

## Grand Opening KaXu Solar One



## Abengoa

Abengoa (MCE: ABG.B/P SM /NASDAQ: ABGB) applies innovative technology solutions for sustainability in the energy and environment sectors, generating electricity from renewable resources, converting biomass into biofuels and producing drinking water from sea water.

### Energy



The growing global demand for energy calls for new solutions, prioritizing those that use clean and renewable sources. Abengoa develops infrastructure projects that convert energy from renewable sources into electricity and biofuels, as well as constructing the transmission lines that make up our electricity networks.

### Environment



The growth of the population, improved living conditions in developing countries and climate change are going to lead to significant changes in demand for natural resources. Aware of this trend, Abengoa produces drinking water from sea water and waste water.



**Abengoa performs its engineering, infrastructure concessions and industrial production activities in both the energy and environmental sectors:**

1

## **Engineering and construction**

---

Engineering and construction include our traditional engineering activities in the energy and water sectors, with more than 70 years of experience in the market. We specialize in carrying out complex turn-key projects for solar thermal electric (STE) power plants, solar-gas hybrid plants, conventional generation plants, biofuels plants and water infrastructures, as well as large-scale desalination plants and transmission lines, among others.

2

## **Concession-type infrastructures**

---

We have an extensive portfolio of proprietary concession assets that generate revenues governed by long term sales agreements such as take-or-pay contracts, tariff contracts or power purchase agreements (PPA). This activity includes the operation of electric (solar, cogeneration or wind) energy generation plants and transmission lines. These assets generate no demand risk and we focus on operating them as efficiently as possible.

