Bandweaver

CASE STUDY

Solar PV Panel LHD — Factory roof panel protection – SiamCraft Thailand

Project Summary

- **Client**: Siam Craft Industry Co., Ltd. (SCG Packaging — SCGP), Ban Pong, Ratchaburi, Thailand
- **Application**: Solar Rooftop PV Panel Continuous Temperature Monitoring & Automatic Fire Protection
- **Solution**: Bandweaver FireLaser DTS System (FireLaser 2km, 4-Channel)
- **Technology**: Distributed Temperature Sensing (DTS) — 62.5/125µm Multimode Armoured Fiber Optic Sensing Cable
- **Key Benefit**: Real-time hotspot detection across 1,850m of solar panels with automatic inverter shutdown on temperature exceedance

Monitored | Secured | Safe

The Scenario

Siam Craft Industry Co., Ltd. (SCGP / SCG Packaging) operates a large-scale paper manufacturing facility at Ban Pong, Ratchaburi Province, Thailand. Paper Machine Building 16 (PM16) features an extensive rooftop solar photovoltaic (PV) installation designed to reduce the facility's energy consumption and carbon footprint. The solar array spans the full length of the PM16 building rooftop, with 1,850m of fiber optic cable ultimately installed, connecting through 6 inverters feeding a Main Distribution Board (MDB) panel.

Large-scale rooftop solar installations carry inherent fire risks arising from overheating PV cells, electrical faults, or inverter failures. Given the size and value of the installation, SCGP required a robust, continuous thermal monitoring solution capable of detecting hotspots anywhere along the full length of the solar array and triggering protective shutdown automatically in the event of a critical temperature event.

Figure 1 - SIamcraft control room

Client Requirements

- Continuous, real-time temperature monitoring across the entire rooftop solar PV array (1,850m cable route)
- Accurate detection and location of hotspots (high maximum temperature) and rapid temperature rise (rate of change alarm)
- Precise identification of the location of any thermal anomaly, mapped to specific panel zones
- Automatic alarm notification (audible and visual) in the control room upon temperature threshold exceedance
- Automatic protective shutdown of the solar PV inverter system when temperatures exceed safe limits
- A reliable, low-maintenance solution suitable for a harsh outdoor rooftop environment
- Historical data logging and temperature trending for system performance analysis

What Did We Do?

Bandweaver's authorised Thai partner, Ensys Motors and Drives Co., Ltd., designed and installed a complete Bandweaver FireLaser Distributed Temperature Sensing (DTS) system at the SCGP PM16 facility, covering the entire rooftop solar array and inverter zone.

