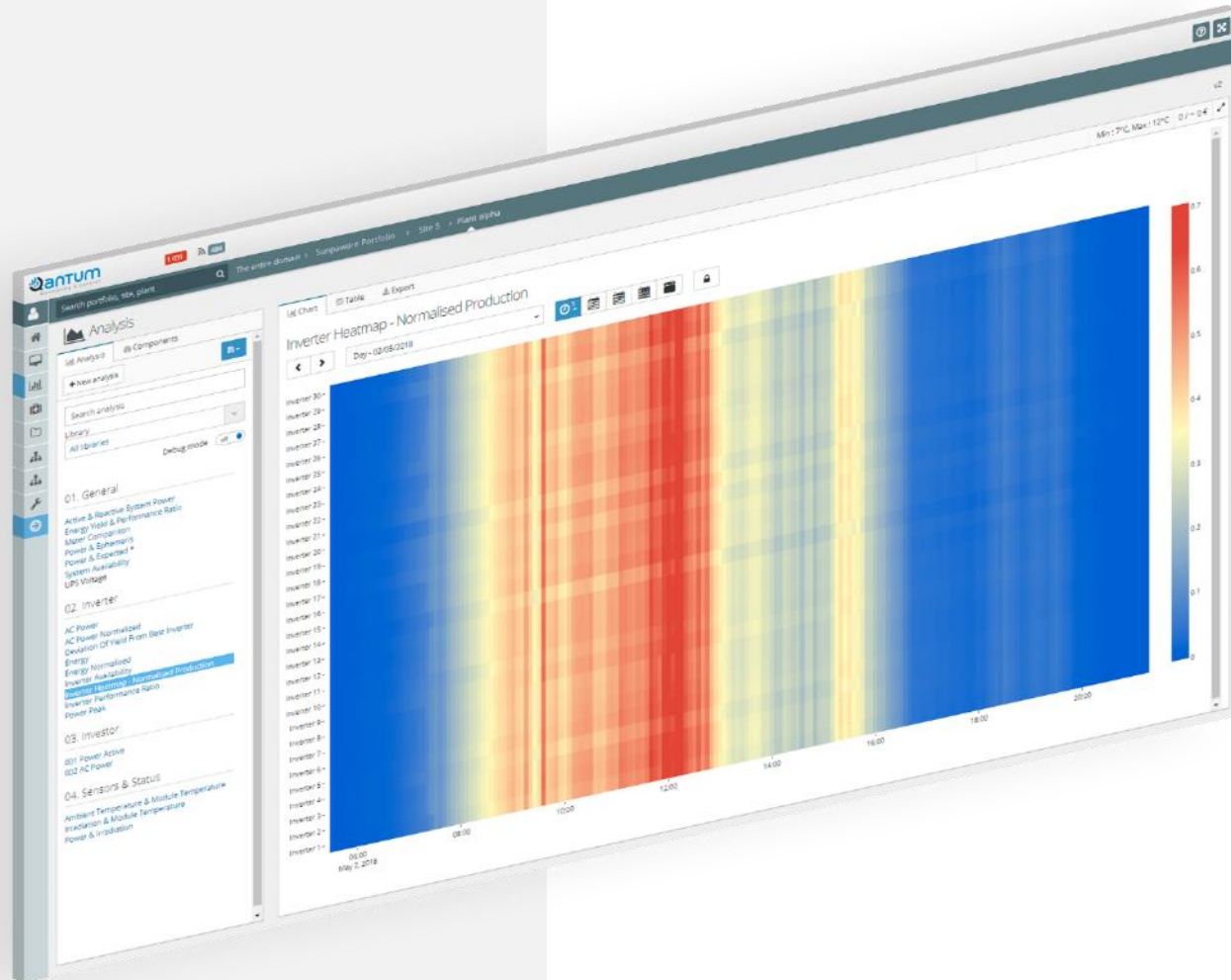
Monitor

Event criticality

Custom alarms

Portfolio & plant availability

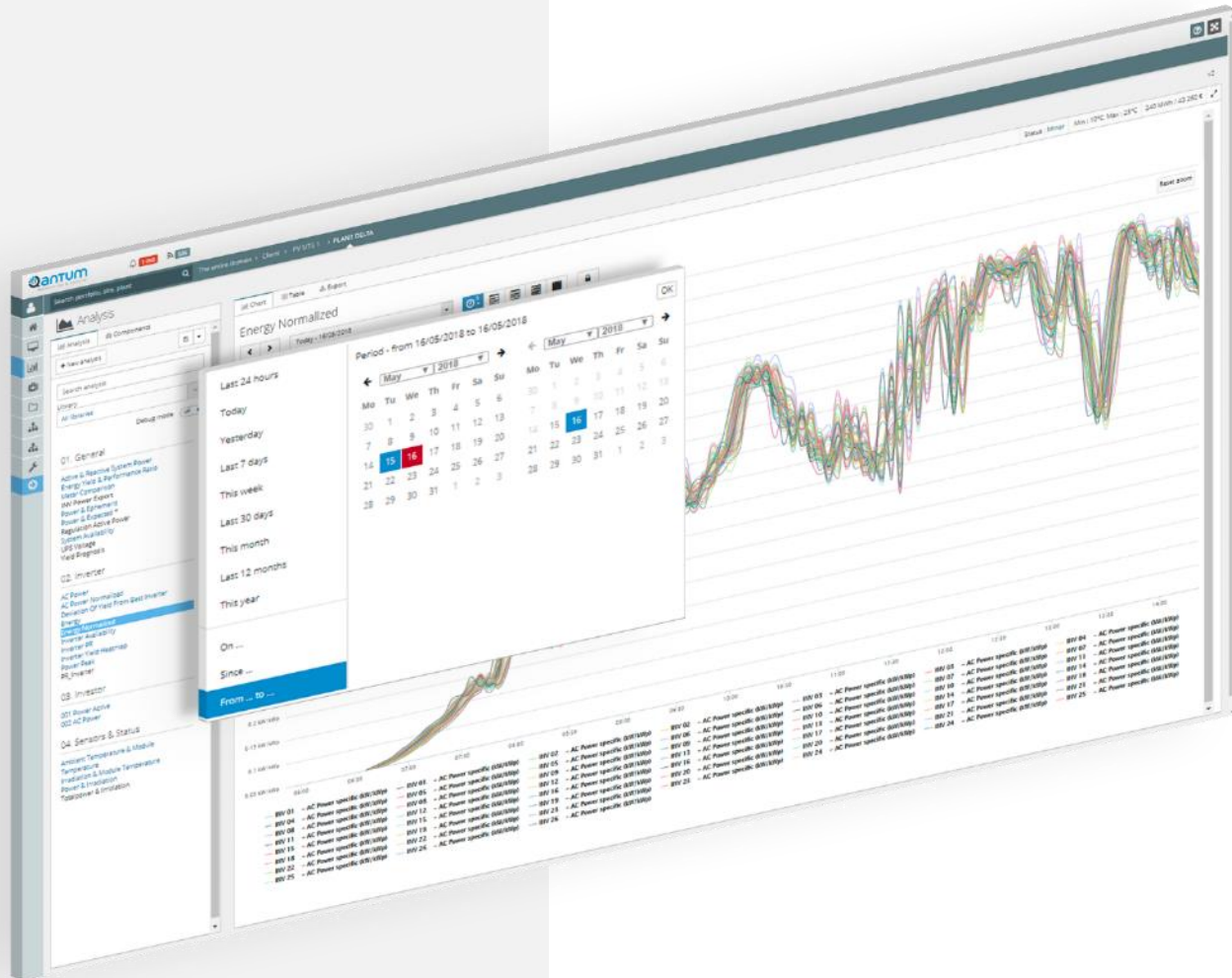




Analys

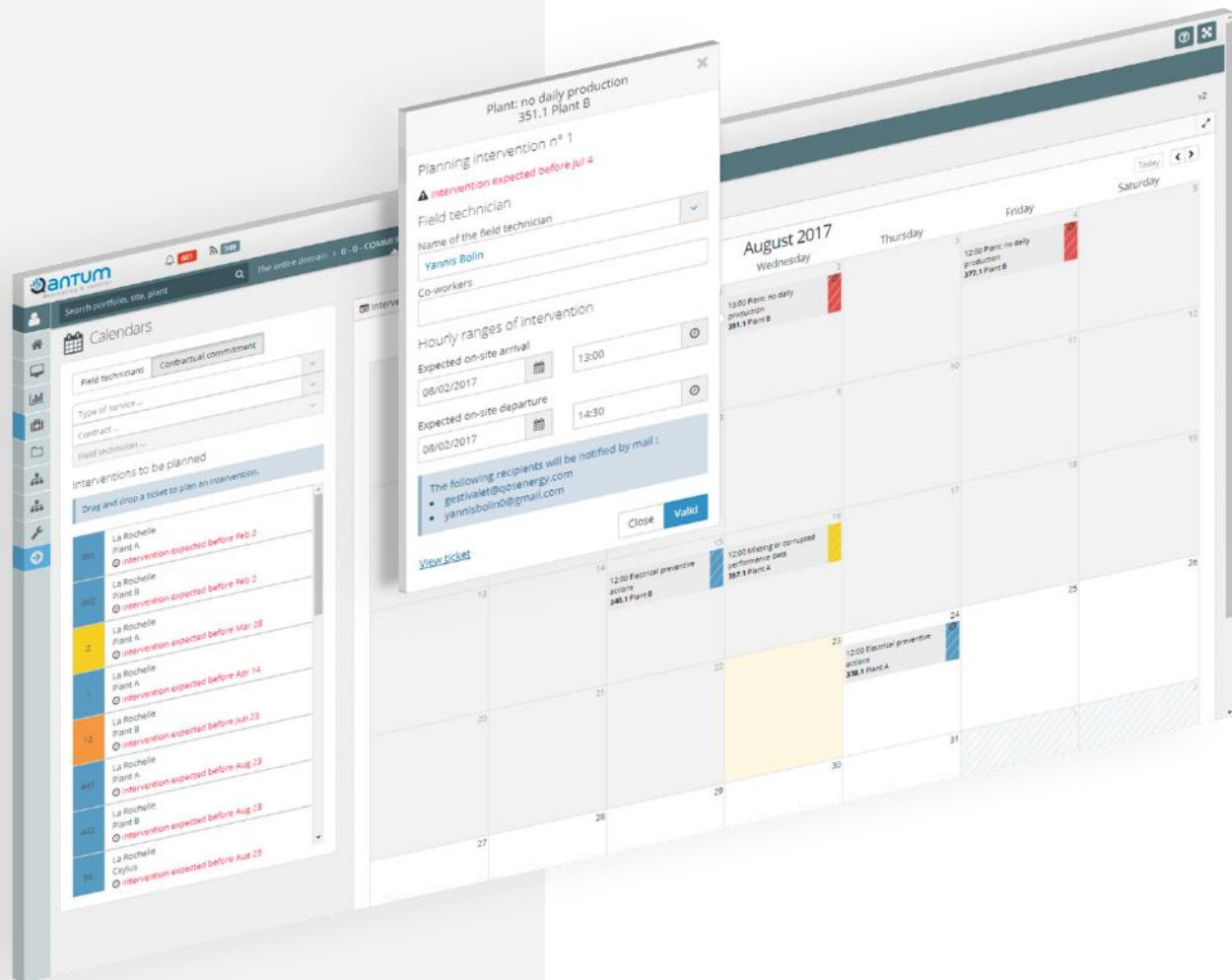
- Benchmark performance
- Custom charts
- Unlimited KPIs & analyses
- Data export





Analise

- Energy production forecasts
- Availability (time & energy)
- Production & revenue losses
- Theoretical power production



Maintain

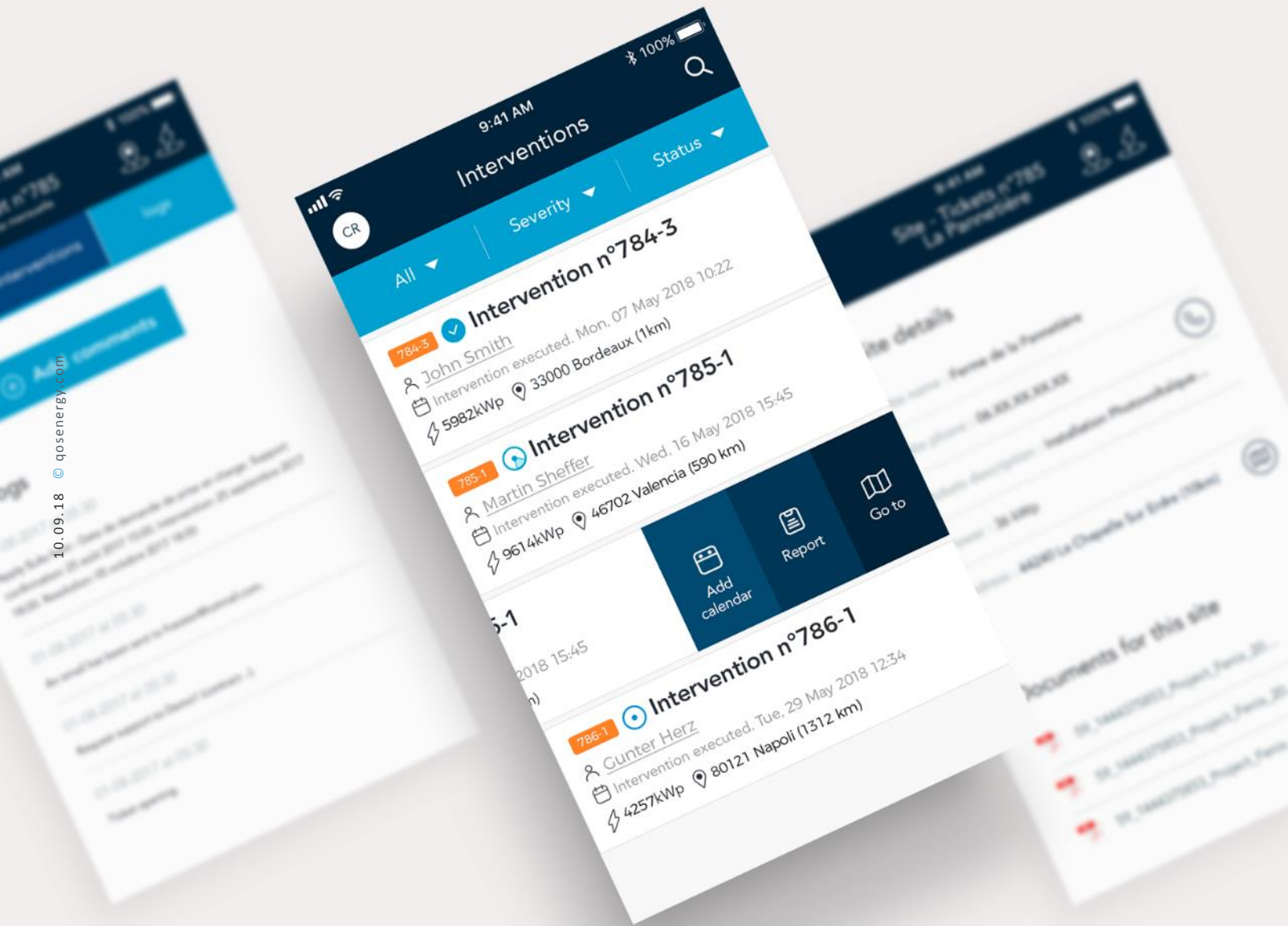
