



THERMOGRAPHIC INSPECTION REPORT

Demo Solar Site



02/04/2024 Demo Santral

Santral Görünümü Hata Bilgisi Santral Detayları Verimlilik Envanter Santral Üyeleri

Yönetici Hesap
register@test.com

Dashboard

Santraller

Raporlar

Bildirimler

HESAP AYARLARI

Profil

Takım

YARDIM MERKEZİ

Bize Ulaşın

SOS

AYARLAR

Uygulama Ayarları

Çıkış Yap

Panel No: a-96-4060

Hata Tipi: Kırık / Çatlak

Hata Önceliği: Yüksek

Seri Numarası: Z3M102016030006076

Panel Durumu: İnceleme Bekliyor

Panel Elektrik Bilgisi: Tamamlandı

13/05/24 18:41 Akım: 44 A Gerilim: 103 V

String Elektrik Bilgisi: Tamamlandı

13/05/24 18:41 Akım: 53 A Gerilim: 119 V

Scotlık: Max: 89.20°C, Min: 40.10°C, Avg: 53.65°C, Delta: 49.10°C

Drone Görüntüleri

Verimlilik Bilgisi

Günlük Kazanç: \$332.35, Günlük Kayıp: \$9,970.5

Yıllık Kazanç: \$119,646

Hata Türleri

Hata Türü	Toplam	İnceleme Bekliyor	Tamir Sürecinde
Hücre Hatası	108	108	0
Diyeç Hatası	124	124	0
Çırak Nokta	124	124	0
Modül Hatası	3	3	0

1 - 4 of 12

Demo Business

Address 1 Ankara Türkiye

1234567890

register@test.com

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1. INTRODUCTION

1.1 Report Definition:

This document has been prepared for the solar power plant (SPP) listed below with a total capacity of 4.493 mw. The report provides a visual inspection of the SPP located at 2009. Cd. No:8 OSB Sincan Ankara Türkiye.

1.2 Work Definition:

The work definition covers thermal camera inspections. Our organization conducts inspection activities in accordance with the TR EN ISO 17020 standard. The TS EN ISO 17020 standard encompasses the inspection of functions, duties, materials, products, facilities, processes, work procedures, or services to determine whether they meet requirements and then reporting these activities to the client. All measurements are conducted in accordance with IEC 62446:2016. IEC 62446-3:2016 is the standard that specifies the equipment to be used in thermal inspection, minimum irradiance, maximum wind speed, and various environmental conditions and specifications. Efficiency calculations of the modules performed during on-site inspections are carried out in accordance with the TS EN IEC 61724-1 standard.

1.3 Scope of Work:

- Verification that the site to be inspected has optimal values in atmospheric effects such as irradiance, temperature, wind speed, and cloud cover.
- Parameters are measured on-site or obtained from the site's SCADA system.
- Checking the contamination level of the panels on the site to be inspected.
- Infrared inspection with a thermal camera after the plant is connected to the grid.
- Inspection of the site using a drone.
- Visual inspection with an RGB camera after the plant is connected to the grid.
- Detection and reporting of anomalies using drone images obtained with thermal and RGB cameras.

1.4 Documents:

- Assignment and scope of work
- Access permission to the SCADA system
- Datasheets of modules and inverters
- Layout plan
- Fault Polygon Network

1.5 Abbreviations:

- AC: Alternating Current
- DC: Direct Current
- Azimuth: Angular measurement in the spherical coordinate system
- PV: Photovoltaic
- MPP: Maximum Power Point
- MPPT: Maximum Power Point Tracker
- STC: Standard Test Conditions
- Wp, kWp, MWp: Power Units 1,000,000 Wp=1,000kWp=1 MWp
- Pmaks: Maximum Power
- Voc: Open Circuit Voltage
- Isc: Short Circuit Current

-
- FF: Fill Factor
 - GHI: Global Horizontal Irradiance
 - DNI: Direct Normal Irradiance
 - DHI: Diffuse Horizontal Irradiance
 - GTI: Global Tilted Irradiance

1.6 Inspection Details

The inspection of the PV system was conducted on 02/04/2024 18:14. During the inspection, all systems were operational. All participants were informed about the inspection date.

Personnel present during the inspection:

- Firat AKYÜREK, Technical Manager
- Elif DALKIRAN, Quality Manager

1.7 Measurement Instruments and Equipment

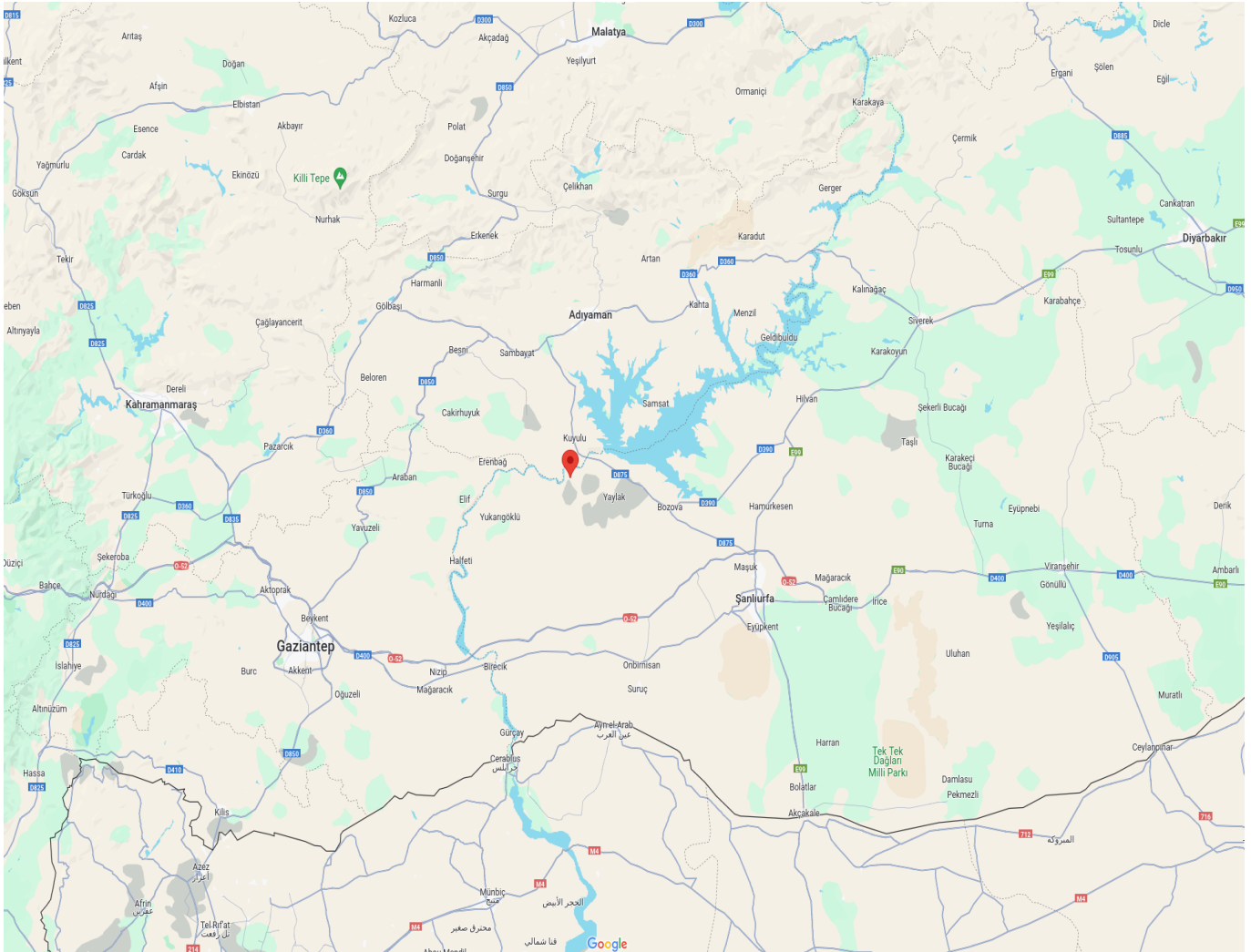
- Thermal Camera: DJI M30T Enterprise
- RTK&GNSS; Device: DJI RTK
- RGB Camera: DJI M30T Enterprise

2. Plant Details

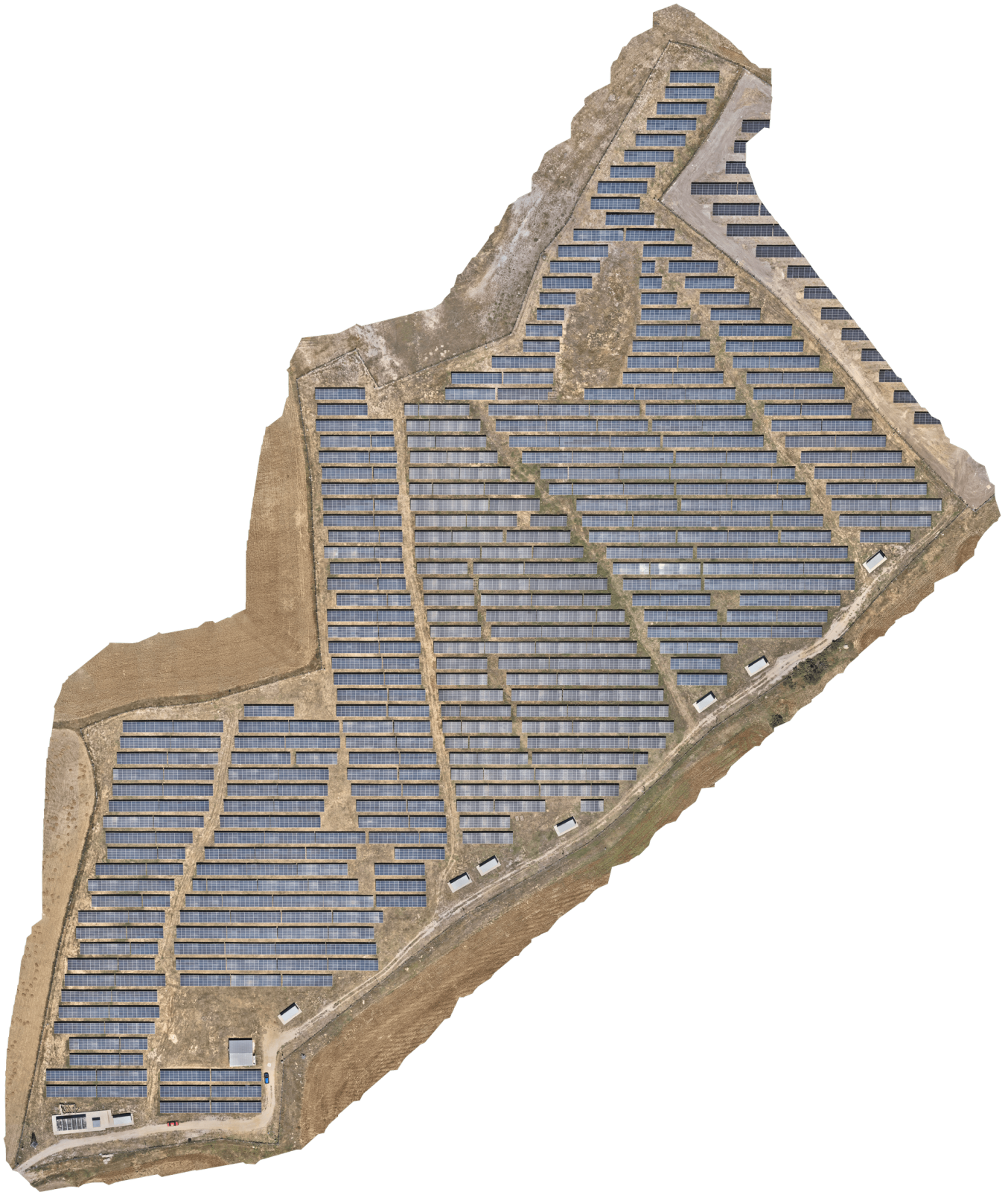
This section presents the operational and technical details of the plant. Information such as location details, RGB and thermal orthophoto data, and a polygon network detailing PV modules is provided. These data are critical for measuring the plant's performance and energy efficiency.

