4.2

Industrial value

€1,4 93 million
Sales

€1,107 million
Contracting

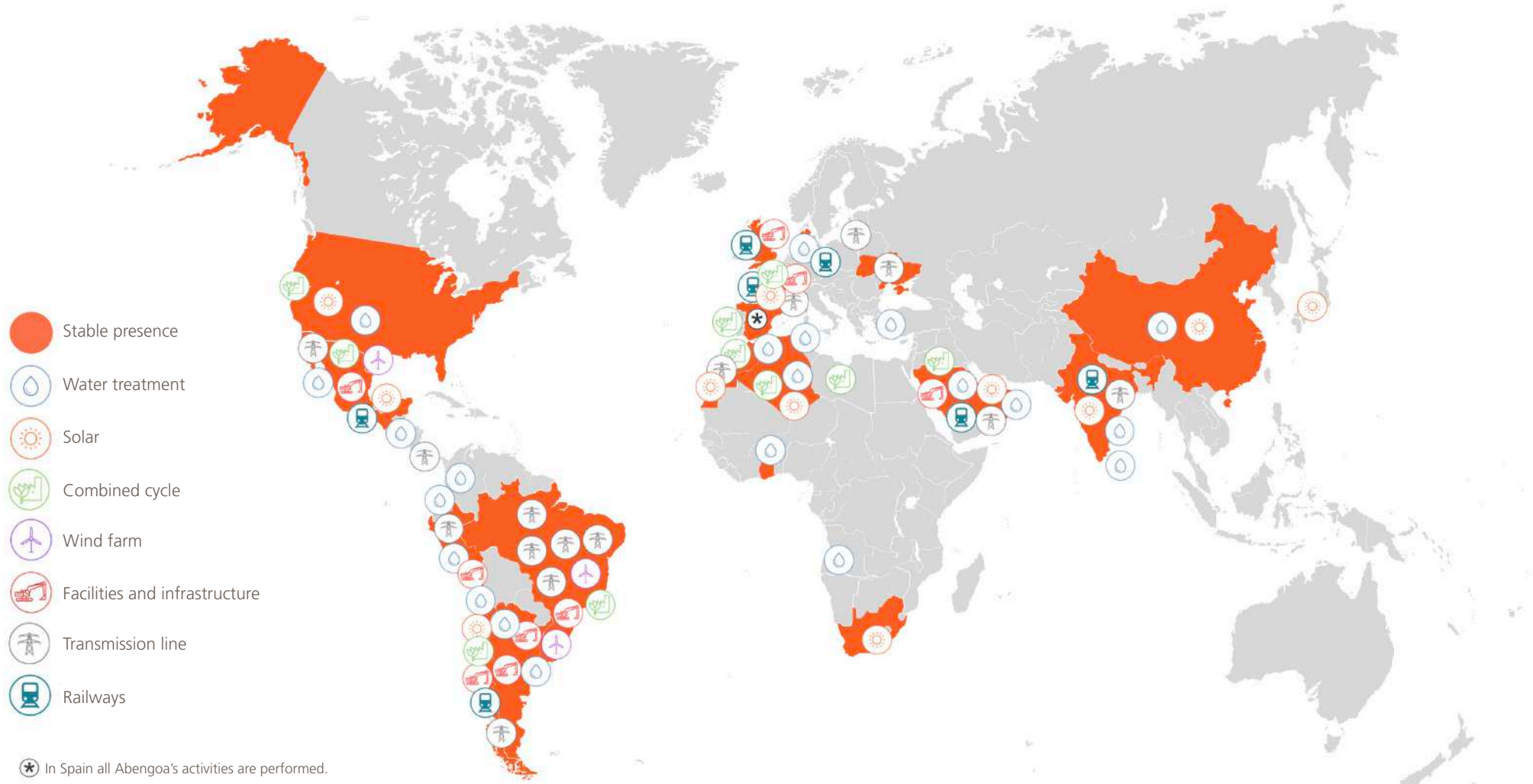
€1,514 million
Portfolio

€24,682 million
Pipeline

Projects in which the company works

Abengoa is an international company that undertakes its main activity of engineering and construction around four areas (water, energy, transmission and infrastructure and services) in the various geographical areas in which it is present and which are of a strategic nature.

These are **South America** (Argentina, Brazil, Chile, Peru and Uruguay), **North America** (United States and Mexico), **Europe** (Belgium, Denmark, France and the United Kingdom), **Africa** (Algeria, Ghana, Kenya, Morocco and South Africa) and **the Middle East** (Saudi Arabia, United Arab Emirates, Oman and Qatar).



Projects by area of activity

Abengoa focuses its activity on the development of turnkey projects including engineering, supply and construction for third-parties in four main areas: energy, water, transmission and infrastructure and, lastly, services, pushing for R+D to drive differentiation of our services and products.

Energy

- Generation of conventional and renewable energy (solar thermal, photovoltaic and wind).
- Storage.
- Waste to energy.

Water

- Desalination.
- Water treatment.
- Hydroelectric infrastructure.
- Industrial water.
- Water management.

Transmission and infrastructure

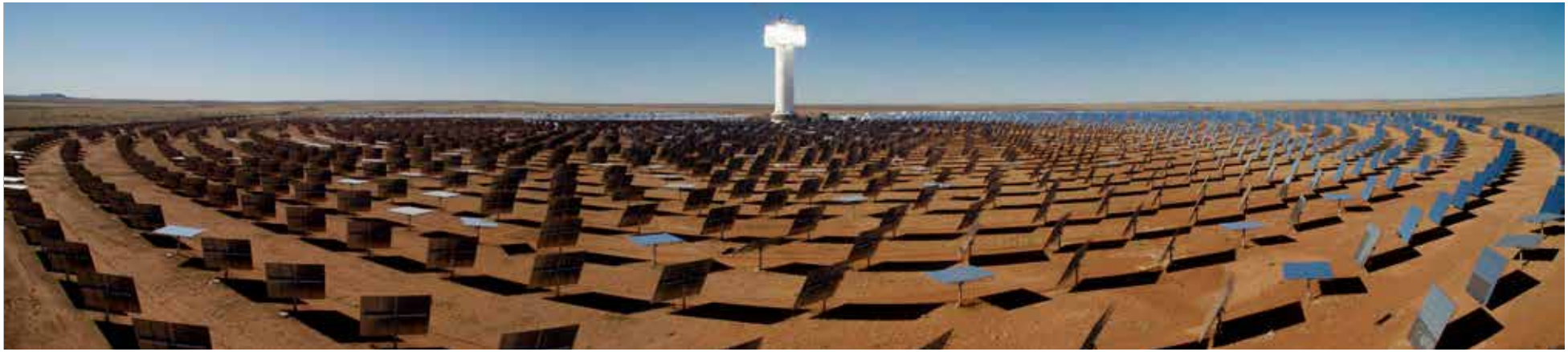
- Transmission and distribution.
- Railways.
- Installations and infrastructure.
- Auxiliary manufacturing.
- Engineering.
- Manufacture of metal structures.

Services

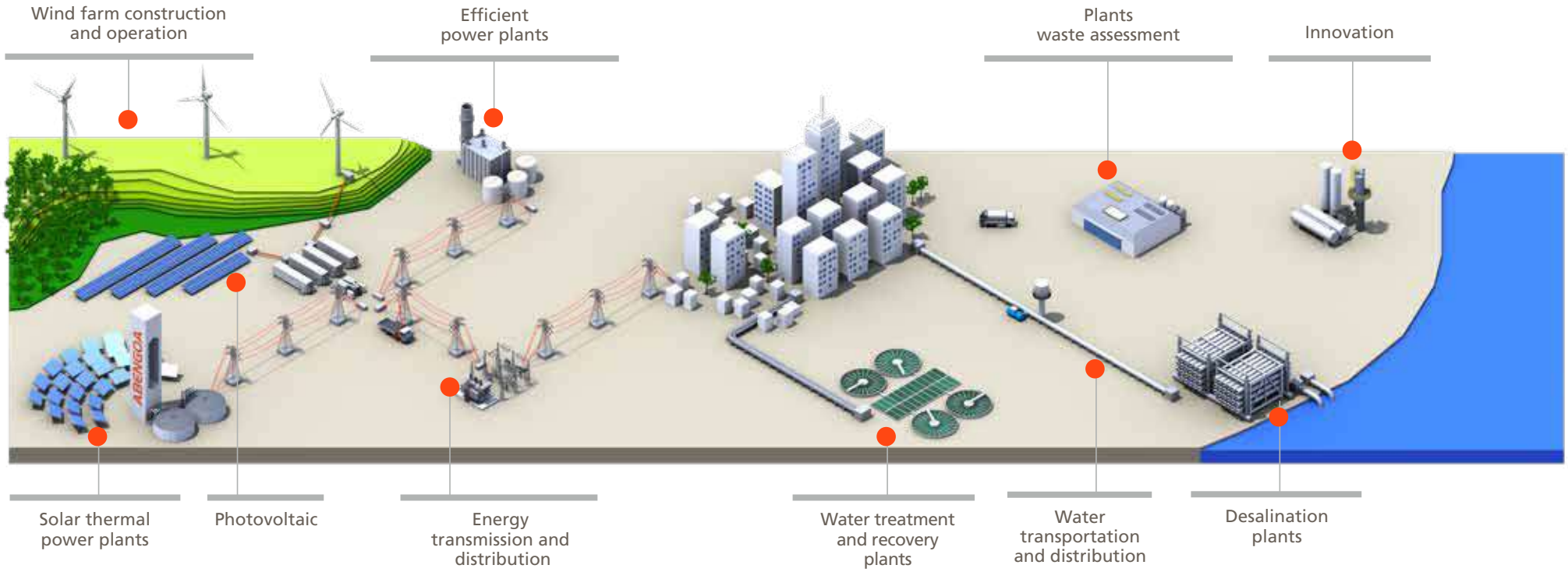
- Operation and maintenance.
- Engineering and plant optimisation services.

Innovation

- Hydrogen.
- Aerospace and defence.
- Power electric systems.
- Solar thermal.
- Railways.



04. Commitment to stakeholders and creation of shared value / Industrial value



1 Desalination

Abengoa is an international benchmark and **leader in the global desalination rankings.** In 2019 Abengoa was awarded the construction of the world's largest reverse osmosis desalination plant in Taweelah, in the United Arab Emirates which will have a capacity to produce 909,000 m^3 of water per day. In 2019, Abengoa also held the inauguration of the desalination plant Shuaibah in Saudi Arabia, executed for ACWA Power, with a capacity of 250,000 m^3/day. In addition, it continued the construction of the desalination plants of Rabigh, in Saudi Arabia, of Salalah, in Oman, of Susa, in Tunisia, and of Agadir, in Morocco.