Ticketing system

Calendar

Contracts

SLAs

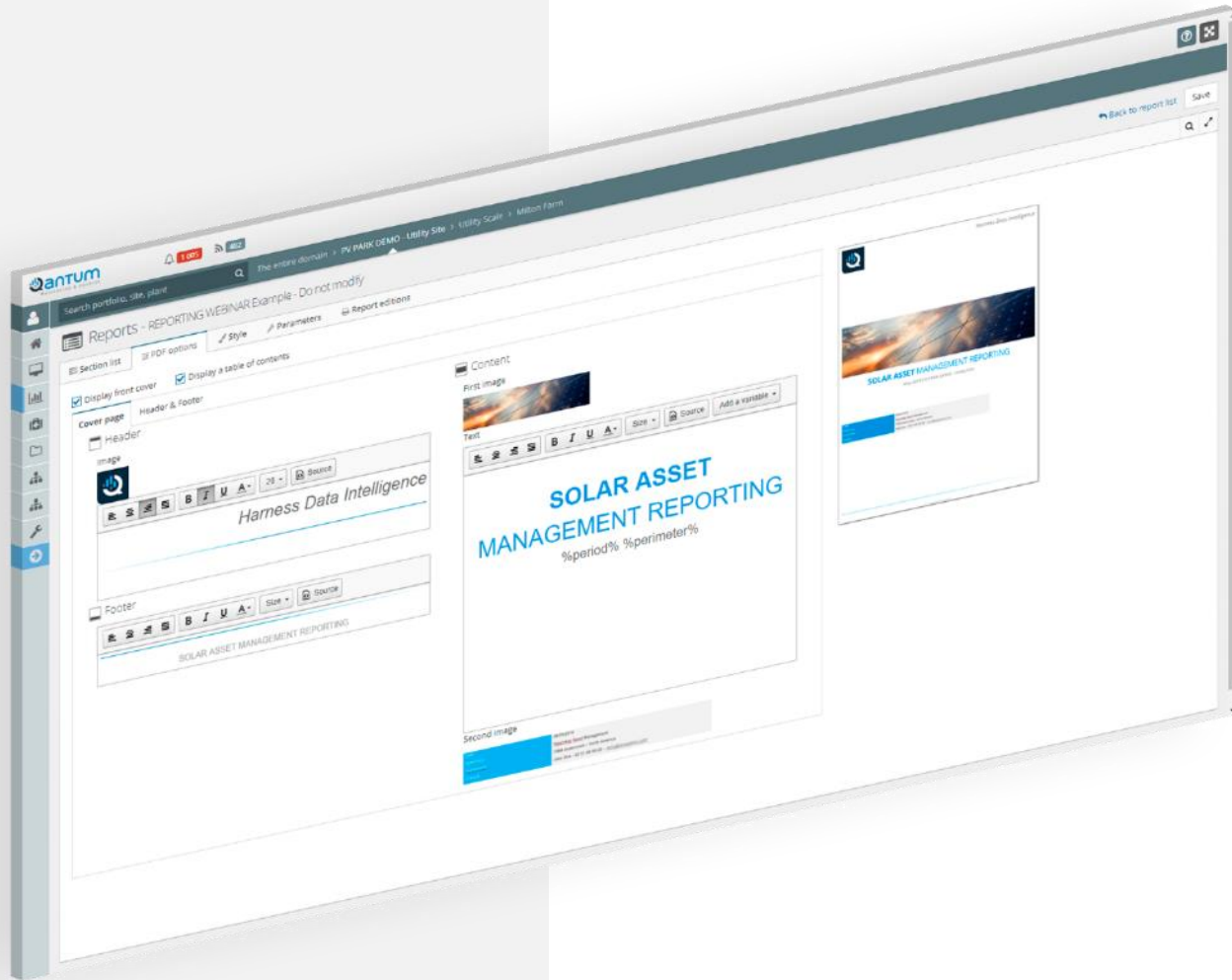




Maintain

Mobile CMMS portal
for field technicians





Manage

Revenues

Asset performance

Automated reporting

Users & team

Exchange data using the API





Truly powerful reporting

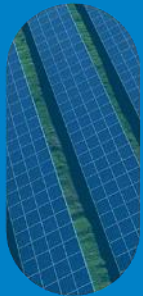
100% customizable reporting
Add any item (analytics, events, tickets) & customize the corporate identity (logo, colours)

100% automated reporting
Automatic edition.

