TWAICE | Battery Analytics Software

BESS Analytics als strategisches Asset – Grundlage für Performance, Sicherheit und Erlöse

MARCH 17, 2026

About TWAICE: Leading & most trusted BESS analytics provider

100+

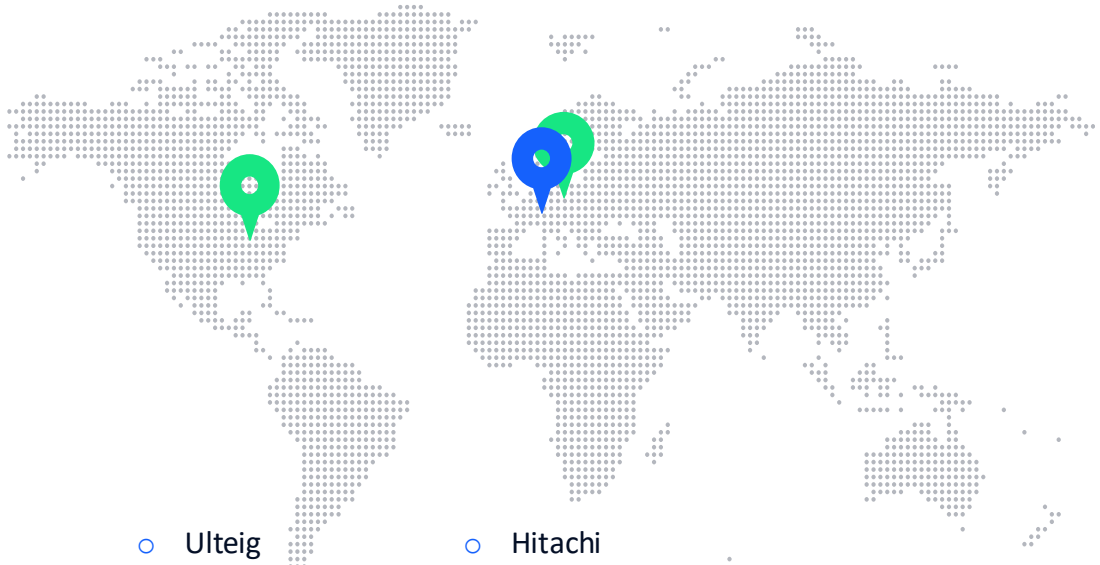
team incl. battery software engineers & data scientists

$90m

funding for long-term security

3 offices: Munich HQ (DE), Chicago (US), Berlin (DE)

1 onsite battery research center



100+

BESS projects connected, over 18 GWh+ contracted

30+

patents[1]

Technologies covered in current projects:

- BYD
- CATL
- LG
- Samsung SDI
- Huawei
- Sungrow
- E-Storage
- Fluence
- Honeywell
- Powin
- Rolls Royce
- Tesla[2]
- Ulteig
- Ecostor
- NIDEC
- Hitachi
- ...

Agenda

1. Key operational challenges in today's BESS market
2. What typically limits BESS performance in practice
3. Why high-accuracy KPIs and analytics matter
4. From insight to action: improving O&M, safety and warranty management
5. Q&A

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Operational Performance of BESS

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System Performance and Availability Is the Top Challenge

- 50% cite “system performance and availability (e.g. imbalances)” as a top challenge
- 44% cite “revenue optimization and market participation”

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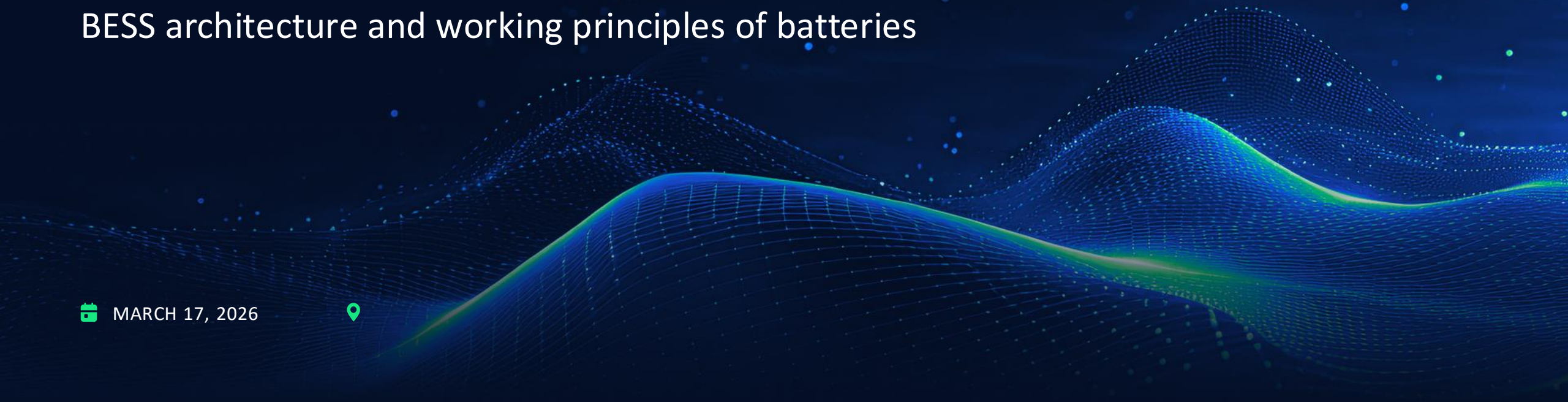
BESS Fundamentals

