



O&M for PV Series: Lowering OPEX Costs for PV Projects

Ruben Martin / Head of O&M UK

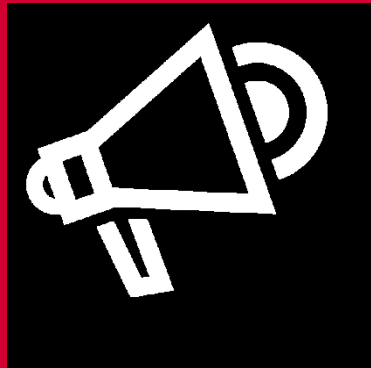
Agenda

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About BELECTRIC O&M

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O&M trends & challenges



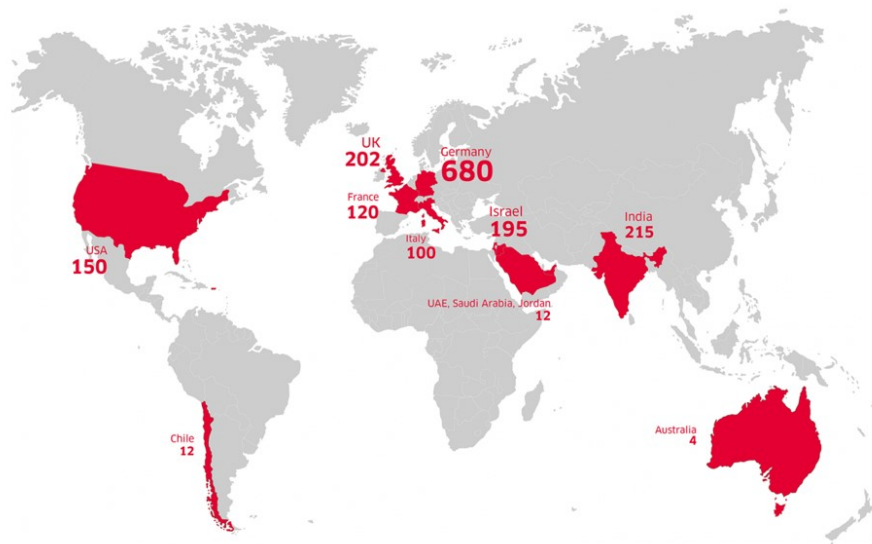
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Big data based O&M