2 Water treatment

With a global capacity to produce 2.2 million m^3/day of drinking water and treating more than 1.5 million m^3/day of waste water, Abengoa has **extensive experience in water treatment**, in purification, treatment and reuse of waste water of urban origin. In 2019, Abengoa has continued working on the construction projects of two waste water treatment plants and their corresponding sanitation networks in the central are of India, particularly in Nasrullaganj and Maheshwar.

3 Water infrastructures

Abengoa has over **75 years of experience in the construction of water infrastructure** for public and private institutions, such as pumping stations (over 40 stations) and large water supply pipes for regulation and transport infrastructure (over 1,100 km). In this context, Abengoa is executing a watering network for a surface of 13,600 ha, corresponding to the desalination plant Agadir, in Morocco. This is a unique project since it is the largest desalination plant designed and conceived to be used jointly for drinking and irrigation water.

4 Industrial water

Abengoa specialises in providing state-of-the-art **technological solutions associated to process water, reusing, waste water and zero liquid discharge (ZLD)**. In this area, it has rolled out projects in different industrial sectors, exceeding 500,000 m³/day of treated water throughout its over **25 years of experience**. In 2019 the works for the reverse osmosis desalination sea water plant of the world's largest aluminium manufacturer, Emirates Global Aluminium, located in Jebel Ali, with a capacity of more than 41,000 m³/day of drinking water were started.

5 Solar thermal

Abengoa is a **leader in the development, construction and operation of solar thermal power plants across the world**, with a global installed capacity that exceeds 2.3 GW, representing approximately 34 % of the global installed capacity. In 2019, the manufacturing and assembling of the last heliostats of the solar plant of Cerro Dominador were carried out. It is the first solar thermal tower in Latin America, under construction by Abengoa in Chile for EIG. Furthermore, Abengoa has continue the works on the solar complex Mohammed bin Rashid Al Maktoum Solar Park, owned by DEWA.

6 Conventional generation

As for conventional generation plants, **Abengoa has an installed capacity of more than 9 GW**. In 2019, Abengoa officially inaugurated the efficient cogeneration plant A3T, the first own development carried out by Abengoa in Mexico, as well as the second cogeneration plant in the country. Furthermore, Abengoa is the **first company in hybridising solar and gas energy in a commercial scale project**. In 2019, in Saudi Arabia the construction works for the largest plant of this type, Waad Al Shamal went on. It will have a total output of 1,440 MW of energy, due to a combined cycle of 1,390 MW and a solar field of cylindrical-parabolic collectors of 50 MW.

7 Wind

Abengoa has been **participating in projects related to wind energy** for **33 years**, since 1985.
It has accumulated experience in over 480 MW across the world over these past 33 years. We offer services for the entire project life cycle, from the study of the resource, optimisation and selection of turbines, to detailed engineering, logistics, construction and operation of the wind farm.

8 Photovoltaic

Abengoa **designs, builds and operates power plants**, optimising their design according to the characteristics of the land, using high, low or zero concentration panels, as well as thin-film panels. **Currently, Abengoa has close to 400 MW built**. In 2019, the company continued the operation and maintenance works of the photovoltaic plant of Cerro Dominador, of 100 MW, built in Chile, among other works.

9 Waste to energy and biomass

Abengoa **specialises in the design and integration of smart solutions**, building and operating innovative facilities to **transform any type of waste and biomass** into energy, generating renewable and sustainable energy in the form of heat, cold, electricity or fuel. In 2019, Abengoa continued the construction works of the first plant that will produce fuel for the aviation industry from municipal solid waste in the United States.

10 Storage and technology hybridisation

Abengoa specialises in providing **manageability and stability solutions for energy generated** from renewable sources **through the hybridisation of technologies and storage systems**. The current commercial operating capacity of this thermal energy storage systems using molten salts exceeds 6,000 MWht and more than 4,000 MWht are under construction.

11 Innovation

Abengoa keeps driving **technological development as the main competitive advantage to carry out high value-added projects**, thus improving current products and services and the acquisition of new skills. The innovation area is divided into three big areas: Hydrogen, Aerospace and defence and Power electrical systems.

12 Energy transmission & distribution

Abengoa has more than **70 years of experience in engineering, industrial and infrastructure construction and maintenance** in the sectors of energy, industry, environment, transport and communications, taking on the development of electrical transmission and distribution lines, railway electrification, facilities and infrastructure of all kinds of plants and buildings, as well as auxiliary electrical, electronic and metallic structures manufacturing.

By areas of activity, these are the main milestones achieved by the company in 2019.

Energy

▶ Abengoa's experience in renewable and conventional plants both in the construction and installation stages accumulates more than 12.8 GW.

Abengoa **specialises in the energy sector** due to the use of conventional and renewable energy technologies. It thus builds combined cycles, cogeneration plants, solar thermal and photovoltaic plants, wind farms and waste to energy and biomass that, jointly, exceed 12.8 GW both installed and under construction.

Furthermore, the company has **extensive experience in energy storage systems**, guaranteed by its storage capacity of more than 6,000 MWht in molten salts thermal solar plants in operation (700,000 tonnes of molten salts installed in the whole world), as well as 4,000 MWht under construction. This allows it to have a high design and hydridisation capacity among generation technologies and offers solutions for optimal management and decarbonisation to their customers.

▶ Thermal solar plants of Xina Solar One and Kaxu Solar One.

Abengoa **develops turnkey projects, applying its experience in the whole value chain**, not just in the development and engineering stages, but also in the purchasing and construction stages, as well as the commissioning, operation and maintenance of the largest plants.

▶ Conventional generation

▶ A3T efficient cogeneration plant, in Mexico.

With an installed capacity of more than 9 GW in conventional generation plants, of which 1.4 GW are under construction, Abengoa has an extensive experience in the construction of simple and combined cycles, converting simple cycles into combined cycles, motor and cogeneration power plants.

In 2019 **Abengoa officially inaugurated the A3T efficient cogeneration plant**, the first proprietary development executed by Abengoa in Mexico, as well as the second cogeneration plant in the country. The plant, which has been in operation since December 2018, is located next to Nuevo Pemex's gas processing complex in Centro (Villahermosa, Tabasco) and has a guaranteed capacity of 220 MW (266 MW of maximum power). Together with Nuevo Pemex's cogeneration plant, also built by Abengoa, they are the most efficient cogeneration plants in the whole of Mexico.

Solar energy

Abengoa is an **international leader in the development of electric generation plants using the sun** through photovoltaic and solar thermal technologies, in which it has its own technologies. In the case of thermal solar technologies, Abengoa has constructed 34 % of the installed capacity worldwide.

One of the cylindrical-parabolic collectors of the solar field of stage IV of Al Maktoum Solar Park.

Solar thermal tower technology allows the production of electricity by concentrating the solar energy captured, through a field of heliostats, into a receiver located at the top of a tower. Abengoa is a pioneer in the construction of tower plants for commercial operation, with more than 80 MW in operation and 110 MW under construction.

Abengoa also develops plants based on **solar thermal parabolic trough technology, where energy is captured through a collector** that allows the heating of a heat transfer fluid for the use of the heat in a conventional thermal cycle. With this technology, Abengoa has more than 1,600 MW in operation and 650 under construction.

Adapting to the needs of strategic sectors requiring reliable alternatives to decarbonisation, Abengoa has developed its **own technology** to answer the heat and steam requirements of heavy industry processes at high temperatures worldwide, **using solar thermal parabolic trough energy with integrated thermal storage**.

In 2019, the manufacturing and assembling of the last heliostats of the solar plant of Cerro Dominador were carried out. It is the first solar thermal tower in Latin America, under construction by Abengoa jointly with Acciona in Chile for EIG Global Energy Partners. This 110 MW plant will add to the photovoltaic plant of 100 MW already built by Abengoa which has been in commercial operation since August 2017. The thermal solar and photovoltaic plants will be joined by a battery storage system of 4 MWh, which will create a renewables complex with a total capacity of 210 MW. It will be the first combining these three technologies in the world. This project will enable generating clean energy that can be managed 24/7 and with 17.5 hours of thermal storage in molten salts.

In China, Abengoa has successfully synchronised the turbine of the Luneng Haixi 50 MW solar thermal tower, in which it has taken part as technology supplier. In the province of Gansu, it has completed the construction of the Royal Tech Yumen 50 MW solar thermal parabolic trough plant where it was in charge of technology and engineering.

Solar thermal tower plant of Luneng Haixi.

Therefore, also in 2019, in the Arab emirate of Dubai, Abengoa continued the construction of the solar field consisting of 3 x 200 MW parabolic troughs, with 12 hours of storage capacity in molten salts. It will be part of the 4th stage of the world's largest solar complex, named Mohammed bin Rashid Al Maktoum Solar Park, owned by DEWA (Dubai Electricity and Water Authority).

In 2019, Abengoa also broke records with Xina Solar One, its third solar thermal plant built in South Africa, following the completion of the output tests guaranteed in a record time: only 16 months. Xina Solar One, developed, designed, built and operated by Abengoa since 2017, with a capacity of 100 MW, provides clean sustainable energy, even in hours without solar radiation due to its storage system in molten salts for more than five hours and a half. More information on this plant on page 65.

Abengoa has been the **first company in hybridising solar and gas energy in a commercial scale project**. In 2019, in Saudi Arabia Abengoa continued with the construction works of what will become the largest plant of this type in the world, Waad Al Shamal, which will have a total output of 1,440 MW of energy, thanks to the combined cycle of 1,390 MW of power and a solar field of 50 MW parabolic trough collectors.

Abengoa has made innovation advances within the solar thermal sector and achieved excellent results in the new generation of parabolic trough collectors that Abengoa has developed in plants such as Xina Solar One and that of DEWA, which provide the largest opening currently installed in the market. This has resulted in international recognition in the sector, with awards such as the **CSP Technology Innovation Award 2019** which it received in China. It is an annual award granted within the scope of the CSP Plaza 2019, which recognises companies which have achieved important advances in innovation and the application of technology in the previous year.

Waste to energy and biomass

The Fulcrum plant is the first one to produce biofuels for aviation purposes from solid urban waste as raw material.

Abengoa, in its on-going search for sustainable solutions to fight against climate change, the elimination of waste and the reduction of the use of fossil fuels, designs and integrates smart solutions and builds and operates innovating facilities to recover all kinds of waste and biomass, for obtaining renewable sustainable energy in the form of heat, cold, electricity or fuels.

In this field, in 2019 Abengoa continued advancing in the construction of a plant that will allow 10 million gallons of fuel to be obtained for aviation purposes from solid urban waste in the United States. This plant will be a benchmark in the sector, since it will be the first of this kind in the country.