BESS architecture and working principles of batteries



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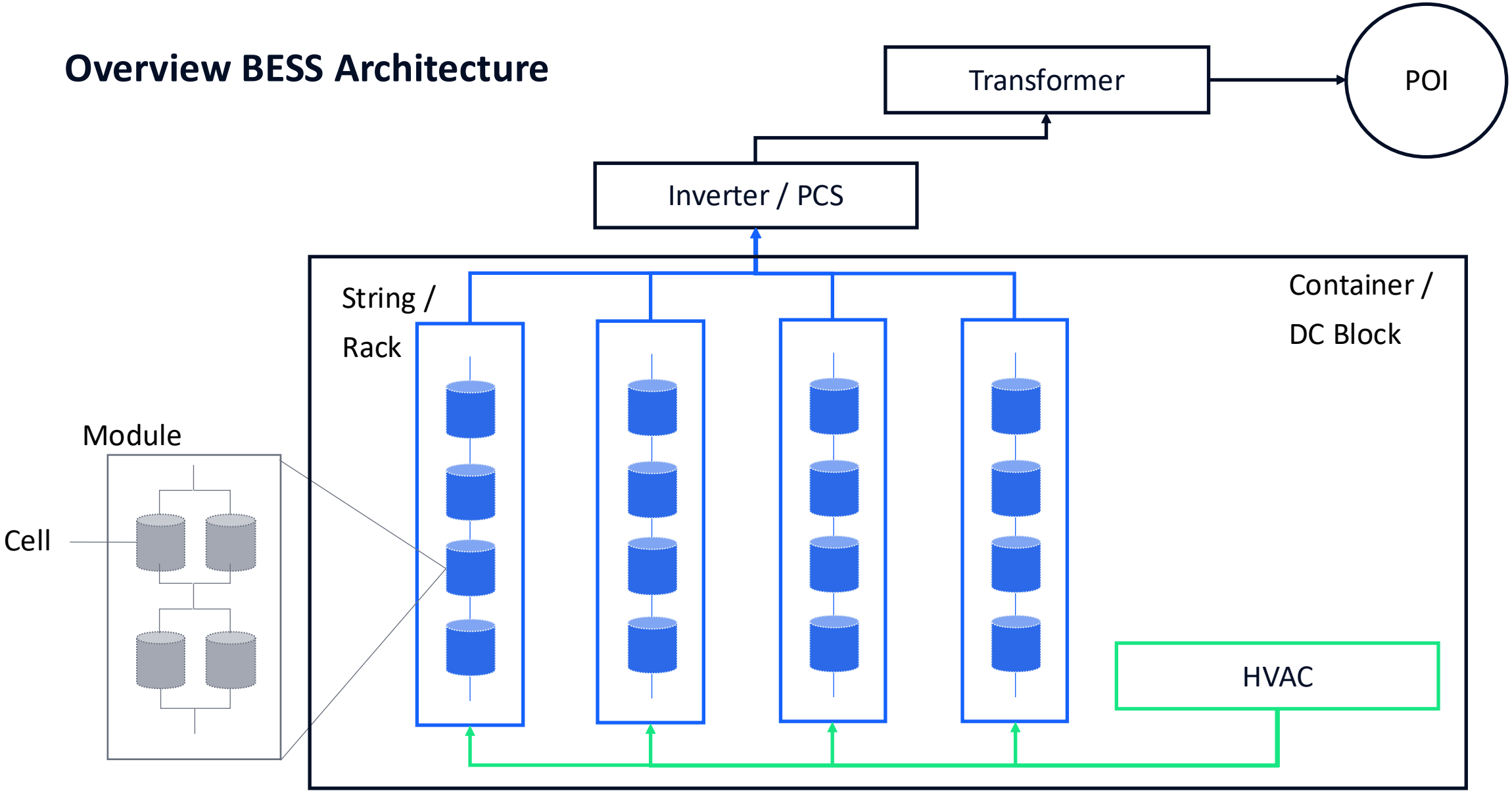
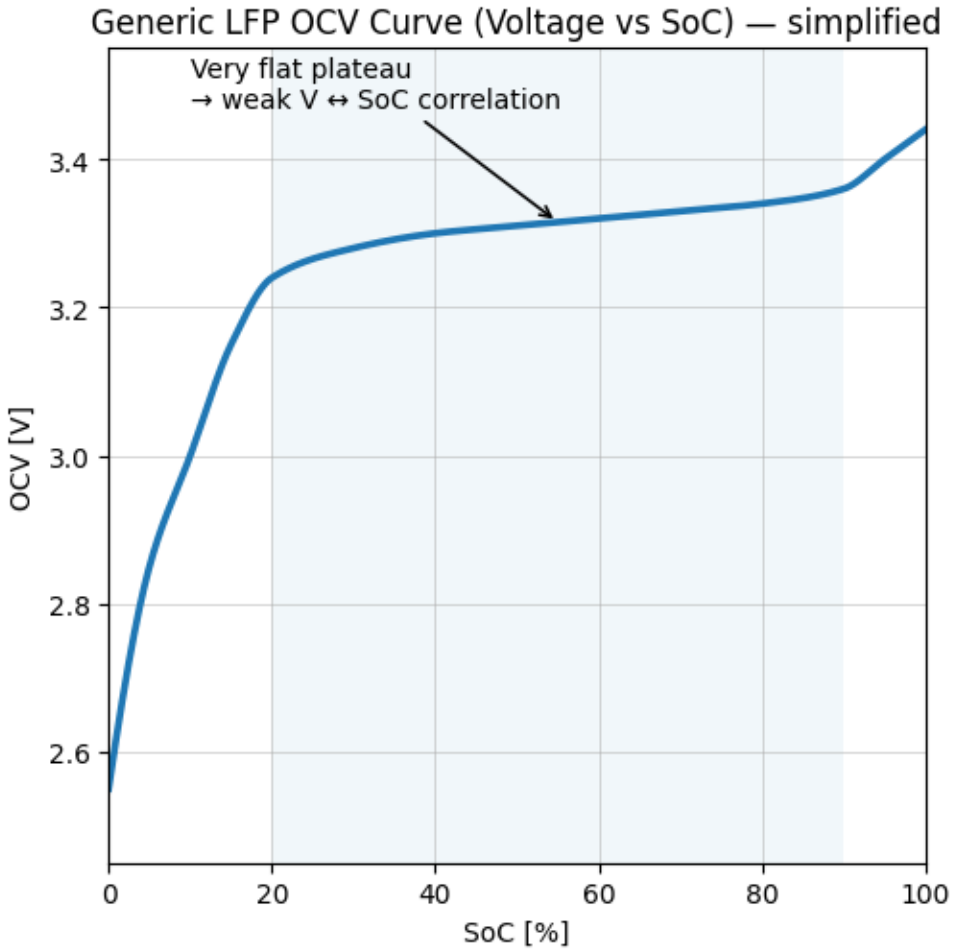
Overview BESS Architecture



