

# Solar Telecom System IIAN TECH Hybrid Solution



**IIAN TECH CO., LTD.**



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## Overview

PV solar energy systems have proven to be reliable methods of powering telecommunication systems in places where grid electricity is not available or impractical. RTU, microwave repeaters, television and radio repeater sites are commonly located on mountaintops or otherwise remote sites not easily accessed. PV solar energy provides excellent sources of clean and reliable power to the telecom site, and maintains batteries charged to back-up the systems. Even if grid power or diesel generator is available at these sites, a renewable energy system can provide security as a back-up in the event of grid failure, and reduce the huge operation cost of the power supply by diesel generators.

The first step is to calculate the solar array size to supply the required power to the radio site.

To size any repeater or RTU site,

- We first evaluate the power consumption of the radio in both stand-by and transmit mode,
- We calculate the amount of solar resources available at the actual radio site.
- We establish a period of autonomy for our system, in the event of extreme rainy or cloudy days, we calculate how long the system needs to be operable. This information will determine the size of the battery bank.

To configure the optimized solar telecom system,

- 1<sup>st</sup>, we calculate the standby power consumption
- 2<sup>nd</sup>, we calculate the transmit power consumption;
- 3<sup>rd</sup>, we calculate the battery size for the autonomy of our system.
- 4<sup>th</sup>, we simulate the hybrid configuration with solar, battery and DG power,

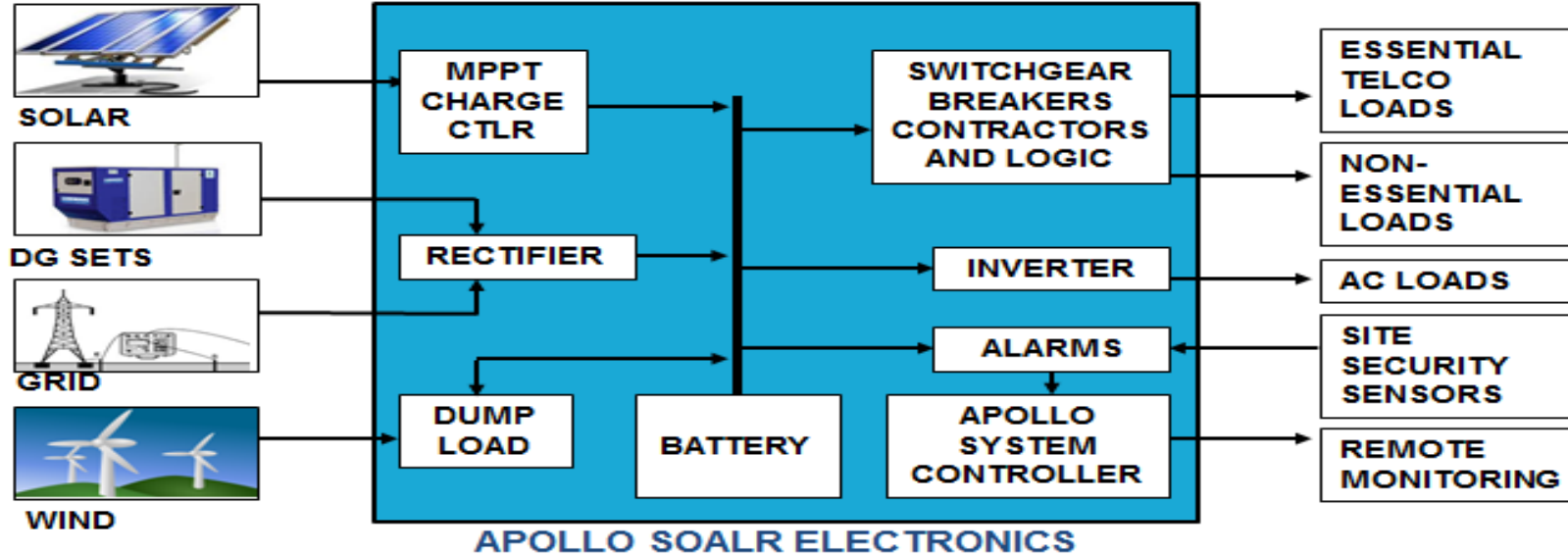
Finally we fix the optimized hybrid configuration of the solar telecom system.

