

# Monitor Version 3

Description and Instruction Manual

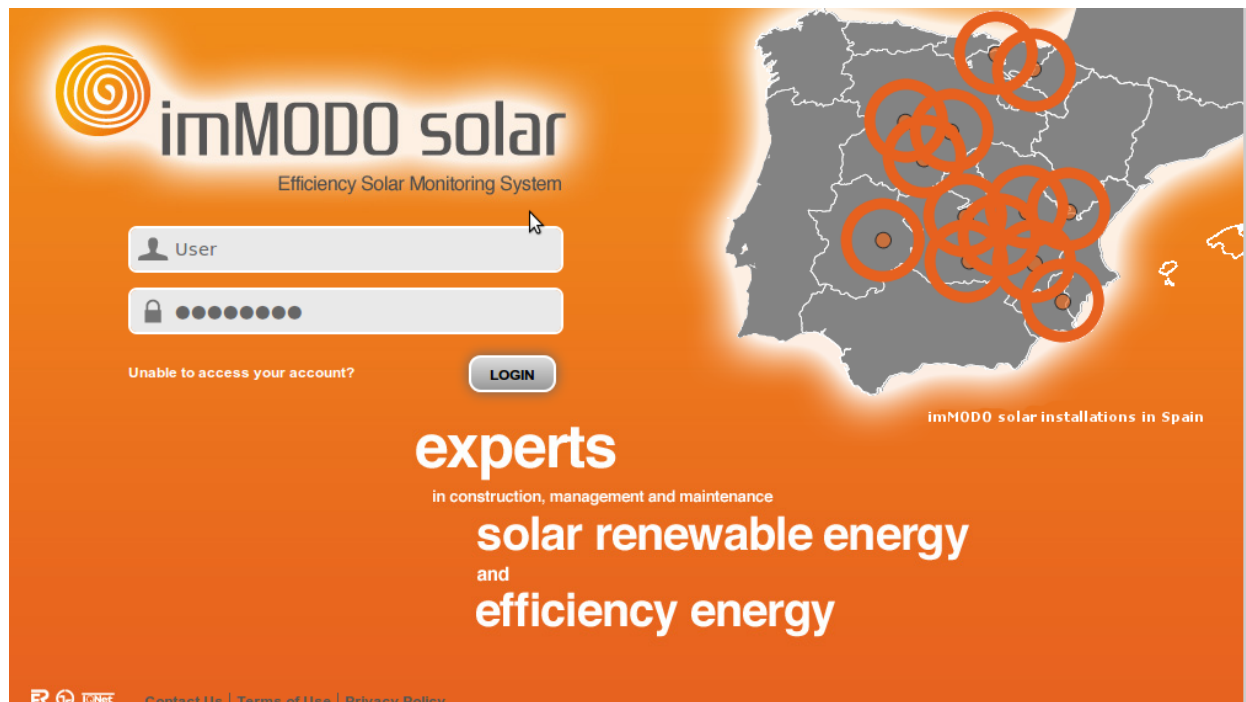


Authors: Systems Dept.

- [1. Start Menu](#)
- [2. Navegating between Solar Farms](#)
- [3. Summary Screen.](#)
- [4. Menu: Status](#)
- [5. Menu: PV Counters](#)
  - [5.1 Summary](#)
  - [5.2 Meetering Production](#)
  - [5.3 SolarFarm Production](#)
  - [5.4 Performance](#)
  - [5.5 PR](#)
  - [5.6 Company Counter](#)
- [6. Menu: Inverters](#)
  - [6.1 Summary](#)
  - [6.2 Real Time](#)
  - [6.3 History](#)
  - [6.4 Analysis](#)
- [7. Menu: Weather Station](#)
- [8. Menu: Performance](#)
- [9. Menu: Trackers](#)
- [10. Menu: Electric Substation](#)
- [11. Menu: Sensors & Actions](#)
- [12. Menu: Operation y Maintenance](#)
  - [12.1 Stock Module](#)
  - [12.2 Expenses Module.](#)
  - [12.3 Events Module](#)
  - [12.4 Communications Module](#)
  - [12.5 Reports Module](#)
  - [12.6 Incidents Module](#)
  - [12.7 Invoicing Module](#)
  - [12.8 Accessories](#)
- [13. Installation Study](#)

# 1. Start Menu

On entering the system you will encounter the screen shown on the following page. Here you need to enter your details supplied to you by the administrators of the monitoring system (user and password). The plants that you will be able to access will depend on the administrative rights of the user.



The image shows the login interface for the imMODo solar system. The background is a solid orange color. On the left, there is a logo consisting of a stylized orange spiral. To its right, the text "imMODo solar" is displayed in a large, white, sans-serif font. Below this, the text "Efficiency Solar Monitoring System" appears in a smaller, white, sans-serif font. The login form consists of two white input fields: the top one is labeled "User" with a small person icon, and the bottom one is labeled with a lock icon and a series of dots representing a password. Below the password field, there is a link that says "Unable to access your account?". To the right of the password field is a white button with the text "LOGIN" in orange. On the right side of the screen, there is a map of Spain with several orange circles overlaid, indicating the locations of solar installations. Below the map, the text "imMODo solar installations in Spain" is written in a small, white, sans-serif font. At the bottom of the screen, the word "experts" is written in a large, white, sans-serif font. Below it, the text "in construction, management and maintenance" is written in a smaller, white, sans-serif font. Further down, the text "solar renewable energy" is written in a large, white, sans-serif font, followed by the word "and" in a smaller, white, sans-serif font, and then "efficiency energy" in a large, white, sans-serif font. At the very bottom, there are logos for "ER" and "ENET" on the left, and links for "Contact Us", "Terms of Use", and "Privacy Policy" on the right.

**imMODo solar**  
Efficiency Solar Monitoring System

User

Unable to access your account?

LOGIN

imMODo solar installations in Spain

**experts**  
in construction, management and maintenance  
**solar renewable energy**  
and  
**efficiency energy**

ER ENET Contact Us | Terms of Use | Privacy Policy

## 2. Navigating between Solar Farms

Once you have entered the system you will see a slider type screen where you will be able to select the plant which interests you. The plant is selected by using the “Solar Farm” menu or by left or right clicking on the image or description of the plant.

On the same screen you can select the language for the application. If a default language has been set for the navigator this will be used for the whole system. If, on the other hand no language has been selected the language used will be English. In any case, in the upper right part of the screen you will be able to change the language used for any of the screens.

The “About us” tab will lead you to a corporate description of the company. By selecting the “Contact” tab you can get in contact with any of the company’s departments.

The screenshot displays the imMODo solar web application interface. At the top, the logo "imMODo solar" is accompanied by the tagline "Efficiency Solar Monitoring System". Navigation tabs include "Home", "Solar Farm", "About us", and "Contact", with a "Logout" button on the right. A language selection dropdown is set to "Choose your country | [US Flag]".

The main content area features a slider of solar farm images. The selected image shows a large array of solar panels in a desert landscape. To the right of the image, the plant name "Cuestablanca" is displayed. Below the name is an "ANALYSIS" button. A table provides detailed information about the plant:

|               |   |
|---------------|---|
| Owner         | LLANOS SOLEIL, S.L.   |
| Location      | Poligono 43, parcelas 2, 28 y 29. Poligono 41, parcelas 84 y 85. Lorca (Murcia) |
| Nominal Power | 3000 KW   |
| Peak Power    | 3648,15 KW  |
| Tracker       | TRINA 225 Wp y 230 Wp   |
| Owner         | FIJAS   |
| Inverters     | SOLARMAX 100C   |

The bottom of the interface features an orange footer bar with the imMODo solar logo, social media icons for Facebook, Twitter, and LinkedIn, and a "Contact us" link.

To enter the selected plant you should select the “Analysis” button immediately above the description of the plant.

### 3. Summary Screen.

When you enter the analysis section of the chosen plant you will be able to see the following summary screen where you see a screen like the following which will provide a concise insight into the chosen plant.



In the upper part of the screen you will see the tabs which provide direct access to the main functions of the application. In the section immediately above this you will have drop down menus which will appear according to the characteristics of the plant. For example, if the plant has trackers the menu "Tracker" will also appear although it did not appear in the previous screen shot.

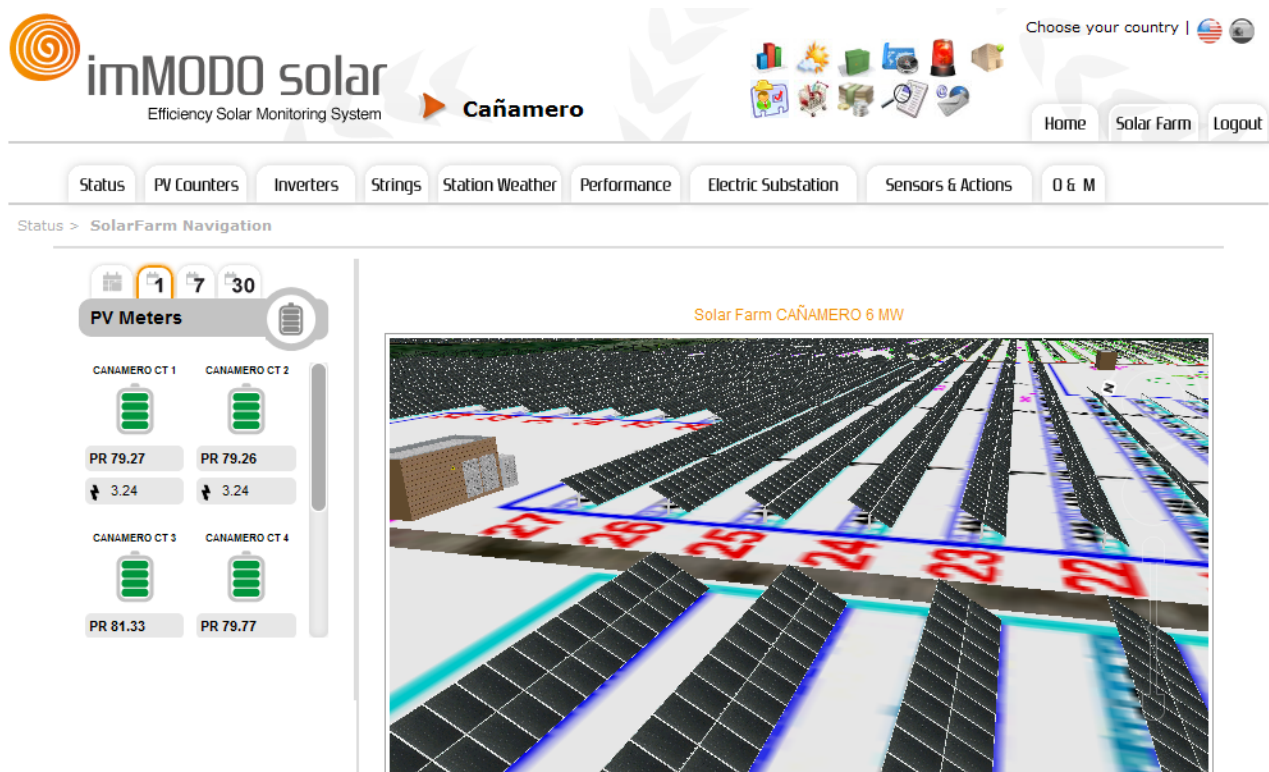
In the central part of the screen you will see a window on the left which will show the data provided by the counters in each installation of the plant. This window is divided in two tabs. You have the current tab where you can see the Performance Ratio and performance of each installation for the last hour. The colors of the icons which represent the installations varies according to the performance of the other plant's installations. On the tab labeled "1" you will be able to see the previous day's performance. On the tab labeled "7" you will be able to see the installation's performance in the last seven days. On the tab labeled "30" you will be able to see the installations' performance in the last 30 days. If the letters "NA" appear this is because the value has not been collected. In this left hand window you will also see the data of the telemetry in plant real time.

In the center right part of the screen you will be able to see a summary of the whole plant which shows the energy for the previous day, the performance ratio achieved, accumulated hours up to the present time, the performance for the previous day, CO<sub>2</sub> saved for the previous day, and the sun rise and sunset times. In addition you will be able to see a graph with the operation of the plant regarding the energy obtained in previous days, and the data received from the weather station and cameras.

## 4. Menu: Status

In this first tools menu the summary screen is found. It can be selected at any moment by choosing the option “Summary”. In addition to this screen there are various other utilities:

- Access to documents. By selecting this option you will be able to see all the plants documentation such as plans, licences etc..
- 3D Navigation. This allows you to navigate through the plant in 3D.
- Cameras. This provides Access to the plants’ cameras.



