



# Torresol Energy, SENER supports thermosolar power

A clean, sustainable and inexhaustible energy source described as the answer to future energy needs and that will form the basis of the engineering group's business strategy in the renewable energy sector.

*SENERtrough collector system, patented by SENER, that will be installed at the CPC projects of Torresol Energy.*





Courtesy of Masdar

*The future Masdar City, the world's first zero-carbon, zero-waste City.*

At the start of 2008, the leading global players in the renewable energy sector met in Abu Dhabi for the first World Future Energy Summit (WFES), an event where the United Arab Emirates, the world's fifth biggest oil exporter, became the global focal point for discussions on the world's future energy needs. At the official opening of the event, the Crown Prince of Abu Dhabi, Sheikh Mohammad bin Zayed Al Nahyan, highlighted the need to invest in new sources of ecological and inexhaustible energy to meet the demands of citizens in the coming decades. In three days WFES brought together experts and scientists in the field, leading personalities such as Britain's Prince Charles and political representatives such as US Energy Secretary Samuel Bodman, as well as leading technological companies, among them SENER. The summit was sponsored by Masdar, a company that specializes in the development of renewable energy and clean technology and was set up by the MUBADALA Development Company, the Emirate of Abu Dhabi's own investment company. WFES also marked the threshold of an agreement between SENER and Masdar that will see the implementation of the Spanish engineering company's innovative technology in the building and operating of thermosolar projects around the world.

After several months of negotiations that paved the way for the creation of Torresol Energy, SENER and Masdar made public the founding of their joint venture company in March. The new company will develop Concentrated Solar Power (CSP) plants using the Spanish engineering group's technological innovations, both in cylindrical – parabolic collectors (CPC) and its system of a central receiver tower and heliostat farm. The Chief Executive Officer (CEO) of the new company is a veteran at SENER, Álvaro Lorente, who has set up operational offices in Madrid, Seville, San Francisco and another one, to be opened in the near future, in Abu Dhabi. SENER Grupo de Ingeniería has a controlling 60% stake in Torresol Energy and Masdar the remaining 40%. For this new venture, the Spanish company will offer its extensive experience in the development of state of the art technology that has made it one of the world leaders in the field of engineering.

Masdar, for its part, will use the new initiative to help diversify the economy of Abu Dhabi and to reinforce the emirate's image as a leading player in the global struggle to ensure the sustainable development of the planet.

#### **SENER, a pioneer in clean energy**

Looking back into its history, SENER's first involvement in the field of renewable energy dates back quite a way. The company designed one of the first wind power generators installed in Spain, near the southern town of Tarifa, and its first heliostats were installed at the Almeria Solar Platform (known as the PSA in Spanish) more than 25 years ago. But it was at the end of 2001 when the company decided to commit itself to thermosolar power, identifying excellent future prospects for a type of



Courtesy of Masdar

*Aerial view of the future Masdar City, in Abu Dhabi.*



energy that is both clean and inexhaustible. However, SENER also realized that the sector requires extensive research and development and that few companies were prepared to invest in it. The same year, 2001, SENER embarked on a project called Solar Tres, an experimental design plant incorporating a central tower and heliostats, in partnership with Ghersa, Boeing and Nexant, a project that SENER eventually lead. Since then, the company has continued to achieve success with a series of advances in its own thermosolar technology as it searches for optimum results and cost reductions that will make this form of energy profitable in the long term. With three plants currently under construction and a further eight projects at the development stage, SENER has become the world leader in thermosolar energy.

Among the technological advances that have propelled SENER to the forefront of Concentrated Solar Power is the development of software such as the Sensol programme that allows users to calculate the necessary dimensions and optimization of the plants. It has also developed various components, ranging from heliostats to their running systems, receiver towers, systems for storing and using molten salts, direct steam generating systems, beam-down control systems and cylindrical – parabolic collectors. In the case of the collectors, SENER has patented a design known as SENERtrough, which offers a significant weight advantage over similar collectors and savings in the time needed to assemble them. But the major technological difference is without doubt the innovative system for storing molten salts, which doubles the energy potential of a conventional thermosolar power plant and which SENER has been the first to employ in commercial power plants.

