

ABENGOA

Accra's desalination plant



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



Abengoa & water

Abengoa reaffirms its commitment to the energy sector and the environment by backing water as a business.

Abengoa is centered on promoting, developing and operating water-treatment plants, and especially on the desalination business due to water scarcity and the lack of suitable water treatments currently available.

Abengoa's leadership and reputation has been recognized on numerous occasions through prizes and awards, including those presented by the prestigious international publication Global Water Intelligence (GWI) during its annual awards ceremony: the Global Water Awards. Abengoa received the award of "Best Project of the Year 2009" for the Qingdao desalination plant (China) as well as the prize for "Desalination Company of the Year 2009 and 2013".



Abengoa carries out its engineering, infrastructure concessions and industrial production activities in both sectors:

1. Engineering and construction

Engineering and construction includes 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 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 and young portfolio of proprietary concession assets that generate revenues that are governed by long term sales agreements with formats 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

Industrial production includes involving our businesses with a high technological component, such as biofuels or the development of solar technology. The company holds an important leadership position in these activities in the geographical markets in which it operates.

Water



Our Model:

As part of its firm commitment to society and the environment and its quest for quality and excellence, Abengoa identifies three key markets in order to satisfy any industrial and human water needs that may arise:

- The desalination market: involves extracting salt from sea and salt water for human consumption or use in the agricultural sector;
- The reuse market: allows wastewater to be reused thanks to disinfection and filtration processes to eliminate suspended solids;
- The industrial market: this market has great potential and centers around satisfying the needs of the mining, oil and gas industries, which need a huge water supply for their businesses to operate;



Abengoa either owns the plants it operates or operates them for third parties under long-term contracts awarded by concession. In order to do this it promotes the Public-Private Partnership (PPP) model of contracting. Abengoa has been successful to develop PPP projects under very different conditions and clients.

Advantages for the public side

- Externalized management
- No specific finance is needed from the utility
- Required investment is taken out from the client balance sheet
- Technical risk is assumed by private partner
- Joint management of the users necessities
- No increase of water price due to a more efficient private management

Advantages for the private side

- Assets with regulated revenues with long term sales contracts or price agreements
- Investment in P3 infrastructure projects with in-house technology as a competitive advantage
- Shared financial risk: both public and private partners
- Allows both parties to take part in "bigger than expected projects"



Our Projects:

Some relevant desalination references



Skikda

Geography
Algeria

Client
Sonatrach and Algerienne des Eaux

Status
In operation since 2009

O&M Period
25 years

Project Type
BOT/PPP

Technology
Reverse osmosis

Investment
\$ 136 million

Capacity
100,000 m³/d



Chennai

Geography
India

Client
Chennai Metropolitan Water Supply and Sewerage Board

Status
In operation since 2010


O&M Period
25 years

Project Type
BOT/PPP

Technology
Reverse osmosis

Investment
\$ 108 million

Capacity
100,000 m³/d



Honaine

Geography
Algeria

Client
Sonatrach and Algerienne des Eaux

Status
In operation since 2011

O&M Period
25 years

Project Type
BOT/PPP

Technology
Reverse osmosis

Investment
\$ 294 million

Capacity
200,000 m³/d

Some relevant water treatment references



Aguas corrientes

Geography
Uruguay

Client
Administración Nacional de Obras Sanitarias del Estado

Status
Commissioned in 2014

Project Type
EPC

Technology
Physical-Chemical treatment and filtration

Capacity
600,000 m³/d



El Zapotillo

Geography
Mexico


Client
Comisión Nacional del Agua (Conagua)

Status
In construction

Project Type
BOT/PPP

Technology
Ozone and filtration

Capacity
328,000 m³/d



Vista Ridge

Geography
USA

Client
San Antonio Water System

Status
Adjudicated

O&M Period
30 years

Project Type
BOT/PPP

Technology
Ozone and filtration

Capacity
168,970 m³/d

Relevant industrial water references



Angamos



Geography
Chile

Client
AES Gener



Status
Adjudicated



Project Type
EPC



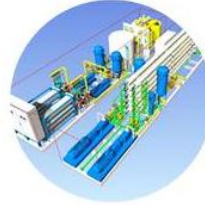
Technology
Reverse osmosis and electrodeionization



Sector
Power



Capacity
4,800 m³/d



Carty



Geography
USA

Client
Abeinsa EPC



Status
Under construction



Project Type
EP



Technology
Ultrafiltration, reverse osmosis and electrodeionization



Sector
Power



Capacity
490 m³/d



Rotterdam



Geography
Netherlands

Client
Abenerand Inabensa



Status
In operation since 2010



Project Type
EPC



Technology
Reverse osmosis



Sector
Refining



Capacity
750 m³/d



Research & Development



Abengoa's strategy is based on developing its own technology, which enables it to find innovative solutions in the water-treatment sphere. For this purpose, it has a 3,000 m² R+D+i centre equipped with cutting-edge facilities including laboratories, exhibition rooms, experimentation areas and a control system that makes it possible to monitor plant operation in real time through a satellite connection.