# IIAN TECH Hybrid Solar Telecom System

IIAN TECH provides the complete Hybrid Solar Telecom System combined with the Apollo Solar electronics. The hybrid solar telecom system consists of,

1. **IIAN TECH Hybrid System (Korea)** ; PV solar power, DG power, Battery and AC Power(grid),  
. The reliable top brand Korean products shall be used only.
2. **Apollo Solar electronics (USA)** ; system controller, real time remote monitoring software,  
. Apollo electronics were already deployed for the worldwide military and commercial purposes.
3. All energy inputs from IIAN TECH Hybrid System are integrated with the System Controller and Remote Monitoring Software of Apollo Solar electronics.

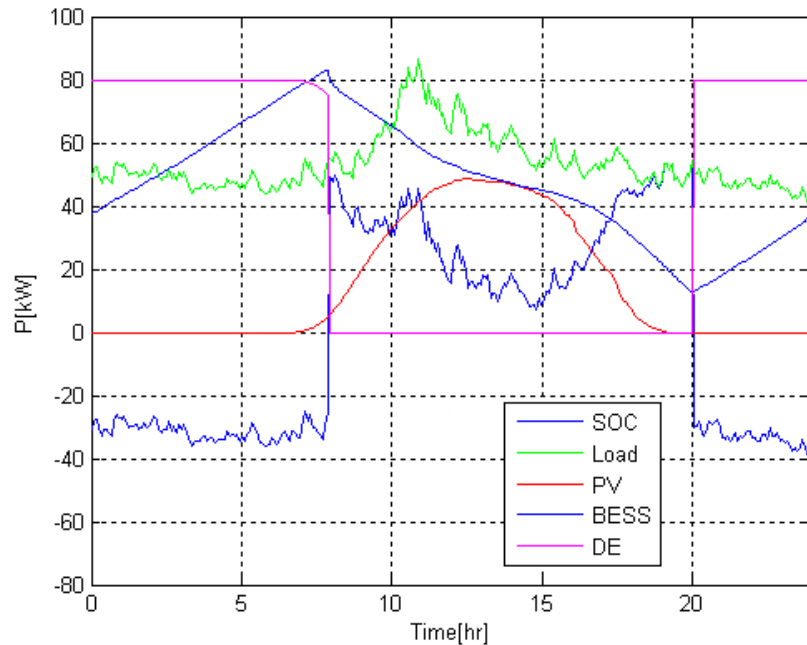
## IIAN TECH HYBRID SYSTEM



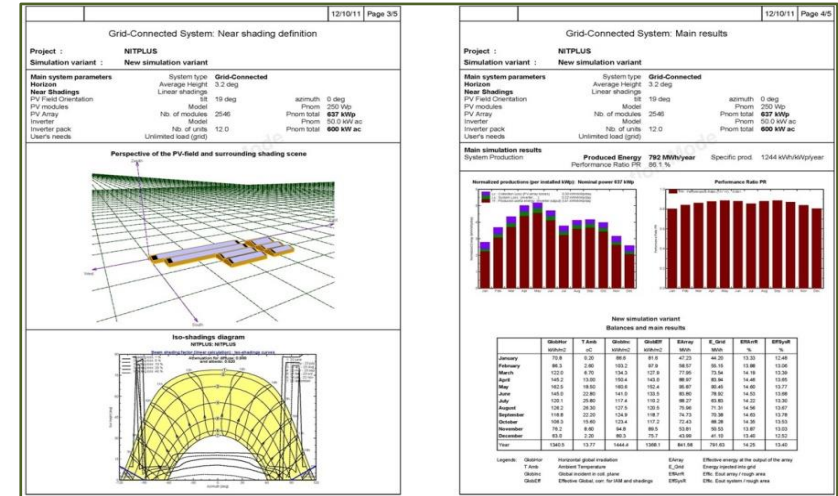
# Optimization of the Hybrid Configuration

