ABENGOA

# Activities 2010

Innovative Solutions for Sustainability

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| Operating terms | |
|---|---|
| A | Ampere |
| bit | Bit |
| B | Byte |
| bar | Bar |
| bsh | Bushel |
| SCADA | Supervisory Control And Data Acquisition |
| $CO_2$ | Carbon dioxide |
| DGS | Distilled Grains and Solubles |
| DMS | Distributed Management System |
| DNA | Dynamic Network Applications |
| EPC | Engineering, Procurement and Construction |
| ETBE | Ethyl Tertiary Butyl Ether |
| BTU | British thermal unit |
| g | Gram |
| gal | Gallon |
| GHG | Greenhouse Gas |
| GIS | Geographic Information System |
| h | Hour |
| ha | Hectare |
| Hz | Hertz |
| ISCC | Integrated Solar Combined Cycle |
| J | Joule |
| km/h | Kilometer per hour |
| L | Liter |
| m | Meter |
| m/s | Meter per second |
| $m^2$ | Square meter |
| $m^3$ | Cubic meter |
| N | Newton |
| Pa | Pascal |
| ppm | Parts-per-million |
| s | Second |
| t | Metric ton |
| V | Volt |
| VA | Volt-ampere |
| VAr | Volt-ampere reactive |
| W | Watt |
| We | Electric watt |
| Wh | Watt hour |
| Wth | Thermal watt |

| Financial terms | |
|---|---|
| € | Euro |
| $ | US Dollar |
| BRL | Brazilian Real |
| CAGR | Compound Annual Growth Rate |
| EBITDA | Earnings Before Interest, Tax, Depreciation and Amortization |
| GDP | Gross Domestic Product |
| PCAOB | Public Company Accounting Oversight Board |
| ROE | Return On Equity |
| SOX | Sarbanes Oxley |

| Prefixes according to the International Metric System | | |
|---|---|---|
| m | Mili | $10^{-3}$ |
| c | Centi | $10^{-2}$ |
| d | Deci | $10^{-1}$ |
| h | Hecto | $10^{2}$ |
| k | Kilo | $10^{3}$ |
| M | Mega | $10^{6}$ |
| G | Giga | $10^{9}$ |
| T | Tera | $10^{12}$ |

# 2

# Main Figures

During the period 2000-2010 Abengoa's revenue has been growing at a compound annual rate of 17 %, the EBITDA by 22 % and earnings per share by 19 %.

| Economic-Financial Data | 2010 | %Var. (10-09) | 2009 | 2000 | %CAGR (10-00) (1) |
|---|---|---|---|---|---|
| **Income Statement (€M)** | | | | | |
| Revenues | 5,566 | 34.2 | 4,147 | 1,205 | 16.5 |
| EBITDA(2) | 942 | 25.6 | 750 | 126 | 22.3 |
| Net Income | 207 | 21.6 | 170 | 36 | 19.1 |
| **Balance Sheet (€M)** | | | | | |
| Total Assets | 16,974 | 37.2 | 12,370 | 1,885 | 24.6 |
| Equity | 1,630 | 39.2 | 1,171 | 302 | 18.4 |
| Net Debt (Cash) ex Project Finance | 1,166 | (7.2) | 1,257 | 177 | 20.8 |
| **Significant Ratios (%)** | | | | | |
| Operating Margin (Ebitda / Revenues) | 16.9 | - | 18.1 | 10.5 | - |
| Return on Equity (ROE) (3) | 16.1 | - | 17.3 | 12.0 | - |
| **Data per Share (€)** | | | | | |
| Earnings per Share | 2.29 | 21.6 | 1.88 | 0.40 | 19.1 |
| Dividend per Share | 0.20 | 5.3 | 0.19 | 0.12 | 5.2 |
| Quotation on the last day of the year | 18.38 | (18.7) | 22.60 | 8.50 | 8.0 |
| Capitalization on the last day of the year (€M) | 1,662 | (18.7) | 2,045 | 769 | 8.0 |
| Daily Average Trading Volume (€M) | 10.7 | 83.1 | 5.9 | 2.0 | 18.2 |

(1) CAGR: Compound Annual Growth Rate.
(2) EBITDA: earnings before interest, tax, depreciation, and amortization.
(3) Net earnings/ Shareholder's funds.

# Types of Activities, Business Units & Geographies

| Evolution 2010 – 2000 | Three Types of Activities | | Engineering Company | |
|---|---|---|---|---|
| | 2010 | | 2000 | |
| **Areas of Activity (%)** | Revenues | EBITDA(1) | Revenues | EBITDA(1) |
| Engineering and Construction | 56.1 | 44.0 | 81.0 | 69.6 |
| Concession-type Infrastructures | 5.5 | 22.1 | 3.1 | 8.6 |
| Industrial Production | 38.4 | 33.9 | 15.9 | 21.8 |
| **Consolidated Total** | **100.0** | **100.0** | **100.0** | **100.0** |
| **Business Units (%)** | | | | |
| Solar | 3.0 | 7.5 | - | - |
| Bioenergy | 28.3 | 22.5 | 3.5 | 5.2 |
| Environmental Services | 15.0 | 13.6 | 16.1 | 21.3 |
| Information Technology and Services | 13.3 | 13.7 | 20.5 | 29.6 |
| Industrial Engineering and Construction | 40.4 | 42.7 | 59.9 | 43.9 |
| **Consolidated Total** | **100.0** | **100.0** | **100.0** | **100.0** |
| **Geographies (%)** | | | | |
| USA | 15.9 | 18.1 | 0.2 | 0.0 |
| Latin America | 34.3 | 38.3 | 29.2 | 19.9 |
| Europe (excluding Spain) | 15.7 | 11.1 | 6.3 | 2.9 |
| Africa | 3.7 | 2.0 | 1.2 | 1.1 |
| Asia | 4.6 | 0.8 | 0.9 | 0.7 |
| Oceania | 0.1 | 0.0 | - | - |
| Spain | 25.7 | 29.7 | 62.2 | 75.4 |
| **Consolidated Total** | **100.0** | **100.0** | **100.0** | **100.0** |

(1) EBITDA: earnings before interest, tax, depreciation, and amortization.

# 3

# Our Commitment

At Abengoa, we believe that the world needs solutions to pave the way for more sustainable development. Scientists tell us that **climate change** is a reality and at Abengoa we believe that now is the time to seek out solutions and put them into practice.

Over ten years ago, Abengoa made the strategic decision to focus its growth on the creation of new technologies geared towards **sustainable development:**

- Generating **energy** from renewable resources.
- Recycling industrial **waste** and generating and managing **water**.
- Creating **infrastructures** that eliminate the need for new investments in assets that generate emissions.
- Creating **information systems** that help to manage existing infrastructures more efficiently.
- Creating **new horizons** for development and innovation.

To this end, we invest in Research, Development and Innovation, R&D&I, **globally** expand those technologies with the greatest potential, and attract and develop the necessary talent.

In a similar vein, we channel human and financial resources into the **Focus-Abengoa Foundation** to promote social action policies that champion social and human progress.

By following this approach, we create **long-term value** for our shareholders, ensure the growth of the companies through which we operate and help to make the world a better and more sustainable place for future generations.

# 4

# Report from the Chairman

2010 was yet another good year for Abengoa. In spite of the economic and financial crisis plaguing some of our markets, we continued to report double-digit growth. Revenues increased by 34 % in comparison to 2009 to total €5,566 M, EBITDA climbed by 26 % to €942 M, and net profit rose by 22 % for a total of €207 M.

Our strategy focuses on offering innovative technological solutions for sustainable development in the energy and environment sectors. Coupled with our geographic diversification, this has enabled us to report consistent double-digit growth over the last fifteen years. We believe that demand for our solutions will continue to increase as the world becomes increasingly more aware of the overriding need for sustainable development.

The two factors we consider essential in order for a solution to be accepted at Abengoa are technology, which is hugely important and affords us a competitive edge, and global leadership. We are convinced that industrial innovation is key to forging a more sustainable world. In our case, we ended the year with 99 patents that had either been granted or which were in the process of being approved.

In this regard, 2010 marked several important milestones for Abengoa, including commencement of construction of Solana, in the United States, which boasts 280 MW of installed power and six hours of molten salt storage; initiation of work on the 100 MW solar thermal power plant in Abu Dhabi, and the operational roll-out in Spain of a further three such plants, each with 50 MW of installed power.

In the biofuel area, we fulfilled our present first-generation bioethanol investment plan by starting up three new plants in Illinois and Indiana (USA), and in Rotterdam (the Netherlands), with a combined annual production capacity of 300 Mgal -1,150 ML-. To this we may add the successful operation of our second-generation biomass-ethanol production plant in Salamanca, Spain.

In India, we completed construction and start-up of a desalination plant in Chennai with a capacity of 100,000 $m^3$ per day.

Work also got underway on the 2,350 km Porto Velho - Araraquara 600 kV direct current power transmission line. Furthermore, together with twenty other partners, the company entered into an agreement to constitute Medgrid, an initiative aimed at developing and promoting a Euro-Mediterranean power grid to encourage the transmission of power produced in countries located on the southern shores of the Mediterranean to the European market.

For the first time, Abengoa features this year the three segments that best reflect the company's reality, stemming from its evolution and transformation over the last fifteen years. The parameters guiding the company at that time are no longer valid today. Nevertheless, the bulk of this Annual Report has been structured for the last time around the company's five traditional business units. In this Report, we have continued to gradually migrate towards the approach to reporting activities we initiated in our presentation of results for the third quarter of 2010. To this end, we have included a table illustrating the key figures in accordance with the new segment composition, as well as a summary of the Activity Report prepared from this new perspective.

We achieved significant growth this year in our three business segments (Engineering and construction, Concession type infrastructures and Industrial production).

- Backed by 70 years of experience in the industry, Engineering and construction draws together our traditional engineering activity associated with energy, water and information technologies. We specialize in the execution of complex turnkey projects involving concentrating solar power plants; solar-gas hybrid plants; conventional generating plants; power transmission lines; hydraulic infrastructure, including, among others, major desalinating plants; biofuel plants; and critical infrastructure control systems.

In this segment revenues totaled €3,121 M in 2010, up 26 % on 2009, and EBITDA increased by 7 % year-on-year to reach €415 M. During the past twelve months, Abengoa's new order intake totaled €4,200 M and closed the year with a backlog of €9,274 M, which affords significant visibility for our revenues in the medium term.

- Concession-type infraestructures group together any asset operations for which we have long-term contract, including take-or-pay contracts, power/water purchase agreements and tariff-type sales contracts. This segment therefore includes solar power plants, transmission lines, cogeneration plants and desalination plants. For these particular assets, our efforts focus on streamlining operations. We have a young asset portfolio, with an average of 27 years of pending life, and a total of €34,976 M in future income. We should also highlight the company's investment volume in assets currently in the construction phase, which will more than double our current capacity once they enter into operation. This is a segment that affords Abengoa tremendous future exposure.

  Revenues from this segment totaled €309 M in 2010, up 41 % on 2009, while EBITDA amounted to €208 M, representing a year-on-year jump of 46 %. This high growth is primarily attributed to the operational start-up of several solar plants and desalination plants, as well as various power transmission line segments.

- The Industrial production segment encompasses Abengoa's business in the biofuel and metal recycling area. These activities, also based on proprietary assets, are focused on high-growth markets in which the company boasts a position of technological leadership.

  Revenues from this segment totaled €2,137 M in 2010, up 48 % on 2009, while EBITDA rose by 46 % to reach €320 M. The key factors here lie in higher ethanol production as a result of three new plants in operation (two in the USA and one in Europe), which have increased our capacity to over 820 Mgal -3,100 ML- per year, as well as the recovery of recycled material volumes in Europe in the wake of a crisis-stricken 2009.

As we can see, 44 % of our revenues and 56 % of our EBITDA in 2010 was generated by the asset operations, in comparison to 2009 figures of 40 % and 48 %, respectively, or the 19 % and 30 % of 2000, which shows the company's evolution towards greater stability and recurrence in terms of income.

By territory, we experienced growth in the United States, Latin America, Europe and Asia, where we witnessed the highest growth rate in percentage terms (up 81 % with respect to 2009), primarily on the back of the first major EPC contracts we secured in the Middle East and the start of construction work on a desalination plant in Quingdao, China.

Spain currently accounts for 26 % of our revenues. Brazil, with 19 %, and the United States, with 16 %, represent, respectively, Abengoa's second and third most important markets. Latin America continues as the region encompassing the highest percentage of our international business, totaling 31 %, followed by North America and Europe, excluding Spain, both with 16 %.

With these results, we managed to overcome a year characterized by the worst worldwide economic and financial crisis seen in the last 75 years, while at the same time succeeding in laying the foundations for company growth in the coming years. In fact, we continued to invest in those businesses we consider to be the focus of our strategy for the future, and, once again this year, we maintained our R&D+I efforts.

1/ In 2010 we created Abengoa Research, an R&D group that will carry out highly innovative research for the entire company, supplementing the different R&D+I areas already in place within the organization. We also invested €93 M in R&D+I, and applied for 39 new patents. We are convinced of the importance of technology and innovation for Abengoa's future, and we therefore continue to support these types of activities. The accomplishments achieved,

which have afforded us recognition as leaders in concentrating solar power (CSP) technology and second-generation biofuel development, spur us on in the direction we decided to take many years ago.

2/ Our human capital constitutes the cornerstone for this generation of knowledge with which we intend to continue growing. We continue to invest in the development of our professionals. We therefore closed 2010 with more than 1.2 M hours of training and an alliance plan in progress with some of the most prestigious universities worldwide to enable us to carry out quality training around the world. Likewise, we continued forward with our international grant program, which this year enjoyed the participation of nearly 700 people, representing an increase of 15 % over 2009. In terms of employment figures, Abengoa has grown by 12 % with respect to last year to reach a total headcount in excess of 26,000 people, thereby consolidating the growth reported in previous years.

3/ We also continued investing in Corporate Social Responsibility to further the social development and environmental balance of the communities in which we operate, paying particular attention to the disabled and to social awareness of climate change, investing to this end more than €10 M.

4/ In addition to completing the second inventory of greenhouse gas (GHG) emissions, we worked hard throughout the year on developing a system for labeling all of our products, which, once completed, will enable us to determine the GHG emissions associated with each and every product. We likewise kept working on the development of a system of sustainability indicators to supplement the GHG inventory.

5/ In 2010 we obtained additional financing totaling €5,000 M approximately, which enables us to fund our investment plan to date. Through prudent administration of our financing needs, we ended the year with cash assets totaling close to €3,000 M, and with sufficiently ample leveraging levels to be able to comfortably face the coming years. Thus, net debt, excluding non-recourse financing, stood at €1,166 M at year-end 2010, 1.8 times our corporate EBITDA, while total net debt amounted to €3,122 M (excluding debt tied up in preoperational assets), 3.3 times our consolidated EBITDA.

6/ As in 2009, with the aim of ensuring the reliability of our financial information, in 2010 we continued to reinforce our internal control structure, voluntarily adapting it to the requirements established under the US Sarbanes-Oxley Act (SOX). Once again this year, we submitted our company's internal control system to an independent assessment process carried out by external auditors in accordance with PCAOB auditing standards.

7/ We also remain staunchly committed to transparency and good governance practices. Our annual report already features six independent audit reports drawn up by external auditors in relation to the following areas: Annual Accounts, SOX Internal Control System, Corporate Social Responsibility Report, Greenhouse Gas Emissions Inventory, Corporate Governance Report, and the Risk Management System Design Process.

Our business model affords us greater visibility as the result of significant investment effort in recent years, which is gradually being reflected in the income statement. We ended the year with over €9,274 M in order backlog in the Engineering and construction area, a total of €34,976 M in Concession-type infraestructures, and with all of our Industrial production plants up and running.

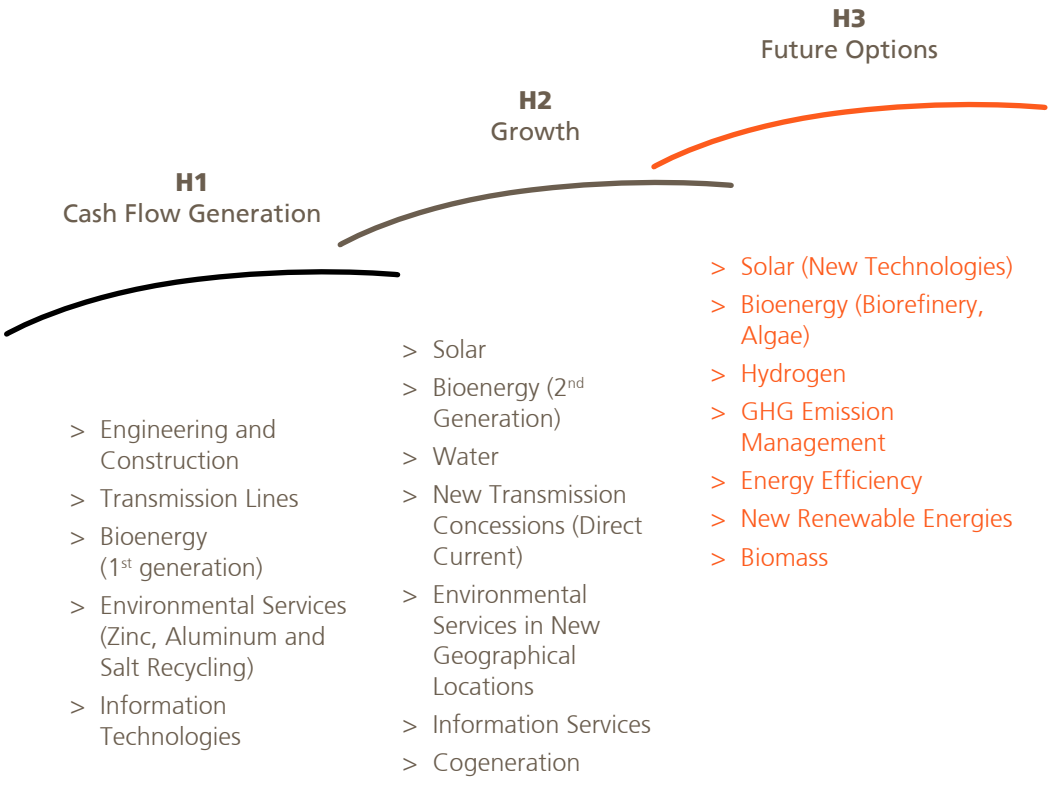
Therefore, our main challenge in 2011 will essentially be to perform our engineering projects in due time and with sufficient margin and to continue operating our assets efficiently.

From 2013 onward, our investment plan will be reflected practically in its entirety in the income statement, once all assets currently under construction go into operation. The objective we have set for that time is to reach €1,500 M in EBITDA, which means doubling 2009 figures. And not only is EBITDA important, but also its corresponding composition and risk profile: approximately 30 % will come from Engineering and construction, 40 % from Concession-type infraestructures, and 30 % from Industrial production.

In short, 2010 was yet another year of accomplished objectives, and 2011 should prove to be another year of fresh opportunities. Our goals for the new year in terms of our three-horizon model will be to continue optimizing our cash generating activities, keep investing towards the consolidation of our businesses in high-growth sectors, expand future options and explore new ones. And all of this will take place around the focal point of technological innovation.

This is reflected in our three horizons described below.

## A balanced set of activities



# 5

# Annual Report Summary according to New Segmentation

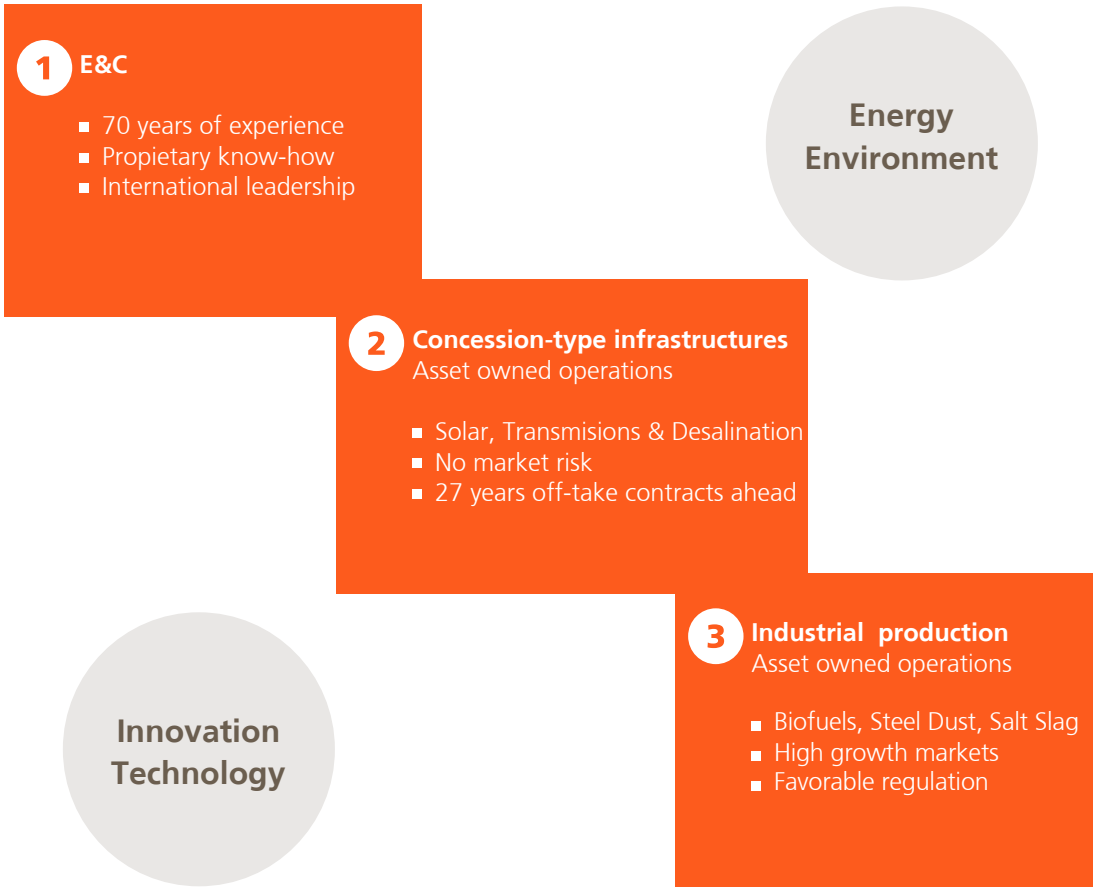
Abengoa has evolved enormously since its inception in Seville back in 1941. Following its very first project to manufacture a five-amp single-phase meter, Abengoa branched out into technical projects and studies, electrical and mechanical assembly work, and control systems, among other lines. It essentially emerged as a leading engineering firm, a line of business that embodied the hallmarks of Abengoa up to the mid-1990s. Thanks to the many challenges and opportunities that have arisen since then, the company has successfully emerged as a leading company, combining its proven ability to perform projects with the capacity to operate a whole host of different assets, including concentrating solar power plants, power transmission lines, desalination plants, industrial waste recycling facilities and biofuel production plants.

In terms of international presence, Abengoa took its first steps outside Spain back in 1963 when it set up its first subsidiary in Latin America, Argentina to be precise. It has since extended its reach further through its concerns in Brazil, Uruguay, Mexico, Peru and Chile. To cite some further examples of this rapid expansion, the company penetrated Morocco and Algeria in the mid-1970s, China in the 1980s and the United States at the start of this century. All major milestones in their day, which have helped Abengoa to become a multinational company with well-entrenched operations on the five continents. Spain currently accounts for 26 % of our revenues. Brazil, with 19 %, and the United States, with 16 %, represent, respectively, Abengoa's second and third most important markets. Latin America continues as the region encompassing the highest percentage of our international business, totaling 31 %, followed by North America and Europe, excluding Spain, both with 16 %.

With a view to tailoring reporting to the current reality, the company has been using new segment reporting since the third quarter of 2010. As the company is fully aware of the work involved in adapting to this new reporting approach for all stakeholders, the financial results for 2010 also featured traditional segmenting. This Annual Report is, for the last time, structured around the traditional business units, and only this summarized report analyzes the company under the new approach.

## New Segmentation

Abengoa, an international technology company, is involved in two sectors - Energy and Environmental Services, which account for 95 % of its revenues - and three lines of business – Engineering and Construction, Concession-type infrastructure and Industrial production.




## Engineering and Construction

This area encompasses core engineering activity in energy, water, and information technologies, a field in which the company boasts over seventy years of experience. Abengoa specializes in complex turnkey projects to construct concentrating solar power (CSP) plants; hybrid solar-gas facilities; conventional power plants; power transmission lines; hydraulic infrastructures, including large-scale desalination plants; and biofuel plants, among others. The company is also recognized worldwide as the leading international contractor in the field of transmission and distribution and the third largest player in power (source: ENR Magazine). It is also a market leader in Information Technologies and Services for critical sectors.

In this particular segment, revenues for 2010 climbed to €3,121 M, up 26 % on figures for 2009, while EBITDA rose to €415 M, marking a 7 % year-on-year increase. Margins moved from 15.7 % to 13.3 % for the same period. Over the last twelve months, Abengoa has generated €4,200 M in order intake, closing the year with a portfolio of €9,274 M (5.2 % up on 2009), meaning that the company can be confident of sizeable revenues in the mid-term.

Major milestones for the year included the following:

- Contract secured to construct the 500 kV Chilca-Marcona-Ocoña-Montalvo power transmission line in Peru, as well as three new substations and extension work on a further three.
- Completion of the Solnova 1, Solnova 3 and Solnova 4 CSP plants, each with an installed capacity of 50 MW and all now operating successfully at full output.
- EPC (engineering, procurement and construction) contract awarded and started construction on what will be the largest CSP plant in the Arab Emirates, namely the 100 MW Shams-1 plant. The contract was secured through an international tender held by Masdar.
- Start of EPC on the Solana CSP plant in Arizona, with 280 MW of gross power and six hours of molten salt storage. The facility utilizes parabolic trough technology with thermal storage achieved through molten salts to extend the hours over which the plant can operate during the day.
- Work continued on three solar thermal power plants, while construction got underway on a further five facilities in Spain, specifically in the municipalities of Écija and El Carpio in Andalucía, Logrosán in Extremadura and Ciudad Real, all with an installed capacity of 50 MW and featuring parabolic trough technology.
- Completion and delivery to the client of the Integrated Solar Combined Cycle (ISCC) solar thermal power plant in Ain Beni Mathar (Morocco), the world's largest ISCC plant. The facility will produce 482 MW of total power, with the solar field contributing 24 MWe, as well as specific consumption associated with the generation of thermal power by the solar field.
- Completion and delivery of three bioethanol plants, two in North America and the other in the Netherlands, with a combined capacity approaching 300 Mgal -1,160ML/year.
- Start of construction on the 300 MW cogeneration plant in Tabasco (Mexico) for the state-owned company Petróleos Mexicanos (Pemex).
- Completion of construction work on the 200 kV high-voltage Carhuamayo-Carhuaquero power line and associated substations in Peru. The project includes 670 km of line, two new substations and five upgrades to existing substations.
- Start of construction on the 600 kV direct current Porto Velho-Araraquara power line in Brazil, accounting with 2,350 km.
- In India, construction work continued on two 400 km sections of the 765 kV Biswanath Chariyali-Agra direct current power line, and work was completed on the awarded section of the 400 kV Bariapada-Bhaddrak line.
- In Saudi Arabia, construction got underway on the 132 kV high-voltage power line in Qurayyat for the SEC (Saudi Electricity Company). The company is also constructing the Jeddah and Riyadh GIS (Gas Insulated Substations), both 380 MW and 132/13.8 kV, again for the SEC.
- Contract awarded for the hydro power plant at the start of the Navarra Channel ("Canal de Navarra") in Spain. Total installed power will stand at 20 MW, with annual production amounting to 30 GWh.
- Contract secured for the Donna desalination plant in Texas.
- Construction of the Qingdao desalination plant in China, which will employ reverse osmosis technology. The facility will be able to desalinate 100,000 $m^3$ of water per day, enough to supply a population of 500,000 people with clean drinking water. This particular project was awarded the "Best Project of 2009" accolade by the prestigious Global Water Intelligence (GWI) publication.
- Unveiling and start-up of the Chennai desalination plant in India, which is capable of desalinating 100,000 $m^3$ per day of water, making it India's largest reverse osmosis desalination facility.
- Desalination plant awarded in Djerba (Tunisia). The plant, which will run on reverse osmosis technology, will be able to produce 50,000 $m^3$/day of desalinated water, enough to supply a population of over 250,000 people.
- Start-up of operations at the Skikda desalination plant in Algeria, with a capacity of 100,000 $m^3$ of drinking water a day through reverse osmosis technologies.