2.1 Plant and Company Information

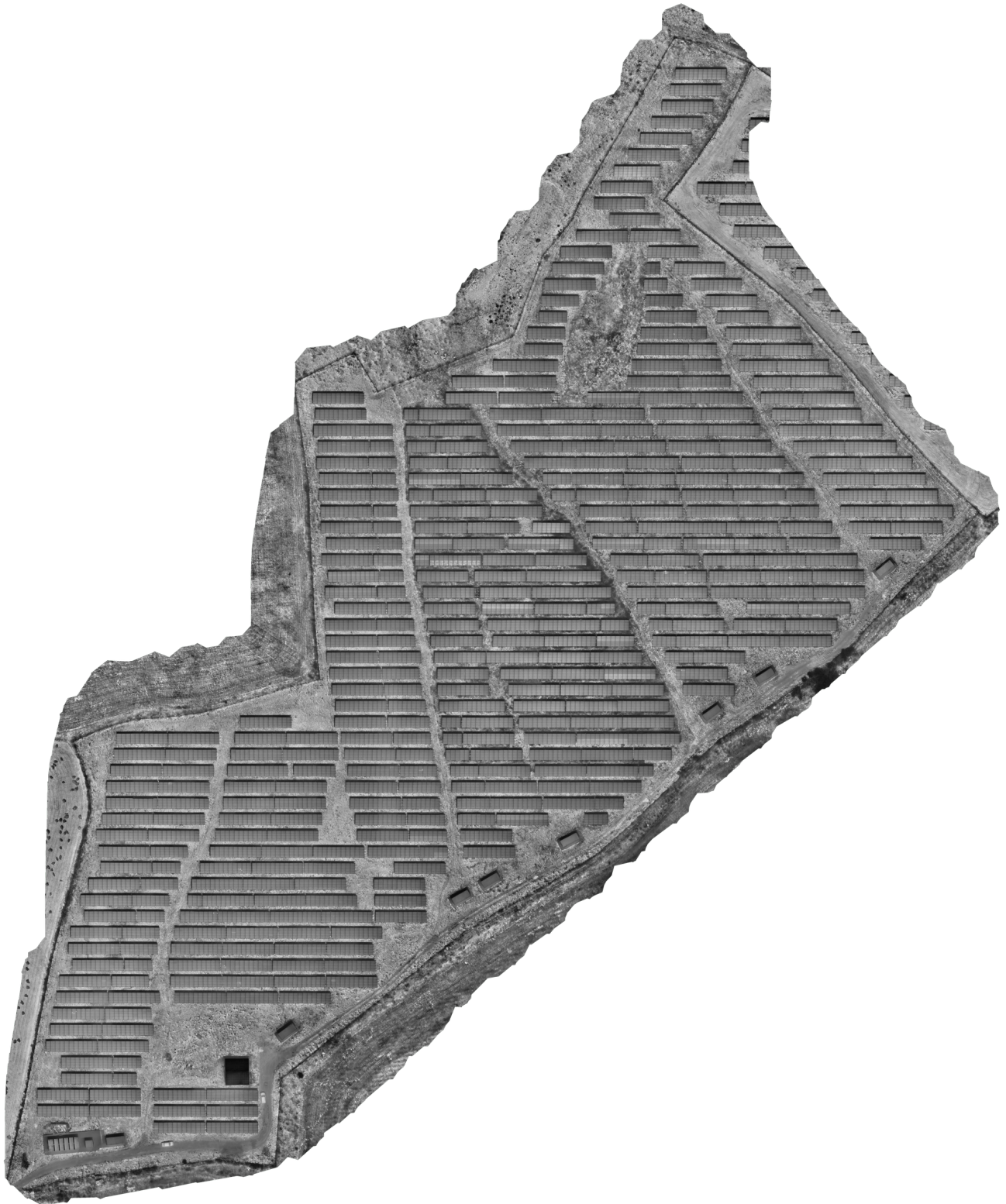
Plant Name	: Demo Santral2	Company Name	: Demo Şirket
Plant Type	: Commercial Rooftop PV	Phone Number	: 1234567890
Commissioning Date	: -	Email	: register@test.com
Installed Power	: 4.493 mw	Plant Manager	: Demo Hesap
Module Type	: Standard	Manager Phone Number	: 1234567890
Plant Address	: 2009. Cd. No:8 OSB Sincan Ankara Türkiye	Company Address	: Address 1 Ankara Türkiye



2.2 Solar Power Plant RGB Orthomosaic Image



2.3 Solar Power Plant Thermal Orthomosaic Image



2.4 Solar Power Plant Module Polygon Network Image



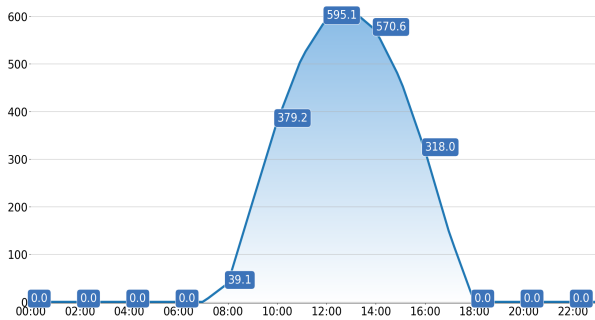
3. Inspection Results

3.1 Measurement Conditions

This section presents the operational and technical details of the plant. It includes information on location details, RGB and thermal orthophoto data, and a polygon network detailing PV modules. These data are critical for measuring the plant's performance and energy efficiency.

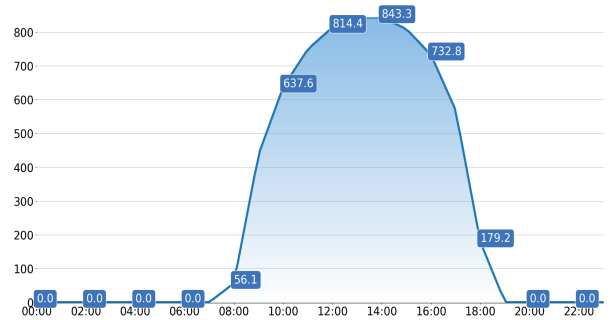
Global Horizontal Irradiance

Represents the total amount of sunlight reaching the Earth's surface, including both direct and scattered rays.



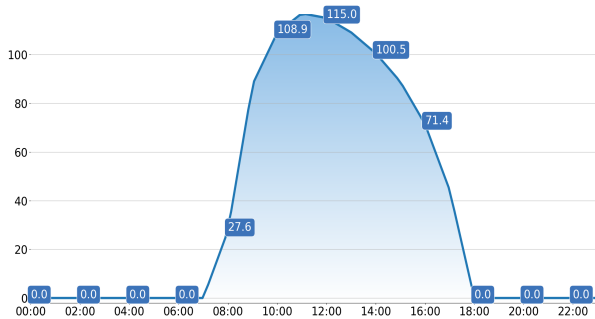
Direct Normal Irradiance

Shows the portion of sunlight that reaches the Earth's surface in a straight line without scattering in the atmosphere.



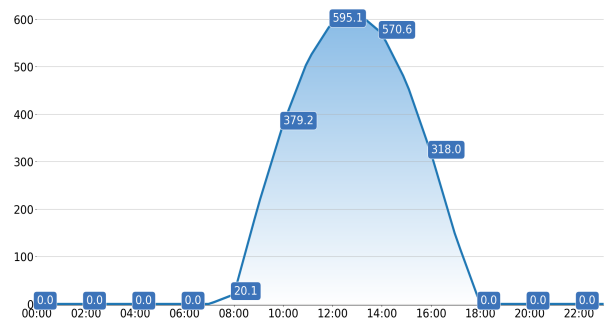
Diffuse Horizontal Irradiance

Indicates the amount of sunlight that has been scattered in the atmosphere and reaches the Earth's surface on a horizontal plane.



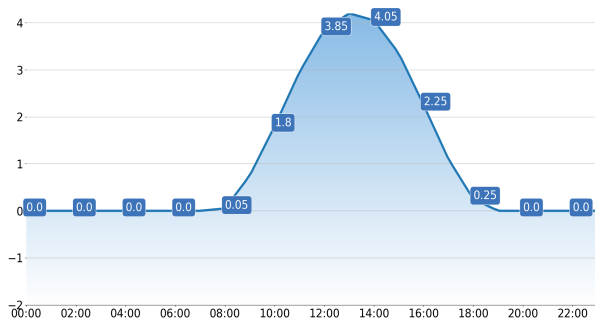
Global Tilted Irradiance

Represents the total amount of sunlight received by a surface at a specific tilt angle. It includes GHI, DNI, and reflected irradiance.



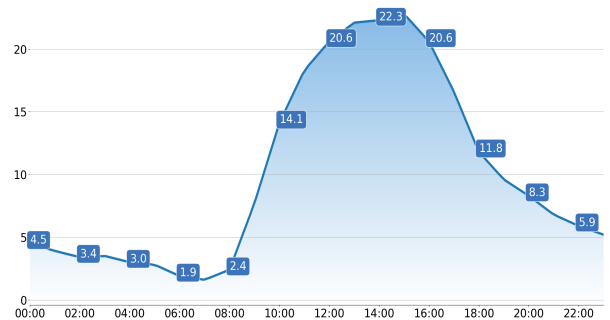
UV Index

A measure that indicates the intensity of ultraviolet (UV) rays from the sun.