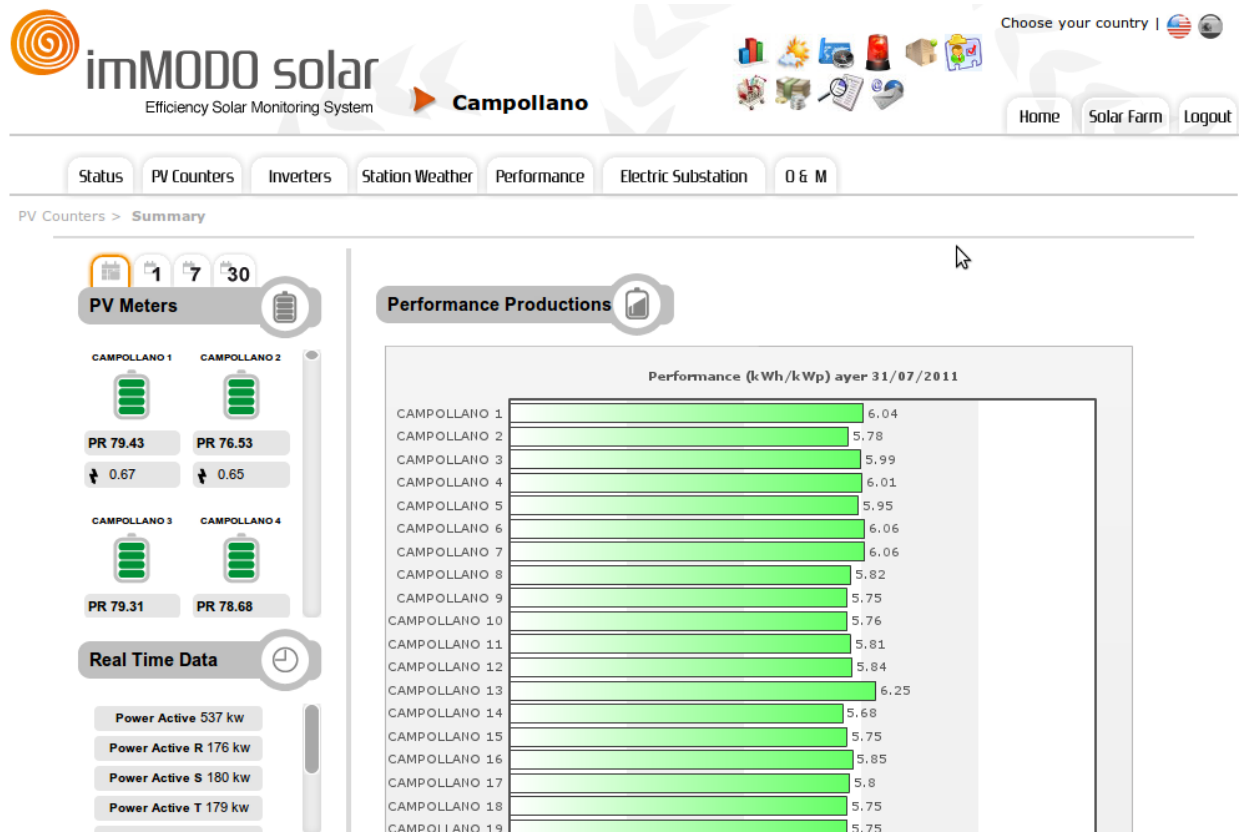
In the previous screen shot you can see the rows of modules of one of the plants.

## 5. Menu: PV Counters

In this menu various options are provided for analysis of the plant using the readings of data collected in the installations’ counters.

## 5.1 Summary

Here you will be able to see a graph with the performances of every installation for the previous day. This performance is calculated dividing the production by the peak power.

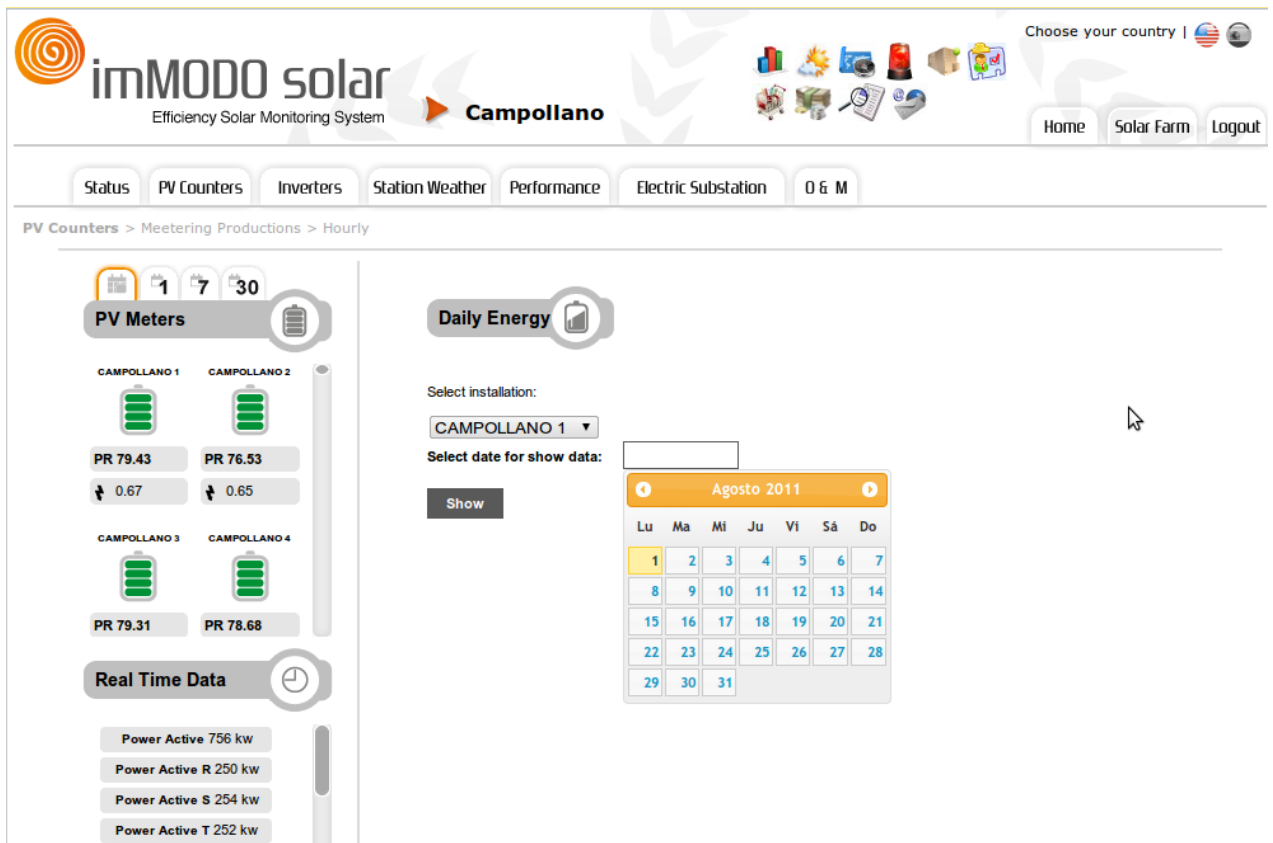


## 5.2 Meetering Production

In this menu various options will appear in the drop down menu and you will be find hourly, daily, monthly, yearly or overall data in order to be able to study each installation.

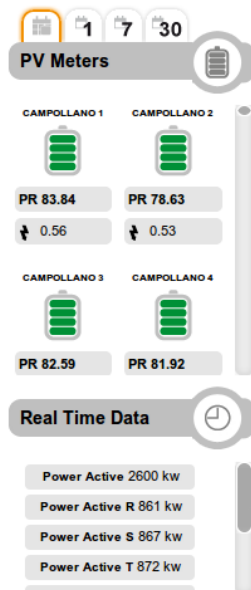
All options require you to fill out a form where you will have to choose the installation and period you wish to consult.





As you can see in the previous screen shot the installation that is being consulted is CAMPOLLANO for 1st August 2011.

PV Counters > Metering Productions > Hourly



This menu options provides you with the possibility of analyzing the Performance Ratio of the plant on a daily, or monthly basis or indeed a monthly basis detailed by day.

## 5.6 Company Counter

This menu offers options for extracting the company's counter data. It is divided into two submenus.

- Data. From this data you can extract daily, montly and annual reports.
- Audits. From this you can extract monthly or annual data identifying all tariffs

The following screen shows an excel sheet generated through one of the above options. This Excel sheet shows the billings of a company counter over the course of a year.

|    | A            | B         | C        | D      | E                | F                | G      | H             | I                            | J                            | K                           | L                           | M                   | N             | O                    | P                  |
|----|--------------|-----------|----------|--------|------------------|------------------|--------|---------------|------------------------------|------------------------------|-----------------------------|-----------------------------|---------------------|---------------|----------------------|--------------------|
| 1  | Techa inicio | Techa fin | Contract | Tariff | ActiveEnergy/Abs | ActiveEnergy/Inc | Excess | MaximumDemand | ReactiveCapacitiveEnergy/Abs | ReactiveCapacitiveEnergy/Inc | ReactiveInductiveEnergy/Abs | ReactiveInductiveEnergy/Inc | QualityActiveEnergy | QualityExcess | QualityMaximumDemand | QualityReactiveCap |
| 2  | 1/1/2010     | 1/2/2010  | 1        | 0      | 49346            | 3075             | 0      | 18            | 543500                       | 35447                        | 0                           | 0                           | 2                   | 130           | 2                    |                    |
| 3  | 1/1/2010     | 1/2/2010  | 1        | 1      | 5246             | 736              | 0      | 17            | 59189                        | 6343                         | 0                           | 0                           | 2                   | 130           | 2                    |                    |
| 4  | 1/1/2010     | 1/2/2010  | 1        | 2      | 9000             | 222              | 0      | 11            | 94576                        | 2712                         | 0                           | 0                           | 2                   | 130           | 2                    |                    |
| 5  | 1/1/2010     | 1/2/2010  | 1        | 3      | 20055            | 1031             | 0      | 6             | 222787                       | 11969                        | 0                           | 0                           | 2                   | 130           | 2                    |                    |
| 6  | 1/1/2010     | 1/2/2010  | 1        | 4      | 1208             | 0                | 0      | 0             | 13719                        | 0                            | 0                           | 0                           | 2                   | 130           | 2                    |                    |
| 7  | 1/1/2010     | 1/2/2010  | 1        | 5      | 4747             | 425              | 0      | 16            | 52147                        | 4955                         | 0                           | 0                           | 2                   | 130           | 2                    |                    |
| 8  | 1/1/2010     | 1/2/2010  | 1        | 6      | 8088             | 660              | 0      | 18            | 101079                       | 7466                         | 0                           | 0                           | 2                   | 130           | 2                    |                    |
| 9  | 1/1/2010     | 1/2/2010  | 2        | 0      | 49346            | 3075             | 0      | 18            | 543500                       | 35447                        | 0                           | 0                           | 2                   | 130           | 2                    |                    |
| 10 | 1/1/2010     | 1/2/2010  | 2        | 1      | 6462             | 799              | 0      | 16            | 74199                        | 9303                         | 0                           | 0                           | 2                   | 130           | 2                    |                    |
| 11 | 1/1/2010     | 1/2/2010  | 2        | 2      | 42863            | 2276             | 0      | 18            | 469300                       | 26143                        | 0                           | 0                           | 2                   | 130           | 2                    |                    |
| 12 | 1/1/2010     | 1/2/2010  | 3        | 0      | 6748752          | 214494           | 0      | 2601          | 209948                       | 6028                         | 320374                      | 19183                       | 2                   | 130           | 2                    |                    |
| 13 | 1/1/2010     | 1/2/2010  | 3        | 1      | 6748752          | 214494           | 0      | 2601          | 209948                       | 6028                         | 320374                      | 19183                       | 2                   | 130           | 2                    |                    |
| 14 | 1/1/2011     | 1/2/2011  | 1        | 0      | 79051            | 3064             | 0      | 19            | 685772                       | 35102                        | 1                           | 0                           | 82                  | 210           | 82                   |                    |
| 15 | 1/1/2011     | 1/2/2011  | 1        | 1      | 8844             | 747              | 0      | 18            | 99576                        | 8321                         | 0                           | 0                           | 82                  | 210           | 82                   |                    |
| 16 | 1/1/2011     | 1/2/2011  | 1        | 2      | 13887            | 244              | 0      | 6             | 150083                       | 2896                         | 0                           | 0                           | 82                  | 210           | 82                   |                    |
| 17 | 1/1/2011     | 1/2/2011  | 1        | 3      | 32382            | 1089             | 0      | 6             | 369708                       | 12566                        | 0                           | 0                           | 82                  | 210           | 82                   |                    |
| 18 | 1/1/2011     | 1/2/2011  | 1        | 4      | 1217             | 0                | 0      | 0             | 13796                        | 0                            | 0                           | 0                           | 82                  | 210           | 82                   |                    |
| 19 | 1/1/2011     | 1/2/2011  | 1        | 5      | 8036             | 392              | 0      | 15            | 89724                        | 4491                         | 0                           | 0                           | 82                  | 210           | 82                   |                    |
| 20 | 1/1/2011     | 1/2/2011  | 1        | 6      | 14682            | 592              | 0      | 19            | 166853                       | 6836                         | 0                           | 0                           | 82                  | 210           | 82                   |                    |
| 21 | 1/1/2011     | 1/2/2011  | 2        | 0      | 79051            | 3064             | 0      | 19            | 685772                       | 35102                        | 1                           | 0                           | 82                  | 210           | 82                   |                    |
| 22 | 1/1/2011     | 1/2/2011  | 2        | 1      | 10292            | 823              | 0      | 15            | 117607                       | 9310                         | 0                           | 0                           | 82                  | 210           | 82                   |                    |
| 23 | 1/1/2011     | 1/2/2011  | 2        | 2      | 68759            | 2241             | 0      | 19            | 771165                       | 25762                        | 0                           | 0                           | 82                  | 210           | 82                   |                    |
| 24 | 1/1/2011     | 1/2/2011  | 3        | 0      | 12204629         | 294221           | 0      | 2503          | 411899                       | 11464                        | 497856                      | 14851                       | 82                  | 210           | 82                   |                    |
| 25 | 1/1/2011     | 1/2/2011  | 3        | 1      | 12204629         | 294221           | 0      | 2503          | 411899                       | 11464                        | 497856                      | 14851                       | 82                  | 210           | 82                   |                    |

## 6. Menu: Inverters

This menu analyses the solar plant using inverters. Various options are provided for the analysis of such.

