



# O&M

TECHNICAL O&M  
SERVICES FOR SOLAR  
PV PLANTS AND  
BATTERY STORAGE  
SYSTEMS

Your investment safe with BELECTRIC's sophisticated operational services



# Your solar investment in safe hands

BELECTRIC Services for Operation,  
Maintenance & Asset Management



“EDF RE Israel has been an O&M client of BELECTRIC Israel for the last 5 years. We have found the operation and maintenance services highly satisfactory. BELECTRIC employs qualified and professional employees with strong technical abilities and vast experience in all aspects of the PV world. Corrective work and site maintenance is performed on schedule and at a high standard. We would be happy to recommend them as an O&M provider.”

*Netanel Eytan, EDF RE Israel.*

# Operation and Asset Management Services

## Run safely right from the start

The profitability and value of a solar investment depend on a continuous monitoring and inspection of the plant. BELECTRIC Operation and Maintenance Service (O&M) provides operators of solar PV and battery storage plants with an all-in-one solution for securing and improving their assets.

### Expertise from the technology leader

BELECTRIC monitors a total plant capacity of more than 1.6 GWp. Over \$ 2 billion worth of PV plants are supervised and inspected by BELECTRIC O&M teams. The successive service plan is designed to detect risks in plant operation at an early stage, initiate countermeasures and thus achieve optimum plant operation with best-in-class availability. As a pioneer in the PV industry, BELECTRIC engineers and electricians show decades of solar expertise and comprehensive knowledge of all components used. On a daily basis this huge experience assists our customers to operationally secure every PV plant worldwide.

### Future-proof O&M

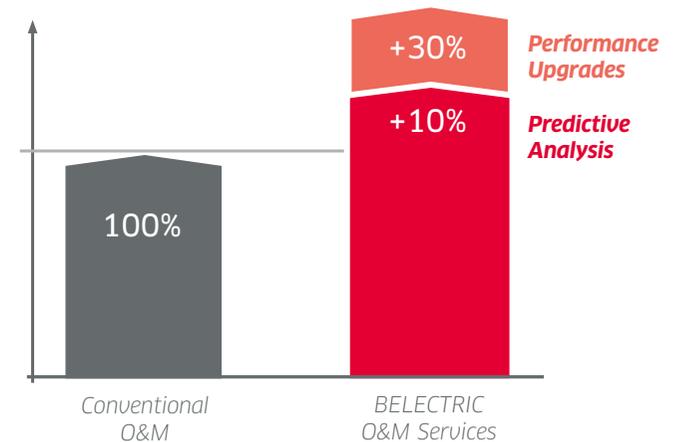
From the beginning, BELECTRIC relies on innovation and technological progress. These values drive our business to harvest highest solar energy yields with best profitability. One of the most important achievements of recent years is the **digitalization of power plants** in order to collect meaningful data from a large number of sensors and to evaluate these for safe plant operation. **Big Data** is the buzzword with which BELECTRIC collects and compares anonymized data of global PV plants. As a result, we compare the economics and eliminate vacancies. With the help of **Predictive Analysis**, we can act preventively and replace components just before they fail.

### Operational safety at the highest level

Despite ongoing digitalization in the energy sector, the basis must not be lost in sight of: security. Both, our employees and your power plant are subject to the highest levels of safety at BELECTRIC. Our directive for Health, Safety & Environment (HSE) applies in principle and our quality work is certified according to **DIN ISO 45001**.

Cyber security is the second aspect that is constantly revised by our IT specialists. In particular, the energy sector requires effective IT security measures to address the threats of everyday operation through its globally linked and constantly accessible networks. BELECTRIC relies on various levels of **cyber security procedures** used in SCADA system to protect clients' power plant portfolio.

### Higher energy yield with advanced O&M:



# BELECTRIC O&M

worldwide • predictive • customized



100%

*Fulfillment of  
O&M contracts*



18yr

*PV expertise  
worldwide*



103%

*Outperforming of  
guaranteed PR*



99.4%

*Power plant  
availability*



# Solar Performance Monitoring and Control

Make your data work harder for you

In order to always keep an eye on your power plant, BELECTRIC O&M relies on an in-house developed and future-proof **Industry 4.0** infrastructure. All plant data from solar power plants and battery storage systems are displayed and analyzed in real time in the **SCADA Control Center**. The central interface is the heart of BELECTRIC O&M and allows direct access to important control mechanisms, if required. It informs the plant operators about all important power plant parameters, current on-site missions and important warning and error messages.

