The assembly work of the Doña Carmen Solar Energy project was completed last May in the city of La Ligua, to the far north of the 5th region of Valparaíso, Chile.

A solar photovoltaic plant (PV) has been developed, which will generate 40 MW of renewable energy, supplying the equivalent to the energy needed for 21,600 homes from a clean source of energy. The plant will prevent the emission of an equivalent to 22,490 tons of carbon dioxide into the atmosphere.

Energía Cerro El Morado S.A. hired Solarcentury, a company specialising in the design of photovoltaic systems, for the development and construction of the solar farm. Solarcentury works as an EPC Contractor and is responsible for providing all engineering, procurement and construction services.

The amount of solar energy radiated annually on the planet exceeds 2000 times global energy demand.

125,000 photovoltaic panels

21,600 homes

320 Wp

The Doña Carmen photovoltaic power station is composed of 125,000 photovoltaic panels with a 320 Wp capacity.

-22.490 CO₂

The plant will prevent the emission of an equivalent to 22,490 tons of carbon dioxide into the atmosphere.
Project data.

The Doña Carmen photovoltaic power station is composed of 125,000 photovoltaic panels with a 320 Wp capacity, providing the system an installed power of 40 MWp, distributed on 180 hectares.

Various transformer substations have been installed around the solar farm because of the large scale of the project, with the purpose of transferring all energy generated to the Medium Voltage distribution lines.

The photovoltaic systems are made up of various separate direct current (DC) circuits; each circuit is made up of a group of modules in series, which form what is commonly known as strings. These are combined into a single circuit before transformation to alternating current (AC), so all of its power can be used and injected into the electrical network. These Stringbox systems must be installed to group different generation lines connected to the photovoltaic panels, which are cabinets that have been specially designed for the interconnection of strings.

The system in Doña Carmen is made up of 6,000 strings, which are connected in parallel with 228 of Circutor’s Stringbox units. Each cabinet is a system that can connect up to 30 strings with a nominal input electrical current of 9 A each and a maximum output of 325 A.

Circutor’s Stringbox solution, an added value for photovoltaic energy installations.

Monitoring and supervision are a fundamental part of any photovoltaic energy installation to guarantee the correct operation of the energy generation system. The different strings should be measured in real time to achieve the highest possible plant management efficiency, so the maintenance supervisors can be informed about any incident that has been detected, quickly and easily, determining the place where the fault was detected and resolving it within the shortest possible time to minimise risks.

Each Stringbox cabinet hosts the different protection elements of the DC system and of the units used for the real-time monitoring of each string.

MT7R, measuring module with Hall effect current transformers.

Installer adjusting one Stringbox from Circutor.
Therefore, each Stringbox is made up of the following:

- 2 x TR16: Installation monitoring unit, used to monitor the voltage and current of the strings in real time.
- Full protection of the installation with the corresponding DC input fuses, overvoltage protection elements and a 1,000 Vdc isolating switch.
- Protection fuses for each 1,000 Vdc input on the positive and negative poles.
- Measuring module with M/TR Hall effect current transformers (Indirect measurement)

Various transformer substations have been installed around the solar farm because of the large scale of the project, with the purpose of transferring all energy generated to the Medium Voltage distribution lines.

Lower investment in the installation: The panels have their own built-in power supply systems, so no additional installation work is required to send a power supply line to each panel.
The integration of both cabinets guarantees an added value for the plant, since it helps reduce the installation costs and increases the return on investment (ROI).

Circutor’s Stringbox provides the following benefits:

- **Lower investment in the installation:** The panels have their own built-in power supply systems, so no additional installation work is required to send a power supply line to each panel.

- **Reduction of the fault detection time and improved preventive maintenance:** The use of measuring equipment with SCADA systems on each panel guarantees that the preventive maintenance tasks are carried out to avoid faults, reducing the response time and associated costs.

- **Efficient management with indirect measurement:** Indirect current measured with the Hall effect transformers offers more advantages than the traditional measurement with the shunt method: Mayor precisión

  » Higher accuracy
  » Greater stability to temperature variations
  » Higher safety levels: It does NOT interrupt the flow of current
  » Greater efficiency: produces no voltage drops
  » Easy maintenance and replacement
  » No impact on production

Conclusions

The Doña Carmen solar farm was a big challenge for all companies participating in the project. The solar farm was commissioned before the end of May 2017 with fully satisfactory results. The solar farm has become a flagship project in Chile, with the commitment to using a new, cleaner and more eco-friendly energy model, reducing the environmental impact and footprint.

Therefore, Circutor is grateful to have participated in such an ambitious project with its energy efficiency solutions.

Solar energy is the energy of the future, in the last 15 years there have been installed more than 18,000 MW in solar energy. In addition, infrastructure costs are increasingly lower compared to other electricity generation technologies.

Founded in 1998, SolarCentury is an international company that builds solar systems and gives fully EPC services such as design, financing, installation and maintenance. With more than 18 years of experience they have carried out more than 1,000 installations with more than 750 MW of PV power.

www.solarcentury.com