- Calculate the required Loads of the radio site,
- Calculate the input Power,
  - PV Solar Power,
  - DG Power,
  - BESS Power,
- Design the hybrid Configuration,
  - PV Solar + DG + BESS
- The best Configuration optimized by simulation

## ❖ Simulation of Solar+DG+BESS



## ❖ Calculation of PV Solar Power



## ❖ Electricity Generation Analysis



## IIAN TECH Solutions

➤ **IIAN TECH provides the solutions,**

- BOT Base with Project Finance (USD40Million ~ without limits)
- EPC Base Construction
- Consulting Service
- Feasibility Study

➤ **The most optimized hybrid configuration saves cost,**

- Diesel OPEX down
- Solar CAPEX down
- Solar Hybrid Systems now offer fast ROI

➤ **The lowest diesel oil consumption,**

- DG runs only during dark time
- No fuel theft (only 25% for delivery to sites),
- No delivery delay of Fuel

\* Solar/Diesel Hybrid system has the best incremental Internal Rate of Return (IRR).

The local cost of diesel fuel and the cost of capital are key determinants of the IRR.

A pure diesel site is more costly, while a solar/diesel hybrid site has a better IRR than that shown.

➤ **More Power, More Modules – No waste and convenient expansion**

➤ **Options for Indoor or Outdoor installation**

➤ **Integrated Remote Monitoring to support maximum reliability**

## Apollo Solar Electronics

➤ **Apollo Solar Electronics Standard System**

Systems are currently available in 8 different sizes rated by the Maximum PV Array power.

<b>APOLLO SOLAR STANDARD SIZE</b>					
APOLLO PART NUMBER	MAX PV ARRAY (kW)	CONTINUOUS TELCO DC LOAD (WATTS)	BATTERY CHARGING AMPS (MAX)	NUMBER OF T80HV CHARGE CONTROLLERS	CABINET SIZE (mm) ALL 300mm Depth
PVT33.6	33.6	4000	640	8	1200x1000 X2
PVT29.4	29.4	3500	560	7	1200x1000 X2
PVT25.2	25.2	3000	480	6	1200x1000 X2
PVT21	21.0	2500	400	5	1200x1000 +800x600
PVT16.8	16.8	2000	320	4	1200x1000
PVT12.6	12.6	1500	240	3	1200x1000
PVT8.4	8.4	1000	160	2	1200x1000
PVT4.2	4.2	500	80	1	800x600

All specifications are based on 48 volt battery. Telecom loads are typical, but depend on Irradiance.

Apollo's standardized sizes reduce the costs of the product and field support. The typical DC Load is shown for reference. Factors such as battery size, The Apollo PVT systems are easy to install indoors or outdoors.

## **Benefits of Apollo Solar Electronics**

### ➤ **Apollo Solar Electronics reduce OPEX Costs**

- . Harness the lower cost of solar relative to diesel
- . Fewer Service Calls: Apollo Solar has the top track record
- . Fewer Site visits with remote monitoring of all functions
- . Faster Installations: standard sizes
- . Factory assembled and tested system backed by a 5 year warranty (extensions available)

### ➤ **Real-Time Remote Monitoring**

The Apollo Solar Telecom Power Solution includes the PV power electronics and all required accessory equipment, management and monitoring software, in a weather-proof cabinet.

- . Automatic updates of the status of entire power system 3 times/minute
- . Instant alarm reports
- . Comprehensive charts showing history of all key parameters
- . Detailed diagnostics
- . Learn more about [remote monitoring](#).