### 6.1 Summary

A series of graphs are shown where the power of the networks or inverter buses into which the plant is divided is recorded. These graphs help to provide an simple overview of the behavior of all the areas of the plant Here you can see the anomalies in the different areas of the plant by identifying the difference in the power curves as well as the time at which they occurred.



In the previous screen shot you can see that the networks are behaving in a similar way and no one network is working less than any other.

### 6.2 Real Time

In this menu you will see the data obtained in the last extract of the inverters of the plant. We may be talking here of a maximum time span of between 10 and 15 minutes depending on the characteristics of the plant.

The data which can be consulted in real time are those of power, energy, power performance and energy performance. The data requested will be shown in the form of a graph.

### PV Meters



### Real Time Data

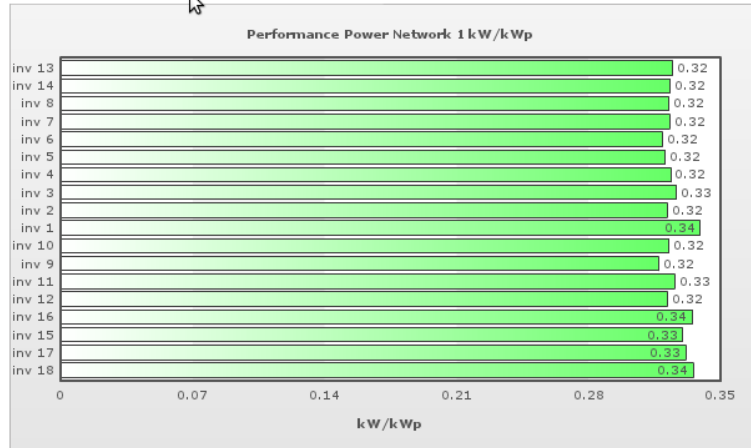
Power Active 294 kw

Power Active R 100 kw

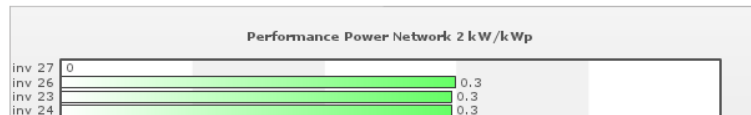
Power Active S 96 kw

Power Active T 98 kw

### Power Performance - Now



Go up



In the previous screen shot you can see that inverter 227 of the Network or Bus 2 is switched off. This error will already have been reported to the operators from the events module.

## 6.3 History

In this menu past days' data can be analyzed. The options offered for such an analysis are: Day's Energy, Month's Energy, Day to Day Energy in a Month, performance in Energy, Day's Availability and Month's Availability.


Inverters > Energy Daily


1
7
30

**PV Meters**


**INSTALACION 1**


**PR 75.59**  
 0.57

**INSTALACION 2**


**PR 73.34**  
 0.55

**INSTALACION 3**


**PR 73.8**

**INSTALACION 4**


**PR 73.76**

**Real Time Data**


Power Active 306 kw

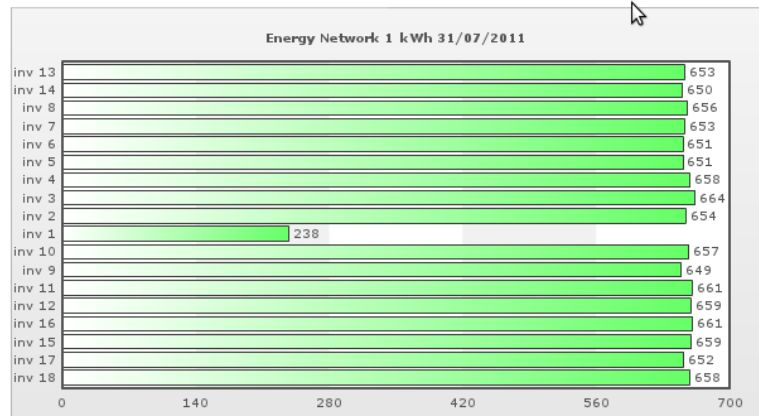
Power Active R 103 kw

Power Active S 100 kw

Power Active T 101 kw

### Energy - Daily

- Excel all data Networks
- Excel Network 1
- Excel Network 2



## 6.4 Analysis

In this menu a comparative analysis of the data from different inverters is provided. The period of time which can be selected for this analysis is: Real Time, Today and Any Other Day.

1

7

30

PV Meters

CAMPOLLANO 1

PR 96.78

0.62

CAMPOLLANO 2

PR 90.76

0.58

CAMPOLLANO 3

PR 93.91

CAMPOLLANO 4

PR 93.16

Real Time Data

Energy - Real Time Data

Select inverters. Today Data

Select individual inverters:

Inst:23-Pos:1- Inst23

Inst:23-Pos:2- Inst23

Inst:23-Pos:3- Inst23

Inst:23-Pos:4- Inst23

RED

NUMERO

POTENCIA

ENERGIADIA

Show

Select inverters of installation:

Instalacion. 23

Instalacion. 24

Instalacion. 25

Instalacion. 26

RED

NUMERO

POTENCIA

ENERGIADIA

Show

| Hora  | Identificacion | RED | NUMERO     | POTENCIA | ENERGIADIA | ENERGIATOTAL | FAC   | FEHLER | HON      | HTOTAL   | IACIST | IPV  | NETZEIN | PAC     | RISO | STATUS | UAC    | UPVIST | UPVSOLL | ZAC | Identif |
|-------|----------------|-----|------------|----------|------------|--------------|-------|--------|----------|----------|--------|------|---------|---------|------|--------|--------|--------|---------|-----|---------|
| 07:00 | Inst:23-Pos:2  | 10  | 2000475237 | 0        | 0          | 0            | 0     | 0      | 0        | 0        | 0      | 0    | 0       | 0       | 0    | 0      | 0      | 0      | 0       | 0   | Inst:23 |
| 07:15 | Inst:23-Pos:2  | 10  | 2000475237 | 0        | 0          | 26340,18     | 49,97 | 0      | 12778,81 | 12120,97 | 0      | 0    | 1276    | 0       | 3000 | 3      | 231    | 368    | 666     | 0   | Inst:23 |
| 07:30 | Inst:23-Pos:2  | 10  | 2000475237 | 0        | 0          | 26340,18     | 49,98 | 0      | 12779,07 | 12120,97 | 0      | 0    | 1276    | 0       | 3000 | 3      | 231    | 403,43 | 666     | 0   | Inst:23 |
| 07:45 | Inst:23-Pos:2  | 10  | 2000475237 | 92       | 10         | 26340,19     | 49,97 | 0      | 12779,29 | 12121,15 | 0,4    | 0,36 | 1277    | 92      | 3000 | 7      | 232,5  | 329,17 | 329,17  | 0   | Inst:23 |
| 08:00 | Inst:23-Pos:2  | 10  | 2000475237 | 164,86   | 50         | 26340,23     | 49,96 | 0      | 12779,55 | 12121,41 | 0,71   | 0,58 | 1277    | 164,86  | 3000 | 7      | 233    | 345,43 | 345,71  | 0   | Inst:23 |
| 08:15 | Inst:23-Pos:2  | 10  | 2000475237 | 232,83   | 110        | 26340,29     | 49,99 | 0      | 12779,78 | 12121,64 | 1      | 0,76 | 1277    | 232,83  | 3000 | 7      | 233,5  | 360    | 360     | 0   | Inst:23 |
| 08:30 | Inst:23-Pos:2  | 10  | 2000475237 | 326,86   | 190        | 26340,37     | 49,98 | 0      | 12780,05 | 12121,91 | 1,4    | 1,04 | 1277    | 326,86  | 3000 | 7      | 233    | 358    | 358,29  | 0   | Inst:23 |
| 08:45 | Inst:23-Pos:2  | 10  | 2000475237 | 426      | 290        | 26340,47     | 49,99 | 0      | 12780,28 | 12122,14 | 1,83   | 1,29 | 1277    | 426     | 3000 | 7      | 232,83 | 367,5  | 367,67  | 0   | Inst:23 |
| 09:00 | Inst:23-Pos:2  | 10  | 2000475237 | 759,71   | 480        | 26340,66     | 49,98 | 0      | 12780,54 | 12122,4  | 3,24   | 2,24 | 1277    | 759,71  | 3000 | 7      | 234,43 | 364,71 | 365,14  | 0   | Inst:23 |
| 09:15 | Inst:23-Pos:2  | 10  | 2000475237 | 1046,86  | 730        | 26340,91     | 49,98 | 0      | 12780,8  | 12122,66 | 4,48   | 3,01 | 1277    | 1046,86 | 3000 | 7      | 233,71 | 370,57 | 371,14  | 0   | Inst:23 |
| 09:30 | Inst:23-Pos:2  | 10  | 2000475237 | 1091,83  | 980        | 26341,16     | 49,98 | 0      | 12781,02 | 12122,88 | 4,67   | 3,3  | 1277    | 1091,83 | 3000 | 7      | 233,67 | 350,83 | 351,33  | 0   | Inst:23 |
| 09:45 | Inst:23-Pos:2  | 10  | 2000475237 | 1689,57  | 1410       | 26341,59     | 49,98 | 0      | 12781,28 | 12123,14 | 7,19   | 4,54 | 1277    | 1689,57 | 3000 | 7      | 234,86 | 392,86 | 393,14  | 0   | Inst:23 |
| 10:00 | Inst:23-Pos:2  | 10  | 2000475237 | 1987,71  | 1890       | 26342,07     | 50    | 0      | 12781,54 | 12123,4  | 8,45   | 5,29 | 1277    | 1987,71 | 3000 | 7      | 235,29 | 396    | 396,57  | 0   | Inst:23 |
| 10:15 | Inst:23-Pos:2  | 10  | 2000475237 | 2347     | 2420       | 26342,6      | 50    | 0      | 12781,77 | 12123,63 | 9,96   | 6,28 | 1277    | 2347    | 3000 | 7      | 235,67 | 392,83 | 393,17  | 0   | Inst:23 |
| 10:30 | Inst:23-Pos:2  | 10  | 2000475237 | 3588,86  | 3080       | 26343,36     | 49,98 | 0      | 12782,03 | 12123,88 | 10,06  | 7,01 | 1277    | 3588,86 | 3000 | 7      | 237,14 | 380,71 | 380,38  | 0   | Inst:23 |

In this menu you can also find the options for comparing the inverter’s power with respect to the Day’s Radiation. In this manner you can determine a possible performance drop in the inverters in the face of certain climate conditions.

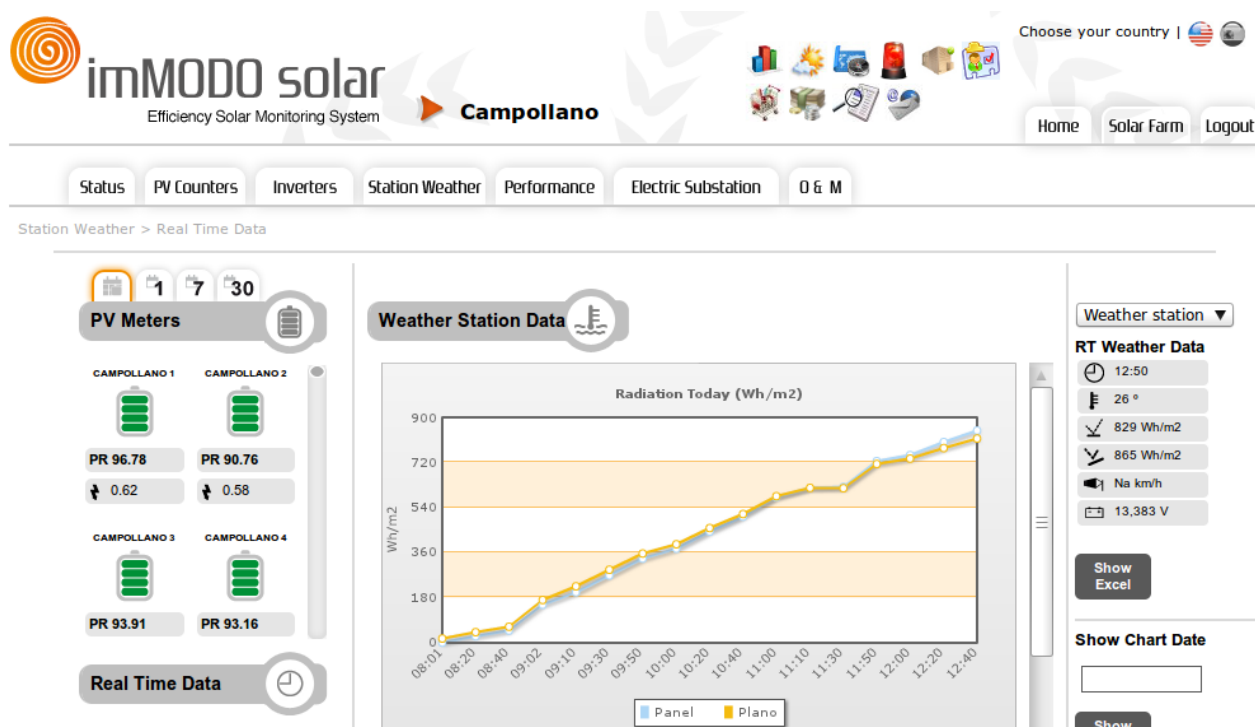
# 7. Menu: Weather Station

In this section the data from the Weather Station is analyzed both in real time and by history.