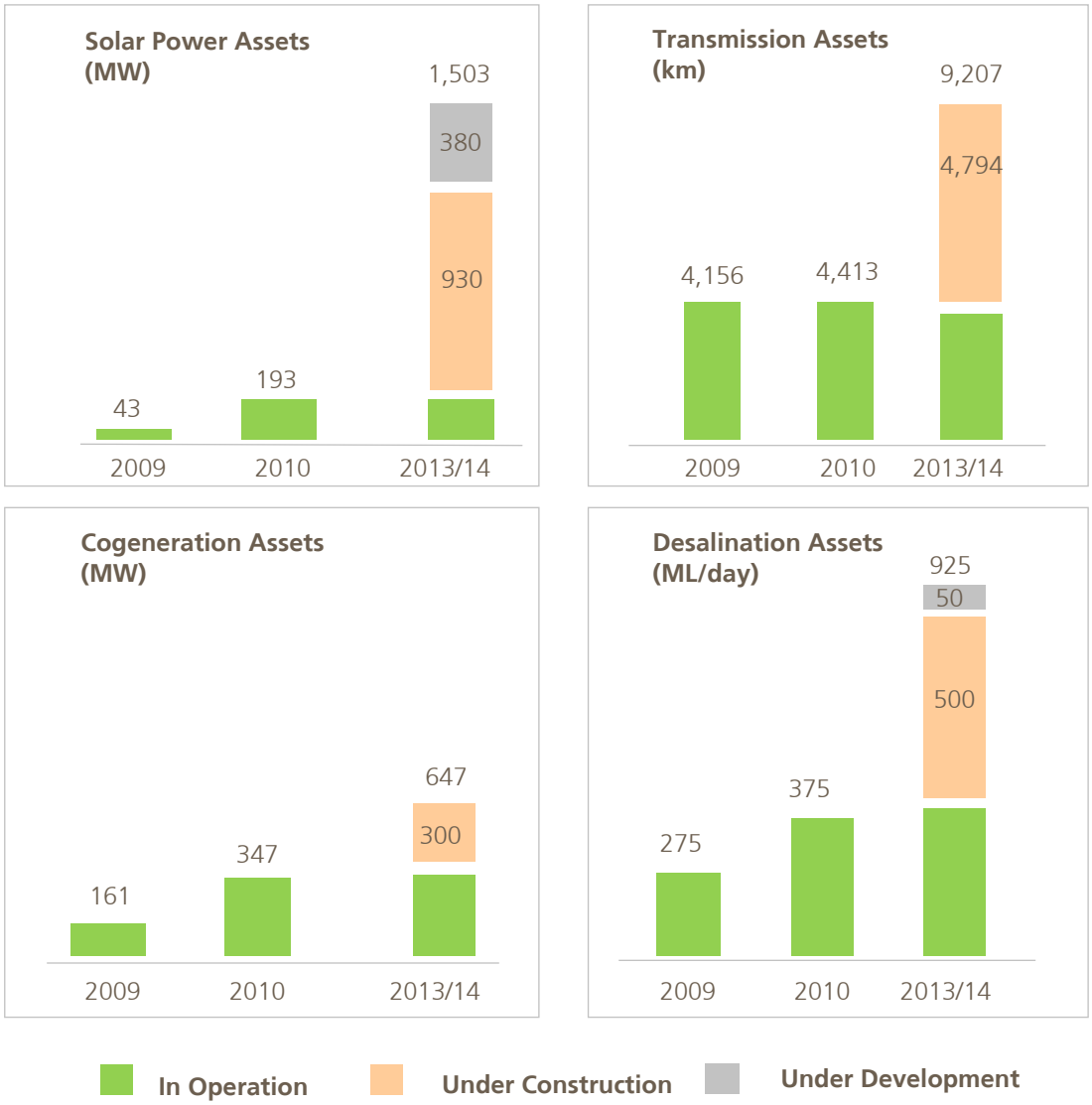
- Completion of work on the Honaine seawater desalination plant (Algeria). Start of the commissioning stage for the same desalination plant, which boasts a daily water generation capacity of 200,000 $m^3$.
- In the industrial sector, electrical upgrade work was carried out on the Ford factory in Almusafes (Spain) for the Fiesta and C-Max models.
- Extension of the operational agreement with the Swedish electric utility Vattenfall until 2014, with various options to increase the value of the information services on offer. Following successful completion of the initial project, 2011 will witness the implementation of this new measurement and infrastructure management services agreement.
- Alliance signed with IBM in North America to create ITS (Intelligent Transport Solutions) mobility management solutions for small-scale transport networks, such as small and medium-sized cities.
- Contract signed with United Airlines whereby the company will provide meteorological services to 122 airports around the world.
- Agreement reached with John Deere Agri Services to link up its platforms by integrating Telvent information into John Deere's AGRIS™ Commodity Management system.
- Contract secured with the EFE news agency to implement a multimedia publishing system (known by its Spanish acronym of SIEM), which will allow it to integrate all content generated by the agency into one sole management system.

## Concession-Type Infrastructures

This segment groups together any asset operations for which we have long-term contracts in effect, including take-or-pay contracts, power or water purchase agreements and tariff-type sales contracts. This segment therefore includes solar power plants, power transmission lines, cogeneration plants and desalination facilities. There is no demand risk for these particular assets, and company efforts focus on streamlining operational aspects. Abengoa has a young asset portfolio, with an average of 27 years of envisaged operation still remaining. Furthermore, the company's investment volume in assets currently under construction will more than double our current capacity once they begin operating.

In this particular segment, revenues for 2010 climbed to €309 M, up 41 % on figures for 2009, while EBITDA rose to €208 M, marking a 46 % year-on-year increase.

## Concesion-type infrastructures




Highlights:

- Operation of solar power plants:

  Three new 50 MW solar power plants, each utilizing parabolic trough technology, were commissioned in Spain, thus bringing the company's operating capacity from 43 MW to 193 MW in 2010. A further milestone for 2010 was confirmation of solar thermal power regulation in Spain by Royal Decree enacted in December.

  Abengoa possesses 930 MW currently under construction in Spain, North America and the Middle East, all of which will be commissioned over the coming three years. These projects include the Solana plant mentioned above, for which Abengoa secured the necessary funding thanks to a $1,450 M federal loan guarantee from the US government.

- Operation of power transmission lines:

  Abengoa closed the year with over 4,400 km of power lines in operation, primarily in Brazil, where the company is the country's leading private power line concessions firm, and also Peru, where a 670 km line crossing the Andes at an average height of 3,000 m above sea level has been brought partially online. Over the coming years, the number of lines in operation will be effectively doubled, thanks to the Norte Brasil (Latin America's longest direct current line), Linha Verde and Manaos projects in Brazil, and the Chilca project in Peru.

  Revenues are strictly regulated and based solely on power line availability.

- Operation of desalination plants:

  2010 witnessed the start-up of the Chennai plant in India, which is capable of generating 100,000 $m^3$ of desalinated water per day, bringing the company's daily operating capacity to 375,000 $m^3$. When the plants currently under construction in China and North Africa are commissioned, this capacity will leap to over 900,000 $m^3$ per day.

## Industrial Production

This last segment embraces Abengoa activities in biofuels and industrial waste recycling. These activities, which are also performed with proprietary assets, focus on high-growth markets in which the company enjoys a position of leadership. Abengoa is the European market leader in ethanol production, and also ranks sixth in North America. In recycling, the company is the market leader in the niche markets where it operates.

In this segment, revenues for 2010 climbed to €2,137 M, up 48 % on figures for 2009, while EBITDA rose to €320 M, marking a 46 % year-on-year increase. The drivers of this growth are increased ethanol production stemming from three new plants currently in operation, two in the United States and one in Europe, which have pushed up the company's capacity to over 830 Mgal -3,140 ML- per year as well as the recovery of recycled material volumes in Europe in the wake of a crisis-stricken 2009. Abengoa's annual recycling capacity currently stands at 2.5 Mt.

Highlights in the biofuels sector for 2010 include:

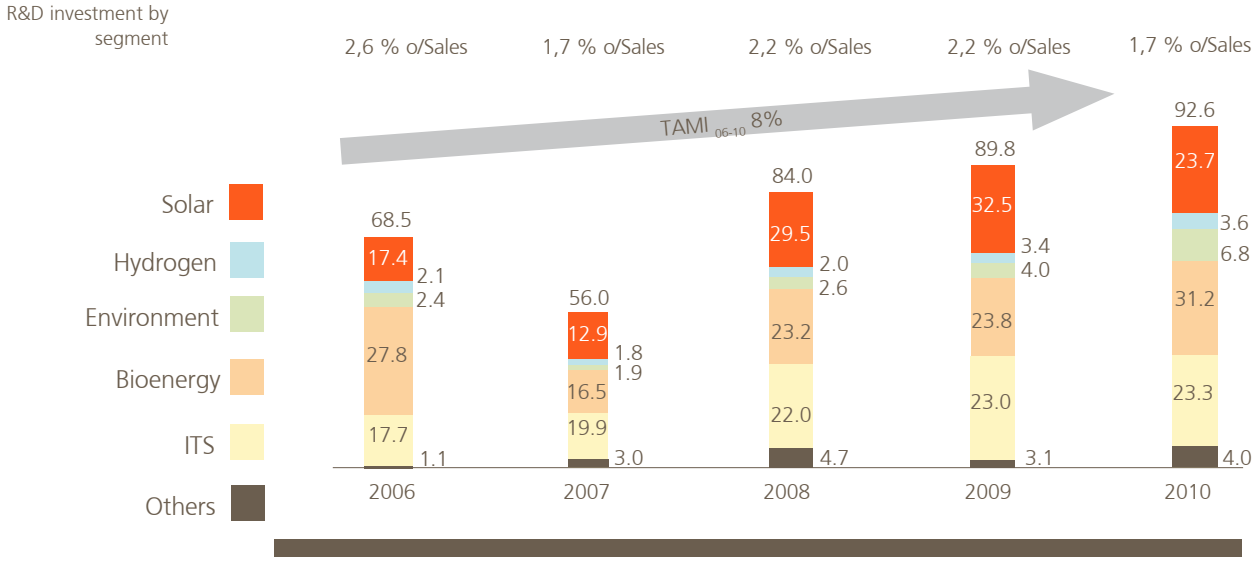
- Start of production at the Mount Vernon plant in Indiana and at the Madison plant in Illinois, boasting an annual capacity of 90 Mgal -340 ML- of bioethanol and 230,000 t of DGS.
- Start-up of the Europoort plant in Rotterdam, the Netherlans, capable of producing 126 Mgal -480 ML- of bioethanol and 360,000 t of DGS per year.
- Start of maritime bioethanol exports from the United States.
- Lease of a new storage terminal in Houston, Texas, with a storage capacity of 2.6 Mgal - 10 ML.
- Promotion and expansion of a network of e85 biofuel service stations in Spain, which already includes 21 distribution points.

Industrial waste over 2010:

- The company's steel dust recycling units treated a combined total of 562,308 t (dry) of zinc-containing steel and iron dusts, marking a year-on-year increase of 11.9 %.
- The company also treated 375,000 t of salt slag over 2010, marking a year-on-year leap of 57 %.
- Successful integration of the three German salt slag recycling plants acquired in 2010.

# Technological Development

Abengoa is a technology company that drives its business via innovation, defined as any knowledge-based change that creates value. Thanks to technological development, Abengoa is able to maintain a competitive edge that creates value throughout its three lines of business, ranging from initial construction to full operation of the asset in question.




In 2010, Abengoa's investment in R&D amounted to €92.6 M, 3.2 % up on the previous year and equivalent to about 1.7 % of its total sales, meaning a 8 % compound annual growth rate in R&D investment during the last five years. Staff engaged in R&D activity already amount to nearly one thousand people, including scientists, engineers and support personnel. The company also collaborates with prestigious international research centers, such as NREL (National Renewable Energy Laboratory) in the United States, and DLR (Deutsches Zentrum für Luft- und Raumfahrt) in Germany.

In 2010 Abengoa Research has been created to bring together all of the highly innovative R&D&i activities and to act as an incubator for ideas at Abengoa, generating new prospects for the future.

As a product of its continuous work in R&D, Abengoa has cemented its position as a global leader in concentrating solar power (CSP) technologies, and similarly in enzymatic hydrolysis technology for producing second-generation ethanol, as illustrated by the 99-plus patents awarded or awaiting approval

## Concentrating Solar Power Technology (CSP)

The solar energy sector is still in its infancy and relies heavily on technology, meaning that innovation is a key aspect that will enable us to develop better technologies at costs that prove competitive with fossil fuels, including the cost associated with $CO_2$ emissions. Two main drivers will combine to lower costs: Improvements to the supply chain and the introduction of more efficient new technologies. This is precisely where innovation has a vital role to play.

Abengoa has an ambitious CSP R&D plan in place, in which many programs have already reached the pilot plant stage. Milestones for 2010 included:

- During 2010, the operation of the superheated steam tower, the Eureka project, has continued, reaching temperatures over 500 ºC. The plant was commissioned by the start of 2009.
- The engineering of a new superheated utility scale tower has been concluded.
- A new and technically improved heat exchanger has been installed in the molten salt storage demonstration plant.
- Performance tests of a new parabolic collector trough have been conducted, as well as a new heliostat, which lower current costs by 15 and 25 % respectively.
- An agreement has been reached with the US Department of Energy for the joint development of new advanced towers.
- During 2010, 25 new patents have been applied, reaching a total of 80 patents awarded or pending of approval.

## Enzymatic Hydrolysis Technology for Producing Second-Generation Ethanol

It is possible to convert agricultural waste from wood and other potential energy crops into ethanol using enzymatic hydrolysis, without affecting the ecological balance or the food chain. Second generation biofuels also have strong potential for reducing emissions compared to the fossil fuels.

Abengoa has two production facilities at R&D scale that are world leaders in enzymatic hydrolysis technology. One pilot plant is in York (United States) and has been operational since 2007, while the other 1.3 Mgal -5 ML- pilot plant is in Salamanca (Spain) and has been operational since 2009.

Milestones for 2010 included:

- The basic process engineering package for the first commercial cellulosic ethanol facility in Kansas has been completed.
- The proprietary enzyme technology at commercial scale for lignocellulosic ethanol production has been demonstrated.
- More than 2,500 h of continuous operations have been accumulated at the cellulosic ethanol demonstration plant in Salamanca, Spain.
- During 2010, three new comprehensive patents have been added, totaling seven.

# 6

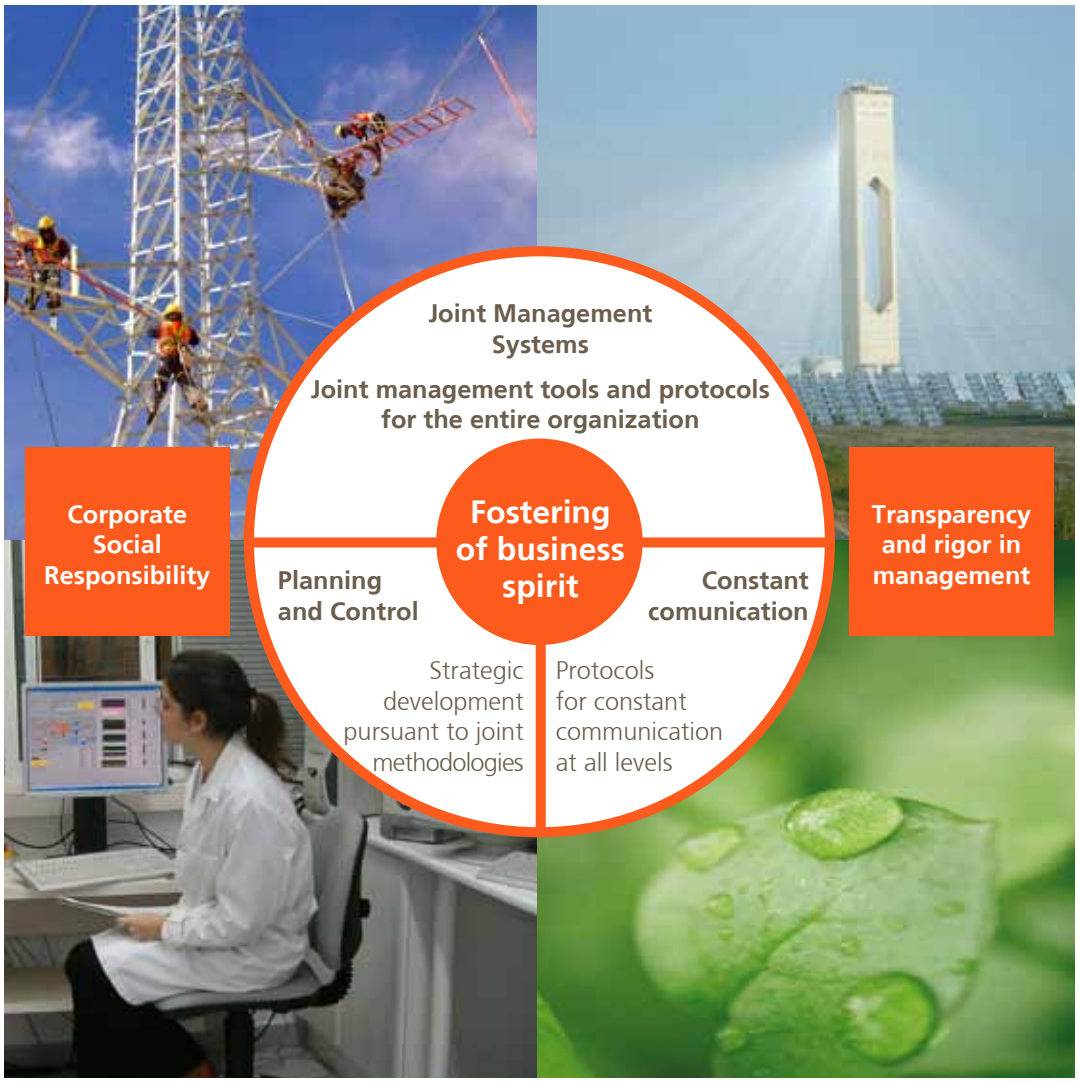
# Our Management Model

Growth at Abengoa is founded on five strategic cornerstones:

- Creation of **new businesses** that help combat climate change and foster sustainable development.
- A dedicated and highly competitive **human team.**
- Permanent strategy of creating value by generating new options and defining **current and future businesses** through a structured process.
- **Geographic diversification** in the markets offering the greatest potential.
- Heavy investment in **research, development and innovation.**

These cornerstones are shaped through a management model based on three core concepts:

- Corporate social responsibility.
- Transparency and rigor in management.
- Fostering of business spirit.



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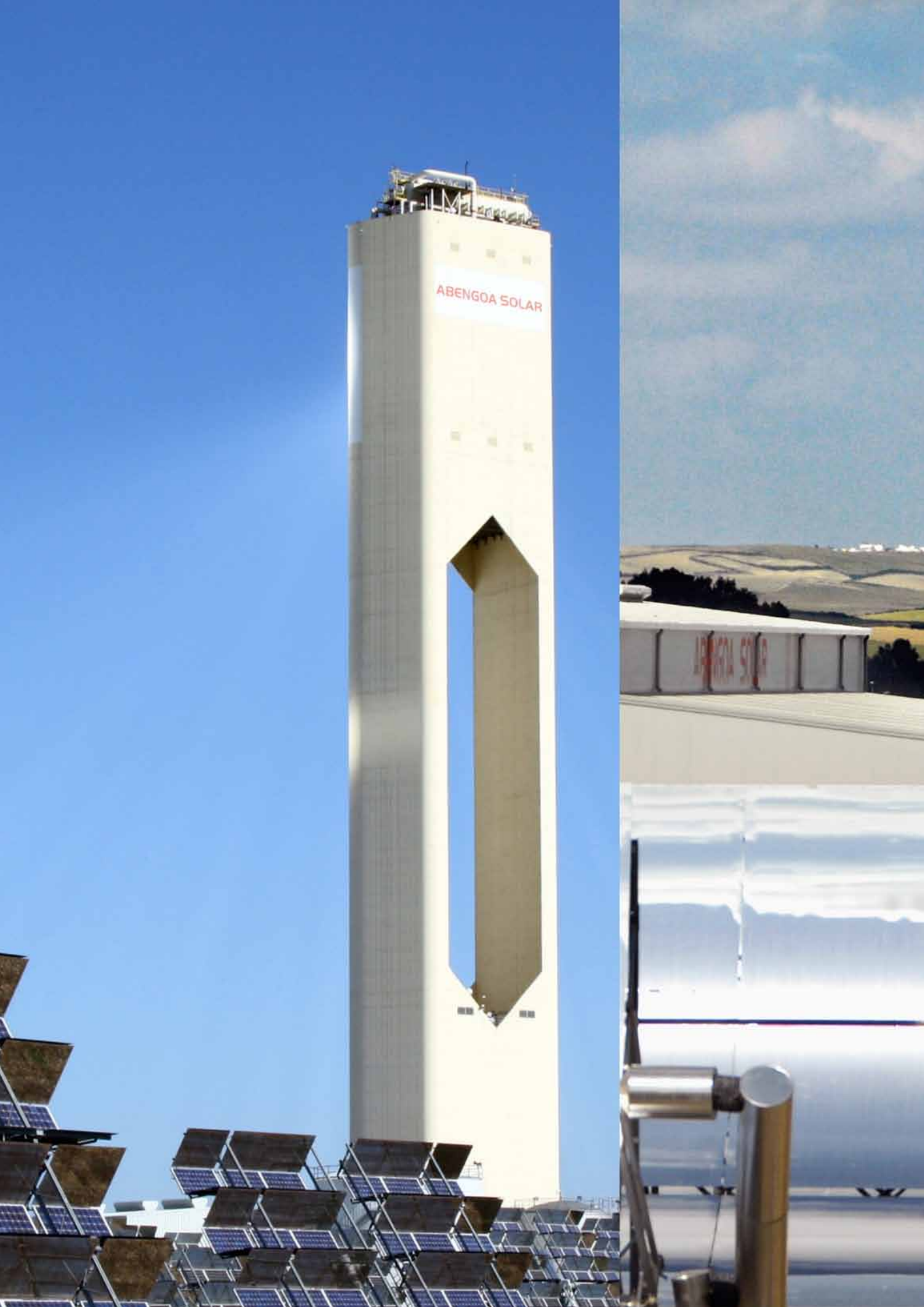

ABENGOA SOLAR

Abengoa Solar develops and applies solar power technologies in order to combat climate change and ensure sustainability through the use of proprietary Concentrating Solar Power (CSP) and photovoltaic (PV) technologies.

**www.abengoasolar.com**

# International Presence


| | |
|---|---|
| Headquarters: | Campus Palmas Altas, Parcela ZE-3 (Palmas Altas)<br>41012-Seville, Spain |
| Telephone: | +34 95 493 7111 |
| Fax: | +34 95 564 1774 |
| E-mail: | abengoasolar@abengoa.com |
| Web: | www.abengoasolar.com |

| Key Figures | 2010 | 2009 | Var. '10-'09 (%) |
|---|---|---|---|
| Revenue (€M) | 168 | 116 | +45.0 |
| EBITDA (€M) | 70 | 22 | +225.4 |
| Plants in operation (MW) | 193 | 43 | +348.8 |
| Plants under construction (MW) | 930 | 450 | +106.6 |
| Plants under development (MW)* | 2,325 | 1,500 | +55.0 |
| Patents requested (cumulative) | 80 | 55 | +45.5 |
| Average number of employees | 450 | 358 | +25.6 |
| Hours of training (h) | 52,620 | 39,094 | +34.5 |

*Includes plants in pre-construction phase

# Our Business

Despite the economic backdrop, 2010 signaled the consolidation of the worldwide solar electricity generation market, as evidenced by the number of projects awarded in existing markets and the advent of new opportunities in emerging markets.

The changes underway in the energy sector in general have caused an increase in the competition among various renewable energy sources increasing the pressure among the various kinds of renewable technology. In this regard, solar power remains highly competitive due to value-added factors such as dispatchability, scalability and the existence of multiple technological options that strengthen its strategic position.

Despite the prevailing financial uncertainty and the constraints on debt markets, the sector's development was bolstered by governmental support, including the confirmation in December of the current regulatory framework in Spain, the establishment of the Federal Loan Guarantee (FLG) program in the US, and the publication of stable and attractive regulatory frameworks in new markets. Following are some highlights:

- In Spain, construction commenced on close to 850 MW of solar thermal capacity, including 400 MW by Abengoa Solar. While a total of 350 MW entered into operation, all of which are included in the pre-allocation registry. Of this capacity that entered into operation, 150 MW are attributed to Abengoa Solar's three parabolic trough plants in Sanlúcar la Mayor, Spain (Solnova 1, Solnova 3 and Solnova 4).
- The United States government earmarked close to $3,785 M of the FLG program for solar projects, of which $1,450 M was guaranteed to Abengoa Solar for the Solana project in Arizona.
- Internationally, new opportunities have arisen in North African and Middle Eastern markets, including Morocco and the United Arab Emirates.

Accordingly, Abengoa Solar has strengthened its strategic position in the industry and, at the close of 2010, held a total of 3,448 MW on portfolio, including: 193 MW in operation utilizing both power tower and parabolic trough technologies, 930 MW under construction, and 2,325 MW in development and pre-construction.


Abengoa Solar and E.ON unveil agreement

Abengoa Solar develops and implements solar power technologies in order to combat climate change and ensure sustainability through the use of concentrating solar power (CSP) and photovoltaic (PV) technologies, contributing to the development of the communities where it operates.

Due to its constant efforts in research and development (R&D), Abengoa Solar has proprietary technology which places it at the forefront of solar technologies in its ability to generate clean and efficient power at a competitive cost.

Aerial view of the Solúcar complex in Seville, June 2010

Abengoa Solar is firmly convinced that solar energy meets the requirements to satisfy a significant part of society's demand for clean and efficient energy sources, since every year the sun irradiates an amount of energy that amply surpasses the energy needs of our planet, and there are proven commercial technologies available today with the capability of harnessing this energy in an efficient way.

Abengoa Solar is also convinced that the renewable energies market, and more specifically the solar energy market, will continue to develop at a high rate, due primarily to:

- The greater political will and social awareness resulting from the mounting concern for climate change;
- The higher costs and volatility associated with fossil fuel markets, driven by the recent increase in demand for energy in developing countries
- The need to reduce energy dependence in countries with limited fossil fuel resources.

This is why Abengoa Solar aspires to develop and implement efficient and dispatchable technologies to produce solar energy in those areas with the greatest solar potential.

Abengoa Solar's business model is based on three lines of activity:

- Development of CSP and PV plants
- Sale of energy from, and operation and maintenance of, those plants
- Development of new technologies through R&D, and the manufacture and sale of key components

Abengoa Solar is firmly convinced that solar energy meets the requirements to satisfy a significant part of society's demand for clean and efficient energy sources, since every year the sun irradiates an amount of energy that amply surpasses the energy needs of our planet, and there are proven commercial technologies available today with the capability of harnessing this energy in an efficient way.

Abengoa Solar operates in three key geographical areas or markets:

- Spain

  Abengoa Solar is posting strong growth in Spain thanks to the 13 projects listed in the pre-allocation registry, which will benefit from the financial framework established under Royal Decree 661/2007.
- United States

  Abengoa Solar commenced its activities in the US in 2006, and has one major project in Arizona that has started construction activities, and one in California that is under development.
- Internationally

  On the international stage, Abengoa Solar is building a CSP plant in Abu Dhabi, and is participating in the construction of an Integrated Solar Combined-Cycle (ISCC) power plant in Algeria. Abengoa Solar is also particularly active in North Africa, the Middle East, India, China, and Australia, and activities are expected to continue to grow in these countries and in new markets.

The geographic diversification of Abengoa Solar's business affords major competitive advantages, such as less reliance on a specific regulatory framework, and helps to achieve greater business stability by reducing exposure to a specific market and its economic context.

Abengoa Solar conducts its business in a major growth market worldwide, with considerable opportunity for further growth due to the global need for energy solutions that combat climate change, that reduce countries' energy dependency, and that avoid the higher cost and price volatility of fossil fuels.

As mentioned above, one of Abengoa Solar's strategic pillars is its drive to develop proprietary new technologies through a constant effort in R&D that can be implemented in its sector, helping it to stay ahead of the field. This effort enables Abengoa Solar to secure economic advantages in a sector where technology evolves very rapidly, allowing it to offer competitive technologies going forward and a portfolio of solutions tailored to individual projects or markets.

Moreover, since its launch, Abengoa Solar has positioned itself throughout the value chain of the solar thermal energy business. This vertical integration enables Abengoa Solar to achieve synergies between the activities of development, operation and technology, such as designing optimal solutions, controlling key components and their supply, and enhancing cost competitiveness.

Lastly, Abengoa Solar's experience in global markets has enabled it to become knowledgeable about a wide variety of regulatory frameworks. This know-how has been pivotal to its expansion in new markets with potential in CSP or PV energy, enabling Abengoa Solar to adapt more quickly than its competitors.

The team at Abengoa Solar has grown exponentially since the company was first launched, due mainly to the growth in activities and the consolidation and growth of the company's project portfolio in several countries. During 2010, Abengoa Solar sought to attract top professionals

View of PS10 and PS20 operating alongside Eureka, the high-temperature solar power tower pilot plant

and further develop their skills. In this regard, Abengoa Solar has implemented an integrated and comprehensive management system capable of meeting the needs of the company and its employees:

- Integrated, in that it covers all human resource processes: identification, description and classification of jobs; selection process to attract the best professionals in the market; training and development, including career plans, assessments, performance management and remuneration. All of this is geared towards retaining talent, and also fostering internal communication and social action.
- Comprehensive, in that it extends not only to interrelated processes, but also to the global nature of Abengoa Solar as a whole, encompassing numerous companies regardless of sector, territory or business line. The human resources policy has been shaped by the mission, vision and values of Abengoa Solar, by the company's strategic objectives and by implementation of its strategic plan.

For a company such as Abengoa Solar, which is founded on the concept of sustainable development, the task of managing relations with the following stakeholders is vital:

- The local communities where Abengoa Solar operates its power plants and contributes to social development;
- The partners and collaborators that embrace Abengoa Solar's sustainability policy as their own;
- The suppliers who are required to align their sustainability policies with those of Abengoa Solar;
- The clients to whom Abengoa Solar strives to offer top quality products and/or services;
- The shareholders, whose returns Abengoa Solar seeks to maximize.
- Society in general, since Abengoa Solar's mission is to combat climate change by offering clean and efficient energy solutions.

Abengoa Solar has a risk management and analysis system in place throughout all of its business lines to hedge against five kinds of risk:

- Business risks.
- Regulatory risks.
- Financial risks.
- Credit risks.
- Operational risks.

Risk Control at Abengoa Solar is structured around two core areas: Common Corporate Management Systems and Internal Audit Services.

The Common Corporate Management Systems implement Abengoa Solar's internal standards and its chosen method of assessing and controlling risk.

The Internal Audit Services are in place to prevent the risks to which the different group companies are exposed, and to control the application of the appropriate management procedures in accordance with the Common Corporate Management Systems.

In this regard, it is worth highlighting the active financial risk management process. During 2010, almost all of Abengoa Solar's revenues were Euro-denominated. However, as the company continues to grow, a significant portion of its revenues and costs will be denominated in other currencies, and the aim is to minimize exposure to exchange rate fluctuations by hedging appropriately. Accordingly, the company manages currency futures, swaps and options contracts on currency exchange rates and interest rates so as to limit the risk deriving from exchange rate fluctuations.

Furthermore, the cut in interest rates has not been directly mirrored in the cost of funding, since, in the broader financing context, funding and hedging margins have actually risen, offsetting the final impact.

In 2011, Abengoa Solar will continue to strive to consolidate its position as a leader in the solar energy sector, operating globally and efficiently with proprietary power tower, parabolic trough and PV technology.

The strategy will therefore continue to rest on the main pillars of Abengoa Solar's business:

- A global presence, with specific emphasis on the United States and Spain, while strengthening and consolidating the company's position in the other international markets in which it operates.
- A forging of alliances in plant development and operation.
- Controlled technological diversification in order to be able to offer a portfolio of solutions tailored to the individual needs of each market.
- Constant innovation in the technologies that Abengoa Solar has identified as key. This will be achieved through the company's own teams and through agreements signed with leading R&D institutions.

2011 is set to be a key year for the implementation of this strategy and for Abengoa Solar's expectations for further growth. The company's main objectives are as follows:

- To optimize the operation of our power tower and parabolic trough plants.
- To make satisfactory progress in the construction of 11 plants and to place 3 of them in service in 2011.
- To reaffirm the company's leadership in CSP and PV technologies that the company considers key.
- To consolidate the globalization of the company.

# 2010 in Review

In 2010, Abengoa Solar consolidated and strengthened its global position as a flagship company in the solar energy sector.