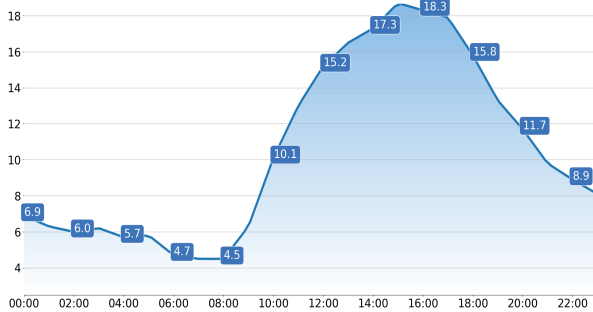
Soil Temperature

The measurement of heat in the ground, which affects panel efficiency and system performance in solar power plants.



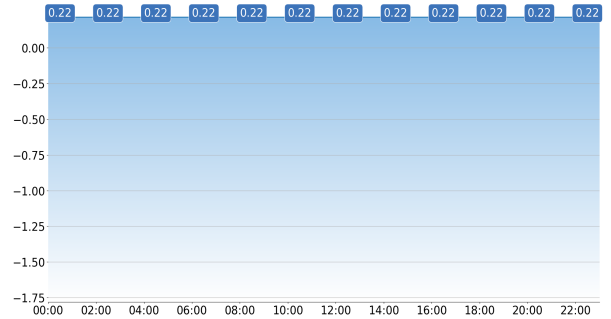
Air Temperature

Measures the temperature of the air at a specific altitude, typically used in meteorological observations and environmental models.



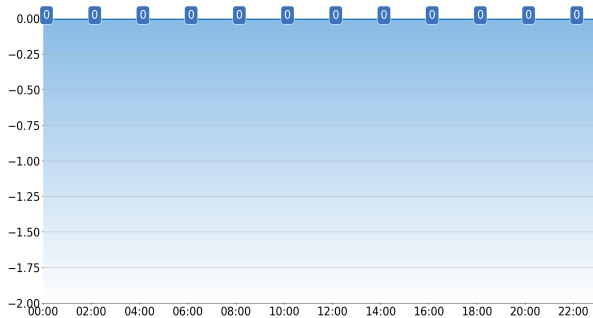
Albedo

A measure of how much sunlight a surface reflects. A high albedo indicates more light reflection.



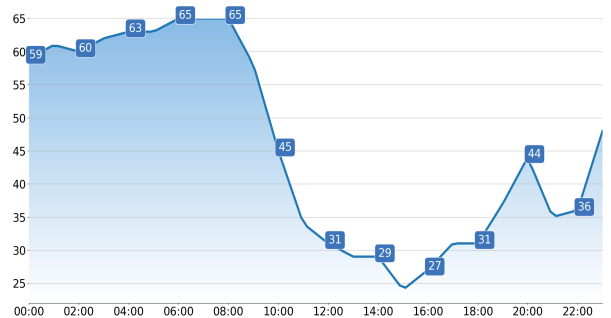
Cloud Opacity

Indicates the opacity or transparency of clouds in the sky, usually affecting the amount of sunlight reaching the Earth's surface.



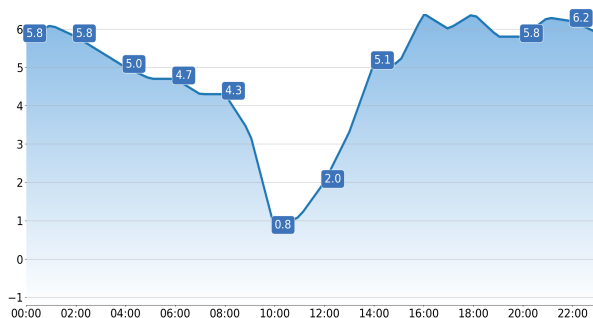
Relative Humidity

The percentage of water vapor in the air compared to how much the air can hold at a given temperature.



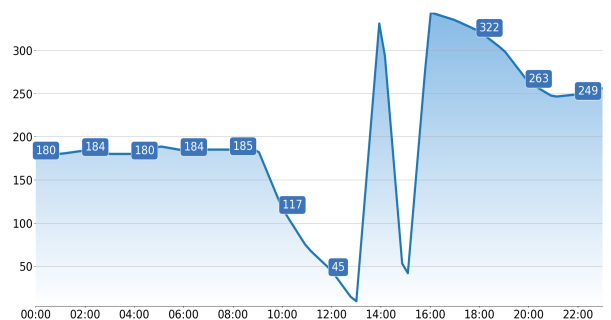
Wind Speed

Represents the speed of the wind at 10 meters height, usually measured in meters per second (m/s).



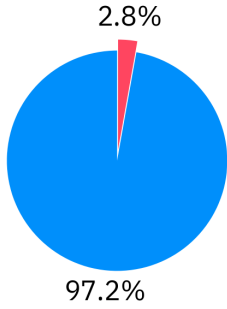
Wind Direction

Indicates the direction of the wind at 10 meters height, usually expressed in degrees, determined by the direction the wind is blowing from.

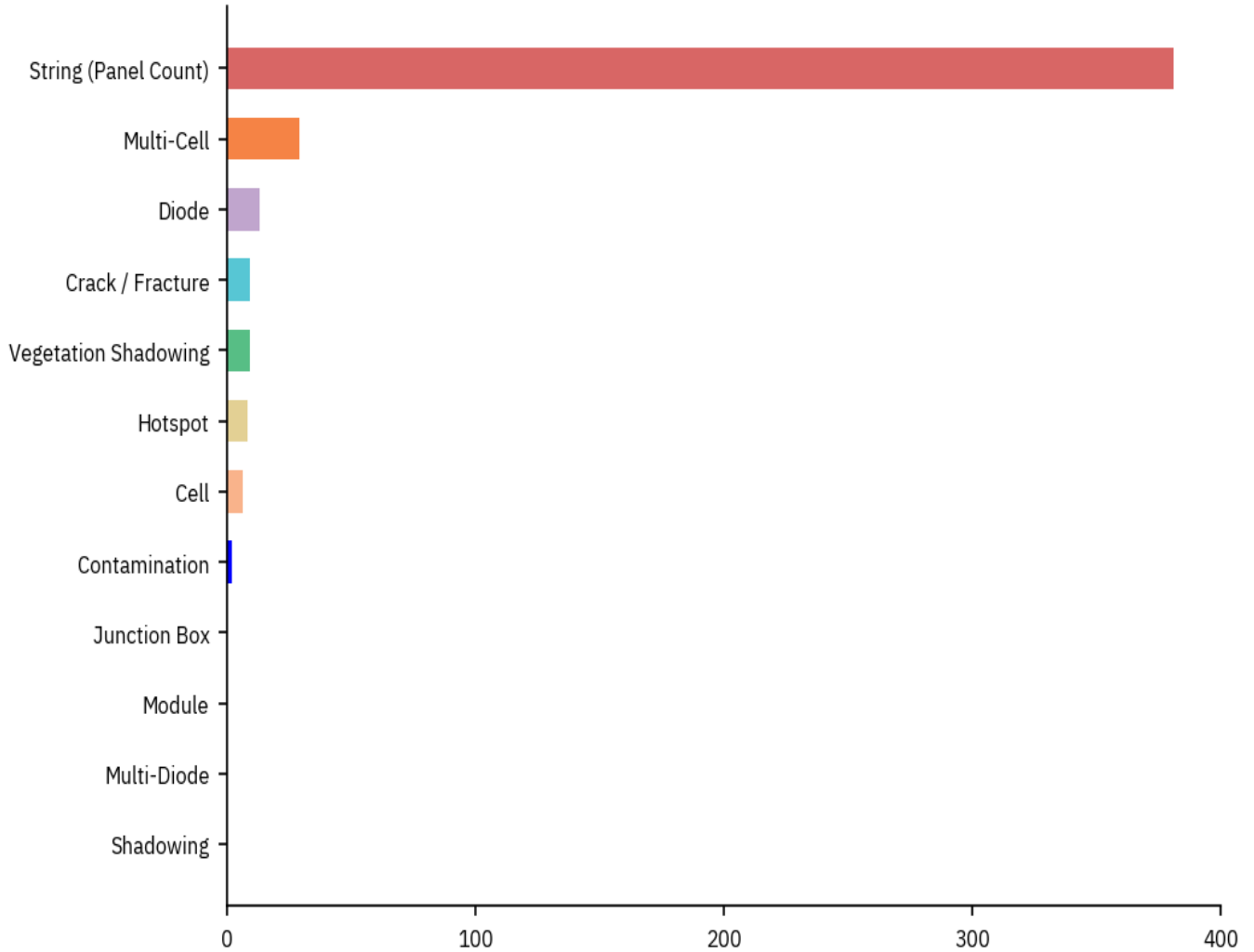
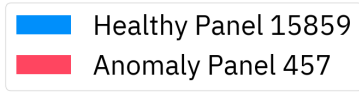


4.0 Thermographic Inspection Results

4.1 Field Inspection Information



After inspecting the solar panel field, faults were detected in 457 panels. The number of faulty panels covers %2.80's of the entire field.



Field Information

Total Panels	Healthy Panels	Faulty Panels	String Fault
16316	15859	457	20

Operation Information

Pending Inspection	In Progress	Completed
457	0	0

Fault Types

As a result of the inspections, a total of 8 anomalies in the category of Anomaly Type have been detected in the PV Plant. The detailed table containing the anomaly classes is as follows.

Anomaly Type	Total	Pending Inspection	In Repair Process	Completed
String (Panel Count)	381	381	0	0
Multi-Cell	29	29	0	0
Diode	13	13	0	0
Crack / Fracture	9	9	0	0
Vegetation Shadowing	9	9	0	0
Hotspot	8	8	0	0
Cell	6	6	0	0
Contamination	2	2	0	0
Junction Box	0	0	0	0
Module	0	0	0	0
Multi-Diode	0	0	0	0
Shadowing	0	0	0	0

4.2 Visualization of Faulty PV Modules on the GYP

[Click here for a larger version of the map.](#)



4.3 Efficiency Calculation and Approximate Financial Loss

Solar panel efficiency is a measure of the ability of panels to convert sunlight into electrical energy. High-efficiency panels produce more energy in less space, reducing energy costs. MapperX conducts efficiency analysis of panels and calculates the monthly and yearly financial impact of anomalies in the plant.