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Asset Management Tool

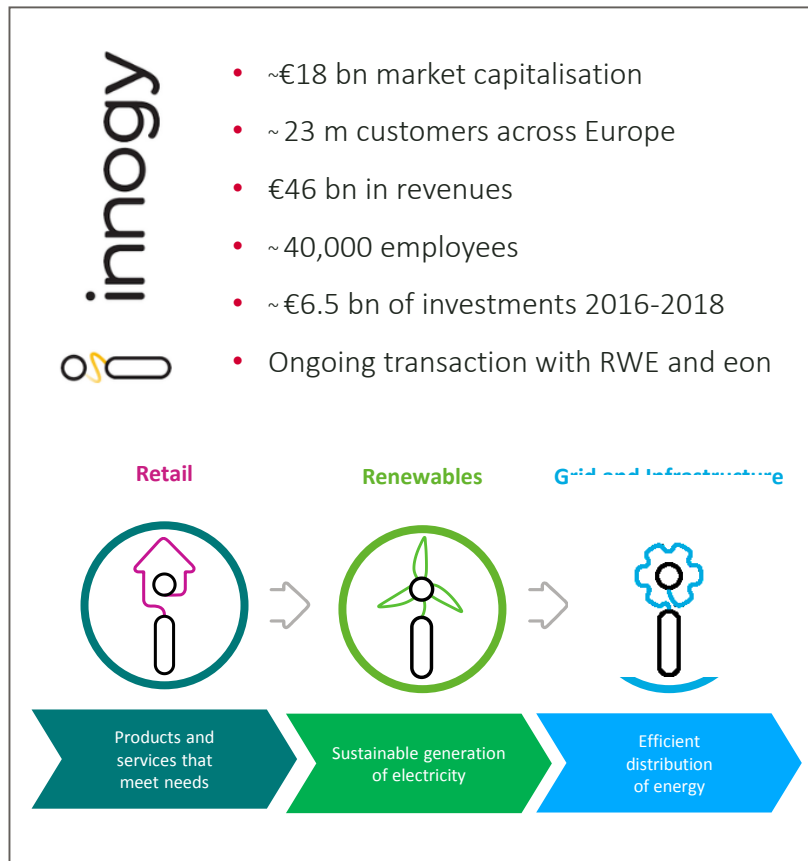
Global organisation



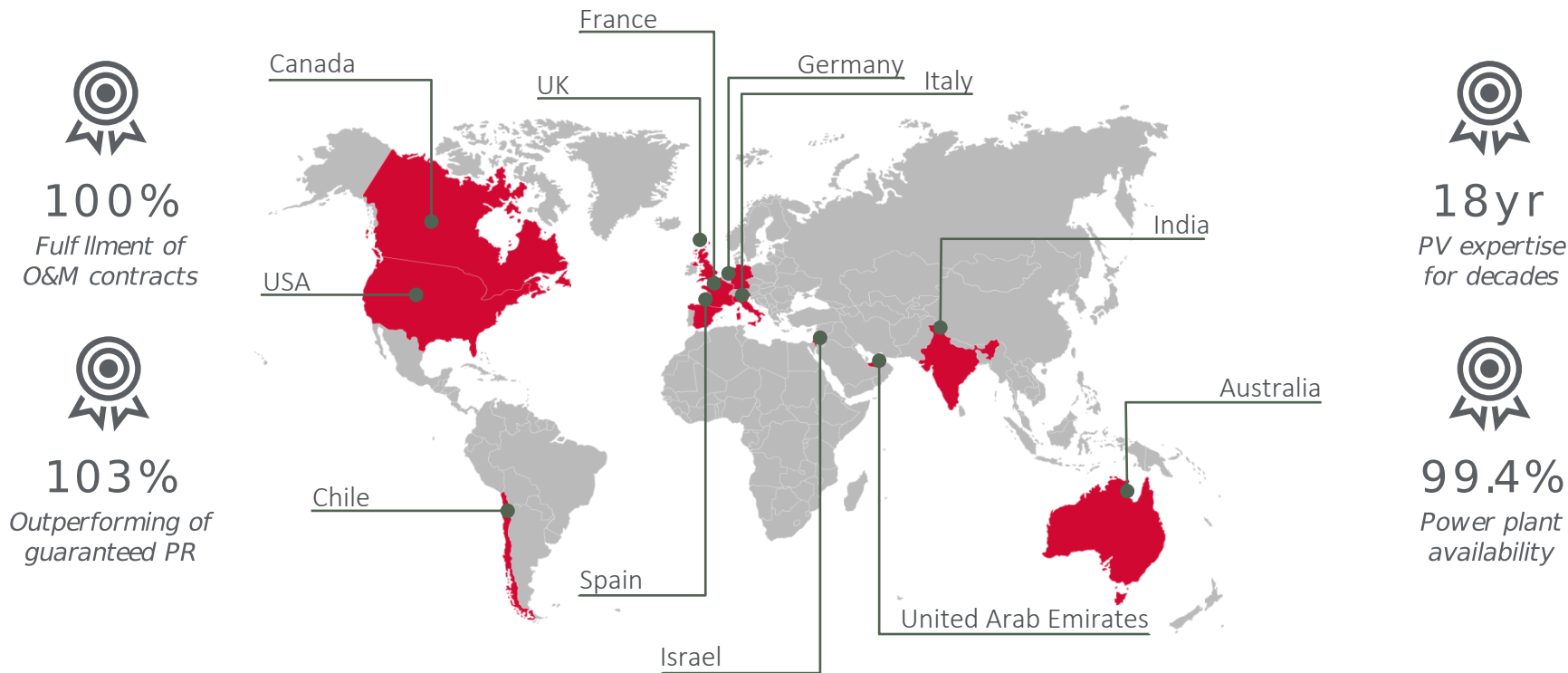
12
countries

4
continents

>2.0
GW in O&M



International network of companies



PADCON Monitoring Services

PADCON GmbH specialises in **monitoring solutions** and **system communication** for PV power plants. The extensive product portfolio includes solutions for solar power plants worldwide.

With more than **3,0 GW** of monitored plant output in **21 countries** worldwide, PADCON consequently ranks among the largest and most experienced suppliers of **SCADA systems** for PV power plants.