## Big solar data and predictive analysis

For more than 10 years, BELECTRIC has set up its own control center, which since then has collected and analyzed plant data from all over the world. Based on the archived solar data and anonymized big data analysis, BELECTRIC is able to compare the operation of solar PV power plants. On this

basis, we can advise our customers and rate their PV plants in regional comparison. BELECTRIC Solar Performance Monitoring is completely compatible with different kinds of SCADA systems.

Thanks to directly coupled data from maintenance works and component service, a **Predictive O&M Analysis** can be carried out. Selected assembly groups are monitored in order to notify on-site service team and to initiate countermeasures even before a possible loss of revenue. In addition, predictive analysis can reliably forecast future energy yields based on weather and irradiation data.





BELECTRIC Control Center with future-proof SCADA system.



### Monitoring

- Realtime performance monitoring
- Failure detection & diagnostics
- Dispatch of service teams
- Grid operator interface



### Analyzing

- Irradiation-to-Power analyzing
- Big Data: Regional yield rating with anonymized PV stock data
- Analyzing hybrid power plants



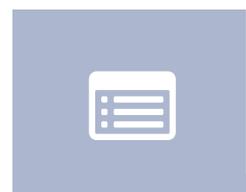
### Predictive analysis

- Yield and energy forecasting
- Meteorological data processing
- Predictive maintenance dispatch
- Individual yield forecast reporting



### Remote control

- Inverter system, MV/HV switchgears
- Power factor / Reactive power comp.
- Line drop compensation
- Power curtailment; ramp rate control
- Park shut-down/start-up



### Guarantee Management

- Response time guarantee
- Plant availability
- Product guarantees
- Performance ratio guarantee

# Technical Asset Management

## Digital-assisted O&M workflow for best reliability

For solar PV investors and operators who demand a comprehensive solution with rapid response and transparent reporting, BELECTRIC's **Technical Asset Management Service** is just the right solution. The O&M service team can handle the whole technical operation of a solar PV power plant or battery storage system.

With the help of an IT-assisted asset management system, all maintenance activities are planned and executed on the basis of energy and availability impacts. In this way, the downtime of the power plants is reduced to a minimum and ensures long-term protection of the assets. Our inhouse-engineered asset management system not only improves workflow, but also ensures that everything is monitored and managed from day to day, from system monitoring and control to preventive and correct maintenance.

BELECTRIC service is always working to secure the best outcome whether it is to minimize a cost, maximize a gain, mitigate a risk or realize an opportunity. Armed with plant data, long term experience to assess every situation, Technical Asset Management is a daily battle to reconcile practicalities with strategic objectives.

### Technical asset management

- Performance supervision
- Performance reporting
- Dialogue with technology suppliers for PV plants optimization
- Framework agreements to leverage scale-effects
- Service reporting
- Spare parts management
- Warranty claim management
- Document Management System
- Periodic performance reviews
- Management of third party contractors





Technical Asset  
Management

# On-site Inspection and Maintenance

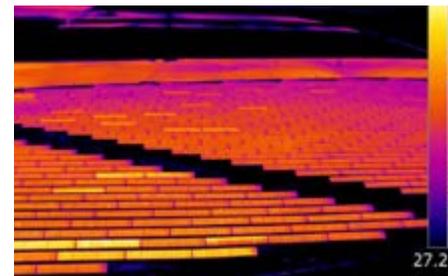
## Preventive yield safe-guarding and emergency service

In addition to monitoring and analyzing plant performance, on-site inspections are just as important. Periodic technical equipment tests and immediate use in the event of a fault are the main tasks of our on-site teams. Thanks to **worldwide O&M** coverage, only a few hours pass between the fault report and the on-site troubleshooting.

