this webinar is powered by TGS

pv magazine webinars

Scaling renewables operations: Using digital tools for efficient asset management at the utility scale

30 October 2024

11:00 am – 12:00 pm | EDT, New York City
4:00 pm - 5:00 pm | CET, Berlin
6:00 pm – 7:00 pm | Riyadh

Matthew Lynas
Editor
pv magazine

Thomas Pettersen
VP, Asset Management Solutions
TGS

Prof. Erik Stensrud Marstein
Chief Scientist PV
The Institute for Energy Technology (IFE)

Welcome!

pv magazine webinars

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. 👀 💡

TGS | Prediktor

Scaling Renewables Operations

Using digital tools for efficient asset management at the utility scale

TGS PREDIKTOR - IFE

Agenda

1. Introductions
2. Considerations for Digital Asset Management
3. Scalable Solutions Supporting Accelerating PV Deployment
4. Industry Challenges, Needs and Solutions
5. Next Challenges
6. Summary / Key Takeaways

TGS | Prediktor

Considerations for Digital Asset Management

TGS Integrated New Energy Value Proposition

Multi-Client and Well Data

Wind and Metocean

Auxiliary Measurements

Imaging and Answer Products

On-demand Market Intelligence

OBN Acquisition

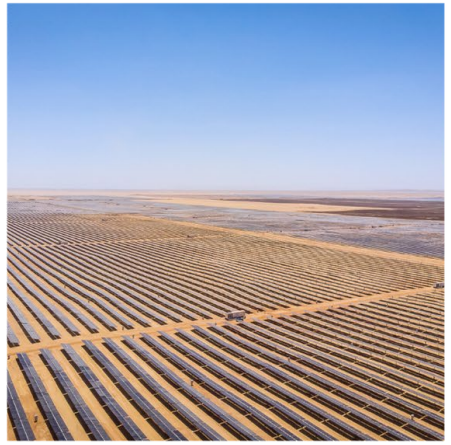
UHR3D Acquisition

Data Gateway to Asset Management

TGS Prediktor's History

- **Established in 1995**
  - Decades of expertise in energy solutions
- **Global Reach**
  - Serving clients worldwide with localized support
- **Managing 2,000+ Assets**
  - Proven track record in asset optimization
- **Dedicated to Energy**
  - Focus on renewable energy management

Providing industry-leading asset management and real-time data solutions tailored for solar asset owners and O&M providers. Leveraging decades of expertise, we empower our clients to optimize utility-scale renewable assets, reduce operational costs (OPEX) and drive increased revenue




Considerations for Digital Asset Management

Background for Discussion

TGS | Prediktor

Defining (Technical) Asset Management

What does asset management entail in a technical context?

Key Drivers for Digital Transformation

What are the main factors fueling the shift towards digitalization in asset operations?

Optimizing Operations with Digital Tools

How can digital solutions streamline the management of large asset portfolios?

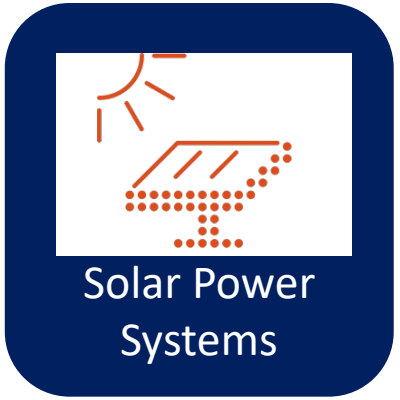
Procurement Considerations for Decision-Makers

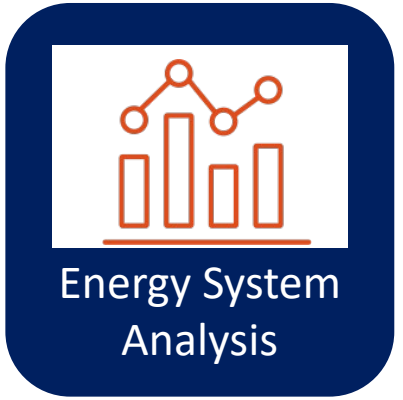
What essential factors should leaders evaluate before investing in digital asset solutions?

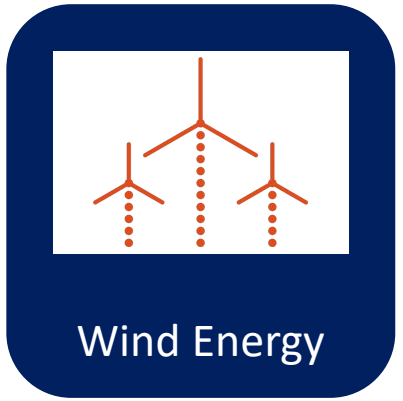
Scalable solutions supporting accelerating PV deployment

Renewable energy R&D at the Institute for Energy Technology (IFE)

- Established in 1948
- 720 employees from 35 countries
- 1.3 BNOK in annual turnover
- 4000 m^2 of advanced laboratories
- 200 international projects