R+D+i programs focused on enabling Abengoa to achieve greater efficiency in water treatment are currently being developed. Water innovation at Abengoa is aimed at getting results and creating value by developing new treatment technologies and keeping sustainable development at the forefront.



8.5 M€
in R&D
(2014)

In order to do this, there is a specific R+D+i plan for water led by Abengoa, which is based on four main elements:

- Its own resources, principally the R+D+i Department and R+D+i Centre;
- R+D financial assistance and grants from various bodies;
- Agreements with universities;
- Technology agreements.

The stance taken by Abengoa is to focus on developing inverse-osmosis desalination technology in order to be able to make sea and salt water drinkable, and developing waste-water treatment technology for regeneration, in order to allow it to be re-used and in that way generate new water resources where they are scarce.





Our commitment to the environment

Due to the increasing shortage of water and lack of suitable treatment methods, the search for effective means of managing water has become a major challenge for all the society.



Our management processes in relation to concessions (project finance), design, construction, water-treatment-plant operation and maintenance and water-sector research, development and innovation are carried out through an integrated management system. This system has been audited for compliance and is certified by:

- ISO 9001 on Process Quality;
- ISO 14001 on Compliance with Environmental Requirements;
- OHSAS 18001 on Risk Prevention in the Workplace and Improving Occupational Health and Safety Conditions.

Furthermore, in Abengoa we are aware that we always need to keep industry-induced climate conditions and changes in mind. Besides identifying the environmental aspects affected by our activity and making prompt decisions to improve, we keep a record of greenhouse gas emissions, which allows us to accurately identify the footprint left by our activity and correctly calculate its cost from this perspective.



Our commitment to society

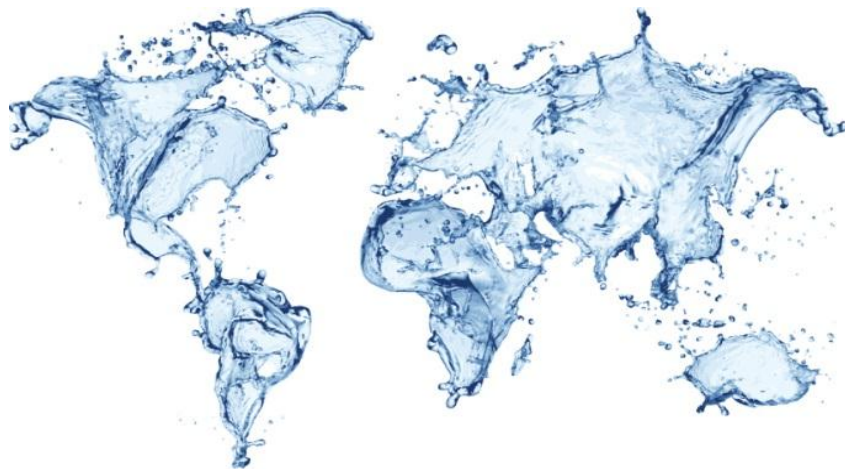
Abengoa wishes to grow alongside the communities where it works, strengthen its bonds with them and promote respect for human rights from within its sphere of influence. The vision of the company is based on achieving international leadership in the water market by managing property assets, and expanding current activity in desalination into other markets such as wastewater treatment, reuse, and water treatment in the industrial sector.

Abengoa considers its commitment to honesty and respect, for all parties involved, to be of the utmost importance. Furthermore, the protection and defense of the environment as well as participation in activities that mitigate climate change are at the core of the values.

Abengoa subscribes to the ten principles that constitute the United Nations Global Compact, especially the four referring to labor standards: upholding freedom of association and recognizing the right to collective bargaining; eliminating all forms of forced or compulsory labor; abolishing child labor effectively; and eliminating discrimination with respect to employment and occupation.