Initial Inspection Date
02/04/2024 18:14



Fault Percentage
 457 Panels
 %2.80 Anomalies



Total Plant
 Panel Count
16316



Average Daily
 Sunshine Duration
12.2 Hours

Daily Financial Loss
 02/04/2024 18:14
\$ 299.92

Monthly Financial Loss
 02/04/2024 18:14
\$ 9,122.56

Yearly Financial Loss
 02/04/2024 18:14
\$ 109,470.71

Fault Type	Total Anomaly	Daily Financial Loss	Monthly Financial Loss	Yearly Financial Loss
	02/04/2024 18:14	02/04/2024 18:14	02/04/2024 18:14	02/04/2024 18:14
String (Panel Count)	381	\$ 278.19	\$ 8,461.76	\$ 101,541.09
Multi-Cell	29	\$ 9.53	\$ 289.83	\$ 3,477.98
Diode	13	\$ 6.96	\$ 211.73	\$ 2,540.75
Crack / Fracture	9	\$ 2.96	\$ 89.95	\$ 1,079.37
Hotspot	8	\$ 0.88	\$ 26.65	\$ 319.81
Cell	6	\$ 0.66	\$ 19.99	\$ 239.86
Vegetation Shadowing	9	\$ 0.53	\$ 15.99	\$ 191.89
Contamination	2	\$ 0.22	\$ 6.66	\$ 79.95
Junction Box	0	\$ 0	\$ 0	\$ 0
Module	0	\$ 0	\$ 0	\$ 0
Multi-Diode	0	\$ 0	\$ 0	\$ 0
Shadowing	0	\$ 0	\$ 0	\$ 0
Total	457	\$ 299.92	\$ 9,122.56	\$ 109,470.71

4.4 Detailed Thermographic Inspection Results of the Modules

Solar energy systems are one of the cornerstones of clean and sustainable energy production. However, the correct operation of solar panels depends on careful monitoring of various technical parameters. In this context, timely detection and analysis of faults in solar panels are critical to optimizing system performance.

This report examines various fault conditions in solar panels in detail. Prepared in accordance with IEC TS 62446-3 standards, this report includes technical data related to each fault condition. These include measured operating temperatures of the modules, weather conditions, and information about the camera and lens used to take the photos, as well as the serial numbers of the devices.

Fault analysis is important to increase the efficiency of solar energy systems and minimize maintenance costs. This report details the origins and potential impacts of faults occurring in solar modules. It also provides recommended solutions and improvement strategies for each fault condition.

4.4.1 Solar Panel Field Panel Numbering System:

The numbering system has been carried out by always aligning the appearance of the field on the map to the north.

Letter Code (a): This indicates the type of panels. For example, the letter "a" represents inverters.

Number Code (1): This indicates the string where the panel is located. Each string is represented by a number. For example, the number "1" indicates the first string.


Sequence Code (0001): This indicates the position of the panel. Panels are arranged from right to left and top to bottom, starting from the northernmost point on the map. For example, the code "0001" represents a panel located in the top right corner of the map.

An example panel number: "a-1-0001" This numbering system facilitates monitoring and management of field operations while allowing for quick location of a specific panel when maintenance, repair, or replacement is required.

								Modül		
A-1-0001 Modül String İvertör	A-1-0008	A-1-0007	A-1-0006	A-1-0005	A-1-0004	A-1-0003	A-1-0002	A-1-0001	String (Dizi)	
	A-1-0016	A-1-0015	A-1-0014	A-1-0013	A-1-0012	A-1-0011	A-1-0010	A-1-0009		
	A-1-0024	A-1-0023	A-1-0022	A-1-0021	A-1-0020	A-1-0019	A-1-0018	A-1-0017		
	A-1-0032	A-1-0031	A-1-0030	A-1-0029	A-1-0028	A-1-0027	A-1-0026	A-1-0025		

Demo Santral2

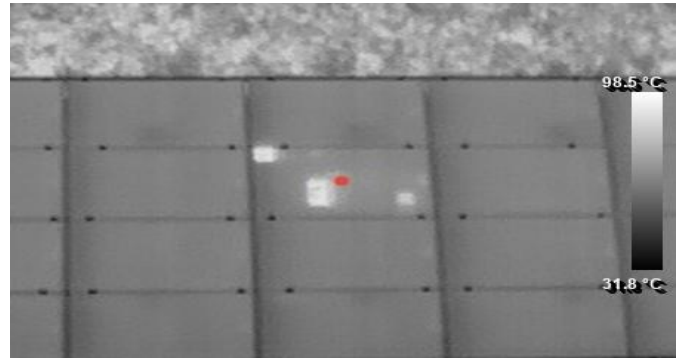
Demo Şirket

Anomaly Type Crack / Fracture	Panel Brand / Model Energy System / Es230	Field Installation Type Fixed Mounting
Anomaly Cause Unknown	Panel Serial No Unknown	Panel Tilt Angle -
Anomaly Priority High	String (Series) Number 303	 Panel Location 40.22207160048811 33.15852076920163



DJI_20230719112118_0951_V.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:21:18
MPX-4236123214



DJI_20230719112007_0888_T.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:20:07
MPX-4236123214

Panel Electrical Measurement Values

Current : - A
Voltage : - V
Power : - W

Measurement Date: -

Measurement values of a healthy panel in the same string:

Current - A | Voltage - V | Power - W

Weather Data

Tref : 11°C
Wind Speed : 1.1 km/s
Temperature : 13°C
Pollution Rate : -%
Efficiency : -%

Panel Temperature Measurement

Minimum : 40.1°C
Maksimum : 98.5°C
OAverage : 52.35°C
Delta T (Δ T) : 58.4C
Emissivity : 0.85

Solar Radiation



GHI : 513.9 W/m²
DNI : 749.4 W/m²
DHI : 116.9 W/m²
GTI : 513.9 W/m²

Sunshine Duration



Average Daily Sunshine Duration
12.2 Hours

Cloudiness



Inspection At the Hour Cloudiness Percentage
0%

Financial Loss

Per-Panel Loss Summary
Daily
0.329 USD
Monthly
9.857 USD
Yearly
119.93 USD

Panel Operation Information

Inspection Pending
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Detected
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Explanation


Cracks or fractures occurring in solar panels cause the panels to heat up and reduce their overall performance. Additionally, cracks allow moisture and other external factors to penetrate inside the panel, damaging internal components and causing corrosion.

Operation Suggestion

When a crack is detected, it is important to intervene considering the size and location of the damage. If the crack is small, replacing the cracked top layer can extend the panel's lifespan and minimize performance loss. However, if the cracks have spread over a large area, it is recommended to replace the entire module.

Demo Santral2

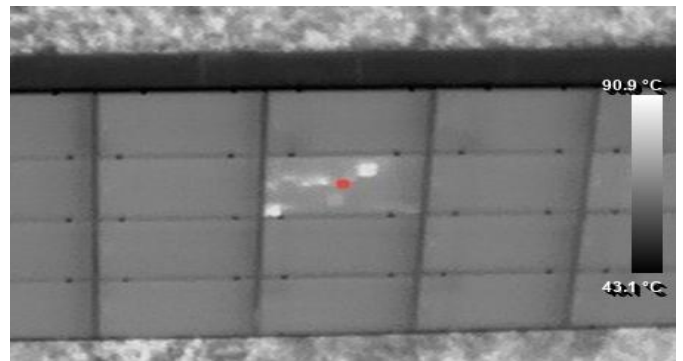
Demo Şirket

Anomaly Type Crack / Fracture	Panel Brand / Model Energy System / Es230	Field Installation Type Fixed Mounting
Anomaly Cause Unknown	Panel Serial No ZSM10201603000676	Panel Tilt Angle -
Anomaly Priority High	String (Series) Number 96	 Panel Location 40.2233363052825 33.16007331067625



DJI_20230719115220_0804_V.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:52:20
MPX-4236123214



DJI_20230719115220_0804_T.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:52:20
MPX-4236123214

Panel Electrical Measurement Values

Current : - A
Voltage : - V
Power : - W

Measurement Date: -

Measurement values of a healthy panel in the same string:

Current - A | Voltage - V | Power - W

Weather Data

Tref : 11°C
Wind Speed : 1.1 km/s
Temperature : 13°C
Pollution Rate : -%
Efficiency : -%

Panel Temperature Measurement

Minimum : 40.1°C
Maksimum : 89.2°C
OAverage : 53.65°C
Delta T (Δ T) : 49.1C
Emissivity : 0.85

Solar Radiation



GHI : 513.9 W/m²
DNI : 749.4 W/m²
DHI : 116.9 W/m²
GTI : 513.9 W/m²

Sunshine Duration



Average Daily Sunshine Duration
12.2 Hours

Cloudiness



Inspection At the Hour Cloudiness Percentage
0%

Financial Loss

Per-Panel Loss Summary
Daily
0.329 USD
Monthly
9.857 USD
Yearly
119.93 USD

Panel Operation Information

Inspection Pending
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Detected
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Explanation


Cracks or fractures occurring in solar panels cause the panels to heat up and reduce their overall performance. Additionally, cracks allow moisture and other external factors to penetrate inside the panel, damaging internal components and causing corrosion.

Operation Suggestion

When a crack is detected, it is important to intervene considering the size and location of the damage. If the crack is small, replacing the cracked top layer can extend the panel's lifespan and minimize performance loss. However, if the cracks have spread over a large area, it is recommended to replace the entire module.

Demo Santral2

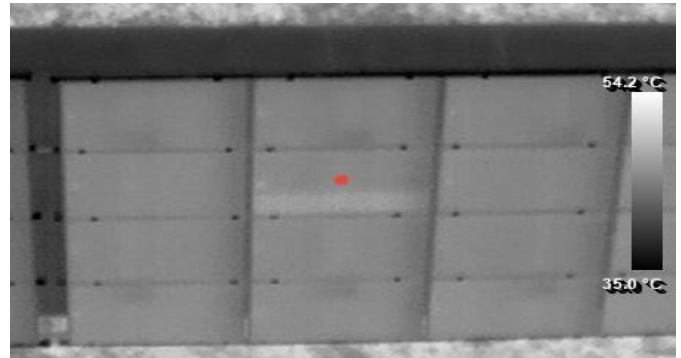
Demo Şirket

Anomaly Type Diode	Panel Brand / Model Energy System / Es230	Field Installation Type Fixed Mounting
Anomaly Cause Unknown	Panel Serial No Unknown	Panel Tilt Angle -
Anomaly Priority High	String (Series) Number 327	 Panel Location 40.22187041039015 33.158494619432325



DJI_20230719112110_0944_V.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:21:10
MPX-4236123214



DJI_20230719112110_0944_T.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:21:10
MPX-4236123214

Panel Electrical Measurement Values

Current : - A
Voltage : - V
Power : - W

Measurement Date: -

Measurement values of a healthy panel in the same string:

Current - A | Voltage - V | Power - W

Weather Data

Tref : 11°C
Wind Speed : 1.1 km/s
Temperature : 13°C
Pollution Rate : -%
Efficiency : -%

Panel Temperature Measurement

Minimum : 31.8°C
Maksimum : 54.7°C
OAverage : 47.75°C
Delta T (Δ T) : 22.9C
Emissivity : 0.85

Solar Radiation



GHI : 513.9 W/m²
DNI : 749.4 W/m²
DHI : 116.9 W/m²
GTI : 513.9 W/m²

Sunshine Duration



Average Daily Sunshine Duration
12.2 Hours

Cloudiness



Inspection At the Hour Cloudiness Percentage
0%

Financial Loss

Per-Panel Loss Summary
Daily
0.535 USD
Monthly
16.064 USD
Yearly
195.442 USD

Panel Operation Information

Inspection Pending
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32
Anomaly Detected
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Explanation


A fault in a bypass diode of the solar panel creates heating problems in one-third of the module. Diodes are critical components that protect the panel during overcurrent or overvoltage conditions. A faulty diode should be replaced quickly before it can cause damage to other parts of the panel.