The main challenge Abengoa faces in the energy sector is continuing its international trajectory in the development of innovative solutions to combat climate change, decarbonisation and sustainable development, due to its unique skills as technology supplier, developer of EPC (Engineering, Procurement and Construction), and expert in the operation and maintenance of conventional and renewable energy generation plants, such as solar thermal and photovoltaic plants, wind farms and storage. Abengoa has its own technology that allows to provide innovative designs based on the hybridisation of technology, adapted to the needs of any specific industry.

Water

Abengoa is leader in the water industry thanks to its large water desalination, purification and infrastructure. In the imagin, the works in the desalination plant of Rabigh (Saudi Arabia).

Abengoa is **leader in the water sector**, providing sustainable solutions both for the scarcity of water resources with **large-scale desalination and purification plants and water infrastructure**, to the protection of the environment with the construction of urban and industrial waste water treatment plants. It **specialises in all the development stages of turnkey projects**, from design and supply, to construction and commissioning, becoming worldwide leaders in desalination.

Desalination

Abengoa is constructing in Agadir (Morocco) a desalination plant with a capacity of 275,000 m^3/day.

Abengoa is internationally renowned for its **leadership in the desalination sector**, in which it is ranked in first position among the main construction companies for its capacity of contracted desalination since July 2018 and in fourth position since 2008, according to the IDA Water Security Handbook 2019-2020 and the magazine *Global Water Intelligence*. It has developed large benchmark projects in Spain, Africa, Latin America, the Middle East and Asia for obtaining drinking or industrial water through advanced membrane processes, which have a capacity to produce more than 1.7 million m^3/day of desalinated water. It is currently building plants in Morocco, Tunisia, Oman, Saudi Arabia and United Arab Emirates which may produce a further 2.6 million m^3/day.

Following its successful bid in 2019, Abengoa has started **construction of the largest reverse osmosis desalination plant in the world** in Taweelah, United Arab Emirates, which will have the capacity to treat 909,000 m^3/day of seawater and will guarantee the water supply to the city of Abu Dhabi throughout the year.

The works in the **sea water reverse osmosis desalination** of the industrial complex of the largest premium aluminium manufacturer in the world, Emirates Global Aluminium, were awarded in 2019 too. The site is located in Jebel Ali and will have capacity to produce more than 41,000 m³/day of drinking and industrial water.

▶ Abengoa's desalination under construction in Salalah, Oman, will work with reverse osmosis technology.

In 2019, the desalination construction projects developed by Abengoa moved forward in Saudi Arabia (Rabigh, of 600,000 m³/day), Morocco (Agadir, of 275,000 m³/day), Oman (Salalah, of 114,000 m³/day) and Tunisia (Susa, of 50,000 m³/day).

The participation of Abengoa in the Agadir desalination project awarded the company with the **recognition in the International Desalination Association (IDA) awards**, granted annually to recognise those companies that are an "example of collaboration and creativity", in the category of Best Public-Private Partnership.

In 2019, Abengoa also held the inauguration of the desalination plant Shuaibah in Saudi Arabia, executed for ACWA Power, with a capacity of 250,000 m³/day This project, which will guarantee stable and quality supply for the cities of Mecca, Jeddah, Taif and Al-Baha, will be in commercial operation 21 months after the construction works were started, which was a challenge given the characteristics and size of the plant, evidencing Abengoa's good performance in the execution of large projects all around the world.

At the beginning of the year, the desalination plant built and managed by Abengoa in Ténès (Algeria) reached 200 m³ of drinking water produced, another important milestone proving the company's success in the desalination sector both in the engineering and construction and the operation and maintenance of plants. The Ténès plant, which uses inverse osmosis technology and has a capacity to produce 200,000 m3/day of drinking water, came into commercial operation in February 2015, the year when the company took charge of operation and maintenance for 25 years.

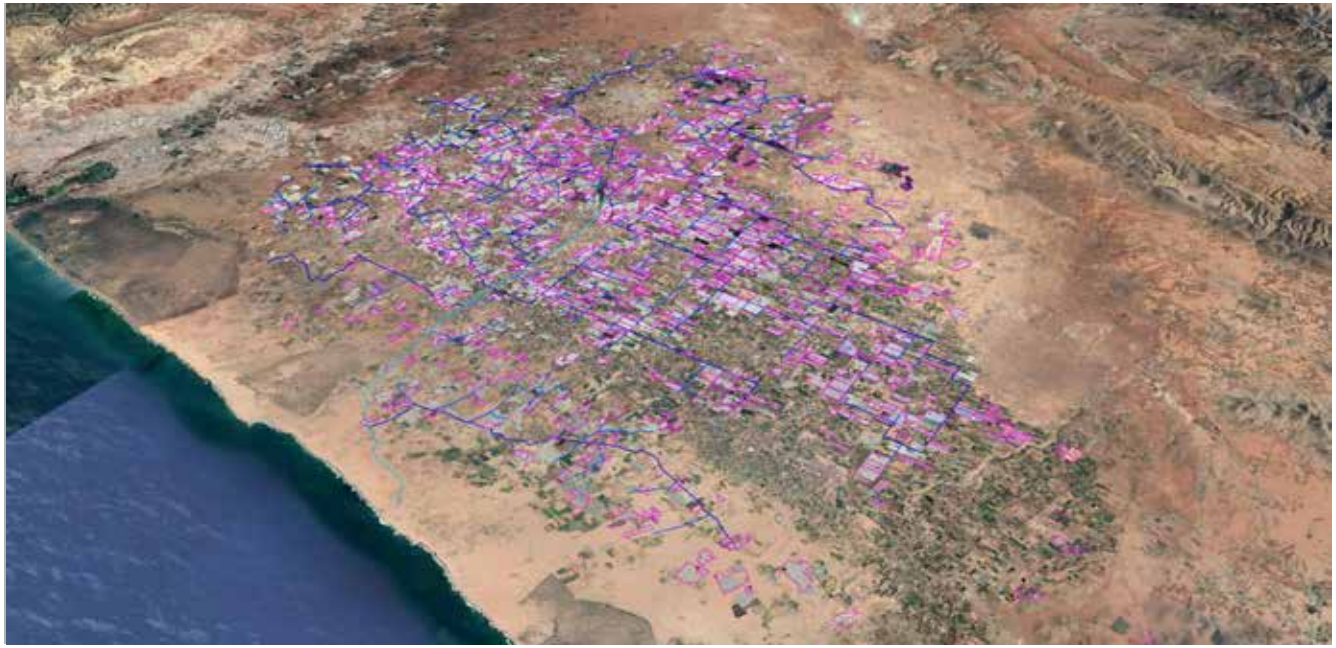
Water treatment

▶ Abengoa stands out worldwide for its work on purification plants.

Abengoa is an **international benchmark in water purification**, and has a global capacity to produce 2.2 million m³/day, and in **the treatment and reuse of urban waste water**, with more than 1.5 million m³/day of purified water. In order to do so it uses physical-chemical and biological processes, including treatments for the digestion and recovery of waste.

In 2019 Abengoa continued working on construction projects for two waste water treatment plants and their corresponding purification networks in the central area of India, particularly Nasrullaganj and Maheshwar. These projects will have a global capacity to treat approximately 10,000 m³/day which will improve the sanitation system of a total population of close to 55,000 inhabitants.

Water infrastructure



The Agadir desalination plant, in Morocco, will have an irrigation network for a surface of 13,600 hectares.

Abengoa has over 65 years of experience in water infrastructure. During this time, it has carried out projects both for public and private customers, such as pumping stations (40), large water supply pipes for regulation and transport infrastructure (over 1,100 km) and distribution of water (supply to more than 4 million inhabitants), installation of irrigation systems and irrigation (more than 500,000 ha), or the construction, improvement and upgrade of hydroelectric power plants (more than 400 MW installed).

In this context, Abengoa is executing a watering network for a surface of 13,600 ha, corresponding to the desalination plant Agadir, in Morocco. This is a unique project since it is the largest desalination plant designed and conceived to be used jointly for drinking and irrigation water.

Industrial water

Abengoa continues the construction in Mexico of a process water treatment plant and a waste water plant for the combined cycle plant Norte III.

In industrial water, it has diversified its range of activities, developing projects in sectors such as power generation, steel production, paper and pulp industry, leachate, oil and gas, petrochemical, pharmaceutical, mining and food, among others. With more than **25 years of experience and more than 500,000 m3/day of water treated**, the company has used the most advanced technological advances in water treatment, purification and reuse of waste water, and for obtaining zero liquid discharge (ZLD).

In the sector of energy generation, in 2019 Abengoa has continued the construction of a process water treatment plant and a waste water plant for the combined cycle plant Norte IIII in Mexico, with a capacity of 1,700 m^3/day.

In 2020, Abengoa will face the challenge of maintaining the high number of contracts signed and the good execution of large projects it is currently developing and place it at the top of the global water sector. Its continued promotion of innovation, extensive experience, as well as its specialised and competitive know-how, are the key to its success.

Transmission and infrastructure

Abengoa has been in charge of all the electromechanical installation in the Lagoh shopping centre in Seville.

The start of the vertical Transmission and Infrastructure (T&I) activities go back to the first steps of Abengoa in the 40s, when it carried out engineering, construction and maintenance works of energy, industry, environmental, railway and telecommunication facilities and infrastructure.

They comprised all products of electrical transmission and distribution, electrification and conventional and high speed railways, and infrastructure for all kinds of industrial and building plants, as well as the auxiliary manufacturing of electronics and metallic structures.

Transmission and distribution

In **Spain**, it has continued with the electrical network for the Güeñes-La Jara and Belesar-Lomba transmission lines, both of 220 kV, in which meteorological and orographical difficulties required the use of helicopters. Furthermore, works for other operators have been carried out. The Alonsotegui -Ortuella high tension line for Iberdrola and the Teso Santo evacuation substation for Solaria's photovoltaic facilities in Salamanca stand out.

Transmission line connecting Alonsotegi with Ortuella, in Biscay.

In **France**, Abengoa has been working for 20 years on an on-going basis for the electrical transmission network operator, for which it has done engineering, construction, assembling and disassembling of high tension lines, both aerial and underground, as well as substations within the high tension framework agreement, renewed periodically since 2003.

In **Ukraine**, the construction works for the 750 kV Zaporizhzhia-Kakhovska high tension line have continued.

In the **Emirates**, two new projects for the high tension operator have been started. They cover several locations in the coastal areas in the regions of Abu Dhabi, North-east and West, as well as the 400 kV line between the Shahama and Taweelah substations.

In **Oman**, the whole project for the two 132/33 kV GIS substations, Samad and Sinaw, and the high tension line connecting them have been successfully completed. The works were completed on time with the best quality and zero accidents. The company has been recognised by the local government and the customer Oman Electricity Transmission Company (OETC) for its "excellent performance" achieved in the work completed for two substations in the country.