Lithium-Ion Fundamentals: Open Circuit Voltage (OCV)

- The voltage (at rest) changes with the amount of charge in the cell.
- The LFP curve is flat in most parts
- During operation, the measured voltage includes overpotentials caused by the batteries resistance
- **→ SOC cannot simply be measured but has to be estimated from current, voltage and temperature**



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What is BESS Analytics?

Transforming data into actionable insights

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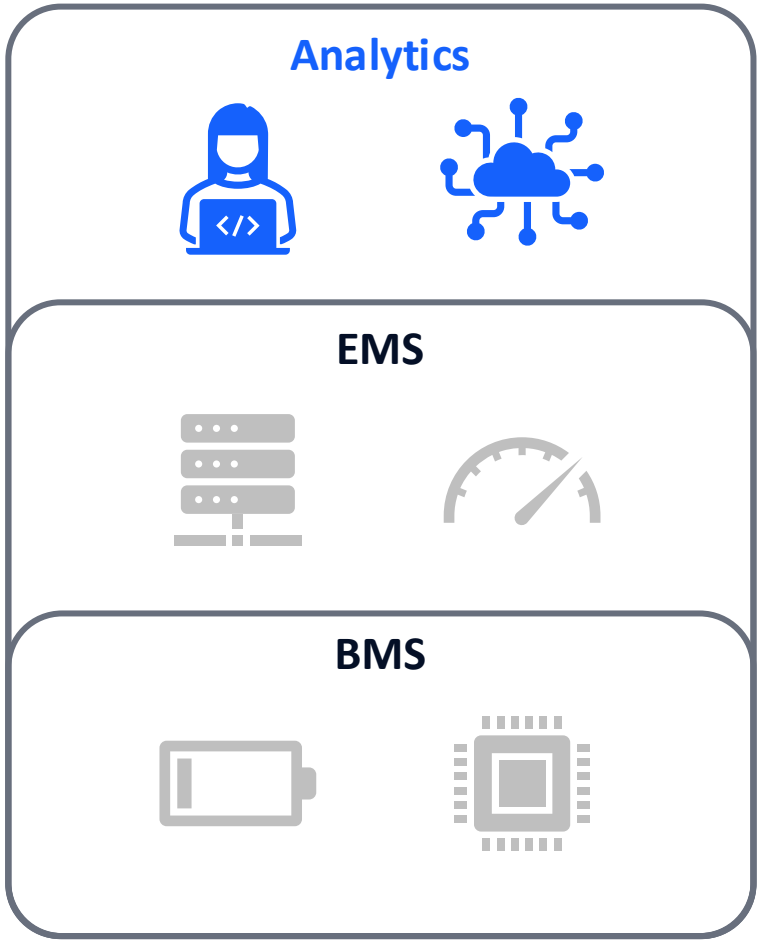
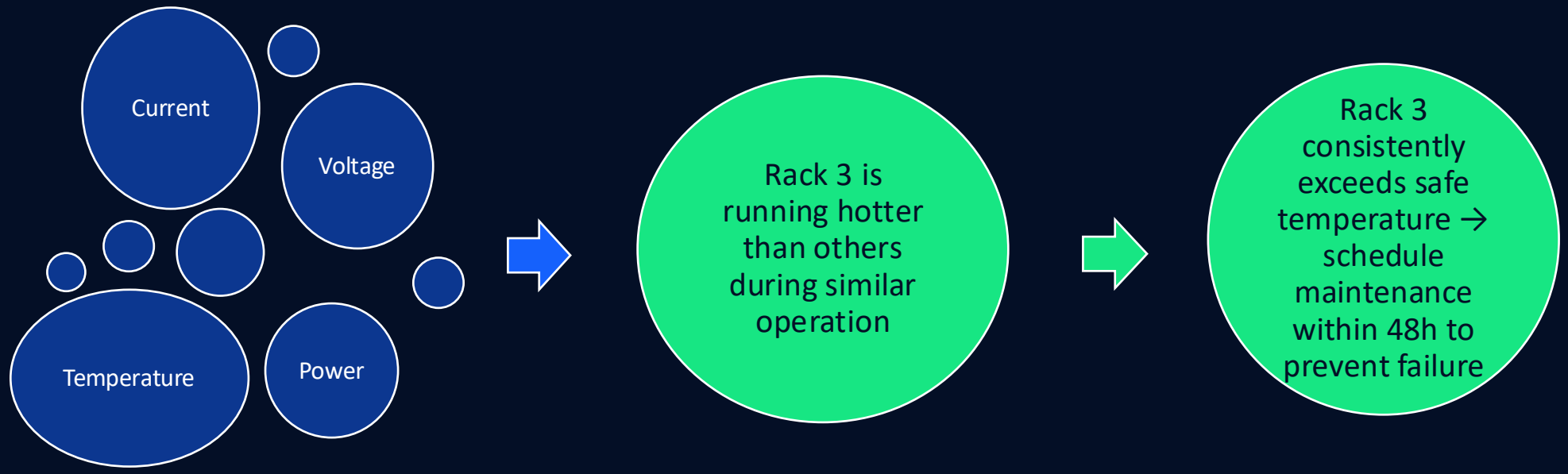
Analytics – the layer on top



Advanced Computation	High accuracy KPIs	Trend and Root Cause Analysis	Proactive Alerting
Trading	System Control	Telematics	System Derating
Measurement	Balancing	Battery State Control	Safety Enforcement

From Non-Actionable to Actionable BESS Analytics



Non-Actionable Raw Data

Analytics Layer

Actionable Insights

Operational Challenges

Which root causes can lead to reduced usable energy and power?