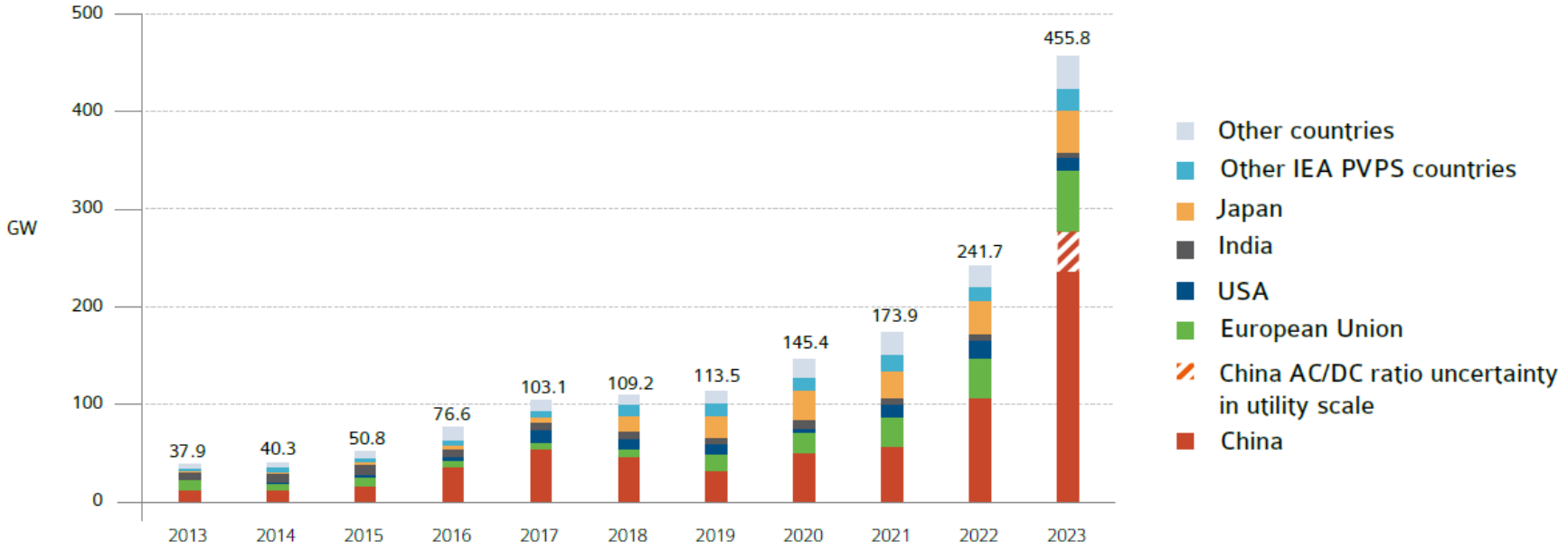




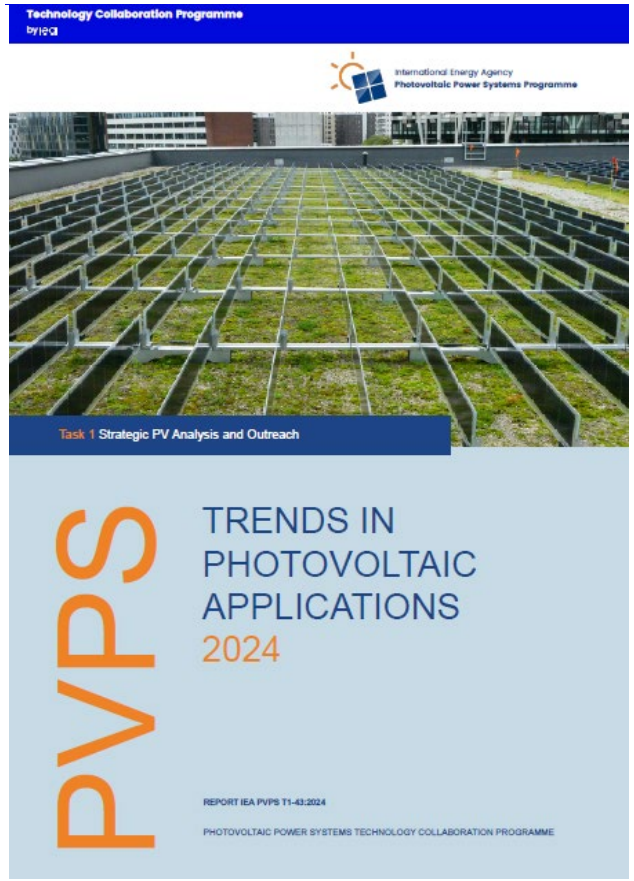
SOURCE: IFE

Accelerating PV deployment

FIGURE 2.3: EVOLUTION OF ANNUAL PV INSTALLATIONS IN MAJOR MARKETS



SOURCE IEA PVPS & OTHERS



SOURCE: IEA-PVPS 2024

The consequences of accelerating PV deployment 1: DATA

~ 450 GW_p

~1 billion new PV modules/y

~tens of millions of strings/y

~tens of millions of data time series/y

We need:

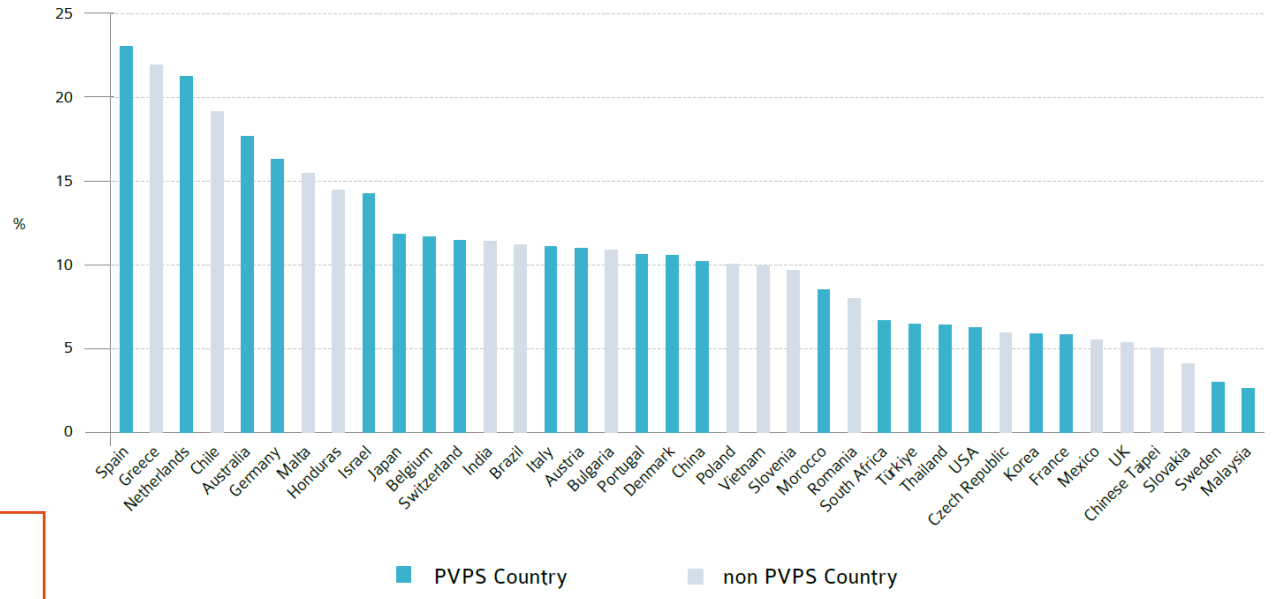
- Scalable, cost-effective and robust monitoring systems
- Scalable, cost-efficient and robust solutions for data aquisition, integration, structuring, storage
- Scalable, cost-efficient and robust (real time) analytics
- Scalable, cost-efficient and robust tools supporting Asset Management, Operations & Maintenance