Railways

In **Spain**, Abengoa has continued working for its customer Adif in the maintenance of the high speed lines of Antequera-Granada, Madrid-Zaragoza-Barcelona-French border, Madrid-Alicante, Madrid-Córdoba-Málaga-Seville, Madrid-Toledo and Madrid-Valladolid. In addition, the works for the electrification of the high speed Madrid-Levante line in the tranche up to Murcia are ongoing, as well as those in the installation and maintenance of protection, safety and telecommunication systems in the Pajares tunnel.

In the **United Kingdom**, as part of the multi annual contract to upgrade the railways in the Great Western and Anglia regions, the T&I vertical attained a highly important milestone when the electrification between London and Cardiff was successfully completed. This will see a significant increase railway traffic between the two cities.

In **France**, the traction substation works for the French railway operator have been resumed.

In **Lithuania**, the company has signed a contract for electrifying the Vilnius-Klaipeda railway corridor, consisting of the electrification of more than 730 km and connecting the country from east to west. This project will allow the circulation of electrical trains from the borders in Belarus to the Klaipeda port, one of the main goods circulation hubs between Baltic counties and a strategic goal for developing the railway sector in Lithuania. Large socio-economic benefits are expected due to the reduction of pollution after removing the current diesel engines.

In **Saudi Arabia**, the high speed railway electrification works joining Mecca and Medina were completed. This railway is already under restricted operation, and the pre-operation commercial and maintenance works are already in motion.

▶ Pajares tunnel, where Abengoa's works in its protection, safety and telecommunications have continued.

Installations and infrastructure

In Spain, Abengoa has taken part in important infrastructure project all around the peninsula. In the image, the new headquarters of Universidad de Loyola in Dos Hermanas (Seville).

In **Spain**, the company has successfully completed the electromechanical installations of the shopping centre and family leisure centre Lagoh in Seville, which has been open since September. Moreover, Abengoa is in charge of the comprehensive maintenance works of said facilities.

The mechanical installations in the new campus of Universidad Loyola de Andalucía have also been successfully completed, which allowed the academic year 2019-2020 to start on the expected date.

The remodelling work of the communication and control systems of Sevilla station (Madrid Metro) has already finished.

In addition, the company continues working in low tension installations for Airbus in the factory in Puerto Real, while these have been completed in Seville.

The voice and data installation works corresponding to maintenance and opening of logistics centres and stores of one of the largest supermarket chains in Europe are continuing, as are electrical maintenance and instrumentation works for the electrical energy generation plants in Almaraz and Trillo. Lastly, in 2019, Abengoa has also continued with electrical maintenance in the Sabic factory in Cartagena.

With regards to new projects, the T&I vertical initiated last year the reform and extension of the terminal building of Seville Airport, of the new building for the assistance and administration centre of Mutua Universal in Malaga and the construction of the Campanar II health centre for the Generalitat Valenciana, the specialities centre, paring and delivery electrical energy centre within the Campanar – Ernest Lluch health complex in Valencia.

Commencement of the works (cementation) of Mutua Universal in Málaga.

Lastly, the works with new telecommunications operators in Navarra have started and the roll-out of mobile, radio and optic fibre phone services, telecommunications structures and GSM-R is continuing.

In **Belgium**, the company continues the execution of the works corresponding to the mechanical installations of the hospital centre in Liège.

In **Denmark**, we have continued working in the electrical-mechanical facilities in the new hospital complex located in Herlev.

In **France**, Abengoa participates in the design and installation works of two 400/22 kV substations within the ITER (International Thermonuclear Experimental Reactor) complex located in Cadarache.

Manufacture of metal structures

A tower of our own design for the 132 kV San Agustin (Zaragoza) line manufactured by Eucomsa.

Abengoa's Transmission and Infrastructure vertical, through its Eucomsa manufacturing centre in Utrera (Seville), is responsible for the design, manufacture and testing of lattice towers for airlines and telecommunications, as well as structures for electrical substations and solar power generation (parabolic trough collectors and heliostats). In addition, it has a test station, designed to test the strength of these structures.

During 2019, its main milestones have been:

In **Spain**:

- The manufacture of 220 kV towers and supports for the substation of the photovoltaic plants of Picon I, II and III in Ciudad Real has been completed.
- Eucomsa's own design towers have been manufactured for the following lines:
  - El Tesorillo, of 66 kV (Seville).
  - San Agustín, of 132 kV (Zaragoza).
  - Guillena – Salteras, of 220 kV (Seville).
  - Evacuation PV La Cabrera, of 220 kV (Seville).
- Red Eléctrica de España (REE) towers have been manufactured for the following lines:
  - Villaverde, of 400 kV (Madrid).
  - Baeza - Caparacena, of 400 DKV.
- Encompassed within the framework contracts in force with electrical companies, supports have been manufactured for:
  - REE (220 kV y 400 kV).
  - Iberdrola (30 kV, 45 kV, 66 kV and 132 kV).
- The production of telecommunication towers has continued for the following customers: Adif (GSM-R system), and Cellnex and Telxius for mobile telephony operators.

In **Germany**:

Se ha completado la fabricación de las torres para la línea de 380 kV Altheim – St. Peter para Tennet.

Construction of the towers for the 380 kV Altheim – St. Peter line has been completed for Tennet.

In **Ireland**:

The company continues with the construction of 38 kV, 63 kV and 132 kV supports, as well cross arms encompassed in the existing framework contracts with the Electricity Supply Board (ESB), the electricity company operating in Ireland.

In **Peru**:

Anchors for the 220 kV Tintaya – Pumiri line have been manufactured.

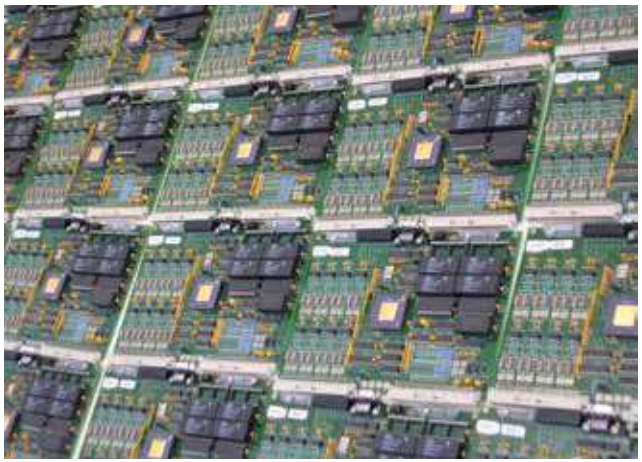
In **Dubai**:

The supply of support structures for parabolic trough collectors at the Mohammed Bin Rashid Al Maktoum solar complex plant has begun.

In **Chile**:

Manufacturing of heliostats support structures for the Cerro Dominador solar thermal plant has been completed.

Auxiliary electric and electronic manufacturing



Some of the electronic components are manufactured by Abengoa.

During 2019, Abengoa has achieved important milestones in auxiliary manufacturing:

- Manufacture and upgrade of Power Distribution Boxes (PDB), including control electronics and protection modules for the UK Ministry of Defence armoured vehicles. These works include the integration of electrical equipment and accessories, busbars, power and control wiring, electronics management, wiring and connection of the system, as well as functional tests and trials.
- Manufacture of urban traffic control devices and equipment for the national and international markets.
- Access control machines and associated electronics manufacture for Metro Madrid and Euskotren.
- Manufacture of monitors for control consoles and control for frigates.
- Manufacture of distribution and control cabinets and power converters for the European Organisation for Nuclear Research in Switzerland (CERN), including the supply of mechanical, electrical and electronic components, integration, wiring, system connections and functional testing as well as CE marking (European Community).
- Manufacture of inclinometers to control the positioning of the heliostats in the Cerro Dominador, Dewa and Luneng thermosolar plants and of remote control stations for the DCS and solar farm of the Cerro Dominador complex solar platform.
- Harness manufacture for the central channel of the high speed Talgo trains.

Engineering

Mecca-Medina high speed line track.

In 2019, some very significant engineering milestones have been achieved:

- **T&D Projects:**
  - Belesar-Lomba 220 kV high voltage line engineering.
  - Engineering for the expansion of the Santiz booster substation (220/30 kV - 75 MVA).
  - Engineering supervision of 132 kV high voltage lines.
- **Railway projects:**
  - Engineering for the Egly traction substation 20 kVac/ 1,500 Vdc.
  - Electrical traction simulation project for the Mecca-Medina project (Haramain) performed with our own ALIS simulation software .
  - Catenary engineering for the electrification of the high-speed La Meca – Medina line.
  - Catenary engineering 1,500 Vcc for the station Perrache Lyon Part Dieu.
  - Catenary engineering for the electrification of the Monforte del Cid - Murcia high speed line.
  - Catenary Engineering UK (Wales & Borders Electrification Project).

Services

▶ Labour work and maintenance work on a transmission line.

Regarding services, Abengoa is responsible for predictive, preventive and corrective integral operation and maintenance (O&M) in the energy and water transmission and renewable and conventional power generation sectors. The main objective of this vertical is to achieve optimum manageability and increase production and efficiency of plants.

Almost 20 years of experience support the company, which works in all stages of the project: from development to operation, through conceptualisation, financing and construction. It is the world leader in solar thermal O&M (with almost 1,700 MW of commercial experience in operation and maintenance), combined cycles, solar and gas hybrid plants and desalination plants, with the largest amount of m^3 operated in the last of these.

Abengoa adapts its O&M services to the particularities of each client, technology and project. To this, it adds its extensive experience in this field, which enables it to offer alternatives of shared risk in the operation of projects. This balances the risk profile that each project or customer requests with the offer.

In addition to the above, Abengoa offers other specific services:

- Predictive techniques: ultrasound, single-platform data analysis and processing, thermography, vibration and electrical quality, and active health technical reporting.
- Plant O&M Engineering.
- Optimisation and rehabilitation of desalination plants.
- Optimisation of facilities manageability.
- Optimisation of O&M and plant performance contracts.
- Optimisation of solar farms for solar thermal technologies.
- Solar farms works.

▶ Operation and maintenance work on a solar plant.

In addition, it has contributed its experience during the maintenance of the 50 MW solar thermal parabolic trough plant in Nagalapuram, in the state of Andhra Pradesh, India, for the company Megha Engineering & Infrastructures Limited, also has worked on the maintenance and optimisation of the Shams solar plant in Abu Dhabi (UAE).

In addition, the Services vertical provides specialised technical operating personnel to the Cerro Dominador solar thermal plant, an activity that began in 2019 and will continue in 2020. This plant, owned by EIG Global Energy Partners, has solar thermal technology and molten-salt energy storage and, although it will begin its operation in 2020, activities related to the mobilisation and training of personnel have already been performed.