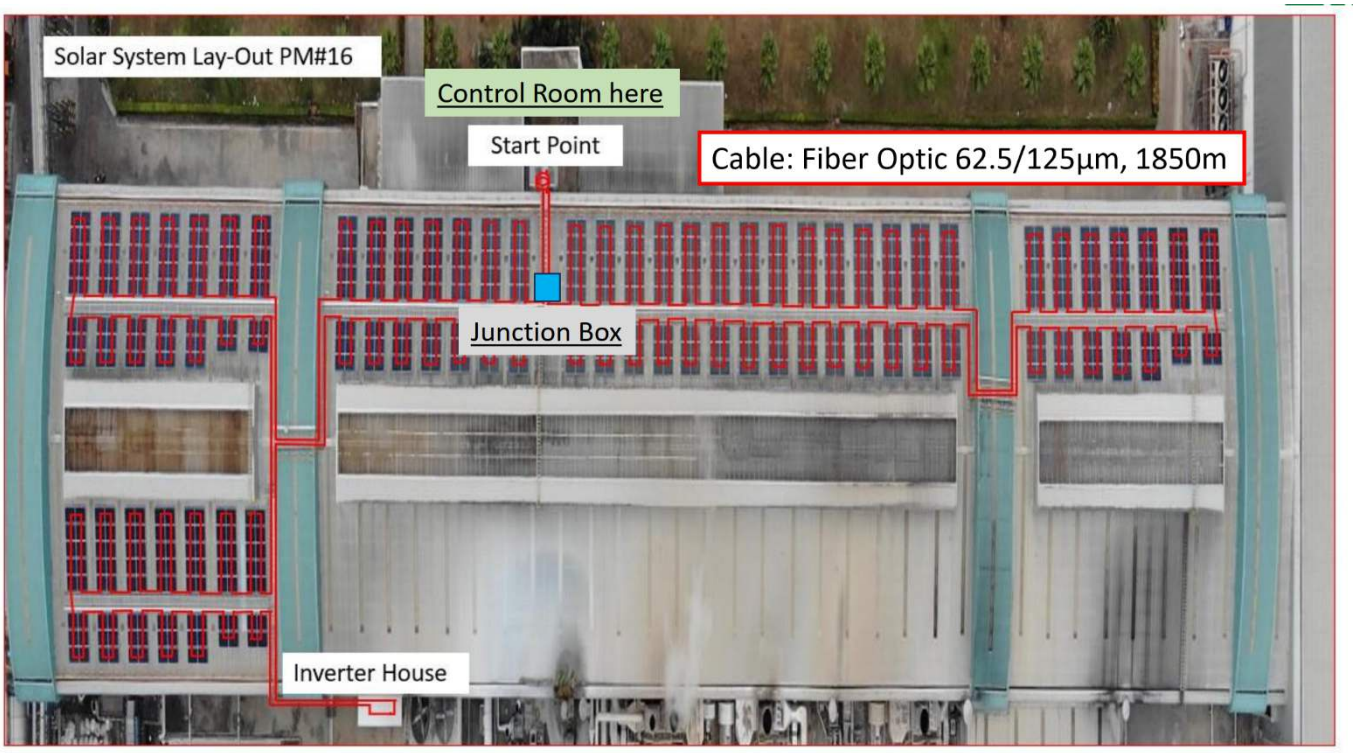


Figure 2 - Overview of panels and cable installation

System Architecture:

- **DTS Detection Unit (FireLaser 2km 4CH):** Wall-mounted in the control room, connected via E2000 fiber optic connectors to two sensing channels (CH1 and CH2), providing a fully redundant loop configuration.
- **Fiber Optic Sensing Cable:** 1,850m of Bandweaver FireFiber AT armoured tube multimode fiber optic sensing cable (62.5/125µm), routed across the full rooftop solar array in 26 monitoring zones (Zone 1 to Zone 26), with each channel covering 1,660m in a CH1-to-CH2 loop.
- **Cable Routing:** From the DTS panel in the control room, the cable runs through PVC conduit up the building staircase (with wall drilling at transition points), across the rooftop alongside the PV panel edges (fixed using ground lugs), through the inverter zone (wrapped around inverter frames using cable ties), and back to the DTS panel via the same route.
- **Junction Boxes:** Four DTS junction boxes (BOX#1 to BOX#4) were installed at key points across the rooftop, each fitted with a temperature gauge to monitor ambient conditions inside the enclosure.
- **Inverter Zone Protection:** VCT cable (220Vac, 300m) was connected from the MDB inverter panel to shunt trip points 1-P1 and 1-P2, enabling automatic shutdown of the entire solar PV system in the event a critical temperature threshold is exceeded.
- **Control Room Integration:** The DTS Detection Unit communicates with an IPC workstation (Lenovo ThinkStation P348 with Dell display) running Bandweaver's DTSCM2 monitoring software via a Gigabit network switch and CAT6 LAN cable (100m). A Schneider Harmony XVG tower lamp with integrated buzzer provides audible and visual alarm indication.
- **Power Conditioning:** A Zircon HR1 2kVA stabiliser provides clean, regulated 220Vac power to the DTS system, with a 220Vac to 24Vdc adapter for low-voltage control circuits.