If you consult the data in real time, you will see that the central part is divided into two zones. The first shows you the graphs of the day for radiation, temperature and wind values. In these graphs you can observe the chronological changes identified by the different sensors. On the right hand side you can:

- Change the Station (in the case of having more than one per plant)
- See the current data of the Weather Station
- Access the radiation for a month in question.
- Show data for a certain day in graph form.

If you consult the historical data you can download an Excel spreadsheet by days or selected months.



In the previous screen shot you can see a consultation of the radiation obtained by a plant by the flat sensor and the sensor inclined until 12:40, the time of the last data acquisition. If you scroll down this screen you can see other graphs for temperature, wind, rainometer or any other sensor which the station has installed.

If you consult the meteorological data of the days which have passed, you can obtain the total radiation registered on that day in the upper part of the screen. This can be seen in the following screen shot.





imMODo solar  
Efficiency Solar Monitoring System



Cuestablanca



Choose your country |  

Home

Solar Farm

Logout

Status

PV Counters

Inverters

Strings

Station Weather

Performance

Electric Substation

Sensors & Actions

O & M

State

PV Meters

INSTALACION 1



PR 75.59

0.57

INSTALACION 2



PR 73.34

0.55

INSTALACION 3



PR 73.8

INSTALACION 4



PR 73.76

Real Time Data

Power Active 454 kw

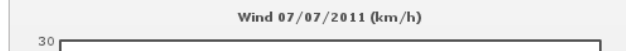
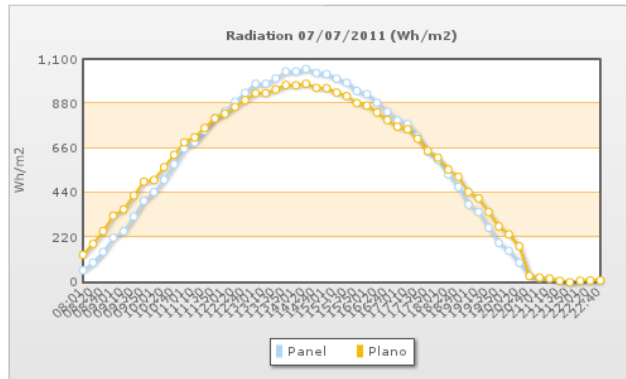
Power Active R 152 kw

Power Active S 149 kw

Power Active T 151 kw

Weather Station Data

• Radiation day: 8129 Wm2



RT Weather Data

18:40

28 °

297 Wh/m2

281 Wh/m2

17 km/h

13,375 V

Show

Excel

Show Chart Date

Show

## 8. Menu: Performance

In this option of the application you can analyze the plant's performance, comparing data by module, invertir and tracker type if they are different.

All these comparisons can be made in different periods, such as seperate days, months and years. In addition to this comparisons can be drawn regarding absolute energy or energies divided by peak power.

On the following screen shot you can see the form used to configure a personalized analysis.

The screenshot displays the 'imMODo solar' web application interface. The header includes the logo, 'Efficiency Solar Monitoring System', and the name 'Campollano'. Navigation links for 'Home', 'Solar Farm', and 'Logout' are present. A secondary navigation bar contains tabs for 'Status', 'PV Counters', 'Inverters', 'Station Weather', 'Performance' (which is active), 'Electric Substation', and 'O & M'. Below this, a breadcrumb trail reads 'Performance > Energy/Peak Power > Daily'. The main content area is split into two panels. The left panel, titled 'PV Meters', shows four sub-panels for 'CAMPOLLANO 1' through '4', each with a battery icon, a 'PR' value (96.78, 90.76, 93.91, 93.16), and a small icon with a value (0.62, 0.58). A 'Real Time Data' button is at the bottom. The right panel, titled 'Energy/Peak Power Daily', contains a 'Select the parameters to obtain performance' section with dropdown menus for 'Module Type', 'Inverter Type', and 'Tracker Type', all set to 'all'. It also has a 'Select Date for Show Data' input field and a 'Percent of Deviation' set to '5%'. A 'Show' button is at the bottom of this panel.

Once the performance study has been configured you will see a screen such as the following.



### PV Meters



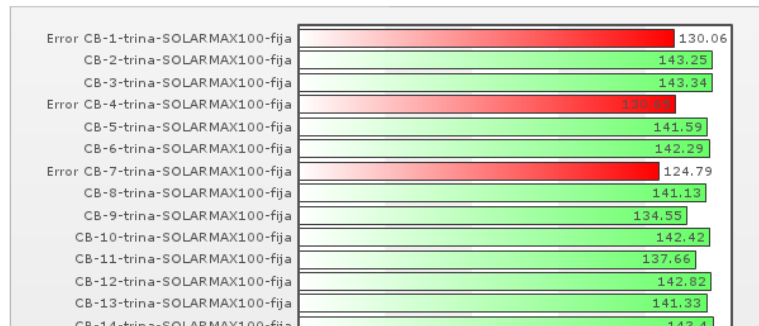
### Real Time Data

Power Active 308 kw  
Power Active R 104 kw  
Power Active S 102 kw  
Power Active T 102 kw

### Energy/Peak Power Monthly

#### Performance 02/2011 cuestablanca

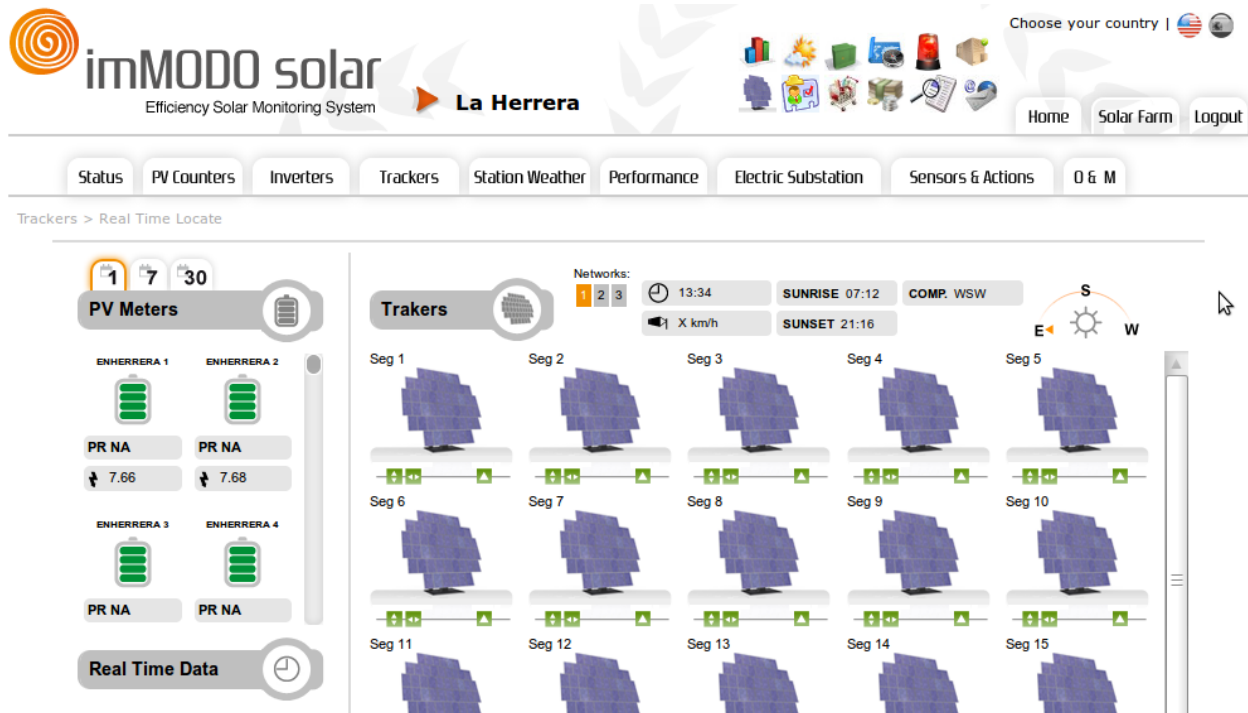
- [Excel File](#)
- Performance Average: 139.39
- Performance Limit: 132.42
- Deviation: 5 %
- Inverter Type: all
- Tracker Type: all
- Module Type: all



As you can see, there are installations which are 5% below the performance of the rest in the month of February. Now you would have to use the analysis tools to be able to determine what is happening in these installations. The analysis tools will be explained later in this manual.

## 9. Menu: Trackers

This section will only be able to be accessed in those plants which have trackers. You are able to consult the position in real time of any of those through the screen “Real Time”.



If the plant has more than one zone of trackers you will be able to change between them in the Networks Section which is just above the trackers.

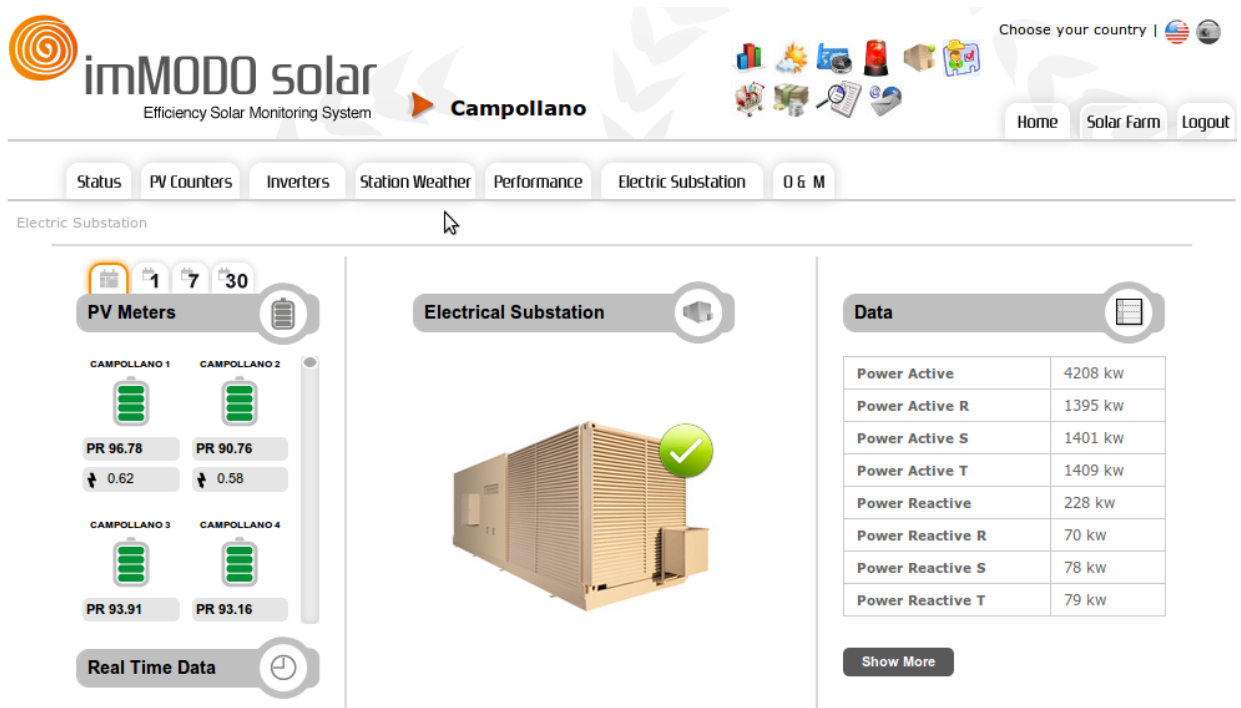
In addition, you can download all the historical data from one day or one month about each minute's position of the trackers.