Abengoa is also responsible for the operation and maintenance of the 100 MW photovoltaic plant in the Cerro Dominador complex, which has more than met the production targets since its operation began in 2017.

In 2019, the Abengoa Services vertical also supported the O&M of the plants built by the company in both the United States and South Africa through the know-how of its service personnel.

Finally, this year an O&M services contract with Ence Energía has been closed to carry out the operation and maintenance of the 50 MW Termollano solar thermal parabolic trough plant in Puertollano (Ciudad Real) over the next few years.

▶ The Abengoa Services vertical was awarded in 2019 the operations and maintenance of the Termollano solar thermal plant of parabolic trough collectors in Puertollano (Ciudad Real).

Moreover, the plants that Abengoa maintains and operates have faced the following challenges in 2019:

- Planned downtime: pressure tests have been carried out on steam generators and solar farm loops, as well as major inspections at different plants, always with positive results. During these downtimes, the predictive maintenance equipment of the electrical system has been installed.
- Repair, consultancy and optimisation works for solar plants in the United Arab Emirates and India.

In 2020, the main challenge of the vertical will be to grow as a technological supplier of solar thermal plants under construction and already operating. In addition, Abengoa will need to look for ways to acquire new contracts and expand its market geographically.

Abengoa will also continue its current works in plants under construction and the services provided at the A3T efficient cogeneration plant in Mexico. It will also continue to optimise the efficiency and availability of its plants within and outside Spain.

Abengoa's presence

Abengoa's activity during 2019 was carried out mainly in the following geographical regions.

Argentina

▶ During 2019, Abengoa has continued to make significant progress in the execution of its project at the 25 de mayo transformer station.

The economic and financial crisis in Argentina, which began in 2018 and which has continued throughout 2019, has once again postponed the country's major electric transport works. In spite of this, Abengoa has continued to advance and win new contracts, such as the construction of the 13.2 kV power distribution lines for the Minera EXAR lithium extraction plant in northwestern Argentina.

Furthermore, significant progress has been made in the implementation of significant projects such as the works of the Altiplano (345 kV) and 25 de mayo (500 kV) transformer stations.

In addition, Abengoa's subsidiary in Argentina has succeeded in reactivating the construction of the Vivorata substation (500 kV), which has been stopped since 2018.

For 2020 the company aims to remain a benchmark in the Argentine electricity sector, in addition to consolidating, within the current framework of the country, the confidence of the market and thus be awarded new contracts. In addition, the company is considering managing opportunities in new locations such as Paraguay, in projects of double circuit lines at 500 kV.

Brazil

▶ Map of Abengoa's presence in Brazil.

▶ Subestación de 500 kV en Brasil.

Abengoa has been present for more than 20 years in Brazil, a country in which it has developed a large number of projects in the transmission and infrastructure sectors.

The year 2019 has been of great importance and has meant a turning point for Abengoa in Brazil, since country, since its financial restructuring (Judicial Recovery) process has successfully completed and execute construction projects again in addition to continuing with its maintenance activities of the construction activity.

Brazil is an attractive market since it is the economic power of the region, which is showing recovery signs and where the energy sector plays an essential role with great opportunities.

Therefore, 2020 will again be a year of vital importance for the company in the country, since it will execute construction projects again in addition to continuing with its maintenance activities of the transmission assets and rental of equipment, all this with the aim of being again a benchmark in the electric transmission sector in the country.

Chile

▶ Interior view of the technical building built for the European Southern Observatory.

With a presence in Chile since 1987, the company has led the development of construction projects of more than 1,900 km of power lines and 50 substations, as well as electromechanical and structural assemblies for important local and international companies.

One of Abengoa's main clients in the country over the past year has undoubtedly been the National Copper Corporation of Chile (Codelco), for which the following projects have been developed:

- Completion of the electromechanical assembly of the Humos Negros project in the Chuquicamata division.
- Also in Chuquicamata, the works related to power supply in 2020 are expected to be completed in 13.8 kV of pumping stations, mitigation wells and others of Tranque Talabre, which will allow the mitigation of leaks from the waste containment dam.
- Completion of various works (civil, electric and piping) in the Valparaiso region, at various points in the mining plant site for the Andean division.
- Completion of the construction of the technical building for the European Southern Observatory (ESO) in Paranal, being an achievement for the company in contributing to the development of aerospace observation.

▶ A transmission line that allows the energy of the Los Condores hydroelectric generation plant to be discharged into the national interconnected system.

- In the Libertador Bernardo O'Higgins region, the project for the replacement of the 110 and 13 kV conductors of the substation that supplies the mining plant site for the El Teniente division was completed.

The following projects have also been completed:

- Reinforcement of the 2 x 220 kV line for Transelec located in Caserones, Atacama region.
- High-voltage transmission line connecting Los Condores hydroelectric generation plant with the Ancoa substation in the Maule region for the client Enel Generacion.
- Relocation of the 23 kV power line, transfer pipes to copper and refining solution processing plant (500 mm) of approximately 1.8 km and relocation of the pumping station (EB3) for Minera Centinela, located in the Antofagasta region.
- A 140 kilometre high-voltage transmission line linking the Los Changos and Kimal substations, as well as different improvement works at each substation.

Additionally, throughout 2019, the maintenance of the electrical system of lines 3 and 6 of the Santiago de Chile metro has continued, in which Abengoa's performance stands out in the recovery of the damaged lines by the demonstrations in the city at the end of October.

▶ Work on the transmission towers in the vicinity of the Arauco biomass generation plant.

During 2020, the company will carry out projects that will consolidate its presence and leadership in electric projects with presence in Chile, being these:

- Switching substation with three 220 kV lines in Malleco, Araucania region, for Transelec.
- Four 13.8 kV transmission lines in Antofagasta for Minera Escondida.
- Connection through two substations and a 220 kV line from the Arauco biomass generation plant owned by Celulosa Arauco to the Chilean National Electrical System.
- Electrical substation that will be connected with two 220 kV diagonals to existing transmission lines in Ancud for Transelec.
- New 220 kV switching substation Nueva Chuquicamata, a 2x220 kV line between this substation and the Calama substation, and expansion of the latter for Engie.
- Expansion works for the Quebrada Blanca mine, one of the country's main copper deposits, through the construction of five 220 kV substations. In addition, Abengoa will continue to build the transmission lines that will distribute the energy inside the mine.

United States

▶ Fulcrum Sierra Biofuels plant, which will allow, once operational, the production of 11 million gallons of renewable synthetic crude.

Abengoa in North America focuses its activity on the west coast of the American territory, in sectors in which innovation and technology are essential parts of the development of energy infrastructure projects and where the company's experience over the last decade is a guarantee of success in the execution of turnkey projects.

With more than 800 MW of renewable energy installed in the United States in recent years, Abengoa continues to work with developers and utilities companies to promote solar power generation projects and, in particular, in solutions that combine generation with energy storage. In the country, about 20 % of electricity generated comes from renewable energy and is a rising trend, supported by federal and state policies in favour of the use of these technologies, as well as reducing the costs on equipment and components that are part of the systems.

The company continues the construction of the biofuels plant from Sierra Biofuels in Reno, Nevada. Once in operation, the plant will be able to produce 11 million gallons of *Syncrude* (renewable synthetic crude) by processing urban solid waste. Construction works are expected to be completed during the second half of 2020 and the plant is expected to be operational by the end of the year.

In 2020, Abengoa in North America hopes to realise some of the opportunities presented for turnkey execution of photovoltaic plants, as well as capitalising on the experience acquired at the Fulcrum biofuel plant, supporting other developers behind similar projects as a technology partner.

Mexico

▶ Despite the difficulties that both Abengoa and the country experienced in 2019, the company remains a leader in transmission.

Abengoa completed 38 years in Mexico in 2019, a year full of challenges, both because of the situation of the company and because of the macroeconomic and sectoral situation of the country after the change of government and the cancellation of projects.

Despite the difficulties, Abengoa remains a leader in the electricity transmission sector and a benchmark in power generation.

The company continues to prospect the private market to offer turnkey projects in its main business lines: transmission and distribution, conventional and renewable energy generation, electromechanical and installations construction and water (desalination plants, treatment and water infrastructure). All this without leaving aside the public sector, with the Federal Electricity Commission (CFE), Petroleos Mexicanos (Pemex) and the National Water Commission (Conagua) as main actors.

▶ A3T 220 MW efficient cogeneration plant.

In this past year, Abengoa has completed two important projects and has generated new portfolios with private clients, maintaining its accident frequency index from low to zero. Also, in the particular case of Abengoa Mexico S.A. de C.V. (Abemex), the company is out of bankruptcy and has agreed with its creditors a restructuring of its debt through an Amendment Agreement to the Insolvency Agreement, which is subject to judicial approval. Therefore, the company has taken an important step to restart its activity in the country and consolidate its viability plan.

Regarding the projects completed in 2019, Abengoa officially inaugurated the A3T (220 MW) efficient cogeneration plant in May, a project developed and built entirely by Abengoa. This key asset in Abengoa's restructuring started its commercial operation in December 2018 and is governed under the legacy self-supply regime.

In March Abengoa obtained the provisional acceptance of a transmission project for the CFE. This project consisted of the execution of four transmission lines and two substations in Ciudad Juarez, Chihuahua, to evacuate the energy produced by the North III combined cycle power plant, built by Abengoa.

▶ In 2019, Abengoa received the provisional acceptance of project 283 for the CFE in Mexico.

Additionally, Abengoa in Mexico has developed various engineering and studies for private clients.

In addition to the commercial activity, Abengoa Mexico's involuntary bankruptcy situation was terminated and an amendment agreement to the insolvency agreement signed between the company and most of its creditors was presented to the Court.

As for the metallic structure factory Comemsa, it increased its sales by 4 % over the previous year and diversified its business to other Latin American countries.

For 2020, Abengoa's main challenge in Mexico will be to obtain judicial approval of the amendment agreement to the insolvency agreement and the generation of a new portfolio focused on EPC projects for private and public clients. In this sense, to initiate the reactivation of the fourth train project (combined cycle A4T located next to the A3T efficient cogeneration) will play an important part.

Another important matter will be to obtain a favourable agreement regarding the Zapotillo aqueduct following the resignation without liability presented in 2017.

Finally, in the A3T case, the challenge will be to complete the sale of the asset.

Middle East

▶ Inauguration of the Shuaibah desalination plant in Saudi Arabia.

Abengoa is increasing its presence in the Middle East in countries such as Saudi Arabia, Kuwait, United Arab Emirates (UAE), Oman, Qatar, Bahrain and Egypt.

One of the major milestones reached in 2019 has been the start-up in time and form of the Shuaibah III 250,000 m3/day capacity desalination plant in Saudi Arabia. In this project, Abengoa has worked in consortium with the Italian company Fisia Italimpianti. Desalination water is being supplied to the state-owned Saudi Water Partnership Company (SWPC).

