

## Solana



**Solana will prevent 475,000 tCO<sub>2</sub> emissions per year.**

**A 3 square mile site with 3,200 collectors.**

**More than 2,000 people involved in the construction.**

**Six hours of thermal storage allows electricity to be produced after the sun goes down.**

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

## **1** Engineering and construction

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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 concentrating solar power (CSP) 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

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We have an extensive portfolio of proprietary concession assets that generate revenues that are governed by long term sales agreements such as take-or-pay contracts, tariff contracts or power purchase agreements (PPAs). 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

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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.

## Solana

### Figures

- Location: Gila Bend, Arizona (USA)
- Capacity: 280 MW gross
- Technology: parabolic trough with storage
- Solar field: 3 square miles
- Homes that will be supplied with clean energy: 70,000
- Tons of CO<sub>2</sub> prevented from entering the atmosphere: 475,000 t
- More than US\$ 420 million in tax revenues over next 30 years

Solana is located about 70 miles southwest of Phoenix, close to Gila Bend, Arizona. The project began to take shape after Abengoa signed a power purchase agreement (PPA) with Arizona Public Service (APS), the largest utility in the state, to purchase 100 % of the electricity produced during 30 years. Construction began in late 2010 when the US Department of Energy (DOE) granted Abengoa a \$1.45 billion federal loan guarantee to help finalize the funding with the Federal Financing Bank (FFB) and to begin construction.



Solana, the largest parabolic trough technology plant in the world, has a gross capacity of 280 MW and six hours of storage, enabling it to satisfy the peak demand in this region in the late summer evenings and night time hours. Its solar field covers 3 mi<sup>2</sup> with approximately 3,200 mirrored parabolic trough collectors.



➤ **Parabolic trough collector technology**

Solana operates using mirrored parabolic trough collectors. The structures track the movement of the sun, concentrating the solar radiation onto a receptor tube that contains a heat transfer fluid that absorbs the heat, reaching high temperatures. The thermal energy in this fluid then converts water into steam, which drives a turbine to generate electricity.



The parabolic trough technology is a mature and viable solution, with more than 25 years of proven operation experience with the launch of the first parabolic trough plants in the US (Solar Energy Generating Systems in California).



## ➤ Thermal storage system

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



Abengoa successfully operated a thermal storage demonstration plant using molten salts, which was then commercialized at Solana. The storage system provides six hours of thermal storage at maximum capacity.



## Environmental benefits

Solana prevents the emission of about 475,000 t CO<sub>2</sub> into the atmosphere every year.

From an environmental perspective, Solana supplies clean energy, free of pollution and greenhouse gases, to around 70,000 homes, preventing the emission of nearly half a million tons of CO<sub>2</sub> every year. These reductions contribute to achieving state renewable energy targets as well as meeting the national targets for climate change mitigation in the US.

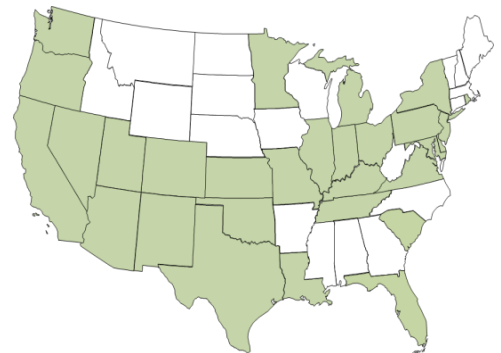


## Social benefits

More than 2,000 jobs were created over the course of the project, as well as numerous indirect positions in the region. Furthermore, it created over 80 full-time, high-paying permanent jobs for plant operation

The plant will generate around \$420 million in taxes for the country over the next 30 years, in addition to the \$2 billion invested during the construction period.

Solana's supply chain covered 29 states and stretched from coast to coast, with contracts signed with 165 companies.



As a result, a new workforce is taking shape that will contribute to reducing costs in an industry that will help to keep the USA competitive in the 21st century.



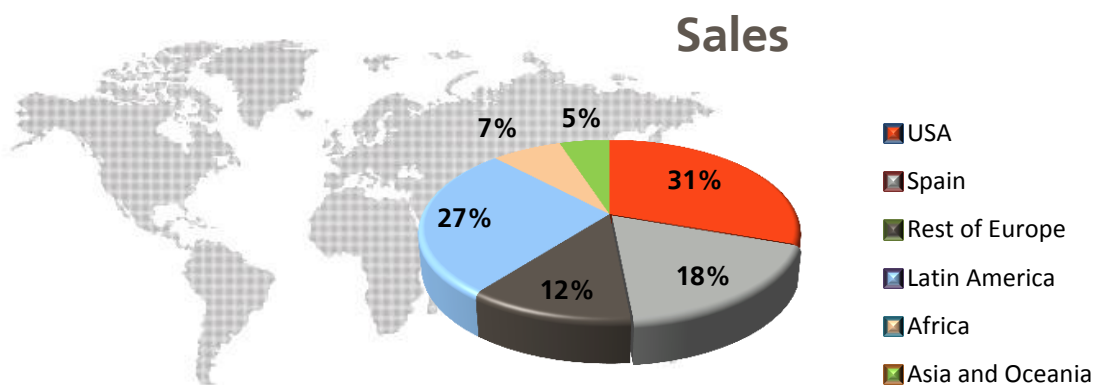


## Abengoa: a global company

Abengoa is committed 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 our strategic plan. With a presence on five continents, our strategy is based on the following points:

- Promoting, constructing and operating innovative solutions for sustainable development.
- Providing customized solutions for all the sectors in which we operate.
- Guaranteeing efficient and responsible distribution and sales of our technologies and products around the world.
- Leading technological development such as second-generation biofuels or concentrating solar power plants in order to supply a sustainable energy alternative.