In addition, since **2013** PADCON has been offering **intelligent solutions** with the Float Controller family in order to stop **PID** on PV systems simply and **effectively**, and to **recover** the affected modules **successfully**. Accordingly PADCON stands worldwide for “**Made in Germany**”, innovative solutions, and permanent, technological progress.



MORE THAN
37.000

Installed combiner boxes

MORE THAN
3,0 GW

Monitored PV Power Plant capacity

350 MW

Currently the largest monitored
PV Power Plant

MORE THAN
1,2 GW

Installed PID Killer worldwide

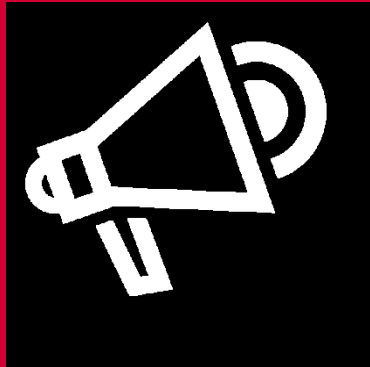
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O&M trends & challenges

#1

**Digital
technician**

#2

**Larger
portfolios**

#3

Across sectors

#4

**O&M
competitiveness**

#5

Cyber Security

#6

Drone surveys

#7

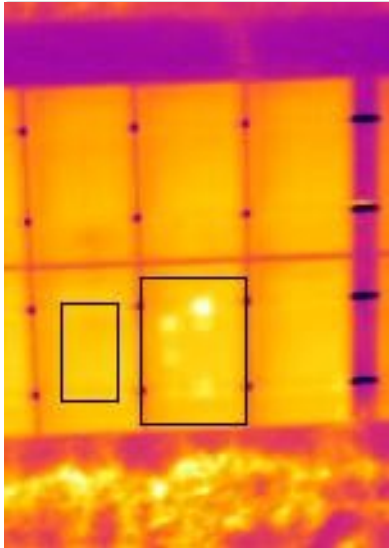
Grid integration

#8

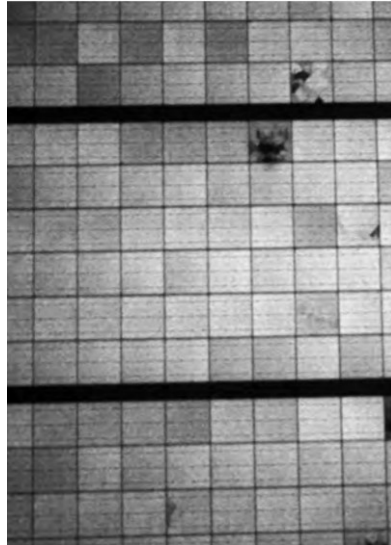
3D printing

Drone surveys

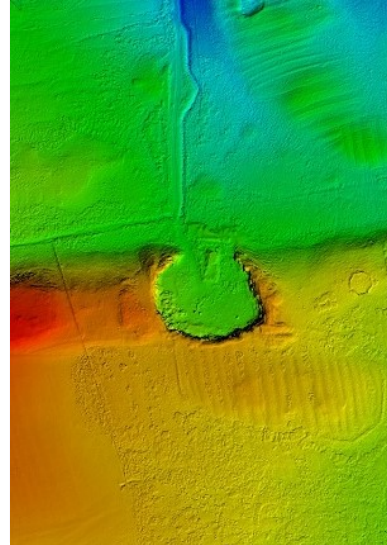
Thermal inspections



EL tests



Topographic surveys



Surveillance

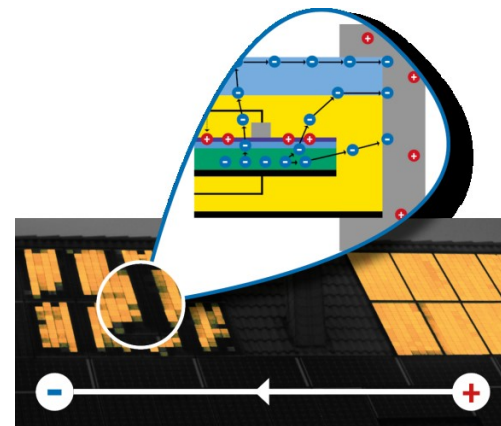


PID Degradation resolution

If the modules have a **negative potential to earth in operation**, there is an equally high negative voltage between the cells of the PV module and the aluminum frame.

The effect is stronger the closer the module is to the negative pole of the PV array, because the potential there can reach more than half the amount of the array voltage.