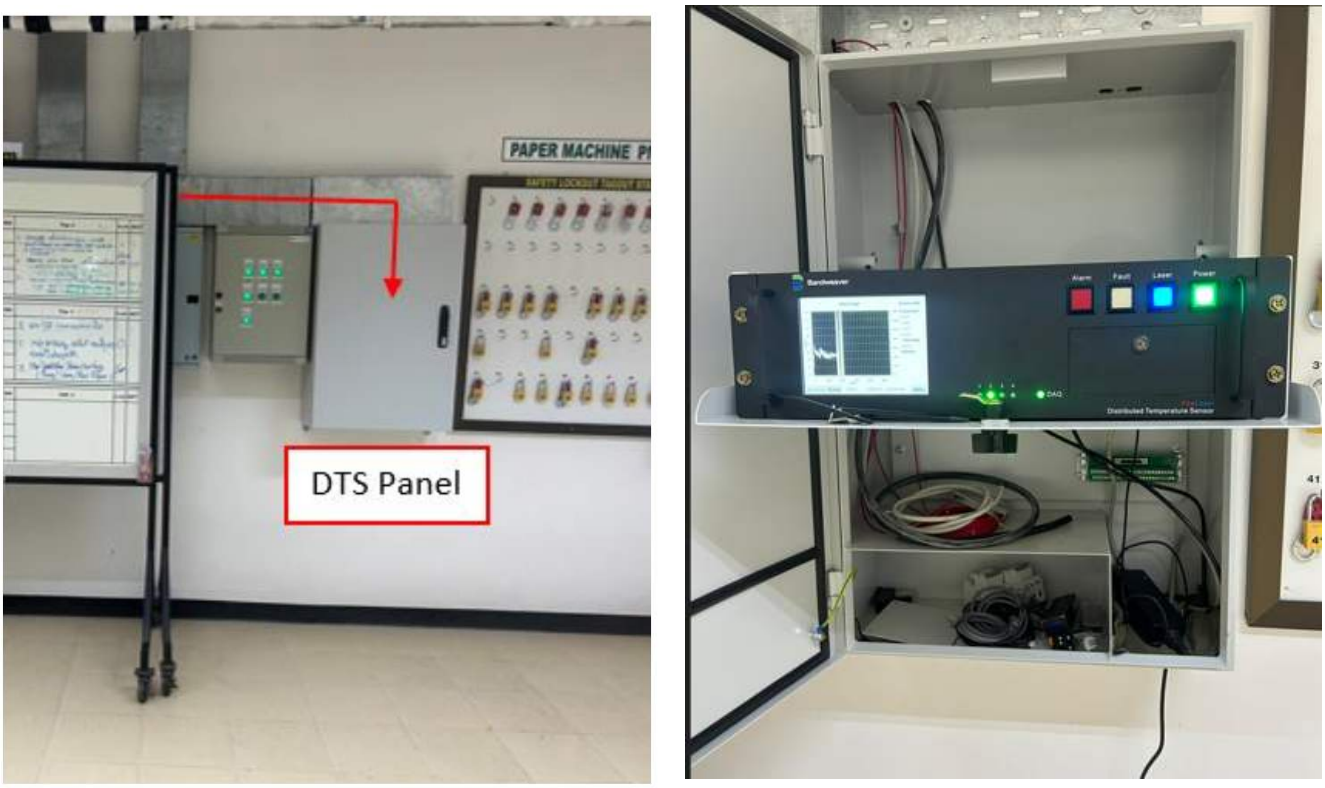
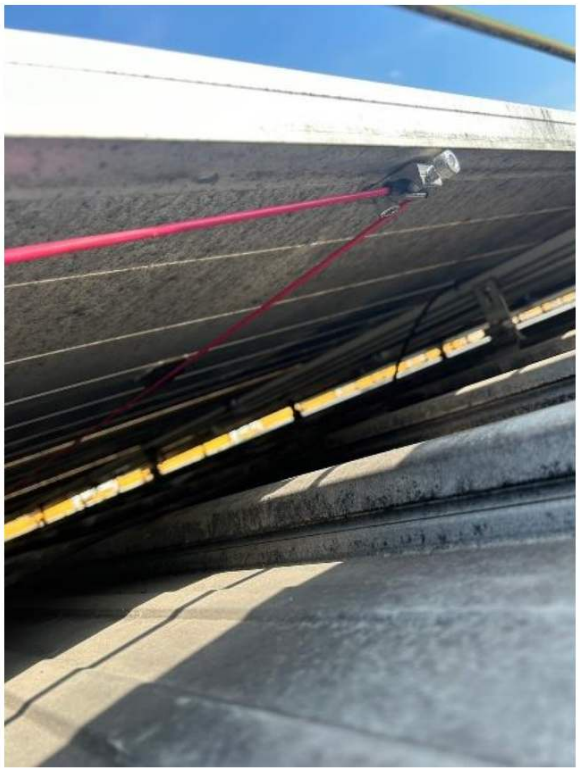