#### Projects under way

At the moment SENER is building three thermosolar plants for two different clients. Two of these are 50 MW plants using the CCP SENERtrough technology. Known as Andasol 1 and Andasol 2, they are being built in conjunction with ACS-Cobra



*SENER's heliostat axis drive mechanism.*

near Guadix in the southern Spanish province of Granada. A third, similar plant, Extresol 1, is under construction in the Extremadura region in southwest Spain. The first of these will become operational later this year. When it does it will be the largest thermosolar power plant in Europe, the second biggest in the world and the first to use molten salts for generating electricity. This novel thermal storage system will be usable for over than 40% of the year, a much higher rate than for any existing solar power plant.

In addition, the company has another eight projects under development, with starting dates running from 2008 through 2009. All are similar to those mentioned above, and will be located in the Spanish regions of Andalucia, Extremadura and Castilla La Mancha.

#### Torresol Energy, a definitive commitment to CSP

The efficiency of the solar projects being promoted by SENER, which have involved considerable investment on the part of the engineering company, has been the key to the establishment of Torresol Energy,



*Installation of SENERtrough collector system at Andasol 1 solar plant.*



*The financial district of San Francisco, where SENER has set up a new office.*

a company whose aim is to build and operate an average of two plants a year around the world. The forecast is for an output of around 320 MW by the end of 2010 that should increase to 1,000 MW in a period of 10 years. It is to meet these objectives, that the two partners are combining forces: Masdar will provide Torresol Energy with the necessary operational capacity and an extensive portfolio of contacts, while SENER will continue implementing and testing new technologies that will enable Torresol Energy to maintain its position as a world leader in this field. Both companies share a common vision: the need to contribute to the protection of the environment for future generations.

Torresol Energy will take over the baton on several projects already started by SENER, where the company has carried out not only the engineering and construction work but also the promotion and investment. These are two CPC technology plants, Termesol and Arcosol, and another one incorporating central tower technology, Gemasolar. The latter represents SENER's most advanced commitment to solar energy so far, using innovations tested on the Solar Tres project for the PSA. The innovative technology to be installed at this plant, which is currently under construction in Seville, will enable it to keep generating electricity for around 16 hours even if the sun is not shining. This will ensure an electricity output for about 6,500 hours a year, two and a half to three times more than other forms of renewable energy such as wind or photovoltaic power. Once it is operating, the Gemasolar plant will be capable of generating sufficient electricity to meet the needs of 30,000 homes. Arcosol, which will be the first thermosolar plant to be built in the Spanish province of Cádiz, will involve an investment of 300 million euros, making it the biggest private sector project in the province. With a potential of 50 MW, it will have the capacity to generate 3,250 hours of electricity a year, the equivalent to the average consumption of 45,000 homes, which is the same number as there are in the provincial capital. The last of these three projects, Termesol, is located in Seville and will be another 50 MW plant, with

very similar specifications to the Arcosol plant. Both will use the SENERtrough collector system.

#### **A promising future for solar energy**

Combining the increasingly growth of the world consciousness of the problems caused by pollution and the more and more favourable international legislation towards clean energy, Torresol Energy will concentrate its strategy on technologies targeted at the design, construction and operation of high potential electricity power plants that are capable of generating higher levels of megawatts, as is the case with the CSP plants. These plants are destined to be part of the medium term energy scene for the so-called 'sun belt': southern Europe, the north of Africa, the Middle East region and the southwest of the United States. Torresol Energy will make an initial investment of some 800 million euros launching the three previously mentioned plants in Spain. To this investment it has to be added another plant that the company will develop in Abu Dhabi. After these four projects, Torresol Energy's main objective for southern Europe is to stimulate interest in the building of a new CSP plant in Spain, and seeking at the same time to promote projects in other European countries with solar power potential. In the Middle East and North Africa the company hopes to develop and build three extra CSP plants in addition to the one in Abu Dhabi before 2012. In the United States it is planning to reach agreement with an American renewable energy company to develop at least one CSP plant in the south west of the country.

The excellent business prospects in North America have prompted SENER to open an office in San Francisco, to help stimulate demand for turnkey projects for CSP plants. The opening represents SENER's first step in the USA and a further example of the group's confidence that this type of technology will be one of the keys to satisfy the planet's growing energy needs for the future. ::