100% sharable reporting
Share with anybody.



Why monitor PV Plant?





Importance of Monitoring PV plants

Are these Energy Assets performing as expected? .



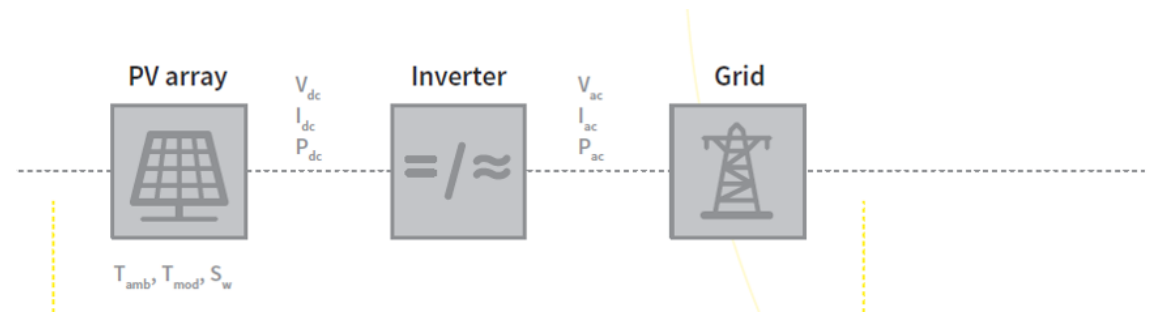
Purpose of Monitoring Plants

Reports on parameters of the energy conversion chain

- String Current
- Inverter
- Export meter

Key Performance Indicators [KPIs]

- String operation ·
- Yield
- Performance Ratio

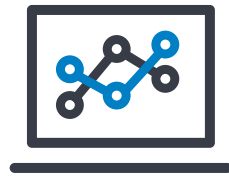




health of a PV plant



alarm triggering



one point of reference



easy to see what is wrong

Outcome



control the plant



MONITORING
KPI



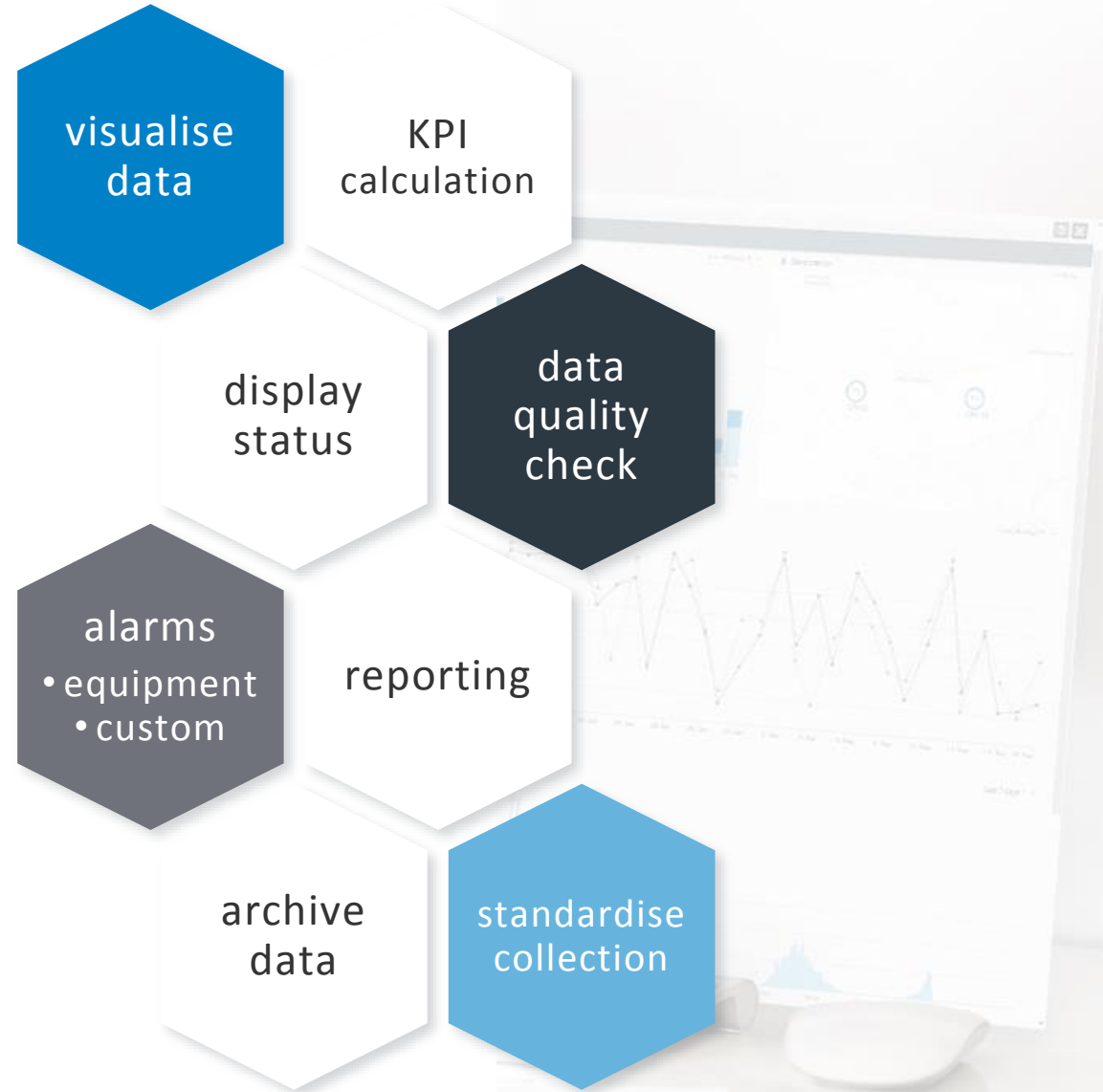


Considerations



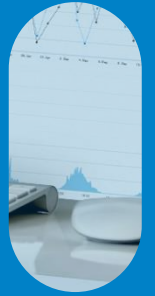
Monitoring Portals

Primary functions





Selecting the right system






Selecting a Datalogger / SCADA

You should consider::

1. Cybersecurity
 - Operate behind a firewall
 - Transmit data securely
2. Connectivity to the internet
3. Compatibility with equipment
 - Inverters
 - Auxiliary equipment
 - Command functionalities (if needed)
4. Robustness





Selecting a Monitoring Portal

You should consider:

- Data protection and Backup policies
- Compatibility with monitoring system
- Data visualisation capabilities (does it meet your needs)
- KPI calculation
- Third-party data integration
- Reporting possibilities
- Process alarms



Event List			
Communication error, Critical, Major...		All Acknowledgements	
All Error Codes		▼	
<input type="checkbox"/>	Beginning / End	Duration/Loss	Scope
<input type="checkbox"/>	Today 15:00 Active	1:13	Site CEB CPV E3
<input type="checkbox"/>	Today 14:30 Active	1:43	Utility Scale Milton Farm
<input type="checkbox"/>	Yesterday 02:00 Active	38:13	Utility Scale Milton Farm
<input type="checkbox"/>	19/08/2018 17:00 19/08/2018 17:00	0s	Site CEB CPV E3
<input type="checkbox"/>	19/08/2018 02:00 Yesterday 01:59	23:59	Utility Scale Milton Farm
<input type="checkbox"/>	18/08/2018 15:45 18/08/2018 15:45	0s	Utility Scale Milton Farm
<input type="checkbox"/>	18/08/2018 02:00 19/08/2018 01:59	23:59	Utility Scale Milton Farm
<input type="checkbox"/>	17/08/2018 02:00 18/08/2018 01:59	23:59	Utility Scale Milton Farm
<input type="checkbox"/>	16/08/2018 12:00 16/08/2018 12:00	0s	Site CEA CPV E2
<input type="checkbox"/>	16/08/2018 09:45 16/08/2018 11:00	1:15	Site CEA CPV E2
<input type="checkbox"/>	16/08/2018 02:00 17/08/2018 01:59	23:59	Utility Scale Milton Farm
<input type="checkbox"/>	15/08/2018 17:30 15/08/2018 18:00	0:30	Site CEA CPV E2
<input type="checkbox"/>	15/08/2018 16:45 15/08/2018 17:00	0:15	Site CEA CPV E2
<input type="checkbox"/>	15/08/2018 02:00 16/08/2018 01:59	23:59	Utility Scale Milton Farm
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<input type="checkbox"/>	13/08/2018 02:00 14/08/2018 01:59	23:59	Utility Scale Milton Farm

Alarms from Equipment and Custom Events

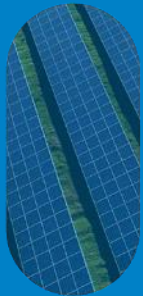
Standard alarms include:

- ↳ Loss of communication
- ↳ Plant outage
- ↳ Inverter outage
- ↳ Plant under performance
- ↳ Inverter under performance