Abengoa Solar's milestone achievements in 2010 include:

- In Spain, the company placed in service three trough plants, for a total of 150 MW of installed capacity. It also secured financing for 6 plants and commenced construction of a total of 400 MW.
- In the United States, construction began on Solana, the 280 MW (gross capacity) solar power plant, one of the world's largest. This plant, which is located in Arizona, received an FLG of $1,450 M from the US government, which helped close financing and pave the way for start of construction. In addition, development activities continued at the 280 MW (gross capacity) plant located in California's Mojave Desert.
- Internationally, Abengoa Solar approached final construction of the ISCC plant in Algeria. It also started the construction of a 100 MW trough plant in Abu Dhabi, and developed a portfolio of PV projects in Italy.
- In 2010, Abengoa Solar struck up alliances with leading multinational companies in order to launch large-scale CSP plants. Highlights included agreements signed with Abu Dhabi Future Energy Company (MASDAR), E.ON, Itochu Corporation, JGC Corporation, and Total.
- In R&D, during 2010 the Solucar complex, located in Seville, (Spain) consolidated its standing as one of the world's leading R&D centers in the field of solar energy. The complex currently features

various groundbreaking and fully operational research facilities, including a high-temperature tower with more than two years of operation, a parabolic trough plant for direct steam generation, a thermal storage facility utilizing molten salt storage, a Stirling dish facility, various high concentration PV installations, and a PV laboratory.

- In the arena of industrial solar thermal facilities, the first integrated facility began operating at a coal-fired power plant located in Colorado and owned by Xcel, a public utility. A new solar facility was also installed to heat water at the Englewood Correctional Institution in Colorado.
- Abengoa Solar, through its subsidiaries, supplied parabolic trough structures for the Ecija and El Carpio solar complex plants, and it has also secured the supply for the Castilla-La Mancha and Extremadura solar complex.

Abengoa Solar became involved in the Desertec Industrial Initiative, which seeks to promote a stable framework to develop renewable energy in desert areas of North Africa and the Middle East for both local consumption and export to Europe.

Abengoa Solar joins the Desertec Industrial Initiative


## Our Activities

Abengoa Solar's business model is based on three lines of activity:

- The development of CSP and PV plants:

  This area includes activities such as identifying ideal locations for solar plants, obtaining the necessary permits, negotiating funding and construction agreements, and, if deemed necessary, identifying potential partners and reaching agreements with them. Furthermore, Abengoa Solar provides support in the engineering and turnkey construction of plants, while supervising the progress of the construction phase.

- Sale of energy from, and operation and maintenance of, those plants.
- Development of new technologies through R&D, and the manufacture and sale of key components for CSP and PV plants.

Abengoa Solar's portfolio of projects is classified according to the degree of maturity of development. There are four project phases that are usually classified as follows:

- Development: primarily encompasses selecting a location, securing land and evaluating solar resources; administrative processing and applying for licenses, permits and authorizations; processing of the grid connection and connection infrastructure.
- Pre-construction: this stage includes activities to secure funding for the plants which, in addition to having rights to the land, permits, authorizations and licenses, also meet the requirements entitling them to receive certain revenues (listing in the pre-allocation registry, or approval of a power purchase agreement by the state public utility commission, in the case of the United States).
- Construction: includes initial physical construction of the facilities, engineering and construction supervision and processing of permits corresponding to this phase, as well as support in starting up the facilities.
- Operation: includes taking operational control of the plant following construction, the evacuation and sale of energy, and the operation and maintenance of the plants.

| MW | Spain | North America | International | Total |
|---|---|---|---|---|
| Operation | 193 | - | - | 193 |
| Construction | 400 | 280 | 250 | 930 |
| Pre-construction | 100 | 280 | - | 380 |
| Development | 1,040 | 280 | 625 | 1,945 |
| Total | 1,733 | 840 | 875 | 3,448 |

**Note:** MW not adjusted according to ownership

## Plants in Operation

Abengoa Solar currently operates a total of 193 MW in Spain.

### PS10

Particularly noteworthy is the solar field comprising 624 heliostats, each measuring 120 $m^2$, concentrating solar radiation onto the receiver, which is located at the top of a 120 m tower.

Located at the Solúcar complex and with an installed capacity of 11 MW, it generates enough clean energy to meet the needs of 5,500 households, and prevents 6,700 t of $CO_2$ emissions per year. The plant also has a storage system of almost one hour's duration which enables it to experience temporary cloudy periods without having to be shut down and restarted. It was the world's first solar power plant to incorporate a power storage system.

In June 2007, the plant passed its first operating tests, and since then it has continued to operate, delivering the expected results. Ever since its start-up, PS10 has proved the viability of the power tower concept and has also been an invaluable learning instrument for improving upon future power tower plants.

## PS20

Launched in February 2009, this plant, located at the Solúcar complex, has benefited from Abengoa Solar's experience in building and operating PS10. The plant incorporates a number of design and operational improvements, which have translated into greater efficiencies and lower parasitics during the nearly two years in which it has been operating. These enhancements include a more efficient receiver and a number of improvements to the control and operation systems and also to the thermal energy storage facility.

With an installed capacity of 20 MW, PS20 supplies power to10,000 households and reduces yearly $CO_2$ emissions by 12,100 t. This second solar tower at the Solúcar complex comprises 1,255 heliostats designed by Abengoa Solar. Each heliostat measures 120 $m^2$ and reflects the solar radiation onto a receiver located on the 165 m tower, thereby enabling the steam production required to generate electricity in the turbine.

## Solnova 1, Solnova 3 and Solnova 4

During 2010, Abengoa Solar started the operation of the first three parabolic trough plants at the Solúcar complex: Solnova 1, Solnova 3 and Solnova 4, each with 50 MW of installed capacity. With the commissioning of Solnova 1, Abengoa Solar now operates plants using both commercial CSP technologies, tower and trough.

The trough technology concentrates solar radiation through high-precision curved mirrors onto a receiver tube containing a fluid flowing at high temperatures. The fluid allows the plant to generate steam, which is then sent to a turbine generator, where it expands to produce energy.

Each Solnova plant has 54,000 $m^2$ of solar collectors, distributed over an area of 120 ha, enabling it to produce enough power to supply 26,000 households and to cut $CO_2$ emissions by approximately 31,000 t. Each collector has 6 m in aperture and a surface area of close to 150 $m^2$.

Solnova 1, Solnova 3 and Solnova 4 solar trough collector plants in operation at the Solúcar complex Seville

## Sevilla PV

With an installed capacity of 1.2 MW, Sevilla PV was the world's first commercial plant to utilize low-concentration PV technology. It has 154 solar trackers on a 12 ha plot at the Solúcar complex.

The plant can supply clean energy to 650 households, cutting yearly $CO_2$ emissions by more than 1,800 t.

## Copero PV

A 1 MW PV facility located on the site of Emasesa's Wastewater Treatment Plant (WWTP) at El Copero, Seville. Emasesa and Abengoa Solar are 50 % co-owners of this PV plant.

## Las Cabezas PV

A 5.7 MW PV plant with single-axis trackers located in an area of high solar radiation in the province of Seville.

## Casaquemada PV

A 1.9 MW PV plant using dual-axis PV tracking technology, located at the Solúcar complex. It includes 100 kW of high-concentration heliostats.

Photovoltaic plant comprising conventional and high-concentration heliostats operating at the Solúcar complex in Seville

## Linares PV

A 1.9 MW PV plant with dual-axis trackers located in Jaen.

# Industrial Facilities

Abengoa Solar develops designs and constructs small-, medium-, and large-scale customized facilities.

Industrial solar thermal facilities employ parabolic trough technology to generate thermal energy (heat and steam) for industrial processes. The main advantage of this technology is that it can be adapted to different needs, while also helping to cut $CO_2$ emissions, since industry is one of the primary sources of greenhouse gas emissions.

Noteworthy in 2010 was the commissioning of three industrial solar thermal facilities:

- The solar thermal facility integrated into a Colorado coal-fired power plant owned by Xcel Energy, a public utility. This facility, which was brought into service in early 2010, increases the plant's thermal efficiency while reducing $CO_2$ emissions by cutting down on coal consumption.
- A new industrial solar thermal system was installed at the Englewood Correctional Institution in Colorado. This facility includes a storage tank that supplies hot water all day. The system supplies 50 % of the hot water consumed at the institution.

Industrial solar thermal facility at the Englewood Correctional Institution, in Colorado

- The industrial solar thermal facility for the Palmas Altas buildings' climate control system was placed in service, thus minimizing the electric power requirements of the complex, where Abengoa's offices are located.

Industrial solar thermal facility for the climate control system at the Palmas Altas Campus

## Plants under Construction

In 2010, Abengoa Solar commenced construction of most of the plants listed in the Spanish pre-allocation registry. Each of these plants will produce enough electricity to supply approximately 26,000 households and cut yearly $CO_2$ emissions by more than 31,000 t.

Construction activities also got underway at the Solana facility in the US, and at the Shams site in Abu Dhabi.

## Ecija Solar Complex

In order to construct and operate the two 50 MW plants, Abengoa Solar entered into a 50 %-50 % alliance with E.ON, and has secured non-recourse debt financing totaling €310 M. With over 88,000 employees, E.ON is today one of the world's major privately owned gas and electricity companies.

The construction work is progressing according to plan, and both plants are due to enter into service in 2011. The main work at these two plants currently involves finishing the installation of the mirrors in the solar field.

Aerial view of the Ecija solar complex in September 2010

## El Carpio Solar Complex

For the construction and operation of two 50 MW parabolic trough plants, Abengoa Solar entered into an alliance with JGC whereby Abengoa Solar holds a 74 % interest, having secured non-recourse debt financing totaling approximately €350 M.

Founded in 1928, JGC Corporation remains a leading engineering company today. It currently offers a broad range of services in planning, design, engineering, construction, and delivery of facilities in sectors such as hydrocarbons, new energies and nuclear energy, and it has a proven track record in more than 20,000 projects in more than 70 countries.

Construction of these two plants got underway in summer 2010 and is advancing according to plan, with current work focusing on the foundations for the solar field.

## Extremadura Solar Complex

Two of the four 50 MW plants comprising the Extremadura solar complex are in the construction phase. For the construction and operation of these two plants, a collaboration agreement was signed with Itochu, a leading Japanese holding company with more than 100 years of experience, a proven track record, and a presence in 74 countries.

The construction of these two plants is progressing according to plan.

## Castilla-La Mancha Solar Complex

Abengoa Solar is building two 50 MW parabolic trough plants in the province of Ciudad Real (Castilla La Mancha).

The initial construction phase has been completed and work on the foundations of the power islands of both plants is nearing completion.

## Solana

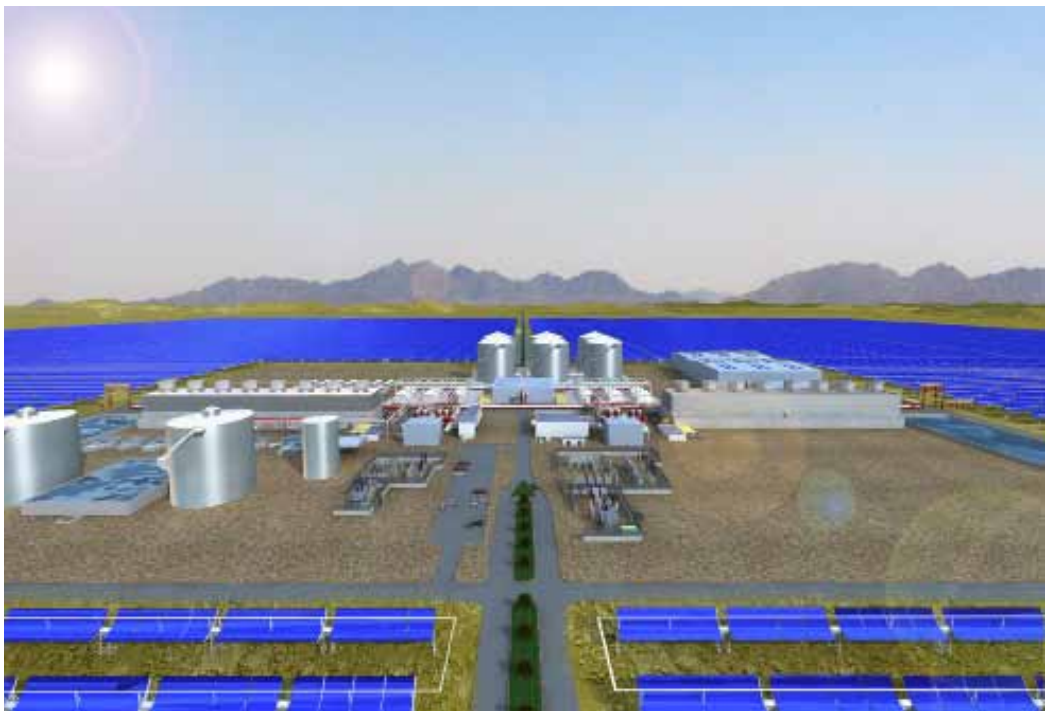
Located approximately 110 km southwest of Phoenix, Arizona, Solana is one of the world's largest CSP plants under construction, with a gross installed capacity of 280 MW (250 MW net) comprising cutting-edge parabolic trough technology. Solana will produce enough power to supply 70,000 US households, slashing yearly $CO_2$ emissions by 475,000 t. The energy will be sold to Arizona Public Service, the state's largest electric utility, through a 25-year power purchase agreement.

Solana will incorporate six hours of storage capacity through molten salt technology, enabling it to generate energy during cloudy periods and after the sun sets. This storage capacity will enable Solana to generate enough electricity to meet peak evening demand in summer.

Abengoa Solar has received an FLG from the US government of $1,450 M, enough to complete financing for the project and commence construction. Earthwork and work on the foundations of the assembly facility are currently under way.

The construction and operation of Solana will bring huge benefits for the people of Arizona, including the creation of 1,600-1,700 jobs during construction and 85 permanent positions once the plant is placed in service.

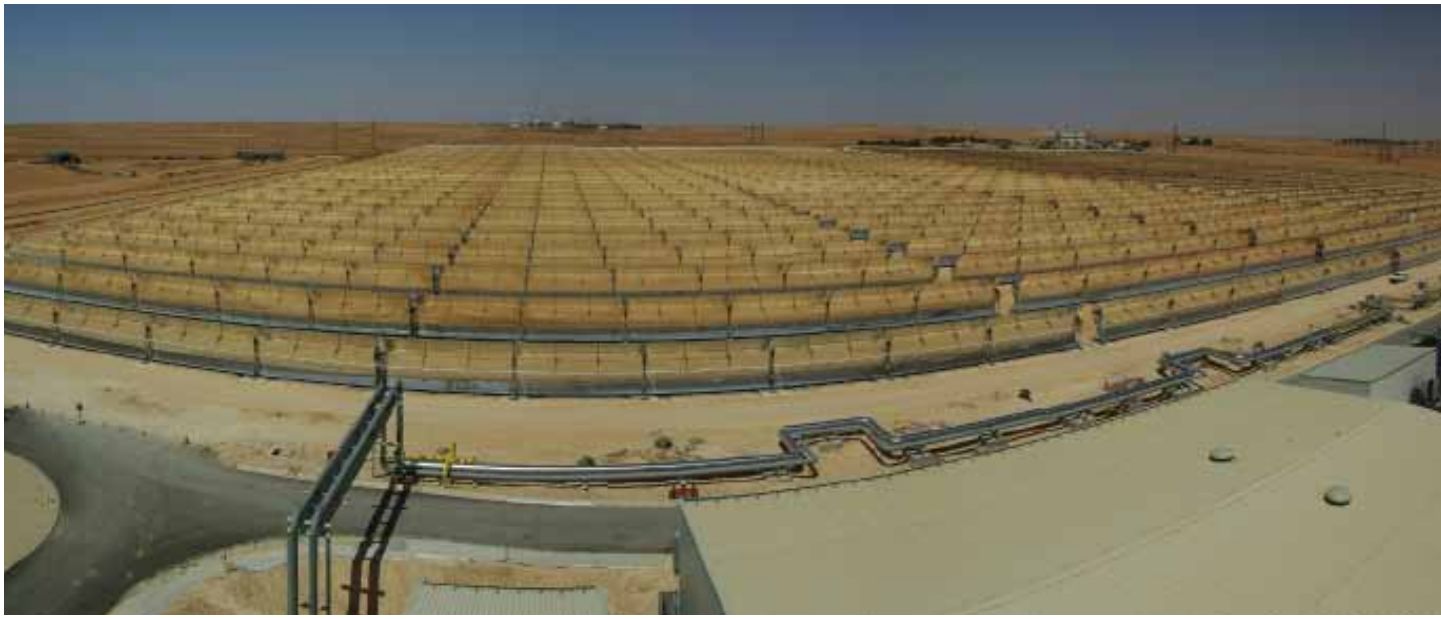
Virtual image of the Solana solar field



## Integrated Solar Combined-Cycle (ISCC) Plant

This project includes the design, construction and operation of a 150 MW ISCC plant in Algeria, 20 MW of which will be provided by a solar field of over 180,000 $m^2$ of reflective area.

The plant is in the final construction phase and is expected to be placed in service during 2011.



Solar field at the ISCC plant in Algeria

## Shams-1

The Shams-1 plant, construction of which began at the end of 2010, covers an area of approximately 300 ha in the Abu Dhabi desert, and will have an installed capacity of 100 MW, by means of 600,000 $m^2$ of parabolic trough collectors.

The project is promoted by a consortium made up of Abengoa Solar, Total and Masdar, which won an international tender to develop and operate the largest solar energy plant in the Middle East. This first solar energy project in the Middle East represents one of the first steps by the Abu Dhabi government to introduce renewable energy into a region which presently remains highly dependent on hydrocarbons, and it marks a strategic milestone for Abengoa Solar due to the immense opportunity for development throughout the Middle East.

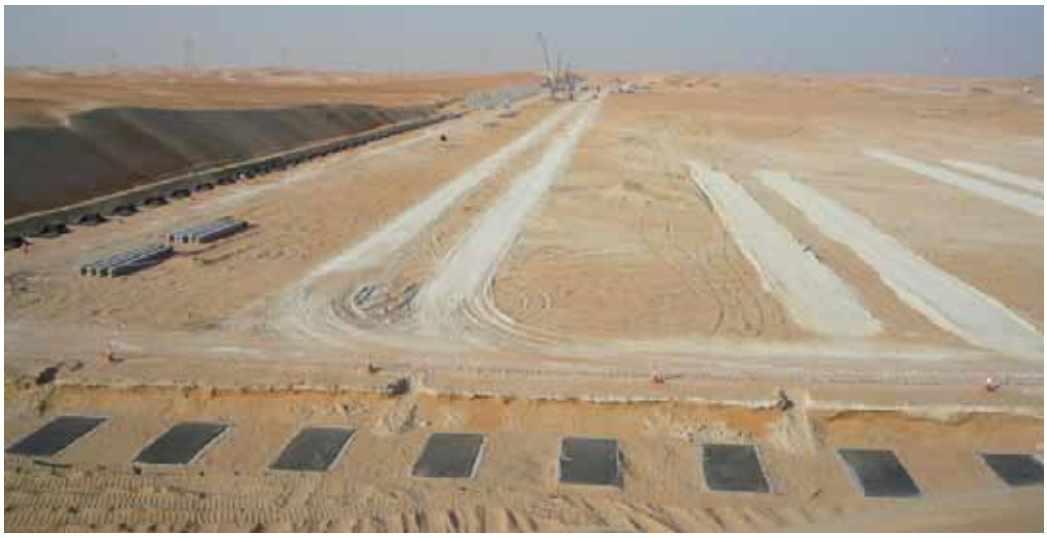


Image of the construction work on Shams-1 in the Abu Dhabi desert

Shams-1 incorporates state-of-the-art parabolic trough technology. Among other innovative features, highlights include the plant's dry-cooling system and its auxiliary heating boiler. The dry-cooling system significantly reduces water consumption at the plant, while the auxiliary boiler, which heats the steam as it enters the turbine, boosts the cycle's efficiency. These two innovations place Shams-1 at the forefront of parabolic trough technology.

The construction work is progressing according to plan, and the plant is due to be placed in service during the summer of 2012.

## Plants in Pre-construction Phase

Abengoa Solar has three plants in possession of all the necessary permits and a defined economic framework, having either been registered in the Spanish pre-allocation registry, or having secured power purchase agreements in the United States.

### Extremadura Solar Complex

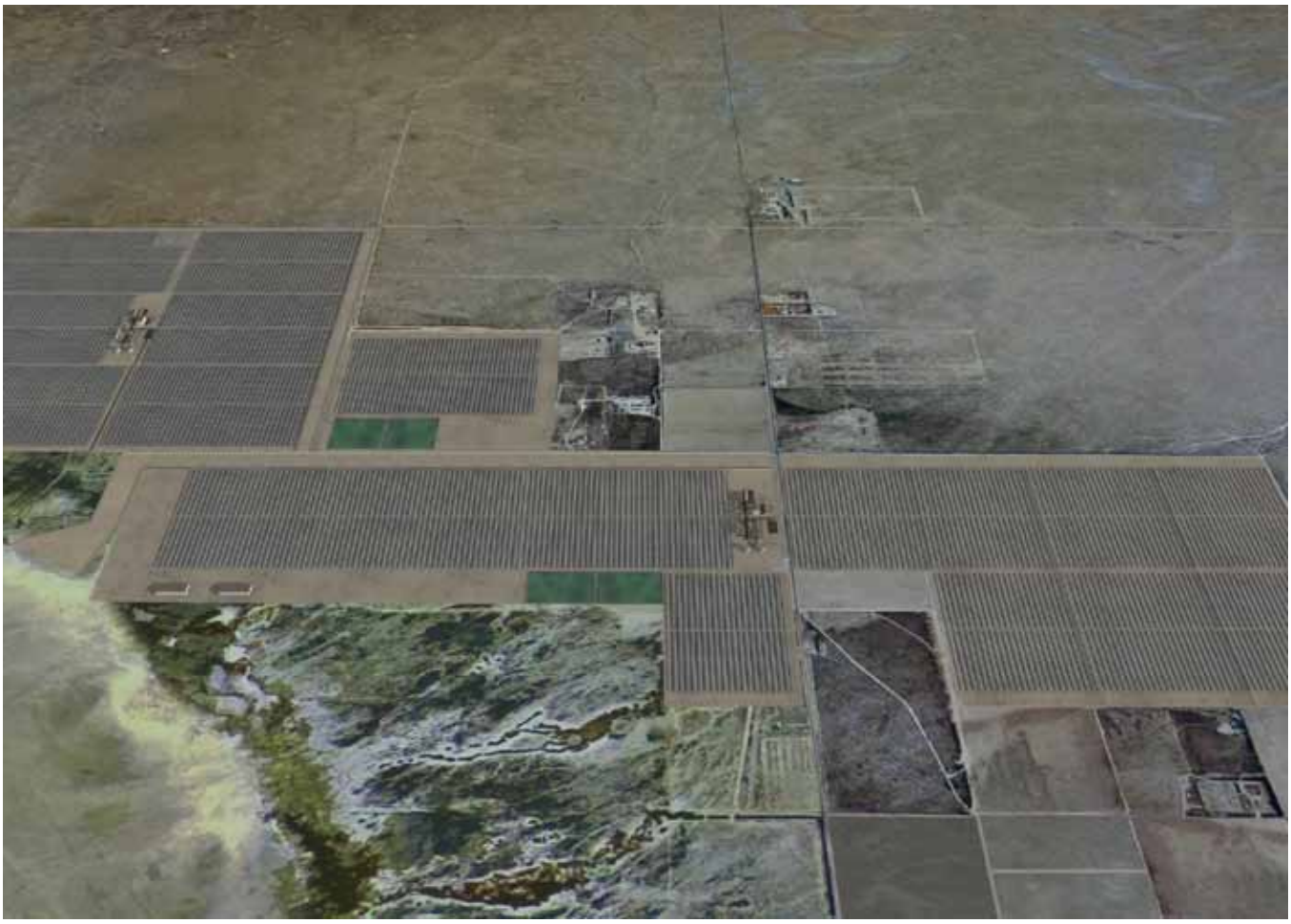
Two of the four trough plants of the Extremadura complex are in the pre-construction phase. These plants have been included in the Spanish pre-allocation registry and therefore have all the necessary permits for their construction.

When the plants are brought into operation, each will be able to supply approximately 26,000 households while reducing yearly $CO_2$ emissions by 31,000 t.

### Mojave Solar

This project stems from an agreement with Pacific Gas & Electric Company (PG&E) to supply the electricity to be generated at the new 280 MW (gross) Mojave Solar power plant. The plant will be located 150 km northeast of Los Angeles, California, and will create 1,600 new jobs in the area during construction and 85 permanent positions for plant operation and maintenance.

Virtual image of Mojave Solar in the Mojave Desert in California



In September, Abengoa Solar obtained final licensing approval from the California Energy Commission to commence construction and by the close of 2010 certain construction activities had already got underway at the plant.

It is worth highlighting that this project will provide a major economic boost to the region, and also contribute significantly to California's renewable energy targets, i.e. replacing fossil fuels with solar energy and other alternative sources to curb greenhouse gas emissions.

## Plants under Development

Abengoa Solar has a team of more than 100 employees working on project development in Spain, the United States and the other markets in which it operates. In recent years, Abengoa Solar has channeled considerable time and resources into developing solar power plants. As a result, it has a sizeable portfolio of projects in various development phases in both CSP and PV technologies.

### In Spain

Abengoa Solar has more than 1,000 MW in CSP plants prioritized by various regional governments. Most of these plants will be built following the introduction of the new regulatory framework in 2014.

### In the United States

Abengoa Solar has a team of experts that has been working on development activities since 2006 and that has enabled the company to launch two major projects in Arizona and California. Abengoa Solar currently has other development projects at various stages in both CSP and PV technology.

### International Development

Outside Spain and the United States, Abengoa Solar has development teams able to offer the best possible solution to every need in the markets considered attractive due to their high levels of solar radiation and stable regulatory framework. Abengoa Solar currently has various projects under development in different phases using both CSP and PV technology.

## Supply of Key Components

Ensuring a reliable supply of high-quality key components is essential for Abengoa Solar. Consequently, through investee companies, Abengoa Solar controls the design and manufacture of certain components identified as critical.

In the area of power tower technology, Abengoa Solar designs its own heliostat structures. These structures are manufactured by Eucomsa, a subsidiary of Abengoa Solar, and later assembled at each plant's assembly facility. During 2010, work began to develop new heliostats to further enhance the plants' technical and economic performance. Furthermore, Abengoa Solar is working with companies specializing in the design and manufacture of receivers in order to maximize performance of these elements while reducing their associated cost.

In the area of parabolic trough technology, Abengoa Solar designs its own collectors. The metallic structures are built by Eucomsa and subsequently assembled at each plant's assembly facility. Abengoa Solar has introduced a high-performance steel collector at a number of its plants.

ASTRO collector

The parabolic trough mirrors are manufactured by Rioglass Solar, with which Abengoa Solar has signed a commercial agreement effectively guaranteeing the supply of this key component. This has translated into lower cost, greater security of supply and improved efficiency and durability of the mirrors in the solar field.

In the area of PV technology, Abengoa Solar has progressed in the development of high-precision trackers for ground-based and rooftop installations as well as in the development of a high-concentration module.

## Development of New Technologies

As mentioned above, one of Abengoa Solar's strategic pillars is the development of new technologies, which enables it to stay ahead of the field in a sector where technologies evolve at a breathtaking pace. This ongoing effort in R&D better enables Abengoa Solar to offer competitive technologies going forward and a portfolio of solutions tailored to each individual project and/or market.

Cameo industrial solar facility integrated into a coal-fired electric power plant owned by Xcel Energy, Colorado

Abengoa Solar's R&D projects are conducted using the Stage-Gate methodology, based on stage-by-stage development with progress evaluations to gauge the degree of fulfillment of pre-set targets and to assess the potential of the technology under study. This methodology is used to achieve excellence in R&D development and management, while minimizing the risks.

The objectives of the company's R&D program include the need to obtain better operating temperatures for both power tower and parabolic trough technologies in order to boost the efficiency of the power cycle; enhance plant control and operation systems; cut technology costs; optimize storage systems; and, develop new and more efficient PV technologies.

In line with these challenges, the company continued to operate a number of pilot plants at the Solúcar complex in 2010, which enabled it to consolidate various key innovation concepts:

- Operation since early 2009 of a tower with superheated steam generated in a second receiver reaching temperatures exceeding 500º C.

- Certification of water as an alternative to oil in parabolic trough collector loops. The Direct Steam Generation (DSG) plant, which also came into operation in early 2009, is ratifying the control system developed by Abengoa Solar for direct steam generation.
- Validation of thermal storage technology. The company has been operating a molten salts pilot plant since 2009, and has accumulated considerable experience in the use of this fluid to store thermal energy and to gauge the overall performance of this kind of storage.
- Development of new PV technologies based on the experience and know-how acquired at the PV laboratory, which has been in operation since 2008.

Pilot molten salts storage plant in operation since 2009 at the Solúcar complex, Seville

As a result of this extensive R&D activity, Abengoa Solar has gained proprietary technology protected through patents. Currently, the company holds priority rights over numerous significant and crucial inventions in the solar sector. In 2010 alone, the company applied for 25 patents, while a total of 80 patents have been requested over the last few years.

Abengoa Solar is currently developing both its own research projects and projects in cooperation with institutions and universities. For example, the company enjoys close ties with prestigious institutions such as the National Renewable Energy Laboratory (NREL), the leading renewable energies laboratory in the United States, Spain's Energy, Environmental and Technological Research Center (CIEMAT), a public research body of excellence in energy and environmental areas, and the thermodynamics department of the German Aerospace Center (DLR).

On a final note, Abengoa Solar is involved in numerous programs promoted by public and private bodies and institutions that offer grants to support R&D projects. In the last three years, the company was awarded five grants for different projects from the US Department of Energy (DOE), a project under the seventh EU framework program, and other projects to develop new technologies subsidized by, among others, Spain's Center for Industrial Technological Development (CDTI) and the regional government for Andalusia. The CENIT project, led by Abengoa Solar with a budget of €24 M, represents a particularly significant award.

Different concentrating photovoltaic systems

The Bioenergy business unit is spearheaded by the company Abengoa Bioenergy, which produces and develops biofuels for transportation, bioethanol and biodiesel among others, that employ biomass (cereal, sugarcane, cellulosic biomass, and oleaginous seeds) as raw material. Biofuels are used for ETBE production (a gasoline additive), or for direct blending with gasoline or diesel. Being renewable energy sources, biofuels help to lower $CO_2$ emissions and enhance the security and diversification of the energy supply, while reducing dependency on fossil fuels in the transportation sector, and helping to reach compliance with the Kyoto Protocol.