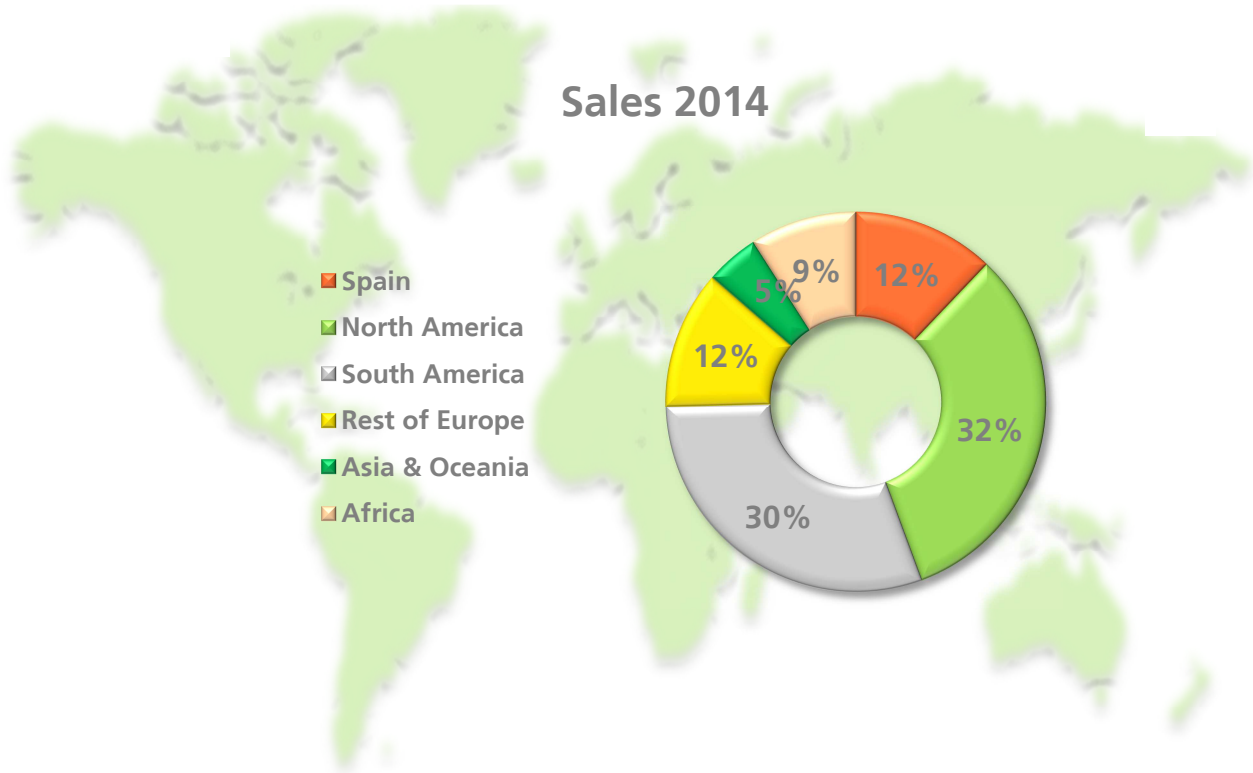
3

## **Industrial production**

---

This covers our businesses with a high technological component, such as biofuels, industrial waste recycling or the development of solar technology. The company holds an important leadership position in these activities in the geographical markets in which it operates.

The internationalization of Abengoa is strengthening our commitment to offering innovative solutions for sustainability with a local perspective, integrated in a global outlook.



Abengoa is committed to internationalization as a key aspect of its strategic plan. With a presence on five continents, our strategy is based on the following points:

- To become an international leader in promoting, constructing and operating innovative solutions for sustainable development.
- To provide customized solutions for all the sectors in which we operate.
- To guarantee efficient and responsible distribution and sales of our technologies and products around the world.

To become a leader in technologies such as second-generation biofuels or STE (solar thermal electricity) plants in order to supply a sustainable energy alternative to the planet.

## Abengoa's solar business

### Other solar facilities worldwide

In addition to 150 MW under construction in South Africa, Abengoa's solar business spans multiple and different geographies on four continents. Commercially operated plants are located in the US, Spain, Algeria and United Arab Emirates, with a combined installed capacity of 1,603 MW. Furthermore, Abengoa has another 260 MW under construction in South Africa and Chile, and 210 MW in pre-construction.

### **Solana, the largest parabolic trough plant in the world:**

This 280 MW parabolic trough plant in commercial operation has a thermal storage system with the ability to produce electricity at full capacity after the sun has set, covering peak demand times in Arizona.



### **Shams-1, the largest parabolic trough plant in the Middle East:**

Shams-1, 100 MW plant includes a proprietary dry-cooling system, significantly reducing water consumption, and an auxiliary heating boiler, boosting the cycle's efficiency.



## **Mojave Solar, clean energy to supply the equivalent of 90,000 households in California**

Mojave Solar is a parabolic trough STE plant with a gross capacity of 280 MW. It is located 150 kilometers north east of Los Angeles, near Barstow, California. It came into commercial operation in 2014.

It will generate enough energy to supply more than 90,000 homes and will prevent the emission of more than 200,000 tons of CO<sub>2</sub> every year compared to a



natural gas plant.

## **The Solúcar Platform, the largest solar power complex in Europe**

The Solúcar Platform is recognized around the world as a unique technology center that houses every type of solar technology, in commercial plants, pilot plants and R&D+i laboratories. The Platform currently generates enough energy to supply the equivalent of 94,000 households, preventing the emission of more than 114,000 tons of CO<sub>2</sub> annually.

The Solúcar Platform, located close to Sanlúcar La Mayor (Seville), consists of several Abengoa plants with 183 MW in commercial operation. The project created more than 1,000 jobs during its manufacturing and construction phase. The complex currently employs 180 people to operate the plants while a further 32 carry out research and development work.



A total of 693 MW of installed capacity in commercial operation in Spain, which includes the first two commercial solar towers in the world as well as 13 parabolic trough plants.



## **Atacama 1, with STE and PV technology, is the first solar power complex in Latin America**

The Atacama 1 project consists of two plants using different technologies: tower STE and photovoltaic. Both are located in the Atacama Desert, Chile.

The STE plant, based on tower technology, has a molten salts storage system. The plant will have an installed capacity of 110 MW and 17.5 hours of storage. Construction began in 2014 and it is due to come into operation in 2017. For its part, the photovoltaic plant will have an installed capacity of 100 MW. Construction began in 2015 and it is scheduled to come into operation in December of this same year.