Add custom alarms



Monitoring for O&M





Monitor

Revenues & KPIs

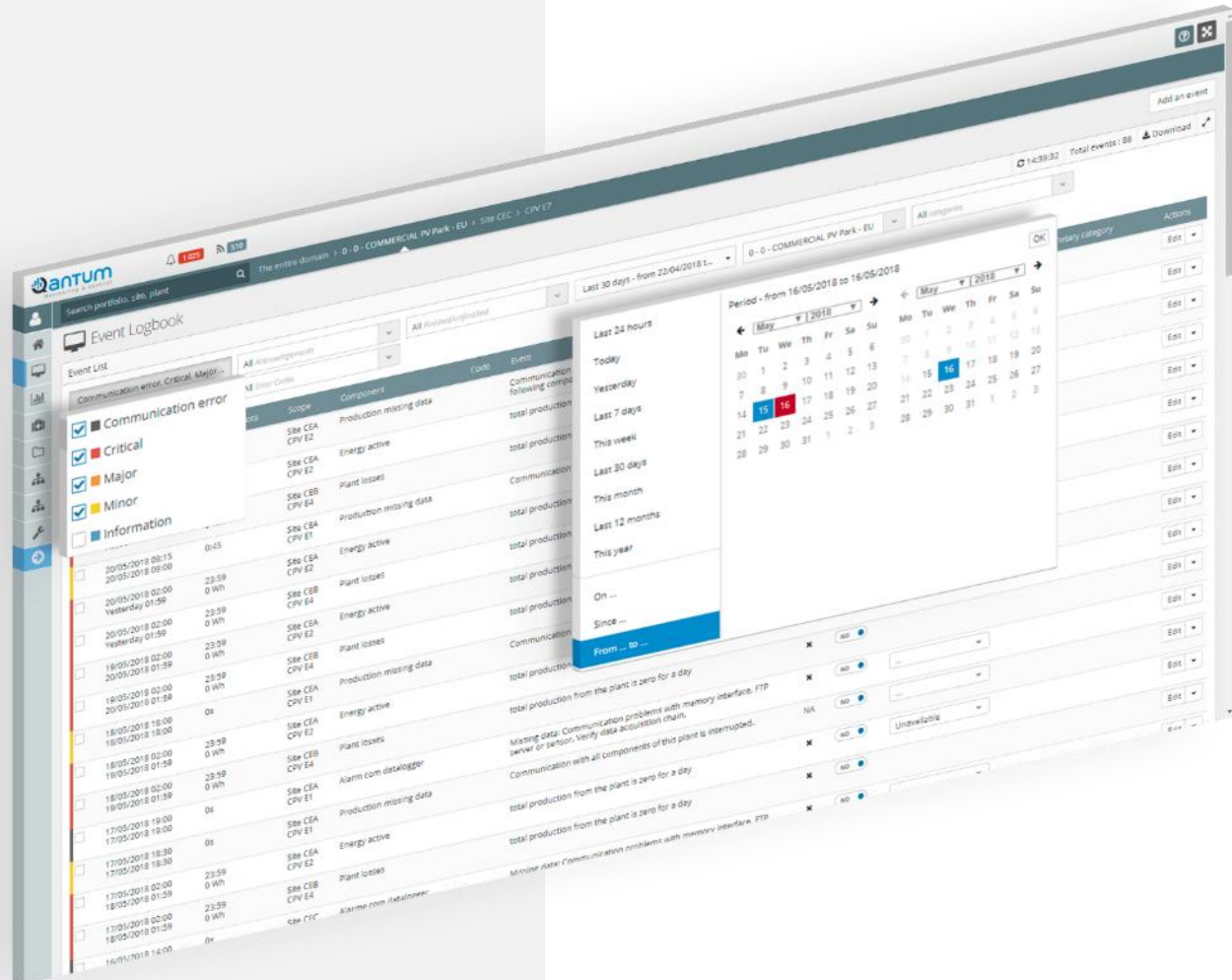
Multiple plants

Real-time

Portfolio aggregation

Direct marketing





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Event criticality

Custom alarms

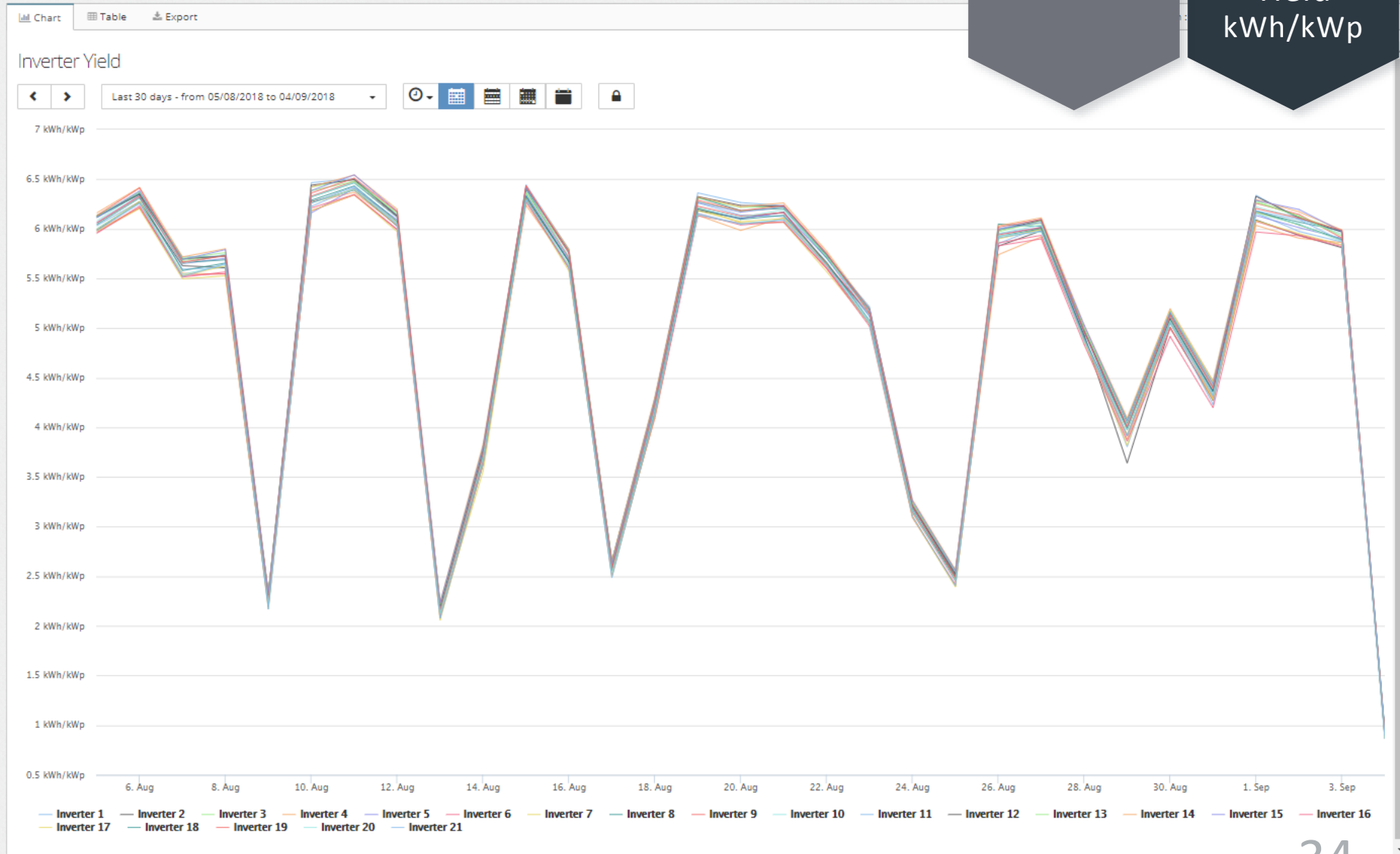