The consequences of accelerating PV deployment 2: INTEGRATION

- The fraction of Variable Renewable Electricity (VRE) production increases in national grids
  - Globally PV up by >2%$_{abs}$ in energy mix in '23 alone
- Global and European energy and climate policy calls for accellerated deployment
  - REpowerEU: 1 TW of PV + wind by 2030
- Grid access is already a large constraint

- Urgent need for profitable solutions facilitating grid connection and alleviating grid constraints
  - Capacity (temporal distribution)
  - Power quality (ancillary services)
  - Reduced need for Points of Connection (PoC)

FIGURE 7.1: PV CONTRIBUTION TO ELECTRICITY DEMAND 2023



SOURCE: IEA-PVPS 2024

The consequences of accelerating PV deployment

- The growth continues: close to 600 GW_p anticipated in 2024
  - Adding tens of millions of new data time series
  - Increasing the global share of PV in the energy mix from ~8% to ~11% (in ONE year!)

- Digitalization is key for enabling asset developers, owners and operators to:
  - Develop increasingly complex and large projects
  - Operate increasingly complex and large assets and asset portfolios
  - Improve profitability of single assets and asset portfolios in markets increasingly dominated by VRE

TGS | Prediktor

Industry Challenges, Needs and Solutions

Industry Challenges, Needs and Solutions

DEVELOPMENT

- Secure bankable projects
- Manage risks
- Select right technology
- Secure grid access
- Ensure grid compliance
- Secure financing

BUILD

- Streamline deployment
- Keep costs down
- Comply with regulations and requirements
- Meet deadlines

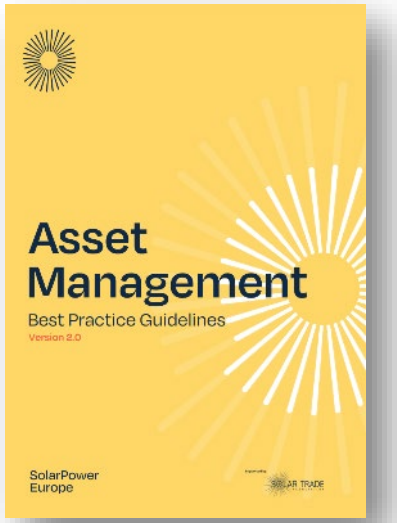
OPERATION

- Ensure lifetime profitability
- Best utilization at lowest OPEX
- Ensure grid compliance
- Profitability in dynamic market

While early-stage development and construction are heavily prioritized, the implementation of operational systems often occurs too late in the process. This can impact long-term efficiency and performance.

Industry Challenges, Needs and Solutions

Asset Management Definition



ENGINEERING

Engineering

- Plant (re)commissioning
- Quality audit/inspection
- Re-powering and upgrades
- Monitoring install / retrofit
- As-built design documentation
- Plant design overview

ASSET MANAGEMENT

Lifecycle project management

Support to the owner throughout the project phases:
- Development
- Construction
- Operation
- Decommissioning

Contract scoping
Risk identification & tracking
Cost management
Execution of obligations

Commercial and Financial Asset Management

Strategy management
Corporate administrative services
Financial reporting
Accounting
Customer relationship
Accounting assistance
Invoicing / billing and payments
Revenue control

Cash flow management
Working capital reconciliation
Financial control
Contract management
Suppliers account management
Suppliers penalites invoicing
Interface with banks and investors
Equity/debt financing management
Tax preparation, filing and administration

Procurement

Supplier selection and evaluation
Supply account control

Supply chain control

Technical Asset Management

Reporting to asset owner
Site visits and non-instrusive inspections
Management of ancillary service providers
Interface with local energy authorities
Regulatory compliance

Warranty management
Insurance claims
Contract management
Asset optimisation
Environmental management
Health & safety mangement

Power Plant Operation

Documentation Management System
Plant performance monitoring and supervision
Performance analysis and improvement
Optimisation of O&M
Power plant controls
Power generation forecasting
Grid code compliance

Reporting to Technical Asset Manager
Management of change
Power plant security
Maintenance scheduling
Spare parts management
Decommissioning

Power Plant Maintenance

Preventive maintenance
Corrective maintenance
Predictive maintenance
Extraordinary maintenance

Spare parts storage

Additional Services:
- PV site maintenance (panel cleaning, vegetation control, PV waste disposal & recycling etc)
- General site management (pest control, waste management, buildings maintenance etc)
- On-site measurements (meter readings, thermal inspections etc)

OPERATION AND MAINTENANCE

ASSET MANAGEMENT
"the coordinated activity of an organisation to realise value from assets"

Source: «Asset Management - Best Practice Guidelines», Solar Power Europe

Industry Challenges, Needs and Solutions

Some of the Challenges

- Maximizing Financial Returns
- Exponential growth & Data overload
- Scarcity of expertise – Human factors capacity
- Regulatory and Market Complexity
- Cost of O&M and Efficiency
- Variability of Energy Production
- Cyber Security