|    | A          | B   | C     | D     | E          | F       | G     | H          | I       | J          | K          | L      | M          | N          | O      | P          | Q          | R      | S          | T          | U      | V          | W          | X      | Y          | Z          | AA     | AB         | AC         | AD     | AE         | AF         | AG    |            |            |
|----|------------|-----|-------|-------|------------|---------|-------|------------|---------|------------|------------|--------|------------|------------|--------|------------|------------|--------|------------|------------|--------|------------|------------|--------|------------|------------|--------|------------|------------|--------|------------|------------|-------|------------|------------|
| 22 | "05:14.00" | REF | "0"   | "0"   | "05:14.00" | "0"     | "0"   | "05:14.00" | "0"     | "05:14.00" | 2°-21°     | "0"    | "05:14.00" | 3°-0°      | "0"    | "05:14.00" | 4°-0°      | "0"    | "05:14.00" | 5°-0°      | "0"    | "05:14.00" | 6°-0°      | "0"    | "05:14.00" | 7°-0°      | "0"    | "05:14.00" | 8°-0°      | "0"    | "05:14.00" | 9°-0°      | "0"   | "05:14.00" |            |
| 23 | "05:29.00" | REF | "0"   | "0"   | "05:29.00" | "0"     | "0"   | "05:29.00" | "0"     | "05:29.00" | 2°-21°     | "0"    | "05:29.00" | 3°-0°      | "0"    | "05:29.00" | 4°-0°      | "0"    | "05:29.00" | 5°-0°      | "0"    | "05:29.00" | 6°-0°      | "0"    | "05:29.00" | 7°-0°      | "0"    | "05:29.00" | 8°-0°      | "0"    | "05:29.00" | 9°-0°      | "0"   | "05:29.00" |            |
| 24 | "05:44.00" | REF | "0"   | "0"   | "05:44.00" | "0"     | "0"   | "05:44.00" | "0"     | "05:44.00" | 2°-11°     | "0"    | "05:44.00" | 3°-0°      | "0"    | "05:44.00" | 4°-0°      | "0"    | "05:44.00" | 5°-0°      | "0"    | "05:44.00" | 6°-0°      | "0"    | "05:44.00" | 7°-0°      | "0"    | "05:44.00" | 8°-0°      | "0"    | "05:44.00" | 9°-0°      | "0"   | "05:44.00" |            |
| 25 | "05:59.00" | REF | "0"   | "0"   | "05:59.00" | "0"     | "0"   | "05:59.00" | "0"     | "05:59.00" | 2°-11°     | "0"    | "05:59.00" | 3°-0°      | "0"    | "05:59.00" | 4°-0°      | "0"    | "05:59.00" | 5°-0°      | "0"    | "05:59.00" | 6°-0°      | "0"    | "05:59.00" | 7°-0°      | "0"    | "05:59.00" | 8°-0°      | "0"    | "05:59.00" | 9°-0°      | "0"   | "05:59.00" |            |
| 26 | "06:14.00" | REF | "0"   | "0"   | "06:14.00" | "0"     | "0"   | "06:14.00" | "0"     | "06:14.00" | 2°-21°     | "0"    | "06:14.00" | 3°-0°      | "0"    | "06:14.00" | 4°-0°      | "0"    | "06:14.00" | 5°-0°      | "0"    | "06:14.00" | 6°-0°      | "0"    | "06:14.00" | 7°-0°      | "0"    | "06:14.00" | 8°-0°      | "0"    | "06:14.00" | 9°-0°      | "0"   | "06:14.00" |            |
| 27 | "06:29.00" | REF | "0"   | "0"   | "06:29.00" | "0"     | "0"   | "06:29.00" | "0"     | "06:29.00" | 2°-21°     | "0"    | "06:29.00" | 3°-0°      | "0"    | "06:29.00" | 4°-0°      | "0"    | "06:29.00" | 5°-0°      | "0"    | "06:29.00" | 6°-0°      | "0"    | "06:29.00" | 7°-11°     | "0"    | "06:29.00" | 8°-0°      | "0"    | "06:29.00" | 9°-0°      | "0"   | "06:29.00" |            |
| 28 | "06:44.00" | REF | "0"   | "0"   | "06:44.00" | "0"     | "0"   | "06:44.00" | "0"     | "06:44.00" | 2°-21°     | "0"    | "06:44.00" | 3°-0°      | "0"    | "06:44.00" | 4°-0°      | "0"    | "06:44.00" | 5°-0°      | "0"    | "06:44.00" | 6°-0°      | "0"    | "06:44.00" | 7°-11°     | "0"    | "06:44.00" | 8°-0°      | "0"    | "06:44.00" | 9°-0°      | "0"   | "06:44.00" |            |
| 29 | "06:59.00" | REF | "0"   | "0"   | "06:59.00" | "0"     | "0"   | "06:59.00" | "0"     | "06:59.00" | 2°-21°     | "0"    | "06:59.00" | 3°-0°      | "0"    | "06:59.00" | 4°-0°      | "0"    | "06:59.00" | 5°-0°      | "0"    | "06:59.00" | 6°-0°      | "0"    | "06:59.00" | 7°-0°      | "0"    | "06:59.00" | 8°-0°      | "0"    | "06:59.00" | 9°-0°      | "0"   | "06:59.00" |            |
| 30 | "06:55.00" | REF | "0"   | "0"   | "06:55.00" | "0"     | "0"   | "06:55.00" | "0"     | "06:55.00" | 2°-21°     | "0"    | "06:55.00" | 3°-0°      | "0"    | "06:55.00" | 4°-0°      | "0"    | "06:55.00" | 5°-0°      | "0"    | "06:55.00" | 6°-0°      | "0"    | "06:55.00" | 7°-0°      | "0"    | "06:55.00" | 8°-0°      | "0"    | "06:55.00" | 9°-0°      | "0"   | "06:55.00" |            |
| 31 | "07:29.00" | REF | "-13" | "8"   | "07:29.00" | "1°-3"  | "9"   | "07:29.00" | "1°-3"  | "9"        | 2°-21°     | "6"    | "07:29.00" | 3°-16°     | "0"    | "07:29.00" | 4°-2"      | "-11"  | "07:29.00" | 5°-1"      | "6"    | "07:29.00" | 6°-13°     | "3"    | "07:29.00" | 7°-2"      | "6"    | "07:29.00" | 8°-13°     | "10"   | "07:29.00" | 9°-0°      | "0"   | "07:29.00" |            |
| 32 | "07:44.00" | REF | "-3"  | "18"  | "07:44.00" | "1°-3"  | "14"  | "07:44.00" | "2°-3"  | "19"       | "07:44.00" | 3°-4"  | "16"       | "07:44.00" | 3°-4"  | "16"       | "07:44.00" | 4°-4"  | "19"       | "07:44.00" | 5°-4"  | "16"       | "07:44.00" | 6°-3"  | "19"       | "07:44.00" | 7°-4"  | "16"       | "07:44.00" | 8°-4"  | "16"       | "07:44.00" | 9°-0° | "0"        | "07:44.00" |
| 33 | "07:59.00" | REF | "-6"  | "19"  | "07:59.00" | "1°-9"  | "19"  | "07:59.00" | "2°-6"  | "19"       | "07:59.00" | 3°-6"  | "14"       | "07:59.00" | 3°-6"  | "14"       | "07:59.00" | 4°-6"  | "19"       | "07:59.00" | 5°-6"  | "16"       | "07:59.00" | 6°-7"  | "14"       | "07:59.00" | 7°-5"  | "16"       | "07:59.00" | 8°-7"  | "16"       | "07:59.00" | 9°-0° | "0"        | "07:59.00" |
| 34 | "08:14.00" | REF | "-9"  | "13"  | "08:14.00" | "1°-9"  | "12"  | "08:14.00" | "2°-10" | "11"       | "08:14.00" | 3°-10" | "12"       | "08:14.00" | 3°-10" | "12"       | "08:14.00" | 4°-9"  | "12"       | "08:14.00" | 5°-10" | "10"       | "08:14.00" | 6°-9"  | "12"       | "08:14.00" | 7°-10" | "11"       | "08:14.00" | 8°-9"  | "12"       | "08:14.00" | 9°-0° | "0"        | "08:14.00" |
| 35 | "08:29.00" | REF | "-12" | "10"  | "08:29.00" | "1°-14" | "10"  | "08:29.00" | "2°-12" | "11"       | "08:29.00" | 3°-12" | "11"       | "08:29.00" | 3°-12" | "11"       | "08:29.00" | 4°-12" | "11"       | "08:29.00" | 5°-12" | "10"       | "08:29.00" | 6°-13" | "10"       | "08:29.00" | 7°-12" | "11"       | "08:29.00" | 8°-13" | "10"       | "08:29.00" | 9°-0° | "0"        | "08:29.00" |
| 36 | "08:44.00" | REF | "-16" | "8"   | "08:44.00" | "1°-19" | "8"   | "08:44.00" | "2°-16" | "8"        | "08:44.00" | 3°-16" | "8"        | "08:44.00" | 3°-16" | "8"        | "08:44.00" | 4°-16" | "8"        | "08:44.00" | 5°-16" | "8"        | "08:44.00" | 6°-19" | "8"        | "08:44.00" | 7°-19" | "8"        | "08:44.00" | 8°-19" | "8"        | "08:44.00" | 9°-0° | "0"        | "08:44.00" |
| 37 | "08:59.00" | REF | "-19" | "8"   | "08:59.00" | "1°-45" | "8"   | "08:59.00" | "2°-19" | "8"        | "08:59.00" | 3°-27" | "8"        | "08:59.00" | 3°-27" | "8"        | "08:59.00" | 4°-20" | "4"        | "08:59.00" | 5°-20" | "4"        | "08:59.00" | 6°-19" | "8"        | "08:59.00" | 7°-20" | "4"        | "08:59.00" | 8°-19" | "8"        | "08:59.00" | 9°-0° | "0"        | "08:59.00" |
| 38 | "09:14.00" | REF | "-23" | "4"   | "09:14.00" | "1°-23" | "3"   | "09:14.00" | "2°-22" | "3"        | "09:14.00" | 3°-23" | "3"        | "09:14.00" | 3°-23" | "3"        | "09:14.00" | 4°-23" | "4"        | "09:14.00" | 5°-24" | "2"        | "09:14.00" | 6°-23" | "4"        | "09:14.00" | 7°-20" | "2"        | "09:14.00" | 8°-23" | "4"        | "09:14.00" | 9°-0° | "0"        | "09:14.00" |
| 39 | "09:29.00" | REF | "-28" | "2"   | "09:29.00" | "1°-29" | "1"   | "09:29.00" | "2°-28" | "2"        | "09:29.00" | 3°-27" | "1"        | "09:29.00" | 3°-27" | "1"        | "09:29.00" | 4°-27" | "1"        | "09:29.00" | 5°-28" | "1"        | "09:29.00" | 6°-30" | "9"        | "09:29.00" | 7°-27" | "0"        | "09:29.00" | 8°-30" | "9"        | "09:29.00" | 9°-0° | "0"        | "09:29.00" |
| 40 | "09:44.00" | REF | "-34" | "0"   | "09:44.00" | "1°-32" | "0"   | "09:44.00" | "2°-33" | "0"        | "09:44.00" | 3°-34" | "0"        | "09:44.00" | 3°-34" | "0"        | "09:44.00" | 4°-34" | "0"        | "09:44.00" | 5°-34" | "0"        | "09:44.00" | 6°-33" | "0"        | "09:44.00" | 7°-32" | "0"        | "09:44.00" | 8°-33" | "0"        | "09:44.00" | 9°-0° | "0"        | "09:44.00" |
| 41 | "09:59.00" | REF | "-42" | "-1"  | "09:59.00" | "1°-40" | "-2"  | "09:59.00" | "2°-41" | "-2"       | "09:59.00" | 3°-41" | "-2"       | "09:59.00" | 3°-41" | "-2"       | "09:59.00" | 4°-42" | "0"        | "09:59.00" | 5°-42" | "0"        | "09:59.00" | 6°-42" | "0"        | "09:59.00" | 7°-40" | "0"        | "09:59.00" | 8°-42" | "0"        | "09:59.00" | 9°-0° | "0"        | "09:59.00" |
| 42 | "10:14.00" | REF | "-43" | "-2"  | "10:14.00" | "1°-49" | "-2"  | "10:14.00" | "2°-43" | "-2"       | "10:14.00" | 3°-47" | "-2"       | "10:14.00" | 3°-47" | "-2"       | "10:14.00" | 4°-43" | "-11"      | "10:14.00" | 5°-44" | "-3"       | "10:14.00" | 6°-47" | "-2"       | "10:14.00" | 7°-43" | "-19"      | "10:14.00" | 8°-47" | "-2"       | "10:14.00" | 9°-0° | "0"        | "10:14.00" |
| 43 | "10:29.00" | REF | "-43" | "-3"  | "10:29.00" | "1°-44" | "-4"  | "10:29.00" | "2°-43" | "-4"       | "10:29.00" | 3°-48" | "-4"       | "10:29.00" | 3°-48" | "-4"       | "10:29.00" | 4°-43" | "-3"       | "10:29.00" | 5°-43" | "-3"       | "10:29.00" | 6°-47" | "-4"       | "10:29.00" | 7°-43" | "-19"      | "10:29.00" | 8°-47" | "-4"       | "10:29.00" | 9°-0° | "0"        | "10:29.00" |
| 44 | "10:44.00" | REF | "-43" | "-9"  | "10:44.00" | "1°-44" | "-4"  | "10:44.00" | "2°-43" | "-4"       | "10:44.00" | 3°-48" | "-4"       | "10:44.00" | 3°-48" | "-4"       | "10:44.00" | 4°-43" | "-9"       | "10:44.00" | 5°-43" | "-9"       | "10:44.00" | 6°-49" | "-10"      | "10:44.00" | 7°-43" | "-9"       | "10:44.00" | 8°-49" | "-10"      | "10:44.00" | 9°-0° | "0"        | "10:44.00" |
| 45 | "10:59.00" | REF | "-43" | "-6"  | "10:59.00" | "1°-44" | "-6"  | "10:59.00" | "2°-43" | "-6"       | "10:59.00" | 3°-45" | "-10"      | "10:59.00" | 3°-45" | "-10"      | "10:59.00" | 4°-43" | "-3"       | "10:59.00" | 5°-43" | "-8"       | "10:59.00" | 6°-47" | "-6"       | "10:59.00" | 7°-43" | "-7"       | "10:59.00" | 8°-47" | "-6"       | "10:59.00" | 9°-0° | "0"        | "10:59.00" |
| 46 | "11:14.00" | REF | "-42" | "-7"  | "11:14.00" | "1°-42" | "-8"  | "11:14.00" | "2°-43" | "-8"       | "11:14.00" | 3°-44" | "-4"       | "11:14.00" | 3°-44" | "-4"       | "11:14.00" | 4°-43" | "-7"       | "11:14.00" | 5°-43" | "-8"       | "11:14.00" | 6°-42" | "-8"       | "11:14.00" | 7°-43" | "-8"       | "11:14.00" | 8°-42" | "-8"       | "11:14.00" | 9°-0° | "0"        | "11:14.00" |
| 47 | "11:29.00" | REF | "-38" | "-9"  | "11:29.00" | "1°-40" | "-10" | "11:29.00" | "2°-40" | "0"        | "11:29.00" | 3°-40" | "-10"      | "11:29.00" | 3°-40" | "-10"      | "11:29.00" | 4°-41" | "-9"       | "11:29.00" | 5°-41" | "-9"       | "11:29.00" | 6°-40" | "-10"      | "11:29.00" | 7°-40" | "-9"       | "11:29.00" | 8°-40" | "-10"      | "11:29.00" | 9°-0° | "0"        | "11:29.00" |
| 48 | "11:44.00" | REF | "-36" | "-10" | "11:44.00" | "1°-38" | "-10" | "11:44.00" | "2°-38" | "-16"      | "11:44.00" | 3°-38" | "-13"      | "11:44.00" | 3°-38" | "-13"      | "11:44.00" | 4°-36" | "-9"       | "11:44.00" | 5°-38" | "-11"      | "11:44.00" | 6°-38" | "-19"      | "11:44.00" | 7°-38" | "-9"       | "11:44.00" | 8°-38" | "-19"      | "11:44.00" | 9°-0° | "0"        | "11:44.00" |
| 49 | "11:59.00" | REF | "-33" | "-12" | "11:59.00" | "1°-34" | "-13" | "11:59.00" | "2°-39" | "-11"      | "11:59.00" | 3°-43" | "-11"      | "11:59.00" | 3°-43" | "-11"      | "11:59.00" | 4°-30" | "-12"      | "11:59.00" | 5°-36" | "-11"      | "11:59.00" | 6°-45" | "-11"      | "11:59.00" | 7°-48" | "-16"      | "11:59.00" | 8°-48" | "-16"      | "11:59.00" | 9°-0° | "0"        | "11:59.00" |
| 50 | "12:14.00" | REF | "-30" | "-13" | "12:14.00" | "1°-30" | "-13" | "12:14.00" | "2°-39" | "-13"      | "12:14.00" | 3°-30" | "-11"      | "12:14.00" | 3°-30" | "-11"      | "12:14.00" | 4°-31" | "-13"      | "12:14.00" | 5°-30" | "-13"      | "12:14.00" | 6°-30" | "-12"      | "12:14.00" | 7°-30" | "-13"      | "12:14.00" | 8°-30" | "-13"      | "12:14.00" | 9°-0° | "0"        | "12:14.00" |
| 51 | "12:29.00" | REF | "-28" | "-15" | "12:29.00" | "1°-28" | "-16" | "12:29.00" | "2°-38" | "-15"      | "12:29.00" | 3°-28" | "-15"      | "12:29.00" | 3°-28" | "-15"      | "12:29.00" | 4°-30" | "-16"      | "12:29.00" | 5°-28" | "-16"      | "12:29.00" | 6°-28" | "-15"      | "12:29.00" | 7°-28" | "-16"      | "12:29.00" | 8°-28" | "-16"      | "12:29.00" | 9°-0° | "0"        | "12:29.00" |
| 52 | "12:44.00" | REF | "-23" | "-16" | "12:44.00" | "1°-26" | "-16" | "12:44.00" | "2°-26" | "-16"      | "12:44.00" | 3°-26" | "-16"      | "12:44.00" | 3°-26" | "-16"      | "12:44.00" | 4°-23" | "-16"      | "12:44.00" | 5°-23" | "-17"      | "12:44.00" | 6°-26" | "-17"      | "12:44.00" | 7°-26" | "-16"      | "12:44.00" | 8°-26" | "-16"      | "12:44.00" | 9°-0° | "0"        | "12:44.00" |
| 53 | "12:59.00" | REF | "-19" | "-17" | "12:59.00" | "1°-20" | "-16" | "12:59.00" | "2°-20" | "-17"      | "12:59.00" | 3°-20" | "-16"      | "12:59.00" | 3°-20" | "-16"      | "12:59.00" | 4°-19" | "-16"      | "12:59.00" | 5°-19" | "-17"      | "12:59.00" | 6°-20" | "-16"      | "12:59.00" | 7°-20" | "-16"      | "12:59.00" | 8°-20" | "-16"      | "12:59.00" | 9°-0° | "0"        | "12:59.00" |
| 54 | "13:14.00" | REF | "-15" | "-18" | "13:14.00" | "1°-16" | "-19" | "13:14.00" | "2°-16" | "-18"      | "13:14.00" | 3°-16" | "-18"      | "13:14.00" | 3°-16" | "-18"      | "13:14.00" | 4°-15" | "-20"      | "13:14.00" | 5°-15" | "-20"      | "13:14.00" | 6°-16" | "-18"      | "13:14.00" | 7°-16" | "-20"      | "13:14.00" | 8°-16" | "-18"      | "13:14.00" | 9°-0° | "0"        | "13:14.00" |
| 55 | "13:29.00" | REF | "-11" | "-19" | "13:29.00" | "1°-12" | "-20" | "13:29.00" | "2°-12" | "-20"      | "13:29.00" | 3°-12" | "-20"      | "13:29.00" | 3°-12" | "-20"      | "13:29.00" | 4°-11" | "-21"      | "13:29.00" | 5°-11" | "-20"      | "13:29.00" | 6°-11" | "-19"      | "13:29.00" | 7°-12" | "-22"      | "13:29.00" | 8°-11" | "-19"      | "13:29.00" | 9°-0° | "0"        | "13:29.00" |
| 56 | "13:44.00" | REF | "-7"  | "-19" | "13:44.00" | "1°-8"  | "-20" | "13:44.00" | "2°-8"  | "-20"      | "13:44.00" | 3°-8"  | "-20"      | "13:44.00" | 3°-8"  | "-20"      | "13:44.00" | 4°-10" | "-20"      | "13:44.00" | 5°-10" | "-19"      | "13:44     |        |            |            |        |            |            |        |            |            |       |            |            |