**www.abengoabioenergy.com**

# International Presence


| | |
|---|---|
| Headquarters: | 16150 Main Circle Drive, Suite 300<br>Chesterfield, St. Louis, MO 63017, United States |
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| E-mail: | abengoabioenergy@abengoa.com |
| Web: | www.abengoabioenergy.com |

| Key Figures | 2010 | 2009 | Var. '10-'09 (%) |
|---|---|---|---|
| Revenue (€M) | 1,575 | 1,010 | +56.0 |
| EBITDA (€M) | 212 | 123 | +71.8 |
| Installed capacity (Mgal) | 830 | 496 | +67.3 |
| Investment in R&D (€M) | 31.2 | 23.8 | +31.1 |
| Average number of employees | 5,256 | 4,224 | +24.4 |
| Hours of training (h) | 206,100 | 200,533 | +2.8 |

# Our Business

Over the course of 2010, Abengoa Bioenergy further cemented its standing as one of the leading producers of biofuels in Europe (397 Mgal - 1,500 ML- of annual production capacity), the United States (380 Mgal - 1,440 ML-) and Brazil (53 Mgal - 200 ML-), affording the company a total installed capacity of 830 Mgal - 3,140 ML.

Bioethanol prices decreased over the first half of the year due to lower demand for gasoline and slumping crude oil prices. Yet prices rallied sharply over the second half of the year on the back of strong demand for bioethanol, coupled with reduced imports from third party countries, with the increase amounting to as much as 25 % at year-end in comparison to the market prices seen at the start of the period.

Moreover, gasoline, crude oil and sugar, the commodities associated with bioethanol, all experienced rapid growth, with projections for next year far outstripping those for 2010.

In Brazil, the ethanol market is largely driven by local supply and demand, with a small volume earmarked for exports and no imports whatsoever. As a result, demand is chiefly influenced by the demand of ethanol-powered vehicles for hydrated ethanol. The ethanol consumption of this fleet and of vehicles that use gasoline mixed with anhydrous ethanol exceeds domestic production, which is directly driving up prices to new highs. Forecasts for this market are also promising and lend further credence to the idea that sales of flex-fuel cars will continue to climb at existing rates over the coming years. To meet this demand, Brazil is facing the major challenge of having to commission 25 production plants in the short to medium term.

The corporate mission of Abengoa Bioenergy is to engage in the following activities with a view to reaping the greatest returns for its stakeholders, industry and society at large:

- To contribute to the sustainable development of the vehicle fuels market and the bio-based chemicals products market by utilizing renewable energy (biofuels) and environmentally friendly technologies that reduce carbon emissions.
- To develop innovative technological solutions through continuous investment in research and development, resulting in more efficient production processes and distinctive and high-value feed coproducts.
- To create value for our shareholders.
- To contribute to the professional and personal development of our employees by providing continuous training, and by establishing and monitoring individualized goals and development plans.

From this platform, Abengoa Bioenergy works on a daily basis to accomplish the following objectives:

- To be recognized as a world-wide leader in the production and commercialization of bioethanol from bio-renewable resources.
- To be recognized as a world leader in research and development, known for technological innovation in the conversion of biomass to bioethanol.
- To provide a superior work environment in order to attract the best possible employees and to maintain excellence in operations.
- To attract the interest and respect of the financial community by means of sustained growth and technological innovation.

In order to reach these lofty targets while honoring the principles of integrity and ethics, Abengoa Bioenergy is guided by the following core values:

- Honesty in relationships with clients, shareholders, associates and co-workers.
- Respect for all people under all circumstances.
- Focus on teamwork by utilizing corporate tools that favor the sharing of information.
- Promote flexibility and mental attitude necessary to adapt to continuous change.
- Protection, defense and improvement of the environment.

The company's activities can be grouped into six main areas:

- Procurement of raw materials.
- Bioethanol origination.
- Production.
- Commercialization of bioethanol, DGS (distiller's grains and solubles) and sugar.
- Electricity cogeneration.
- New technologies.

Abengoa Bioenergy, with operations in five countries on three different continents, currently owns thirteen plants for producing bioethanol and other process-related coproducts, along with a biodiesel production plant, distributed as follows:

- Europe: Spain, France and the Netherlands.
- North America: United States.
- South America: Brazil.

These plants cater to the demands of global bioethanol markets from practically any corner of the world. Most sales stem from current producer countries, in addition to Sweden and South Asia.

Abengoa Bioenergy seeks out growth by attempting to consolidate operations in all business areas, investing continuously in technology with a view to streamlining production and sales processes, and developing new biofuel and coproduct production technologies, thus enabling the company to employ sustainable raw materials and curb greenhouse gas (GHG) emissions.

The company operates with the utmost respect for best industrial practices. It has also been striving for many years to obtain sustainable raw materials and produce sustainable products, with sustainability constituting the main cornerstone of its business. This commitment to the environment is finally beginning to seep through to society, and governments from most countries are now addressing this overriding concern through legislative change.

The prevailing environment in which all companies currently operate is defined by constant flux and change, which is forcing companies to step up their competitive efforts in order to ensure further development. In order to set itself apart from the crowd, Abengoa Bioenergy is focusing on converting this competitive drive into one of the key parameters for guaranteeing innovation, flexibility and reactivity at all times, and this is reflected in the company's strategic plan.

Competency-based management, Abengoa Bioenergy's chosen management model, mirrors the company's need to generate markedly competitive value and advantages through people, a competitive edge that is truly difficult to imitate. The company's employees are therefore one of the most important assets underpinning its market dominance, thereby making talent attraction, creation and retention a key priority. All selection and recruitment processes, whether internal or external, are rooted in this model.

With this in mind, Abengoa Bioenergy views training as a systematic and continuous process through which to hone, enrich, strengthen and adapt the conceptual, attitudinal and procedural skills and competencies of its employees. Competency-based management sees training as a means of improving the technical and generic skills of people in the workplace by improving their knowledge, developing aptitudes and skills and enhancing capacities. In order to perform at optimum levels, companies must roll out constant training initiatives and refresher courses. With this in mind, Abengoa Bioenergy is investing heavily in staff training within the different required areas.

It is also worth noting that Abengoa Bioenergy engages in these management processes while continuously upholding human and labor rights and respecting freedom of association. The company fully recognizes the right to collective bargaining, and strives to eliminate all forms of forced and obligatory labor, abolish child labor and, lastly, eliminate all kinds of discrimination with the utmost respect for employment. Abengoa Bioenergy shapes its working practices to reflect the United Nations Universal Declaration of Human Rights, associated protocols and other

international treaties and agreements on social rights, and likewise ensures that the conduct of its employees reflects these commitments.

Abengoa Bioenergy is fully aware of the importance of all stakeholders to its business and growth. For this reason, the company not only offers them continuous, transparent and accurate information on its business activities, but also attempts to encourage dialogue with all of them through different channels of communication tailored to their unique characteristics, while also developing new channels as a response to what must be a dynamic and enriching process for all parties involved.

The main stakeholders of Abengoa Bioenergy are its employees, customers, suppliers, shareholders and the community at large. All their expectations are mirrored in the course of business and in the company's strategic plan, which addresses the trends and challenges of the sector and reflects the company's path towards sustainable development and the fight against climate change. The plan defines the risks and opportunities associated with each of Abengoa Bioenergy's products and services throughout all of its territories and markets, as well as the projected results. It explores the impact sustainability can have on the company, based on the information provided by market reports and internal reports.

Abengoa Bioenergy attaches great importance to communication with customers and their privacy. Its unflinching commitment to providing excellent service is one aspect the company considers of paramount importance. It has therefore set up direct channels of communication between its technical and sales departments and customers, the aim being to forge a closer relationship and address any comments or suggestions its customers may have.

The management systems in place have highlighted the need to implement mechanisms to gauge customer satisfaction and analyze their needs and expectations. The company therefore periodically conducts satisfaction surveys, which are managed by the plants' quality assurance departments. This analysis ultimately leads to specific objectives and action plans to cover expectations and improve levels of satisfaction.

Abengoa Bioenergy adheres to Abengoa criteria and systems when it comes to customer privacy. Abengoa guarantees the validity, integrity and security of all the information it handles, particularly the personal data of its customers. In order to ensure suitable security measures relating to communications and information systems, there is a security policy statement that extends to all Abengoa companies and organizations. This statement provides information on the implementation of an Information Security Management System as a means of attaining the security objectives, with security encompassing confidentiality, integrity and availability.

The main objective for 2011 and successive years is to continue performing and improving on all areas of business, while pursuing best practices in terms of risk management and process efficiency and making sustainability an absolute priority.

A key objective will be to consolidate production and sales. The company's global presence will also enable it to harness arbitrage opportunities that are sure to arise between different markets. In 2011, Abengoa Bioenergy will continue to focus on quality, measured in terms of sustainability, ahead of quantity. Every effort will be made to improve the sustainability of all production assets, and similarly to consolidate operations at the latest plants to have been commissioned and continue construction on a second generation bioethanol plant in the United States.

# 2010 in Review

At present, Abengoa Bioenergy ranks as one of the leading biofuel producers in Europe, the United States and Brazil, with an annual production capacity of 830 Mgal (3,140 ML).

The Bioenergy business unit is currently reporting excellent levels of business, reflecting its standing as one of the world's leading bioethanol producers and marketers. Production at existing plants is living up to the company's best expectations, and the commissioning of new plants in the United States and the Netherlands has further strengthened the company's critical mass. Furthermore, an increase in trading activity has led to greater control and management in accordance with the company's strategy.

There is now a clear need for a change of practices and policies and various governments have already begun to act accordingly. Business performance depends largely on favorable legislation that facilitates the development of new technologies while enabling biofuel culture to expand and combat the obvious signs of climate change. 2009 turned out to be a very fruitful year in this respect.

Two new legislative acts were enacted on June 25th 2009 in order to consolidate and kick-start the biofuel market over the coming ten-year horizon. European Directive 2008/28/EC on renewable energy sources dictates that at least 10 % of transportation fuel within EU member states must be produced from renewable energies by 2020. The amendments made to Directive 2009/30/EC on fuel quality include an additional incentive for using biofuels by ushering in a compulsory reduction in greenhouse gas emissions during gasoline and diesel life cycles between 2011 and 2010.

Working in tandem, these two directives ensure the future of existing biofuel production plants and those currently under construction. At the same time, they provide a platform for long-term growth within the biofuel sector by harnessing current commercial technologies, and also offer special incentives and support for those attempting to develop the next generation of lignocellulosic technologies. All in all, they provide the market platform and the outlook for the coming decade that the sector was hoping for.

Legislation aimed at combating climate change has been a key aspect on the agenda of the US government over 2009 and 2010. The main objective is to reduce the GHG emissions generated by the transportation fuel sector. The main act currently championing the development of the bioethanol sector, and underpinning the RFS (Renewable Fuel Standards) and the rules and regulations governing production and biofuel implementation requirements, is the Energy Independence and Security Act, which was approved in 2007 and enacted in 2010.

The United States has also recently witnessed a number of important political changes. This has complicated the task of ushering in the required legislative changes and hindered existing policies on renewable energies and climate change. Although funds were indeed earmarked for incentives aimed at stimulating technology and the ethanol industry and to bring these advantages to end consumers, actual biofuel implementation has been slower than expected.

Against this backdrop, Abengoa Bioenergy has managed to harness the existing legislative framework and the biofuel markets, and has likewise been able to roll out its expansion plans over 2010, completing the bioethanol and biodiesel projects initiated in previous years in Spain, the Netherlands, the United States and Brazil, as well as cogeneration projects in Brazil to increase the overall performance of the plants already operating within the country.

Following the start-up of the company's most recent plant in the Netherlands, Abengoa Bioenergy has, in a touch over ten years, climbed from an initial installed capacity of 40 Mgal (150 ML) to over 830 Mgal (3,140 ML) in 2010.

For Abengoa Bioenergy, 2010 was a year of consolidation and growth, with a wealth of success stories reported in the United States, Europe and Brazil. All objectives were met, with the company

completing construction and commissioning of numerous projects underway, while exploring new paths to expansion and market penetration:

- Commissioning with total loading of a plant in Mount Vernon, Indiana, capable of producing 90 Mgal (340 ML) of bioethanol and 230,000 t of DGS per year.
- Commissioning with total loading of a plant in Madison, Illinois, capable of producing 90 Mgal (340 ML) of bioethanol and 230,000 t of DGS per year.
- Start-up of a plant at the Europoort in Rotterdam, the Netherlands, capable of producing 127 Mgal (480 ML) of bioethanol and 360,000 t of DGS per year.
- Commencement of maritime bioethanol exports from the United States.
- Lease of a new 2.6 Mgal (10 ML) capacity storage terminal in Houston by Abengoa Bioenergy Trading US.
- Abengoa Bioenergy initiates ethanol and DGS export activity by barge along the Mississippi and Ohio rivers.
- Abengoa Bioenergy Netherlands starts up a system to load grain from the jetty at the Europoort, featuring a 600 m conveyor belt.
- Promotion and expansion of a network of e85 biofuel service stations in Spain, which already boasts 21 distribution points.
- Implementation of the STOP program, resulting in improvements to on-site work safety and staff performance.
- Staging of the IX World Biofuels Conference.
- Organization of the first Environment Week (SIMA) in Brazil.
- €13.6 M subsidy granted by the Spanish Ministry for Science and Innovation as part of the CENIT program for the Sustainable Biorefinery Project.
- Start-up of the Lignocellulosic Ethanol Demonstration (LED) project, funded by the European Commission and developed by a consortium of five companies from four different countries headed by Abengoa Bioenergy.
- Involvement in the incorporation of the new ePure European renewable ethanol association.
- Southwestern Illinois award presented to Abengoa Bioenergy of Illinois.
- Economic development award (EDIE) presented to Abengoa Bioenergy of Illinois.
- Abengoa Bioenergy Operations receives the Chemical Safety Excellence Award for the second year running.
- Abengoa Bioenergía San Roque secures ISO 9001, ISO 14001 and OHSAS 18001 certification.

# Our Activities

Abengoa Bioenergy is a benchmark company in the development of new technologies geared towards the production of biofuels and the sustainability of raw materials, channeling to such end a tremendous amount of resources into research. The presence of a trading division means that the company is also a service provider capable of offering global solutions, with impressive capacity for marketing and managing commodities, reliably backed by its global production and raw material procurement capacities and highly efficient operations – cornerstones that afford reliability and critical mass, which are key to optimum business development.

Abengoa Bioenergy contributes to sustainable development by marketing fuel compounds obtained from renewable sources (biofuels) through the use of environmentally-friendly technologies that help bring about a net reduction in polluting emissions, for use in both public transportation and private vehicles.

The company develops innovative technological solutions through continuous R&D investment. These solutions are put into practice in production processes, allowing the company to enjoy the same production costs as for conventional fossil fuels, while affording our DGS coproduct a distinct competitive edge.

Abengoa Bioenergy honors its commitment to creating value for shareholders and contributes to the personal and professional development of its employees through continuous training as well as by setting up and overseeing individualized plans.

Abengoa Bioenergy creates new opportunities for sustainable rural development by providing incentives for energy crops and the creation of farming industries, thus helping to maintain employment and income levels in rural areas.

Bioethanol and biodiesel are renewable and clean energy sources which, for some time now, have proved to be a reliable and effective replacement for gasoline and diesel fuel in vehicle engines, while also helping to diversify and improve the security of the energy supply. Their use, either in a pure state or blended with fossil fuels, reduces $CO_2$ emissions, slows down climate change, and reduces the emission of polluting agents into the environment.

The company's activities can be grouped into six main areas:

- Procurement of raw materials.
- Bioethanol origination.
- Production.
- Comercialization of bioethanol, DGS and sugar.
- Electricity cogeneration.
- New technologies.

## Raw Material Procurement

One of the driving forces behind the positive business results reported by the Bioenergy business unit is the procurement of raw materials for producing biofuels.

As it currently stands, the most important grain cereals for the production of bioethanol at Abengoa Bioenergy's plants are wheat, barley, corn and sorghum, not only due to their alcohol yield, but also their significant protein yield (DGS), highly valued in the livestock feed sector. For biodiesel production, the most frequently used oils are soybean and palm.

Since operations began, Abengoa Bioenergy has managed to build up a wealth of experience in both the supply and logistics of commodities. It has displayed great prowess and versatility both on the international stage and when purchasing within the domestic market, and has also secured direct supply agreements with farmers, thus ensuring the unit's plants have the volume of materials they require. Similarly, the company has in-depth knowledge of all applicable rules and regulations governing operations in the European Union and North America.

Abengoa Bioenergía Brasil grows sugarcane while ensuring sustainable rural development, biodiversity and regional economic growth. Its subsidiary company, Abengoa Bioenergía Agrícola, ensures that the company's production plants are properly supplied by signing contracts with landowners, carrying out the necessary work for combined use of the land, and with farmers, by providing the necessary resources and advice in order to start up production.

## Bioethanol Origination

In addition to Abengoa Bioenergy's bioethanol production capacity, which is marketed by the trading companies, the latter also carries out bioethanol origination from third-party producers to add this product to the pool, thus allowing for greater flexibility and competitiveness in terms of the customer portfolio.

## Production

Bioethanol is produced in plants across Europe, North America and Brazil. Bioethanol is obtained from cereal grains through chemical processes and treatment, to produce either ETBE (a component of all types of gasoline), or for direct blending with gasoline to obtain biofuels, either e85 (a mixture of 15 % gasoline and 85 % bioethanol) or e10 (90 % gasoline and 10 % bioethanol).

The coproduct DGS is also obtained from the bioethanol production process. This high-protein compound is obtained by extracting starch from cereal grains and is ideal for producing livestock feed.

The production of bioethanol from sugarcane also returns sugar as a coproduct. This sugar is processed to make it suitable for human consumption and for further use in producing other food products.

## Commercialization of Bioethanol and Coproducts

Abengoa Bioenergy has operations in key locations for worldwide bioethanol trading and exports, namely Rotterdam (the Netherlands), affording immediate access to the Europoort; St. Louis, MO (USA), right in the heart of the country's main cereal production and cattle breeding region; and in São Paulo (Brazil), the birthplace of bioethanol-from-sugarcane production. Through all these facilities, Abengoa Bioenergy is able to meet the bioethanol, DGS and sugar demands of the European, North American, and Brazilian markets.

Market fluctuations, prevailing political conditions throughout the different territories and other factors affecting operations in terms of procuring raw materials and producing the products to be commercialized, are all carefully analyzed from a global standpoint in order to give us a better vision of the global market. Meticulous analysis and risk management improve the performance of corporate processes, always within the context of sustainable development, and respect for the environment, human rights and the community remains one of the company's guiding principles. Abengoa Bioenergy is therefore able to offer its customers the option of selecting solutions best tailored to their needs by providing the necessary reliability and flexibility throughout its bioethanol supply process.

## Electricity Cogeneration

Some of the current bioethanol production facilities also feature electricity cogeneration systems. Either natural gas or sugarcane bagasse is used to generate the steam and electricity required to operate the plants. At present, the plants in Spain, the Netherlands and Brazil feature generators that produce more than enough electricity to meet the needs of the plants themselves, and the plants in France and the United States are soon to follow suit. The surplus electricity is fed back into the power grids of the country in question, further enhancing the profitability and sustainability of the facilities.

There is currently a project under construction in Hugoton, Kansas, that will mark another step forward in the field of cogeneration by employing agricultural waste as raw material, thus squeezing the most possible out of available resources.

## New Technologies

Abengoa Bioenergy fully intends to become a leading figure within the bioenergy sector and a worldwide producer of biofuels. Its mission is to develop innovative technological processes for producing bioethanol and associated coproducts. To this end, it works to develop production and processing technologies, with unbeatable and highly efficient operational practices.

The human team of engineers and scientists, who coordinate their work with other R&D centers, universities and industrial partners, develops innovative processes in order to increase the

performance of grain-based bioethanol, develop new coproducts, improve the quality of existing products and develop lignocellulosic biomass technology for bioethanol production. As part of its business strategy, the company creates and registers intellectual property to provide technology to third parties under management agreements.

## Projects by Territory

### Europe

Abengoa Bioenergy currently operates five bioethanol production plants in Europe, three of which are located in Spain, one in France and one in the Netherlands. It also operates a biodiesel production plant in Spain.

Abengoa Bioenergy is the European leader in bioethanol production as biofuel usage. Its plants in Spain are: Ecocarburantes Españoles in Cartagena, Murcia; Bioetanol Galicia in Teixeiro, La Coruña; and Biocombustibles de Castilla y Leon in Babilafuente, Salamanca, which have a total annual installed capacity of 40, 52 and 53 Mgal (150, 195 and 200 ML), respectively.

Its Biocombustibles de Castilla y Leon plant in Babilafuente, Salamanca, also includes a second generation bioethanol plant capable of producing 1.3 Mgal (5 ML) of bioethanol a year from biomass. It is the world's first plant to utilize this kind of technology on such a scale.

The company believes that the shortest path to developing technology for producing second generation biofuels is through "hybrid plants", which combine first and second generation facilities to cut the cost of implementing new technologies and harness the advantages offered by economies of scale.

Unloading dock at the Europoort plant in Rotterdam, the Netherlands

The biodiesel production plant in San Roque, Cadiz, has been designed to operate with different kinds of vegetable oil - soybean, rapeseed and palm - and does not therefore depend on just one supply source. The plant boasts a total annual installed capacity of 200,000 t of biodiesel and 18,500 t of glycerin.

Following the start-up of this new plant, Abengoa Bioenergy now has the necessary biodiesel market knowledge and production technologies, cementing its leading role in forging a global biofuel market for the transportation industry.

In addition, Abengoa Bioenergy, through Abengoa Bioenergy France, has now consolidated operations in its French plant, which has a production capacity of 66 Mgal (250 ML) a year and utilizes corn and low-quality vegetable alcohols as raw materials.

Abengoa Bioenergy Netherlands (ABN) has started up its plant at the Europoort, Rotterdam, Europe's largest bioethanol plant and one of the largest in the world, with a projected annual grain-to-bioethanol production capacity of 127 Mgal (480 ML). Apart from bioethanol, the Europoort plant has an annual DGS (distiller's grains and solubles) and high-quality $CO_2$ production capacity of 360,000 t and 300,000 t, respectively. The $CO_2$ is transported through pipelines to the various greenhouses in the region and is used to help grow crops, thus reducing reliance on natural gas, enhancing sustainability and cutting total GHG emissions.

The facility also features a grain loading system, which includes a 600 m conveyor belt to transport the grain from the jetty to the plant. This system allows the company to unload small vessels, ranging from 1,000 t, to 600,000 t Panamax-type ships. ABN has a capacity of over 55,000 t at its own grain silos, enabling it to store a grand total of 1.2 Mt of grain per year.

In addition to marketing bioethanol, Abengoa Bioenergy continued work over 2010 on a bioethanol supply network in Europe, primarily in Spain and Germany, with over 20 directly supplied points in each country. This network is key to expanding the reach of bioethanol, and although the project is still in its early stages, it promises to become an undisputed reality within the next few years, capable of supplying biofuels to consumers across Europe.

World Biofuels Conference, Seville

In May 2010, the IX World Biofuels Conference was held in Seville, bringing together representatives from the main biofuel producer associations in the United States, Brazil and the European Union.

The conference tackled numerous pressing issues, with highlights including the sustainability of biofuel life cycles and the associated raw material procurement process, along with the necessary verification mechanisms for ensuring this sustainability; the globalization of biofuel markets; raw materials and the current state of existing conversion technologies to bring second generation biofuels further into the fold.

Abengoa Bioenergy secured a €13.6 M subsidy for its Sustainable Biorefinery Project from the Spanish Ministry for Science and Innovation as part of the CENIT program. The BioSos project aims to tackle the entire biomass value chain, ranging from generation of the initial resource to final market-ready products, with special attention paid to production, primary transformations into intermediate products and transformation of these intermediate products into final market-ready products. It also attaches particular importance to developing studies and honing the tools needed to ensure the sustainability of the developed solutions.

March 2010 witnessed the start of the Lignocellulosic Ethanol Demonstration (LED) project, funded by the European Commission within the context of the Seventh Framework Program. The project is being developed by a consortium of five companies from four different countries and has Abengoa Bioenergy at the helm.

It not only envisages the design and construction of a biorefinery to produce second generation bioethanol from cereal straw, but also the use of such fuel in public vehicle fleets and the use of the lignin contained in the raw material to produce high valued added products. The project marks an important step forward in terms of the technology required to market and sell second generation bioethanol successfully.

Furthermore, Abengoa Bioenergy is one of the chosen members of the first Executive Committee of ePure launched in November 2010. ePure is the association of European renewable ethanol producers and is essentially a fusion of two former European bioethanol associations, namely UEPA and eBIO. As with eBIO, ePURE is an industrial association run by bioethanol producers, but while eBIO focused solely on bioethanol as a biofuel, the work of ePure, and UEPA for that matter, extends to all bioethanol uses, including not only biofuels, but also beverages and industrial applications.

The company operates the following production facilities in Europe:

### Ecocarburantes Españoles

- Owned by Abengoa Bioenergy (95 %) and IDAE (5 %).
- Annual installed bioethanol capacity of 40 Mgal (150 ML).
- Annual DGS production capacity of 110,000 t.
- Annual electricity production capacity of 135,000 MWh.
- Annual grain consumption of 300,000 t.

Bioethanol plant in Valle de Escombreras, Cartagena, Murcia

The company Ecocarburantes Españoles SA owns a bioethanol production plant in Valle de Escombreras in Cartagena, Spain. Abengoa Bioenergía SA owns 95 % of the company, while IDEA, the Spanish Institute for Energy Diversification and Savings, owns the remaining 5 %.

Part of the $CO_2$ produced during the grain-to-ethanol transformation process is sold to facilities close to the plant, thereby eliminating the need for these companies to produce their own additional $CO_2$ and, therefore, making the bioethanol production process even more efficient and curbing carbon dioxide emissions into the atmosphere.

Similarly, electricity is generated during the production process, which provides power for the entire plant, with the surplus fed to the national power grid.

### Bioetanol Galicia

- Owned by Abengoa Bioenergy (90 %) and Xes Galicia (10 %).
- Annual installed bioethanol capacity of 52 Mgal (195 ML).
- Annual DGS production capacity of 120,000 t.
- Annual electrical power production capacity of 165,000 MWh.
- Annual grain consumption of 340,000 t.

Bioethanol plant in Teixeiro-Curtis, La Coruña

The plant, which is owned by Bioetanol Galicia SA, is currently in operation in Teixeiro (A Coruña) and boasts a yearly bioethanol production capacity of 52 Mgal (195 ML). The company is 90 % owned by Abengoa Bioenergy and 10 % by Xes Galicia.

The surplus electricity generated during the bioethanol production process, which greatly outstrips actual plant consumption, is fed to the national power grid and accounts for part of the profits from the process.

### Biocarburantes de Castilla y León

- Fully owned by Abengoa Bioenergy.
- Annual installed bioethanol capacity of 53 Mgal (200 ML).
- Annual DGS production capacity of 120,000 t.
- Annual electrical power production capacity of 139,000 MWh.
- Annual grain consumption of 585,000 t.

Bioethanol plant in Babilafuente, Salamanca

The plant, owned by the company Biocombustibles de Castilla y Leon SA, is located in Babilafuente, Salamanca, and has a yearly production capacity of 53 Mgal (200 ML).

As with the other Spanish plants and in accordance with applicable law, plant-generated electricity that is not employed in bioethanol production is fed to the power grid.

## Abengoa Bioenergy France

- Owned by Abengoa Bioenergy (69 %) and Oceol (31 %).
- Final installed bioethanol capacity of 66 Mgal (250 ML) per year.
- Annual DGS production of approximately 145,000 t.
- Estimated annual grain (corn) consumption of roughly 500,000 t.
- Estimated annual consumption of wine and sundry alcohol of approximately 13 Mgal (50 ML).

Bioethanol plant in Lacq, Pau, France

Abengoa Bioenergy France owns Abengoa Bioenergy's fourth ethanol production plant in Europe (the first outside Spain). It is 69 % owned by Abengoa Bioenergy and 31 % owned by Oceol, an association of the region's main agricultural cooperatives and industries.

This plant employs corn and low-quality vegetable alcohols as raw materials and is located at the Petrochemical Platform at Lacq, Pyrénées-Atlantiques (France). Projected total annual bioethanol production capacity amounts to 66 Mgal (250 ML), broken down into 53 Mgal (200 ML) using corn as the raw material, and 13 Mgal (50 ML) produced from the distillation of lower-quality vegetable alcohols.

### Abengoa Bioenergy Netherlands

- Fully owned by Abengoa Bioenergy.
- Annual bioethanol production capacity of 127 Mgal (480 ML).
- Annual DGS production capacity of 380,000 t.
- Annual grain consumption of 1.2 Mt.

Bioethanol plant at the Europoort, Rotterdam, the Netherlands

The Bioenergy business unit has started up operations at the Europoort bioethanol plant in the port of Rotterdam, the Netherlands, with total investment amounting to €550 M. The company Abengoa Bioenergy Netherlands was set up to manage and operate the 127 Mgal/year (480 ML/year) grain (corn) bioethanol plant, currently the largest in Europe and quite possibly the world.

The plant also produces 300,000 t of high-quality $CO_2$ per year. The $CO_2$ is transported through pipelines to the various greenhouses in the region and is used to help grow crops, thus reducing reliance on natural gas, enhancing sustainability and cutting total GHG emissions.

The geographic location of the Port of Rotterdam, Europe's largest, where the Rhine and Meuse rivers reach the sea, makes it the main hub of European trade. Its unrivalled location allows for exports by river into central Europe and to Nordic destinations and the rest of the world by sea. The plant currently provides permanent work for 84 employees.

## Abengoa Bioenergía San Roque

- Fully owned by Abengoa Bioenergy.
- Annual biodiesel production capacity of 59 Mgal (225 ML).
- Annual crude glycerin production capacity of 22,000 t.
- Estimated annual vegetable oil consumption of 205,000 t.

Biodiesel plant in San Roque, Cadiz

Abengoa Bioenergy's San Roque plant is located on a site annexed to the Gibraltar Refinery on the Palmones de San Roque industrial estate (Cadiz, Spain). It was started up in February 2009 and started supplying the refinery in March.

It has been designed to operate with different kinds of vegetable oil - soybean, rapeseed and palm - and does not therefore depend on just one supply source. The plant produces 200,000 t of biodiesel, which is utilized in 5 % blends with diesel at the Cepsa refinery. The plant also produces 18,500 t of glycerin with 85 % purity. The plant provides direct employment to 55 highly qualified workers.

## Biomass Plant

- Fully owned by Abengoa Bioenergy.
- Annual bioethanol production capacity of 1.3 Mgal (5 ML).

Biomass-to-bioethanol plant in Babilafuente, Salamanca

Managed by Abengoa Bioenergía Nuevas Tecnologías, the purpose of the plant is to produce biofuels from lignocellulosic biomass. It is the first plant in the world to operate this kind of technology for commercial ends. The plant is located within the Biocombustibles de Castilla y Leon plant, meaning that both facilities share common services and process chains. The plant is currently operating continuously, using wheat straw as its raw material. The ethanol it produces is distilled to 42 % and then concentrated and dehydrated.