92% of lost EBITDA is due to underproduction, dwarfing all other sources of risk

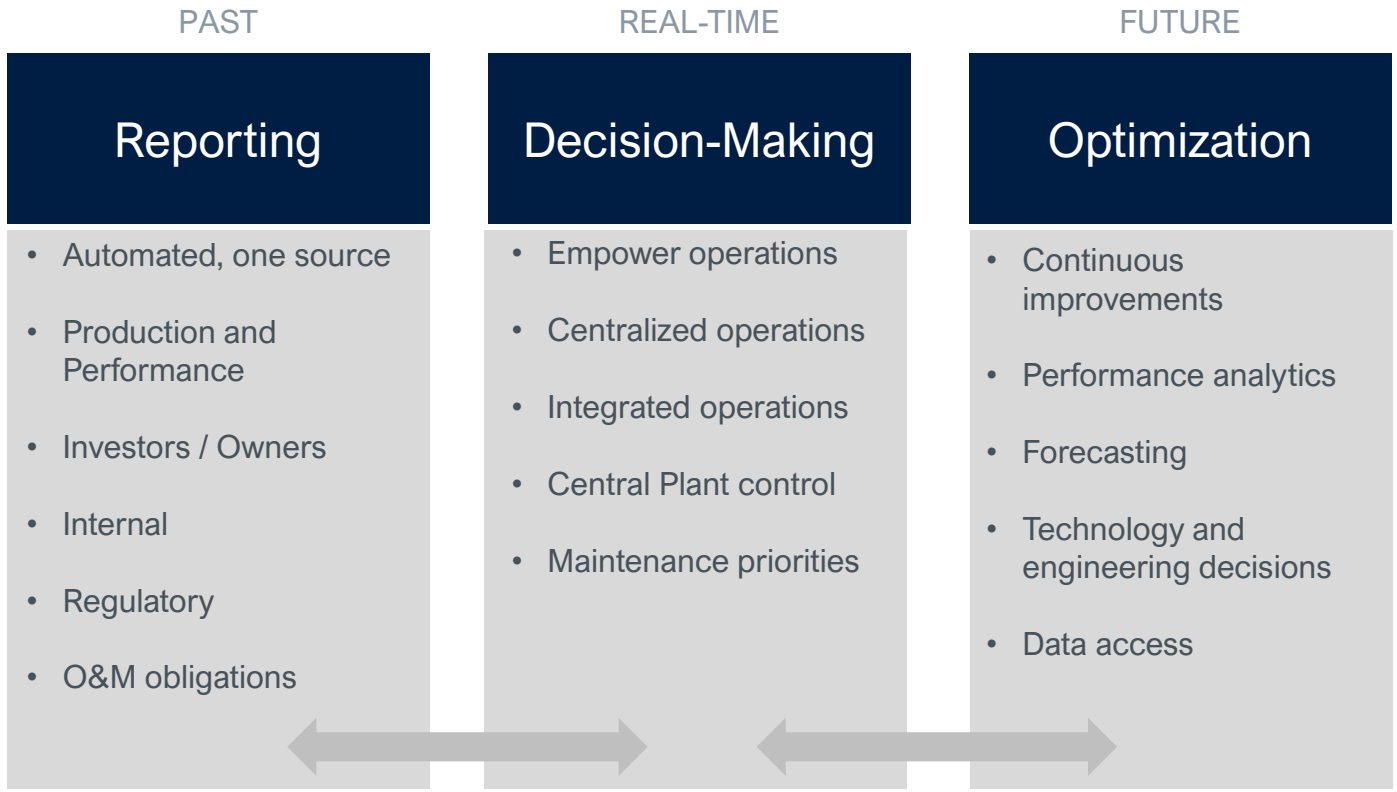
Source: kWh Analytics

→ *A gap in the market between claimed best practice and operational reality*

Industry challenges, needs and solutions

Centralized Platform

- One central data repository
- Targeted capabilities for various users
  - Owner
  - Asset Manager
  - Operations
  - Maintenance
  - Analysts
- Reporting, Monitoring, Analysis, Control
- Integration with adjacent expert systems