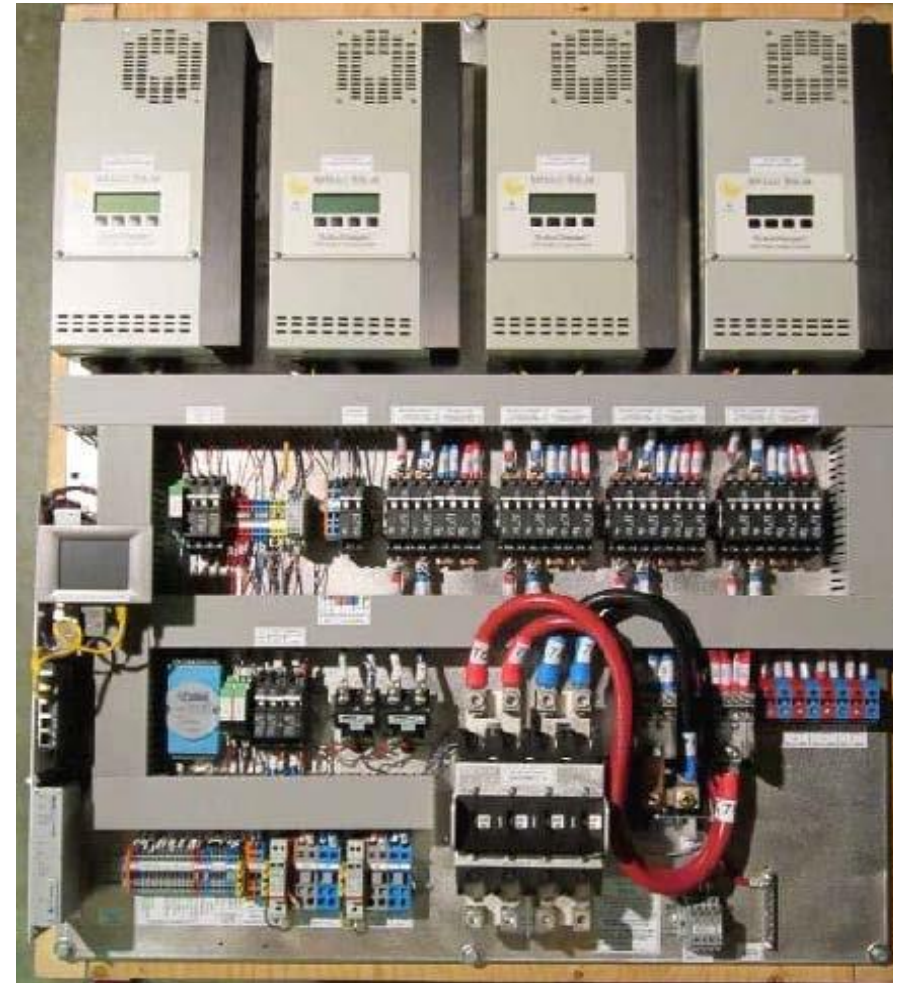
### ➤ **Designed for Remote Installations**

- . Remote monitoring system reduces number of site visits after installation
- . Standard configurations ensure rapid, turnkey installation
- . Reliable electronics and all equipment housed in IP66 weather-proof cabinet.

## [Introduction of Apollo Solar Electronics]

### Apollo Solar PVT 16.8 kW System

- In a pure solar system, each 4.2kW of PV will provide about 500 watts of continuous DC power.
- The 4 T80HV Charge Controllers support 16.8kW of PV providing 2000 watts to the DC load.
- Smaller systems support 4.2, 8.4 or 12.6kW of PV array and larger system by adding cabinets up to 33.6kW of PV which is 4kW
- The System Controller along with the Load Relays, Alarm Inputs and GSM Modem in the lower left provide the same Remote Monitoring features in all systems.