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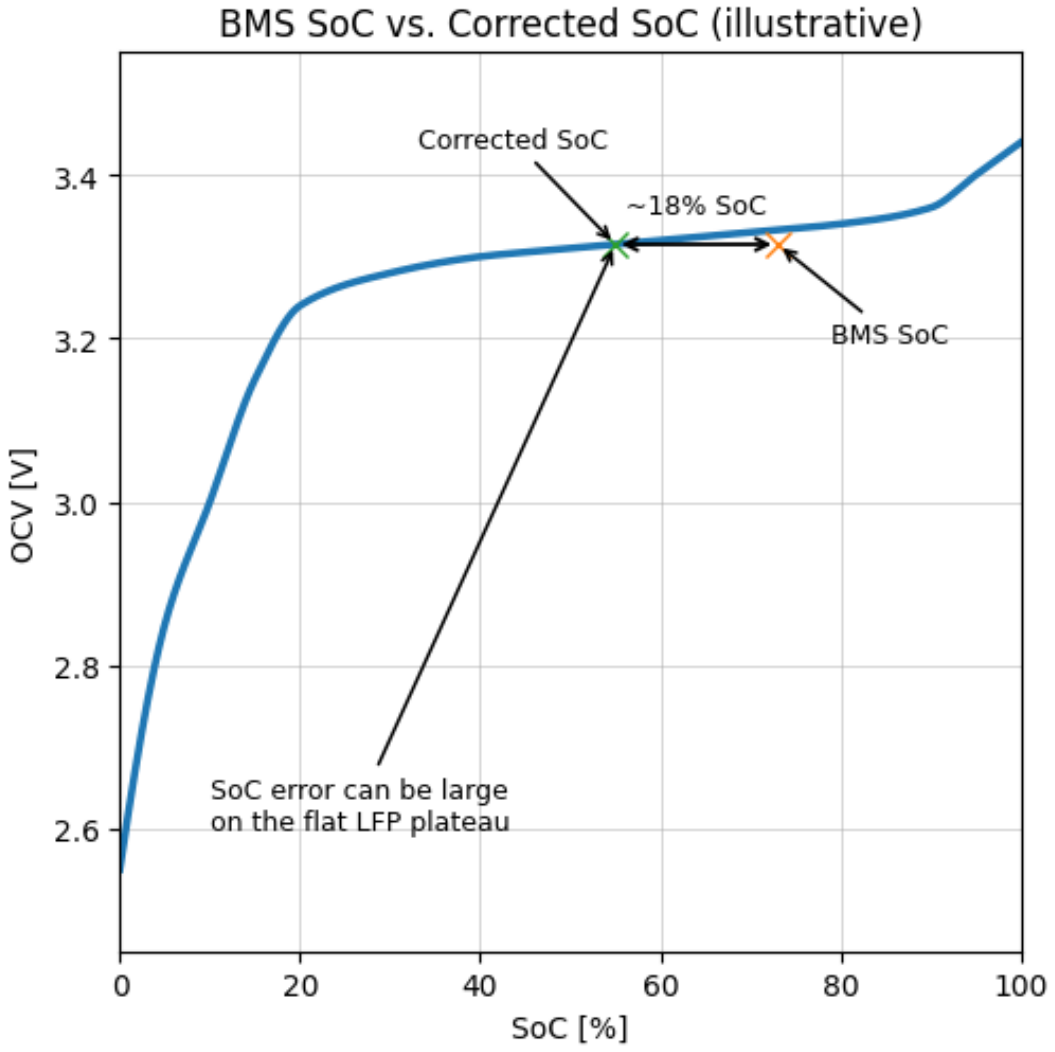
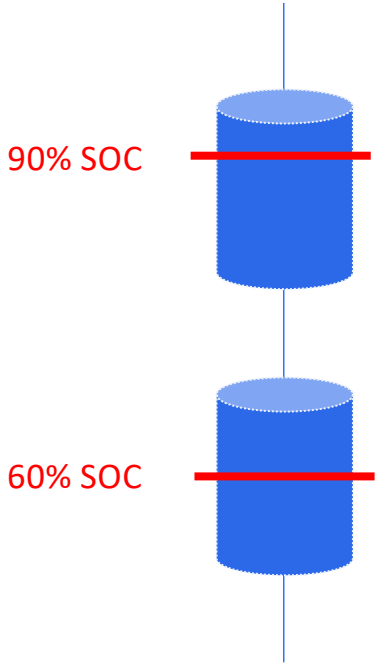
Root Cause 1: SOC Errors

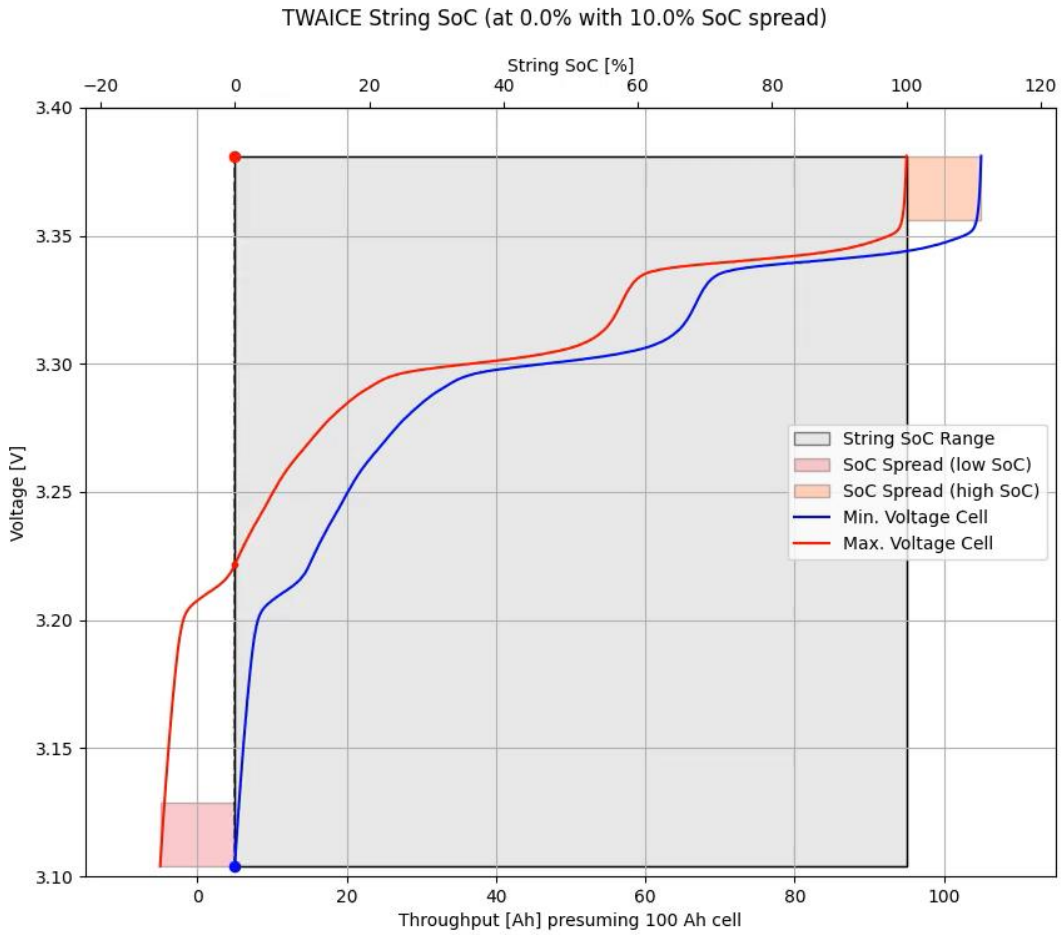
- SOC has to be estimated
  - Method 1: Throughput tracking
  - Method 2: Voltage correction
- The BMS is limited in compute, which can lead to large SOC errors and sudden jumps
- This can lead to unexpected power deratings
- → **It is important to be aware of SOC inaccuracies to trigger recalibration**