Industry Challenges, Needs and Solutions

Centralized Platform

Operations Platform
CENTRAL DATA REPOSITORY

API

DATA HARMONIZATION

SCADA 1

SCADA 2

Logger

CMMS

FAM

Analytics clients

Engineering

Visual Inspections

Industry Challenges, Needs and Solutions

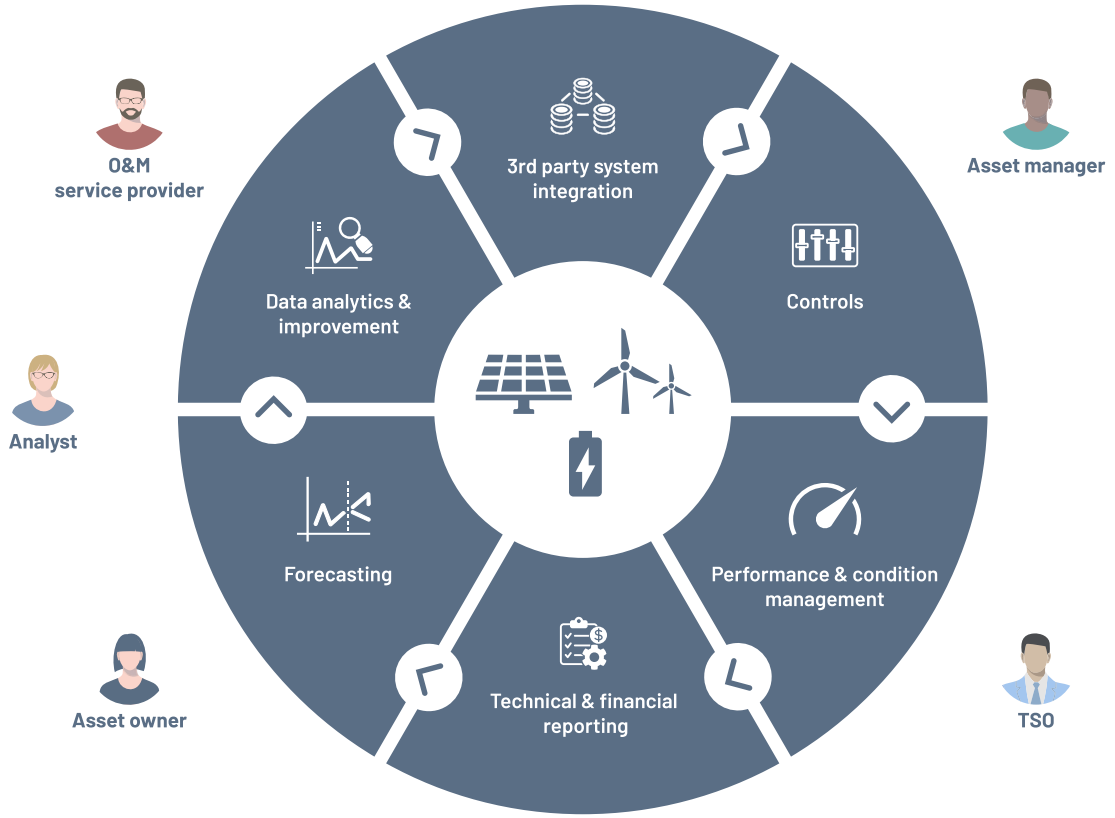
High-Level Decision Support

- Increasing portfolio and asset sizes
- Enormous amounts of data
- How to make decisions efficiently?

→ Aggregation of data is required

→ Applying knowledge

→ Consider stakeholders needs

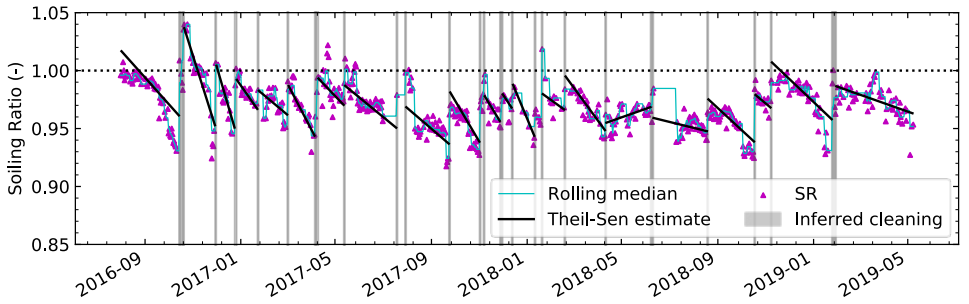


Industry Challenges, Needs and Solutions

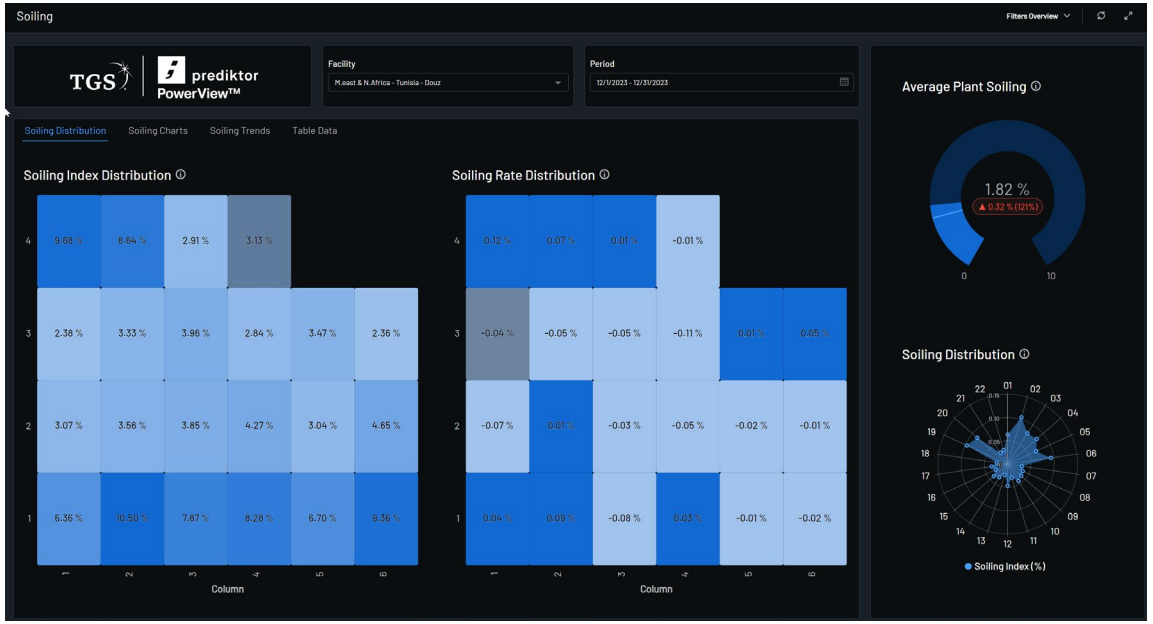
High Level Decision Support

EXAMPLE:

Soiling Estimation From String Data



→ Effective planning of cleaning sessions



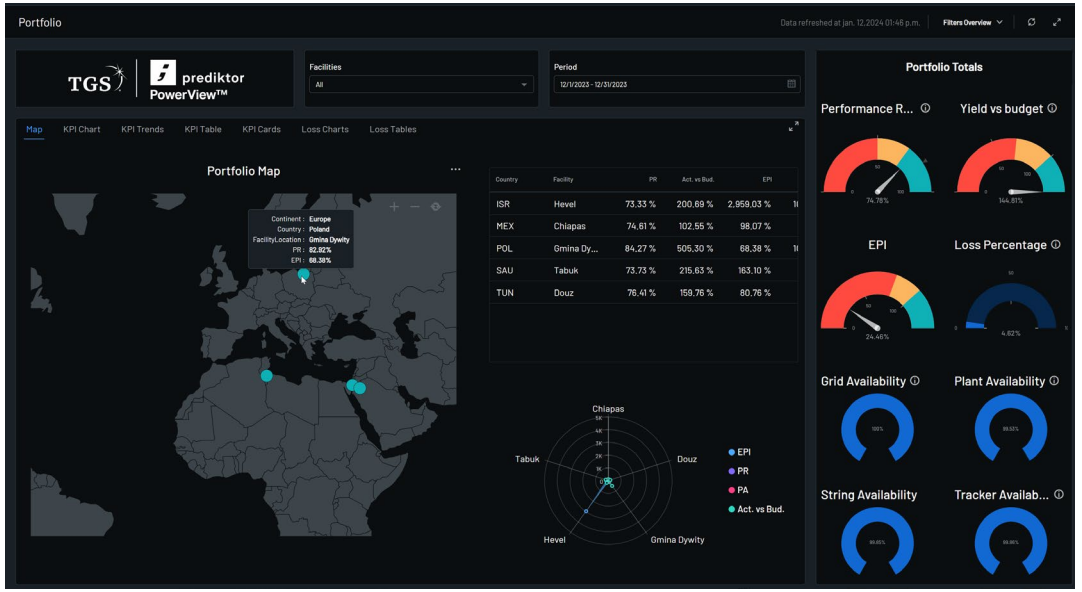
Industry Challenges, Needs and Solutions

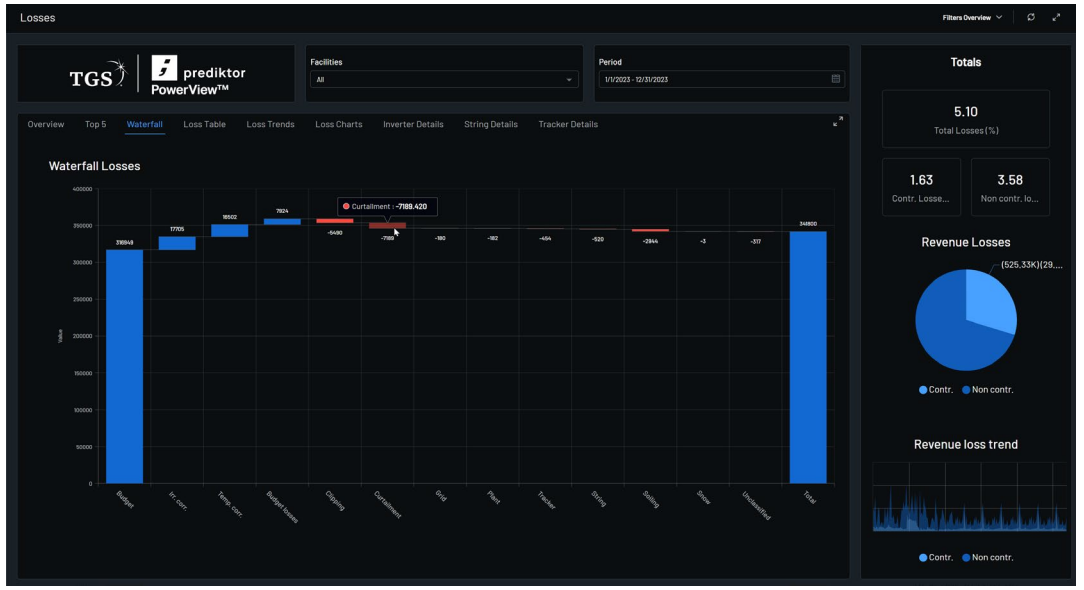
High-Level Decision Support

EXAMPLE:

Performance and Profit Loss Estimation

→ Prioritization of O&M efforts





Next challenges

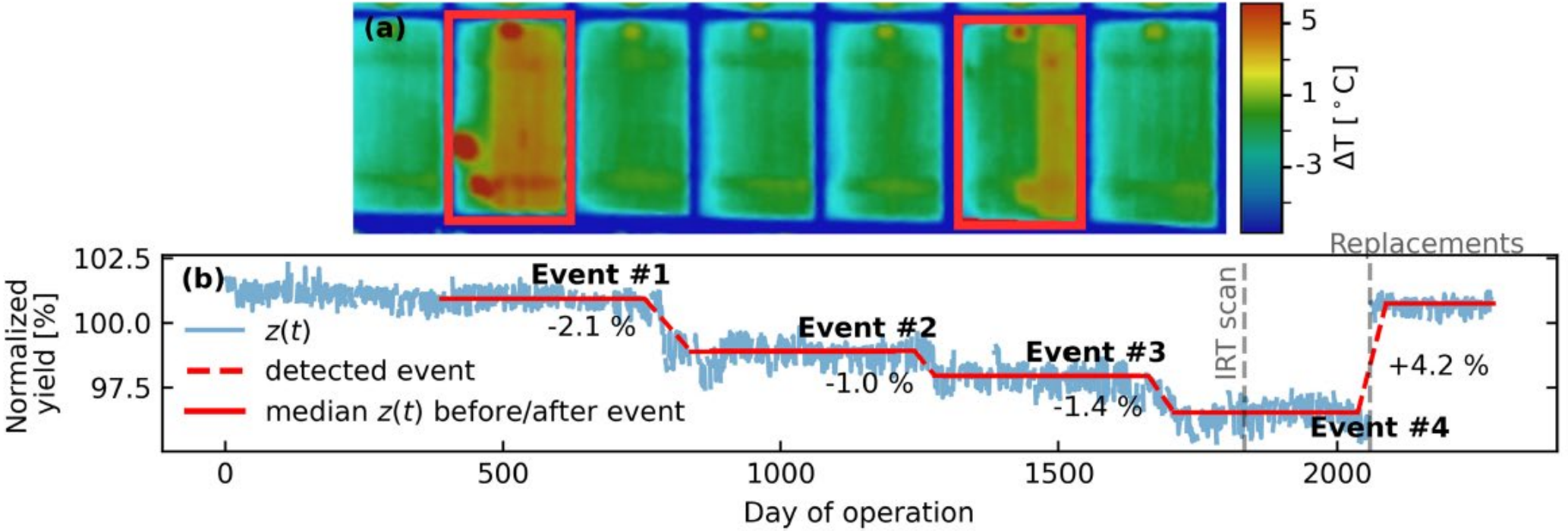
Integration of increasingly complex data in automated systems