## 10. Menu: Electric Substation

This utility allows you to monitor many parameters of the electric substation of a plant. In the screen shot you can see how the substation is working and in a box on the right you are shown data in real time which it provides.

Any type of performance or relay can be activated or visualized using this tool.

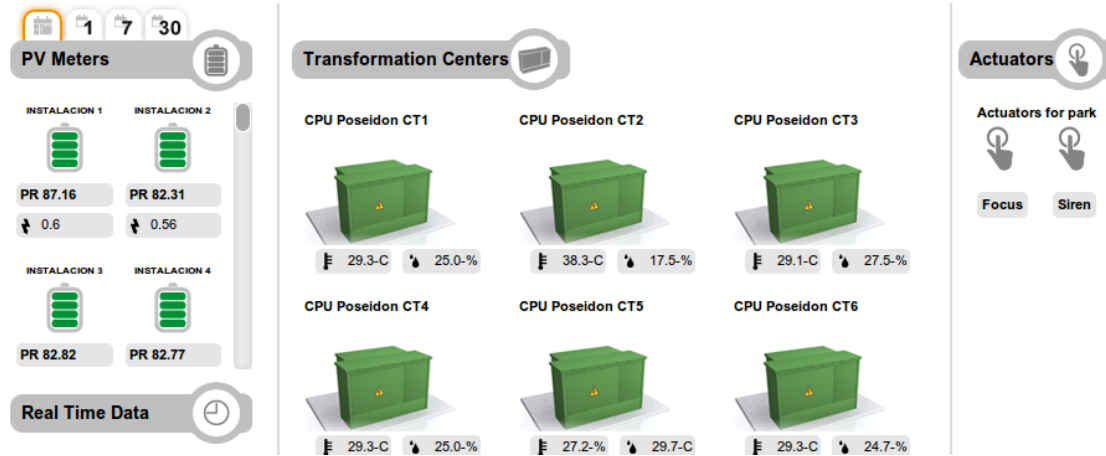


Monitoring this station allows you to detect any fault within it, which could mean important financial savings for the company.

## 11. Menu: Sensors & Actions

This tool allows you to analyze the installed sensors in the transformer centers of the plant, as well as interact with the plant by remote. For example you can establish the temperature and humidity of each center, and thus know if the door is open or closed or if there is smoke in any of them.

### Transformation Centers



As you can see in the right hand part of the screen, it allows you to act on relays which offer different functions. For example in the image you can switch on the plant's flood lights and siren. This screen is completely configurable according to what you have installed in the plant.

As in the former tools you can consult the history of the values provided by the sensors over the course of a given day. This allows you to analyze different situations in a plant, for example, when and how long each transformer center has been open.

## 12. Menu: Operation y Maintenance

In this menu various modules have been added to facilitate the task of operating and maintaining said departments. Each of its submenus corresponds to a different module which will now be explained.

### 12.1 Stock Module

In this menu you can maintain total control over the material which enters and leaves the warehouse. It has a screen for stock summary which offers a table with all the products which you have registered in the warehouse, their current quantity, their minimum quantity (below which a warning message will be sent to the person responsible), the person responsible for the product and its management, the units which have been consumed and their approximate price.

The screenshot displays the imMODo solar Efficiency Solar Monitoring System interface. The top navigation bar includes the logo, user name 'La Herrera', and a 'Choose your country' dropdown. Below this is a menu bar with options: Status, PV Counters, Inverters, Trackers, Station Weather, Performance, Electric Substation, Sensors & Actions, and O & M. The main content area is titled 'Stock > Summary'. On the left, there are sections for 'PV Meters' (showing four meters with status indicators and PR NA values) and 'Real Time Data' (showing power active for different components). The central 'Stock Summary' section features a table with columns: Name, Description, Amount, Minimum Amount, Spent Balance, Prices, and Respon. The table lists two items: 'Conversor RS485/Eth' and 'Crimpadora'. Below the table, there are pagination controls showing 'Showing 1 to 2 of 2 entries' and buttons for 'First', 'Previous', '1', 'Next', and 'Last'.

| Name                | Description  | Amount | Minimum Amount | Spent Balance | Prices | Respon                        |
|---------------------|--|--------|----------------|---------------|--------|-------------------------------|
| Conversor RS485/Eth | Conversor usado en las TTR   | 11     | 2              | 0             | 150    | jesus.vergara@immodosolar.com |
| Crimpadora          | Herramienta para crimpar las conexiones RJ45 de las comunicaciones de los parques. | 2      | 1              | 11            | 13     | agonzalez@immodo.org          |

The table allows you to order the objects by any column. In addition this table can be consulted by page number and allows a product search by key word.

As in the whole application, this table can be downloaded into Excel or PDF so it can be printed or sent by E mail.



The stock module allows you to list the product which are found in a critical situation as regards their quantity in stock, i.e those product which fall below the defined minimum. .

You can register new products which did not formerly exist by filling out the following form.

imMODo solar  
Efficiency Solar Monitoring System

La Herrera

Choose your country |

Home Solar Farm Logout

Status PV Counters Inverters Trackers Station Weather Performance Electric Substation Sensors & Actions O & M

Stock List

**PV Meters**

1 7 30

ENHERRERA 1 ENHERRERA 2

PR NA PR NA

7.66 7.68

ENHERRERA 3 ENHERRERA 4

PR NA PR NA

**Real Time Data**

Power Active 1084 kw

Power Active R 365 kw

Power Active S 359 kw

Power Active T 360 kw

**Add Product**

Name:

Description:

Amount:

Minimum Amount:

Prices:

Responsible:  (email)

Add Product

In addition you can add units to already existent products, remove units (showing the reason and the person responsible for such action) and extract reports for a period of time or a product for which a consumer study is required.

## 12.2 Expenses Module.

This module allows you to control the expenses assigned to the installations which are being maintained. You can see a screen like the following where a summary of the expenses is shown.