## **Apollo T80HV MPPT Charge Controllers** **Heart of the System with Proven Reliability**

- 98% Efficiency
- Supports up to 4.2 kW of PV array
- Delivers 80 Amps into batteries at up to 45°C ambient
- Best MPPT energy harvest available
- 180 Volt Input (PV Open Circuit)
- Internal Battery State-of-Charge meter
- Designed for Positive Ground as well as Negative Ground installations
- Accurate battery voltage sensing for long battery life
- Field proven reliability since 2005

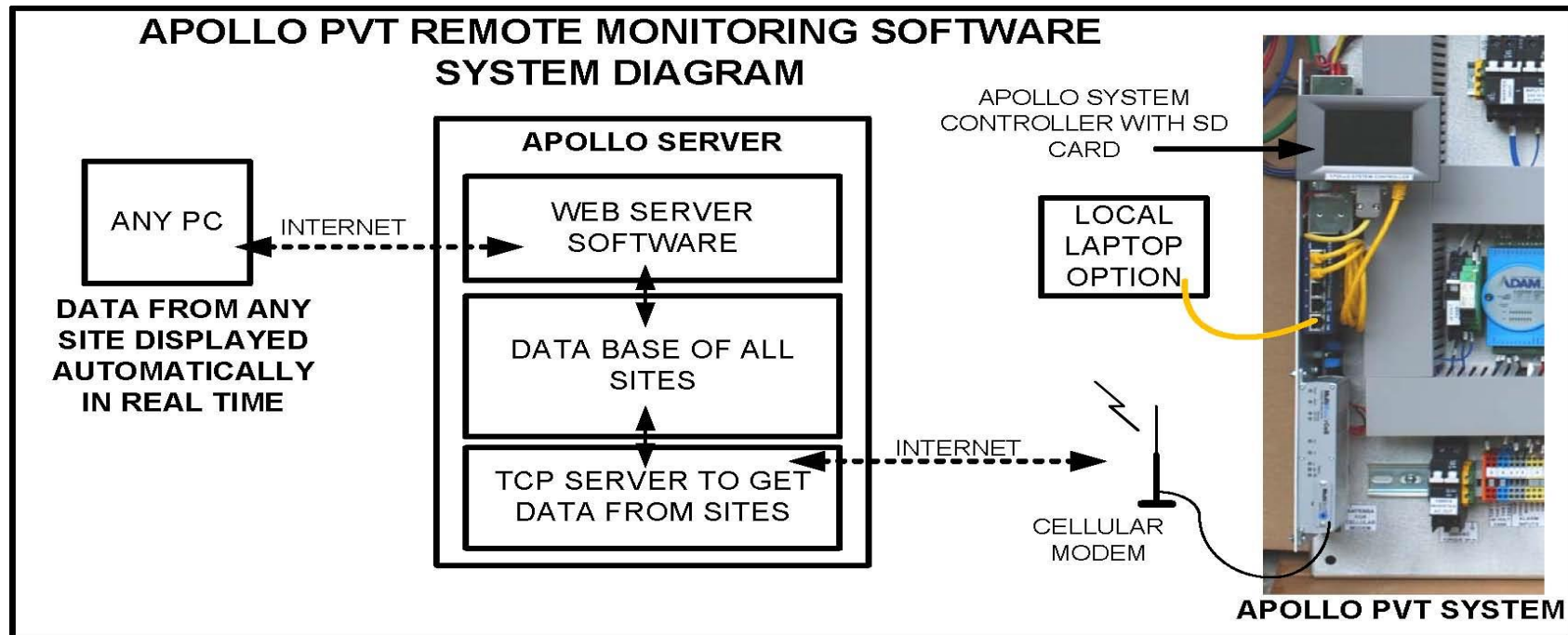


## Real Time Remote Monitoring

- **Apollo real time remote monitoring system provides important features:**
  - . Alarms on critical items and site security show on the map view
  - . Real Time (every 6 seconds) data from all your sites
  - . Monitor and control all important energy flows and generator starting
  - . Diagnostic data to allow remote troubleshooting
  - . The database stores the manufacturing specs and serial numbers of all major parts
  - . Charts of historical data by hour, day, month or year
  
- **Providing these Benefits:**
  - . Map view of all sites shows you current system health at a glance
  - . Generator run time is calculated for long battery life at minimum fuel
  - . Avoid unnecessary site visits – Diagnostic tools do the work for you
  - . Avoid paperwork – as built drawings and specs are in the database
  - . Know the health of your PV arrays and Batteries at all times