Examples of operation-related KPIs		Examples of maintenance-related KPIs	
Technical	Economical	Technical	Economical
Performance ratio	Levelized cost of electricity	Mean time between failures	Equivalent labour cost
Final yield	Operational expenditure	Mean time to repair	Equivalent spare parts cost
Reference yield	Earnings before interest, taxes,	Mean time to failure	Maintenance planning
Array yield	depreciation, and	Availability	
Array capture losses	amortization	System degradation	
System losses	Annual insurance tax	Response time	
System efficiency		Corrective maintenance	
Array efficiency		Preventive maintenance	
Inverter efficiency		Schedule compliance	
Performance index		Overtime jobs	
Capacity factor		Backlog	
Availability time-based		Wrench time	

- New hardware and software supporting management related to one or more KPIs entering market
  - E.g. UAV IRT, string-level IV-scans, EL, PL...

H. Walpita (IFE) et al. (2024)

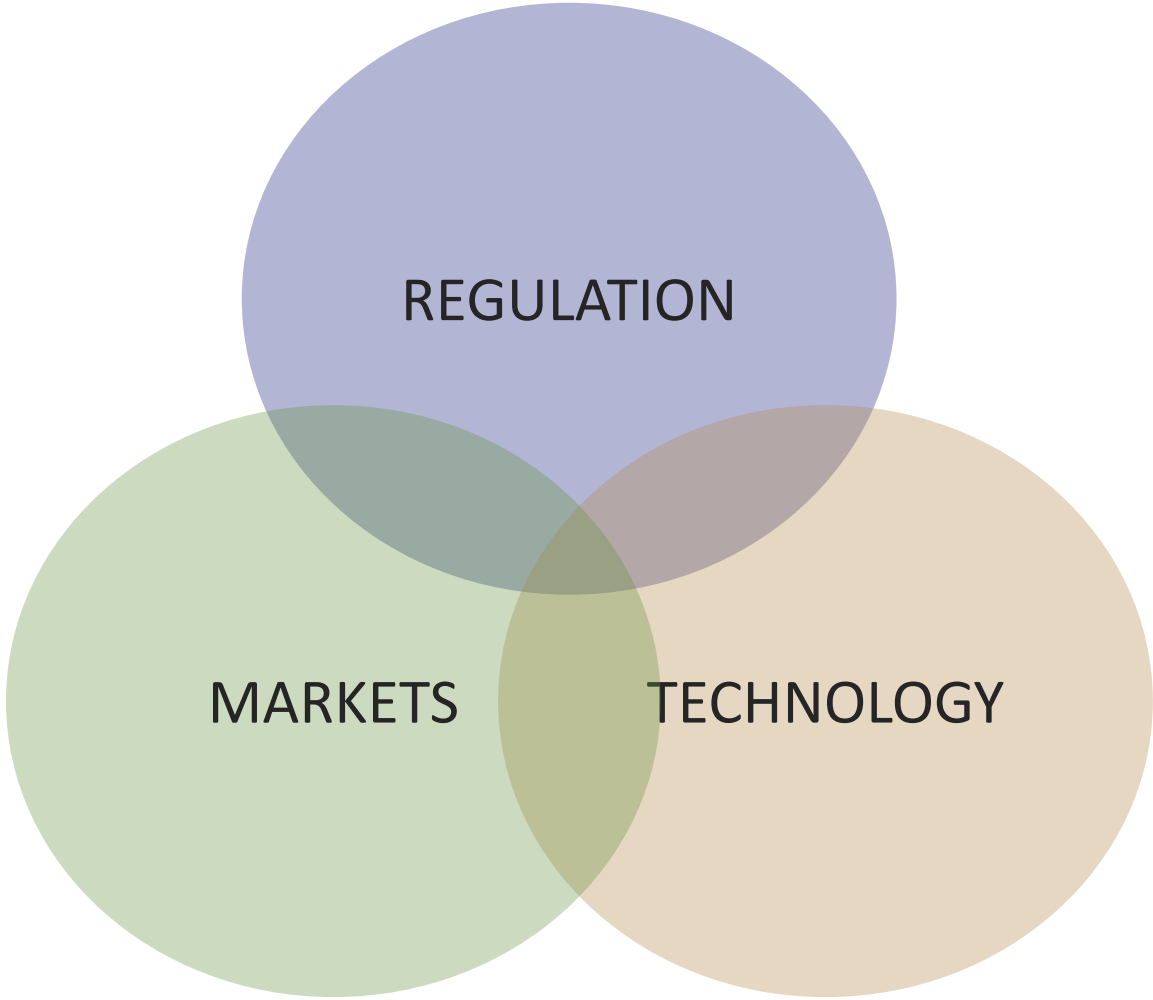
Integration of increasingly complex data in automated systems



SOURCE: B. Aarseth et al. (IFE), IEEE JOURNAL OF PHOTOVOLTAICS, VOL. 12, NO. 5 (2022)