Portfolio & plant availability



Inverter Data

Calculation

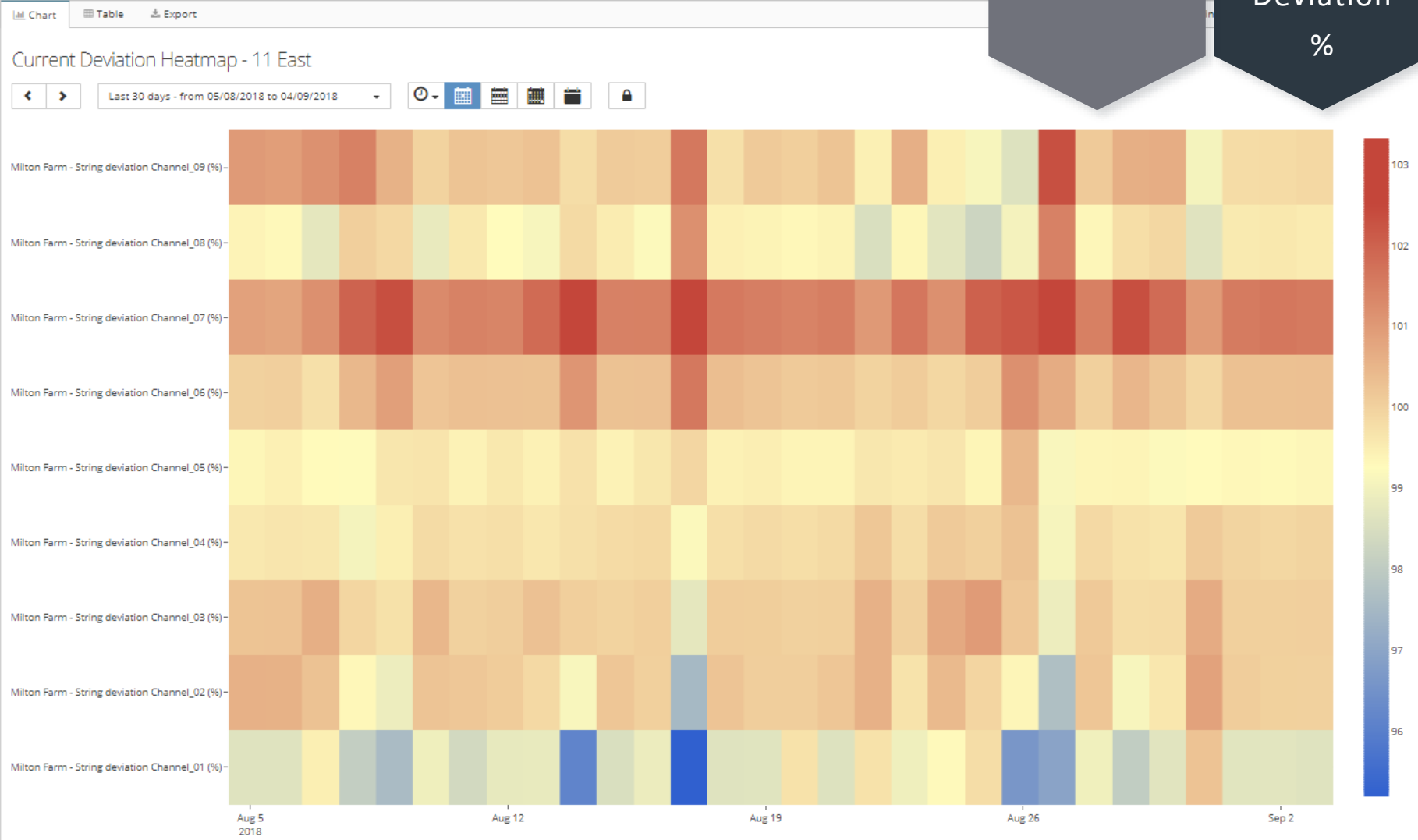
Inverter Yield kWh/kWp

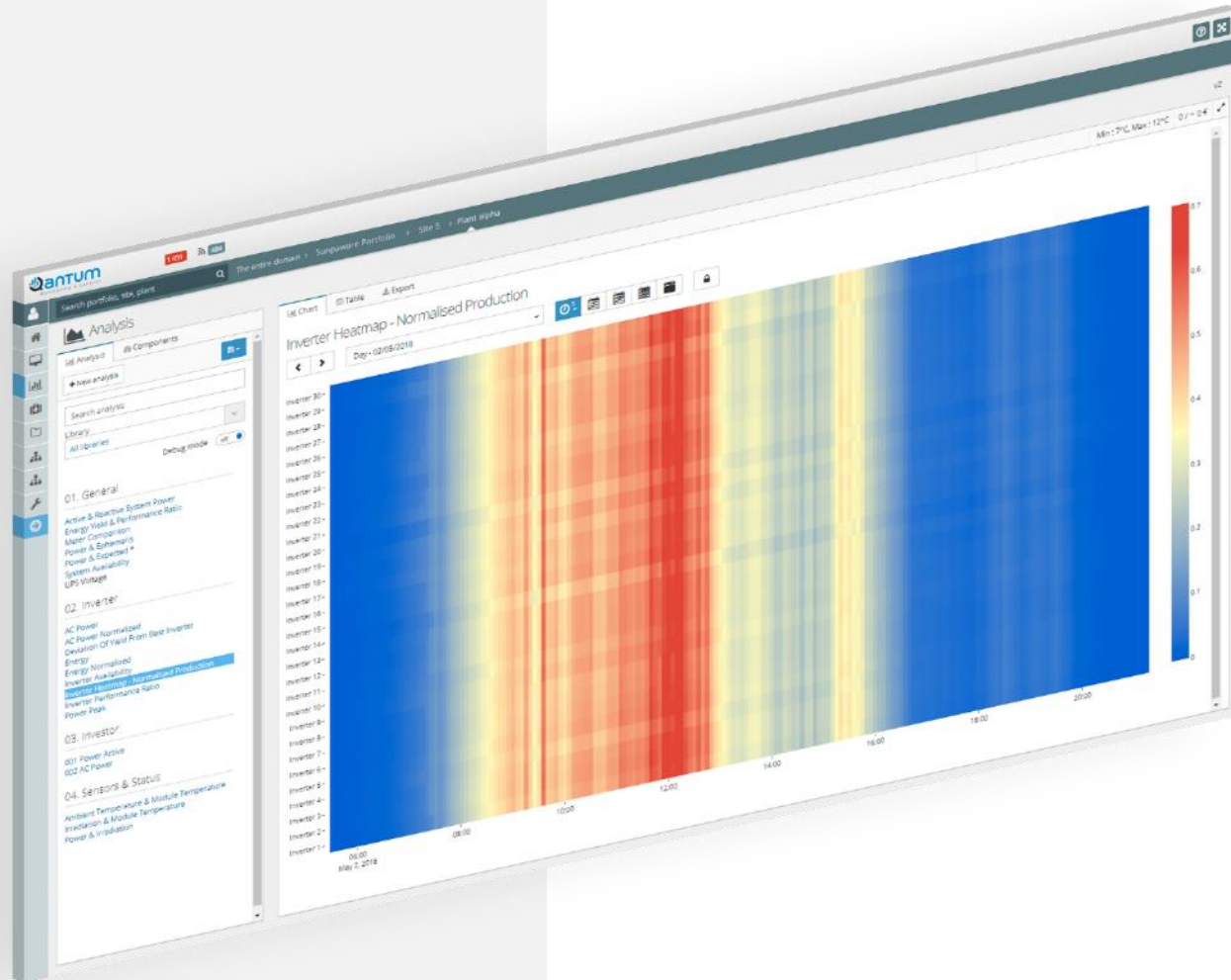


String Data

Calculation

String Current Deviation %





Analys

- Benchmark performance
- Custom charts
- Unlimited KPIs & analyses
- Data export



