

# PV MODULE LIFETIME FORECAST AND EVALUATION



## Causes of degradation and performance improvement in a complete PV system for O&M activities

M. sC. Guillermo Oviedo Hernández (ESR 14)  
guillermo.hernandez@baywa-re.com

### Project summary

The research activities will be focused on PV performance enhancement by improved O&M, through the analysis of monitoring data in order to identify the most relevant effects causing degradation and reduction in plant performance.



PV plant in Germany. Photo: Guillermo Oviedo

### Research topics to be covered

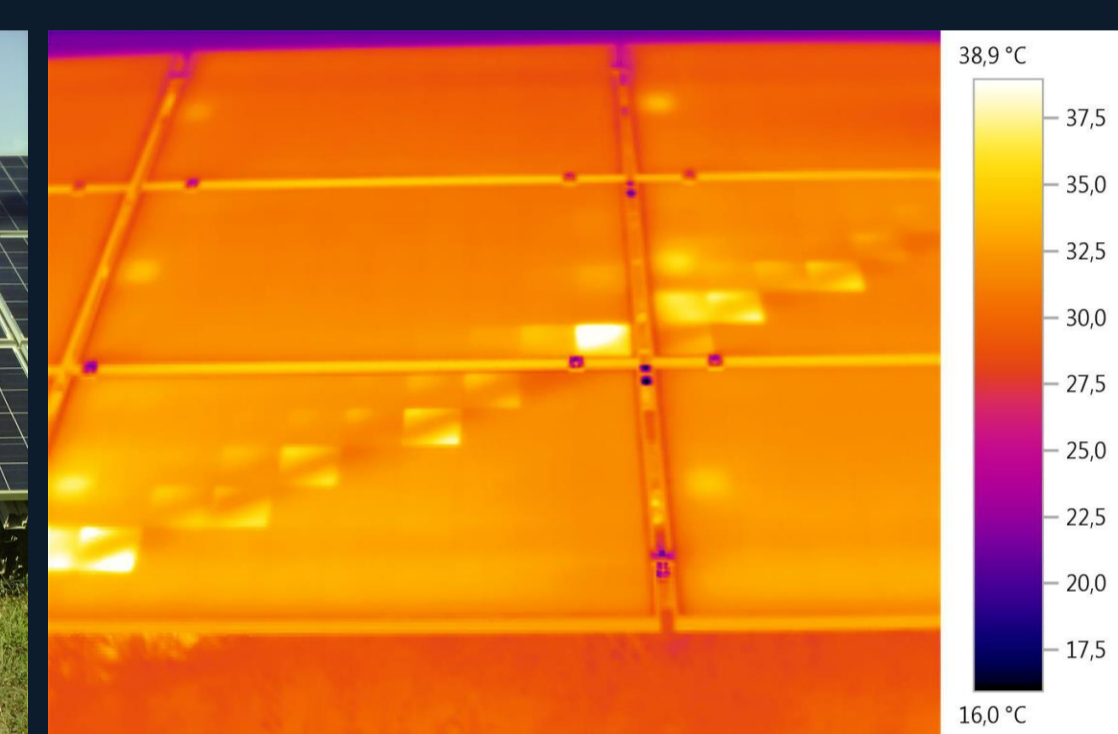
- Cloud-based data management
- Data analysis for automated failure detection and diagnosis
- Energy production forecast (irradiance and weather prognosis)
- Solar economics (impact of degradation and O&M strategies)
- Cybersecurity of PV SCADA systems
- On-site technical inspections for PV module quality assessment:
  - I-V curve tracing
  - Electroluminescence (EL) imaging
  - Infrared (IR) thermography



Aerial IR inspection. Photo: Guillermo Oviedo



Shaded PV modules. Left: visual photo, right: thermal image. Source: PI Berlin



### Research design

#### Theoretical framework

Theoretical study of the different causes of performance degradation and possible solutions during the lifetime of PV systems, as well as monitoring data analysis.

months 11-13

#### PV data analysis

Development of suitable data analysis processes for the identification of the relevant parameters out of PV plant monitoring data sets. A market research of suitable software for analysing big data will be carried out, to see how it can be integrated into BayWa's O&M platform.

months 14-19

#### Case studies

Elaboration of case studies on PV plant performance, to be achieved mainly remotely through big data analysis, having access to a huge database of hundreds of PV plants monitored and maintained by BayWa r.e. Operation Services S.r.l. Field trips to selected PV plants will be scheduled.

months 20-31

#### Diagnostic methods

Setup of remote and on-site effective diagnostic methods for reducing operational costs and production losses based on the results of the case studies.

months 32-43

#### New trends and technologies

Market and technical analysis about new technologies and their effectiveness for performance improvement of PV systems.

months 44-46

### Research questions

- Which key performance indicators (KPIs) must be analysed and how, in order to study the causes of performance degradation of PV plants?
- Which are the most suitable processes for analysing data sets recorded by monitoring/SCADA systems?
- How to integrate effectively diagnostic methods into BayWa's cloud-based O&M platform for reducing operational costs and production losses?

### About BayWa r.e. Operation Services

Formerly known as Kenergia Sviluppo, is today the leading independent PV plants management company operating in Italy, with a portfolio of over 400 MW of PV and wind plants put under control, many with full Operation and Maintenance services.



Horizon 2020  
Marie Skłodowska Curie Actions  
Innovative Training Networks

SOLAR-TRAIN Beginners Week  
Freiburg, Germany, July 3<sup>rd</sup> – July 7<sup>th</sup> 2017

