GEÓNICA S.A.
EARTH SCIENCES

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SOLAR ENERGY MEASUREMENT SYSTEM (SEMS) for solar power plants

Remote diagnostic monitoring and efficiency analysis In real-time via internet

- **SOLAR RESOURCE ASSESSMENT**
  Continuous solar radiation measurements
- **REAL-TIME MONITORING**
  Web Posting
- **YIELD ANALYSIS**
  Off-line or on-line
- **REMOTE ALARM**
  Automatic SMS and email alert messages

SOLAR AND METEO SENSORS

REMOTE TERMINAL UNIT
DATA LOGGER & TRANSMITTER

WEB-POSTING
Real - Time graphic presentation and data download via internet

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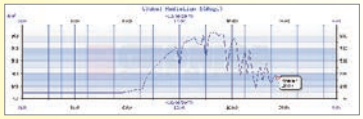
SOLAR POWER PLANT (THERMAL OR PHOTOVOLTAIC)

PLANT SENSORS
and
WEBCAMS

INPUTS SIGNALS

DATA, ALARM AND STILL IMAGES
TRANSMISSION VIA INTERNET
(GPRS/CDMA) – WEB POSTING
SMS and email Alarm messages

WEB POSTING BY THE
WEBTRANS Platform



SOLAR RADIATION
- Global
- Direct
- Diffuse
- Daily/Monthly Insolation

ARRAY PARAMETERS
- DC Voltages and Currents
- Battery Voltage
- DC Power
- Modules Temperature
- Thermal fluid temperature and flow

GRID PARAMETERS
- AC Voltage and injected currents
- AC Power

METEOROLOGY
- Turbulent Wind Effects
- Wind Speed and Direction
- Precipitation (rain, snow, hail)
- Temperature and Relative Humidity

STILL IMAGES
- Optional color Webcams for still images transmission

ANY OTHER Plant Parameter

GPRS

REMOTE TERMINAL UNIT 2000/3000
DATA LOGGER TRANSMITTER

OTHER LOCAL
CONNECTIONS
ETHERNET, etc...

THE SYSTEM PROVIDES:
- Quick look and off-line Analysis
- Identification of failed components or abnormal operation conditions
- Minimization of trouble-shooting efforts and maintenance work
- Prevention of key components damage
- Improvement of overall plant performance

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SYSTEM DESCRIPTION

GEONICA introduces the SOLAR ENERGY MEASUREMENT SYSTEM (SEMS), a turnkey integral solution specifically designed for the remote monitoring and effiecient analysis of solar power plants, thermal or photovoltaic, in real-time, via Internet.

Solar resource assessment is the first objective to be covered, in order to determine, during a certain time, the site conditions regarding the avilable solar energy. So the SEMS has been designed for allowing the measurement of all solar radiation parameters, such as globlal, direct and diffuse radiation, by means of highly sensitive pyranometers and pyrheliometers supported by very precise solar trackers.

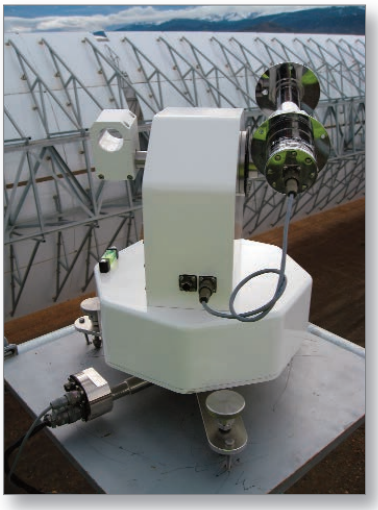
Once the solar plant is in operation, other three fundamental issues have to be considered:

◊ Real-time monitoring of all the main or critical plant parameters. This will provide the possiblity of a quick identification of failed components or abnormal operation conditions of the plant.

◊ An efficient remote alarm managent procedure by means of the urgent transmission of SMS alert messages to cellular phones and emails to central computers, in order to minimize the trouble-shooting efforts and to prevent damages in key plant components.

◊ Off-line analysis of the plant effciency, in order to know the overall performance of the thermal or photovoltaic installation.

These three issues will allow to enlarge the operative life of the plant and, at the same time, to assure the maximum investement profitability.

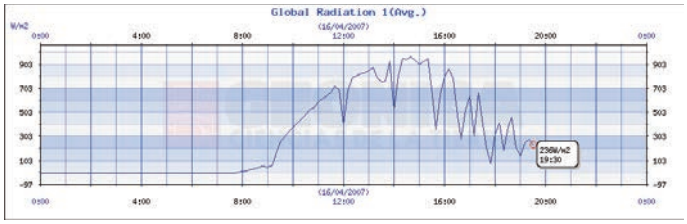


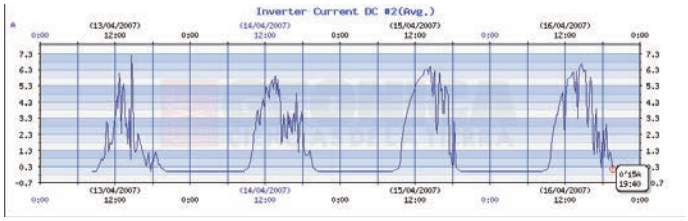
WEB POSTING

A very valuable option offered by GEONICA with the SEMS is the possibility of web posting, in such a way to provide worldwide access via INTERNET, to the historical and instant values of all the parameters measured at the solar plant.

This optional service is offered by WEBTRANS Platform, which is supported by a poweful Server located at GEONICA's facilities. All the parameters measured at the solar plant, are displayed in the WEBTRANS pages as clear graphical presentation.

WEBPOSTING BY THE WEBTRANS Platform





WEBPOSTING BY THE WEBTRANS Platform

At the same time, all historical can be also downloaded to your own computer. In all cases, only a user's name and password are required for accesibility, assuring a total confidentiality to your own information.

The remote Acquisition and Transmission Unit Model 2000C/3000C Series (the heart of the SEMS) includes a GPRS cellular modem that allows the trasmission of data, and also still images when connecting optional color webcams to the remote unit. Data and image transmission to the WEBTRANS Platform, is carried out in near-real-time, or at programmable intervals of 5, 10, 20 or 30 minutes.

An advanced and useful graphical presenttaion of historical data is shown int the standard layout of the WEBTRANS Platform, but the portal can be also designed according to customer's preferences.