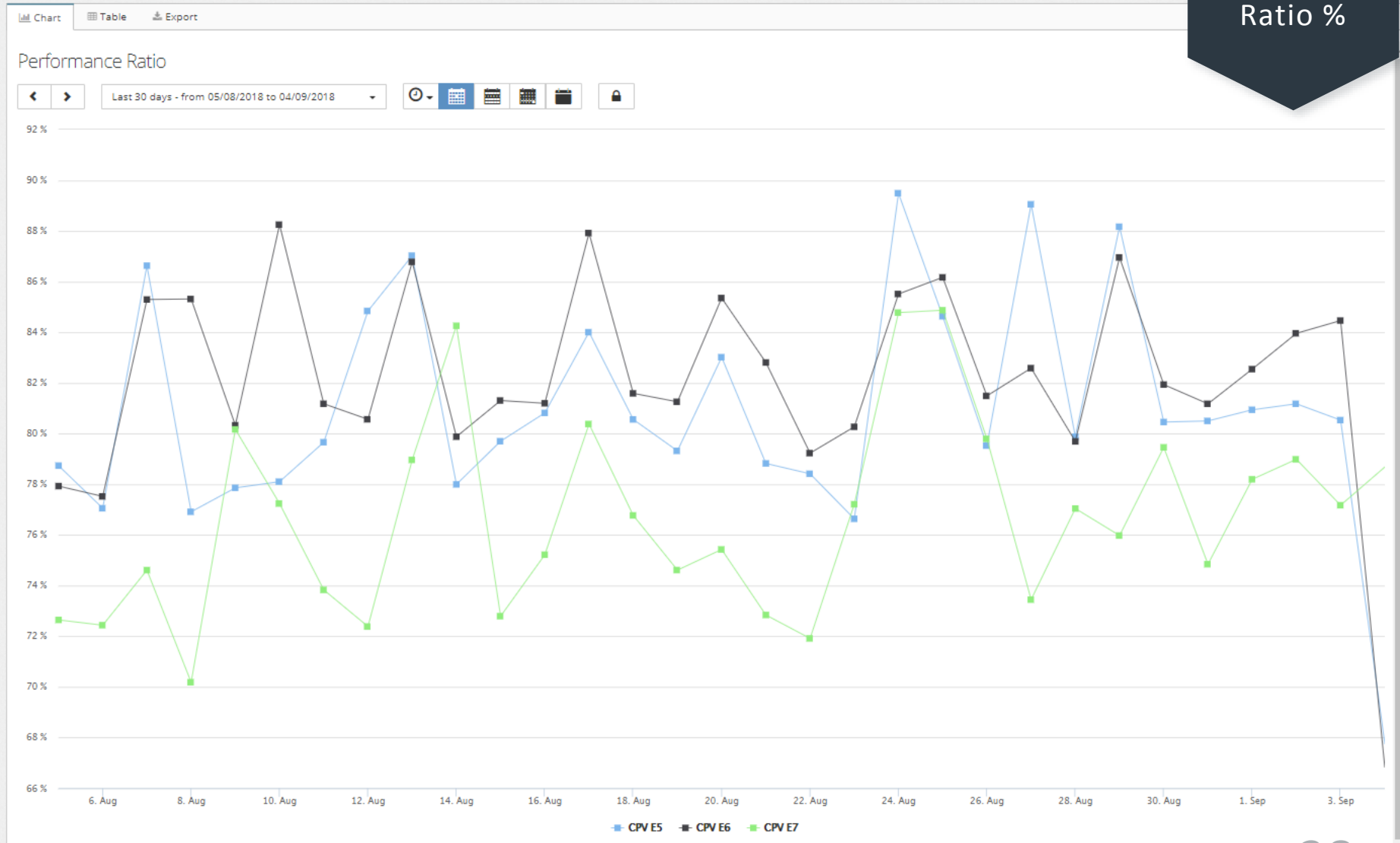
Analyse

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Calculation

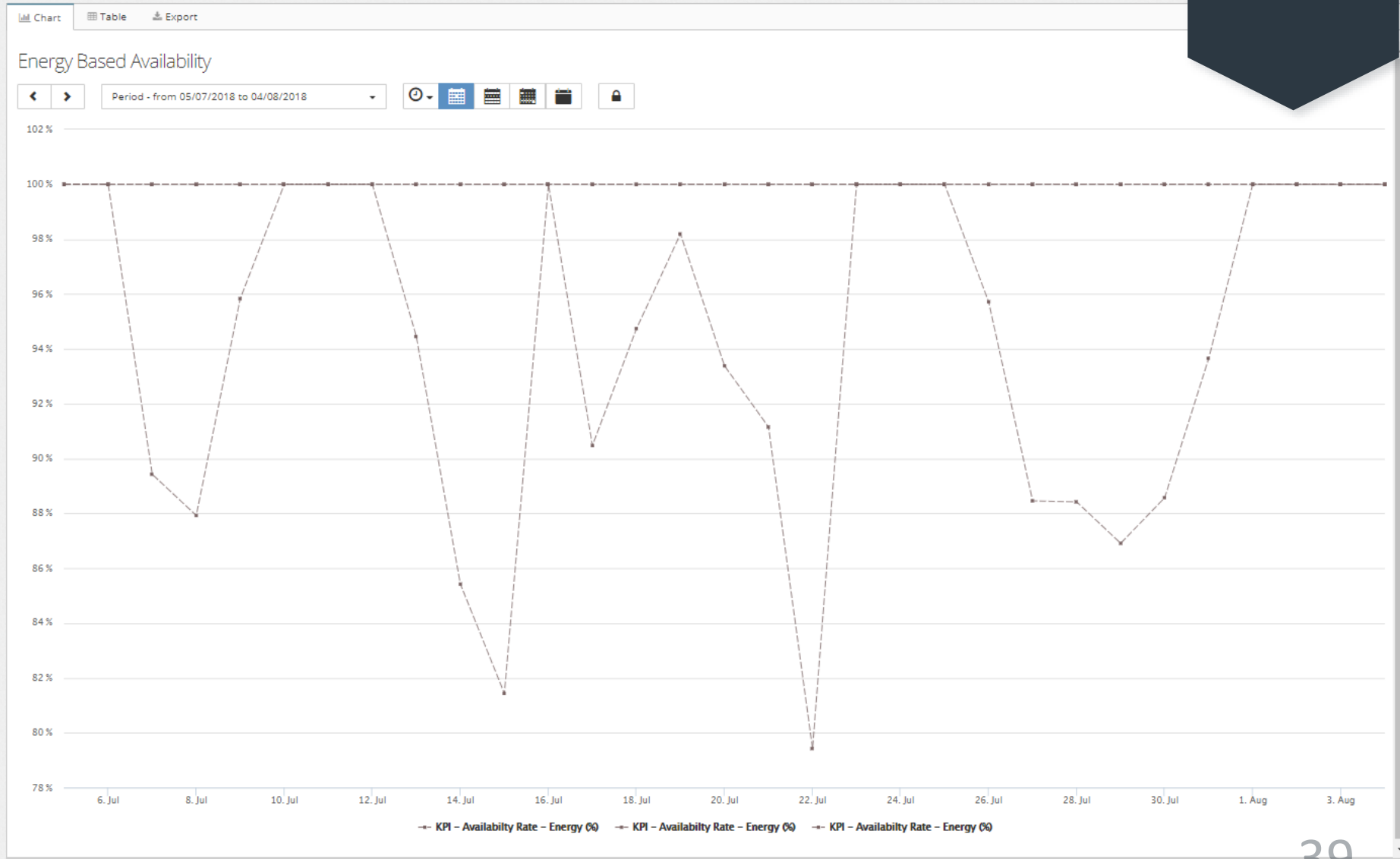
Performance Ratio %

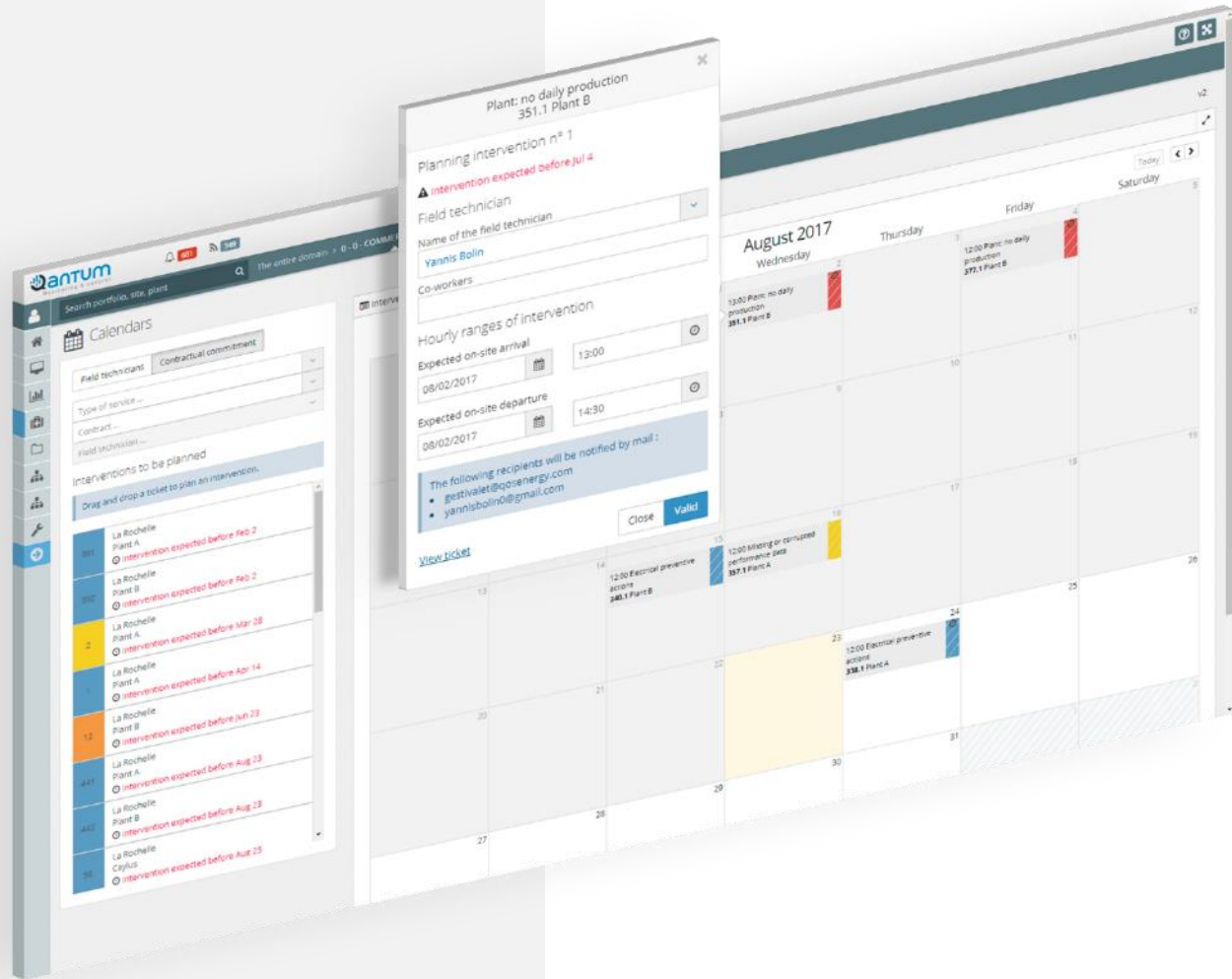


Calculation

Energy Based Availability %

Navigation sidebar with menu items: Analysis, Reports, Slideshows, Actions, Asset management, Administration, Quantum Admin, Integration. A sub-menu is open under 'Analysis' showing 'Energy Based Availability' selected.