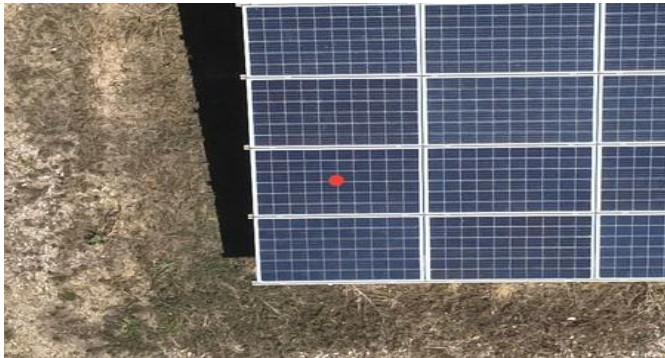
Operation Suggestion

The faulty diode must be replaced immediately. Using an incorrect or low-quality diode can lead to more significant damages to the panel, so high-quality diodes with appropriate specifications should be used during replacement.

Demo Santral2

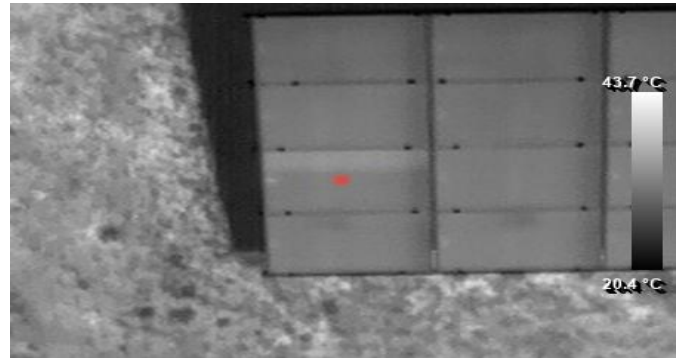
Demo Şirket

Anomaly Type Diode	Panel Brand / Model Energy System / Es230	Field Installation Type Fixed Mounting
Anomaly Cause Unknown	Panel Serial No Unknown	Panel Tilt Angle -
Anomaly Priority Medium	String (Series) Number 370	 Panel Location 40.2212325137291 33.15816877565793



DJI_20230719112459_1149_V.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:24:59
MPX-4236123214



DJI_20230719112501_1150_T.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:25:01
MPX-4236123214

Panel Electrical Measurement Values

Current : - A
Voltage : - V
Power : - W

Measurement Date: -

Measurement values of a healthy panel in the same string:

Current - A | Voltage - V | Power - W

Weather Data

Tref : 11°C
Wind Speed : 1.1 km/s
Temperature : 13°C
Pollution Rate : -%
Efficiency : -%

Panel Temperature Measurement

Minimum : 27.7°C
Maksimum : 43.7°C
OAverage : 37.4°C
Delta T (Δ T) : 16.0C
Emissivity : 0.85

Solar Radiation



GHI : 513.9 W/m²
DNI : 749.4 W/m²
DHI : 116.9 W/m²
GTI : 513.9 W/m²

Sunshine Duration



Average Daily Sunshine Duration
12.2 Hours

Cloudiness



Inspection At the Hour Cloudiness Percentage
0%

Financial Loss

Per-Panel Loss Summary
Daily
0.535 USD
Monthly
16.064 USD
Yearly
195.442 USD

Panel Operation Information

Inspection Pending
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32
Anomaly Detected
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Explanation


A fault in a bypass diode of the solar panel creates heating problems in one-third of the module. Diodes are critical components that protect the panel during overcurrent or overvoltage conditions. A faulty diode should be replaced quickly before it can cause damage to other parts of the panel.

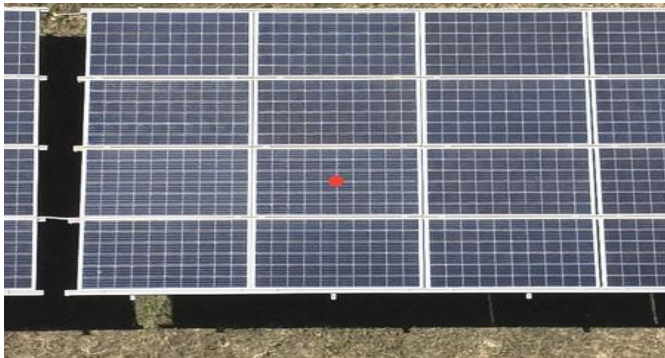
Operation Suggestion

The faulty diode must be replaced immediately. Using an incorrect or low-quality diode can lead to more significant damages to the panel, so high-quality diodes with appropriate specifications should be used during replacement.

Demo Santral2

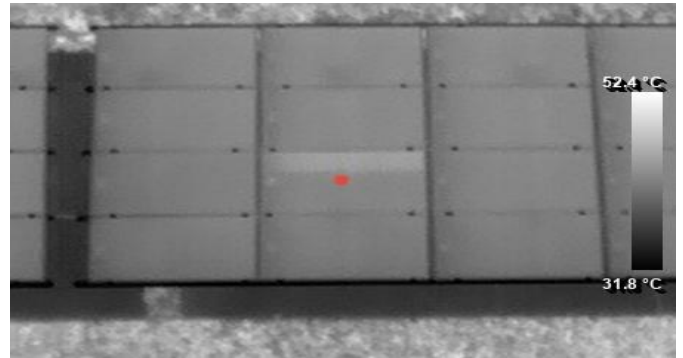
Demo Şirket

Anomaly Type Diode	Panel Brand / Model Energy System / Es230	Field Installation Type Fixed Mounting
Anomaly Cause Unknown	Panel Serial No Unknown	Panel Tilt Angle -
Anomaly Priority High	String (Series) Number 341	 Panel Location 40.22171401191683 33.157947589038756



DJI_20230719112840_1346_V.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:28:40
MPX-4236123214



DJI_20230719112840_1346_T.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:28:40
MPX-4236123214

Panel Electrical Measurement Values

Current : - A
Voltage : - V
Power : - W

Measurement Date: -

Measurement values of a healthy panel in the same string:

Current - A | Voltage - V | Power - W

Weather Data

Tref : 11°C
Wind Speed : 1.1 km/s
Temperature : 13°C
Pollution Rate : -%
Efficiency : -%

Panel Temperature Measurement

Minimum : 32.4°C
Maksimum : 52.4°C
OAverage : 44.2°C
Delta T (Δ T) : 20.0C
Emissivity : 0.85

Solar Radiation



GHI : 513.9 W/m²
DNI : 749.4 W/m²
DHI : 116.9 W/m²
GTI : 513.9 W/m²

Sunshine Duration



Average Daily Sunshine Duration
12.2 Hours

Cloudiness



Inspection At the Hour Cloudiness Percentage
0%

Financial Loss

Per-Panel Loss Summary
Daily
0.535 USD
Monthly
16.064 USD
Yearly
195.442 USD

Panel Operation Information

Inspection Pending
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32
Anomaly Detected
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Explanation


A fault in a bypass diode of the solar panel creates heating problems in one-third of the module. Diodes are critical components that protect the panel during overcurrent or overvoltage conditions. A faulty diode should be replaced quickly before it can cause damage to other parts of the panel.

Operation Suggestion

The faulty diode must be replaced immediately. Using an incorrect or low-quality diode can lead to more significant damages to the panel, so high-quality diodes with appropriate specifications should be used during replacement.

Demo Santral2

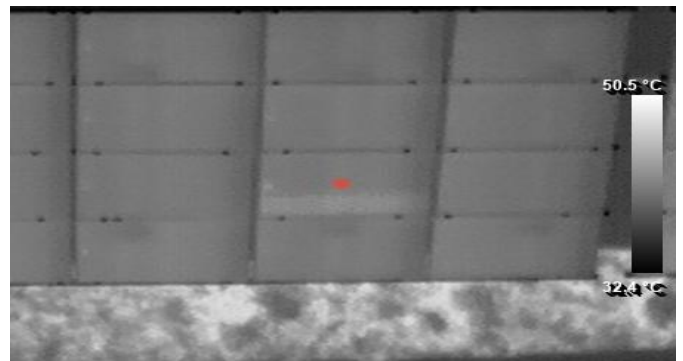
Demo Şirket

Anomaly Type Diode	Panel Brand / Model Energy System / Es230	Field Installation Type Fixed Mounting
Anomaly Cause Unknown	Panel Serial No Unknown	Panel Tilt Angle -
Anomaly Priority Medium	String (Series) Number 327	 Panel Location 40.2218616364921 33.15865136382245



DJI_20230719111852_0821_V.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:18:52
MPX-4236123214



DJI_20230719111853_0822_T.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:18:53
MPX-4236123214

Panel Electrical Measurement Values

Current : - A
Voltage : - V
Power : - W

Measurement Date: -

Measurement values of a healthy panel in the same string:

Current - A | Voltage - V | Power - W

Weather Data

Tref : 11°C
Wind Speed : 1.1 km/s
Temperature : 13°C
Pollution Rate : -%
Efficiency : -%

Panel Temperature Measurement

Minimum : 35.0°C
Maksimum : 50.5°C
OAverage : 43.96°C
Delta T (Δ T) : 15.5C
Emissivity : 0.85

Solar Radiation



GHI : 513.9 W/m²
DNI : 749.4 W/m²
DHI : 116.9 W/m²
GTI : 513.9 W/m²

Sunshine Duration



Average Daily Sunshine Duration
12.2 Hours

Cloudiness



Inspection At the Hour Cloudiness Percentage
0%

Financial Loss

Per-Panel Loss Summary
Daily
0.535 USD
Monthly
16.064 USD
Yearly
195.442 USD

Panel Operation Information

Inspection Pending
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Detected
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Explanation


A fault in a bypass diode of the solar panel creates heating problems in one-third of the module. Diodes are critical components that protect the panel during overcurrent or overvoltage conditions. A faulty diode should be replaced quickly before it can cause damage to other parts of the panel.