Also in Saudi Arabia, Abengoa, in partnership with SIDEM of the Veolia group and SepcoIII, is making progress in the construction of the Rabigh III reverse osmosis desalination plant, with a capacity of 600,000 m³/day.

▶ Desalination plant in Salalah, Oman, which will operate with reverse osmosis technology and will have a capacity of 114,000 m³/day.

In 2020, Abengoa expects to complete the construction of the world's largest hybrid solar gas plant Waad Al Shamal.

In the United Arab Emirates, Abengoa has consolidated its presence in the country with the execution of three projects.

In particular, in 2019 it continues with its main partner Shanghai Electric Group Co. Ltd. on the construction of the world's largest solar thermal project in Phase IV of the Mohammed bin Rashid Al Maktoum Solar Park in Dubai. The plant is being developed by DEWA (Dubai Electricity and Water Authority) in collaboration with ACWA Power.

Additionally, at the end of 2019, Abengoa, together with its partners SepcoIII and partners ACWA Power, began construction works of the largest reverse osmosis desalination plant in the world, which will be located in Taweelah, Abu Dhabi, and will produce about 909,000 m³/day. The water will be supplied to the authority in Abu Dhabi, EWEC (Emirates Water and Electrical Company). The plant will involve the installation of a solar photovoltaic plant to be carried out by SepcoIIII.

▶ Recreation of the world's largest reverse osmosis desalination plant in Taweelah, Abu Dhabi.

Additionally, Abengoa is in the advanced phase of the 41,000 m³/day plant for drinking and industrial water that it is developing along with SepcoIII at the Emirates Global Aluminum (EGA) industrial complex in Dubai.

In Oman, Abengoa continues to work on Salalah III the largest desalination plant in the Dhofar region, which is expected to be started up by the end of 2020.

With these projects, Abengoa continues its strong presence in this geographic area, where it has a broad portfolio that includes projects in reverse osmosis desalination, conventional and solar generation.

Abengoa continues to work constantly to maintain its current business and continue to contribute to the growth of this area. Additionally, it is trying to expand its portfolio with new products that the Middle East is starting to demand, such as *Waste to Energy* and *Waste to Biofuels*, sectors in which the company has great worldwide recognition.

More information about Energy Projects on page 89

More information on water projects on page 92

Peru

Abengoa has had a permanent presence in Peru for more than 25 years, during which it has been focused on the construction of projects for the mining, energy and infrastructure sectors. The company also operates and maintains high-voltage transmission systems for mining and energy customers.

In fact, during the past year, Abengoa consolidated itself as a company specialised in providing comprehensive solutions in these sectors, also being awarded new and important projects.

▶ Transmission line project from the port of Marcobre to the Mina Justa substation for Techint.

Regarding transmission systems, Abengoa has been awarded the engineering and construction of a 46 km 22.9 kV distribution line for the company Marcobre's Mina Justa mining project, located in the Ica region; a 30 km 22.9 kV transmission line and the 138 kV/22.9 kV exit bay of the San Gaban III hydroelectric plant in the Puno region; the final section of the 14 km 138 kV transmission line of the 8 de Agosto hydroelectric plant in the Huanuco region; and the detail engineering and permit management of the 60 kV transmission line of the mining company Poderosa's Chacparrosa project, located in the La Libertad region.

Furthermore, regarding infrastructure and mining projects, Abengoa has been awarded the civil works associated with the modernisation project of the desalination plant of the Talara refinery, owned by Petroperu, located in the Piura region.

▶ Abengoa's works on the Incapuquio project in Toquepala.

Similarly, Abengoa has been awarded the construction of a retention dam of more than 50,000 m3 of reservoir capacity for the mining company Southern Peru Corporation, as well as the water management system of the tailings impoundment for the Cuajone copper mine. These works will be carried out at an altitude of 3,500 metres.

At the same time, Abengoa will be in charge of the construction of five new workshops and transport and logistics facilities in an area currently in operation in the expansion of the Toquepala mine.

Finally, and also for Southern Copper Peru, it will be responsible for the repair of the water drive line in the Incapuquio project in Toquepala.

Maintenance for various electrical and instrumentation projects were contracted for Shougang Hierro Peru, located in the Ica region.

Apart from the awards, Abengoa achieved several milestones in the country during 2019, such as the construction of the above mentioned dam which positions the company in Peru as an integral mining solutions company. In addition, it has incorporated the BIM methodology (Building Information Modelling) for the execution of mining infrastructure projects.

For 2020, Abengoa is considering consolidating itself as a specialist company in integral solutions for the mining sector.

South Africa

Abengoa has been present in South Africa since 2009. In 2019, the company continued to carry out the O&M of the three solar thermal plants that developed in the country under the Renewable Energy Independent Power Producer Programme (REIPPP), launched in 2011 by the South African government.

These are three of the most important projects of this type in the country, each one with characteristics that make them pioneers for different aspects:

(i) **KaXu Solar One**, which was the first solar thermal plant to enter into commercial operation in the country with parabolic trough collector technology;

(ii) **KHI Solar One**, the first and, for the time being, the only solar thermal plant built in South Africa with tower technology and heliostats; and,

(iii) **Xina Solar One**, in which Abengoa used for the first time a new large-opening parabolic trough collector, whose design improves the optical efficiency of the solar field while optimising its thermal losses, reducing both the number of collectors and the steel weight ratio per reflective surface.

O&M execution of three thermosolar plants of two different technologies (parabolic trough collectors and tower and heliostats) with combined installed power of 250 MW, in addition to the three with energy storage (two by molten salts and the third by steam) makes Abengoa an outstanding leader in this activity in South Africa.

In addition to O&M, the remaining obligations of the respective EPC construction contracts of the plants have continued to be met, since all three were still in warranty at the beginning of 2019.

It was already indicated in the 2018 report that, at by end of November of that year, Xina Solar One passed the guaranteed production test. The achievement of this important result has been officially confirmed in August 2019, following the corresponding analysis carried out by the technical advisor of the financing banks and their subsequent agreement.

▶ The imposing Khi Solar One tower is reflected in one of the plant's heliostats.

In addition, the plant, with parabolic trough collector technology, 100 MW of power and 5.5 hours of molten salt storage, has completed that goal at the end of the first 16 months of operation since the Practical Completion Date (PCD) was reached on 1 August, 2017, which has undoubtedly been a record among solar thermal projects developed by any promoter in South Africa so far. Reaching the guaranteed level of production is a fundamental commitment associated with the EPC construction contract of the plant, which must be supported by a good performance of the operator during the warranty period in order to fulfil it successfully.

▶ View at dusk from the Xina Solar One plant.

Furthermore, at Kaxu Solar One, with parabolic trough collector technology, 100 MW of power and 2.5 hours of thermal energy storage using molten salts, Abengoa received in 2019 the Certificate of Final Competition, the final acceptance of the construction contract in EPC mode, after passing the corresponding guaranteed production test in October 2018 and finishing the warranty period in October 2019. This is a very important achievement, since this is the first Final Completion obtained by a solar thermal plant in South Africa.

At Khi Solar One, with tower and heliostats technology, 50 MW of power and thermal energy storage through steam, an agreement was successfully reached in October 2019 that will allow the optimisation of the plant's performance, by implementing certain improvements, some of them not even contemplated in the original design. These actions will have to be performed over the next two years, with a deadline of January 2022.

Regarding production levels, the three plants remain in the same line as those achieved in 2018, when they achieved excellent results, since in that year both Kaxu Solar One and Xina Solar One passed the guaranteed production test. The 2019 results do not in any way downplay those of 2018 in any of the three plants.

Continues ▶

▶ General view of the large air condenser of Kaxu Solar One.

Thus, since the commercial operation of these facilities began, in 2019 Khi Solar One has reached the maximum value achieved in a calendar year for the ratio of actual versus guaranteed production, and in both Kaxu Solar One and Xina Solar One 2019 has been the year of the highest gross energy production.

All of the above was done by maintaining an excellent performance in the Health and Safety area, thus fully responding to Abengoa's strategic commitment in this area. In all three installations, no incidents occurred during 2019 involving the injury of any Abengoa employee.

The protection of the environment has also been one of the pillars of Abengoa's activities in South Africa during 2019, in accordance with its corporate strategy and with the commitments acquired in projects adhering to the REIPPP.

In this respect, the degree of compliance measured in the extensive external environmental audits to be performed periodically at the plants has improved, with water consumption per Mwh being significantly reduced, among other things.

▶ Colony of meerkats established next to the access road to Khi Solar One.

Finally, during 2019, social, economic and business development programmes have continued to be promoted for the benefit of communities close to the sites where the plants are located, where approximately €1.3 million have been invested in 2019.

The actions put in place have focused on: assistance to disadvantaged groups (soup kitchens, construction of dwellings for later donation); (promotion of education and personal development (training programmes for young people in new technologies and in other aspects such as *curriculum vitae* preparation, recruitment of supply teachers in rural schools, grant of scholarships, both for university studies as paid practices in the centres); and enterprise development (agricultural development programme with the ultimate objective of creating a social agricultural enterprise in the medium term, support to micro-enterprises of the area with donation of tools and other diverse material).

Uruguay

Since 1980, Abengoa has been present in Uruguay through its Abengoa Teyma subsidiary. Since then, it has developed engineering, construction and industrial services projects, among others. We also provide services linked to the forestry sector, urban hygiene and waste management activities and operation and maintenance activities.

During 2019, a rehabilitation project of 327 km of railway tracks was continued, in which track laying has been completed and the reinforcement of bridges continued. As early as December, 70 % of railway bridge superstructure reinforcements had been performed.

▶ Construction process of the sanitary landfill in Rio Negro.

Additionally, the construction of the sanitary landfill for the Rio Negro administration has also continued, with 90 % progress being made in December, and the start of the operation phase of the landfill is expected in the first months of 2020. This project consists of a sanitary landfill with a capacity of 30,000 tons, and the operating service for up to 12,500 tons of urban solid waste from the city of Fray Bentos, in Rio Negro department.

Furthermore, last year was marked by the start of new works and the achievement of new awards. In June, for example, with the presence of the minister of the A ceremony took place with Mr. Victor Rossi, Transport and Public Works, and Mr. Alberto Díaz, the president of the National Port Administration, among other authorities, for the commencement of the Puerto Capurro fishing terminal works. The works consists of the executive project and construction of approximately 1,000 metres of dock for industrial fishing vessels, with their corresponding access, mooring and protection works. In addition, an area of about 3.3 hectares will be filled, paving, drains, distribution of water and fuel energy works, as well as the dredging of the corresponding dock and its final disposal in geocontainers, innovative technology to be used for the first time in Uruguay.