Maintain

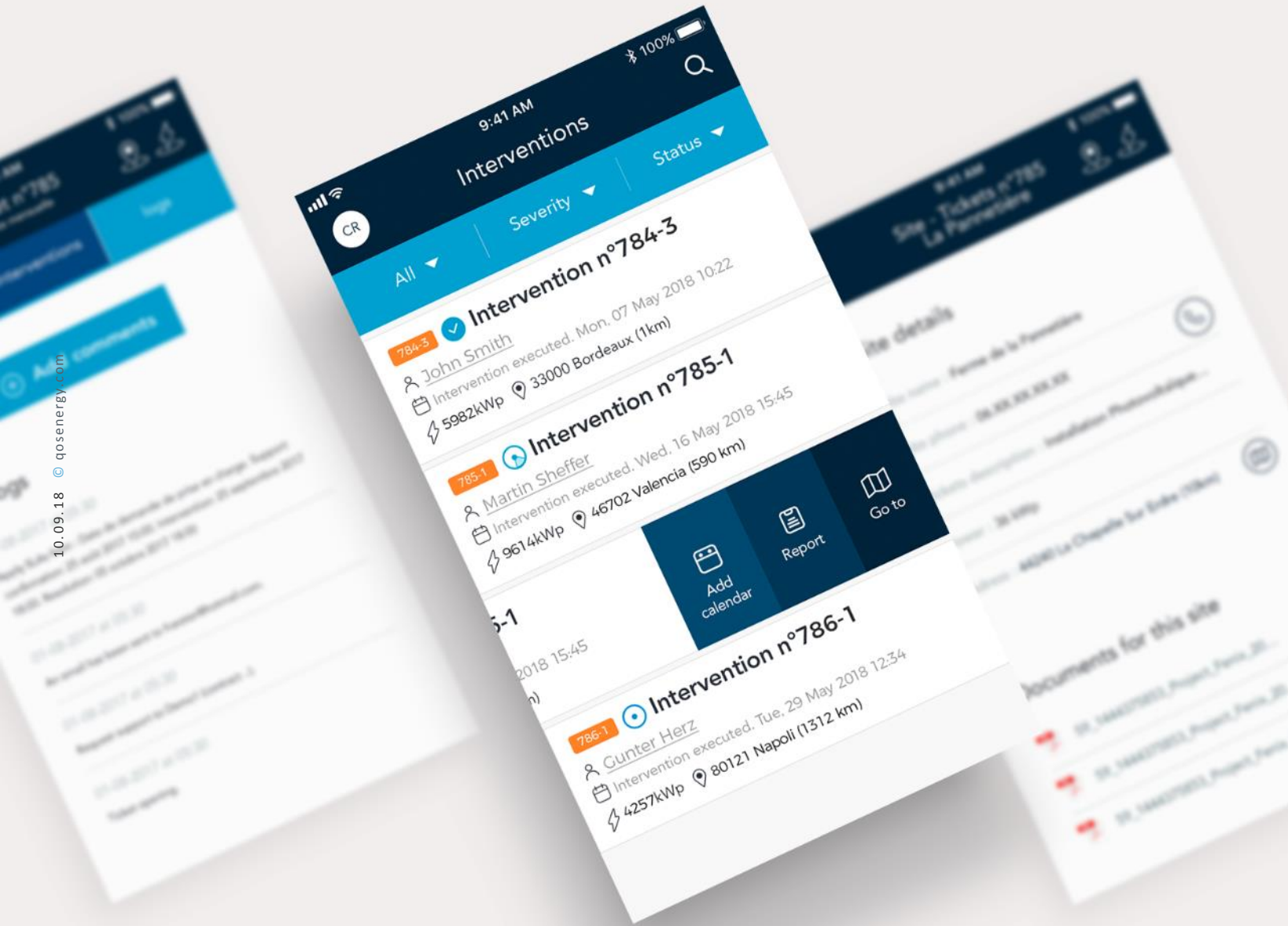
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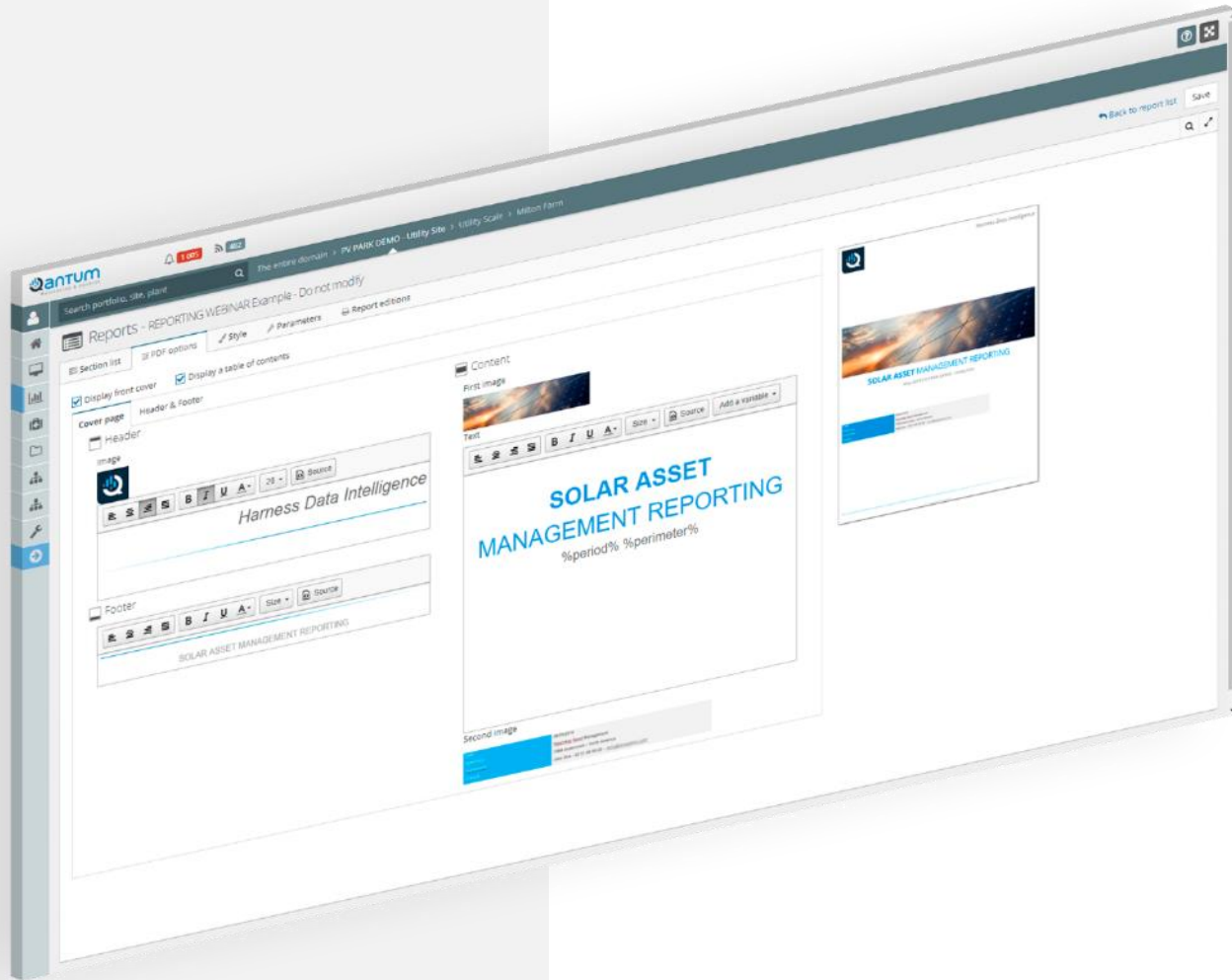




Maintain

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Exchange data using the API



Digital Twin Technology:

“ a digital representation of a plant designed to benchmark performances “

Early aging detection

Data replacement

Digital Twin Technology

Data Science & Machine Learning technologies to harness solar power

Loss calculation

Data Science & Machine Learning Techniques

Smarter Alarms

DIGITAL TWIN APPLICATIONS

Condition Monitoring system

Data cleaning

Reliable production forecast

Failure prediction

Soiling Analysis

Shadow detection

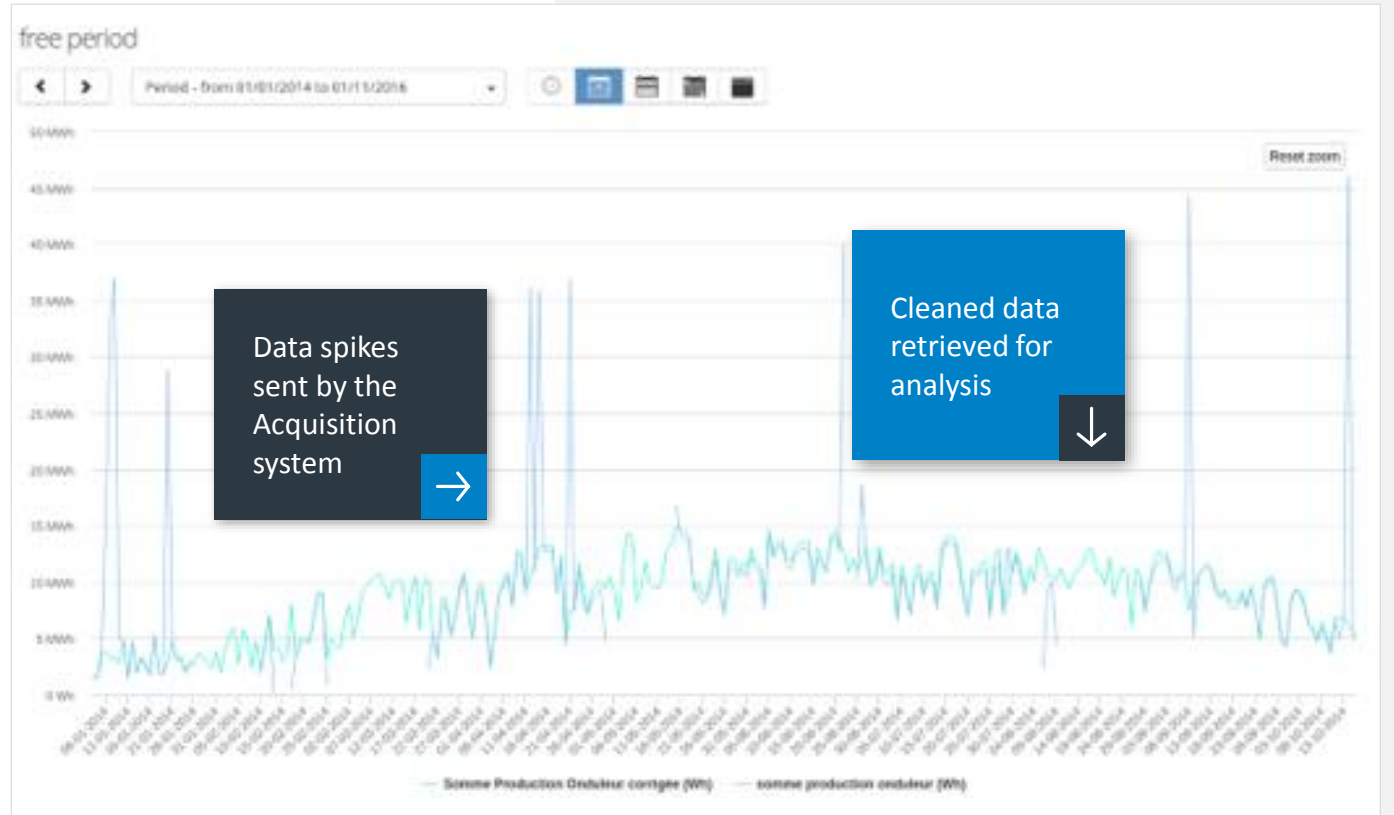


100% R&D / data science

Data cleansing based on Machine Learning

Data cleansing : data received is sometimes incoherent

- Use Machine Learning mechanisms to filter incoherent / inaccurate data in a robust & scalable way
- Provider higher data Quality & Accuracy Level