As a result **electrons** follow this electric field and finally **flow out the module** via the aluminum frame (leakage currents).



✗ CAUSES

- The system configuration (e.g. length of strings, inverter type).
- High ambient temp, high irradiation, high humidity, ..
- The quality of your modules

🎬 CONSEQUENCES

- Performance loss
- Higher degradation rate for modules



✓ SOLUTION

- Increasing the entire PV generator to a high positive potential relative to the earth potential by using PADCON Float Controller.

📊 OUTCOME

- Immediate PID protection
- Regeneration on up to 100% of the nominal capacity
- Securing your returns

PID Degradation resolution

	DAYTIME OPERATION	NIGHTTIME OPERATION	STAKEHOLDER INTERESTS
EXISTING PV PLANTS	Stop Loss (thin-film modules)	Recovery (crystalline modules)	 INVESTOR: Protection of asset and expected revenues FINANCING INSTITUTE: Protection of refinancing TECHNICAL ADVISOR: Technical Due Dilligence ASSET MANAGER/O&M: Bonus-malus system
NEW PV Plants	PID Protection (crystalline & thin-film modules)	Recovery of daily loss (crystalline modules)	 INVESTOR: Protection of asset and expected revenues FINANCING INSTITUTE: Protection of refinancing EPC (+O&M): Bonus-malus system, guarantees TECHNICAL ADVISOR: Yield reports incl. 5% PID free loss ENGINEERING: Prevention as a part of system design ASSET MANAGER/O&M: Bonus-malus system