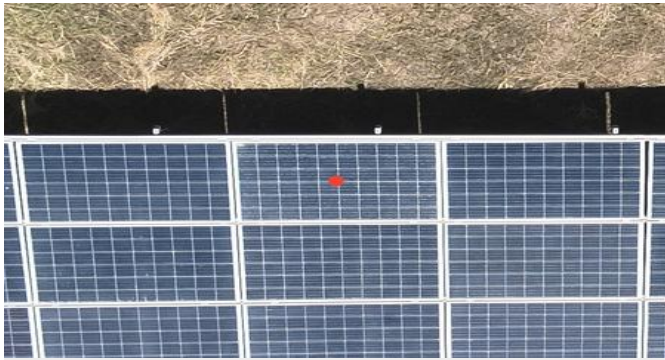
Operation Suggestion

The faulty diode must be replaced immediately. Using an incorrect or low-quality diode can lead to more significant damages to the panel, so high-quality diodes with appropriate specifications should be used during replacement.

Demo Santral2

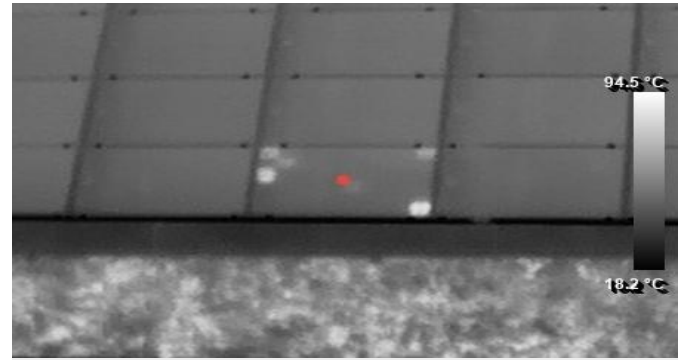
Demo Şirket

Anomaly Type Multi-Cell	Panel Brand / Model Energy System / Es230	Field Installation Type Fixed Mounting
Anomaly Cause Unknown	Panel Serial No ZSM10201603000676	Panel Tilt Angle -
Anomaly Priority High	String (Series) Number 42	 Panel Location 40.22365915371 33.16044645270787



DJI_20230719120014_1228_V.JPG
DJI Mavic 3T Enterprise

19/07/2023 12:00:14
MPX-4236123214



DJI_20230719120015_1229_T.JPG
DJI Mavic 3T Enterprise

19/07/2023 12:00:15
MPX-4236123214

Panel Electrical Measurement Values

Current : - A
Voltage : - V
Power : - W

Measurement Date: -

Measurement values of a healthy panel in the same string:

Current - A | Voltage - V | Power - W

Weather Data

Tref : 13.2°C
Wind Speed : 2 km/s
Temperature : 15.2°C
Pollution Rate : -%
Efficiency : -%

Panel Temperature Measurement

Minimum : 33.7°C
Maksimum : 101.9°C
OAverage : 47.93°C
Delta T (ΔT) : 68.2C
Emissivity : 0.85

Solar Radiation



GHI : 595.1 W/m²
DNI : 814.4 W/m²
DHI : 115 W/m²
GTI : 595.1 W/m²

Sunshine Duration



Average Daily Sunshine Duration
12.2 Hours

Cloudiness



Inspection At the Hour Cloudiness Percentage
0%

Financial Loss

Per-Panel Loss Summary
Daily
0.329 USD
Monthly
9.857 USD
Yearly
119.93 USD

Panel Operation Information

Inspection Pending
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32
Anomaly Detected
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Explanation


Heating affecting multiple cells in the solar panel and occurring with a quadrangular geometry can affect a large portion of the panel, reducing energy production. Such damages can endanger the overall health of the panel.

Operation Suggestion

Multi-cell damage usually requires the replacement of the panel. However, after a detailed technical examination, repair may be possible depending on the extent of the damage. This will allow the panel to have a longer lifespan and maintain overall energy efficiency.

Demo Santral2

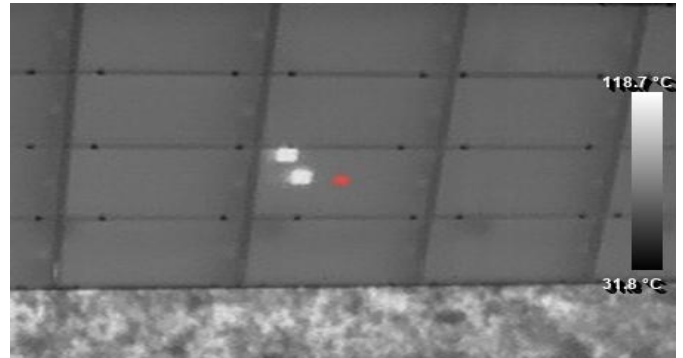
Demo Şirket

Anomaly Type Multi-Cell	Panel Brand / Model Energy System / Es230	Field Installation Type Fixed Mounting
Anomaly Cause Unknown	Panel Serial No Unknown	Panel Tilt Angle -
Anomaly Priority High	String (Series) Number 28	 Panel Location 40.2237994671026 33.16036393272053



DJI_20230719115831_1136_V.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:58:31
MPX-4236123214



DJI_20230719115713_1066_T.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:57:13
MPX-4236123214

Panel Electrical Measurement Values

Current : - A
Voltage : - V
Power : - W

Measurement Date: -

Measurement values of a healthy panel in the same string:

Current - A | Voltage - V | Power - W

Weather Data

Tref : 11°C
Wind Speed : 1.1 km/s
Temperature : 13°C
Pollution Rate : -%
Efficiency : -%

Panel Temperature Measurement

Minimum : 35.6°C
Maksimum : 118.7°C
OAverage : 49.57°C
Delta T (ΔT) : 83.1C
Emissivity : 0.85

Solar Radiation



GHI : 513.9 W/m²
DNI : 749.4 W/m²
DHI : 116.9 W/m²
GTI : 513.9 W/m²

Sunshine Duration



Average Daily Sunshine Duration
12.2 Hours

Cloudiness



Inspection At the Hour Cloudiness Percentage
0%

Financial Loss

Per-Panel Loss Summary
Daily
0.329 USD
Monthly
9.857 USD
Yearly
119.93 USD

Panel Operation Information

Inspection Pending
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32
Anomaly Detected
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Explanation


Heating affecting multiple cells in the solar panel and occurring with a quadrangular geometry can affect a large portion of the panel, reducing energy production. Such damages can endanger the overall health of the panel.

Operation Suggestion

Multi-cell damage usually requires the replacement of the panel. However, after a detailed technical examination, repair may be possible depending on the extent of the damage. This will allow the panel to have a longer lifespan and maintain overall energy efficiency.

Demo Santral2

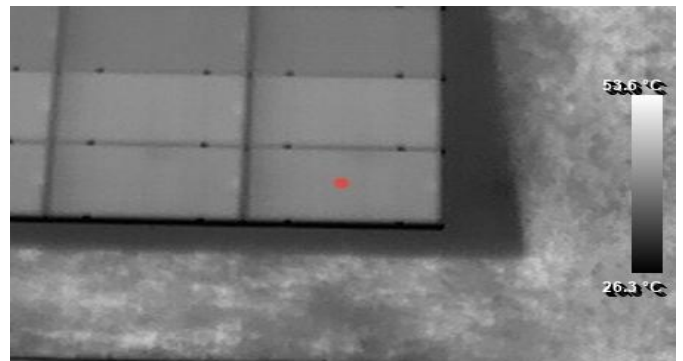
Demo Şirket

Anomaly Type String (Panel Count)	Panel Brand / Model Energy System / Es230	Field Installation Type Fixed Mounting
Anomaly Cause Unknown	Panel Serial No Unknown	Panel Tilt Angle -
Anomaly Priority Medium	String (Series) Number 139	 Panel Location 40.22313618247175 33.159273703655124



DJI_20230719110521_0098_V.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:05:21
MPX-4236123214



DJI_20230719110521_0098_T.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:05:21
MPX-4236123214

Panel Electrical Measurement Values

Current : - A
Voltage : - V
Power : - W

Measurement Date: -

Measurement values of a healthy panel in the same string:

Current - A | Voltage - V | Power - W

Weather Data

Tref : 11°C
Wind Speed : 1.1 km/s
Temperature : 13°C
Pollution Rate : -%
Efficiency : -%

Panel Temperature Measurement

Minimum : 40.1°C
Maksimum : 53.6°C
OAverage : 49.73°C
Delta T (Δ T) : 13.5C
Emissivity : 0.85

Solar Radiation



GHI : 513.9 W/m²
DNI : 749.4 W/m²
DHI : 116.9 W/m²
GTI : 513.9 W/m²

Sunshine Duration



Average Daily Sunshine Duration
12.2 Hours

Cloudiness



Inspection At the Hour Cloudiness Percentage
0%

Financial Loss

Per-Panel Loss Summary
Daily **0.73 USD**
Monthly **21.905 USD**
Yearly **266.512 USD**

Panel Operation Information

Inspection Pending
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Detected
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Explanation


A condition where multiple modules in a string of solar panels connected in series are damaged can seriously affect the overall system performance. Such issues may arise from connection errors between modules, faulty wiring, or physical damages caused by external factors.

Operation Suggestion

When string faults are detected, the first step is to ensure that all connector connections between the modules are correct and secure. Loose or damaged connections can lead to faults. Next, the electrical connections should be thoroughly examined using technical equipment.

Demo Santral2

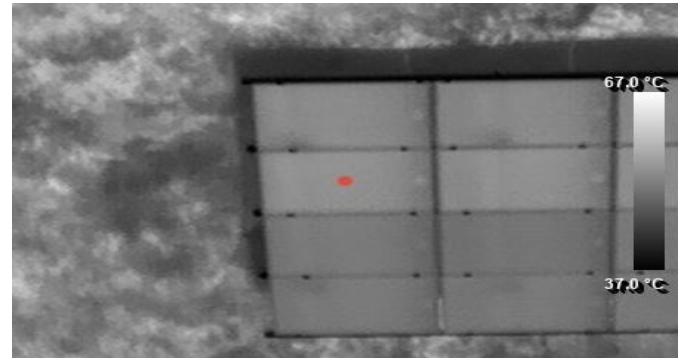
Demo Şirket

Anomaly Type String (Panel Count)	Panel Brand / Model Energy System / Es230	Field Installation Type Fixed Mounting
Anomaly Cause Unknown	Panel Serial No Unknown	Panel Tilt Angle -
Anomaly Priority Medium	String (Series) Number 49	 Panel Location 40.2235985684552 33.16000380628455



DJI_20230719114901_0626_V.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:49:01
MPX-4236123214



DJI_20230719115058_0730_T.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:50:58
MPX-4236123214

Panel Electrical Measurement Values

Current : - A
Voltage : - V
Power : - W

Measurement Date: -

Measurement values of a healthy panel in the same string:

Current - A | Voltage - V | Power - W

Weather Data

Tref : 11°C
Wind Speed : 1.1 km/s
Temperature : 13°C
Pollution Rate : -%
Efficiency : -%

Panel Temperature Measurement

Minimum : 50.1°C
Maksimum : 67.0°C
OAverage : 62.96°C
Delta T (Δ T) : 16.9C
Emissivity : 0.85

Solar Radiation



GHI : 513.9 W/m²
DNI : 749.4 W/m²
DHI : 116.9 W/m²
GTI : 513.9 W/m²

Sunshine Duration



Average Daily Sunshine Duration
12.2 Hours

Cloudiness



Inspection At the Hour Cloudiness Percentage
0%

Financial Loss

Per-Panel Loss Summary

Daily
0.73 USD

Monthly
21.905 USD

Yearly
266.512 USD

Panel Operation Information

Inspection Pending

MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Detected

MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Explanation


A condition where multiple modules in a string of solar panels connected in series are damaged can seriously affect the overall system performance. Such issues may arise from connection errors between modules, faulty wiring, or physical damages caused by external factors.