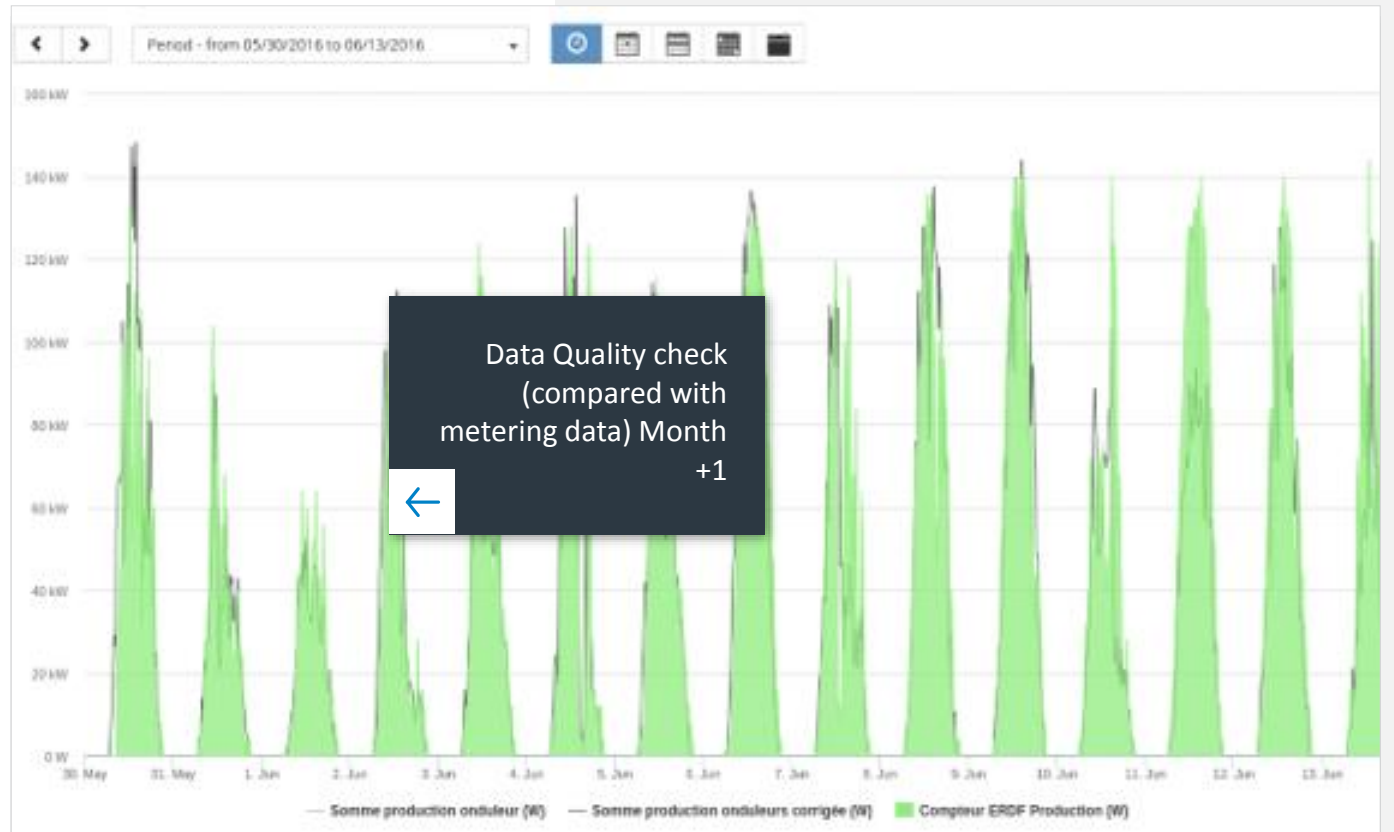


100% R&D / data science

Data Completion using machine learning technologies

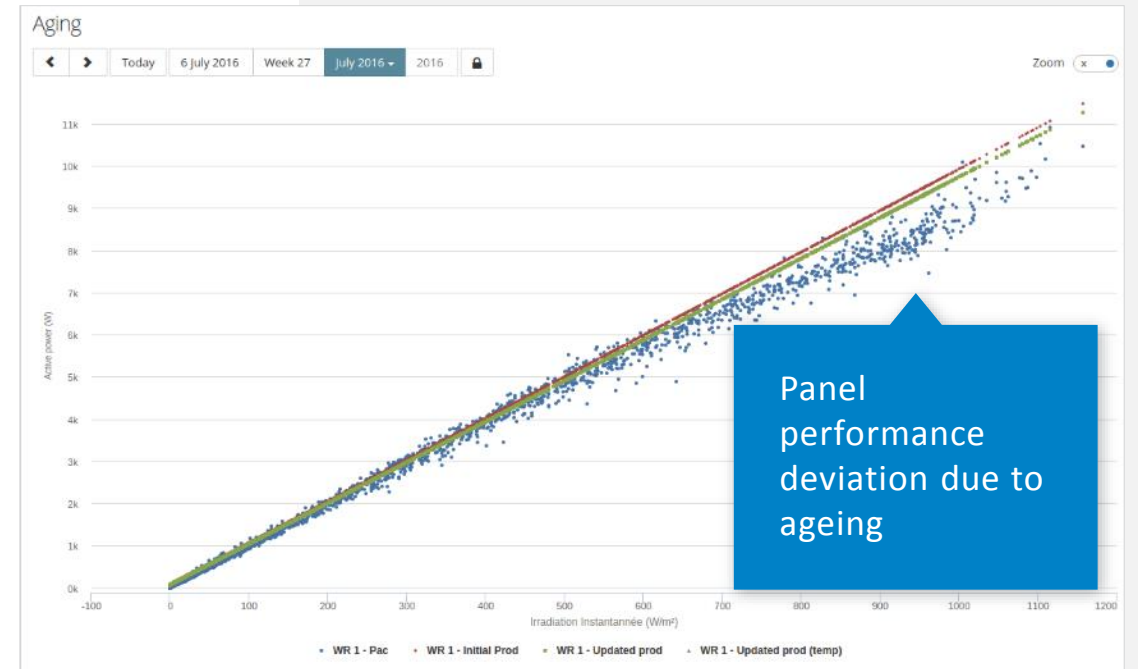
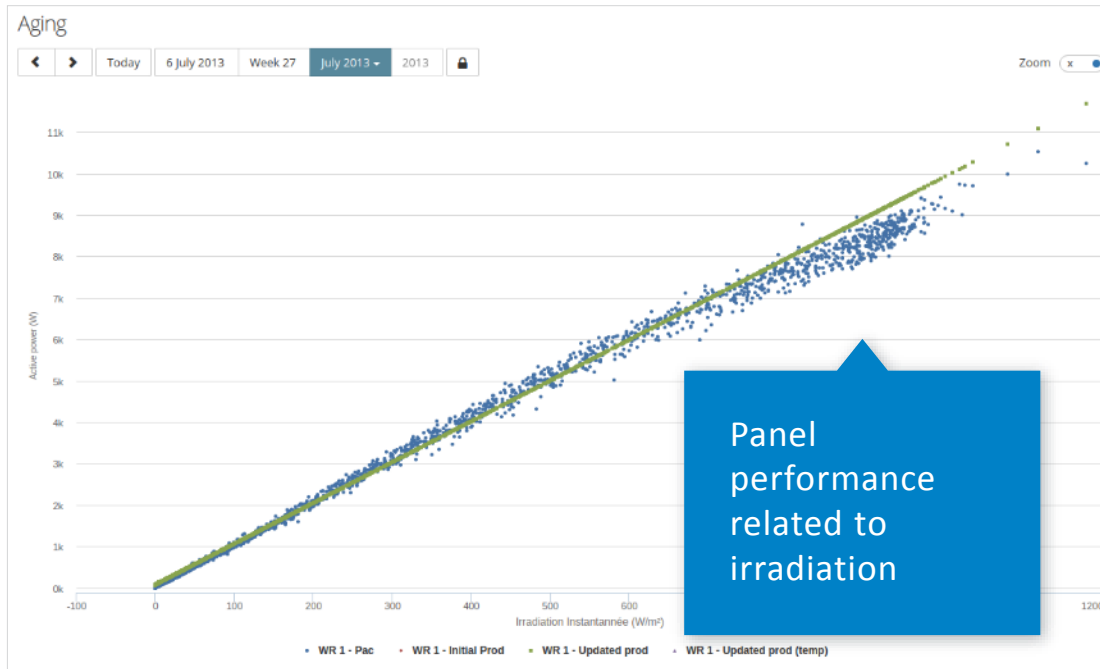
A plant of 500 kWp

Use machine learning techniques to fix missing, incoherent or inaccurate data in a robust & efficient way



100% R&D / data science

Quantification of the panel ageing / based on the digital twin technology



Thank you
for your
attention.