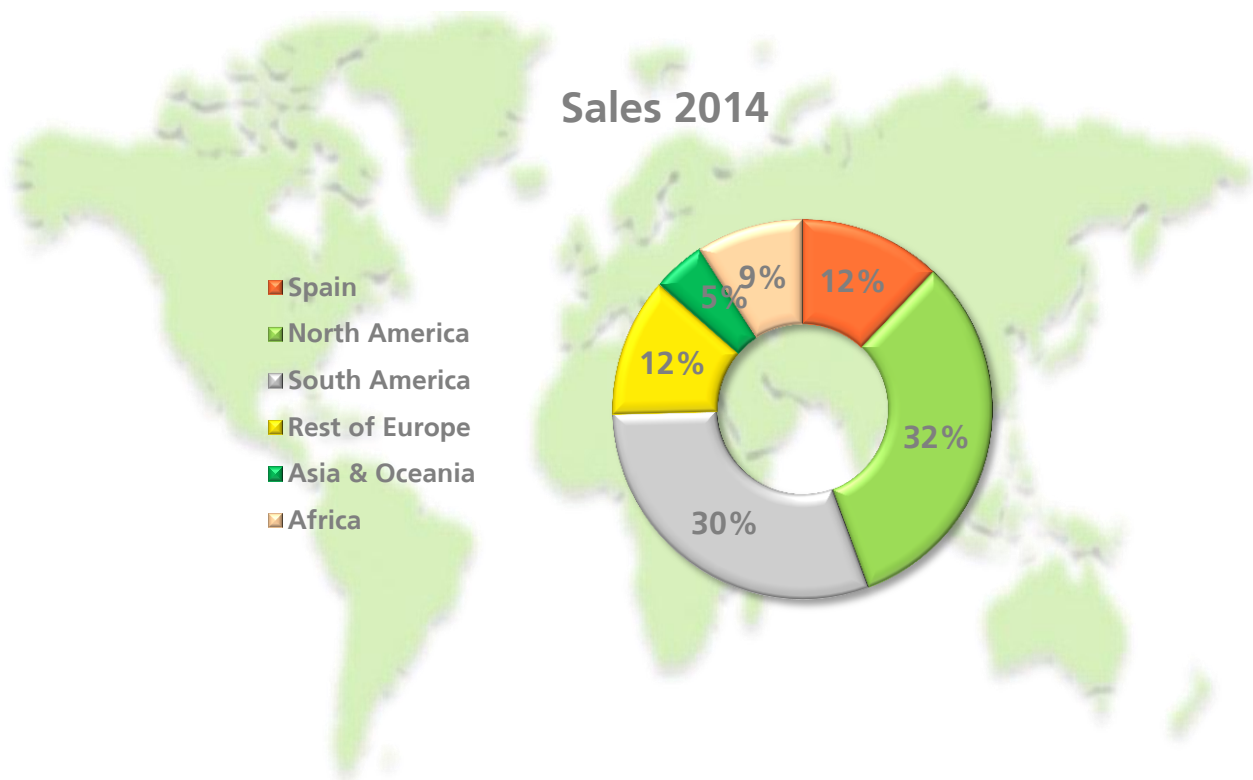
Abengoa provides transparent reports on its activities and is audited to ensure that this information is complete, truthful and meaningful.

As regards to Social and Environmental Responsibility, Abengoa follows the GRI (Global Reporting Initiative) guidelines to define the parameters for its different areas to ensure that it complies with the mission of the report.



Abengoa: local partner, global reach

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



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

- Become an international leader for promoting, constructing and operating innovative solutions for sustainable development.
- Provide customized solutions for all the sectors in which we operate.
- Guarantee efficient and responsible distribution and sales of our technologies and products around the world.
- Achieve leadership in technologies such as second generation biofuels or solar-thermal plants in order to supply a sustainable energy alternative to the planet.

Abengoa in Africa

Abengoa has a wide international presence. We have a great team with diverse professional backgrounds, and we work with local employees in every country we have business in.

Abengoa has achieved a leading position within the renewable energy construction and technology sector in the African continent. Through its efforts in developing commercial scale solar thermal electricity (STE) projects in South Africa, as well as several energy transmission projects all over the continent, Abengoa has become a key player in the sustainable development sector in Africa.

In the water sector, Abengoa is currently operating three desalination plants in the North of Algeria, as well as developing a brand new, 100,000 m³/d plant in Agadir, Morocco. Abengoa has built the first desalination plant of West Africa in Accra, Ghana, and it can boast of a total installed capacity in Africa of over 660,000 m³/d. This is enough to provide with clean drinking water to more than 3.5 million people in the whole continent.

Abengoa is also responsible for developing several other desalination projects in an EPC basis in places such as Libya or Angola.

Industrial growth, increasing population and a rise in the rate of urbanization is driving the need for reliable clean water sources in Africa. The Sub-Saharan region of Africa has the largest number of water-scarce countries in the world. To avoid the high cost derived of water scarcity in the population, such as health issues, and the damaging impact that water uncertainty has on the local economy, new solutions must be found.