Root Cause 2: SOC imbalances

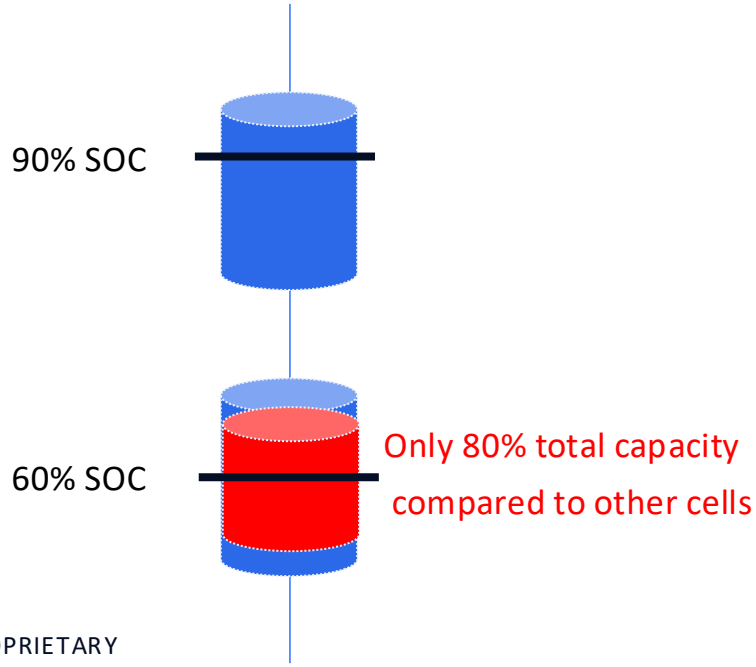
- Cells in series can get out of balance
- During charging, the cell that hits the maximum allowed voltage first limits the whole string
- → **It is important to know when and how much to balance**