Data as of August, 2013.

## Abengoa in the USA

Abengoa's presence in the USA has grown exponentially since the company decided to expand its business in the world's leading economy more than a decade ago. Abengoa has a wide range of activities in this market, including bioenergy and solar thermal energy as well as numerous areas of engineering and the environment. Some 26% of the company's assets are currently in the USA, which is Abengoa's largest market in terms of sales.

### 1 Concentrating Solar Power

This activity focuses on developing new technologies that produce electricity from the sun. Abengoa is a global leader in concentrating solar power (CSP).

The geographical strategy is based on promoting and selling energy at a local scale with the presence of specialist teams in different locations, manufacturing components on a regional level and developing new technologies globally.

Abengoa's solar business is made up of 160 employees in the USA, with four offices in the southwest, in Denver (CO), Phoenix (AZ), San Francisco and Victorville (CA), strategically positioned in the areas with the greatest solar resources, as well as an office in the capital, Washington, DC.



The company's CSP activities in the US currently are concentrated on the operation and maintenance of Solana, currently the world's largest parabolic trough plant with a gross capacity of 280 MW; and the construction of Mojave Solar in California with 280 MW (gross). Together these plants have created more than 3,000 direct jobs during the construction process, providing a major boost to their local economies.

In 2012, Abengoa was selected to engineer, construct and commission one of the largest photovoltaic plants in the world, in California, with a 200 MW capacity, which will progressively come into operation during the second half of 2014.

Abengoa also has resources specifically for solar energy research and development. In the US, there are more than 20 people dedicated to research in collaboration with the National Renewable Energy Laboratory (NREL) as well as other leading institutions and universities. The team includes some of the world's leading experts, including NREL employees, at plants such as Mojave.

In addition to our activities in the US, Abengoa's solar business spans through multiple and different geographies in four continents. Plants in commercial operation are located in Spain, Algeria and United Arab Emirates, reaching a total installed capacity of 1223 MW. Furthermore, Abengoa has 150 MW under construction in South Africa, and 110 MW in preconstruction in Israel and another 100 MW in South Africa.



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

## 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.



## 150 MW under construction in South Africa:



Khe Solar One, a 50 MW tower plant with 2 hours of steam storage, using superheated air and a dry cooling system to reduce water consumption; also, KaXu Solar One, a 100 MW parabolic trough plant with 3 hours of storage in molten salts.

## 2 Biofuels

Abengoa produces and sells bioethanol and has a leading position in the US market. Indeed, it is the only company with a presence in the three major biofuels markets of USA, Europe and Brazil.

Abengoa understands that ethanol production reduces our dependence on oil and contributes to energy supply security and diversification. Ethanol also reduces CO<sub>2</sub> emissions and therefore plays a fundamental role in slowing down climate change. Lastly, ethanol production also offers an alternative use for agricultural land, which helps to provide secure incomes for the local population.

The company currently focuses its activities on developing second-generation biofuels technologies using lignocellulosic biomass, especially for bioethanol, by means of enzymatic hydrolysis and the gasification and catalytic synthesis of alcohols, and on obtaining high value-added bioproducts.



Abengoa currently has six bioethanol plants in the USA in York (NE), Portales (NM), Colwich (KS), Ravenna (NE), Mount Vernon (IN) and Granite City (IL), with a combined capacity of 380 Mgal/year and an investment of more than \$1.4 billion.

In Hugoton, Kansas (USA), Abengoa is developing the first second-generation bioethanol plant that it will operate commercially. It will use cereal straw instead of grain to produce 95 ML of bioethanol per year and 20 MW of power. It is scheduled to come into operation in 2014.

Abengoa has been authorized by the US Environmental Protection Agency (EPA) to produce E15 (15 % ethanol and 85 % gasoline), the new mix permitted for cars and trucks manufactured after 2001.

## 3 Water treatment

Abengoa is recognized as an innovator in the private development of water-related infrastructure projects, offering a range of successful alternative project delivery models, such as public delegated services, public-private partnerships and turn-key design-build-finance-operations contracts. The U.S. is the leading geography in terms of revenues for Abengoa, accounting for 26 percent of global revenues in 2012 and is also the company's fastest growing market. Abengoa has successfully designed and constructed over 200 water supply treatment and transmission infrastructure projects, including a total of over 317 MGD of desalination capacity.



#### 4 Other activities

In the transmission lines business, the USA continues to be a priority due to the obsolescence of existing transmission systems, the huge distances between generation and consumption centers, and the inclusion of renewables into the energy mix. With its accumulated experience and involvement in other regions in this sector, the company expects to become a key player in electricity transmission in the North American lines market.



Furthermore, as part of its ongoing commitment to the environment, Abengoa is studying new opportunities under existing and future regulations in the country, both for advisory services for reducing greenhouse gas emissions, and emissions neutralization and labeling.