Figure 3 - FireLaser installed in wall mounted cabinet



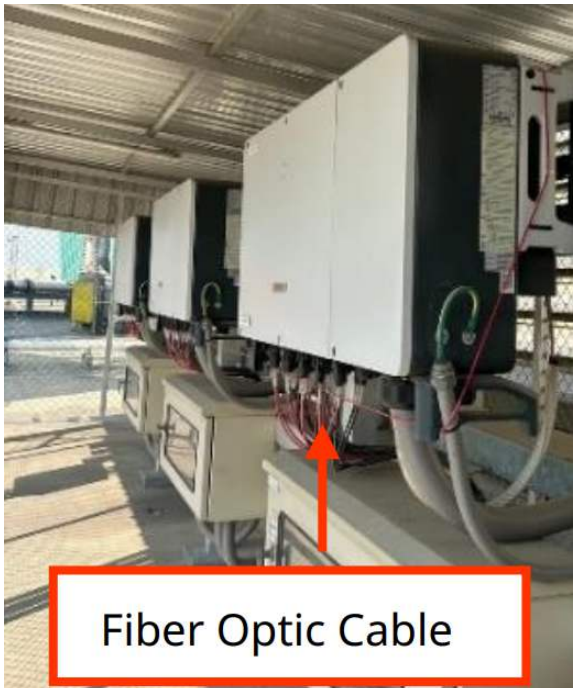

Fiber Optic Cable

Figure 4 - Fiber optic installation

Zone Configuration & Commissioning:

The 26 sensing zones were mapped to the physical solar panel layout using the heat gun method, with each zone spanning 2–3 panel rows. Alarm thresholds were configured at: Max Temperature Alarm = 60°C and Rate of Rise (ΔT) = 10°C per 120 seconds, with a measurement cycle of 10 seconds per channel.

The system was commissioned and performance-tested over 5 days (January 15–19, 2024). Ten test points were applied across the array using a thermal heat gun, spanning zones 2, 4, 6, 10, 14, 18, 19, 21, 24 and 25. All 10 test points successfully triggered accurate Max Temp and/or Rate of Rise alarms in the DTSCM2 software, correctly identifying the zone and distance of the heat source in both CH1 and CH2, confirming the system's precision and reliability across the full cable length.