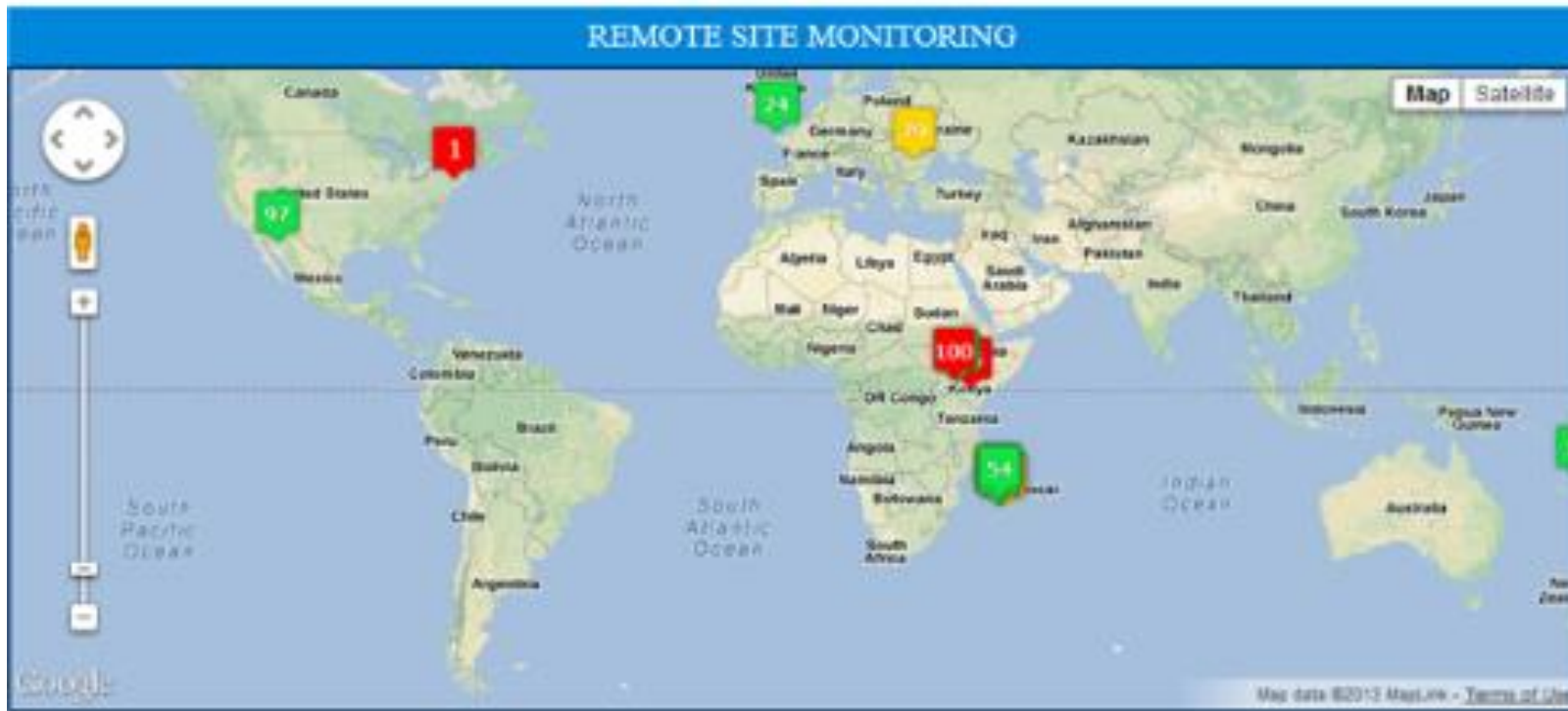
# Apollo Solar PVT – Real Time Remote Monitoring

- Each Apollo Solar PVT System sends the status of all its operating conditions to our server every 10 seconds or more.
- Our Database handles alarm conditions and stores the status of each site.
- The Web Server software interfaces with authorized users to retrieve charts and data from any site.