The facility is being used to improve the design of commercial plants to be constructed in years to come, gauge operational costs, identify bottlenecks and streamline operations.

## United States

Abengoa Bioenergy is one of the leading bioethanol producers in the United States. It currently boasts an annual installed production capacity of roughly 380 Mgal (1,440 ML), distributed among its six plants located in Nebraska, Kansas, New Mexico, Indiana and Illinois. Abengoa Bioenergy is also one of the main marketers of ethanol and DGS for animal feed. It has built up an extensive network of customers, including the likes of Shell, Exxon-Mobil, Total, Valero and BP. Most of the ethanol is marketed in the form of e10, although sales in e85 have been increasing steadily.

The unit's three longest standing plants continue to operate under the control of Abengoa Bioenergy Corporation, and are located in Colwich, Kansas, Portales, New Mexico, and York, Nebraska. However, a number of different companies have been specially incorporated to operate the new plants in Nebraska, Indiana and Illinois, and also the future commercial biomass plant in Hugoton, Kansas. Similarly, separate companies have been created for marketing, engineering and construction activities.

The Indiana bioethanol plant has already entered into operation. The plant is located near to Evansville, Indiana, in the so-called Corn Belt and next to the Ohio River, one of the country's main river routes. The bioethanol and DGS produced on-site can be transported by truck, train or boat to supply the markets on the eastern side of the United States, or exported to other markets. The plant currently employs 56 workers and produces 90 Mgal (340 ML) of bioethanol and 230,000 t of DGS per year.

The Abengoa Bioenergy Illinois plant in Madison is sited next to the Mississippi River, one of the main communication and transport arteries running through the US Midwest. The plant was brought online at the start of the year. The facility gets through 825,000 t of cereal grain per year as raw material and produces 90 Mgal (340 ML) of bioethanol and also 230,000 t of highly durable DGS, thanks to its cutting-edge pelletizing systems. It currently employs 52 permanent workers.

Abengoa Bioenergy Trading US has leased a new storage terminal with an approximate capacity of 2.6 Mgal (10 ML). Located on the Houston Ship Channel, the terminal allows for loading and unloading to or from train, truck, barge and ship, while also providing direct access to international waters, thus opening up imports and exports to and from the United States. It also complements the company's bioenergy hubs in two other major international ports, namely Rotterdam in Europe and Santos in Brazil.

The year 2010 also saw Abengoa Bioenergy start up maritime exports of bioethanol from the United States to Southeast Asia. The ship Bow Faith carried Abengoa's cargo along the Houston Ship Channel and on to its final destination in Asia.

The company strives to implement best practices in order to streamline all its processes, improve performance and minimize risk in production, marketing and R&D. Prime examples of the company's success in this field are the official accolades that the various North American unit companies received in 2010.

Abengoa Bioenergy US Operations received the Leadership Council of Southwestern Illinois Award, a distinction illustrating the trust the public authorities place in the company. The award

was presented to Abengoa Bioenergy of Illinois at a ceremony held on May 6, 2010. The prize is awarded yearly to individuals and organizations from southwest Illinois that have reached impressive milestones and displayed leadership along the way. Abengoa Bioenergy of Illinois was specifically singled out as a leader in sustainable biofuel technologies and for its production capacity. It was similarly praised for its newly constructed state-of-the-art plant, which not only provides jobs but also marks a "leap forward in the nation's search for energy independence, while also benefitting the environment".

Moreover, the Illinois State Chamber of Commerce awarded Abengoa Bioenergy of Illinois its EDIE economic development award for its work on the Madison plant. The EDIE distinction is awarded yearly in various different categories in recognition of projects from the preceding twelve months that have made a major contribution to economic development. Abengoa Bioenergy of Illinois was awarded the prize in the Energy category. More specifically, the prize was awarded for the company's heavy capital investment in a project that creates new jobs and bolsters the state's economy.

CSX Transportation, one of the leading US transportation firms, providing rail and intermodal services for the transportation of goods, awarded the company Abengoa Bioenergy Operations the annual Chemical Safety Excellence award for its operating facilities, an accolade that reflects the company's commitment to maintaining and promoting the safety of motor vehicles and its continuous safety processes when loading tank cars.

All the plants of Abengoa Bioenergy in North America, save for the new facilities in Indiana and Illinois, which are currently undergoing official certification processes, have integrated OHSAS with ISO 9001:2000, 14001:2004 and 18001:2001 standards, reflecting the unflinching commitment of Abengoa Bioenergy Operations to quality, safety and the environment. This set of rules is a verifiable health and safety system and was sought to reflect the company's desire to have a standardized occupational health and safety system in place that can be used for the purposes of certification and registration. With the initial audits now finished, the companies operating the plants in Indiana and Illinois and the trading company have now met the necessary requirements to secure ISO 9001, ISO 14001 and OHSAS 18001 certification. All US plants are now registered under these standards.

The company operates the following production facilities in the United States:

### Abengoa Bioenergy Corporation – Colwich

- Fully owned by Abengoa Bioenergy Corporation.
- Annual installed bioethanol production capacity of 25 Mgal (95 ML).
- Annual installed DGS production capacity of 70,000 t.
- Combined annual consumption of corn and sorghum of 240,000 t.

Bioethanol plant in Colwich, Kansas

This is one of the three operational plants fully owned by Abengoa Bioenergy Corporation in North America. The plant currently operates at 100 % capacity and continues to report excellent

efficiency and consistent operations. Production capacity amounts to 25 Mgal/ year (95 ML/year), achieved through continuous batch cooking and fermentation processes. The $CO_2$ generated is captured and refined by an on-site client. The plant currently employs 44 highly qualified workers.

It is one of the oldest dry mill bioethanol facilities in the United States, having been operating non-stop for the last 25 years. The DGS it produces is not dried in the process and 100 % of the coproduct is sold in its natural state. The plant can process corn and sorghum at the same time and 50 % of its energy requirements are covered with methane from a municipal solid waste landfill.

### Abengoa Bioenergy Corporation – Portales

- Fully owned by Abengoa Bioenergy Corporation.
- Annual installed bioethanol production capacity of 30 Mgal (115 ML).
- Annual installed DGS production capacity of 75,000 t.
- Annual sorghum consumption of 260,000 t.

Bioethanol plant in Portales, New Mexico

Expansion work was completed in 2006 to double production capacity by utilizing batch cooking and fermentation processes, with two separate distillation and dehydration stages. The DGS it generates is not dried in the process and 100 % of the coproduct is sold in its natural state. The plant can operate with corn and sorghum simultaneously. Annual installed bioethanol production capacity of 30 Mgal (115 ML). The fully operational plant employs 48 highly qualified workers.

### Abengoa Bioenergy Corporation – York

- Fully owned by Abengoa Bioenergy Corporation.
- Annual installed bioethanol production capacity of 56 Mgal (210 ML).
- Annual installed DGS production capacity of 145,000 t.
- Annual corn consumption of 520,000 t.

Bioethanol plant in York, Nebraska

The plant currently operates at 100 % capacity and continues to report excellent efficiency and consistent operations. More than 50 % of the produced $CO_2$ is captured and refined by an on-site client. The facilities also provide services and logistical support to Abengoa Bioenergy New Technologies' adjacent pilot biomass plant. Annual production capacity amounts to 56 Mgal (210 ML), achieved through continuous batch cooking and fermentation processes. The plant currently employs 54 highly qualified workers.

## Abengoa Bioenergy of Nebraska

- Fully owned by Abengoa Bioenergy.
- Annual installed bioethanol production capacity of 90 Mgal (340 ML).
- Annual installed DGS production capacity of 230,000 t.
- Annual corn consumption of 825,000 t.

Bioethanol plant in Ravenna, Nebraska

The subsidiary Abengoa Bioenergy of Nebraska, wholly owned by Abengoa Bioenergy, is responsible for operating the Ravenna plant in Nebraska. Construction on the plant got underway in 2005 and was completed in 2007. The plant is currently operating at 100 % capacity according to specifications and boasts an installed bioethanol capacity of 90 Mgal per year (340 ML), achieved through continuous fermentation. It employs 56 highly qualified workers. The facility is the first in North America to utilize continuous fermentation technology.

The project includes a double railway circuit for simultaneous loading and shipment of 2.6 Mgal (10 ML) of bioethanol in 95 tank cars.

The plant is designed to recycle all process water, which is then treated and made ready for reuse. The plant therefore consumes less water, produces minimal pollution and therefore has the minimum possible impact on the ecosystem.

## Abengoa Bioenergy of Indiana

- Fully owned by Abengoa Bioenergy.
- Annual installed bioethanol production capacity of 90 Mgal (340 ML).
- Annual installed DGS production capacity of 230,000 t.
- Annual corn consumption of 825,000 t.

Planta de bioetanol en Mount Vernon, Indiana

The plant is located near Evansville, Indiana, in the so-called Corn Belt and next to the Ohio River, one of the country's main river routes. The bioethanol and DGS produced on-site can be transported by truck, train or boat to supply the markets on the eastern side of the United States, or exported to other markets.

The Indiana plant currently employs 55 workers. When operating at full capacity, it consumes 825,000 t of corn, and produces 90 Mgal (340 ML) of bioethanol and 230,000 t of DGS per year.

### Abengoa Bioenergy of Illinois

- Fully owned by Abengoa Bioenergy.
- Annual installed bioethanol production capacity of 90 Mgal (340 ML).
- Annual installed DGS production capacity of 230,000 t.
- Annual corn consumption of 825,000 t.

Bioethanol plant in Madison, Illinois

The Abengoa Bioenergy plant in Madison, Illinois, is sited next to the Mississippi River, one of the main communication and transport arteries running through the US Midwest. The facility generates bioethanol and DGS from corn and gets through 825,000 t of cereal grain per year as raw material. It produces 90 Mgal (340 ML) of bioethanol and 230,000 t of DGS per year and provides employment to 52 workers.

### Abengoa Bioenergy Biomass of Kansas

- Fully owned by Abengoa Bioenergy.
- Annual biomass-to-bioethanol production capacity of 25 Mgal (95 ML).
- Daily biomass consumption of 930 t.

Biomass used to produce second generation bioethanol

The aim of the Abengoa Bioenergy Biomass of Kansas project is to construct a plant capable of producing 25 Mgal (95 ML) of cellulosic ethanol and 120 MW of renewable energy from biomass (mix of agricultural waste, wood waste and non-food energy crops). The plant will be located to the west of Hugoton, Kansas, and will create 170 permanent jobs. The Hugoton project is expected to slash $CO_2$ emissions by approximately 1.7 Mt a year, and is scheduled to be commissioned towards the end of 2011.

## Brazil

Brazil is one of the world's largest markets for bioethanol, and bioethanol production is expected to continue growing sharply thanks to the success of flex-fuel vehicles, which currently account for nearly 90 % of vehicles sold in Brazil and which can run on either gasoline or bioethanol.

Sugarcane, the primary raw material used to produce bioethanol in Brazil

Abengoa Bioenergy is the only company worldwide that operates in the world's three largest bioethanol markets: Europe, the United States and Brazil. Having streamlined operations in Brazil, the company is reporting sharp growth in production throughout all its existing plants. It is also weighing up the merits of constructing a new plant and is marketing its production overseas more effectively, thanks to the sales networks the company has in place. Moreover, the company is making technological advances and improving sugarcane bagasse to cellulosic ethanol technology so as to increase production in the mid-term and cut costs efficiently.

The company currently operates three plants: two sugarcane-to-bioethanol plants, with an annual installed capacity of approximately 53 Mgal (200 ML) of ethanol and 642,000 t of sugar, and one plant that produces 30,000 t of sugar and 25,000 t of molasses.

The company is striving to incorporate best sustainability practices, and to reflect this, Abengoa Bioenergía Brasil has staged the first Environment Week (SIMA) in Brazil. The event, which involved 1,500 collaborators from both industry and agriculture, took place during the second week of June and was intended to raise workers' awareness of the need to protect the environment.

SIMA was also attended by numerous companies and public bodies. The week included various entertaining activities related to environmental protection, rounds of interactive questions and answers with the collaborators and informative talks on the environmental goals of Abengoa Bioenergy, and on how society and local communities can help to preserve the environment.

Abengoa Bioenergía Brasil, with head offices in the city of São Paulo, started exporting bioethanol from Brazil to Europe and the United States in 2009, and has been steadily stepping this up over 2010. This important step forward, which is being coordinated alongside Abengoa Bioenergy Trading Europe and Abengoa Bioenergy Trading US, has allowed the company to arbitrage bioethanol sales between its main markets, and also localize new markets and opportunities. This move strengthens the company's standing worldwide, with production facilities and trading presence in the world's top three bioethanol markets.

As part of its drive towards sustainable development, Abengoa Bioenergía Brasil has completed construction on two state-of-the-art power cogeneration facilities with an installed capacity of 70 MW, one of which can be upgraded to 140 MW. The raw material for these two plants is sugarcane bagasse, which is fed into the boilers to produce steam. The steam is then used to generate electricity in order to feed the production processes. The cogeneration plants are located in the state of São Paulo, one at the São Luiz plant in the city of Pirassununga, and the other at the São João plant in the city of São João da Boa Vista.

The company operates the following production facilities in Brazil:

### Abengoa Bioenergia São Luiz

- Fully owned by Abengoa Bioenergy.
- Annual installed bioethanol capacity of 18 Mgal (70 ML).
- Annual sugar production of roughly 285,000 t.
- Annual sugarcane consumption of 3 Mt.

Bioethanol plant in Pirassununga, São Paulo, Brazil

During 2010, operation of a 70 MW cogeneration plant started, using sugarcane bagasse as raw material. The plant is annexed to the existing ethanol and sugar production plant.

### Abengoa Bioenergia São João

- Fully owned by Abengoa Bioenergy.
- Annual installed bioethanol capacity of 35 Mgal (130 ML).
- Annual sugar production of roughly 360,000 t.
- Annual sugarcane consumption of 3.5 Mt.

Bioethanol plant in São João, São Paulo, Brazil

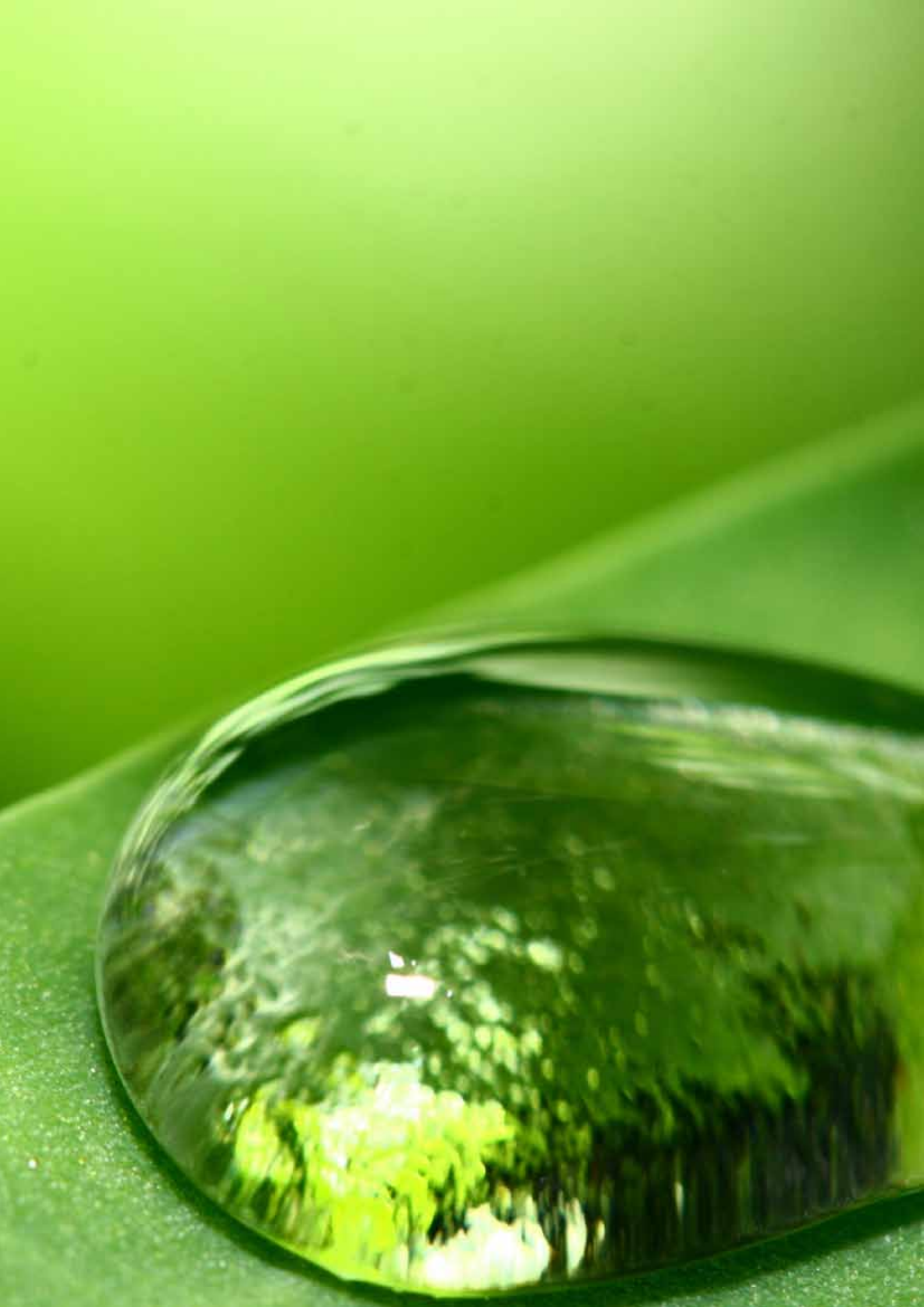
During 2010, operation of a 70 MW cogeneration plant started, using sugarcane bagasse as raw material. The plant is annexed to the existing ethanol and sugar production plant.

## Abengoa Bioenergia Santo Antônio de Posse

- Annual sugar production of roughly 30,000 t.
- Annual molasses production of roughly 20,000 t.
- Annual sugarcane consumption of 380,000 t.

Sugar production plant in Santo Antônio de Posse, São Paulo, Brazil

This particular sugar and molasses production plant only accounts for business and sales within Brazil, albeit to a lesser extent than the other plants operating in the country. The company is currently streamlining processes to up operational performance.



Befesa is an international company that specializes in the integral management and recycling of industrial waste and in water management and generation, with full awareness of its social responsibility to help create a sustainable world.

**www.befesa.com**

# International Presence


| | |
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| Key Figures | 2010 | 2009 | Var. '10-'09 (%) |
|---|---|---|---|
| Revenue (€M) | 833 | 722 | +15.4 |
| EBITDA (€M) | 129 | 119 | +8.2 |
| Desalination capacity (M $m^3$/day) | 1.3 | 1.2 | +8.3 |
| Waste managed (Mt) | 2.2 | 1.8 | +22.2 |
| Average number of employees | 2,835 | 2,698 | +5.1 |
| Hours of training (h) | 89,000 | 92,149 | -3.4 |

# Our Business

Befesa operates in two key areas: industrial waste recycling and water generation and management.

The industrial waste recycling market's main growth drivers are the rapidly expanding world population and the increased pressure from environmental laws and regulations.

These two macro trends are dictating the development and evolution of the market in which Befesa carries out its industrial waste recycling activities. Existing legislation and policies governing the environment do however vary considerably between countries and regions. For example, environmental regulation in Asia is still in its infancy, while companies operating in the United States or Latin America face more severe control. As these regions gradually adopt tougher regulatory policies, the market for industrial waste treatment and recycling will slowly open up.

The steel waste recycling business has experienced sharp year-on-year growth on the back of the gradual recovery of the European steel production industry. Aluminum waste recycling also rallied to return to the highs reported several years ago, driven largely by exports and government aid plans.

The water generation and management market is currently witnessing huge growth, with heavy investment expected to flow in from all regions of the world. The territories tagged as key with the greatest investment potential are currently the United States, China, the Middle East, India, North Africa and Latin America. This growth is mainly due to two global-scale events: on one hand, the world's growing population and, on the other, the scarcity of water resources, both magnified by the effects of global warming.

At present, the water market is highly fragmented, both in terms of water management companies and those that supply the technology, essentially meaning construction and engineering firms.


Truck at Befesa Zinc Duisburg facilities, Germany

Skikda desalination plant, Algeria

Befesa Zinc Aser's Waelz furnace in Erandio, Spain

# Environmental Services

Befesa aims at provide technologically innovative and viable solutions for industrial waste recycling and water generation and management, with the ultimate goal of becoming a world reference in the sectors in which it operates, while helping to forge a more sustainable world. This commitment is reflected in Befesa's various lines of business:

- Befesa recycles aluminum waste without generating new waste in the process, thus bringing the waste cycle full circle.
- Management of common steel and stainless steel waste, as well as waste from the galvanization process. The company therefore recycles a wide variety of metals, doing away with the need to dump them and minimizing the need for further mining.
- Befesa offers the iron and steel industry high value-added environmental services through the treatment and valorization of residual dust generated from common and special steel production processes, as well as other waste containing zinc from the steel galvanization sector.
- The company designs and constructs infrastructures to manage waste efficiently and safely, while protecting the environment.
- The company manages, transports, treats and temporarily stores hazardous and non-hazardous industrial waste for valorization, recovery, reuse or eventual controlled disposal.
- Befesa generates water by utilizing seawater desalination technologies, reusing urban wastewater and modernizing irrigation systems to reduce consumption.
- Befesa protects rivers and coastlines by purifying urban and industrial wastewater.
- It champions economic and social development by making water drinkable and helping to irrigate agricultural land and the environment.
- The company develops technologies to improve the efficiency of the integral water cycle, thus helping to bring access to water and sewage to everyone and making these essential rights a viable reality throughout all regions, particularly underprivileged ones.

Aluminum swarf dryers at Befesa Aluminio facilities in Las Franquesas del Valles, Spain

Befesa business focuses on environmental respect and protection, and is rooted in three key premises directly related to the company's contribution to sustainable development and the fight against climate change: i) strict compliance with all aspects of applicable environmental law; ii) minimizing consumption of natural resources and; iii) continuously streamlining technical, environmental and economic efficiency throughout all processes.

Befesa intends to become a world leader not only in industrial waste recycling and management, but also in water generation, management and transportation, thus contributing to sustainable development.

The main drivers helping Befesa to reach this objective are research, development and innovation (R&D&I), given that the company operates in areas where technology plays a crucial role. The purpose of its strategic R&D&I plan is therefore to coordinate and channel actions in this respect, gearing them towards value creation and healthy returns on investment.

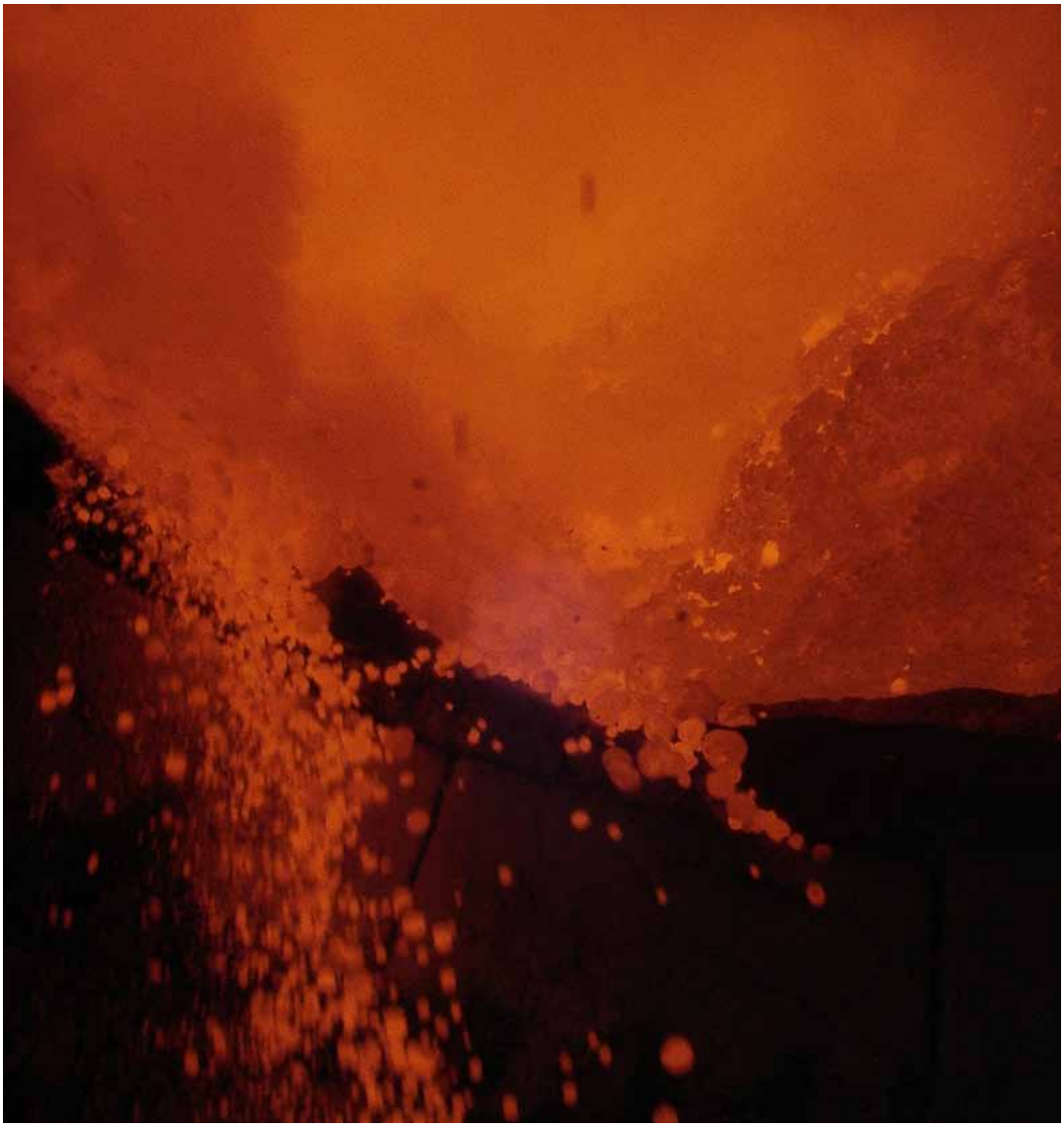
Unveiling of the Chennai desalination plant, India

Befesa is involved in two different activities, industrial waste recycling and water, which in turn comprise various sub-activities. The industrial waste recycling segment encompasses steel waste recycling, aluminum waste and salt slag recycling and industrial waste management. The water segment, on the other hand, includes the engineering, procurement and construction (EPC) and water concessions divisions. The company manages over 2.2 Mt of waste, channeling in excess of 1.2 Mt into the production of new materials through recycling, thus curbing annual $CO_2$ emissions by 0.7 Mt. Befesa is able to desalinate over 1.3 M $m^3$ of water per day, enough to supply 8 M people.

The company enjoys a truly impressive international presence, with offices in 27 countries on four of the five continents. In Europe, Befesa's steel waste, salt slag and aluminum waste recycling activity is carried out at treatment plants in Spain, Germany, France, Sweden, the United Kingdom and, from 2010 onward, Turkey. The industrial waste management unit has built up a significant presence throughout Spain and Latin America. With regard to the water business, Befesa boasts a prominent global presence, with important projects in China, India, North Africa, the Middle East, the United States and Latin America.

View of the Alcoy WWT plant, Spain

Slag falling from the Waelz furnace at Befesa Zinc Aser facilities, Spain



In order to continue growing in its existing markets, Befesa has an ambitious strategic plan in place based on organic and non-organic growth.

Growth in the steel recycling business has largely stemmed from organic growth in Europe and inorganic growth in other strategic territories. The greater the regulatory pressure from applicable environmental law, the faster this worldwide market grows. This pressure has reached different maturity levels in different parts of the world, with Europe being the most advanced. In the case of Befesa, the patented and proprietary Waelz-SDHL processes carried out at its plants afford the company hugely important energy savings, increased capacity and enhanced performance for zinc recovery, making it one of the most technologically advanced companies in the world within its sector. It also has an ambitious plan to step up its capacity and expand internationally.

The aluminum and salt slag recycling area is looking into new markets with huge potential, such as Iceland, Eastern Europe, Norway and the United States, and is similarly developing new recycling alternatives for waste managed through dumping. Befesa is also seeking to expand in its industrial waste management business.

In the water segment, growth is driven by two complementary factors: major contracts awarded under concession, which require a long-term investment; and the innovation as the differentiation strategy, improving quality and competitiveness of its assets.

To fend off competitors and remain at the forefront of the desalination sector, it is hugely important to offer a unique range of water treatment, waster reuse and hydraulic infrastructure products through continuous work in R&D&I and by devising new prototypes, and Befesa has made sure of this when setting up subsidiaries in countries such as India, China and the United States and when expanding into other promising territories, such as the Middle East, Brazil, Singapore and Libya.

View of the Tenes desalination site, Algeria

Befesa business has witnessed impressive growth over recent years in terms of staff and geographical scope, and this has been made possible thanks to the company's highly qualified human team, which has lent its extensive experience to the different areas of business.

Befesa is committed to attracting and retaining human talent and this is one of the cornerstones underpinning its strategy of future growth. This is because the nature of the company's activities, in which technological leadership plays a fundamental role, means that attracting and retaining both technical and commercial talent is key to ensuring future success.

Side view of the Waelz furnace at Befesa Zinc Aser facilities, Spain


Tank truck at Befesa Zinc Aser facilities, Spain

Befesa business is based on sustainable development, around which the company centers its activities and strategies. Because of this, the company's mission and values reflect its firm commitment to financial and social progress, environmental protection and respect for fundamental rights. Through this business model, Befesa's activities are aimed at:

- Creating long-term value for shareholders.
- Providing customer service.
- The professional and human development of its employees.
- Growth of the societies and communities in which it operates.
- Developing sustainable solutions for managing industrial waste and the integral water cycle, while fully respecting and protecting the environment.
- Reintroducing secondary raw materials into productive cycles.
- Waste-free production.
- Offering a new range of waste treatment services for industry.

Befesa's main goals for 2011 include full integration of its steel dust recycling plant in Turkey, coupled with further expansion into the steel dust recycling market. Befesa will also keep its eyes over 2011 for possible opportunities for inorganic growth, particularly in the steel waste recycling sector. Moreover, the company will continue to focus on R&D&I over 2011, given that this is one of the building blocks for future growth.

In the industrial waste recycling and management sector, Befesa is fully committed to energy valorization, developing new waste treatment technologies, stepping up business in the integral waste management market, prioritizing valorization/recovery over elimination/disposal, and strengthening the company's presence in those markets offering the greatest value-add.

