

# CORE CAPABILITIES

Keep systems running at 100% with actionable data that guides boots on the ground directly to trouble spots



**CORE Energy Works** is an engineering services company with expertise in photovoltaic performance testing. Our experience draws on years of working in the solar industry, both in cell and module manufacturing as well as operating a certification laboratory. We use test methods that are non-disruptive, allowing us to quickly and inexpensively inspect an entire solar installation, or perform an audit on a limited number of panels to uncover the root cause of performance losses.

## Field-Based Testing

Using IR aerial imaging (drone or lift) we can detect outages and other issues that cause solar arrays to underperform. The modules remain in place for targeted IV and EL follow on testing. Additionally, we can perform thorough visual inspections often revealing issues with backsheets, Jboxes and wiring. After analysis, CORE Energy Works provides visual maps pinpointing defective modules. Our detailed reports are valuable in assisting warranty claims and scoping a repair/replace project.

## Laboratory Testing

CORE Energy Works operates from our laboratory / warehouse facility in the United States and can conduct solar industry standard testing on quantities as small as a single module up to a full shipping container of product for evaluation. We also offer module storage and logistics as it pertains to warranty services management.

## What You Get

A CORE Energy Works report will give you a clear picture of the DC health of your system. It will have a list of recommended actions, including clear guidance on modules recommended for replacement and their specific location. If a warranty action is recommended, the CORE Energy Report will be the first thing to submit to the manufacturer.

## Field Test Capabilities

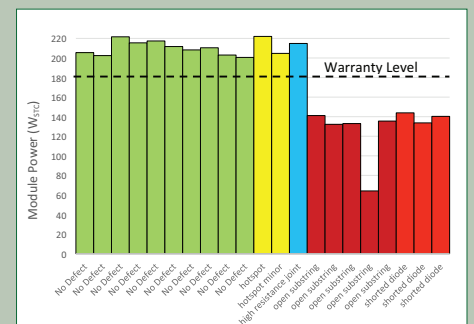
- ◆ Drone and Ground Based IR Inspections
- ◆ Module and String Level I-V Measurements
- ◆ Electroluminescence (EL)
- ◆ DC Balance of System IR and Visual Inspections

## Laboratory Test Capabilities

- ◆ From Single Module STC testing to Full Shipping Container Evaluation for Transportation Damage
- ◆ Capability to Carry Out Many Certification Level Tests

## Actionable reports for O&M teams

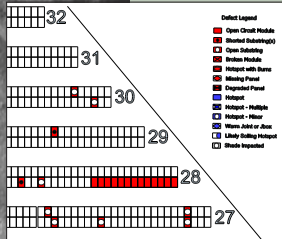
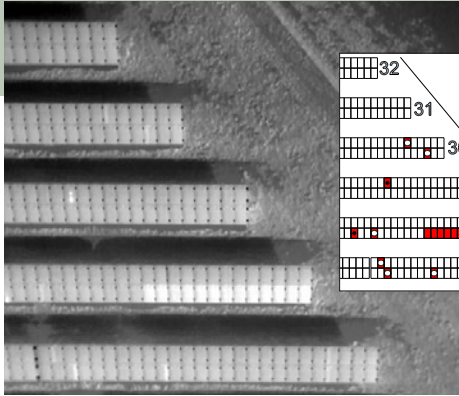
- ◆ Detailed defect maps categorized by urgency
- ◆ Root cause analysis of failures
- ◆ Data needed to support warranty claims



# SEEING WHAT WE SEE

There are plenty of reasons why a solar product can fail, but the real challenge is to **find the problem and pinpoint the location**.

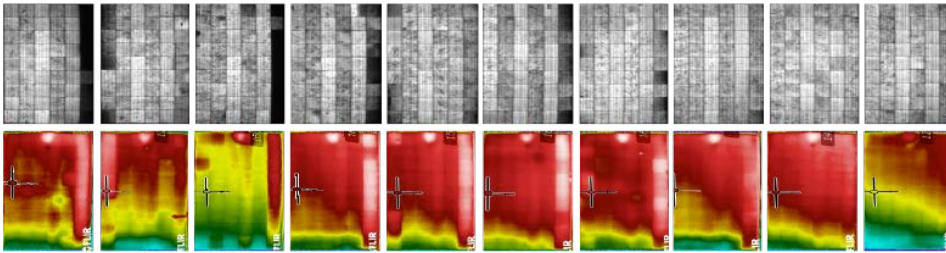
CORE Energy Works does exactly that and provides the documentation needed to remedy the issue.



## Detailed IR Mapping

Using an extended lift and/or drone flyover with specialized Infrared thermal imaging equipment, we can quickly

pinpoint the location of failure issues in the field without disassembling the array or using other more costly and tedious methods.

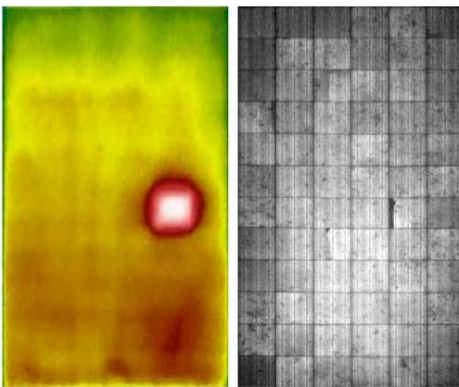


## Potential Induced Degradation (PID)

PID can be confirmed with very clear IR and EL signatures.

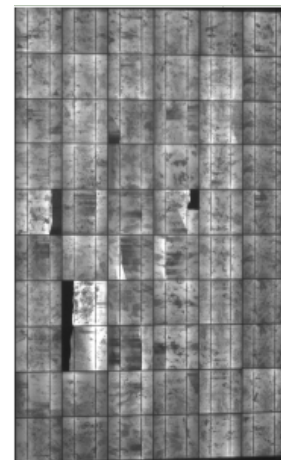
## Transportation and Handling Damage

Although cracks in solar cells are ubiquitous, the technology chosen and handling procedures will strongly influence the long term



## Hot Spot created by Cracked Solar Cells

While cracked solar cells are everywhere in silicon modules, identifying problem modules from a safety and performance point of view can be difficult. We can do detailed characterizations by IR and EL to recommend replacement and warranty action in some cases, and identify key modules to watch year over year in other cases.



impact to the module. We have tested this sensitivity in a wide range of technologies and seen the impact in the field. Prevention is the best cure.



## Field-wide wiring defect

In person inspection is often required to uncover wiring issues that can be contributing high-resistive losses to the system.

## Improper manufacturing

Often hot spots, in tandem with improper manufacturing, cause larger problems. Issues like the one show here was found initially with IR, but required visual inspection to identify it as a workmanship issue.



Contact CORE Energy Works for field or laboratory performance testing of photovoltaic products

Call 610.416.7771 or visit [www.CoreEnergyWorks.com](http://www.CoreEnergyWorks.com)