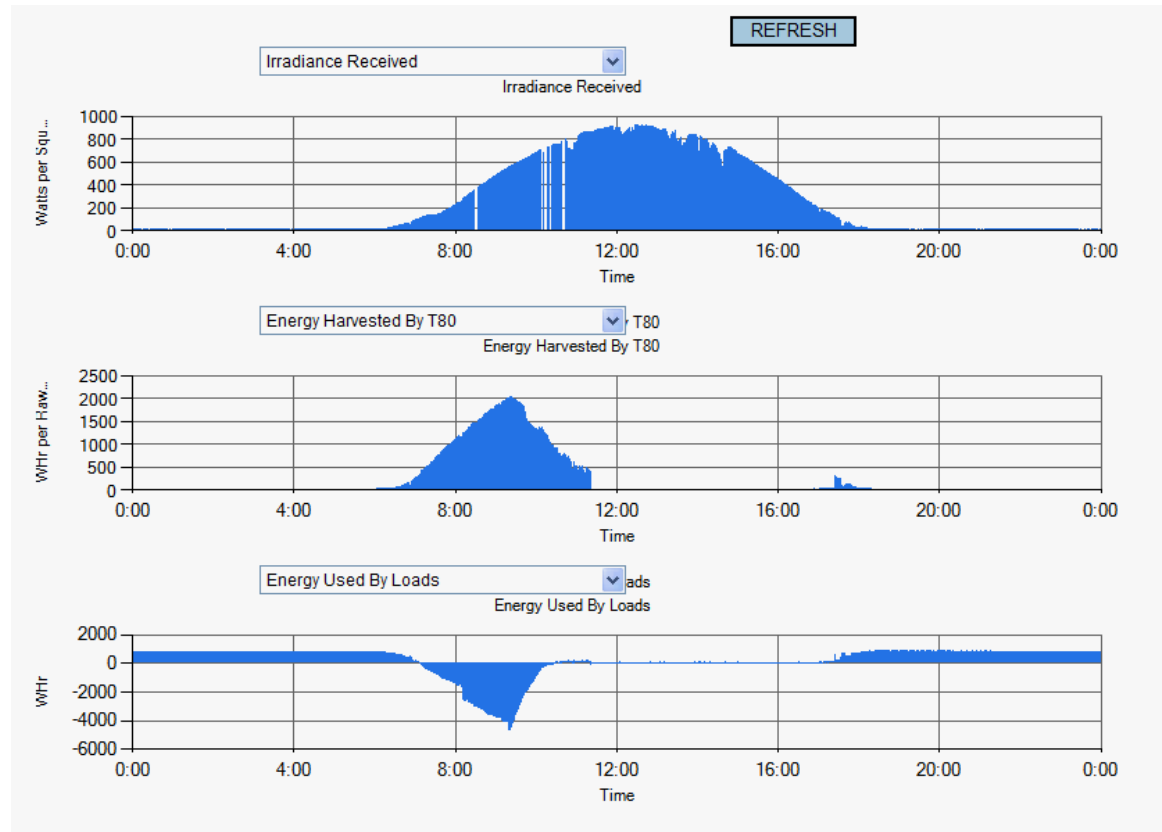
# Apollo Solar PVT – Real Time Remote Monitoring

- Monitor all your sites simultaneously – from any PC
- The Map display shows the exact location of each site
- The color of the pin indicates the Alarm Status (Red, Yellow or Green)
- Clicking on the pin brings up the proper Site Status page



## Apollo Solar PVT – Real Time Remote Monitoring

- Over a dozen different Charts are provided showing all critical parameters on every site.
- 3 different charts can be displayed at one time. The user can select which charts to show.
- The time period can be selected from 10 minutes to 1 year and the frequency can be selected from the raw data to averages every 10 minutes, daily or monthly.



# IIAN TECH provides the best Solutions with Apollo Electronics



**John Pfeifer**  
Apollo Solar, CEO



**LEE SEONGSOON**  
CEO/Managing Director



**YU JAI DUK**  
Tech support Director