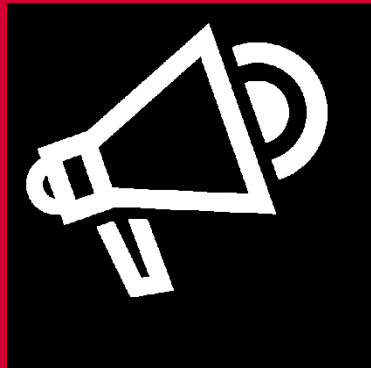
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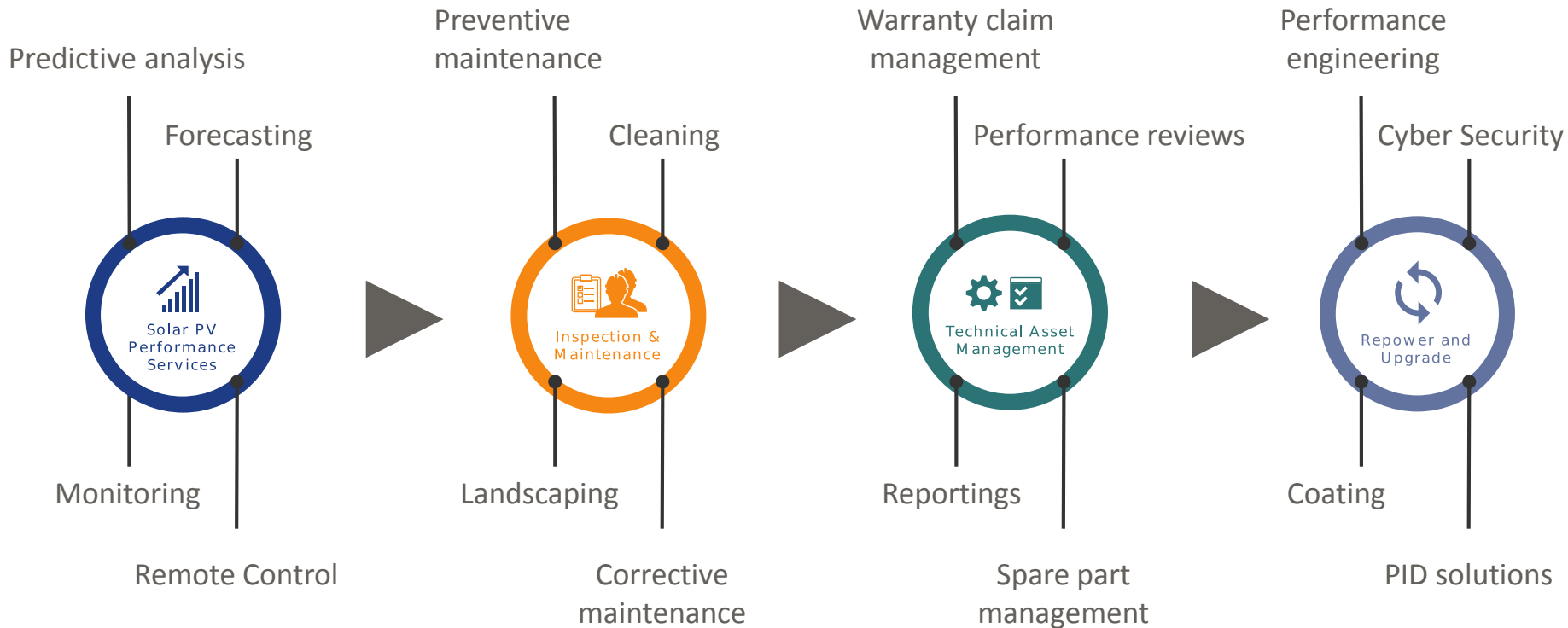
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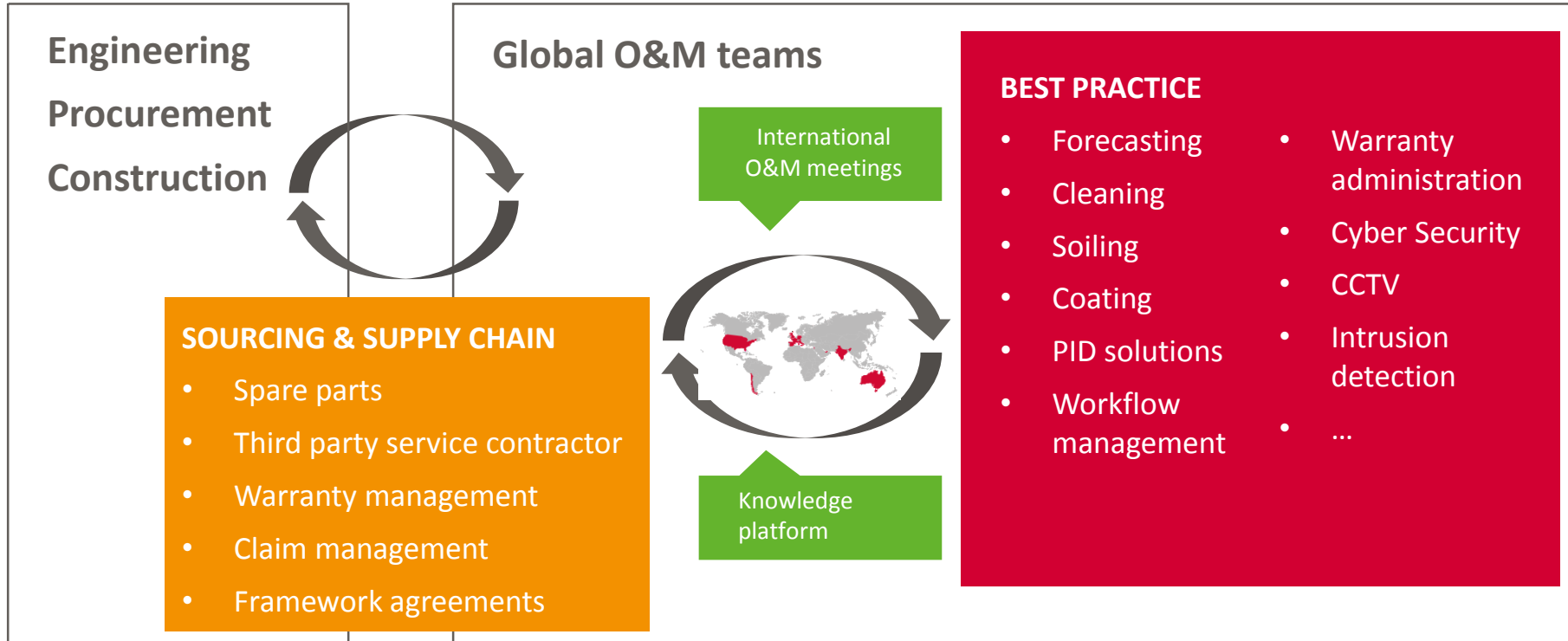
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Asset Management Tool

Scope of services



Data driven knowledge transfer



“Make your data work harder for you”

