Corporación Instituto de Tecnologías Limpias (ITL)
Antofagasta
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CHALLENGE TITLE

Operation and maintenance of solar power plants.

CHALLENGE DESCRIPTION

The operation and maintenance of solar power plants in northern Chile consistently face challenges related to local weather conditions, such as high temperatures and intense solar radiation, as well as the significant accumulation of dust, which accelerates equipment wear and failure. The slow, manual, and costly process of detecting thousands of faulty modules, coupled with persistent failures in key components like inverters, presents an ongoing challenge. This initiative aims to bridge the technological gap to optimize the quality and duration of solar module inspections, reduce failures in panels and inverters, and lower overall operation and maintenance costs for the plants.

GENERAL OBJECTIVE

To contribute to the reduction of operation and maintenance costs in solar power plants by co-developing new technologies that enable shorter inspection and fault detection times for solar modules and inverters. Concurrently, the aim is to extend the service life of inverters through technological solutions that directly address the root causes of their failures.

SPECIFIC OBJECTIVES

1. Design of new technologies to simplify the inspection of solar modules and inverters for identifying and predicting faults.
2. Creation of autonomous systems to perform operational status assessments of solar modules and inverters for fault detection.

3. Co-development of intelligent algorithms and systems capable of processing information on the health of modules and inverters rapidly and reliably, as well as predicting future failures.
4. Extension of the service life of solar modules and/or inverters.

EXPECTED RESULTS

- Development of prototypes for industrial implementation.
- On-site design, development, and validation of the technologies.
- Development of validated simulation models and tools for determining causes and predicting failures in solar modules and/or inverters.
- Techno-economic reports on the improvement of operation and maintenance processes and cost reduction in solar plants.

SCOPE

Includes:

- Demonstrations in a controlled, relevant environment, along with semi-industrial and operational piloting and validation.
- Testing of inspection algorithms under semi-industrial and operational conditions.
- The prototypes are expected to be capable of operating in utility-scale solar power plants.

Does not include:

- Concept proofs and/or laboratory-scale testing (TRL ≤ 4).
- Solutions that pose risks to the safety of workers, equipment, or the environment.

- Technologies that increase the consumption of strategic resources such as water or energy.
- Interventions that alter or interfere with the continuity of the power generation process.

KEY PERFORMANCE INDICATORS (KPIs)

1. Mean inspection time for solar modules and/or inverters.
2. Man-hours (MH) invested in maintenance and inspection.
3. Failure rate of modules and/or inverters.
4. Related maintenance costs.

DESIRABLE CONTRIBUTION TO ITL CAPACITY BUILDING

- Development of smart algorithms and systems for fault detection.
- Building capabilities in the areas of simulation and modeling, and technologies for predicting failures in solar modules and/or inverters.
- Prototypes and testing infrastructure for the generated technology.