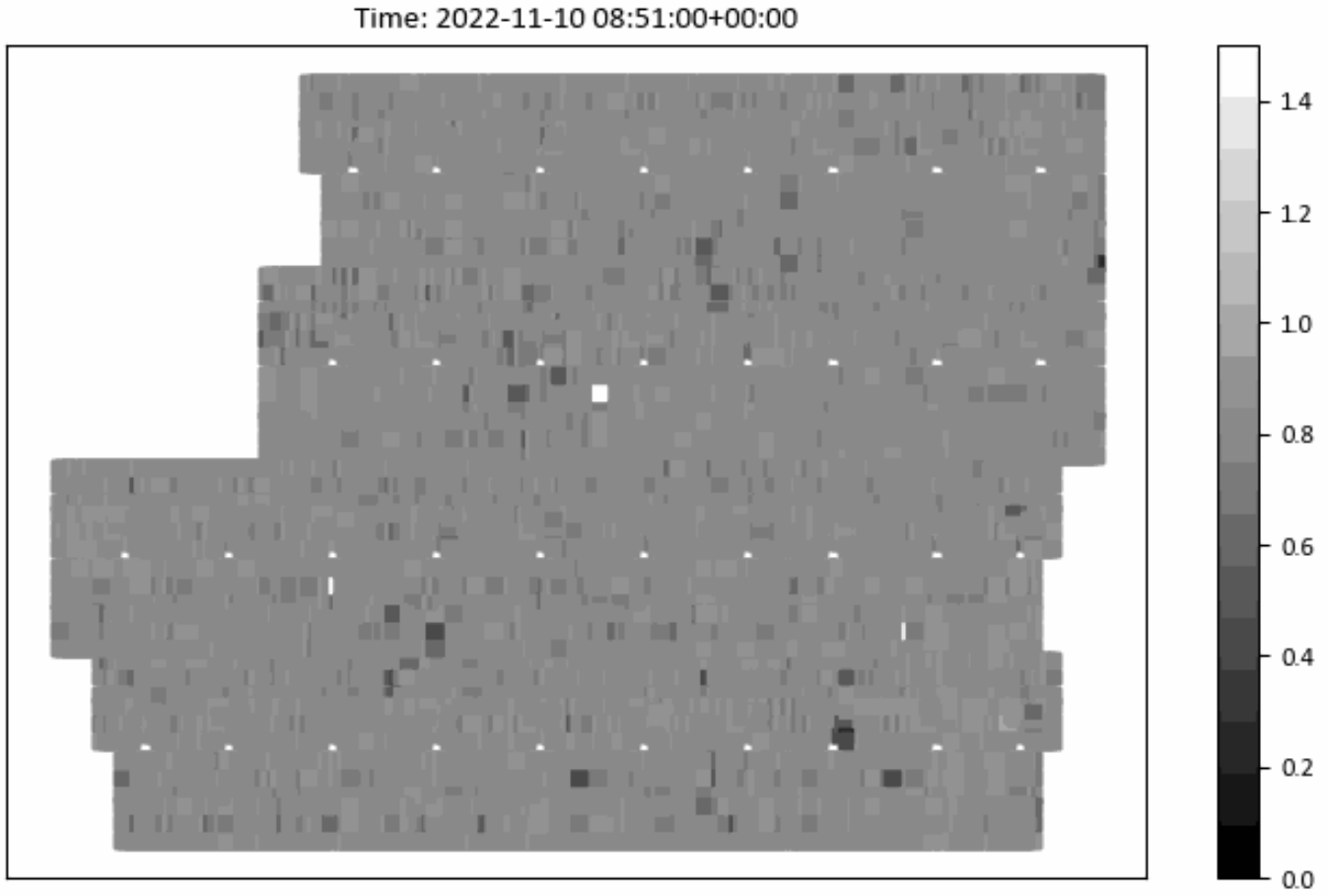
Development of hybrid assets

- Examples
  - PV + BESS
  - PV + wind + BESS
  - PV + hydro
  - PV + DGS
  - PV2X
- Challenges
  - Increasingly complex project development
  - Increasingly complex AM and O&M
- Opportunities
  - Increased profitability
  - Synergistic AM and O&M



Forecasting supporting market operations

- Short-term forecasting
  - Supports intra-day operations
  - Several proposed methods
    - Machine learning approaches
    - Sky cameras
    - Satellites
  - With good data availability and quality: production data



SOURCE: M.M. Nygård et al. (IFE) EUPVSEC (2024)

Key Takeaways

→ Digitalization is key to allowing **efficient operation** of increasingly larger portfolios

→ Make sure operational data can be **shared between project phases**

→ Make sure portfolio data is **standardized** and **validated**

→ The potential applications of operational data are **extensive**. Ensure that APIs and interfaces are equipped to support this **versatility**

→ **Centralized operations** cater to the effective use of expertise through integrated operations

→ When signing contracts with system providers, make sure **data access is specified**

→ O&M contracts with incentives for **data-driven operation**

Thank you

Thomas Pettersen

Erik Marstein

thomas.pettersen@tgs.com

erik.stensrud.marstein@ife.no

Energy Starts With Us

this webinar is powered by TGS

pv magazine webinars

Scaling renewables operations: Using digital tools for efficient asset management at the utility scale

Q&A

30 October 2024

11:00 am – 12:00 pm | EDT, New York City
4:00 pm - 5:00 pm | CET, Berlin
6:00 pm – 7:00 pm | Riyadh

Matthew Lynas
Editor
pv magazine

Thomas Pettersen
VP, Asset Management Solutions
TGS

Prof. Erik Stensrud Marstein
Chief Scientist PV
The Institute for Energy Technology (IFE)

pv magazine webinars

The latest news | print & online

10% off
your subscription with
Webinars10

Most-read online!

[Saudi Arabia's 3.7 GW solar tender attracts lowest bid of $0.0129/kWh]

by Emiliano Bellini

[Credence unveils 725 W bifacial TOPCon solar module]

by Uma Gupta

pv magazine webinars

Coming up next...

Thursday, 31 October 2024
11:00 am – 12:00 pm EDT, New York City
4:00 pm - 5:00 pm CET, Berlin

Navigating Climate Disruptions: Solar Tracker Technologies for a Resilient Future

Wednesday, 6 November 2024
8:30 am - 9:30 pm CET, Berlin
3:30 pm – 4:30 pm CST, Beijing

The impact of modularity on cost-efficiency of battery storage systems

Many more to come!

In the next weeks, we will continuously add further webinars with innovative partners and the latest topics.

Check out our pv magazine Webinar program at:

www.pv-magazine.com/webinars

Registration, downloads & recordings are also be found there.

pv magazine roundtables EUROPE

pv magazine group

DEC 5, 2024 | VIRTUAL EVENT

Explore the latest developments and trends in the European solar + storage industries.

REGISTER NOW

this webinar is powered by TGS

pv magazine webinars

Matthew Lynas
Editor
pv magazine

Thank you for joining today!