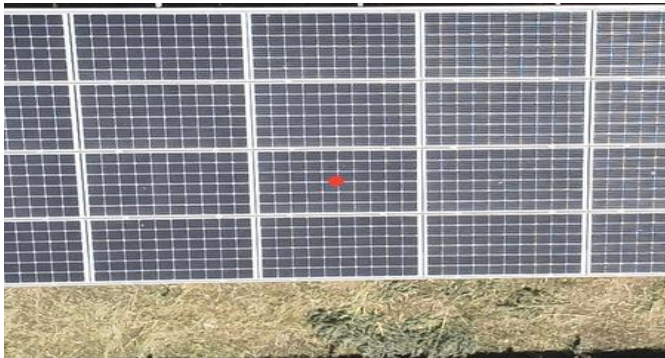
Operation Suggestion

When string faults are detected, the first step is to ensure that all connector connections between the modules are correct and secure. Loose or damaged connections can lead to faults. Next, the electrical connections should be thoroughly examined using technical equipment.

Demo Santral2

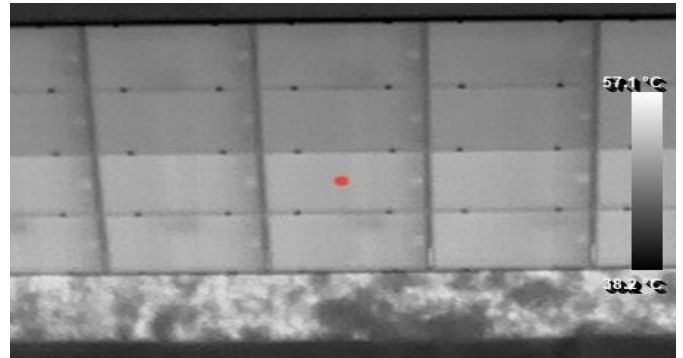
Demo Şirket

Anomaly Type String (Panel Count)	Panel Brand / Model Energy System / Es230	Field Installation Type Fixed Mounting
Anomaly Cause Unknown	Panel Serial No Unknown	Panel Tilt Angle -
Anomaly Priority Medium	String (Series) Number 245	 Panel Location 40.222488604517 33.160012472336774



DJI_20230719115016_0693_V.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:50:16
MPX-4236123214



DJI_20230719115018_0694_T.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:50:18
MPX-4236123214

Panel Electrical Measurement Values

Current : - A
Voltage : - V
Power : - W

Measurement Date: -

Measurement values of a healthy panel in the same string:

Current - A | Voltage - V | Power - W

Weather Data

Tref : 11°C
Wind Speed : 1.1 km/s
Temperature : 13°C
Pollution Rate : -%
Efficiency : -%

Panel Temperature Measurement

Minimum : 42.5°C
Maksimum : 56.6°C
OAverage : 53.21°C
Delta T (Δ T) : 14.1C
Emissivity : 0.85

Solar Radiation



GHI : 513.9 W/m²
DNI : 749.4 W/m²
DHI : 116.9 W/m²
GTI : 513.9 W/m²

Sunshine Duration



Average Daily Sunshine Duration
12.2 Hours

Cloudiness



Inspection At the Hour Cloudiness Percentage
0%

Financial Loss

Per-Panel Loss Summary
Daily
0.73 USD
Monthly
21.905 USD
Yearly
266.512 USD

Panel Operation Information

Inspection Pending
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32
Anomaly Detected
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Explanation


A condition where multiple modules in a string of solar panels connected in series are damaged can seriously affect the overall system performance. Such issues may arise from connection errors between modules, faulty wiring, or physical damages caused by external factors.

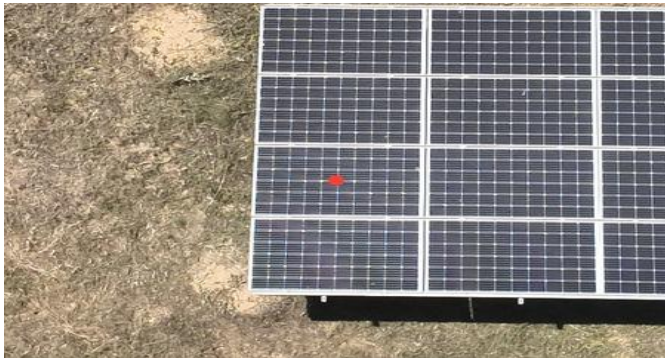
Operation Suggestion

When string faults are detected, the first step is to ensure that all connector connections between the modules are correct and secure. Loose or damaged connections can lead to faults. Next, the electrical connections should be thoroughly examined using technical equipment.

Demo Santral2

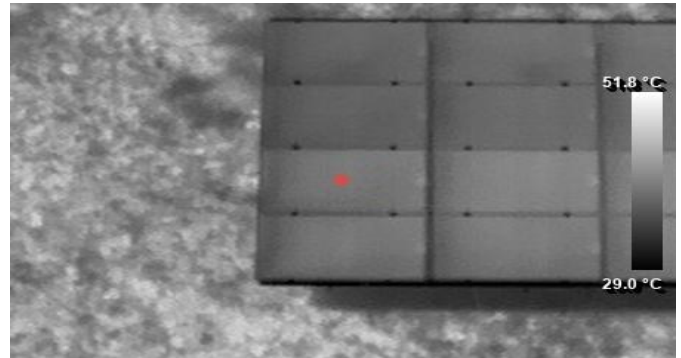
Demo Şirket

Anomaly Type String (Panel Count)	Panel Brand / Model Energy System / Es230	Field Installation Type Fixed Mounting
Anomaly Cause Unknown	Panel Serial No Unknown	Panel Tilt Angle -
Anomaly Priority Medium	String (Series) Number 287	 Panel Location 40.2222353580142 33.159812793028



DJI_20230719114646_0506_V.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:46:46
MPX-4236123214



DJI_20230719114646_0506_T.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:46:46
MPX-4236123214

Panel Electrical Measurement Values

Current : - A
Voltage : - V
Power : - W

Measurement Date: -

Measurement values of a healthy panel in the same string:

Current - A | Voltage - V | Power - W

Weather Data

Tref : 11°C
Wind Speed : 1.1 km/s
Temperature : 13°C
Pollution Rate : -%
Efficiency : -%

Panel Temperature Measurement

Minimum : 33.7°C
Maksimum : 51.8°C
OAverage : 44.74°C
Delta T (Δ T) : 18.1C
Emissivity : 0.85

Solar Radiation



GHI : 513.9 W/m²
DNI : 749.4 W/m²
DHI : 116.9 W/m²
GTI : 513.9 W/m²

Sunshine Duration



Average Daily Sunshine Duration
12.2 Hours

Cloudiness



Inspection At the Hour Cloudiness Percentage
0%

Financial Loss

Per-Panel Loss Summary

Daily
0.73 USD

Monthly
21.905 USD

Yearly
266.512 USD

Panel Operation Information

Inspection Pending

MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Detected

MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Explanation


A condition where multiple modules in a string of solar panels connected in series are damaged can seriously affect the overall system performance. Such issues may arise from connection errors between modules, faulty wiring, or physical damages caused by external factors.

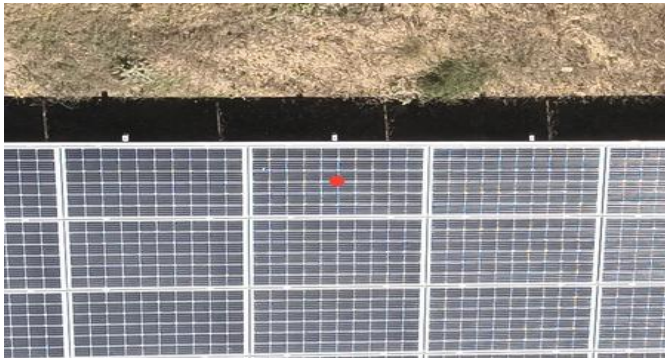
Operation Suggestion

When string faults are detected, the first step is to ensure that all connector connections between the modules are correct and secure. Loose or damaged connections can lead to faults. Next, the electrical connections should be thoroughly examined using technical equipment.

Demo Santral2

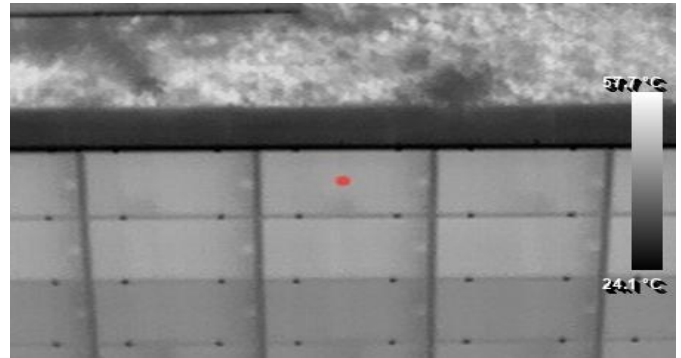
Demo Şirket

Anomaly Type String (Panel Count)	Panel Brand / Model Energy System / Es230	Field Installation Type Fixed Mounting
Anomaly Cause Unknown	Panel Serial No Unknown	Panel Tilt Angle -
Anomaly Priority Medium	String (Series) Number 141	 Panel Location 40.22313567049375 33.15970738196088



DJI_20230719114312_0315_V.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:43:12
MPX-4236123214



DJI_20230719114450_0402_T.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:44:50
MPX-4236123214

Panel Electrical Measurement Values

Current : - A
Voltage : - V
Power : - W

Measurement Date: -

Measurement values of a healthy panel in the same string:

Current - A | Voltage - V | Power - W

Weather Data

Tref : 11°C
Wind Speed : 1.1 km/s
Temperature : 13°C
Pollution Rate : -%
Efficiency : -%

Panel Temperature Measurement

Minimum : 43.7°C
Maksimum : 57.7°C
OAverage : 54.56°C
Delta T (Δ T) : 14.0C
Emissivity : 0.85

Solar Radiation



GHI : 513.9 W/m²
DNI : 749.4 W/m²
DHI : 116.9 W/m²
GTI : 513.9 W/m²

Sunshine Duration



Average Daily Sunshine Duration
12.2 Hours

Cloudiness



Inspection At the Hour Cloudiness Percentage
0%

Financial Loss

Per-Panel Loss Summary

Daily
0.73 USD

Monthly
21.905 USD

Yearly
266.512 USD

Panel Operation Information

Inspection Pending

MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Detected

MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Explanation


A condition where multiple modules in a string of solar panels connected in series are damaged can seriously affect the overall system performance. Such issues may arise from connection errors between modules, faulty wiring, or physical damages caused by external factors.