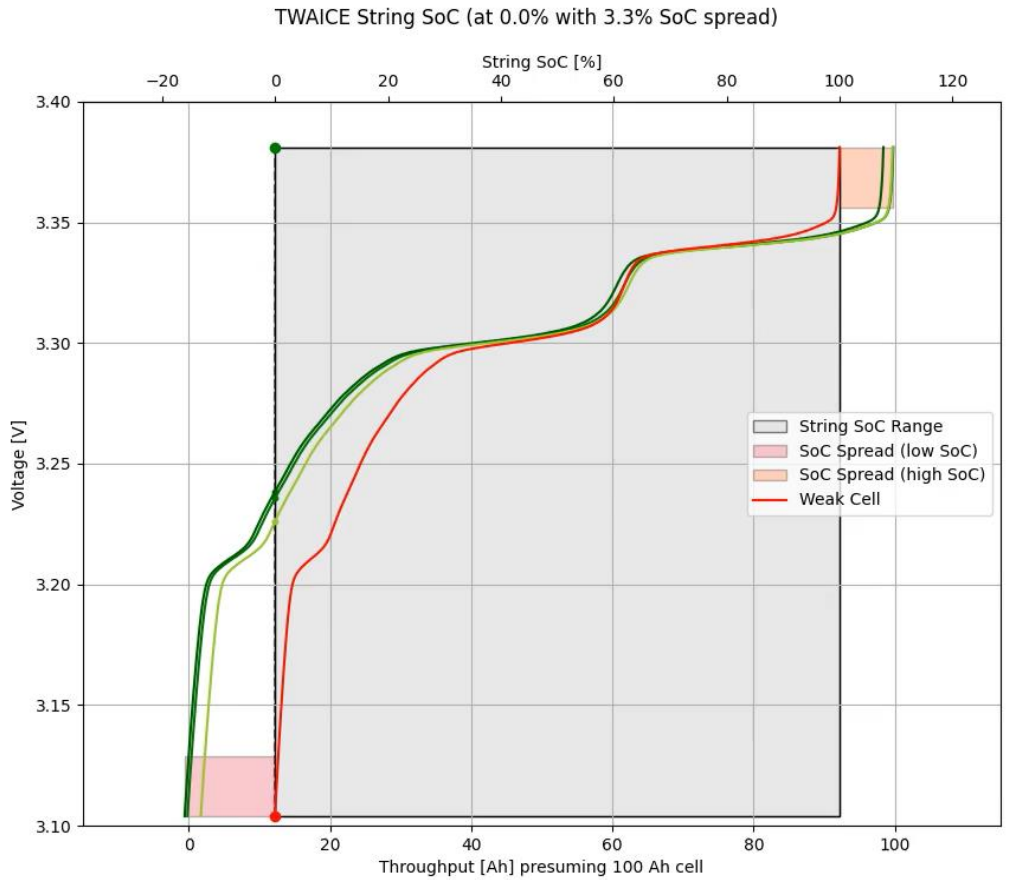




Root Cause 3: Weak Cells

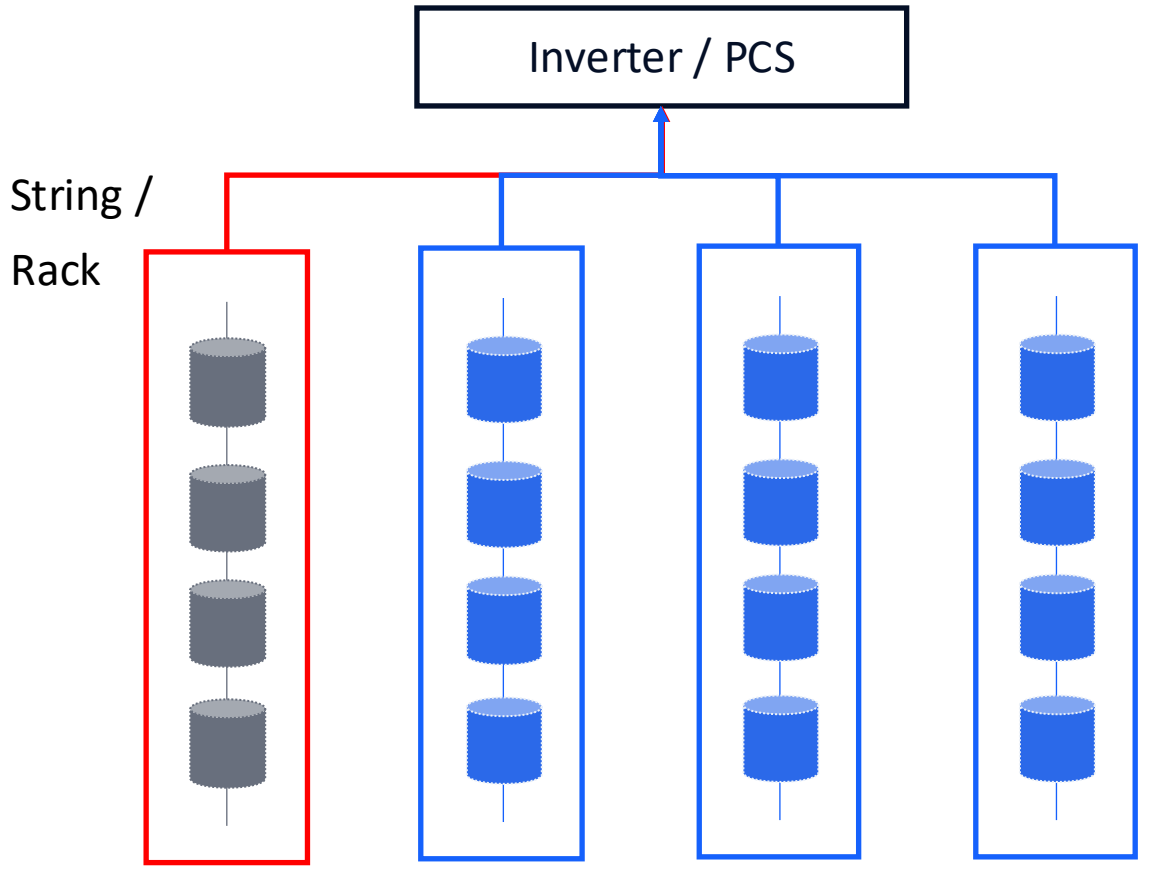
- The weakest cell limits the whole string
- It is not trivial to understand the difference between an imbalance and a weak cell
- → **It is important to know if balancing will not help but components (modules or whole strings) have to be replaced**





Root Cause 4: Disconnected Components

- If control systems (BMS, PCS) detect unsafe states, they electrically disconnect that component to avoid incidents.
- Re-establishing the connection requires manual intervention by a technician
- → **It is important to identify disconnected components as early as possible to react quickly, plan O&M work, improve usable energy and avoid revenue loss.**



Why high-accuracy KPIs matter in BESS operations

Accurate KPIs → **Earlier detection** → **Earlier intervention**

Know the true system state

Accurate SoC, SoH and Usable Energy show what the asset can really deliver.