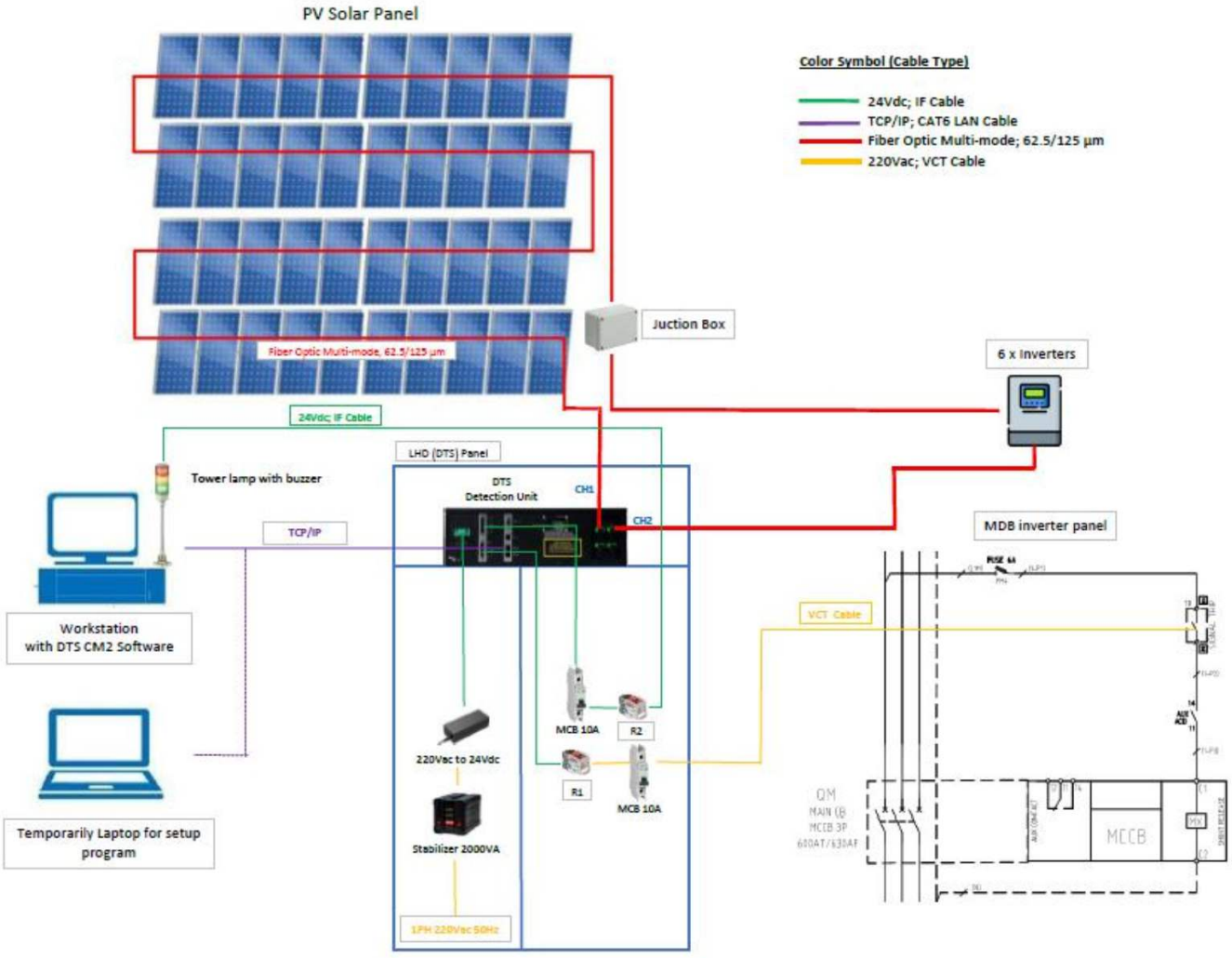


Figure 5 - System architecture schematic

Benefits To The Client

The Bandweaver FireLaser DTS system delivered a comprehensive solar panel thermal monitoring and fire protection solution that met all of SCGP's requirements. Key benefits to the client include:

- **Early Detection of Overheating:** The FireLaser DTS system monitors temperature every 1m along the full 1,850m cable route in real time (10-second measurement cycle). Max Temp alarms at 60°C and Rate of Rise alarms at ΔT = 10°C/120 seconds enable early intervention before a thermal event can escalate to fire.
- **Complete Coverage with No Blind Spots:** The distributed nature of the fiber optic sensing cable provides continuous temperature measurements every 1 metre along the entire solar array, eliminating the gaps and blind spots inherent in point-sensor systems.
- **Precise Location Identification:** 26 monitoring zones, each mapped to specific panel rows, enable the DTS system to identify the exact location of any thermal anomaly to within the sub-zone. This allows maintenance teams to quickly locate and address the issue.
- **Automatic Solar System Shutdown:** VCT cables connected to shunt trip circuits at the inverter MDB provide automatic shutdown of the solar PV system the moment a critical temperature threshold is exceeded, preventing fire escalation and protecting both the asset and the building.
- **Fully Redundant Loop Configuration:** The CH1-to-CH2 loop configuration means the system continues to monitor and protect even if the sensing cable is cut or damaged at a single point — providing a highly resilient monitoring solution.
- **Low Maintenance, Long Service Life:** Bandweaver's armoured fiber optic sensing cable is fully passive with no moving parts, immune to electromagnetic interference, non-corrosive and weather-resistant. With a service life exceeding 30 years, the system delivers very low total cost of ownership.
- **Real-Time Visibility and Data Logging:** The DTSCM2 software provides operators with a real-time temperature profile display, zone-based alarm management, event logging and temperature trend analysis — supporting both immediate response and longer-term performance reporting.
- **Proven Performance:** All 10 commissioning test points (covering zones across the full cable length from Zone 2 to Zone 25) passed successfully, with accurate alarm triggering and precise location identification in both CH1 and CH2, confirming system reliability across the entire installation.

About Bandweaver Technologies

With an installed base of over 90,000km and 9,000 systems installed worldwide, Bandweaver's vision is to be the first choice for integrated distributed fiber optic sensing solutions across the globe. Since 2002, Bandweaver has been committed to delivering reliable, innovative, client-centric and value-added products and services, via a dedicated and talented team of people.

Bandweaver manufactures and distributes advanced fiber optic monitoring sensors and integrated technologies, enabling customers to monitor, secure and keep personnel and critical assets safe.

Utilising the latest technologies, Bandweaver provides solutions for Linear Heat Detection, Intrusion Detection, Condition Monitoring, Dynamic Cable Rating and Leak Detection.
For further information please contact our global team at info@bandweaver.com