Operation Suggestion

When string faults are detected, the first step is to ensure that all connector connections between the modules are correct and secure. Loose or damaged connections can lead to faults. Next, the electrical connections should be thoroughly examined using technical equipment.

Demo Santral2

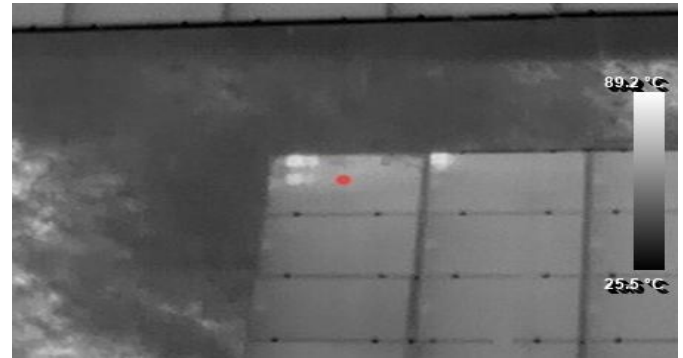
Demo Şirket

Anomaly Type Vegetation Shadowing	Panel Brand / Model Energy System / Es230	Field Installation Type Fixed Mounting
Anomaly Cause Unknown	Panel Serial No Unknown	Panel Tilt Angle -
Anomaly Priority High	String (Series) Number 152	 Panel Location 40.223057923710776 33.15997674139053



DJI_20230719114921_0644_V.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:49:21
MPX-4236123214



DJI_20230719114921_0644_T.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:49:21
MPX-4236123214

Panel Electrical Measurement Values

Current : - A
Voltage : - V
Power : - W

Measurement Date: -

Measurement values of a healthy panel in the same string:

Current - A | Voltage - V | Power - W

Weather Data

Tref : 11°C
Wind Speed : 1.1 km/s
Temperature : 13°C
Pollution Rate : -%
Efficiency : -%

Panel Temperature Measurement

Minimum : 35.6°C
Maksimum : 89.2°C
OAverage : 48.15°C
Delta T (ΔT) : 53.6C
Emissivity : 0.85

Solar Radiation



GHI : 513.9 W/m²
DNI : 749.4 W/m²
DHI : 116.9 W/m²
GTI : 513.9 W/m²

Sunshine Duration



Average Daily Sunshine Duration
12.2 Hours

Cloudiness



Inspection At the Hour Cloudiness Percentage
0%

Financial Loss

Per-Panel Loss Summary
Daily
0.058 USD
Monthly
1.752 USD
Yearly
21.321 USD

Panel Operation Information

Inspection Pending
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Detected
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Explanation


Uncontrolled vegetation growth around solar panels can cast shadows on the panels, causing them to heat up and reducing panel performance. Furthermore, vegetation can lead to moisture accumulation, damaging the panel structure.

Operation Suggestion

Plants causing shading on the modules should be removed. Additionally, regular landscape maintenance and controlling vegetation will minimize shading and moisture problems, ensuring the panels work efficiently and extending their lifespan.

Demo Santral2

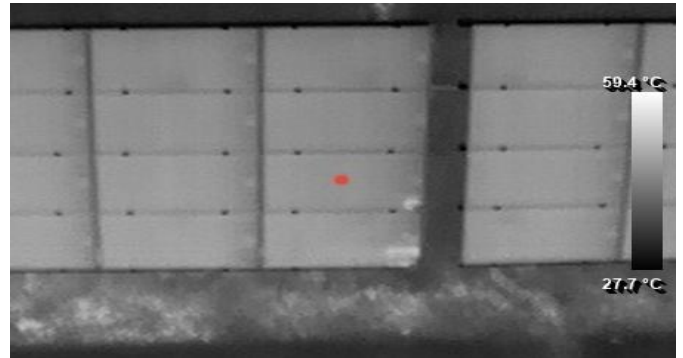
Demo Şirket

Anomaly Type Vegetation Shadowing	Panel Brand / Model Energy System / Es230	Field Installation Type Fixed Mounting
Anomaly Cause Unknown	Panel Serial No Unknown	Panel Tilt Angle -
Anomaly Priority High	String (Series) Number 227	 Panel Location 40.22259375972885 33.15988431410862



DJI_20230719114723_0538_V.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:47:23
MPX-4236123214



DJI_20230719114723_0538_T.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:47:23
MPX-4236123214

Panel Electrical Measurement Values

Current : - A
Voltage : - V
Power : - W

Measurement Date: -

Measurement values of a healthy panel in the same string:

Current - A | Voltage - V | Power - W

Weather Data

Tref : 11°C
Wind Speed : 1.1 km/s
Temperature : 13°C
Pollution Rate : -%
Efficiency : -%

Panel Temperature Measurement

Minimum : 36.3°C
Maksimum : 63.6°C
OAverage : 46.48°C
Delta T (Δ T) : 27.3C
Emissivity : 0.85

Solar Radiation



GHI : 513.9 W/m²
DNI : 749.4 W/m²
DHI : 116.9 W/m²
GTI : 513.9 W/m²

Sunshine Duration



Average Daily Sunshine Duration
12.2 Hours

Cloudiness



Inspection At the Hour Cloudiness Percentage
0%

Financial Loss

Per-Panel Loss Summary
Daily
0.058 USD
Monthly
1.752 USD
Yearly
21.321 USD

Panel Operation Information

Inspection Pending
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Detected
● MapperX Software
İşlem Tarihi: 19/10/2023 12:32

Anomaly Explanation


Uncontrolled vegetation growth around solar panels can cast shadows on the panels, causing them to heat up and reducing panel performance. Furthermore, vegetation can lead to moisture accumulation, damaging the panel structure.

Operation Suggestion

Plants causing shading on the modules should be removed. Additionally, regular landscape maintenance and controlling vegetation will minimize shading and moisture problems, ensuring the panels work efficiently and extending their lifespan.

Demo Santral2

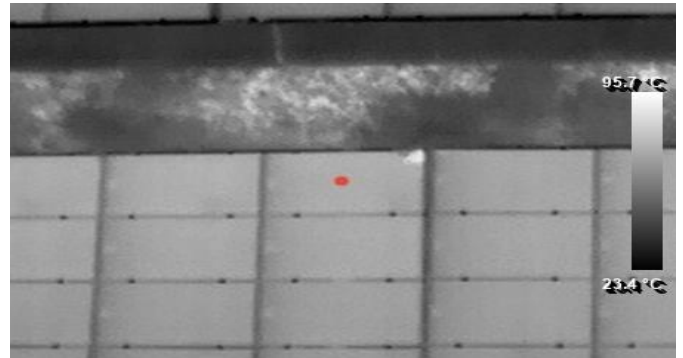
Demo Şirket

Anomaly Type Vegetation Shadowing	Panel Brand / Model Energy System / Es230	Field Installation Type Fixed Mounting
Anomaly Cause Unknown	Panel Serial No Unknown	Panel Tilt Angle -
Anomaly Priority High	String (Series) Number 159	 Panel Location 40.223004624077355 33.159959420726295



DJI_20230719114923_0646_V.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:49:23
MPX-4236123214



DJI_20230719114923_0646_T.JPG
DJI Mavic 3T Enterprise

19/07/2023 11:49:23
MPX-4236123214

Panel Electrical Measurement Values

Current : - A
Voltage : - V
Power : - W

Measurement Date: -

Measurement values of a healthy panel in the same string:

Current - A | Voltage - V | Power - W

Weather Data

Tref : 11°C
Wind Speed : 1.1 km/s
Temperature : 13°C
Pollution Rate : -%
Efficiency : -%

Panel Temperature Measurement

Minimum : 31.1°C
Maksimum : 95.7°C
OAverage : 48.96°C
Delta T (Δ T) : 64.6C
Emissivity : 0.85

Solar Radiation



GHI : 513.9 W/m²
DNI : 749.4 W/m²
DHI : 116.9 W/m²
GTI : 513.9 W/m²

Sunshine Duration



Average Daily Sunshine Duration
12.2 Hours

Cloudiness



Inspection At the Hour Cloudiness Percentage
0%

Financial Loss

Per-Panel Loss Summary
Daily **0.058 USD**
Monthly **1.752 USD**
Yearly **21.321 USD**

Panel Operation Information

- Inspection Pending**
- MapperX Software İşlem Tarihi: 19/10/2023 12:32
- Anomaly Detected**
- MapperX Software İşlem Tarihi: 19/10/2023 12:32

Anomaly Explanation

Uncontrolled vegetation growth around solar panels can cast shadows on the panels, causing them to heat up and reducing panel performance. Furthermore, vegetation can lead to moisture accumulation, damaging the panel structure.

Operation Suggestion

Plants causing shading on the modules should be removed. Additionally, regular landscape maintenance and controlling vegetation will minimize shading and moisture problems, ensuring the panels work efficiently and extending their lifespan.

5.0 Results and Recommendations

Within the scope of the thermal inspection, the important results and recommendations deemed important by us for the Demo Santral2 4.493 mw GES Project are shared below.

5.1 Results

- It was noted that testing and reporting services were provided by Biriz Global Teknoloji Ltd. Şti. for the Demo Santral2 4.493 mw GES Project,
- A total of 88 high priority, 348 medium priority, and 21 low priority faults/errors were detected in the PV modules used for energy production in the facility,
- A total of 15859 healthy and optimally producing modules were identified in the facility,
- The ratio of the modules identified as faulty/errors to the total number of modules in the facility was determined to be %2.80,

5.2 Recommendations

- Repair/maintenance/replacement operations should be carried out in order of maximum priority for high, medium, and low priority fault types identified as a result of the thermographic inspection.
- Job descriptions for the technical personnel assigned to carry out maintenance/repair/replacement operations in the project sites should be planned.
- It is necessary to clean the soiled panels in the project site.
- Uncontrolled plant growth causing faults/errors in the project site should be prevented.
- Repair operations for parts replacement/module replacement of modules identified with anomalies in the project site should be carried out according to the recommendations in the fault/error group.
- It is recommended to have another thermographic inspection within a maximum of 1 year as the faults related to contamination and environmental conditions encountered as a result of the thermographic inspection in your site are likely to occur again in the future.