- Data is the most important part of our business but why?
- Data allows us to see where we are succeeding or failing
- Data allows us to look into the future and predict failures
- Data allows us to learn from our mistakes and make us better
- Data allows us to suggest improvements to our clients
- Data allows us minimise a cost, maximise a gain, mitigate a risk or realise an opportunity

**Descriptive
analytics**

**Diagnostic
analytics**

**Predictive
analytics**

**Prescriptive
analytics**

Data driven maintenance strategies

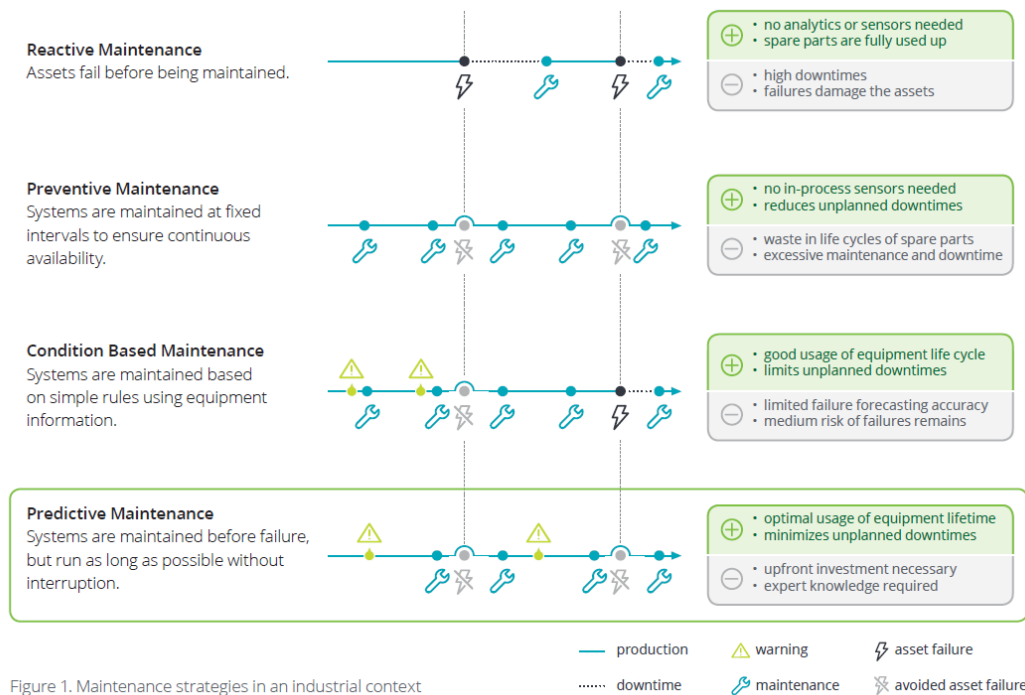


Figure 1. Maintenance strategies in an industrial context

“Predictive maintenance increases equipment uptime by 10 to 20% while reducing overall maintenance costs by 5 to 10% and maintenance planning time by 20 to 50%”

Source:
https://www2.deloitte.com/content/dam/Deloitte/de/Documents/deloitte-analytics/Deloitte_Predictive-Maintenance_PositionPaper.pdf