On-site technicians perform preventive, predictive, and corrective maintenance on the entire PV plant, quickly restoring production in the event of unplanned downtime. BELECTRIC takes over the maintenance of all components involved in plant operation, including regular visual inspections and functional inspections. On-site inspections are carried out at regular intervals to ensure that your system is functioning properly and protected from future errors.

### Plant and site maintenance

- Preventive maintenance
- Corrective maintenance
- Electrical and mechanical maintenance
- Maintaining and inspecting at high, medium, low-voltage levels
- Photovoltaic module cleaning
- Vegetation abatement
- Spare part management



Thermographic analysis is used to detect defective strings, PV modules and weak points in the DC and AC system.



BELECTRIC can also carry out maintenance work in the medium-voltage sector with trained specialist personnel and tools.



*BELECTRIC O&M service teams on the battery storage power plant "Herdecke" and the solar power plant "Reckahn".*

# Yield Improvement by Performance Upgrades

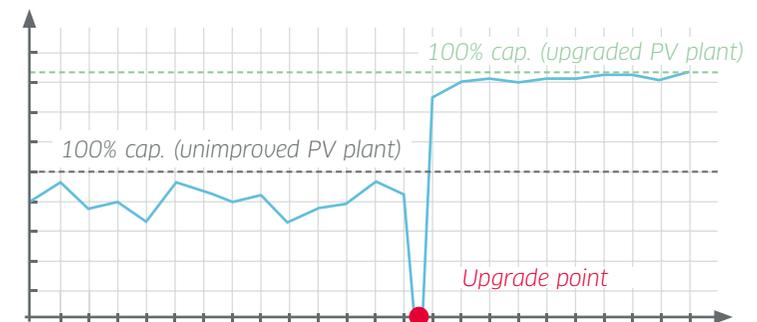
"Old" becomes "new" thanks to advanced plant technology

The PV industry is constantly evolving. In addition to reducing the production costs for PV modules, all components are subject to further development in terms of efficiency and reliability. Added to this is the influence of networking and IT control. BELECTRIC offers various **technical upgrades** for solar power plants, whose benefits and profitability are tested by our experts on a customer-specific and non-binding basis.

## Upgrades & engineering services:

- Technical due diligence to all components and quality audits
- PV plant repowering (PV generator)
- Capacity boost: Replacing old technologies like lead-acid batteries
- Integration of Anti-PID System
- Re-engineering DC/AC power electronics

**Expected yield increase with PV repowering:**  
(PV panels and inverter system)





IMPACT OF PERFORMANCE UPGRADES  
TO ENERGY YIELD:



