Charging electric vehicles with solar photovoltaic energy

Case study

CIRCUTOR

Energy efficiency technology

Charging electric vehicles with solar photovoltaic energy

PROJECT
Charging electric vehicles using "RECARGO" renewable sources

SECTOR
Commercial vehicles

CLIENT
Urbaser e.on

Most significant results

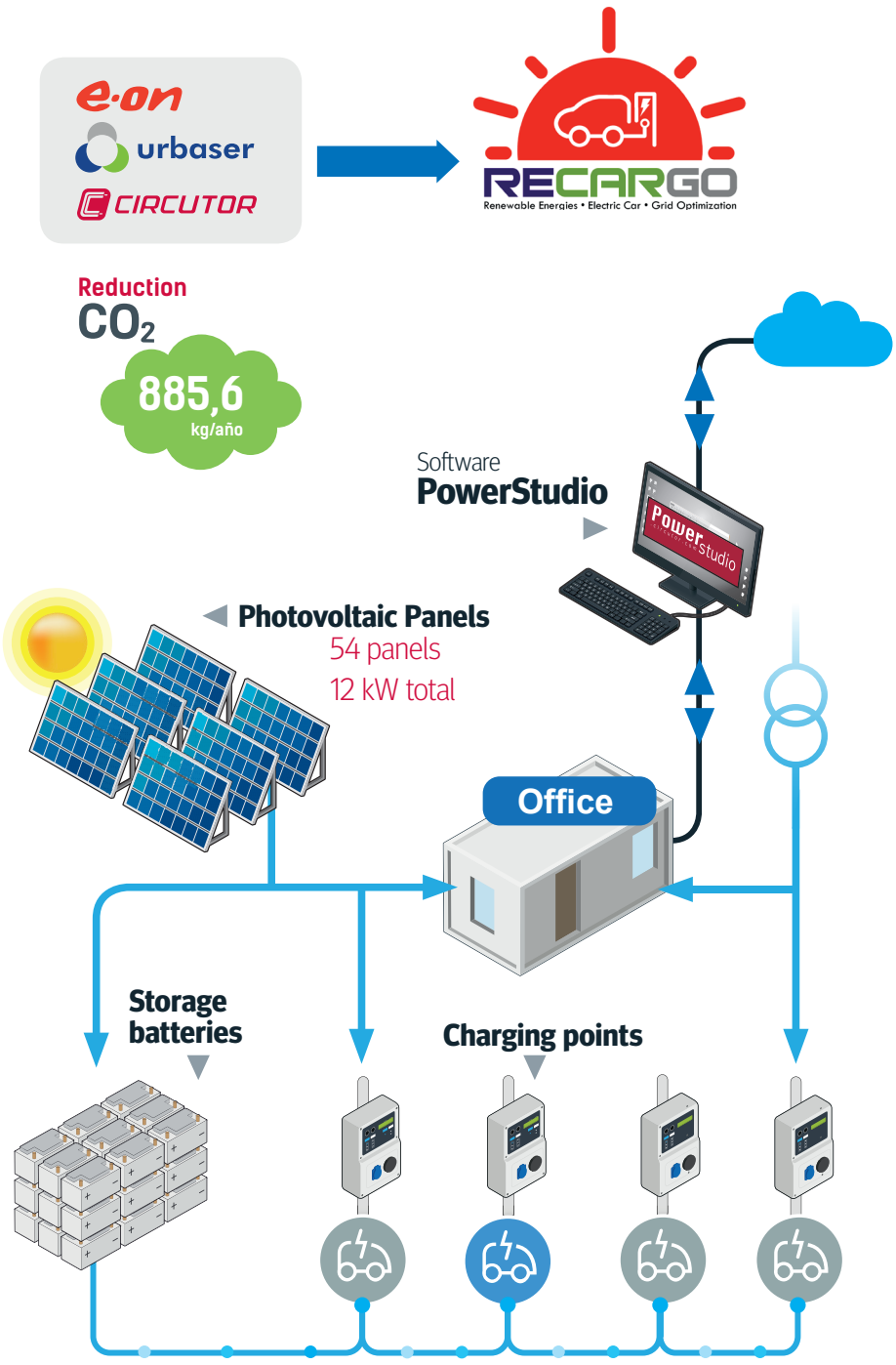
SAVINGS
€3 198 a year

ANNUAL PROFITABILITY
4.5%

REDUCTION OF CO_2 EMISSIONS
885.6 kg/year

TARGET ACHIEVED:

Maximum charging of the fleet of electric vehicles with renewable energy sources



Initial situation

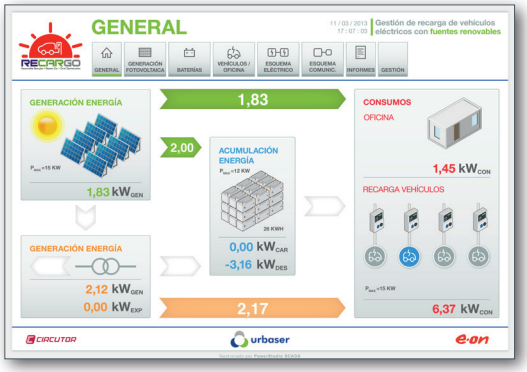
The possibility of charging the fleet of electric cleaning and maintenance vehicles through self-consumption of renewable energies was suggested, with zero injection into the network to comply with current legislation. As spending on electricity for charging electric vehicles was the main component of the operating cost of these vehicles, charging efficiency was fundamental. The installation was already a pioneer in 2013 and it achieved the expected return on investment.