Also in June the contract was signed for the turnkey construction of a parking building in downtown Montevideo. The works include the executive project and the construction of a parking lot with a capacity for 95 cars and 19 bike spaces, distributed on a semi-basement level, a ground floor level, a mezzanine level, eight upper levels and, finally, the deck level.

In September 2019, the contract with UTE (National Administration of Power Generation and Transmission Facilities) was signed for the construction of a high voltage transmission station of 150 kV with GIS technology (Gas Insulated Switchgear) in the Jose Ignacio locality, Maldonado department, Uruguay.

At the end of the year, one of the most important contracts of the year for Abengoa in Uruguay was signed. This is an award for the Ministry of the Interior of the country that will consist of the construction of the new Scientific Police building in the city of Montevideo. This project will involve the execution of the executive project and the turnkey construction of a building of approximately 3,000 m^2, developed on six levels, in which the departments of Forensic Ballistics, Road and Labour Accidentology, Expert Inspection, Forensic Informatics, Photography and Acoustics, Planimetry, Facial and Jewellery Identification, Criminal Identification Informatics, Fingerprints, Biological Laboratory, Forensic Science School and the National Registry of Genetic Footprints.

▶ Puerto Capurro fishing terminal.

Continued on the next page ▶

▶ Building in which the Parking Florida will be located in Montevideo centre, which will have capacity for 95 cars and 19 bikes.

Another milestone of the year occurs in December, when the inauguration of the second stage construction of Tower Five of the Military Hospital takes place. In these works, Abengoa has been in charge of the project and construction, finishes and installations of a seven-level building (3,618 m^2), six of them destined for hospitalisation and one level for the cardiological intensive care unit.

Also in December, the inauguration of the new effluent treatment plant in the city of Acegua in the Cerro Largo department takes place. This works consisted of the installation of more than 9,000 meters of networks by gravity, 1,000 meters of delivery pipes to transport liquids, two pumping stations with their drive lines and the waste water treatment plant with its corresponding pipeline.

In November 2019, Abengoa handed over to the UTE (National Administration of Power Generation and Transmission Facilities) the works of the 150 kV station called Tacuarembo B and connected it to the transmission network. The scope of the works included the construction of a 150 kV switchyard with four manoeuvring sections, the construction of the 150 kV station building, the supply and assembly of medium voltage cells, the execution of ground-grid consisting of 15 km of cables, the execution of shielding against atmospheric discharges, installation of protection and control systems, lighting systems, security and works required to connect the new station to the existing UTE communications network.

During 2020, in the framework of a change of national government, many challenges will be faced. Regarding contracting, essentially associated with the revitalisation of the private sector, it will be necessary to continue to increase business volume, maintaining a profitable and diversified portfolio. Regarding execution of works, the significant advances foreseen for the works of the Puerto Capurro fishing terminal stand out, as well as the completion of the construction phase and the subsequent start of the Sanitary Landfill operation phase of Fray Bentos.

Another major challenge will be to further improve occupational health and safety indicators in the various sectors in which the company operates.

▶ Tacuarembo B power station with a capacity of 150 kV.

Innovation

Objectives established in
SCSRP 2019-2023

Maintain and place value in the existing technological development of the company, and try to reach strategic agreements that allow us to opt for EPC and conventional projects, thanks to the knowledge and intellectual property acquired so far.

100 %

▶ Abengoa continues to bet on technological development as the main competitive advantage.

Abengoa continues to bet on technological development as the main competitive advantage to carry out projects of high added value, thus improving the benefits of current products and services and the acquisition of new skills.

Main figures

	2019	2018	2017
Investments in R&D and Innovation (thousands of €)	1,597	1,420	621
Personnel	20	19	25
Cumulative patents granted since 2008	280	342	395

Abengoa's innovation area is divided into three major fields: Hydrogen, Aerospace and defence, Electrical power systems, Solar thermal and Railway.

Main lines of technological development

Hydrogen

Abengoa offers innovative solutions related to hydrogen and fuel cell production technologies, ranging from product-specific development to engineering, procurement and construction (EPC) projects, in which, in collaboration with key industry technologists, the hydrogen vector is integrated into the company's decarbonisation products. These are:

I. Green hydrogen production plants by electrolysis integrated with renewable energies.

II. Hydrogen production plants using natural gas vapour and liquid fuels (e.g. methanol and ethanol) for specific applications such as the maritime sector.

III. Fuel cell-based power generation systems, both low- and high-temperature.

IV. Hydrogen service stations for hydrogen powered vehicles.

V. Energy storage based on hydrogen technologies through the combination of electrolysis production, compression, storage and power generation.

VI. Special projects in the defence and aerospace areas.

In 2019, within the framework of the Grasshopper project (GA No. 779430), the design milestone has been completed and the manufacturing of a 100 kW power plant based on PEM fuel cells (Proton Exchange Membrane) has begun. This demonstration plant will allow the validation of project developments in different areas, mainly in fuel cell stacks, with the ultimate objective of achieving a modular design at MW scale of a new commercial generation of this type of power plants, with more competitive costs and highly flexible and scalable electricity production.

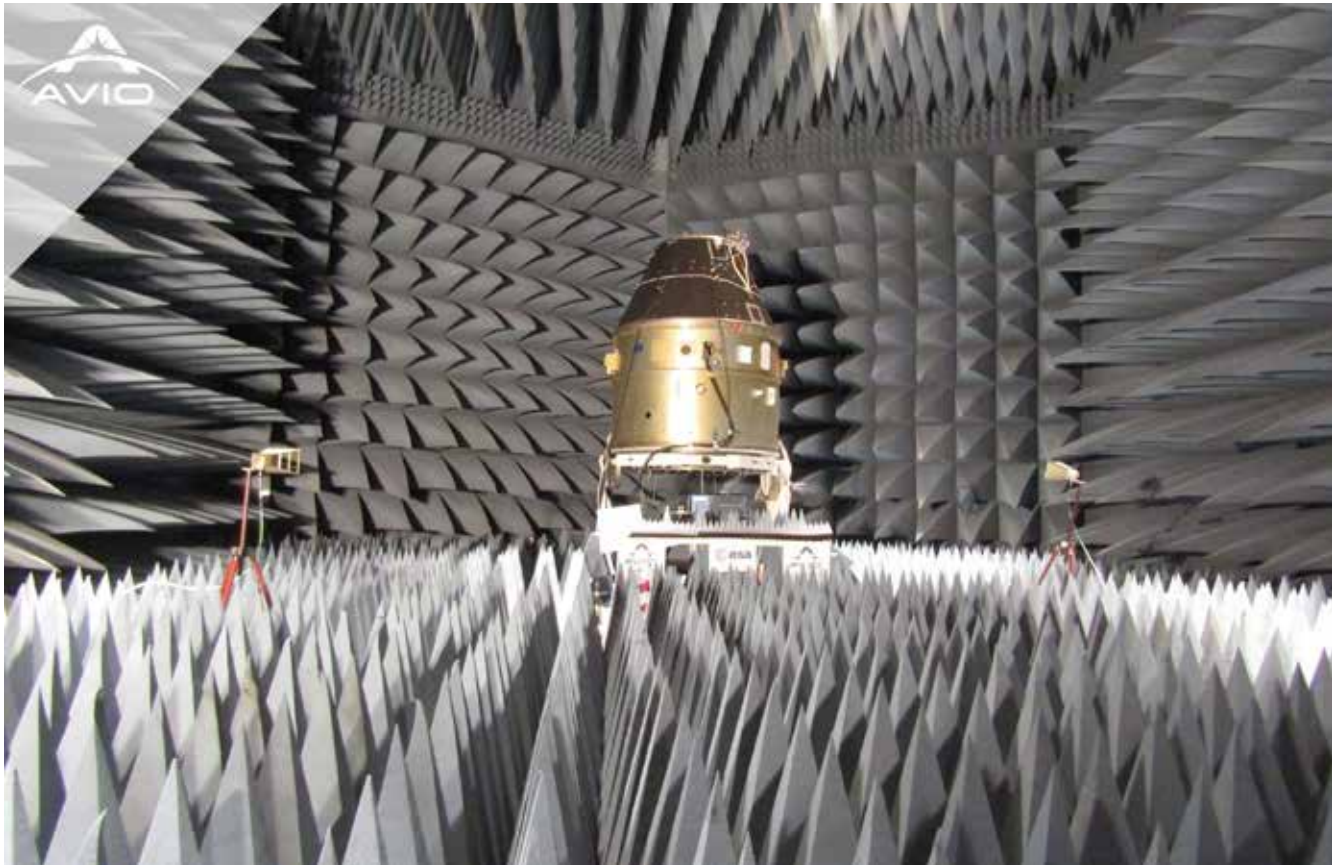
▶ Hydrogen service station.

The start-up of the Grasshopper 100 kW pilot plant will be in 2020 at the test facilities in Abengoa's Innovation Area in Torrecullar (Seville), which will be moved at the end of the year to its final location in Delfzjil (Netherlands), where the operation will be validated in a representative industrial environment, using the hydrogen by-product from the Nouryon chemical park for power production.

During 2019, the Hydrosol- beyond project (GA No. 826379) was also started, in which Abengoa participated in the implementation feasibility analysis of an advanced control system for the solar hydrogen production plant, which will be completed in 2020. During this year, the life-cycle and technical-economic analysis studies of the process will begin.

The consolidation of Abengoa as an international benchmark company offering solutions for decarbonisation through hydrogen technologies, in combination with other types of technologies, as well as the establishment of alliances with strategic suppliers, are presented as main challenges for the year 2020.

Aerospace and defence



Tests on the VEGA-C launcher of the European Space Agency (ESA).

During the 2019 financial year, Abengoa has strengthened its commitment to the defence sector. Based on a relevant experience in the space sector, in which it has participated with electronic monitoring systems, control and power distribution in the main European projects for the development of launchers and satellites of different types, it has begun to transfer this knowledge and experience to participate in the main defence programmes.

The last financial year has posed a major challenge in implementation and recruitment given the current political context, which has slowed the start of new programmes and activities. Nonetheless, Abengoa has expanded its defence activity and maintained its position in space.

Thus, in 2019, the first contracts with Navantia have been secured, for the supply of power distribution units, and with the Belgian company John Cockerill, for the development of positioning sensors, both projects for defence systems.

In addition to these first contracts, partnerships have been made with international companies such as John Cockerill, with which a *Memorandum of Understanding* (MoU) has been signed to participate in the new developments, manufacture and representation of its products in Spain, Portugal and Latin America.

