

Solar Data Gateway

Trimark Associates, Inc. (Trimark) is a proven firm with expertise in bringing utility-scale solar plants into compliance with CAISO's metering and telemetry requirements, including the Participating Intermittent Resource Program (PIRP).

Trimark collects all real-time data required by CAISO and the utility directly from the Solar Data Gateway on an hourly basis using the Trimark RIG Aggregation Server (RAS). Data from each Gateway will be evaluated, validated and processed through encrypted data channels to CAISO. That data will also be available for presentation to each client or other stakeholder via the Trimark *Power Viewer* Web Service.



Trimark Solar Data Gateway (SDG):

In order to reliably communicate to each solar installation, Trimark offers Solar Data Gateway (SDG) System with interfaces to the revenue metering, the reference cells, inverters, meteorological stations and to the plant SCADA. The gateways can be configured with the following major components:

- Trimark's Solar Data Gateway system to store and forward the interval meter data, inverter performance and status information as well as reference cell data
- Industrial style ADSL router
- Reference cell for measuring irradiance and cell temperature to provide an independent Modbus data feed for the *Power Viewer* application

Our Data Gateway is UL rated and housed in an electrical enclosure with clearly labeled connectors for the customer's Cat 5 cable and for the Current and Voltage connections. Power for the electronic devices will be established from a 120 VAC connection to the electric service.



Meteorological Equipment – The real-time data from the meteorological (MET) stations must be integrated with the utility in order to satisfy the CASIO Participating Intermittent Resource Program (PIRP) telemetry requirements.

The Solar Data Gateway (SDG) consists of the Trimark T1S Solar Data Gateway software application capable of communicating with several varieties of intelligent electronic devices including revenue meters, solar inverters, DC sub-combiners, and plant breakers. Trimark is the creator of the SDG application and we have extensive experience with it.

The SDG hardware platform consists of an industrial grade Intel Pentium Industrial PC (IPC) running Microsoft Windows XP Professional Operating System. The system will be installed in a customer-provided rack enclosure that houses the IPC, network switch, and Uninterruptible Power Supply (UPS).

The SDG supports DNP 3.0, OPC, and Modbus protocols over Ethernet or Serial communication links. The system also has the ability to accept 4-20 mA analog signals as well as discrete digital inputs. The communications to the RAS must be established via a dedicated circuit connecting to the internet. The SDG is remotely managed via Trimark's secure Internet connection, giving the critical capability of performing many troubleshooting tasks without incurring travel expenses.

The DNP 3.0 interface to the RAS will be established through a Trimark-provided ADSL router and will be encrypted using a Trimark issued cryptographic certificate. The SDG will have an Ethernet interface on the meters, and two spare ports can be made available to the interface to the plant SCADA, the utility, and/or customer as required.



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Figure 1

Communications:

Trimark scans the SDG via the ADSL every 4 seconds. All data transmitted to the RAS is encrypted with X509 V1.4 PKI encryption certificates on port 20,000 of the SDG system. The revenue metering will be interrogated by CAISO once daily through the ADSL router.

Services:

- *Aggregating RIG Configuration*
- *Engineering*
- *SCADA System Integration*
- *Factory Testing*
- *SDG Commissioning and Certification*
- *Metering System Commissioning and Certification*



Trimark Power Viewer

The screen-shot in Figure 1 gives an example of the web interface that Trimark will provide for each project. The screen can be enhanced with different types of charts, dials and gauges. The Trimark Power Viewer is tightly integrated with the TIS Gateway.

Specifications:

Power Input	Communications	System Hardware	I/O Interface
120 Volt Single Phase 60 Hertz Minimum power 120 Watts	RS-232 RS-485 Ethernet 10/100 Base-T Wireless Cellular Wireless 802.g Wi-Fi	Celeron M 600 MHz Memory 512 MB Storage - SSD Internal Flash	Serial 2 x RS-232 Serial 2 x RS-485 LAN 2 x 10/100 Base-T USB Serial - 2 x USB

Environmental	Compatible Protocols	Compliance	Interfaces
Humidity 95% Non Condensing Operating Temp -20 to 50C Shock Protection - IEC 68 2-27 Vibration Protection IEC 68 2-64	Modbus RTU Master Modbus RTU Slave Modbus TCP Master Modbus TCP Slave DNP 3.0 TCP Master DNP 3.0 TCP Slave OPC Standard	IEC 61010 (Safety) FCC 15 Part B CFR 47 ANSI C63.4 Underwriter Lab	All commercial inverters Available set-point control Alarm monitoring Real time voltage and current Meteorological systems Revenue metering



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