# Sky2Earth
### Technology
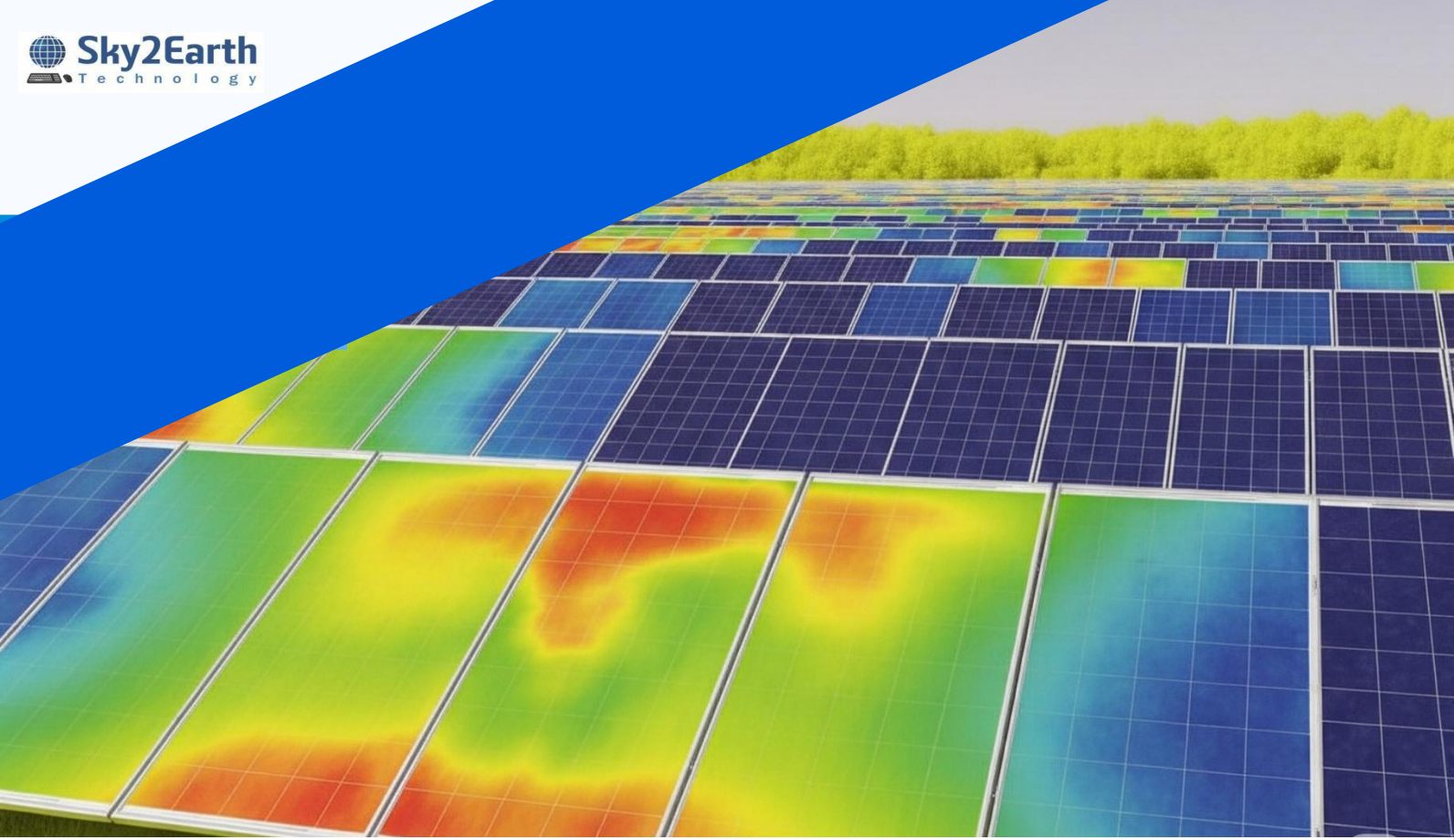
## Executive Report of Drone Thermography
## 45MW at XXXX Project, District, State

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## About Us

Sky2Earth Technologies specializes in end-to-end thermal inspection and survey services, along with the development of cloud-based software tools to streamline drone thermography operations. Our primary focus is on energy infrastructure, with a strong emphasis on solar plants and transmission lines.