**Innovative technology solutions for sustainability**

## Abengoa in South Africa

Abengoa has been present in this African country since 2012, when construction began on the Khi Solar One and KaXu Solar One plants, which harness the solar radiation that is abundant in this region. The sun comes up at 5.00 am and does not go down until after 7.00 pm in the evening. Its power is a major advantage when generating energy from this natural resource.

Abengoa has been selected by the South African Department of Energy (DOE) to develop the largest solar power complex in the region. This initiative forms part of the South African's government's strategy to obtain up to 17,800 MW of power from renewable sources by 2030 while reducing its dependency on oil and natural gas.

Abengoa's STE projects in South Africa will not only provide a cleaner energy future for the southern part of this continent, but will also drive the economic development of the region.





## Khi Solar One

The Khi Solar One plant will be the group's third commercial-scale solar tower project. This plant, which has two hours of energy storage, represents major technological progress in terms of efficiency by using higher temperatures. Moreover, its nominal capacity is two and a half times greater than the last tower plant developed by Abengoa, all of which is thanks to the new generation of superheated steam technology developed by Abengoa at its R&D centers.

Khi Solar One uses a dry-cooling system, reducing its water consumption by two thirds compared to previous projects. The tower plant is constructed over 600 hectares near Upington in Northern Cape province.

### Environmental – social – economic benefits

- Khi Solar One will prevent the emission of 183,000 tons of CO<sub>2</sub> every year.
- Some 600 jobs have been created during its construction, with a further 35 required to operate and maintain the plant.



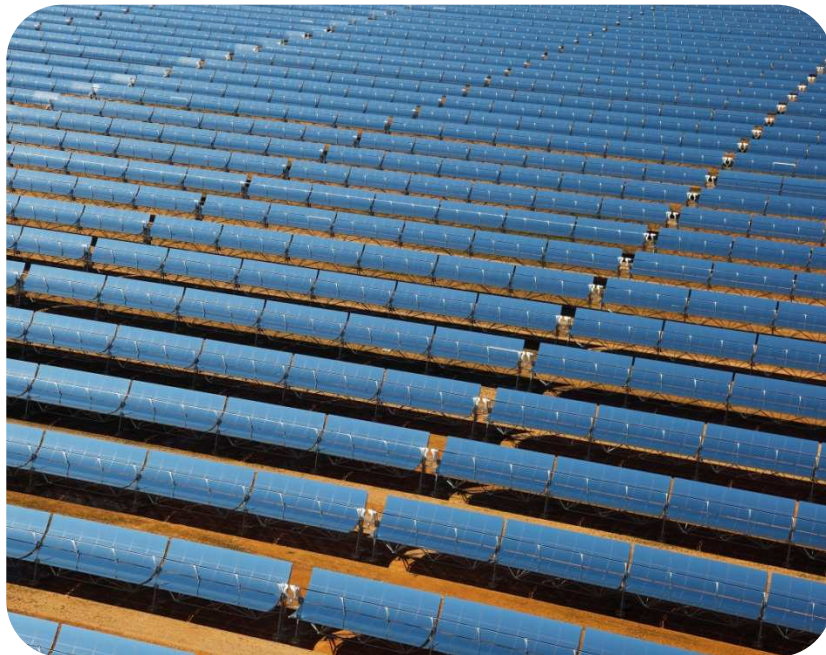
## Xina Solar One

This 100 megawatt (MW) plant uses parabolic trough technology and a system of molten salts for storing thermal energy for up to five hours to generate power when there is no sunlight.

Construction of Xina Solar One –part of the largest solar complex in Sub-Saharan Africa– has already begun. It is scheduled to come into commercial operation in the third quarter of 2017.

### Environmental – social – economic benefits

- Xina Solar One will prevent the emission of 398,000 tons of CO<sub>2</sub> into the atmosphere every year.
- Up to 1,300 jobs will be created during the construction stage, while a further 45 people will be employed to operate and maintain it.
- Xina Solar One will supply clean electricity to Eskom, the South African power utility, under a 20 year power purchase agreement.