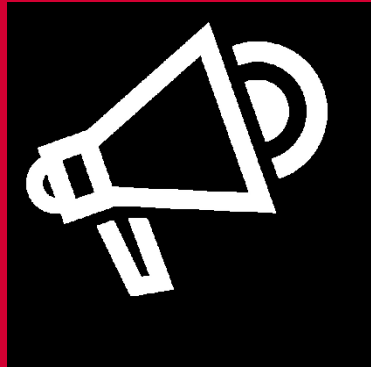
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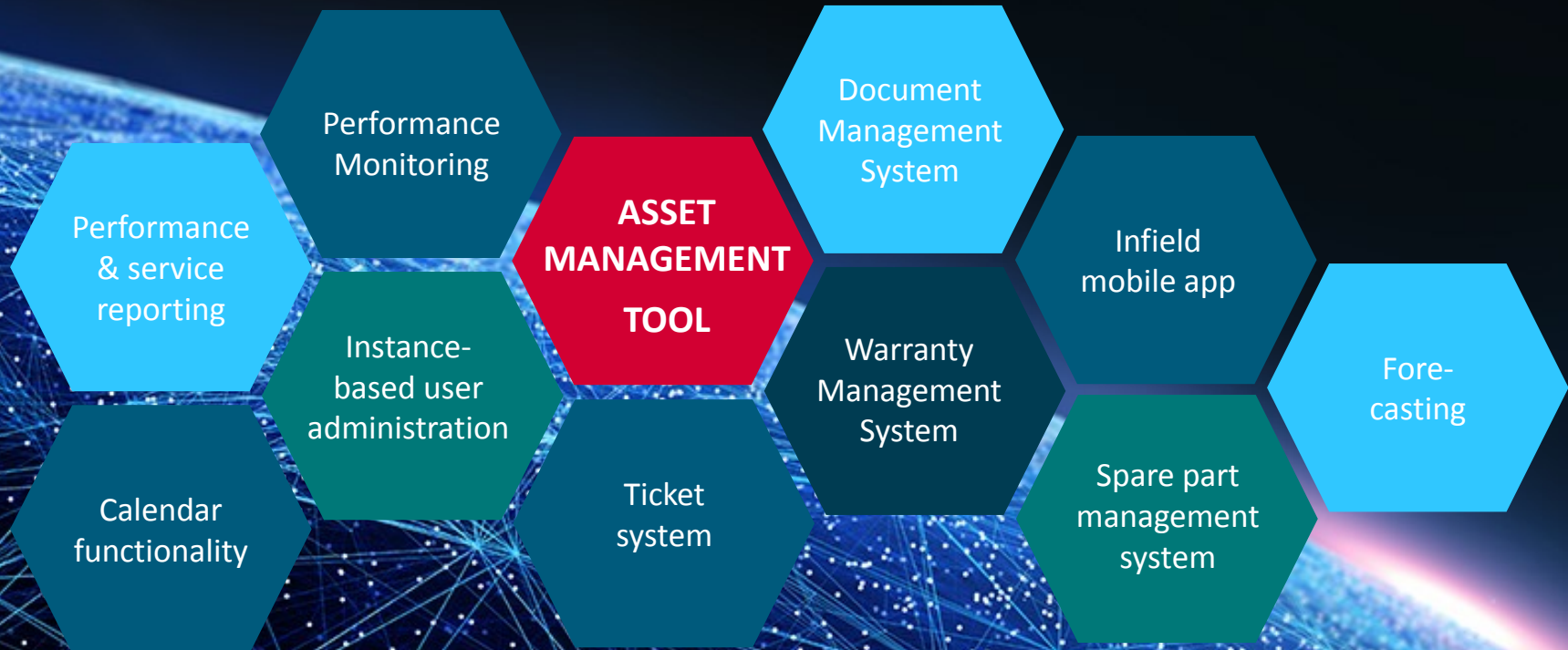
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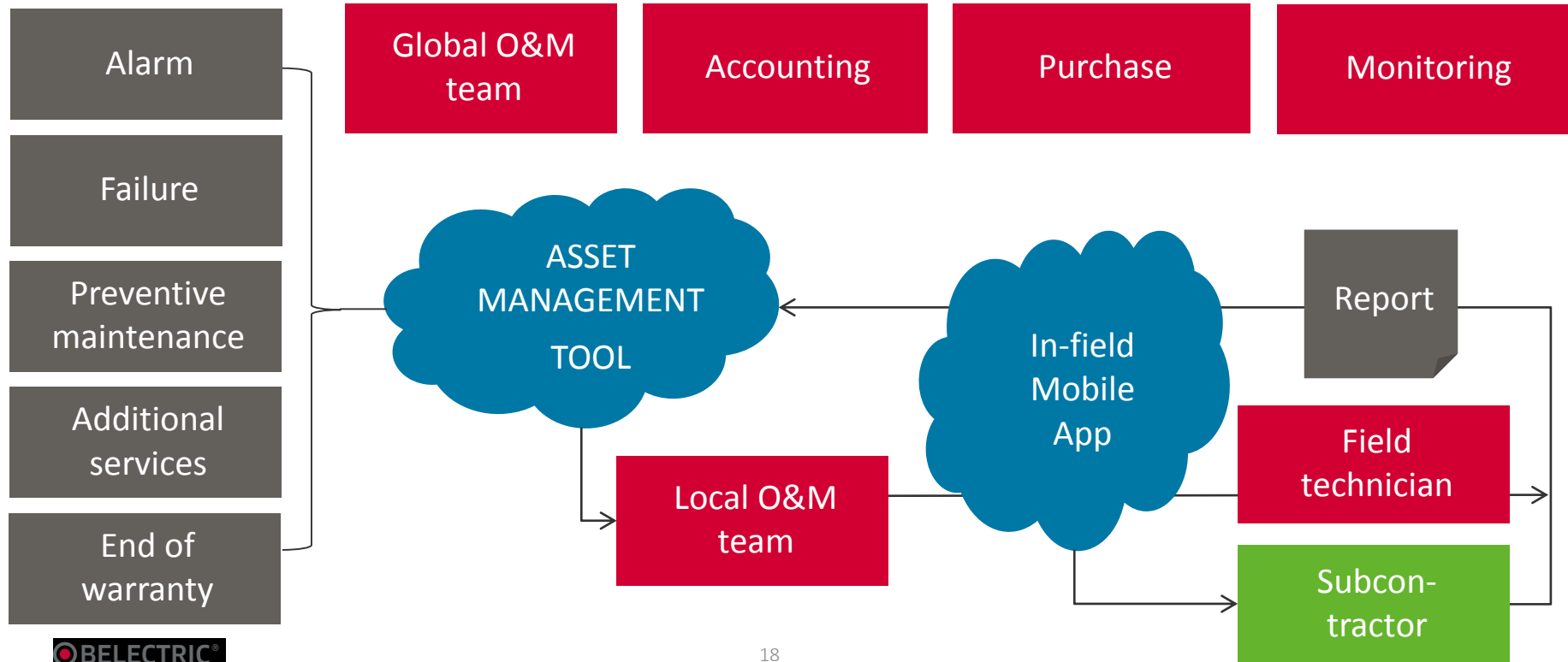
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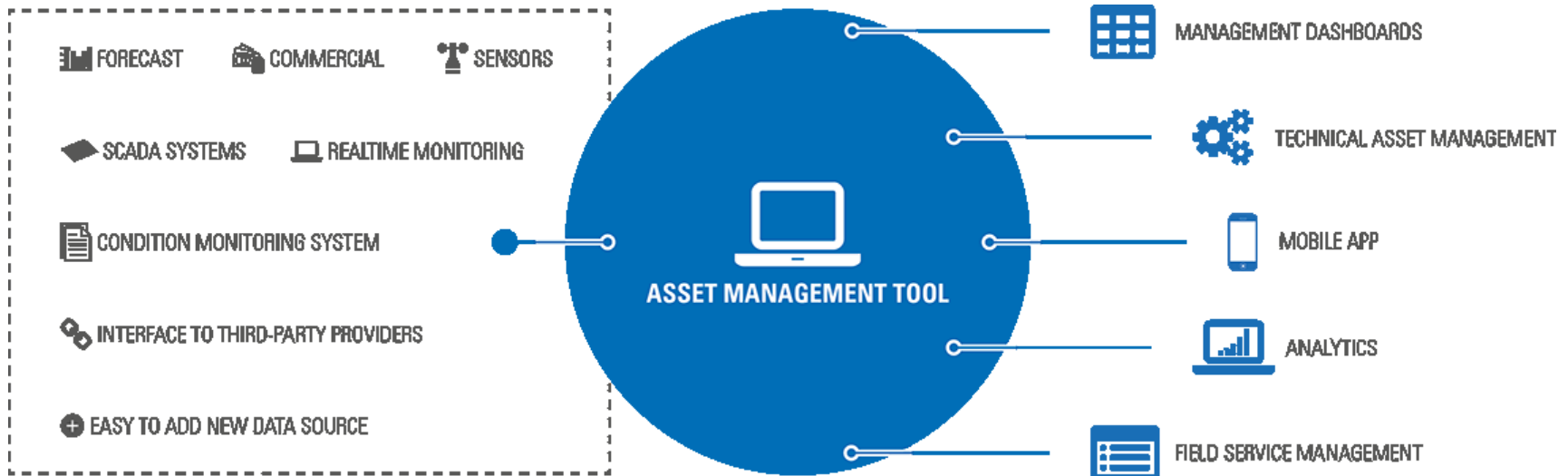
Best practice: BELECTRIC AMT



One-for-all platform



Scope of an Asset Management Tool



A high-angle photograph of two technicians in grey BELECTRIC t-shirts working on a large solar panel array. The panels are dark blue and mounted on a metal frame. The technicians are wearing gloves and are focused on their work. The background shows a grassy field under bright sunlight.

Thank you for your attention!

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