See issues before losses grow

Small imbalances and weak components become visible before losses escalate.

Act while the issue is still small

Balancing or maintenance can start sooner, with less disruption.

Why not rely on BMS values alone?

BMS - Limited compute, noisy signals, limited context.

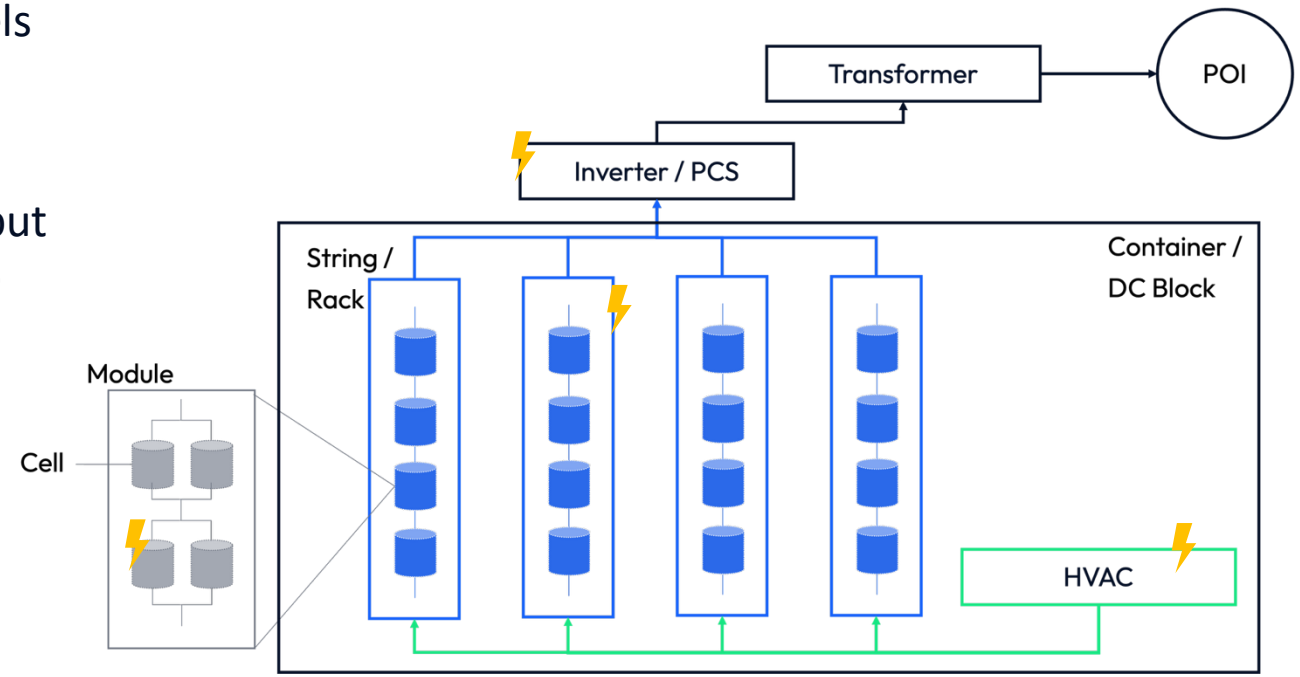
Cloud - More history, more compute, advanced models.

Enable pro active maintenance with high accuracy KPIs and unlock

Up to **20%** **increase in Usable Energxy**

Many possible failure points — limited visibility

- Operational issues can originate at different levels — from cells and modules to HVAC, rack, PCS or transformer.
- At system level, the symptom may be visible — but the real root cause is often hidden deeper in the hierarchy.



This is why root-cause analysis is time-consuming — and why analytics must help localize where the issue actually sits.

BayWa x TWAICE

BayWa r.e.

- ✓ Asset operations and customer interface
- ✓ Operation & Maintenance coordination and execution
- ✓ Plant-level operational ownership
- ✓ Turning findings into action on site

High-accuracy KPIs

Earlier intervention

Higher asset lifetime value

TWAICE

- ✓ Accurate SoC, SoH and Usable Energy KPIs
- ✓ Early detection of imbalances and hidden constraints
- ✓ Faster localization of operational issues
- ✓ Better decisions to protect long-term value

Key Takeaways

Many BESS issues stay hidden until they impact performance, safety or revenue

High-accuracy KPIs make hidden issues visible earlier — enabling faster, more targeted intervention

Combining BayWa's O&M execution with TWAICE analytics helps protect usable energy, asset lifetime and long-term value

Questions? Reach out!

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Q&A