## Kaxu Solar One

### Figures

- Location: Pofadder, Northern Cape (South Africa)
- Capacity: 100 MW
- Technology: parabolic trough with storage
- Solar field: 310 ha
- Homes that will be supplied with clean energy: 80,000
- Tons of CO<sub>2</sub> prevented from entering the atmosphere: 300,000 tons

KaXu Solar One is in Northern Cape province close to Pofadder. Construction began in late 2012. KaXu Solar One has a gross capacity of 100 MW and 2.5 hours of storage, which enables it to supply peak electricity demand in South Africa while offering clean and reliable power. The solar field has 3.2 km<sup>2</sup> of mirrored surface with approximately 1,200 parabolic trough collectors.



## ➤ Parabolic trough collector technology

KaXu Solar One uses parabolic trough mirrors. These are attached to a structure that enables them to track the movement of the sun, concentrating the solar radiation onto a receptor tube located at the focal point of the parabolic shaped mirrors that contains a heat absorbing fluid, reaching high temperatures. The thermal energy in this fluid is then converted into steam, which feeds a turbine to generate electricity.

Parabolic trough technology is commercially mature, with proven history and more than 30 years of operations since the launch of the first parabolic trough plants in the USA (Solar Energy Generating Systems in California).



## ➤ Thermal storage system

One of the advantages of STE technology compared to other types of renewable energies is its capacity to store energy efficiently. This allows electricity to be generated at peak times, such as early evening. The thermal storage system makes the generated energy highly flexible, allowing the plant to continue to operate when it is cloudy or after the sun has set.

Abengoa successfully operates a commercial STE plant with thermal storage using molten salts at KaXu Solar One. The plant provides 2.5 hours of thermal storage at maximum operational capacity.



## Environmental benefits

---

**KaXu Solar One prevents the emission of 300,000 tons of CO<sub>2</sub> into the atmosphere every year.**

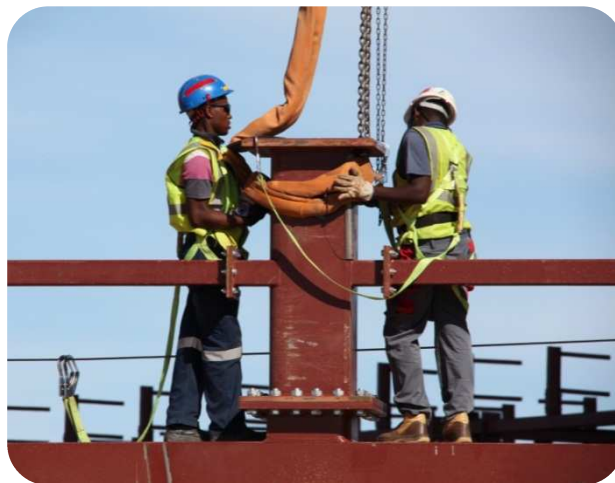
From an environmental perspective, KaXu Solar One supplies **clean energy**, free of greenhouse effect gases, to around **80,000 homes**, offering clean and **reliable** electricity for South Africa. It contributes to the State's renewable energy targets as well as to national targets for climate change mitigation in the country.

## Job creation

---

About **1,000 jobs** have been created during the **construction** period, with about **80 permanent positions required to subsequently operate the plant.** Numerous direct and indirect full-time jobs will be created through its supply chain every year.

A new workforce is therefore taking shape, which will help to reduce costs in an industry that will increase South Africa's competitiveness in the 21st century.



## Economic growth

---

The plant will generate around **5.9 Billion ZAR in taxes for the country over the next 20 years**, in addition to approximately 8 Billion ZAR invested during the construction period.

KaXu Solar One's supply chain generates **1.2 Billion ZAR** in expenditure on components and services from **local businesses.**

## Socio-economic development

Abengoa is committed to local communities, designing solid programs for education, the protection of vulnerable groups, and development of new and existing services and infrastructure. Moreover, the company has already launched a program to boost the local business network, accompanied by investment in training activities to strengthen entrepreneurial skills.



The KaXu Community Trust is made up of people from the local community. This organization represents community interests and ensures that their share of the funds accruing from the project is invested in beneficial social and economic programs.