# Worldwide O&M

BELECTRIC O&M Services are available on all continents

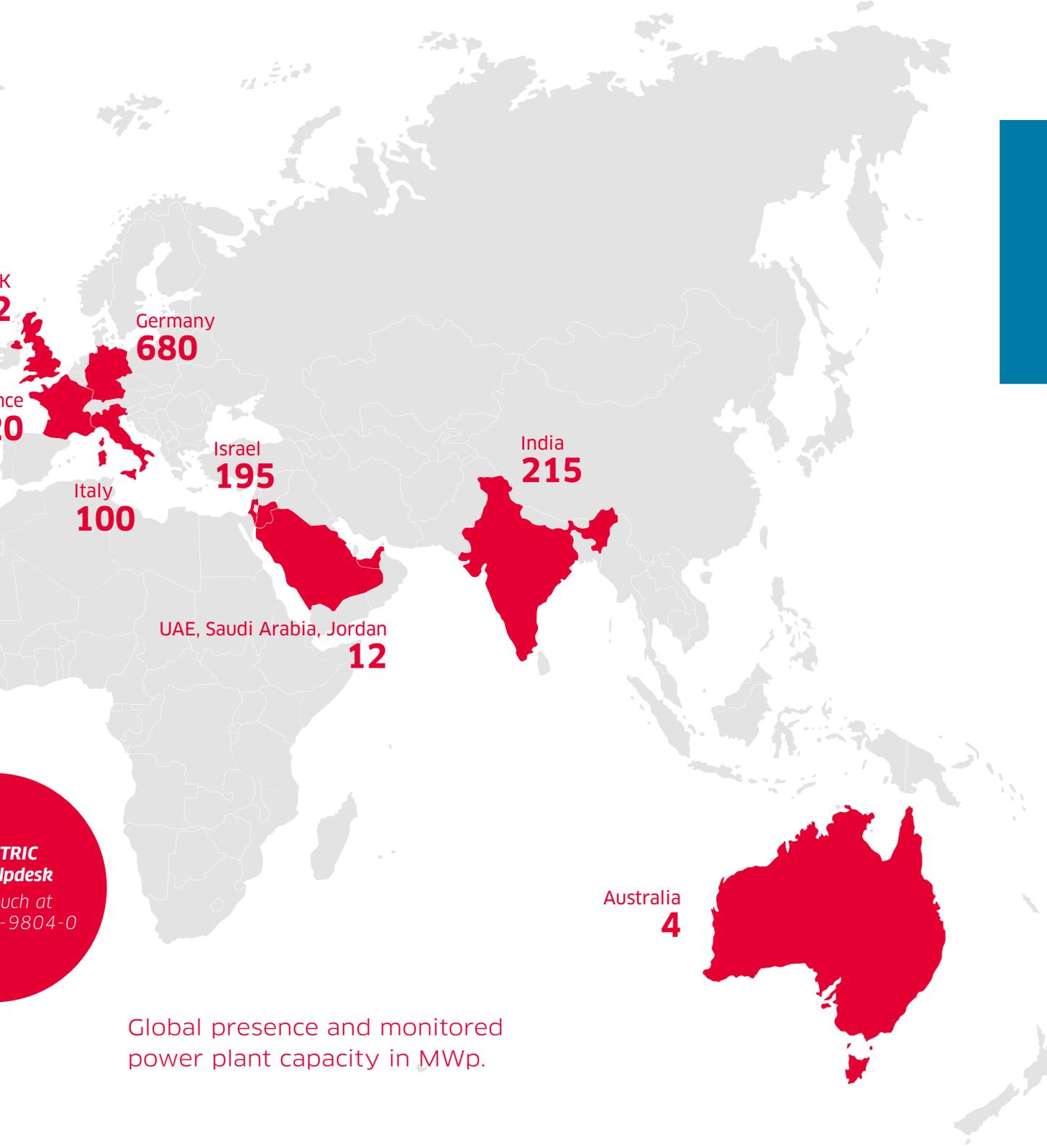
With established and digital-assisted processes, we achieve a fast and customer-friendly reaction to all solar power plants and battery storage systems worldwide. BELECTRIC on-site service teams can eliminate failures in a matter of hours, not only during scheduled inspections, but also in an emergency, minimizing potential revenue shortfalls.

The reliable operation of a solar power plant requires no major investment. A cost-efficient option is an O&M contract that can be transparently calculated based on predetermined parameters. If you are interested, our sales staff will gladly make you an individual offer.

Visit us online: BELECTRIC O&M  
[www.belectric.com/service](http://www.belectric.com/service)



**BELECTRIC**  
**O&M Head Office**  
Get in touch  
+49 9385



“We continue to work with BELECTRIC as they combine great technical understanding with fine project management.”  
*Duncan Bott, LCF ALLIANCE*

99.4%

*Power Plant Availability*

15 Countries

*International O&M Presence*

+1.7 GWp

*O&M supervised PV capacity*

BELECTRIC  
 Head Office  
 Tel Aviv, Israel  
 Tel: +972-3-523-9804-0

Global presence and monitored power plant capacity in MWp.



# Next generation of Solar PV

**BELECTRIC Solar & Battery GmbH**  
Wadenbrunner Str. 10  
97509 Kolitzheim, Germany

Phone +49 (9385) 9804 - 0  
info@belectric.com

Visit us at:



[www.belectric.com](http://www.belectric.com)



BELECTRIC Solar & Battery GmbH is one of the most successful enterprises in the development and construction of utility-scale solar PV power plants and battery storage systems. The company was established in 2001 and has been expanded to an international group with activities on all continents since then.

BELECTRIC has constructed over 300 solar PV power plants with around 2 GWp PV capacity. In addition, the company realized battery energy storage systems and hybrid power solutions, which combines different technologies to autarkic systems. As one of the largest O&M providers globally, BELECTRIC's full-integrated services provide continuous operation.