1730

PV Meters

ENHERRERA 1

ENHERRERA 2

PR NA

PR NA

7.66

7.68

ENHERRERA 3

ENHERRERA 4

PR NA

PR NA

Real Time Data

Power Active 966 kw

Power Active R 325 kw

Power Active S 320 kw

Power Active T 321 kw

### Expensives Summary

Show 10 entries

Search:

| Date       | Solarfarm | Installation | Provider    | Bill | Amount | Summary                        |  |  |
|------------|-----------|--------------|-------------|------|--------|--------------------------------|--|--|
| 2010-09-13 | HSG       | GARCIA 52    | Juan Miguel | 123  | 14.89  | Desbroce + Hervicida           |  |  |
| 2010-09-14 | HSG       | GARCIA 52    | ABM         | 23   | 21.56  | TTR installation               |  |  |
| 2011-02-07 | Olmeda    | Prueba 03    | ABM         | 132  | 1456   | Averia en modems de telemedida |  |  |
| 2011-06-27 | MINAYA    | MINAYA 1     | ABM         | 1234 | 23     | Prueba                         |  |  |

Date

Solarfarm

Installation

Provider

Bill

Amount

Summary

Showing 1 to 4 of 4 entries

First

Previous

1

Next

Last

As you can see the table has the same format as that of the former module but with columns related to expenses. In these expenses you have the date of the expense, the plant, the installation to which the expense is attributed, the supplier, the invoice, the amount, and the description. In addition you can edit and delete each of these expenses with the buttons at the end of each line. Once again this can be exported to Excel or PDF using the buttons at the top right of the screen.

The table can once again be ordered by each column and allows you to search the tables for a certain word.

In this module you can create new suppliers or new expenses, as well as extract reports on general expenses, by period or related to a certain supplier or particular installation.

## 12.3 Events Module

This is one of the most important modules of the system, given that in it you can control all the plants which you have in the application. The errors or alarms which occur in all of such plants are recorded and managed in this module.

1730

PV Meters

ENHERRERA 1

ENHERRERA 2

PR NA

PR NA

7.66

7.68

ENHERRERA 3

ENHERRERA 4

PR NA

PR NA

Real Time Data

Power Active 701 kw

Power Active R 235 kw

Power Active S 232 kw

Power Active T 233 kw

Events List

Actions
Select Action

Show
10
entries

Search:

| Description                 | Park      | Ins | Net | Number     | Hour     | Day      |  |
|-----------------------------|-----------|-----|-----|------------|----------|----------|--|
| Inverter off: CC-06 - Fil.A | CARACOLES | 6   | 1   | 5          | 18:30:12 | 11-08-01 |  |
| Inverter off: CC-06 - Fil.B | CARACOLES | 8   | 1   | 12         | 18:30:12 | 11-08-01 |  |
| Inverter off: CC-11 - Fil.C | CARACOLES | 11  | 1   | 13         | 18:30:12 | 11-08-01 |  |
| Inverter off: CC-11 - Fil.C | CARACOLES | 11  | 1   | 14         | 19:00:13 | 11-08-01 |  |
| Inverter off: CC-13 - Fil.D | CARACOLES | 13  | 1   | 20         | 13:00:17 | 11-08-01 |  |
| Inverter off: ED-31         | EDUARDO   | 31  | 2   | 15         | 19:00:16 | 11-08-01 |  |
| Inverter off: ED-31         | EDUARDO   | 31  | 2   | 16         | 19:00:16 | 11-08-01 |  |
| Inverter off: ED-36         | EDUARDO   | 36  | 2   | 17         | 19:00:16 | 11-08-01 |  |
| Inverter off: ED-36         | EDUARDO   | 36  | 2   | 18         | 19:00:16 | 11-08-01 |  |
| Inverter off: GA-69 - O2    | HSG       | 69  | 13  | 2000463186 | 19:00:25 | 11-08-01 |  |
| Description                 | Park      | Ins | Net | Number     | Hour     | Day      |  |

Showing 1 to 10 of 2,043 entries

First

Previous

1

2

3

4

5

Next

Last

Tables are shown with the description of each event, showing a description, the plant, the installation, the network, the component number, the time and the day. This table can be ordered by each column, it is numbered by page and allows you to search by word in the events. In addition, you can select one or various columns, marking them and selecting an action from the drop down menu above. The options to be carried out with an event reported by the system are the following:

- Ignore for a day. Thus, the event disappears from the list and is not added during the day. For example, if you know that an inverter is switched off because it is being changed, you can decide to omit this event in the management program.
- Ignore for a week. Thus, the event disappears from the list for 7 days. For example when you
- Ignore for a month. As above but over a period of 30 days.
- Ignore until a given date. Thus, no warning will be given until the given date by the user has come.
- Ignore indefinitely. This would putt he event in a permanent list of ignored events. This option can be selected when the expected correction of the fault can not be predicted or is long term.

- Report to Maintenance. This option can be used when the maintenance department is required. A maintenance request will be created for the said event from the list of event. The request will be linked to a person responsible. When the work is concluded the request will be closed.


Such requests are of interest because they will be linked to the report on a plant or installation in the reports module.


The events module allows you also to manage the ignore rules for the events tables, i.e. manage those rules which you put in the events table. For example, in the following screen shot you can see how an inverter in the CARACOLES plant is ignored until a given date.



The screenshot displays the 'imMODo solar' interface for 'La Herrera'. The top navigation bar includes the logo, the name 'La Herrera', and a 'Choose your country' dropdown. Below this is a menu with 'Status', 'PV Counters', 'Inverters', 'Trackers', 'Station Weather', 'Performance', 'Electric Substation', 'Sensors & Actions', and 'O & M'. The main content area is titled 'Rules > List'. On the left, there are sections for 'PV Meters' (showing ENHERRERA 1, 2, 3, 4 with PR NA and values like 7.66, 7.68) and 'Real Time Data' (showing Power Active for various components). The main 'Rules List' section shows a table with columns: Type, Park, Ins, Net, Number, Hour, Day, Exp Type. A single entry is visible: 'Inverter Off' for 'CARACOLES' plant, with 'Ins' 6, 'Net' 1, 'Number' 5, 'Hour' 00:00:00, 'Day' 11-08-02, and 'Exp Type' 1. Navigation buttons like 'First', 'Previous', 'Next', 'Last' are at the bottom right of the table.







The rules show what you are ignoring, the plant, installation, network and component number to which we are applying the rules and the date and time of expiry.

In addition to editing and deleting rules from this screen you can create new more general rules. For example, if you want to ignore the switched off inverters which there may be in the CUESTABLANCA plant, you can complete the following form accessed through the drop down menu in the upper part of the screen.


**imMODo solar**  
 Efficiency Solar Monitoring System


**La Herrera**

Choose your country |  

[Home](#)
[Solar Farm](#)
[Logout](#)

[Status](#)
[PV Counters](#)
[Inverters](#)
[Trackers](#)
[Station Weather](#)
[Performance](#)
[Electric Substation](#)
[Sensors & Actions](#)
[O & M](#)

Rules > Add


1

7

30

PV Meters


ENHERRERA 1



PR NA

7.66


ENHERRERA 2



PR NA


7.68

ENHERRERA 3



PR NA

ENHERRERA 4



PR NA

Real Time Data

Power Active 533 kw

Power Active R 179 kw

Power Active S 176 kw

Power Active T 177 kw

Add Rule

Expiration Type

Weekly

Park

CUESTABLANCA

INS

All

Type

Inverter Off

Number

0

Network


0


OK



Cancel










Here any switched off inverter has been ignored for a week in all the installations of Cuestablanca. The Number and Network fields are set to 0 and can not be completed. This means that the rule will be applied to all the components of any network.

Another of the tables which can be seen in this module is that of the maintenance requests.


**imMODo solar**  
 Efficiency Solar Monitoring System


**La Herrera**

Choose your country |  

[Home](#)
[Solar Farm](#)
[Logout](#)

[Status](#)
[PV Counters](#)
[Inverters](#)
[Trackers](#)
[Station Weather](#)
[Performance](#)
[Electric Substation](#)
[Sensors & Actions](#)
[O & M](#)

Work Report > List

1

7

30

PV Meters

ENHERRERA 1

ENHERRERA 2

PR NA

PR NA

7.66

7.68

ENHERRERA 3

ENHERRERA 4

PR NA

PR NA

Real Time Data

Power Active 571 kw

Power Active R 192 kw

Power Active S 189 kw

Work Report List

Actions

Select Action

Show

10

entries

Search:

| Type         | Ins | Park      | Net | Num | Date                | Description                 |
|--------------|-----|-----------|-----|-----|---------------------|-----------------------------|
| Inverter Off | 7   | CARACOLES | 1   | 1   | 2011-06-26 00:00:00 | Inverter off: CC-07 - Fil.A |

Type

Ins

Park

Net

Num

Date

Description

Showing 1 to 1 of 1 entries

First

Previous

1

Next

Last

The maintenance requests can be edited, deleted, consulted and exported to PDF to be printed.

As always, you can extract a PDF list of events, rules and maintenance requests in the system.

## 12.4 Communications Module

Although it is an independent module this has been integrated as a submenu of the Events module. When accessing this you can view a table of communications.

### Communications Manager

1 7 30

**PV Meters**

ENHERRERA 1



PR NA

6.42

ENHERRERA 2



PR NA

6.46

ENHERRERA 3



PR NA

ENHERRERA 4



PR NA

**Real Time Data**

Power Active 5 kw

### Communications Manager

Actions **Select Action**

Show 10 entries

| User                            | EMail                            | Type   | Start | End   | Periodicity      |                          |
|---------------------------------|----------------------------------|--|-------|-------|------------------|--------------------------|
| Miguel Angel Hernando Fernandez | miguel.hernando@immodosolar.com  | Fault PV Counter Communication                   | 12:00 | 15:00 | One time per day | <input type="checkbox"/> |
| Jesus Vergara Igual             | jesus.vergara@immodosolar.com    | Fault PV Counter Communication                   | 12:00 | 13:55 | One time per day | <input type="checkbox"/> |
| Jose Javier León                | josejavier.leon@immodosolar.com  | Fault TTR  | 00:00 | 23:55 | Always           | <input type="checkbox"/> |
| Alfonso Gonzalez                | alfonso.gonzalez@immodosolar.com | Fault TTR  | 00:00 | 23:55 | Always           | <input type="checkbox"/> |
| Guardias                        | guardias@immodo.org              | Fault TTR  | 00:00 | 23:55 | Always           | <input type="checkbox"/> |
| Miguel Angel Hernando Fernandez | miguel.hernando@immodosolar.com  | Fault TTR  | 00:00 | 23:55 | Always           | <input type="checkbox"/> |
| Jesus Vergara Igual             | jesus.vergara@immodosolar.com    | Fault Yesterday Performance Installation Level 2 | 12:00 | 15:50 | One time per day | <input type="checkbox"/> |

As you can see in the table there is a row for each warning programmed for events in the system. For example the third row shows that the user José Javier León will have to receive all faults related to the telemetry in real time which occur between 0:00 and 23:55. The column related to periodicity can be of two types: warn once a day or warn every time the fault occurs. The second option is more usual, although the first one may be useful in cases such as low performance of an installation, this can be communicated between 12:00 and 15:50 as can be seen in the last line. If at this time the performance of an installation is below the rest it is already significant and it won't be necessary to communicate it more times over the course of the day.

Each line can be edited or deleted. This can be done marking the row and applying the required action in the drop down menu above.

New warnings can be added if no option is marked and the option "New Notice" is selected in the drop down. In this case a form such as the following appears.

The screenshot shows the imMODo solar Efficiency Solar Monitoring System interface. The top navigation bar includes links for Home, Solar Farm, and Logout. Below this is a secondary navigation bar with tabs for Status, PV Counters, Inverters, Trackers, Station Weather, Performance, Electric Substation, Sensors & Actions, and O & M. The main content area is divided into two sections: PV Meters and Communications Manager.

**PV Meters Section:** This section displays four PV meters labeled ENHERRERA 1, ENHERRERA 2, ENHERRERA 3, and ENHERRERA 4. Each meter shows a status icon (green for active, red for fault) and a power reading (PR NA). Below the meters, a 'Real Time Data' section shows 'Power Active 4 kw'.

**Communications Manager Section:** This section contains a form for creating or editing a communication entry. The fields are:
 

- User: A dropdown menu with 'Select User' as the placeholder.
- Email: A text input field.
- Type: A dropdown menu with 'Fault SolarFarm Communication' selected.
- Time Ini: A text input field.
- Time End: A time selection table.
- Periodicity: A text input field.

 The time selection table has columns for Hour and Minute, with AM and PM indicators. The table shows the current time as 07:35. Below the table are 'OK' and 'Cancel' buttons.

The user must be created in the system (consult administrator). Once selected the field E-mail will be completed automatically. Regarding the type of fault, you can choose from the following:

- *Fault SolarFarm Communication* : The plant can not communicate with the outside world..
- *Fault Inverters Network Communication*: An inverter network is not communicating or is doing so with a problem.
- *Fault Trackers Network Communication*: A network of trackers is not communicating or is doing so with a problem.
- *Fault PV Counter Communication*: The counter has not been able to communicate to extract the reading of the previous day or the morning.
- *Fault Current Performance Installation*: The installation in question shows a poor performance in the past hour in respect to the rest of the installations of the plant.
- *Fault Yesterday Performance Installation*: The installation in question shows a poor performance on the previous day in respect to the rest of the installations of the plant.
- *Fault Lower Inverter Production*: An inverter is generating an energy performance lower than the rest in the plant.
- *Fault Very Lower Inverter Production*: An inverter is generating an energy performance much lower than the rest in the plant.
- *Fault Level 1 Tracker*: Tracker has deviated from its reference point.
- *Fault Level 2 Tracker*: Tracker has deviated greatly from its reference point.