## Vision

Sky2Earth Technologies aims to be the leading end-to-end provider of drone inspection services and cloud-based management tools for the energy sector. From surveys and work-in-progress monitoring to thermal inspections, we help optimize operations, enhance efficiency, and support sustainable growth.

## Mission

Our mission is to Delivering accurate, reliable, and repeatable aerial data to build cost-efficient ecosystems and future-ready assets.

# OBJECTIVE OF IR INSPECTION

- The primary **objective of this IR/Thermal inspection is to find anomalies** which indicate specific types of defects of various components of a Solar PV Module, the cause of such types of defects to avoid further damage & ensure normal functioning of modules.

- **AI-powered drone inspections** of solar panels enable fast and cost-effective early detection of potential power losses and safety risks, helping to minimize operational downtime and protect your asset value.

- We also offer a **cloud-based platform** for secure storage and easy access to all inspection data. Our services help reduce operations and maintenance (O&M) costs by enabling more targeted, efficient on-ground inspections — particularly useful for tasks like **Technical Due Diligence**, where focus on key findings is essential.

# SCOPE OF INSPECTION & METHODOLOGY
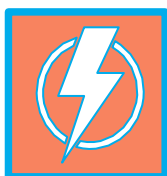


**SCOPE**

The scope of this project entails a non-contact infrared thermal inspection performed with the thermal sensor mounted on a UAV inspect thermal & visible anomalies on solar PV panels.



**METHODOLOGY**

This power plant was divided into Multiple geographical blocks and each block is converted as a part of report.

## DATA COLLECTION

The Block was covered in multiple flights using FLIR Vue Pro thermal sensor mounted on a UAV – the flight path was optimized to enable the creation of thermal Ortho mosaic layer. The data collection process is explained in the following steps:

- The flight mission was designed for the specific layouts using compatible map files that contain the plants GPS boundaries.
- Image resolution & overlapped were specific at the time of mission planning. Less than 5cm Pixels is the GSD resolution. The degree of overlap between consecutive images is specified using frontal overlap & side overlap parameters. The values of these parameters are 80% & 80% respectively for thermal.
- Upon reaching the site, the visual & thermal drone were assembled and the connected to the smartphone via the link app.
- Upon the receiving the confirmation that the environmental conditions were within satisfactory levels the scan was carried out. Some key parameters that were considered were irradiance, wind speed, cloud cover and tome of the day. The parameters thresholds were considered as the prescribed by the IEC TS62446-3:2017.
- The UAV then embarked on a near autonomous flight with minimal inputs from the pilots.

# FAULT CATEGORY

Fault category will help you decide your next actions steps based on severity and impact of findings.
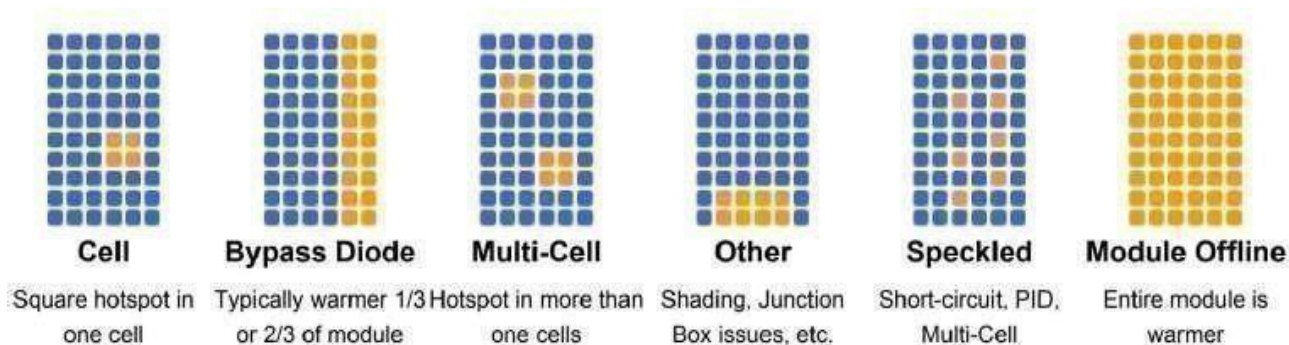
## REMEDIATION RECOMMENDED FAULTS

Modules with a high probability of causing system energy loss. The choice to remediate modules depends on anomaly density, replacement costs and replacement availability.