In the water segment, Befesa intends to consolidate its presence in current geographies by strengthening relationships with the stakeholders, to up its presence in concessions in promising territories. It also plans to cement the structure and increase the visibility of the concessions division, enabling the company to develop and streamline this line of business to the fullest. Lastly, Befesa intends to continue investing in R&D&I with a view to cutting costs and developing sustainable solutions.

Befesa has built up a diversified customer portfolio, ranging from both regional and national public bodies to top-tier companies operating in important industries, such as the steel, automotive and chemical sectors. Befesa enjoys long-standing commercial relations with its main customers, thanks to the quality and regular control of its services and also its technological innovation.

Inside the Chennai desalination plant, India

# 2010 in Review

2010 turned out to be a busy year for Befesa. The aluminum recycling business recovered over the year, with year-on-year growth exceeding 40 % on the back of the rallying automotive industry.

Although it has yet to replicate the volume of business reported prior to the onset of the economic crisis, the steel dust recycling business experienced sharp year-on-year growth over 2010 by making use of more installed production capacity at its plants due to the greater abundance and availability of raw materials. This in turn can be put down to the rallying European steel production industry. Moreover, the high prices that zinc fetched on international markets over 2010 (the listed price on the London Metal Exchange, or LME, averaged in the region of $2,100 per t of Zn-SHG - high grade zinc with minimum zinc content of 99.995 %) have had a positive economic impact on profits, despite being largely offset by the previously signed metal price hedge agreements.

Control center at the SAIH (Automatic Hydrologic Information System) on the Guadalquivir River, Spain

Last but not least, Befesa is a worldwide benchmark company in the field of water desalination, thanks to its chosen strategy over the last few years based on international expansion and consolidation. This has enabled the company to cement its position in the territories that offer the greatest growth potential in the water market, such as the United States, Latin America, North Africa, India and China, while affording it an unrivalled position from which to expand and improve upon its water treatment, irrigation, hydraulic construction and water management lines of business. Befesa currently has eight concessions for large-scale desalination plants. These concessions are located in Algeria (Honaine and Tenes, 200,000 $m^3$/day, and Skikda, 100,000 $m^3$/day), India (Chennai, 100,000 $m^3$/day), China (Qingdao, 100,000 $m^3$/day), Tunisia (Djerba, 50,000 $m^3$/day), and three more in Spain (Cartagena, 65,000 $m^3$/day, Almeria, 50,000 $m^3$/day, and Bajo Almanzora, 60,000 $m^3$/day).

Reverse osmosis membrane frame at the Bajo Almanzora desalination plant in Almeria, Spain

Befesa secured its presence in the Turkish steel dust recycling market at the end of September 2010 by signing a joint venture agreement with the Canadian company Silvermet Inc. to acquire a 51 % stake in the Waelz plant owned by the latter in Iskenderun (Turkey). The investment was channeled through the company Befesa Silvermet Turkey SL and required a total outlay of $10 M, most of which will be used to develop new technologies to treat electric arc furnace steel dust, the ultimate aim being to drive forward the company's steel dust recycling business in the country. This venture has allowed Befesa to gain rapid entry into Turkey, a strategic market and one of the world's main producers of electric arc furnace steel. It is also one of the emerging markets promising the greatest potential in terms of future growth within the sector.

Befesa continued work over 2010 to fully integrate its German salt slag treatment plants, which were acquired mid-2009, into the organizational structure and to implement Befesa's joint management systems. This has enabled the company to treat an additional 240,000 t of waste, thereby returning to the industry a similar volume of secondary raw materials. Furthermore, Befesa's plant in the United Kingdom is now a fully operating waste treatment plant for the waste generated from used primary aluminum electrolytic cells (otherwise known as spent potlining, or SPL).

The prestigious international publication Global Water Intelligence (GWI) staged its annual Global Water Awards ceremony at the start of 2010 to recognize and reward excellence within the international water industry. Befesa was awarded the "Best Project of 2009" distinction for its Qingdao desalination plant, which is currently under construction in northern China. In addition to being the first desalination facility constructed through project finance and fully financed by local Chinese banks, the plant is set to become a groundbreaking project for the supply of desalinated water in the country. Investment in the plant amounts to €135 M, and encompasses the design, construction and 25-year operation of the plant. The facility will be capable of desalinating 100,000 $m^3$/day of water, enough to supply drinking water to a population of 500,000 people. The plant will employ cutting-edge reverse osmosis technology, both for the pretreatment stage (ultrafiltration membranes) and also the centralized pumping system, all of which will result in enhanced energy efficiency.

The year 2010 also saw Befesa consolidate its international standing within the desalination sector. On the one hand, the company secured several important contracts in a number of different territories, such as the Djerba desalination plant (Tunisia) and work to expand the Brasov and Videle treatment plants (Romania), while on the other it started up commercial operations at the Skikda (Algeria) and Chennai (India) desalination plants and completed construction on the Honaine desalination plant (Algeria).

Towards the close of 2010, the company reached an agreement to sell its water engineering, procurement and construction (EPC) business line to Abeinsa.Following completion of the deal, which tookplace on January 1, 2011, Befesa is now responsible for promoting, developing and operating water generation plants and for handling the associated technology and R&D+i, while Abeinsa is now charged with full EPC performance of such projects. The arrangement has enabled Befesa to focus its attention on promoting, developing and operating water generation assets, a field in which technology plays a pivotal role. The water market offers enormous growth potential, particularly in North Africa, Southeast Asia and the United States. Befesa intend to channel this line of business through the company Befesa Water, a truly international company employing close to 400 workers boasting operations on four different continents.


Inside the Honaine desalination plant under construction, Algeria

## Our Activities

Steel waste recycling focuses on the treatment and recycling of waste resulting from the manufacture of common and stainless steel and of waste produced from the steel galvanization process. In order to carry out these activities, Befesa has eight production plants in Europe and a further plant it recently acquired in Turkey. These play a fundamental role in the zinc recovery cycle, avoiding the pointless loss of tons of this material by cutting down on dumping and helping reduce the need to mine zinc, nickel and chrome. Befesa is the European leader in the treatment and valorization of steel dust and the only company in Spain to offer an integral steel dust collection and treatment service for valorization.

The aluminum waste recycling division provides collection and treatment services for aluminum-containing waste, manufactures and markets aluminum alloys, and designs, builds and assembles aluminum recycling equipment. This line of business is particularly effective at reducing $CO_2$ emissions when compared with the primary aluminum sector. The division also recycles salt slag, a hazardous toxic waste generated from the aluminum waste recycling process, and hazardous spent potlining (SPL) waste from used electrolytic cells. Recovery of salt slag and SPL provides a viable alternative to dumping. The purpose, in the case of salt slag, is to separate the metallic aluminum, the salt and the aluminum oxide, while for SPL, the aim is to eliminate cyanides and soluble fluoride salts. All solid metals obtained from the process are reused. This enables the company to bring the recycling cycle full circle and make valuable use of all aluminum-containing waste.

View of the main Befesa Salzschlacke building in Hannover, Germany

The industrial waste management division provides integral waste management services to industrial clients. It handles all stages of the industrial waste management cycle, ranging from transportation, temporary storage, treatment and valorization, to recovery and controlled and safe final disposal, all in strict accordance with Spanish and European environmental law. It also provides a broad spectrum of high value-added industrial cleaning services to most industrial sectors. In addition, it has an area that provides effective solutions for the collection, transportation and elimination of PCB-contaminated materials, transformers and condensers, and for recycling the film used as greenhouse covering. This unit also performs desulfurization work to produce sulfuric acid from residual sulfur, while generating electricity, which is then sold and returned to the national grid. Lastly, it provides a range of fully-comprehensive soil decontamination solutions.

Business within the water generation and management division is geared towards promoting, designing, constructing and operating infrastructures to cover the entire water cycle. Befesa has become a benchmark company worldwide thanks to its impressive track record spanning more than sixty years and its continuous investment in R&D&I. The water business is divided into two mutually complementary lines of business: on the one hand, the design and construction (EPC) of hydraulic infrastructures and, on the other, concessions of large plants under various different project finance structures for timeframes between 15 and 25 years. In turn, the water division has six product lines: desalination, water treatment, industrial water, upgrading of irrigation systems, hydraulic construction and hydrologic and hydraulic infrastructure management.

The steel dust recycling business invested over €5 M in property, plant and equipment during 2010, the most significant entries being the acquisition of new industrial equipment and improvements to the efficiency of certain core operations and processes.

The aluminum and salt slag waste recycling division is currently investing heavily in the German plants in order to bring them in line with business unit standards.

## Steel Waste Recycling

Befesa is the current European leader in iron and steel waste recycling. Through its steel waste recycling unit, Befesa provides high value-added environmental services to the steel industry. These involve the treatment and valorization of the residual dust generated from both common and special steel manufacturing processes, as well as other zinc-containing waste produced by the galvanization sector. The recycling of zinc-bearing waste, which constitutes the company's core business, has a dual benefit for the environment: it prevents the soil and phreatic layer contamination caused by the dumping of steel dusts (environmentally hazardous due to their toxic heavy metal content), while also ensuring an inexhaustible source of natural resources, in stark contrast to mining, thus helping to alleviate the world's shrinking reserves of metals such as zinc, nickel and chrome.

The company currently has nine production plants engaged in these important activities: Befesa Zinc Duisburg GmbH and Befesa Zinc Freiberg GmbH (Germany), Recytech SA (France), Befesa Zinc Aser SA (Spain) and, from the end of September 2010, Befesa Silvermet Turkey SL (Turkey), these being the companies that operate Befesa's electric arc and smelting furnace steel dust recycling facilities, while Befesa Valera SAS (France) and Befesa ScanDust AB in Landskrona (Sweden) recover and treat stainless steel waste. Lastly, the factories operated by Befesa Zinc Sondika SA and Befesa Zinc Amorebieta SA (Spain) recycle the zinc and zinc alloy waste generated by the galvanization, metal injection and construction industries.

View of the galvanization waste recycling furnace at Befesa Zinc Amorebieta, Spain

Befesa is currently Europe's leading recycler of steel waste, with a market share far above that of its competitors within the sector. The strategic positioning of its plants enables it to be close to customers and suppliers alike, affording it its key competitive edge. Other characteristics that set Befesa apart from the competition include its extensive knowledge of recycling processes and the technology it employs, and also the fact that its commercial relations with customers are based on long-term collaboration agreements.

The patented and proprietary Waelz-SDHL and lixiviation processes in use at its facilities are the product of the continuous innovations that Befesa has made to the traditional Waelz process, leading to hugely significant energy savings, increased capacity and improved performance in zinc recovery, and placing the company at the technological forefront of its sector. The European Commission itself has recognized the technical, economic and environmental efficiency of the pyro and hydrometallurgical steel dust recycling processes in place at Befesa facilities by classifying them as Best Available Technology (BAT) in the benchmark BREF document applicable to the non-ferrous metal industry.

Over 2010, the production units integrated into the steel waste recycling division treated a combined total of 562,308 t (dry) of zinc-bearing steel and iron dust, 11.9 % up on figures for 2009. Of these, 470,685 t, marking a 15.5 % year-on-year increase, came from large factories involved in the production of common steel, and also from various smelting facilities operating within the European Union, while the remaining 91,623 t were collected from the leading stainless steel production facilities in the EU.

This input volume has enabled the company to obtain 170,280 t dried of Waelz Oxide, representing a year-on-year increase of 14.6 %. The volume of treated Waelz Oxide (D-L.W.O.®) was similar to that reported for 2009, standing at 104,684 t. The stainless steel dust recycling plants also produced 42,811 t of nickel alloy and other metal alloys capable of fetching a high market price, and 51,715 MWh of electrical power were self-produced at the production facility in Sweden.

View of the Waelz furnace at Befesa Zinc Aser facilities in Erandio, Spain


The company Befesa Zinc Comercial is responsible for marketing and selling the end product obtained from the plants operated by this division. Thanks to the sterling work conducted in 2009 to penetrate new territories and diversify its Waelz Oxide customer portfolio, the company managed to sell a grand total of 170,939 t of this product in 2010, 13.3 % up on figures for 2009. A further 30,822 t of alloys rich in nickel and other metals were also sold through Befesa Steel Services in 2010, representing growth of 26.5 %.

By the close of 2010, the Sondika and Amorebieta plants in the Spanish region of Biscay, which treat the zinc waste and zinc alloys generated by the galvanization, metal injection and construction sectors, had recycled a combined total of 15,100 t of waste, including in particular zinc dross and gross zinc ash from Spain and other European countries, marking a 29.1 % increase in the volume treated at these two plants.

In 2010, Befesa Zinc remained an active member of its working group in the European IZA (International Zinc Association), with head offices in Brussels, which was created in order to make REACH regulations accessible and help members implement them, in accordance with Regulation (EC) No. 1907/2006 of the European Parliament and of the Council, of 18 December 2006, concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH), which entered into force on June 1, 2007. The purpose of these regulations is simply to increase existing protection for human health and the environment by duly identifying and controlling the intrinsic properties of chemicals consumed within the European Union.

According to this EU Regulation, Befesa Zinc must register all the products and sub-products obtained from its eight production plants in the European Union prior to November 30, 2010, the deadline in this particular case. After having duly pre-registered its products in November 2008, the company presented the requisite dossier at the start of September 2010, which included the corresponding application to register the manufactured products of Befesa Zinc Duisburg under the names Waelz Oxide and Waelz Slag. Following on from this, it intends to do the same with the products of the other companies as soon as the European Chemical Agency (ECHA) grants its approval.

Lastly, and as mentioned above, Befesa burst onto the Turkish steel dust recycling market towards the end of September 2010 as part of its growth strategy based on geographic business expansion. This venture has allowed the company to gain rapid entry into Turkey, a strategic market and one of the world's main producers of electric arc furnace steel. It is also one of the emerging markets promising the greatest potential in terms of future growth within the sector.

Aerial shot of the Befesa Zinc Duisburg plant, Germany

Waelz furnace at Befesa Zinc Freiburg facilities, Germany

## Aluminum Waste Recycling

Befesa is currently the European leader in aluminum waste and salt slag recycling. Similarly, Befesa operates a unique model geared towards integrating both sides of the aluminum waste recycling process.

Befesa's current growth strategy in this area encompasses organic growth in the aluminum recycling business in Central Europe, coupled with international expansion in the salt slag business, thus helping to promote the company from its current status as European leader to a position of worldwide dominance.

The main competitive edges underpinning Befesa's goal of continued sustainable growth include in-depth knowledge of the processes and technologies involved in aluminum waste recycling, a broad range of products derived from secondary aluminum and excellent commercial relations with customers and suppliers of raw materials.

### Aluminum Waste Recycling

The aluminum waste recycling business unit recovers aluminum contained in various different types of waste. Befesa does this by collecting and transporting waste and aluminum scrap metal, carrying out its integral recovery and producing and marketing secondary aluminum alloys. Recycled aluminum waste is primarily used to produce alloys, which are then sold to the construction and automotive industries and turned into components. It is worth noting that this line of business is particularly effective at reducing $CO_2$ emissions. Befesa carries out these activities at three plants - Biscay, Valladolid and Barcelona (Spain).

The sector rallied over the course of 2010, which also witnessed sharp growth in sales and prices. Against this backdrop, Befesa remained a market leader and key player not only in Spain, where its leadership is unquestionable, but also in Europe.

Work continued in 2010 to integrate the three production plants in Erandio, Valladolid and Granollers, which has enabled the company to continue streamlining overheads and improving administrative management. All actions and initiatives undertaken during the year were intended to increase the productivity of the various plants, reduce energy costs and improve the end service provided to customers.

In 2010, Befesa recycled roughly 175,000 t of various types of aluminum waste, leading to 105,000 t of alloy production and sales and avoiding the equivalent of 1 Mt of direct $CO_2$ emissions.

Ingot piles at Befesa Aluminio facilities in Las Franquesas del Valles, Spain

## Salt Slag Recycling

Befesa's aluminum waste recycling system involves the recovery and integral valorization of all the waste generated by the aluminum industry and also the goods produced from aluminum at the end of its life cycle. It is precisely the salt slag recycling business that brings this process round full circle and makes it a meaningful venture.

As is also the case with the manufacture of parts and other products, oxides and other impurities are incorporated along the aluminum production value chain. The valorization of these is more costly, both because of the technical difficulties involved in the industrial process and because of the lower financial value of the products that can be recovered. Befesa has developed its own technology, thereby helping to ensure the sustainability of the aluminum industry. Due to its physical and chemical properties and in particular its lightness, aluminum plays a crucial role in helping to curb greenhouse gases within the transportation sector.

Salt slag valorization plants are also able to recover other types of waste from the aluminum industry, such as gas filtering dust from smelting furnaces and the dust obtained from milling and grinding aluminum dross.

The company has also been treating the waste produced by primary aluminum electrolysis (SPL) since 2009. This hazardous waste, which contains cyanides and soluble fluoride salts, is generated during the process of obtaining primary aluminum from minerals. Due to the significant volume of waste generated, 22 kg per ton of primary aluminum to be precise, the need to recycle SPL has become one of the industry's most pressing environmental challenges. To date, there have only been partial treatments of the waste and most ends up being dumped at authorized sites. Befesa, on the other hand, offers fully-comprehensive management with integral waste recovery to provide leading waste producers with a definitive solution.

Evaporators at the Befesa Salzschlacke salt slag plant in Lünen, Germany

In 2009, Befesa acquired three salt recovery plants in Germany, making it Europe's leading salt slag management company. In addition, its technological know-how will enable it to expand towards other geographical markets, such as the United States and Eastern Europe.

Befesa is thus contributing to sustainable development through five plants specifically designed to treat this type of waste. The plants in question are located in Valladolid (Spain), Whitchurch (United Kingdom) and Lünen, Hannover and Töging (Germany) and have a combined capacity of 630,000 t. The company also manages smaller amounts of other waste from the primary and secondary aluminum industries. Befesa treated 375,000 t of waste over 2010, marking a year-on-year leap of 57 %. All this waste is fully converted into raw materials that can be used by industry (aluminum, molten salts and aluminum oxide). The company's salt slag recycling activity has eliminated the need to mine 267,100 t of non-renewable raw materials (mineral oxides and salts) and to dump 224,200 t of hazardous waste.

Befesa's strategic goals and business processes mirror the commitments assumed by the aluminum industry: to eliminate, in the mid-term, the dumping of solid waste directly and indirectly generated by industry. The company is working tirelessly to incorporate innovative treatment technologies for valorizing other types of waste, thereby helping the industry to move forward in a sustainable manner.

## Sales of Machinery and Technology

The machinery and technology sales division provides technical support to the aluminum waste recycling plants, and is engaged in the design, construction, assembly and start-up of installations for the aluminum and zinc industries. It boasts an extensive portfolio of more than 100 installations in 40 different countries. Its main products include automated lines for producing 5-25 kg aluminum ingots, casting wheels, rotary ovens and sludge cooling and treatment facilities.

Of the many projects undertaken in 2010, highlights include the start-up of two casting lines for the company Emal (United Arab Emirates); the launch of three molding lines for Qatalum (Qatar); the manufacture and assembly of four molding lines with trailer loader system for Vedanta (India); and the start-up of a casting line for Rusal (Liberia). Despite the difficulties stemming from the widespread slump in investment, this business unit has completed all its projects and its order intake effectively guarantees work for the next twelve months.

Aluminum swarf dryer at Befesa Aluminio facilities in Las Franquesas del Valles, Spain

# Industrial Waste Management

Befesa is the leading company in Spain when it comes to managing industrial waste (measured in terms of treated volume). It is also a prominent figure in the Latin American countries in which it operates (Argentina, Chile, Mexico and Peru).

Befesa's main competitive edge is the fact that it operates across the integral industrial waste management cycle and is therefore able to harness significant synergies between the various links in the chain.

Through its centers and offices located across Spain, Befesa aims to provide its customers with an integral waste management service, while minimizing or reducing the potential environmental impact through proper management.

Befesa's growth strategy in the area of industrial waste management is based on achieving organic growth in the management of non-hazardous waste in the countries in which it operates and on penetrating new territories offering high potential.

The industrial waste recycling market will continue to grow, spurred on by increasingly heavy legislative and environmental pressure not only on production companies but also with regard to the treatments required.

Demand for Befesa's industrial waste management services flows in from small and medium-sized companies with a strong local component, and also from the environmental divisions of large industrial corporations generally associated with the construction trade.

The prevailing economic crisis plaguing the automotive, steel, chemical, petrochemical and construction industries has led to a significant drop in waste generation. This is due to low levels of industrial activity, which have had a negative impact on the company's business.

## Industrial Waste

Befesa manages, recycles, valorizes and reuses waste through cutting-edge technology under the 3R rule: "Reduce, Reuse and Recycle", based on the premise that the best waste is no waste. This way, materials that can be put to subsequent use are recovered, thus helping to reduce our reliance on new raw materials. The company accomplishes this not only through its 15-plus network of centers distributed throughout Spain, which treat waste to reduce the associated contamination, but also through its transfer centers, at which waste is separated, classified and sent off for recovery, recycling and/or valorization, helping to reduce the consumption of natural resources. Lastly, it has a safety landfill site for the controlled disposal of waste that cannot undergo any further form of treatment.

Befesa maintained its leading status within the sector by managing 641,665 t of industrial waste in 2010, 28 % of which was classified as hazardous industrial waste. Work also continued during the year to remodel the physicochemical treatment plant so as to enable it to treat third-party industrial waters, thereby extending the range of management services offered to customers. The rainwater, potentially contaminated water and clean rainwater network at the Nerva center was also remodeled.

## Industrial Cleaning

The Industrial Cleaning division's activities contribute to the sustainable development of the industries it serves, combining the goals of minimizing waste production, maximizing waste recovery, reusing raw materials and developing more efficient equipment, leading in turn to lower energy consumption. Its wide range of services includes mechanical and high pressure hydrodynamic cleaning processes, ultra-pressure hydrodemolition and hydrocutting; chemical cleaning and steam blowing; air through circuits and boilers; changes of catalyst beds; cleaning

of refinery tanks and oil installations, both manually and with automated systems; on-site waste treatment through mobile and fixed plants, and cleaning of interchangers.

In 2010, the division attempted to consolidate its standing in the pre-operational chemical cleaning market for thermal power and solar thermal plants by securing and performing work on Abengoa's Solnova 4 parabolic trough solar power plant in Sanlucar la Mayor (Spain), and the ISCC Hassi R'Mel plant (Algeria). The company has continued to expand outside Spain, where it has been carrying out automatic cleanings of tanks, catalysts and heat exchangers in France, Portugal, Switzerland and Italy, and submitting bids for work to be carried out in 2011. It also made its first commercial contacts in the Near East, where the construction of large petrochemical installations will provide the company with opportunities for further work, mainly in tank and catalyst cleaning.

## Soil Decontamination

This division provides integral technical solutions to the problem of soil contamination. Over 2010, the company pressed on with contaminated soil investigation and diagnostic projects for top-tier customers within the petrochemical, steel, real estate construction, energy and chemical industries, among others, and was similarly involved in a host of other soil decontamination activities, such as bioremediation treatments, on-site treatments, and soil excavation and management.

Over the year, the soil management and decontamination department continued to cement Befesa's standing as a benchmark company when it comes to investigating and restoring contaminated soil in Spain. Given the slumping levels of business seen in the real estate market, Befesa has focused on the industrial sector, primarily the oil sector, where the company has conducted numerous investigations into contaminated sites across the Iberian Peninsula.

Other highlights include the on-site restoration work being performed on the Canary Islands and Ceuta, both emerging markets where Befesa has already set up operations, along with the decontamination work on the land previously occupied by the Tussam bus depots in Seville, which has converted the land to residential use.

## Plastics

Befesa Plásticos manufactures special low density polyethylene pellets by recycling the film used as greenhouse covering. The pellets are then sold and used for a variety of applications, such as manufacturing sheeting for the construction industry (waterproofing and protection), sacks and bags, irrigation piping and electrical and telecommunications ducts. They can also be injected to create pots or otherwise used to obtain modified asphalts. As the only Spanish company capable of carrying out the complete recycling cycle from collection to product manufacturing, Befesa is the European leader in this particular field.

Over 2010, Befesa recycled 14,625 t of film and used irrigation pipes, and likewise produced 11,200 t of polyethylene pellets, thus maintaining its position as market leader in the low density polyethylene recycling business, a field in which it operates in all the major regions of cultivation under plastic in Spain: Alicante, Murcia, Andalusia and Extremadura.

Befesa has also constructed a new fiberglass waste recycling facility. This will afford the company a more diversified product range and synergies between both facilities, which will make the company less vulnerable, seeing as though to date it has been solely dependent on just one product/kind of waste, namely polyethylene and greenhouse film. The main advantage of this is the production system: internal mixer capable of mixing various types of materials and reinforcements, followed by an extrusion machine, the sole purpose of which is to manufacture pellets from the mix. This allows the company to mix different materials in order to produce completely different commercial products for different sectors, all employing waste to strengthen plastics.

Raw material and end product storage facility at the new Befesa Plásticos plant, Spain

## PCB

Befesa Gestión de PCB operates out of Cartagena (Spain) and specializes in providing effective solutions for the collection, transportation and elimination of transformers, condensers and materials contaminated with PCB (polychlorinated biphenyls). Using cutting-edge technology, the company recovers all reusable materials while eliminating all contaminated materials for good.

More than 3,600 t of PCB-contaminated devices and materials were treated by the company during 2010, confirming its market leadership in Spain. This makes Befesa Gestión de PCB the company of reference for PCB treatment in the electricity sector.

## Desulfurization

Befesa Desulfuración produces sulfuric acid and oleum (a compound rich in $SO_3$) by using the residual sulfur recovered from petrochemical plants. It owns a plant that provides viable solutions to the environmental problems associated with oil plants by applying the cleanest and safest processes.

During 2010, 261,100 t of equivalent acid were produced, with an associated electricity generation of 49,900 MWh. After deducting self-consumption, this resulted in sales of 24,000 MWh of surplus electricity.

It is worth noting that in May 2008 the land on which the desulfurization plant is located was sold pursuant to the town of Baracaldo's (Biscay) Sefanitro Special Interior Reform Plan ("Plan Especial de Reforma Interior Sefanitro"). The plant is currently operating and the land will be handed over within an appropriate timeframe to ensure that the business can be transferred to the new location.

## Water

Befesa's water generation and management division designs, constructs and operates infrastructures to cover the entire water cycle. Befesa Agua has become leading company worldwide thanks to its impressive track record of more than sixty years and its continuous investment in R&D&I. The water division focuses on two complementary segments of business:

- Design and construction of hydraulic infrastructures (EPC).
- Concessions of large plants under various different project finance structures, with contracts running from 15 to 25 years.

This activity can, in turn, be broken down further into six product lines:

- Desalination. Seawater and brackish water desalination. Befesa has sufficient installed capacity to produce over 1.3 M $m^3$/day of desalinated water at its various facilities around the world.
- Water treatment. Water potabilization, treatment and reuse. Befesa facilities are able to supply or treat water for more than 8,000,000 people.
- Industrial water. Treatment of process water, service water and wastewater, sludge treatment and water reuse and recycling. Over 200 major projects.
- Upgrading of irrigation systems. More than 500,000 ha irrigated. The company's facilities are capable of regenerating and reusing over 100,000 $m^3$/day of wastewater.
- Hydraulic works. Supply, treatment, pressurized pipelines, hydroelectric power plants. Over 200 projects.
- Hydrologic and hydraulic infrastructure management. SAIH (Automatic Hydrologic Information System), SAICA (Automatic Water Quality Information System), dynamic regulation of canals, control of irrigation areas, water supply and treatment control systems.

Some of the most significant milestones of 2010 by territory are described below.

Inside the Plaza de España water treatment plant in Seville, Spain

## Spain and Europe

- Contract awarded to upgrade the Brasov and Videle treatment plants (Romania). The state-owned companies Apa Brasov and Apa Serv Alexandria awarded the contracts, which total over €20 M, with the aim of increasing their treatment capacity to 116,000 $m^3$/day. The plants feature compact pretreatment utilizing fine screens, primary sedimentation, biological treatment and secondary sedimentation. Biological treatment in both cases is based on a process of half-load activated sludge and aeration in two reactors of the same size, with the possibility of nitrification and denitrification and with anaerobic chambers to eliminate phosphorus through biological processes.
- Contract worth more than €10 M awarded for the hydro power plant at the head of the Navarra Channel ("Canal de Navarra") in Spain. Canasa awarded Befesa, operating as a temporary joint venture with Iberinco, the rights to harness the hydro power resulting from the Itoiz dam. The plant will be constructed at the exit of the dam headrace tunnel. The plant will be able to process up to 400 $hm^3$/year through two vertical axis Francis turbines with a total water flow rate of 45 $m^3$/s attached to two synchronous generators. Total installed power will stand at 20 MW, with annual production amounting to 30 GWh.
- Contract awarded for the Amés y Brión potable water treatment plant in A Coruña (Spain). The public corporation Empresa Pública de Obras y Servicios Hidráulicos attached to the Regional Government of Galicia awarded Befesa, operating as a temporary joint venture with Puentes y Calzadas, a contract worth over €5 M to construct a potable water treatment plant capable of treating 175 L/s, which can be doubled during stage two. The plant will include a water line with coagulation-flocculation, lamellar settler, filtration and final disinfection, as well as a sludge line to thicken and dewater sludge.
- Contract awarded for the La Codosera treatment plant in Badajoz (Spain). The Department of Development of the Regional Government of Extremadura awarded Befesa, operating as a temporary joint venture with the company Padilla y Zazo, a contract worth close to €3 M to construct an activated sludge wastewater treatment plant (WWTP) with nitrogen elimination in the municipality of La Codosera, a compacting plant in El Marco and another in La Rabaza, both the latter utilizing oxidation through blower-induced air insufflation. The WWTP will be able to treat 800 $m^3$/day of water.
- Work was completed on the Baix Llobregat desalination plant in Barcelona (Spain). This particular plant will reuse the effluent produced by the Baix Llobregat treatment plant in Barcelona. The €13 M-plus project for Depurbaix was performed by Befesa operating as a temporary joint venture with the company Acsa. This desalination plant produces over 57,000 $m^3$/day of water through reverse electrodialysis (RED) technology. The plant is one of the largest wastewater reuse facilities of its kind in the world and the second largest RED plant capable of functioning with any kind of water.