- *Fault Null PV Counter Production*: Not in use
- *Fault String series at low intensity*
- *Fault String series off*
- *Fault Weather Station File dat*: Weather Station has had no summary files for more than 3 days.
- *Fault Weather Station Current*: Weather Station is not giving data of current sensors.
- *Inverter Off*
- *Inverter with Error*
- *Fault Yesterday Performance Installation Level 2*: The performance of an installation on the previous day was far below the rest of the plant.
- *Fault TTR*: Fault of the telemetry in real time.
- *Fault Reading data of PV Counter for more than 4 hours*
- *Fault Null Production PV Counter Hourly*
- *Fault, Counter without Telemetry*

The management of warnings must be configured and refined by using the rules in the events section. If a rule hides an event, the event will not be reported.

## 12.5 Reports Module

In addition to being able to obtain Excel or PDF files of each list or result obtained in the application, an events module has been created which takes care of analyzing installations or complete plants over a given period of time. These reports will be generated in PDF.

The options which we have in this module are the following.

- Report on a plant in a month.
- Report on a plant in a year.
- Report on a installation in a month.
- Report on a installation in a year.

These reports will include data related to production as well as everything related to the expenses modules, maintenance requests etc.. Thus you have a useful tool at your disposal when studying or selling an installation.

## 12.6 Incidents Module

This module allows you to manage incidents created by opening a maintenance request or even those managed directly by maintenance personnel.

There are various options offered in the incidents module. You can list opened incidents, closed incidents, all incidents or even make a personalized search of the incidents. This search is done using the following form:

imMODo solar  
Efficiency Solar Monitoring System

La Herrera

Choose your country |

Home Solar Farm Logout

Status PV Counters Inverters Trackers Station Weather Performance Electric Substation Sensors & Actions O & M

Incidents > Manager

**PV Meters**

ENHERRERA 1 ENHERRERA 2

PR NA PR NA

6.42 6.46

ENHERRERA 3 ENHERRERA 4

PR NA PR NA

**Real Time Data**

Power Active 699 kw

**Incidents Manager**

Park

Installation

Responsible

Type

Origin

Status

Date From  [Delete](#) Date To  [Delete](#)

As you can see a search can be completed using different fields. In addition a list can be extracted pressing the button "Search" or a report can be produced in PDF or in Excel. In any case, the result of a search or of a preconfigured list will be as follows:

1730

PV Meters

ENHERRERA 1

ENHERRERA 2

PR NA

PR NA

6.42

6.46

ENHERRERA 3

ENHERRERA 4

PR NA

PR NA

Real Time Data

Power Active 757 kw

Incidents Manager

Actions Select Action

Show 10 entries

Search:

| Date       | Park         | Ins   | Responsible         | Status | Type       | Origin    |                          |
|------------|--------------|-------|---------------------|--------|------------|-----------|--------------------------|
| 2011-07-28 | CUESTABLANCA | 1,2,3 | Jesus Vergara Igual | Opened | CDTI       | cliente   | <input type="checkbox"/> |
| 2011-07-09 | CUESTABLANCA | 2     | Administrador       | Closed | Correctivo | cliente   | <input type="checkbox"/> |
| 2011-07-09 | CUESTABLANCA | 3     | Administrador       | Closed | Correctivo | cliente   | <input type="checkbox"/> |
| 2011-07-09 | CUESTABLANCA | 18    | Administrador       | Closed | Correctivo | cliente   | <input type="checkbox"/> |
| 2011-07-09 | CUESTABLANCA | All   | Administrador       | Opened | CDTI       | cliente   | <input type="checkbox"/> |
| 2011-05-04 | Cuestablanca | 02    | Jose Javier         | Opened | fija       | historico | <input type="checkbox"/> |
| 2011-04-15 | Cuestablanca | 12    | Jose Javier         | Opened | fija       | historico | <input type="checkbox"/> |
| 2011-04-08 | Cuestablanca | 20    | Jose Javier         | Opened | fija       | historico | <input type="checkbox"/> |
| 2011-04-04 | Cuestablanca | 27    | Jose Javier         | Opened | fija       | historico | <input type="checkbox"/> |
| 2011-04-01 | Cuestablanca | 23    | Jose Javier         | Closed | fija       | historico | <input type="checkbox"/> |

In this table the rows can be ordered and the incidents can be manipulated according to the options that can be seen in the previous screen shot.

The form which appears when creating an incident forces you to complete almost all fields and there are very few which can be completed freely. This makes things easier in the future regarding the organization and analysis of incidents. The following screen shot shows the screen for creating a new incident.

Incidents Manager

Created

Select User

▼

Responsible

Select User

▼

Production Lost

No

▼

Date

Park

All

▼

Installation

All

▼

Reason1

-- Please Select --

▼

Origin

cliente

▼

Reason2

▼

Type

CDTI

▼

Reason3

▼

Status

Opened

▼

Description

Notes

Material

Worker

Machine

Pending

Localization

OK

Cancel

When creating an incident, editing one or closing one an e-mail will be sent to the person responsible.

The reasons for an incident are highly annotated and can be set at three levels. For example, if you select as reason 1 for the incident "MODULE", a series of possible reasons 2 are available, such as "dirt", "breakage", etc. and so follows. The same occurs with the installations affected by the incident, which can be all, certain ones of those existent in the plant or an open field to be completed with various installations.

## 12.7 Invoicing Module

This module allows you to consult invoices generated for clients for the maintenance carried out in their installations. When accessing the module the following table can be seen.

**imMODO solar**  
Efficiency Solar Monitoring System

Choose your country |

Home Solar Farm Logout

Status PV Counters Inverters Trackers Station Weather Performance Electric Substation Sensors & Actions O & M

Bills > Manage

**PV Meters**

ENHERRERA 1 ENHERRERA 2

PR NA PR NA

6.42 6.46

ENHERRERA 3 ENHERRERA 4

PR NA PR NA

**Real Time Data**

Power Active 1086 kw

**Bills Manage** Actions Select Action

Show 10 entries Search:

| Link | TITULAR   | CIF        | PARQUE         | INSTALACION | CODIGO CONTADOR | Fecha Hasta | Total Factura |
|------|---|------------|----------------|-------------|-----------------|-------------|---------------|
|      | PICKMAN Y SALA S.C                              | G-41956681 | LAS TIESAS 18  | TI-18       | 388816111       | 2011 - 07   | 524.14        |
|      | RODRISOL, S.C.                                  | G-02449940 | SARA-MINAYA 34 | SA-34       | 388954840       | 2011 - 07   | 121.62        |
|      | RODRISOL, S.C.                                  | G-02449940 | SARA-MINAYA 35 | SA-35       | 388954842       | 2011 - 07   | 122.53        |
|      | Merindades Sol S.C.                             | G-01424076 | CASA CARACOL   | CC-13       | 73321199        | 2011 - 07   | 105.04        |
|      | José Fco. Victoriano y Ana-Araceli López Moreno | E-84410448 | EDUARDO        | ED-31       | 75459233        | 2011 - 07   | 112.78        |
|      | CASADO SIENES, C.B.                             | E-42184713 | ENHERRERA 46   | HE-46       | 18300221        | 2011 - 07   | 236.86        |
|      | METALURGIAS PRIGAR, C.B.                        | E-19247840 | ENHERRERA 35   | HE-35       | 18300231        | 2011 - 07   | 234.63        |
|      | TINFOCER  | G-01424076 | GARCÍA         | CC-13       | 73321199        | 2011 - 07   | 105.04        |

One line appears for each invoice generated in the system. These invoices are generated automatically on the 2nd of every month. They can be organized by any field required. In the first column you will find a link to a corresponding PDF file.

One or various invoices can be selected and exported to Excel or PDF by selecting the corresponding action.

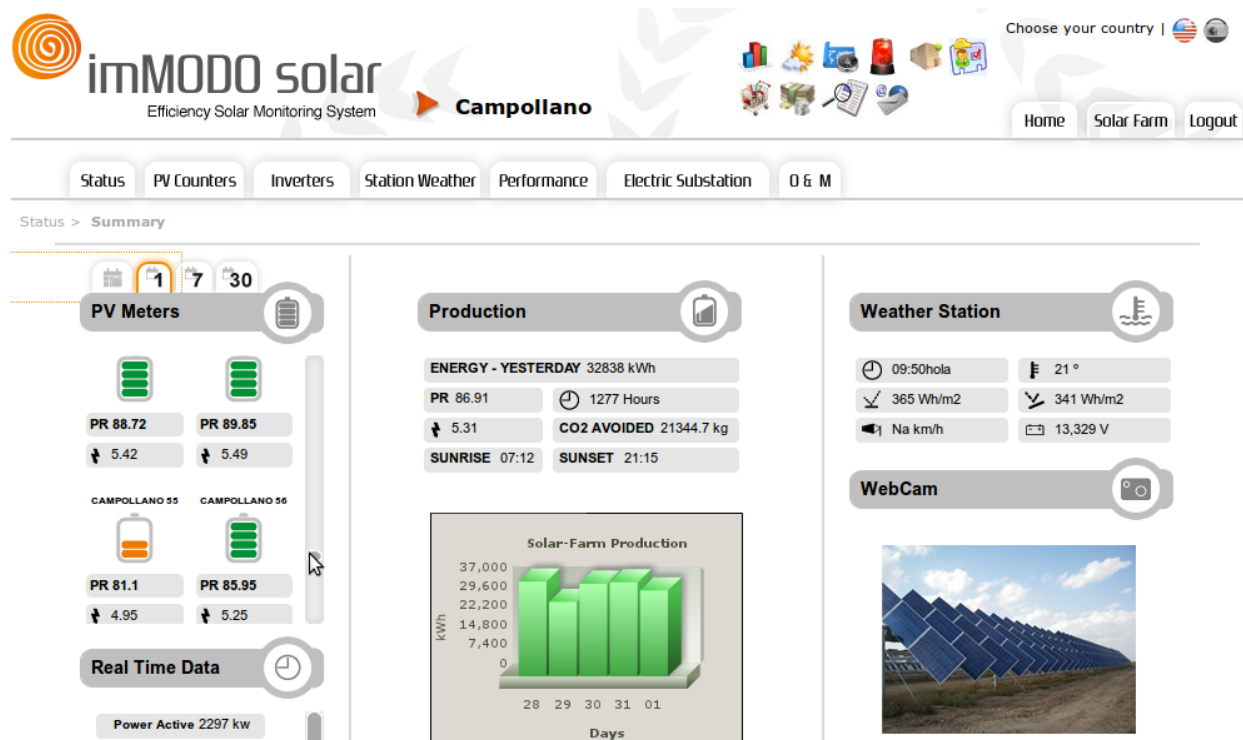
## 12.8 Accessories

From the Operation and Maintenance menu the sensitivity of the application can be changed. For example the percentage of average deviation for the warnings of low performance of inverters. Similarly the systems sensitivity regarding trackers and counters can be changed.

The system offers the option of downloading the file of the events history which have occurred in the system over the course of a day or even the communications of faults which have been sent to maintenance personnel.

## 13. Installation Study

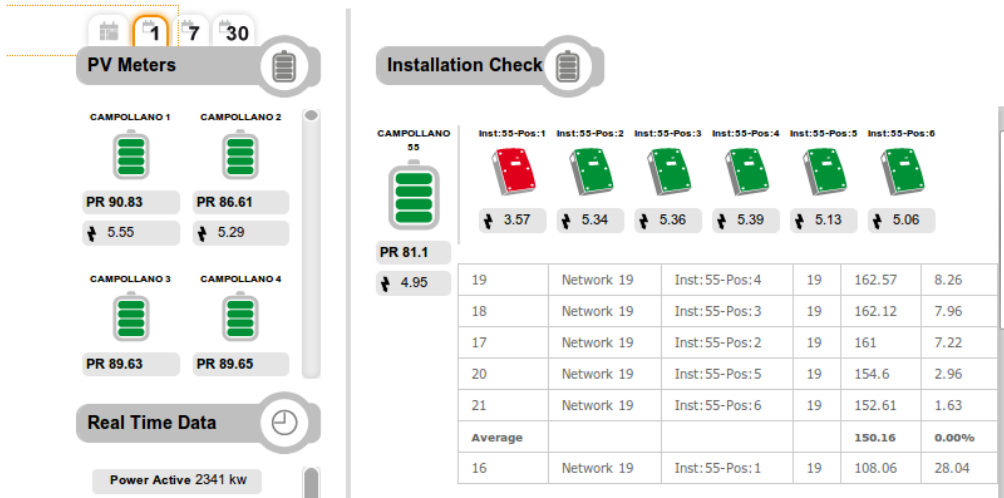
When analyzing a plant, a colour warning may be seen in the area on the left hand side of an installation. When analyzing the CAMPOLLANO plant in the following example you can see that there is an installation with a low performance: CAMPOLLANO 55.



If you select on the installation icon you will enter into the composition of inverters of the installation, showing a screen with the analysis. This allows you to detect which is the inverter or inverters which are proving problematic.

StatusPV CountersInvertersStation WeatherPerformanceElectric SubstationO & M

Status &gt; Installation Check



in orange or red.

This tool allows you to analyze the installation's problem in a few simple steps.