

INDUSTRIAL IOT SOLUTIONS FOR SOLAR FARMS

Background

Sensata's Industrial Internet of Things (IoT) solutions provide condition monitoring capabilities that can be leveraged in mission critical applications. One such application is high resistance joint monitoring, where use of IoT can ensure safety on solar farms. A high resistance joint is a hazard that can result from loose or corroded electrical connections. The flow of current through the high resistance joint then leads to a rise in temperature and in some cases an electrical fire. Because of the high currents generated and exposure to large temperature and humidity variations, solar farms are particularly prone to fires caused by high resistance joints.

Make safety the priority with Sensata's IoT solutions for solar farm high resistance joint remote monitoring solutions

As these joints increase in temperature, micro arcing and more advanced arcing may start to occur. In severe cases, arcing may lead to electrical fire, resulting in a safety hazard and damage to expensive equipment. Currently, these high resistance joint connections are monitored periodically by maintenance personnel who must travel to access the solar farms in remote locations. Because multiple tasks are performed during these visits, including and in addition to taking readings, panel cleaning and grounds keeping, the root cause of any potential issue is often overlooked. Some maintenance personnel perform thermal imaging to look for heat spots, but this poses health and safety issues which will become more problematic as the market migrates to more dangerous, high voltage (1,500 V) systems. Even if thermal imaging is done regularly, it does not give real time or predictive data. This data scarcity makes it harder to analyze trends and predict joint failures. Sensata's solution replaces the need for expensive, periodic manual maintenance of solar farms by providing real-time data directly to the cloud.

Solution

Sensata's high resistance joint monitoring solution provides real-time access to temperature data from the solar farm terminals. Digital temperature sensor integrated circuits built into micro sensing tubes are installed as near to the actual termination as possible. To enable quick and easy installation, Sensata also designed a flexible strip with multiple sensors for use on standard-width fuse terminals. A wireless transmitter is then used to transmit the digital temperature data to the IoT gateway. The IoT gateway stores and transmits the data received to a cloud-based server using MQTT packets. The data is then logged into an SQL database, where it can be displayed in easy-to-monitor dashboards and used for alarm generation.

For example, a traffic light color code of green, amber, and red can be used to display that a terminal is operating within defined values, will require attention, or is exceeding temperatures, respectively. Each alarm level is linked to the current ambient temperature minimizing the chance of false alarms. These alarms can also be linked to SMS or email alerts, notifying the solar farm management team immediately so that they may take corrective action and avoid failure.

Access to real-time and continuous data through Sensata's IoT solution also has a significant advantage over periodic readings conducted manually. This continuous data can be analyzed over time to determine trends that may result in failure modes. Armed with this data, the solar farm can be proactively managed with well-timed preventative maintenance.



Photo courtesy of Mycena Systems

Example of damage to substation due to electrical fire

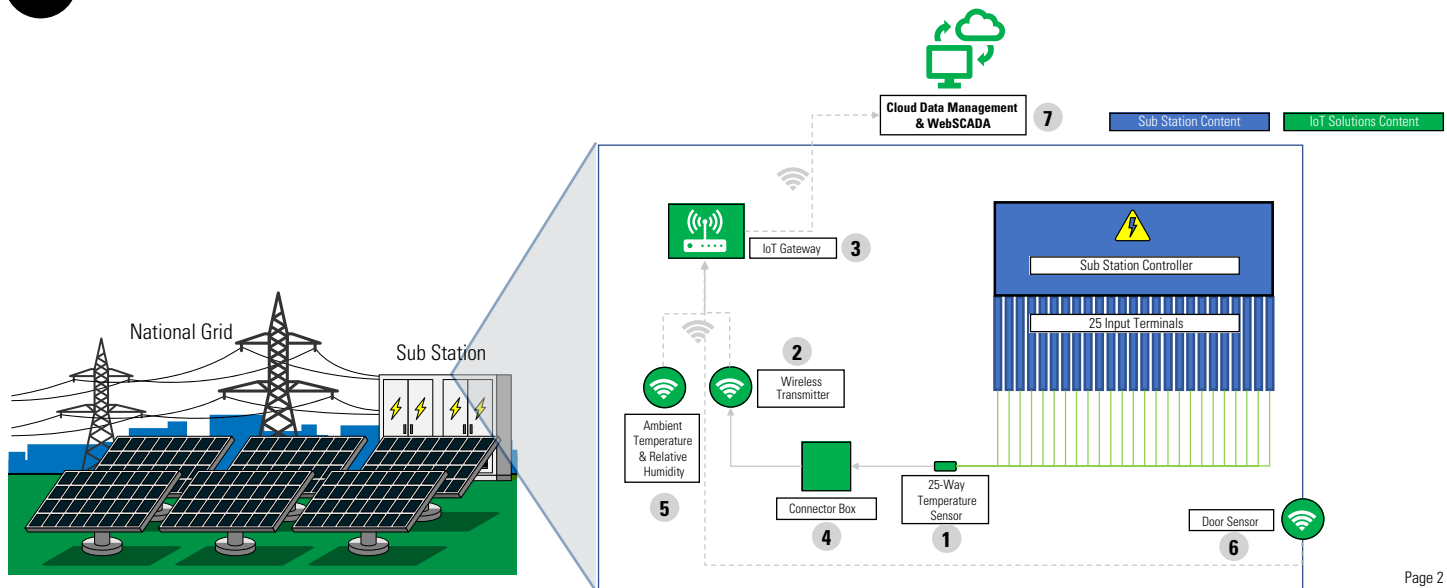


RECOMMENDED PRODUCTS

Reference on Diagram	Product	Part Number	Features	Function
1	Temperature Sensor cables / Strip	II-TEMPCAB-000-XX	<ul style="list-style-type: none"> Digital temperature sensor ICs within micro sensing tubes 	Provides voltage reading proportional to temperature at terminal
2	Wireless transmitter	IWT-NODE TEMPCAB	<ul style="list-style-type: none"> Connects to multiple digital temperature sensor cables 	Transmits data from temperature sensors to the IoT gateway
3	IoT Gateway	IoT-Gateway-Solar	<ul style="list-style-type: none"> Analog & Digital I/Os In-built optional GPS 4 off relay control/ alarm outputs 	Communicates secure MQTT messages to the server to report sensor readings
4	Multway Connector	Accessory	<ul style="list-style-type: none"> Accepts either 4 or 8 cable inputs Single cable output 	Aggregates multiple temperature sensors to one
5	IWTRhT	IWTRhT-000	<ul style="list-style-type: none"> Accepts either 4 or 8 cable inputs Single cable output 	Measures ambient temperature and relative humidity
6	Door Sensor	Accessory (Optional)	<ul style="list-style-type: none"> Digital contact 	Indicates when substation door is opened
7	WebSCADA	Solar Monitoring System	<ul style="list-style-type: none"> Server hosting package 	Customised data output from Sensata WebScada displays real-time temperature data and sends alarms and notifications if out of specification



SOLAR FARM DIAGRAM



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