Objectives

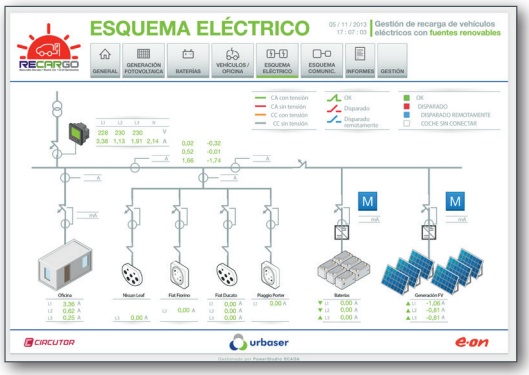
The main objective was to achieve maximum charging of the fleet of electric vehicles using renewable sources.

This objective was subdivided as follows:

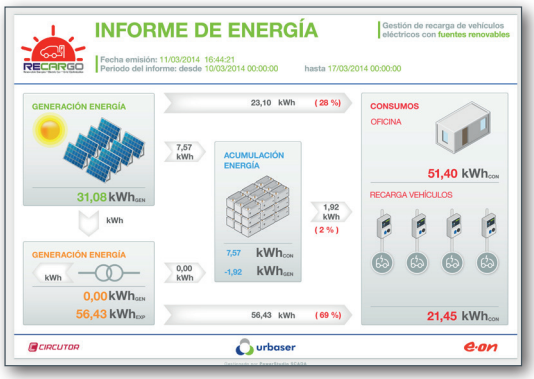
- Charging electric vehicles without increasing contracted power.
- Use, supervision and electric energy management of the installation: to optimise photovoltaic energy generation.
- To make use of surplus maximum radiation and days of maximum insolation using a system of batteries and inverters to store the energy.
- To simulate electricity billing and to draw up cash-flow forecasts through monitoring and control of electrical energy generation and billing parameters.



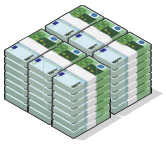
› The general **PowerStudio SCADA software** screen was designed to represent the installation's block diagram and the status of the lines and units.



› The "Electrical diagram" screen was intended to show a single-line diagram of the installation and to find out the main electrical parameters. It also offered a chance to see and act on the protection elements that could be operated in this way.



› The idea of the "Energy Report" was to present the energy generated and consumed by the different elements of the system, indicating the total energy generated or consumed during specific time periods.



Savings
€3198
a YEAR

More information about the solution

The fleet of vehicles was composed of electric cars with a 2.5 kW to 6 kW power, depending on the model, making an estimated annual consumption of 24360 kWh. For this reason fifty-four photovoltaic panels, each with a peak of 240 Wp, were installed, with a total power of 12 kW. This set of photovoltaic cells produced 24600 kWh a year, as they were located in the province of Barcelona, which has an average six hours of insolation a day.

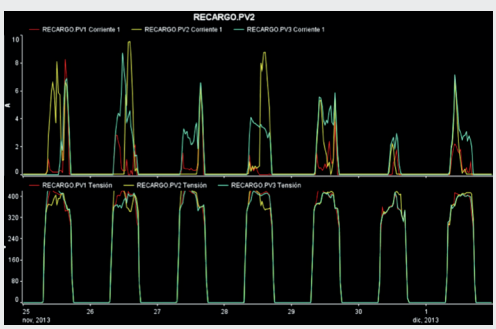
In this way, a balance was achieved between the energy produced by photovoltaic generation and the daily energy needed by the vehicle fleet. Storage batteries were also installed to store the energy produced so it could be used when needed for charging and during periods of less insolation.

All the power required for charging the vehicles was supplied by the photovoltaic solar installation with instantaneous self-consumption, together with the storage batteries, backed by the electrical network. This meant vehicle charging was guaranteed at all times.

Energy measurement and control units **(EDS, EDS 3G and CVM analyzers)** were used to control photovoltaic generation and energy use. Once the measurements had been taken, the data was analysed and supervised using the **PowerStudio SCADA energy management software.**

One of the uses that most interested the managers was that the whole system was controlled via the web using the **PowerStudio SCADA software,** both for managing the parameters and displaying alarms. The system could be controlled from a central point and monitored from any other point with an Internet connection. In this case, the whole **CIRCUTOR** system communicated with the **e.on** management software in the cloud.

· To know about actual consumption in different time periods, to check that generation and vehicle charging is performed at the right times and to optimise the installation and its management.



Results

The installation achieved a saving of €3198 the first year through photovoltaic electric energy generation. The annual return on investment of the installation was 4.5%. Using the storage batteries it was possible to make maximum electricity produced with photovoltaic generation systems compatible with charging at the most suitable times, in accordance with the use of the vehicles. The system also made it possible to save 885.6 kg of CO^2 a year.

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