Aerial shot of the Meco treatment plant, Spain

- Opening of the Fonsanta pumping station in Barcelona (Spain). Fonsanta pumping station and section of piping to connect it to the Trinitat distribution station. The work was completed by Befesa under a temporary joint venture with Acsa and Six Constructores for Aguas del Ter de Llobregat, with the corresponding contract amounting to more than €20 M. This project uses two-way piping to connect the two networks currently supplying Barcelona and all the municipalities within the metropolitan area, namely the Llobregat system and the Ter system.
- Opening of the Arcas del Villar and Villar de Olalla treatment plant in Cuenca (Spain). Contract worth over €2 M awarded by the Regional Government of Castilla La Mancha to construct a water treatment plant in the municipal district of Villar de Olalla. The plant will treat the wastewater of this municipality and that of Arcas del Villar. With a treatment capacity of 1,000 $m^3$/day, the facility employs active sludge technology and features a biological reactor-settler followed by sludge dewatering. Over 10 km of collectors have also been implemented to channel wastewater from the two municipalities into the plant.
- Opening ceremony to mark the start of the tertiary treatment work at the Blanca treatment plant in Murcia (Spain). The work to be carried out by Befesa for the Regional Department of Agriculture and Water of Murcia amounts to over €1.2 M and will involve the construction of the treatment equipment to reuse water from the treatment plant for agricultural purposes. This treatment system, with a capacity of over 208 $m^3$/h, will feature flocculation, open filtration and ultraviolet disinfection. The project will allow the region to reuse 500,000 $m^3$/year of water.

## United States

- Contract awarded for the Donna desalination plant (Texas). The North Alamo Water Supply Corporation (NAWSC) entrusted Befesa WaterBuild and NRS Consulting Engineers with the design and construction of a desalination plant to treat the water from a saline aquifer. The plant will be sited close to the existing water treatment plant in Donna. The facility, which requires a €5 M investment, is the company's first water supply desalination facility in Texas to include the design and construction of the facilities. The new plant will employ reverse osmosis technology and will generate more than 7,500 $m^3$/day at the outset.

## China

- Construction of the Qingdao desalination plant. In addition to being the first desalination facility constructed through project finance and fully financed by local Chinese banks, the plant is also set to become a groundbreaking project for the supply of desalinated water in the country. The contract, which entails total investment of €135 M, encompasses the design, construction and 25-year operation of the seawater desalination plant. The facility will be able to desalinate 100,000 $m^3$/day of water, enough to supply drinking water to a population of 500,000 people. The chosen technology is state-of-the-art reverse osmosis, both for the pretreatment stage (ultrafiltration membranes) and also the centralized pumping system, all of which will result in enhanced energy efficiency. This particular project was awarded the "Best Project of 2009" accolade by Global Water Intelligence (GWI).

## India

- Opening and start-up of the Chennai desalination plant. The €80 M contract to start up commercial operations was awarded by the Chennai Metropolitan Water Supply and Sewerage Board to a consortium comprising Befesa and the local construction firm Infrastructures & Projects. The plant is able to desalinate 100,000 $m^3$/day of water and is India's largest reverse osmosis desalination facility and the first in the country to operate under the DBOOT (design, build, own, operate and transfer) system. The contract includes operation of the plant for a 25-year term.

Membrane frame and other equipment at the Chennai desalination plant, India

## Sri Lanka

- Contract signed to supply water to Ratnapura (Sri Lanka). The National Water Supply and Drainage Board of the Democratic Socialist Republic of Sri Lanka awarded Befesa a contract worth nearly €26 M to design and construct stage one of the Ratnapura water supply system, essentially involving a 13,000 $m^3$/day potable water treatment plant, which will include pretreatment, prechlorination, coagulation, flocculation, sedimentation, filtration and post-chlorination. It also includes the capture systems to bring water from the Kalu Ganga river, a 2,500 $m^3$ storage tank and close to 20 km of piping to distribute the drinking water.

## North Africa

- Desalination plant awarded in Djerba (Tunisia). The Société Nationale d'Exploitation et de Distribution des Eaux (SONEDE) and the Tunisian Ministry of Agriculture and Water Resources awarded Befesa and Princesse Groupe a contract worth €70 M to design, construct and operate, for a 20-year term, a seawater desalination plant on the island of Djerba in the Gulf of Gabes. The plant will be able to produce 50,000 $m^3$/day of desalinated water, enough to supply over 250,000 people. The facility, which will utilize reverse osmosis technology, is set to become Tunisia's largest desalination plant.
- Start-up of operations at the Skikda desalination plant (Algeria). The Algerian Energy Company awarded this $110 M contract to a consortium comprising Befesa and Sadyt under a 25-year concession. Capable of producing 100,000 $m^3$/day of drinking water through reverse osmosis technology, the plant at full load will be able to supply a population of 500,000 people. The Skikda desalination plant, which falls within the first Algerian desalination program, is the first plant to have been actually delivered and commissioned.
- Completion of work on the Honaine seawater desalination plant (Algeria). Start of the commissioning stage for the desalination facility awarded to Befesa as part of the Geida consortium. The plant boasts a water production capacity of 200,000 $m^3$/day through reverse osmosis technology, and the contract includes operation of the plant for a 25-year term. The facility has entailed an investment of roughly €165 M.

View of the Honaine desalination plant under construction, Algeria

## Latin America

### Befesa Argentina

Befesa Argentina operates  in the handling, analysis, transportation, recycling, recovery, treatment, incineration and final disposal, through secure waste landfills, of non-hazardous industrial waste and special or hazardous waste. It also provides a range of other services, such as crushing and compacting of waste and contaminated materials in order to reduce its volume and prepare loads for processing or recycling. These environmental management services are carried out using state-of-the-art technology under strict international environmental standards, combining experience, technology and responsible handling of resources. The company thus contributes to sustainable industrial development by providing suitable treatments for each type of waste. The company has two plants to accomplish this goal: Campana, which provides inertization and final disposal services, and Pacheco, which operates as an incineration plant.

The former has been fitted with cutting-edge technology and has likewise benefited from numerous other structural enhancements to bring the company to the forefront of the aerosol treatment market, while maintenance and upgrade work has been carried out on the furnace at the latter plant with a view to improving management.

Befesa, acting through its subsidiary Befesa Servicios, is involved in industrial cleaning, physical and chemical cleaning of aqueous waste, recovery and distillation of stainless steel solvents, sludge centrifugation, oil and derivative product tank cleaning, and the production of an alternative fuel for cement furnaces. Thanks to an intensive sales campaign, actual order intake and performance for 2010 outstripped expectations. Improvements were also made to the process of producing alternative liquid fuels from waste. On a final note, the company successfully completed the three-year process of extracting all the liquid and semi-solid waste from Tank 263 at the YPF La Plata refinery, which measures 50 m in diameter, has a floating

roof and an interior slop volume of over 30,000 m³. The same tank will be hydrocleaned and sanded in 2011 to leave it ready for repair work.

## Befesa Chile

Befesa Chile, through its company Soluciones Ambientales del Norte, operates in the integral management of solid hazardous and non-hazardous industrial waste. It achieves this through temporary storage and final disposal systems and treatments aimed at valorizing the waste and minimizing the hazard posed by it, recycling wherever possible. The waste, which is mainly produced by mining and industry, is managed safely and responsibly, contributing to the country's sustainable development.

The company's Sierra Gorda plant, located in the Atacama desert, 120 km inland from the city of Antofagasta and 1,600 km from the capital city of Santiago, takes up a 40 ha plot of land and has been operating since May 2008. The facility managed over 22,500 t of waste in 2010, and moreover Befesa Chile has been busy making investments, such as the acquisition of four trucks, primarily intended to serve major mining clients from regions I to III. Work was also completed towards the end of November on the second hazardous waste landfill site, which will be able to store 80,000 m³ of the material.

The company also continued to work on various contracts signed with important companies from the mining industry, such as Minero Escondida (BHP Billiton), Cia., Minera Quebrada Blanca (Teck), Cía., Minera Lomas Bayas (Xstrata), Soc., Minera Química, Compañía Minera Ines de Collahuasi (Angloamerican) and Electroandina (Endesa). In light of this, the company has tightened its safety and mining standards, inviting its competitors to follow suit.


Befesa Perú truck

## Befesa Perú

Befesa Perú specializes in providing the industry with integral environmental services, including the collection, transportation, treatment and final disposal of industrial and hazardous waste, environmental management of industrial installations, recycling of metallic containers and PCB exports. All this is accomplished through tried and tested techniques pursuant to national and international standards that effectively guarantee environment protection. This way, the company employs the best available technology to help protect both the environment and public health, ensuring that waste is kept in strict isolation and permanently removing any semblance of risk by monitoring it during operations and following sealing of the waste.

Befesa Perú also started up its industrial cleaning service in 2010, meaning that the company has had to invest in resources and assets such as tank trucks for sludge suction and industrial cleaning, a double-chamber static incinerator for the existing facility in Chilca (60 km south of Lima), and work was also started on the new Trujillo hazardous waste landfill (563 km north of Lima). The Chilca facilities also enjoyed a number of improvements, including extensions to the laboratory and administrative office area, construction of a truck washing area, extension of the fire protection system to cover all treatment and operating areas, construction of three lixiviate treatment tanks, roofing for the temporary waste storage platform and start-up of the industrial effluent treatment plant. The year 2010 also saw Befesa Perú start up the country's first commercial incinerator, which is capable of treating 1,800 t/year of inflammable and hospital waste.

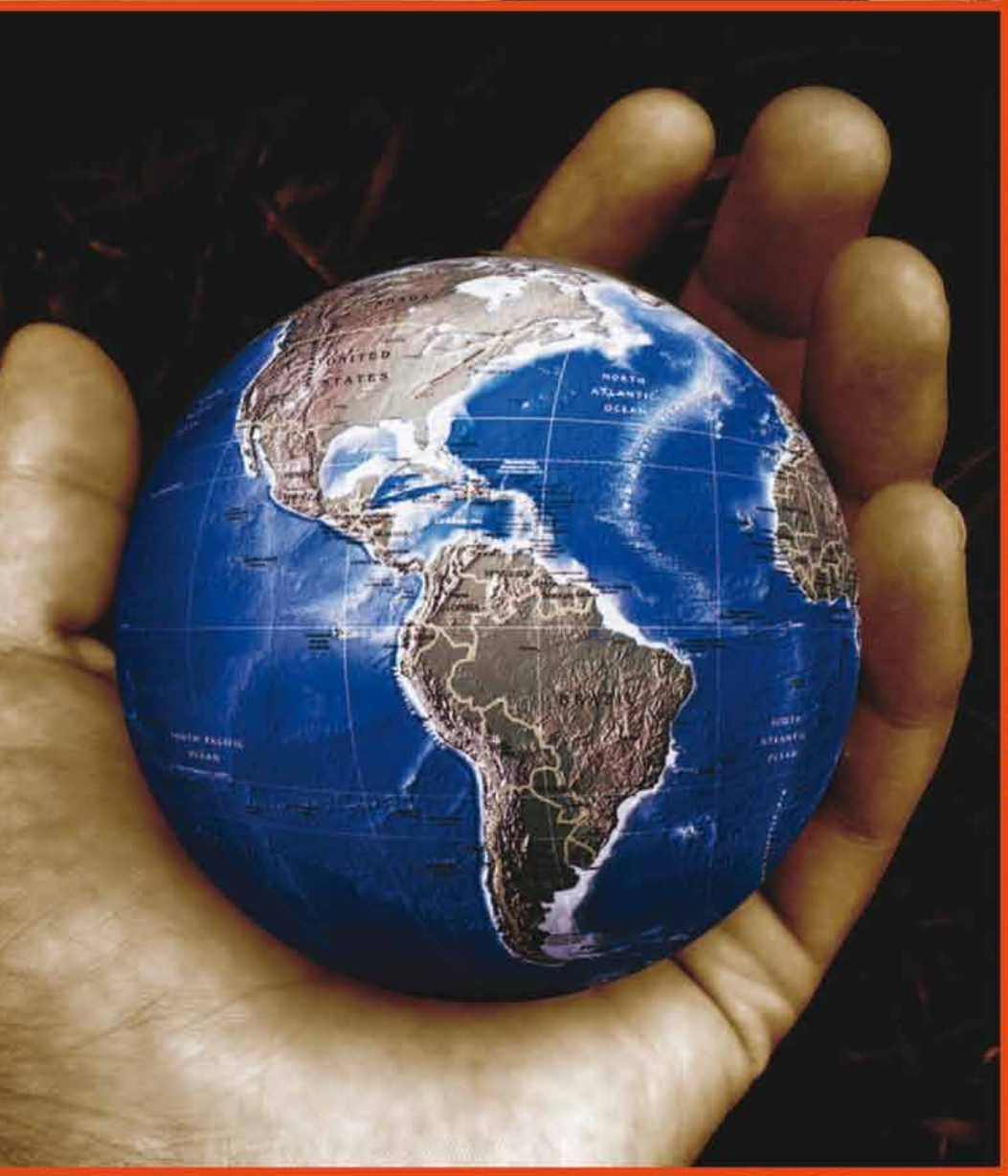
Befesa is the first company in Peru to be authorized by the Ministry of Health's Directorate-General for Environmental Health (DIGESA) to carry out the treatment and final disposal of hazardous industrial waste. It has also secured the approval of the Environmental Impact Study ("Estudio de Impacto Ambiental"). The company successfully managed over 14,400 t of waste over the year.

Waste analysis laboratory

## Befesa México

Befesa Mexico and its subsidiary, Sistemas de Desarrollo Sustentable (SDS), are involved in the management of hazardous waste for industry and the public sector. These activities foster sustainable development by offering a responsible alternative to the management of hazardous waste, which might otherwise lead to significant environmental contamination.

In 2010, Befesa México continued to expand its business of managing waste ultimately intended for third-party facilities. Whereas previously specializing almost exclusively in hazardous waste confinement, the company is now experiencing demand for cement furnaces, confinement of non-hazardous waste and incineration. The company also opened a waste transfer center in Tultitlán, State of Mexico, in 2010.


UNITED
STATES
NORTH
ATLANTIC
OCEAN

Telvent is a global technological solutions and business information services company that helps to enhance the efficiency and security of leading companies worldwide. Telvent targets markets tagged as critical to the sustainability of the planet, including the energy, transportation, agriculture and environmental sectors.

**www.telvent.com**

# International Presence


| | |
|---|---|
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| Key Figures | 2010 | 2009 | Var. ´10-´09 (%) |
|---|---|---|---|
| Revenue (€M) | 742 | 759 | -2.3 |
| EBITDA (€M) | 129 | 173 | -25.1 |
| New intake | 787 | 881 | -10.7 |
| Rail, subway and bus network passenger travel management (M passengers annually) | 2,500 | 2,500 | +0.0 |
| Average number of employees | 5,717 | 5,787 | -1.2 |
| Hours of training (h) | 203,070 | 216,379 | -6.2 |

# Our Business

In 2010, Telvent continued to achieve powerful growth despite financial turmoil, worldwide budgetary austerity, and the energy crisis and its fallout — particularly in the environmental arena. The company significantly improved its operating earnings, profitability and efficiency, and even consolidated strategic targets in markets with a direct impact on the planet's economy and sustainability, such as energy, transportation, the environment and agriculture.

Playing a central role in a host of external and internal initiatives and events, Telvent reinforced its position in all fields. Over the year, the company became more solidly focused on sustained growth.

Telvent renewed its efforts to remain a cutting-edge supplier of advanced solutions, implementing best practices in all of its fields of action. Its overarching goal of excellent performance guides its day-to-day work and relationships with all of its stakeholders: shareholders, potential investors, analysts, customers, suppliers, its people — who make each project possible — and the communities in which it operates. All of these fall within the company's strategic framework, shaped by its mission, vision and values.

Its mission is to provide efficient and secure management services, based on its innovative technology and proven expertise — helping to manage operational and business processes for leading companies worldwide.

A global company, Telvent employs the most talented professionals in the countries in which it operates. Through the use of state-of-the-art information technologies, these individuals help it to overcome the formidable challenge of creating a sustainable and secure world for future generations.

Telvent is fully committed to integrity and ethical conduct, and will attain its mission on the basis of the following core values:

- Showing honesty and respect in dealings with customers, shareholders, collaborators, technological partners and suppliers.
- Demonstrating flexibility and the capacity to assume risks, enabling it not only to maintain, but also to strengthen its leadership position in the industrial sectors in which it operates.
- Supporting innovation, hard work, and collaboration among its highly-qualified professionals.
- Predicting and utilizing future industrial and technological trends for long-term business success.

It is the only Spanish company listed on the United States technology stock exchange, NASDAQ (ticker symbol TLVT). In 2008, Telvent was selected to be a part of the NASDAQ Global Select Market, an index of international companies that meet stringent financial, corporate governance and Cleantech™ (CTIUS) requirements. This is the first and only index reflecting the present demand for technology goods and services that support the sustainability of the planet.

Telvent has offices and facilities in more than 20 countries around the world. Its nearly 6,000 high-caliber professionals undertake projects and initiatives specific to each business area. In addition to its headquarters in Madrid (Spain) and Rockville, Maryland (United States), Telvent has offices in the following locations:

- Europe: Spain, Portugal, Netherlands and Sweden.
- North America: United States and Canada.
- Latin America: Mexico, Brazil, Venezuela, Peru, Chile, Uruguay, Panama and Argentina.
- Asia-Pacific: China, Thailand and Australia.
- Middle East-Africa: United Arab Emirates, Turkey and Saudi Arabia.

The company's growth is rooted in its strategy, which is based on: business and territory diversification; an unwavering commitment to continuous innovation in support of proprietary technology; and in-depth knowledge of the market, with an extensive, loyal customer base that provides a solid foundation.

Telvent's approach is to build stable, long-term relationships with those it provides services and products. Every year, more than 85% of its sales come from existing customers, and 30 % from recurring agreements. These figures can largely be attributed to its quality policy around one key principle: customer satisfaction.

Through a close and constant watch on all its ongoing projects, Telvent is focused on gradually improving its technologies and services to meet the evolving expectations its customers. The company's transparency and communications efforts enable it to nurture enduring confidence among investors, suppliers and customers year to year. An example of its business philosophy is its policy of holding "open door" days for shareholders and analysts. More than twenty such events were hosted in 2010. Moreover, its annual customer satisfaction survey is a direct review of the company's perceived performance in various endeavors.

Throughout 2010, Telvent voluntarily offered all stakeholders clear, regular and accurate information on all its activities, policies and results. Anyone, from a qualified investor to a member of the public anywhere in the world, can find detailed information on the company, make inquiries, or communicate with Telvent via its web.

Telvent's success can be attributed to two factors: first, its key competitive edge from its proprietary technology; second, the hard work and dedication of its team of nearly 6,000 employees. In 2010, the company implemented its Technological Talent Program, designed to expand and reinforce in-house technological know-how. The program is set to play a key role in talent and leadership development within the organization.

The company recruits the highest-caliber engineers and technical specialists, offering them a work setting designed to foster productivity, draw out creative insight, encourage high performance, and provide systematic ongoing training via progressive development of new skills and competencies. The company's Equality Master Plan is designed to offer all of its employees equal opportunities for career development and compensation. In 2010, hours spent in training exceeded 203,000 — encompassing a wide range of different subjects, including new techniques, professional refresher courses, management models, administration and finance, the environment, quality, operations and logistics, office systems, languages, and risk prevention, among others.

Its human resource policies are focused on creating the right conditions for talent to thrive, and for each employee to achieve excellence in his or her specific role. This team brings together the finest professionals from around the world, who are guided and characterized by the company's values of hard work, high motivation, independence, and commitment to the organization.

Looking ahead to 2011, Telvent continues to focus on the core principles of excellence and innovation as the cornerstones of its business, always in the interest of a more secure, sustainable world. It will remain committed to the following objectives:

- Providing solutions and services that help curb $CO_2$ emissions.
- Improving the mobility of people in relation to their daily travel needs.
- Developing technological solutions to ensure the efficient management of electrical energy, oil and gas.
- Offering a high value-added technological response geared towards protecting the environment worldwide.
- Providing a global technology outsourcing model that covers the complete life cycle of customers' information and communication technologies — thereby guaranteeing user security.
- Streamlining the exchange of proprietary information in real time, which is of high added value to farmers and other critical sectors of the current social and economic model.

This year, Telvent will continue to strive towards maximizing the efficiency information technologies can bring to critical industries, and therefore, leave a better environmental legacy to future generations.


Telvent firmly believes in the value of information technologies to make the world a better legacy for future generations

# 2010 in Review

In 2010, leading international companies felt pressure from worldwide market turmoil. Despite tough international economic conditions, Telvent further cemented its position as a leading player in its chosen fields, and opened up new business opportunities around the world.

The year saw a number of unexpected events that have altered the dynamics of the energy sector. Telvent has grasped opportunities created in this new scenario to expand its products and services with the aim of helping customers achieve performance excellence. The Oil and Gas division's revenue exceeded expectations. Moreover, in the electric industry, Telvent considerably increased its market share and boosted brand recognition in Smart Grid-related projects.

In the field of transportation, the company's strong progress in the United States and the increase of business expectations in the Middle East and North Africa regions was highlighted. Even in the face of the present financial turbulence, Telvent underscored its strength in the Asia-Pacific region, and put in an excellent performance in Latin America, while retaining its lead in Spain. Deploying a strategy that combines ongoing evolution with project globalization, the Traffic and Transportation segment secured further contracts on the back of existing projects and won new tenders, mainly in urban mobility, passenger information services and toll management.

The Environment division rose to the year's challenges by firmly establishing its water business in North America, and rolling out its new Telvent DTN weather information and forecasting solution. Throughout the year, Telvent achieved growth in the strategic North American market thanks to its intelligent water management and weather forecasting solutions — the United States now accounts for 40 % of the segment's entire business. The company retained its strong foothold in Europe and won new ground by entering markets such as Libya, Jordan and Qatar.

The Agricultural sector's inherent volatility, which at first sight might seem a hazard, has in fact helped it expand its business yet again in 2010. Seed and fertilizer price fluctuations further consolidated Telvent DTN's position as the leading supplier of critical business information to support the production, marketing and distribution of grain and livestock, predominantly in the hugely influential North American market. Subscription services maintained their traditionally high retention rate — nearly 90 % — and new producers and agricultural businesses joined the customer base.

In 2010, the Global Services division laid foundations for growth in the coming years. The consolidation of Telvent Housing, Telvent Interactive and Matchmind was completed. The division strengthened its in-house capabilities in the consultancy and data center areas, and continued to build on its relationships with hardware manufacturers and software developers. Global Services achieved the feat of keeping up a local company's standard of customized care while offering the reliability and robustness of a multinational corporation, rolling out resources in Latin America and the United States to boost its business by 250 %.

## Major Milestones of 2010

The Energy business area continued to invest in Advanced Distribution Management System (ADMS) technology and in the marketing of its proprietary Smart Grid solutions. Fending off powerful industry rivals, Telvent won large Smart Grid contracts in Canada, the United States, China and Europe, and in the process attracted a number of major awards. Telvent's achievements in this area were recognized by a prestigious Innovación Digital prize awarded by the Barcelona Digital Technology Center. The company was selected for its DMS technology, a suite of robust and versatile Smart Grid tools focused on energy efficiency and sustainability. The suite was also lauded as Product of the Year 2010 by the Technology Marketing Corporation (TMC). Telvent was selected as a contestant in the "Sustainable City" in recognition of the first-ever green residential buildings built in Madrid, Spain. The company deployed the technology to make government-protected apartment rentals for young people in Spain's capital city more energy-efficient

One of the Traffic and Transportation division's highlights included the agreement signed with IBM in North America to create Intelligent Transport Solutions (ITS) for mobility management over small transport networks in small and mid-sized cities, university campuses, government complexes and theme parks. This year Telvent SmartMobility™ Tollling — Telvent´s turnkey solution for electronic toll collections — took the market lead in advanced pay-per-use management systems for transport infrastructure. As a result, Telvent secured top-level contracts in the United States, Spain and Latin America to install its vehicle control systems, and has successfully closed initiatives such as advanced systems of toll free-flow of New Hampshire Hamppon Plaza and Pocahontas (United States), allowing process nearly five times more vehicles than a conventional toll road.

In 2010, the Environment division took steps offer its wide range of Telvent DTN information services internationally. The company made further progress by developing synergies and integrating with Telvent DTN. Acquired in 2008, this North American firm is largest private sector supplier of information services for the aviation, energy and transportation sectors in the United States. A special highlight is Telvent DTN's patented rainfall forecasts, which for the fourth consecutive year outperfomed other companies in the industry in an independent, third-party study.

The Agriculture division has continued to grow and entrench its position as the undisputed market leader in the United States. It supplies critical data in real time and SAAS (Software as a Service) solutions to all players throughout the supply chain, from producers to brokers and intermediaries. In the field of publishing, Telvent DTN achieved fresh successes by securing 20 editorial awards given out by the North American Agricultural Journalists (NAAJ). Telvent DTN was also a big winner at the American Agricultural Editors' Association (AAEA) award ceremony, where it carried off a total of 27 accolades in the editorial, design and photography departments, and a special prize for marketing communications. 2010 was the fourth year running in which Telvent DTN won the most AAEA awards. The company also received two awards from the American Society of Business Publication Editors (ASBPE) and the Star Prize for Broadcasting Award from the International Federation of Agricultural Journalists (IFAJ).

In the Global Services arena, the integration of three companies — Telvent Housing, Telvent Interactive and Matchmind — into a single corporation, Telvent Global Services (TGS), was finalized. The merger involves all corporate levels and departments (legal, head offices, organizational charts, product range, information systems and human resources), so all parties have fully committed to a common goal: The creation of a single company that combines the strategic vision of the consultancy profession with the accuracy and reliability of engineering, thus enriching Telvent's broad array of services.

In healthcare, the Global Services division reaped the rewards of its determined bid to create innovative technology when it was awarded the Andalusia Information Society Prize for the best ICT project to improve the quality of life of the general public. The regional government of Andalusia awarded Global Services the prize specifically in response to the installation and configuration of the region's health network PACS infrastructure. Health professionals can now access a patient's medical checkup history across all hospital locations and dates. This saves public funds and avoids inconvenience to patients.

Success stories like this are the outcome of Telvent's consistent year-to-year dedication of technology and human resources to the research and development of new solutions. Telvent seeks innovation in everything it does. From 2008 to 2010, an anomalous period strongly influenced by the economic downturn, close to €70 M were channeled into R&D initiatives. More than 2,500 software engineers and engineering Ph.D.s worked on a daily basis across an international network of technology centers, ranging from Canada, Colorado and Minnesota to Spain and Serbia. The company's geographical diversification is the key strength underpinning the meteoric rise in its technological capabilities. By encouraging a global exchange of creativity, the latest developments achieved at an Asian laboratory can be put within the reach of Americans, and vice versa.

Telvent conducts its research and innovation programs within the international network of technology centers

# Our Activities

Telvent offers high value-added information services and technological solutions in sectors critical to the economy and sustainability of the planet: energy, transportation, environment and agriculture.

The company's Energy business develops real-time automation solutions for the power industry. The Smart Grid solutions suite, for instance, optimizes power supply for both distributors and users. Telvent's systems are present in widely diverse operational settings, from the power supply to the New York subway to the electricity distribution networks of cities as distant from each other as Madrid, Bangkok and Rio de Janeiro. Telvent also offers a broad range of solutions for the integrated operation of oil and gas pipelines.

The Traffic and Transportation business helps improve urban and inter-urban mobility, and makes rail and maritime infrastructure safer and more efficient. Its solutions and services support the operation of public transport, and this in turn encourages people to make use of it. Telvent products help control city traffic and support effective management of highways, toll facilities, tunnels and inter-urban means of transport. These systems form the basis of traffic control in major cities all around the world, including Beijing, Buenos Aires, Sao Paulo, Mumbai, New York and Madrid.

The purpose of Telvent's Environment division is to provide technological solutions and services that protect biodiversity and help mitigate the effects of climate change. Today, Telvent controls key environmental disaster prevention infrastructure all over the world, and manages water distribution to more than 45 M people in Europe, North America, Latin America, Asia and the Middle East. The company supplies weather information management technology to airport operators, air forces, and the weather and hydrology authorities of several European countries, including Spain's State Meteorology Agency (Agencia Estatal de Meteorología), inter alia. It has supplied real-time critical information for business decision making in the agricultural sector for more than 30 years. These services cater to the entire supply chain of the complex North American grain and livestock market — from producers seeking to avoid the effects of market volatility, to commodities operators and brokers trading on the big international markets. Telvent's agriculture solutions facilitate spot price formation for grain and create higher transparency across the sector via real-time data and online trading, primarily in the grain market.

## Energy

Telvent's Energy business area provides real-time IT solutions and services to the oil, gas and power industries.

The division's business model combines several key elements. First, Telvent's in-depth knowledge of the vertical market, based on robust relationships of trust built with its customers over many years of recurring business. Second, the great value it offers in the form of sophisticated, highly scalable technology platforms supported by ongoing investments in research, development and innovation. Third, its delivery model that provides systems, services and critical business data in real time.

Telvent has been providing support services to the electricity industry since the 1980s

This model is successful thanks to the effort of the Energy team's 1,400-plus professionals, and the consistent excellent performance of its executives. In 2010, the company's efforts were focused on attracting and retaining the industry's finest talent, and perfecting the technologies and applications in Telvent's product range. It operates five product centers, three competency centers, and business units located in Europe, the Americas and Asia.

Today, Telvent serves approximately 500 utilities and more than 400 customers from the oil and gas sector worldwide. World-class energy companies rely on its technology and services to meet the requirements of their customers, shareholders and industry regulators, at all times ensuring the highest standards of infrastructure security and public and environmental safety in all operations.

A broad customer base coupled with wide geographic diversification has enabled Telvent to continue to grow, offering solutions and services to customers around the world. In 2010, the company's growth performance translated into revenue of €253 M, 5.1 % up from 2009, and accounting for 33.7 % of Telvent's total business.

Telvent's Energy area works in the following segments:

## Electric Utilities

Since the early 1980s, Telvent has supplied specific applications and support services to the utility sector. Thanks to its long track record, it is able to respond to power utilities' needs by providing technology to operate critical infrastructure and information required for agile decision making.

The Smart Grid Solution (SGS) suite encompasses Telvent's broad array of solutions for meeting the industry's needs, and constitutes one of the company's key bids for innovation and sustainability. SGS helps power utilities to transform their grids to distribute electricity in a safer, cheaper and more efficient way.

The company's Advanced Distribution Management System (ADMS) raises energy efficiency by supporting real-time control of the power distribution network. The suite also aids more rational and efficient use of human resources and infrastructure, for a stronger bottom line.

Telvent's geographic information systems (GIS) solutions within the SGS suite provide water and gas utilities with tangible benefits for cutting costs, increasing productivity and offering better customer service. The ArcFM™ solution is a single platform that captures all spatial data for a utility's assets and manages it in real time.

## Oil and Gas

Telvent's technology, services and information suite for the oil and gas sector provides applications to manage and supervise pipeline transportation from refining sites to end-users in an integrated way. Its proprietary technology, developed and perfected over the course of more than 30 years, is installed at more than 60% of oil and gas transportation networks across the Americas. The company's price data, business risk management, back-office solutions, and product sales platforms connect producers to end consumers throughout the whole supply chain, aiding operations and decision making in a complex business through times of high volatility.