## MONITOR & REMEDIATE FAULTS

Modules that pose a significant known energy loss or potential safety hazard on the site which require prioritized attention to recover energy loss and improve site safety

## LONG-TERM MONITORING FAULTS

These modules have a low probability of causing extensive energy loss. Theses anomalies are unlikely to require remediation immediately but tracking the progression of anomalies over time is recommended.

| **Cell** | **Bypass Diode** | **Multi-Cell** | **Other** | **Speckled** | **Module Offline** |
|---|---|---|---|---|---|
| Square hotspot in one cell | Typically warmer 1/3 or 2/3 of module | Hotspot in more than one cells | Shading, Junction Box issues, etc. | Short-circuit, PID, Multi-Cell | Entire module is warmer |

# EXAMPLE OF ANOMALIES

Below are visual examples of anomalies

### Cell Hotspot

### Multi Cell Hotspot

### Bypass Diode
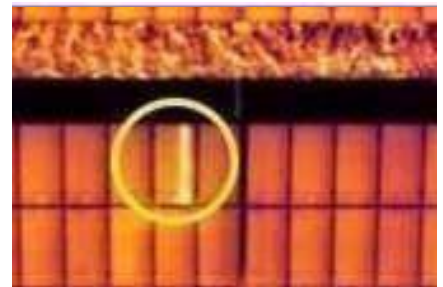
### Power Mismatch

### Speckled
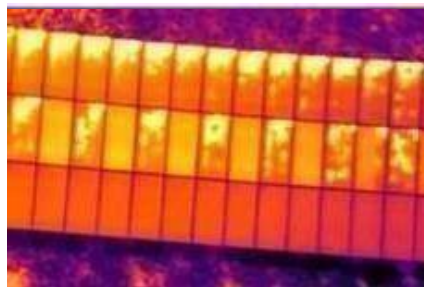
### PID

### Module Offline
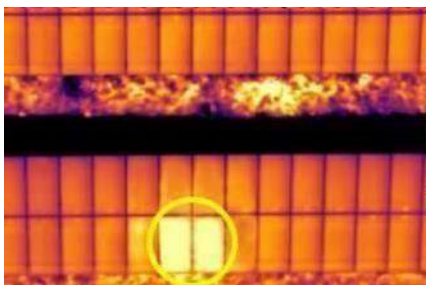
### Partial String Offline
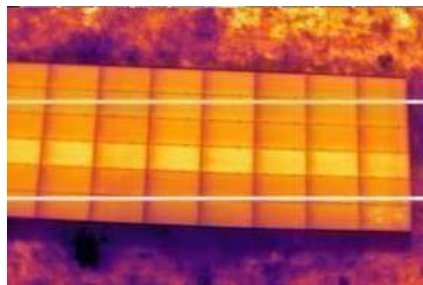
### String Offline

# 1. Site Overview

## 1.1 Company Details

| | |
|---|---|
| Company Name | xxxx |
| Address | xxxx |

## 1.2 Site Summery

| | |
|---|---|
| Project Name | xxxx |
| Project Location | Village, Taluka, District, State |
| Total MW | xxxx |
| Coordinates | 76.222, 65.5455 |
| Type of Modules | xxxx |
| Tilt Angle | xxxx |
| Total Module Installed | xxxx |
| Total Area | xxxx |

## 1.3 Weather Details

| | |
|---|---|
| Temperature | 42.8 ℃ |
| Wind Speed | 8.5 km/h |
| Irradiation during fly | 630 to 1900 |
| Cloud Cover | Sunny |

## 1.4 Sensor Details

| | |
|---|---|
| Sensor Type | IR (Thermal) |
| Sensor Resolution | 640 x 512 |
| Frame Rate | 30 Hz |
| Lense Model | 40mm |

## 1.5 Data capture

| | |
|---|---|
| GSD | < 5cm |
| Fly Height | 30mtr |
| Front Overlap | 90% |
| Side Overlap | 90% |

## 2. RESULTS & ANALYSIS

### QUICK SUMMARY

| Sr. No | Anomalies Type | Numbers | Percentage |
|---|---|---|---|
| 1 | Module Missing | 2 | 1.098901099 |
| 2 | Multi Cell Hotspot | 56 | 30.76923077 |
| 3 | Cell Hotspot | 89 | 48.9010989 |
| 4 | Power Mismatch | 25 | 13.73626374 |
| 5 | String offline | 4 | 2.197802198 |
| 6 | Bypass Doide | 6 | 3.296703297 |
| **Total Anomalies** | | **182** | **100** |