Accra, the capital of Ghana, with nearly three million inhabitants, currently struggles to meet the demand for water from its more remote towns and villages. In a country with a rapidly growing population, the Ghanaian authorities have therefore prioritized water supply projects and private investment within the country's Economic Recovery Program, which was launched in the 1980s to revitalize its economy.

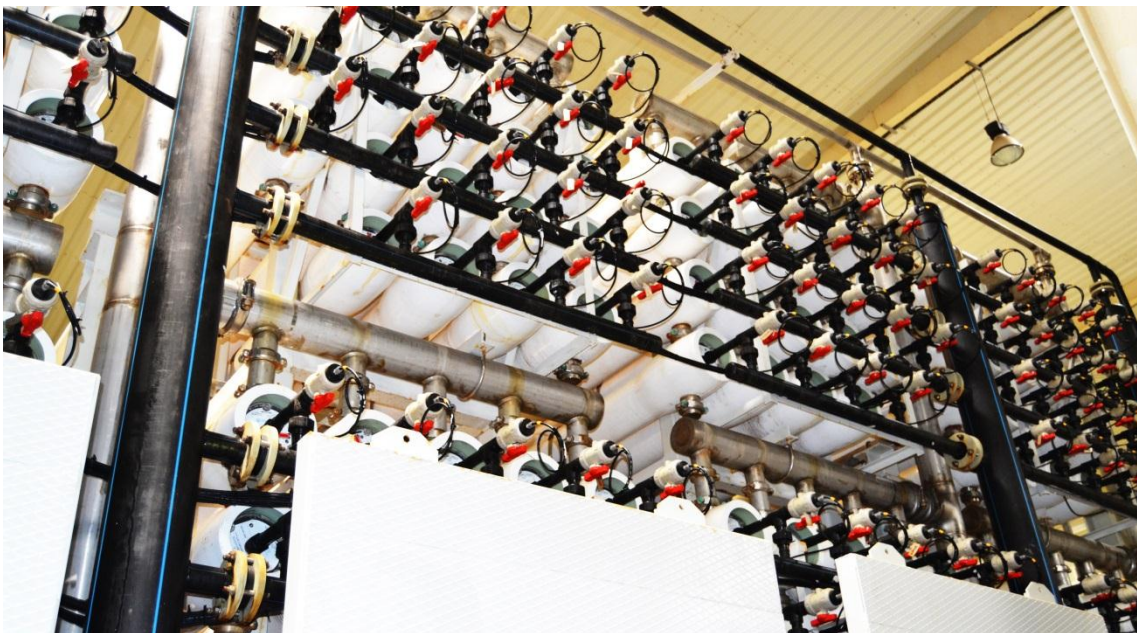
Desalination is a sustainable alternative to help water-scarce areas to find new sources of fresh water and achieve water security, helping protect their populations and boosting their economic growth.

Accra Water Desalination Plant

Figures

- Location: Nungua, Greater Accra (Ghana)
- Capacity: 60,000 m³/d
- Technology: UF + Reverse Osmosis
- Sea Intake: Submarine pipeline 450 m
- People to be provided with fresh water: 300,000-500,000

The Accra Water Desalination plant is a 60,000 m³/d treatment plant that serves almost 500,000 people in the area. It was implemented through a Build, Operate, Own and Transfer (BOOT) mechanism for a period of 25 years under Abengoa's management. This plant required an investment of \$126 million it was financed through African financial institutions (the NedBank and the Standard Bank of South Africa). The plant initiated construction in 2012 and started producing water at the end of 2014, formally commencing operations in the first trimester of 2015.



➤ Ultrafiltration membranes



Accra Water desalination plant uses UF Membranes used for these processes have pores that allow the removal of particles between 0.01 and 0.1 μm in size. During the filtration process, the water may pass directly through the membrane, allowing for undissolved particles and contaminants to be caught by the membrane.

In desalination, this serves as a pre-treatment for the water, helping protect pumps and other membranes as well as it creates a microbiological barrier that is extremely useful to control microorganisms carried by the untreated water, which is particularly relevant when compared to traditional treatments, systems that result in microbiological growth and the formation of preferential pathways.

➤ Reverse Osmosis

The plant has four racks of reverse osmosis membranes. This system works by pushing water applying mechanical pressure through a semipermeable membrane, which allows water molecules to pass through and rejects dissolved ionic species. This results in a flux called permeate, which is practically free of salts, and a flux with a higher concentration of salts (brine) which contains those rejected by the reverse osmosis membrane. This flux is usually called salt rejection.



Reverse osmosis is considered to be the best possible desalination technology currently in the market, as it uses less energy and requires less physical space than thermal processes. It also gives a higher return of fresh water than other technologies, which makes reverse osmosis the most efficient technology out there for those