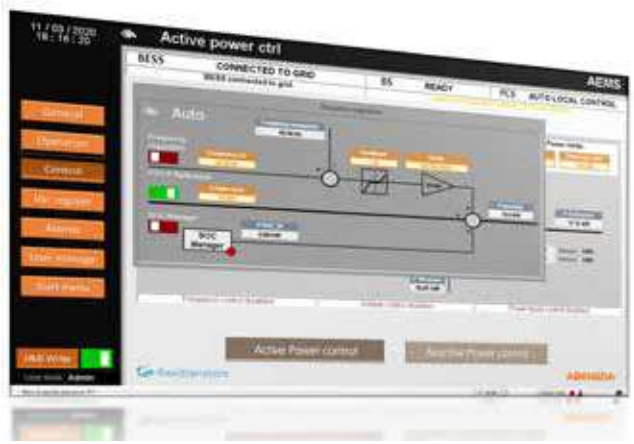
In space, the company has won new contracts in the development line of the European Space Agency (ESA) known as *In-Site Resources Utilisation*, which works on the utilisation of natural resources that exist on other planets and satellites (such as the Moon) to create a life-friendly environment. In addition, it has delivered important systems for the European space industry, such as the test system being used for the qualification of the new VEGA-C launcher, and has won new customers like INTA, for whom it will develop and manufacture a new monitoring and control system for the satellite tracking antennas in Maspalomas (Gran Canaria), Villafranca del Castillo and Torrejon de Ardoz (Madrid).

Moment in which the agreement between Abengoa and John Cockerill was signed.

Electrical power systems

Abengoa works on innovative energy control and storage technologies to improve the safety, quality and flexibility of the electrical system, favouring greater integration and manageability of renewable energies.

In 2019, a fundamental technological milestone was reached within the company's strategic plan for energy storage: **the development of the energy control and management platform Abengoa Energy Management System (AEMS)**. This platform has been integrated into the Flexitranstore project, successfully tested in the Innovation laboratory Area of Abengoa Innovación in Torrecullar. This system will be implemented in Cyprus and will provide network services at a transmission/ distribution substation.



▶ Abengoa Energy Management (AEMS) platform for energy management.

In addition, the company has established strategic alliances with important battery suppliers, both of lithium batteries, with the most immediate present in mind, and of flow batteries, in the longer term, both keys to a better market positioning and greater competitiveness.

R&D and innovation in the solar thermal area

Abengoa continues to develop solar technology as a strategic product in the energy market. The manageability that concentration technology allows, with thermal storage, places it as a key product among the renewable hybrid solutions that lead the company's energy portfolio.

▶ 3D model of the Sun-to-Liquid plant project (commercial scale).

Renewable hybrid solutions

Abengoa continues to develop custom-designed hybrid products that allow the integration of low-cost renewable technologies, such as wind and photovoltaic, with concentration technology (and its thermal storage capacity) to ensure the full manageability of the offered solution.

For hybrid configuration optimisation, throughout 2019 work was done for the integration of emergent energy storage technologies with full integration of electric batteries, optimised thermal storage systems in molten salts and electric heaters of molten salts for the reduction of solar field dumping.

Similarly, work is being done to develop new applications of solar thermal technology in the heat production process field, with the design of solutions adapted to the need of strategic sectors such as mining and the chemical and petrochemical industries. Abengoa has also developed a solution adapted to the decarbonisation strategy of traditional thermal plants, allowing the use of their thermal cycles powered by renewable sources.

Among the major milestones that began in 2019 is **the development of the GEA platform**, a software application for modelling and simulating hybrid thermal and/or electrical power plants. GEA is an ongoing development in which Abengoa highlights the value of having its own renewable energy technology and/or integrating it all over the world, which offers the company a competitive advantage over the rest of the companies in the sector, consolidating our leadership in technology and as specialists.

In particular, the GEA platform allows custom modelling of the hybrid solution, incorporating the production model of the solar thermal plant into photovoltaic field production, facilitating the integration of auxiliary equipment such as batteries and electric heaters with thermal storage. This allows Abengoa to offer the different configurations and hybridisations required by the market today.

▶ GEA graphical interface.

The models have tools to respond to the entire life of the plant, from a first phase of optimisation and parametrisation in the offer phase to a technical and detailed model in the production phase. GEA allows to model each of the involved systems in detail in the final configuration of the plant, thus allowing solutions to be simulated with real and very specific configurations and strategies, moving away from commercial generic models.

Component optimisation

Abengoa continues to seek to reduce the costs of key components of solar thermal technology. To this end, it continues to work, in the Solucar R&D platform, on the validation and optimisation of solar field components. The area has three locations for trials on a different scale:

- Pontones platform, for evaluation and testing of new heliostats with cutting-edge technology optimisation.
- Repow platform, to test parabolic trough collectors and their components. Optical validation of new designs.
- Solnova platform, for validation of parabolic trough collector modules.

  In 2019, tests have been performed for the optical, structural and operational validation of solar field components, both for new optimised designs based on the learning curve as market leader of the solar thermal market with 34 % of the current plants, as for supplies or equipment to be installed in commercial plants currently under construction (Cerro Dominador and DEWA).

  Platform tests also allow the assembly and operational procedures to be optimised for field components in commercial plants, increasing their operational reliability.

Finally, at the component level, the continuous optimisation of start-up operations and point operations in the field should be highlighted where, in 2019, development has continued of new control algorithms in heliostat parks, flow map simulations and surface temperature simulations of the pipes of the receiver. This development has been validated in the PEM of the project recipient Lungg Haixi and work is performed in PEM techniques for the Cerro Dominador project.

▶ Detail of heliostats in Pontones.

Long-term strategic lines

Finally, Abengoa continues to bet on solar thermal technology for high-temperature industrial heat and the production of renewable fuels as solutions for the future. In this line, we highlight the three H2020 projects that have continued to be developed this year:

H2020 project: Sun-to-Liquid

Sun-to-Liquid project participants.

Throughout 2019, the H2020 Sun-to-liquid project has demonstrated the technical feasibility of aviation kerosene production using concentrated solar energy as an energy source. During this period, Abengoa has directed the efforts of the consortium members to maintaining these developments within the technical possibilities of solar thermal technology. The project has celebrated a milestone: the validation of the downscaled pilot process in a novel solar thermal tower plant that provides the energy needed to produce fuel from water and CO_2.

The solar park has been designed to meet the demanding technical specifications of the solar reactor that requires operating temperatures of up to 1,500 °C, with solar radiation flows exceeding 2,500 kW/m2, which means concentrating more than 2,500 times the radiation received directly from the sun on the earth's surface. The solar reactor absorbs incident energy of 50 kW on a porous ceramic material of CO_2, which is oxidized and reduced by alternative thermal cycles. During the reduction stage, the porous material releases oxygen and in the oxidation stage it is reoxidized by reacting with a mixture of CO_2 and H_2O, resulting in the production of synthesis gas which is subsequently pressurised and sent to a catalytic reactor where liquid fuels are generated by a Fischer-Tropsch (F-T) process.

H2020 project: Solpart

Pilot plant of the Solpart project.

Abengoa's participation in the Solpart project has allowed the company to continue to lead the way in the development of particle receptors, knowing first hand all the problems encountered at the pilot plant installed and operating in Odeillo, France. For this project, Abengoa focused its efforts on the integration of equipment at industrial level, providing simulations of heliostats fields compatible with the requirements of the partners.

The project has successfully validated, on a pilot scale, a high-temperature (800-1,000 °C) solar particle receiver with a 24-hour operation, suitable for the treatment of non-metallic particles typical of mineral industries with high energy consumption.

Family photo of Solpart consortium members.

H2020 project: Scarabeus

Abengoa also continues to work on the next generation of high-efficiency solar thermal technology. In April 2019, the H2020 Scarabeus project began, with the objective to integrate supercritical CO_2 cycles in solar thermal technology.

Throughout the year, Abengoa has participated with this consortium updating the state of art CSP technology and interacting with the other partners, thus allowing for a better view of the real possibilities for integration of this technology. Abengoa is responsible for the integration of the solar thermal plant into the commercial solution to be developed.

Members of the Scarabeus consortium.

R&D and innovation in the railway area

Abengoa has continued its work on numerous innovation projects in the railway area during 2019. Details of some of them are given below.

The Railway Innovation Hub

Members of the railway cluster during their participation in the Innovation Meeting on Railway Mobility, organised by The Railway Innovation Hub in Málaga.

Since 2016 Abengoa has participated in this railway cluster based in Málaga, currently serving as its vice president and being one of its founding companies. The Railway Innovation Hub objective is to become a benchmark for rail innovation at both national and international levels through support to the sector. The Railway Innovation Hub already has more than 90 partners covering the entire value chain, including reference entities in innovation (universities and technology centres) and advancing in the incorporation of high-tech companies that can bring technological solutions to rail mobility.

Additionally, in the promotion of the association agents as important as Adif, Renfe, Metro de Madrid, Metro de Sevilla, Fundación Once and even the Junta de Andalucía and the Technological Park itself are involved.

During 2019 the Railway Innovation Hub has launched more than 20 innovative projects or initiatives, subdivided between these technological challenges, strategic lines or R&D&i projects.

To give some example of the most significant projects on which the members of the Railway Innovation Hub are currently working, we can highlight projects to improve accessibility and inclusiveness of the stations for people with some kind of disability through the development of robots, guidance systems and user assistance avatars. In addition to this, we are currently working on projects for the intermodal parcel service between rail transport sectors and the utilisation of existing infrastructures and services, or even on projects for the implementation and standardisation of the BIM methodology in the rail sector, or projects for the standardisation of Hyperloop systems, which has already been presented as a unified proposal to the European Union.

Broken Track project

This is a real-time rail track breakage detection system on high-speed lines, designed and executed by Abengoa. The company continues performing tests and trials of the system while negotiating its possible marketing with Adif.

Development of the BIM tool for railway environments

Currently, the BIM tool is still in development. This tool aims to automatically redesign catenaries and substations, as well as modelling systems in a way that is fully integrated into a workflow.

All of the above will allow a 3D vision of the railway project as well as cross sections per pole, extraction of measurements of the materials to be used in the project and automatic generation of project modification logbooks.

In other words, the BIM tool aims to integrate all information from a railway project into one digital model to facilitate its development. This software is expected to be ready in 2021.

Abengoa continues to innovate in the railway sector with projects such as Broken Rail for the detection of breakages in rail tracks in real time.

Alis project

This project consists of a comprehensive simulation tool for electrification, safety and energy efficiency in railway systems.

The tool is currently in the commercialization phase, which gives Abengoa a great competitive advantage in the international railway market, allowing intelligent designs of railway electrification systems at the mechanical and electrical levels. Additionally, it will substantially improve the study of safety both for facilities and workers and travellers, optimising the design and execution processes of railway infrastructure.

Abengoa is currently developing traction and power demand simulations for the La Meca-Medina project, as well as pantograph-catenary interaction simulations for clients such as NetworkRail, and even efficient running simulations for Metro de Granada, among other works.

▶ The MICRail project is being developed with the BIM tool.