The Energy division has retained its status as an industry leader. 2010 highlights include:

- An extension to the operating contract with Swedish power utility Vattenfall, that extends the relationship out to 2014,with new options that increase the value of offered services. After successfully installing 600,000 metering devices and AMR facilities for Vattenfall, from 2011 onward, Telvent will operate under the new metering and infrastructure management services contract.

- Two key milestones in Europe: Telvent won its first tender in Germany, with SCADA OASyS technology and advanced applications for the Bunde-Etzel pipeline; and it started work with Gas de France to update its SCADA system and related advanced applications underlying the company's pipeline management.
- Four major contracts to install renewable energy control systems for solar power plants in Spain, and completion of its first international projects in the solar power business in Algeria and Morocco.
- Successful fulfillment of the first phase of a pilot DMS project for Guizhou Power in China. This customer chose Telvent to implement its power distribution management system (DMS). The initiative is intended to upgrade the management of a facility that supplies power to more than 40 M people in Guizhou in southern China. Telvent's solution will provide one of the main components of its Smart Grid strategy, thus raising grid safety and making power outages shorter and less frequent.
- PetroChina Company Limited continues to use Telvent as a supplier of control and monitoring systems for critical hydrocarbon distribution infrastructure in China. In 2010, Telvent's Oil and Gas division billed more than €13 M for rural development projects implemented for PetroChina and Sinopec.

## Traffic and Transportation

The transportation networks that criss-cross Earth support more than 23,000 M.km of passenger travel a year — and this figure is expected to increase to 105,000 Mkm by 2050. These networks also transport goods worldwide, which will be 60 % higher by 2020. To support this critical industry, the company offers Telvent SmartMobility™, an integrated solutions suite that completely rethinks the intelligent management of existing transport facilities.

Telvent's advanced tolling systems are capable of processing five times more vehicles than a conventional tolling station.

In 2010, Telvent's Traffic and Transportation division further broadened its product range and won major tenders in several different geographic regions.

In Spain, Telvent maintained the volume of recurring operation and maintenance service agreements (Seville, Barcelona, Vitoria and Bilbao) and has also secured major contracts for the construction of new road infrastructure. The company is set to achieve a strategic foothold in new, high-growth niches in the rail sector through projects like the development and implementation of an integrated management system for the new metropolitan light rail transit system in the Bay of Cadiz.

On the international stage, the company's customer base now includes the Department of Infraestructure and Transportation of Brazil; Saudi Oger Ldt, in Saudi Arabia; Ferrocarriles de la Junta de Andalucía, in Spain, and Enterprise Metro d´Alger, in Algeria, demonstrating Telvent's firmly established strength throughout the world.

Strong performance in Latin America, where revenue grew 20 %, was driven largely by consistently good news out of Brazil, where Telvent is a leader in mobility management and toll networks. The start up of a traffic management system in the city of Panama and fresh contract awards in Mexico and Chile open up promising business prospects.

New contracts with recurring customers, as well as increased business expectations with key customers such as departments of transportation in Florida, New York, Texas and Washington reveal leadership in the US. market. One relevant milestone includes the introduction of a new traveller information system to the Maryland Department of Transportation — which showcases "a before and an after" in traffic systems management.

Finally, Telvent bolstered its client list in Saudi Arabia, where it closed a deal to implement the traffic management system for King Abdullah Road in Riyadh. Moreover, new contracts to prioritize light rail transit systems in Algeria and Morocco widen the company's business vistas in North Africa and the Middle East.

2010 sales in the Traffic and Transportation division totaled €209 M, a 3.9 % increase year-over-year; the segment now accounts for 27.7 % of Telvent's total revenue.

Telvent's Traffic and Transportation area works in the following segments:

## Urban and Inter-Urban Mobility

Cities and roads are plagued with daily traffic and pollution problems due to society's excessive dependence on private modes of transport. Telvent is aware that new challenges call for new solutions, and it has accordingly developed an integrated suite of intelligent transport systems — Telvent SmartMobility Road suite, which combines critical data in real time with advanced mobility management services to raise road safety while lowering pollutant emissions.

The suite supports daily traffic management, tunnel and parking lot operation, passenger information systems, highway tolls and offense management. Telvent also offers consultancy and project planning services, highway payments management and intelligent traffic systems (ITS).

## Rail

The company offers Telvent SmartMobilityTM Rail Suite, an integrated railway network management solution to enhance safety in rail traffic and infrastructure control, support user access to public transport and foster transport intermodality.

This suite encompasses solutions for comprehensive rail management: rail traffic control and regulation, railway ticketing, station management and user information systems to remote energy control systems, communication networks and park-and-ride car park management.

## Maritime

Maritime authorities and operators are provided integral port management solutions coupled with a wide range of maritime and fishing simulators to operate and manage maritime transport to the highest standards of safety.

Telvent's SmartMobility™ Maritime is an integrated management suite designed to offer the maximum flexibility and address all of the different aspects of maritime port management: maritime traffic, port facilities control, fleet management, real-time information systems, port security, port communications and advanced business applications.

The Traffic and Transportation division's 2010 milestones and achievements include:

- A contract with the railway management unit of the Andalusian regional government in Spain to develop and implement an integrated management system for the new metropolitan light rail transit system in the Bay of Cadiz. The project will centralize signaling, communications, security and passenger information systems.
- A contract secured with Fomento de Construcciones and Contratas (FCC) in Spain to develop and implement the management system for the Despeñaperros, La Cantera and El Corzo tunnels on the section of the Autovía del Sur (A-4) highway connecting Venta de Cardenas to Santa Elena.
- A contract signed with the Washington State Department of Transportation (WSDOT) to implement an Open Road Tolling system on Seattle's SR 520 bridge. The project aims to improve traffic conditions and enhance driver safety, while ensuring that toll collection operations remain efficient and reliable.
- A contract with the Maryland State Highway Administration (MD SHA) to implement, operate, host and maintain a statewide passenger information system.
- A one-year extension with the New York Department of Transportation to provide specialized staff for support roles in operating the Joint Transportation Management Center (JTMC) of New York.
- A signed contract with the Brazilian infrastructure and transport directorate (DNIT) to supply and install the control system for the Morro Alto tunnels. This project will centralize tunnel-mounted devices to manage tunnel traffic.
- A contract with DERSA in Brazil to supply, install and maintain the traffic control system for the Sao Paulo ring roads (Marginais Tietê and Pinheiros).
- A contract with Integrated Port Authorities (API) for Ensenada, Puerto Vallarta and Guaymas, in Mexico, for the preventive, corrective and evolving maintenance of marine traffic control centers for a 24-month period.
- A contract with Concesionaria Valles del Desierto (Sacyr Concesiones) in Chile to supply and install a toll system on the Ruta 5 Vallenar-Caldera highway. The project will ensure efficient, reliable collections while shortening user waiting time.
- A contract with Fushun City Urban Traffic Management Project Office in China to renovate and extend the traffic management center in Fushun. The project consists of developing the mobility management platform combining traffic control and guidance systems, enforcement, security and the communications network.

- A contract with Dazhong Panjin Co. Ltd. in China to supply and install an enforcement system for the city of Panjin. The project involves developing and installing photo red light and speed offense detection systems supported by a registration plate identification device to trace offenders.
- A contract with Saudi Oger Limited in Saudi Arabia for traffic management on King Abdullah Road in Riyadh, Saudi Arabia. This contract, for which the end customer is the High Commissioner for the Development of Riyadh, involves implementing the Telvent SmartMobility™ Road system to manage 6 km of highway equipped with four tunnels.
- A project in progress to install traffic regulation systems in the cities of Jeddah, Mecca and Medina, Saudi Arabia.

## Environment

In the interest of a sustainable future, Telvent helps different companies and public bodies overcome the social, environmental and economic restrictions affecting the supply of water to users. The company strives to ensure the quality of the drinking water supply, and fosters good use of emerging technology and services as an integral part of responsible water management.

Telvent manages the supply of water to over 45 M people worldwide

In 2010, Telvent's Environment business area continued to update and improve its technology-based solutions. In the fields of both product and business development, the company has engaged in a policy of selective strategic alliances to bolster the value it offers and entrench its privileged vantage-point in markets where it has achieved leadership.

In geographical terms, Telvent consolidated its environment activities in its strategic regions. North America now accounts for more than 40 % of the segment's entire business. In Western Europe, it has become a benchmark in aeronautical meteorological observation systems. And over the course of the year, it managed to create a solid base of recurring business in countries such as Libya, Jordan and Qatar, thus confirming the powerful attraction exerted by its transport and water distribution management technologies

.

As to business diversification, the focus on water utilities moved towards new business proposals and a wider, more dynamic offering of value-added services. The Environment division made good progress in developing high-quality, robust solutions that add value via efficient water demand management, energy use optimization, leakage control and resource quality. This set of modular, scalable applications make up Telvent's Water Management Suite, WMS, the cornerstone of what Telvent calls Smart Network Management (GIS).

The company's strong bid for innovation and excellence is reflected by the Environment division's sales figures, which in 2010 rose 7.3 % year-over-year to €63 M, accounting for 8.4% of Telvent's total revenue.

The Environment business area includes the following fields of activity:

## Aeronautical Meteorology

Telvent offers aeronautical meteorological observation solutions that meet all International Civil Aviation Organization (ICAO) and World Meteorological Organization (WMO) recommendations. It also supplies rainfall and temperature forecasting to the main airports in the United States and for several international airlines.

## Hydrometeorology

The company develops solutions that include surface meteorology, seismic detection systems, remote detection, meteorological radar networks, surface water flow and quality monitoring and control systems, and hydrologic detection and alert systems. In all these areas, accurate forecasting is vital.

## Meteorological Information

Telvent observes climatic conditions, forecasts weather, tracks and alerts to adverse meteorological and water-related events, and monitors contamination by supplying real-time technology and high value-added services.

In order to provide weather forecasting customers with added value when managing processes and assets, the company has prepared a horizontal platform of decision making support applications that serve the energy, transportation, aviation and other sectors at international level.

## Air Quality

Telvent supplies equipment and installs, maintains and operates air quality control networks and pollutant emission measurement systems in cities and industrial zones. Its concern for the quality of the air we breathe also extends to developing and implementing environmental emergency management systems.

## Water Utilities

Telvent provides technological solutions and services to ensure the integral management of water and purification companies. These solutions embrace applications that operate, maintain and plan comprehensive supply and sanitation systems (networks and treatment plants) and technological platforms capable of processing data in support of business decision making.

In order to combine the operational and corporate activities of water utilities, the company developed its Water Management Suite (WMS), a modular system that allows users to optimize

operational processes and assure service quality by cutting energy costs, reducing network loss, managing demand and controlling the quality of treated water

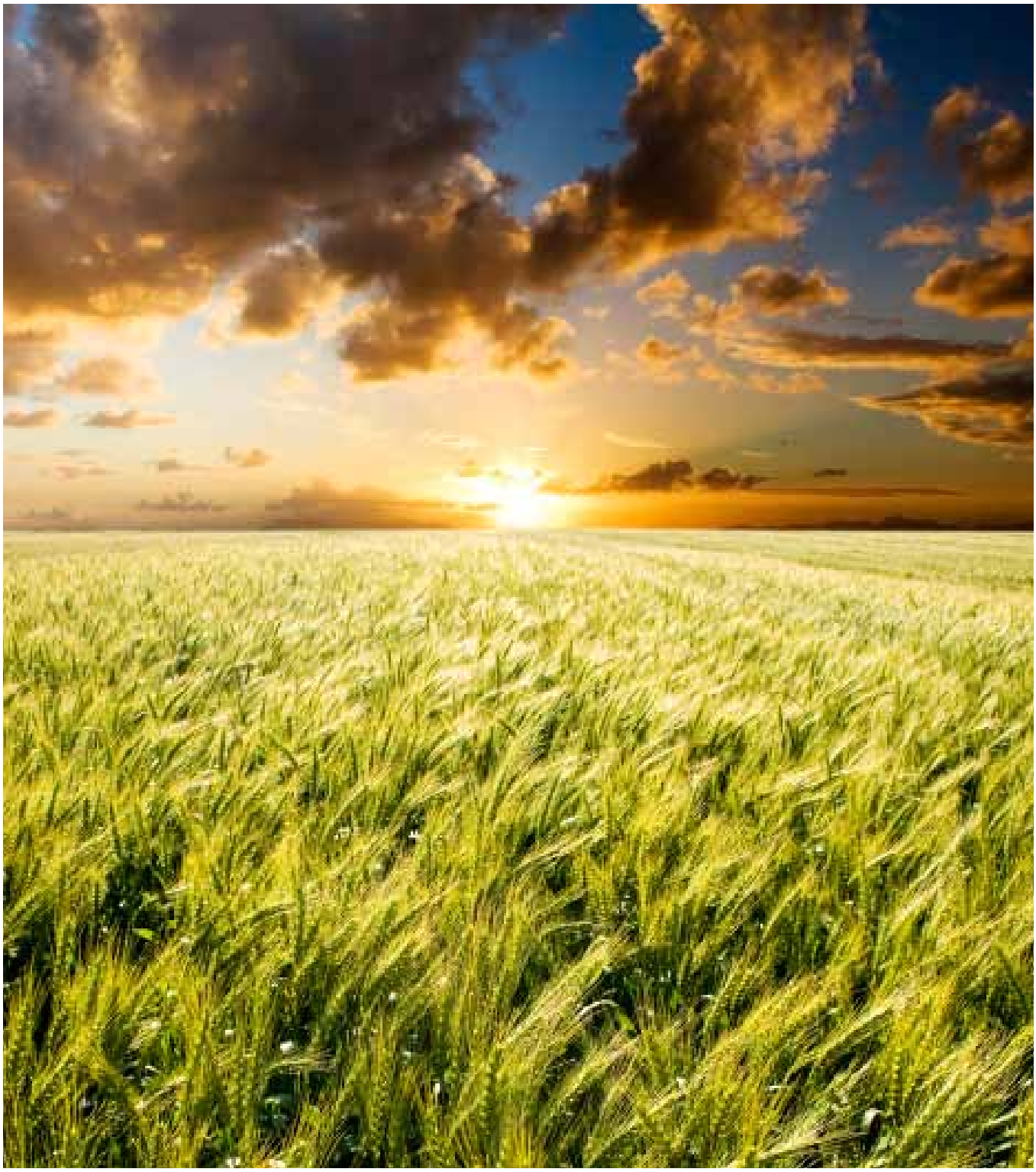
The main 2010 projects and milestones achieved by the Environment business area include:

- The Andalusian Water Agency, a division of the regional government of Andalusia in Spain, commissioned Telvent to maintain the automated hydrological information system (SAIH) for the Guadalquivir basin.
- Telvent maintains Spain's airport meteorology systems under a contract with AEMET, the State Meteorology Agency. After more than a decade of service, this relationship showcases the institution's continued confidence in Telvent's solutions.
- The German Weather Service (Deutscher Wetterdienst) awarded Telvent the tender for the supply, installation and maintenance of an automatic weather observation system (AWOS). The AWOS solution will be implemented at Germany's 16 international airports over 2011 and 2012, including the Berlin, Frankfurt and Munich airports.
- The Central Arizona Water Conservation District (CAWCD) chose Telvent to supply an updated SCADA OASyS solution for the Arizona Central project. This venture is designed to distribute approximately 1,850 M $m^3$ per year of water from the Colorado River to Pima, Pinal and Maricopa counties. The project Telvent has undertaken includes setting up multiple control centers and advanced alert features, among other services.
- Under an agreement with United Airlines, Telvent DTN will support up to 122 airport sites around the world with access to MxVision AviationSentry Online® Airport Operations Edition. This proprietary patented system will provide specific forecasting over the Internet or cell phone network, supplying real-time data on lightning risks and various alerts. Users will also have 24-hour access to Telvent DTN's team of meteorologists via an online forum.
- Florida Power & Light (FP&L)/NextEra Energy, in the United States, has engaged Telvent to implement MxVision WeatherSentry Online®. FP&L will equip its 75 wind farms with the company's technology to receive weather data, real-time lightning alerts and other key warnings.
- Telvent will deliver a SCADA OASyS DNA 7.5 system to the city of Columbus, in the United States, for the Parsons Avenue water treatment plant. The system will build on existing control infrastructure and update the OASyS technology supplied by Telvent in years previous.
- Telvent has signed a deal with Prime Controls in the United States to modernize the SCADA system now operated by City of Dallas Water Utilities (DWU). The company's technology will give the system more robust security and reliability while reinforcing its data distribution features.
- The Eastern Municipal Water District of Perris, California, has awarded Telvent the tender for upgrading the OASyS SCADA system currently in operation in the area. Perris Eastern Municipal Water District supplies water for domestic and agricultural use and collects and purifies wastewater for an area with a population of 699,000.
- In Cali, Colombia, Telvent will implement a SCADA system for the city's aqueduct and sanitation network. The project involves management of the primary network, comprised of nine pump stations, four water treatment plants and a wastewater treatment plant, as well as the secondary network, including an additional 16 pump stations and the sewerage system. The company's solution will integrate all data at the control center running SCADA, GIS and specific network operation applications.
- Rio de Janeiro, Brazil, plans to introduce a Telvent SCADA system to oversee and control part of its water distribution network. The project carries strategic significance for the company in that it firmly establishes it as the leading supplier of water network supervision and control technology in Brazil.
- Water Authority of Jordan (WAJ) commissioned Telvent to implement a Telvent SCADA system in the northern part of the country. This project calls for the control of more than 130 wells and 30 pump stations. Jordan currently faces severe water resources difficulties, because its strategic location is attracting increasing immigration, which in turn puts greater demand on the water supply.

## Agriculture

Telvent DTN's agricultural information services give an edge to customers in the production, marketing and distribution of grain and livestock in the large, complex Canadian and US. markets. These services facilitate the daily business and operational decision making processes of 550,000 subscribers throughout North America. The company supplies vital information to producers, brokers and commodity traders that can help them minimize business risks.

Telvent offers critical information in real-time to improve decision-making along the entire agricultural supply chain



The company's solutions provide exclusive, award-winning editorial content, accurate, location-based weather information, consultancy services, and an online marketing portal that brings together buyers and sellers. These features make it the industry's most advanced information service.

Throughout the year, high price volatility prompted increased sales of Telvent DTN services in this field. Real-time business management requires accurate information — even more so in the present economic uncertainty. The company's customers have shown a high degree of loyalty, and the value of its services has been enhanced. Customer retention rates are near 90 %.

Innovation is fundamental to Telvent DTN's corporate culture. The new, improved products launched this year were widely welcomed by customers. In addition, Telvent DTN's team of 100 analysts and experts is highly regarded as leaders in the industry.

The advertising area has faced tough challenges over the past year as a result of increasing financial pressure on advertisers at all levels. Telvent DTN's offline publication, The Progressive Farmer, which celebrated its 124th anniversary in 2010, continues to be regarded within the industry as a top quality traditional trade publication, and has strong relationships with major advertisers, including John Deere, Sygenta, Bayer, and Pioneer.

In 2010, the Agriculture division's sales grew 6.6 % year-over-year to reach €83 M, or 11 % of Telvent's total revenue.

The Agriculture business area includes the following lines of business:

## Producers

Telvent DTN is the leading supplier of agricultural information services to the North American corn, soybean and livestock industries. The company offers widely-adopted solutions for a range of different agricultural sub-sectors, such as DTN Grains®, DTN Marketspace™, DTN Livestock®, DTN Dairy®, DTN Canada®, DTN Mobile® and DTN Six Factors® Market Strategies..

## Brokers, Converters and Agricultural Businesses

Telvent DTN enjoys a dominant position among the leading intermediaries, converters and associated agribusinesses, including traders, ethanol plants, cooperatives and brokers. All of this is possible thanks to two key applications: DTN Portal™, which enables market players to manage their grain purchases online on a 24-hour basis and integrate sales directly with their management systems; and DTN AgHost®, a powerful management platform for other key industry suppliers.

## Risk Management

DTN ProphetX® is a risk management and commodities trading platform widely used by market professionals for trading and critical information needs. DTN ProphetX offers real-time prices, analysis tools, market news, expert commentary and order execution.

## Advertising

The Progressive Farmer is the leading trade publication in the United States agricultural sector. Released monthly, its highly specialized and educational content has made it a market opinion leader, as confirmed by the editorial awards it wins year after year.

In 2010, the Agriculture division undertook a range of different projects, including the following highlights:

- John Deere Agri Services and Telvent DTN entered into an agreement to link their platforms by integrating the company's information with John Deere's AGRIS™ Commodity Management system. This alliance will help agribusiness professionals using the AGRIS system to automate data entry of pricing information and contracts for completed offers, allow management of cash basis prices in one place, and simplify inventory valuation processes.
- Telvent DTN launched the first comprehensive agricultural app for the Apple® iPad®. Telvent DTN remains the leading supplier of services that keeps in step with the constantly-evolving needs of farmers and producers. Industry professionals can now access agricultural news, market data and specialized weather information in an iPad-optimized format.
- Pioneer Hi-Bred, the leading supplier of advanced plant genetics for farmers around the world, has replaced the conventional news and market data in its online product platform with Telvent DTN's Ag Host technology. This success bolsters Telvent DTN's lead in content aggregation, online data and infrastructure solutions for farmers and agricultural producers.
- Telvent DTN successfully released new order routing capabilities in its agriculture risk management platform, DTN ProphetX, to help customers anticipate market performance and execute transactions. Simultaneously, it also significantly enhanced its infrastructure for delivery of these services, resulting in great sales generation and even higher customer retention in 2010.
- As part of the enhancement of DTN ProphetX, Telvent DTN partnered with CQG, a leading international supplier of futures order routing services, to implement direct futures trading within the flagship trading platform. This project positions Telvent DTN as the leading, agricultural-focused, one-stop-shop for market news and information coupled with instant futures trading execution.
- Telvent DTN won a contract with Illinois-based Archer Daniels Midland Company to implement its weather content. ADM is one of the world's largest agriculture sourcing, transportation, storage and processing companies. The company will replace its current vendor with Telvent DTN's professional weather content for use in its eADM platform. ADM is a very prominent partner in the agriculture industry. Incorporating Telvent DTN weather content will help expand its market intelligence to other leading commodity participants.
- The existing relationship with Abengoa Bioenergy (ABG) was expanded with implementation of the new futures trading capability within DTN ProphetX. ABG is now able to route trades directly to the exchanges via its current Futures Clearing Merchants. Additionally, ABG's use of DTN ProphetX is expanding throughout North and South America, increasing total annual recurring revenue with this key customer.
- Telvent DTN partnered with a premium content provider, Lanworth, LLC to provide state-of-the-art analysis of crop condition, progress, yield and production estimates. This emerging technology uses a combination of satellite imagery, agronomic crop modeling and ground truthing, to provide earlier and more accurate crop forecasts than the USDA. This new service provides Telvent DTN customers with a "heads-up display" on critical issues affecting crop development.
- A contract with Iowa-based Agro National was won to implement Telvent DTN AgHost services. Agro National provides farmers with insurance products and marketing information necessary to make sound financial decisions to increase farm profitability. The company's objective was to provide value-added services (weather, news, market data) to customers via its Web site as well as provide its marketing team with capabilities to electronically communicate to customers and prospects.

## Global Services

Telvent Global Services is Spain's only independent supplier of information technologies able to provide added value to customers over the entire life cycle of its business technology.

This group provides services and solutions that foster security, sustainability and present and future business feasibility, enabling companies and government authorities to keep up with the dizzying changes in technology, manage change and support innovation through collaborative models.

The solutions of Telvent Global Services help corporations and public bodies alike to keep up with the dizzying technological changes we are currently witnessing

The Global Services group aims to help its customers define and re-engineer their processes, technology strategies and systems planning. It provides support for framing and implementing technology solutions that meet the emerging needs of the business. The team works on simulating processes and exploiting and analyzing relevant data in support of successful decision making.

Telvent's competency centers and software factories (six in Spain and two in Latin America) develop tailored applications that provide customers with added value. In addition, the company's five data processing centers located across the Iberian Peninsula offer users more than 25,000 M facilities to meet rising demand for systems and service outsourcing.

In Spain, Telvent Global Services followed a territorial positioning strategy by seeking to grow and create jobs at a local level. The company's approach to customers combines the personalized care, prompt responsiveness and flexibility of a local supplier with the wide-ranging capabilities and robustness of a multinational corporation.

On the international stage, the division continues to diversify geographically. It made a determined effort to develop the company in Latin America by deploying its capabilities in Chile, Brazil, Uruguay and Mexico, while continuing to grow in the United States. As a result, the company created two software factories in Brazil and Uruguay, and more than 200 jobs, on the back of a 250 % leap in sales.

Telvent Global Services' growth in 2010 has made it an exceptionally strong player in terms of proprietary capabilities (consultancy, software factories, product and data processing centers) and third-party relationships (software developers and hardware manufacturers). It is able to offer its customers latest-generation service outsourcing — Software As A Service (SAAS) and Infrastructure As A Service (IAAS) — while generating new ideas (sustainability management solutions) and achieving a clean break with established models (zero-defect apps) to lay the foundations for growth in the coming years.

As a result of new services, geographical diversification and, most importantly, the strong performance of its more than 1,500 highly-qualified professionals, Telvent's Global Services division reached year-end having achieved sharp year-over-year growth in order intake on a like-by-like basis. Revenue for 2010 increased year-over-year by 14.4 % to €145 M, and accounted for 19 % of Telvent's entire business.

The Global Services business area includes the following lines of business:

## Consultancy

Telvent assists its customers in the day-to-day running of their multifaceted businesses, deploying technology and/or process consultancy expertise to provide industry-specific solutions, ranging from the initial stage of pinpointing needs to business transformation.

## Integration

The company consistently demonstrates its ability to integrate different technologies, set complex projects in motion and develop applications within the timeframes prescribed by the market, thereby ensuring their feasibility and ultimate success.

## Outsourcing

Telvent handles the daily running and maintenance of its customers' information systems at their own sites or on an outsourced basis using the company's data center network.

In addition to providing support to key Telvent divisions (Energy, Transportation, Environment and Agriculture), Global Services targets IT-intensive segments like industry, retail, banking and insurance, telecommunications, health care and government.

The Global Services division's milestones and achievements of 2010 were:

- EFE, Spain's state news agency, engaged Telvent to implement the SIEM (Sistema de Edición Multimedia) system to bring together all EFE-generated content onto a single management platform.
- Telvent widened the scope of its contract with Yoigo to embrace help desk services, admin, systems and database monitoring and data storage and backup. The company will continue to be Yoigo's strategic IT partner for the next three years, over which time the Spanish operator plans to gain a strong foothold in the Spanish cellular network market
- The telephone support center attached to the health department of the regional government of Valencia, Spain, chose Telvent to provide technical support in response to incidents affecting health care site employees in the Valencia region.
- Telvent signed a deal with Metrovacesa to provide support to this real estate company's micro IT management and user care area and to its technology department, including consultancy and SAP development services. The contract is intended to achieve comprehensive facility outsourcing in the form of outsourced integrated management of the customer's data processing center and systems administration tasks.
- Telvent entered into a contract with the state-controlled Red.es Corporation to upgrade and expand its services, ranging from hosting Red.es systems at Telvent's facilities to Internet access, backup, operation and maintenance services.
- A number of local authorities and government institutions in Spain opted to use Telvent products to implement their compliance with the recently enacted Law 11/2007, which gives citizens a statutory right to access public services online. Highlighted customers in this connection were the electronic services entity of the regional government of Aragon, Alicante City Hall, Albacete City Hall, Saragossa City Hall, Roquetas de Mar City Hall and the local authorities of El Ejido, Sagunto, Hellin and Cuevas del Almanzora.
- Telvent secured a deal with ADIF, Spain's state-controlled rail infrastructure operator, to develop a rail traffic control simulator. Telvent will re-create a fully functional rail control center at the customer's training facilities where trainees will be required to deal with life-like emergencies.
- Spain's Ministry of the Presidency chose Telvent to provide a validation and electronic signature platform. Telvent will develop electronic signature validation services to put the Spanish authorities in a position to exchange online documents in the European Union setting.
- The company closed a deal with Acciona to train its employees under the Training Itinerary Model (Modelo de Itinerarios Formativos). The project involves designing a new training plan focusing on three competency areas: customer orientation, communication, and flexibility and change management.
- IRB-RE, Instituto de Resseguros do Brasil, awarded a contract to Telvent to implement its new SAP management system, encompassing consultancy, implementation, maintenance and support.
- Isban Chile (a Santander Group company) selected Telvent to develop banking applications and technical support for banking projects in which the Santander Group is involved.
- The Dominican Republic's CEDIMAT, a healthcare entity, is using Telvent's TiCares solution to implement its new healthcare management model. The project will integrate health care management with financial management solutions.

Abeinsa is an industrial and technological business unit that offers fully-comprehensive solutions in the fields of energy, transportation, telecommunications, industry, services and the environment. Its highly innovative solutions are geared towards sustainable development and help generate value for customers, shareholders and employees alike, thus guaranteeing the company's international expansion and future success and the profitability of its investments.

**www.abeinsa.com**

# International Presence


| | |
|---|---|
| Headquarters: | Campus Palmas Altas, Parcela ZE-3 (Palmas Altas)<br>41012-Seville, Spain |
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| Web: | www.abeinsa.com |

| Key Figures | 2010 | 2009 | Var. '10-'09 (%) |
|---|---|---|---|
| Revenue (€M) (1) | 2,248 | 1,541 | +45.9 |
| EBITDA (€M) (1) | 402 | 314 | +28.1 |
| Backlog (€M) | 7,546 | 6,311 | +19.6 |
| Intake (€M) | 3,033 | 3,464 | -12.4 |
| Average number of employees | 11,869 | 10,256 | +15.7 |
| Hours of training (h) (2) | 656,390 | 534,586 | +19.1 |

(1) Including corporate activity and consolidation adjustments
(2) Including the corporate area

# Our Business

The upshot of the prevailing economic gloom both within Spain and abroad is that banks are tightening their purse strings when it comes to lending and demanding more for their money. The crisis has therefore restricted project start-up and led to a slump in business, reflected by the widespread drop in viable opportunities.

This uncertainty and market instability illustrates the managerial prowess and impressive strategy of Abeinsa, which has once again faced up to the crisis and held its ground, closing the year with a grand total of €2,895 M in revenues, €3,033 M in order intake and €7,746 M in the order book, marking an increase of 8 % in turnover.

Abeinsa offers its customers a wide range of solutions relating to energy, transportation, telecommunications, industry, services and the environment. It provides groundbreaking solutions in clean energies and champions sustainable development by applying its considerable technological know-how to the following areas:

- Design and construction of electrical power plants that utilize renewable energies and are capable of generating thousands of MWh of clean energy.
- Design and construction of biofuel plants, which help to combat climate change.
- Design and construction of cleaner and more efficient power plants.
- Design and construction of energy efficient power transmission lines, which help to curb energy consumption.

Parabolic trough at the Solucar platform in Seville, Spain

Abeinsa also conducts research into different fields and develops and applies new technologies to help combat climate change:

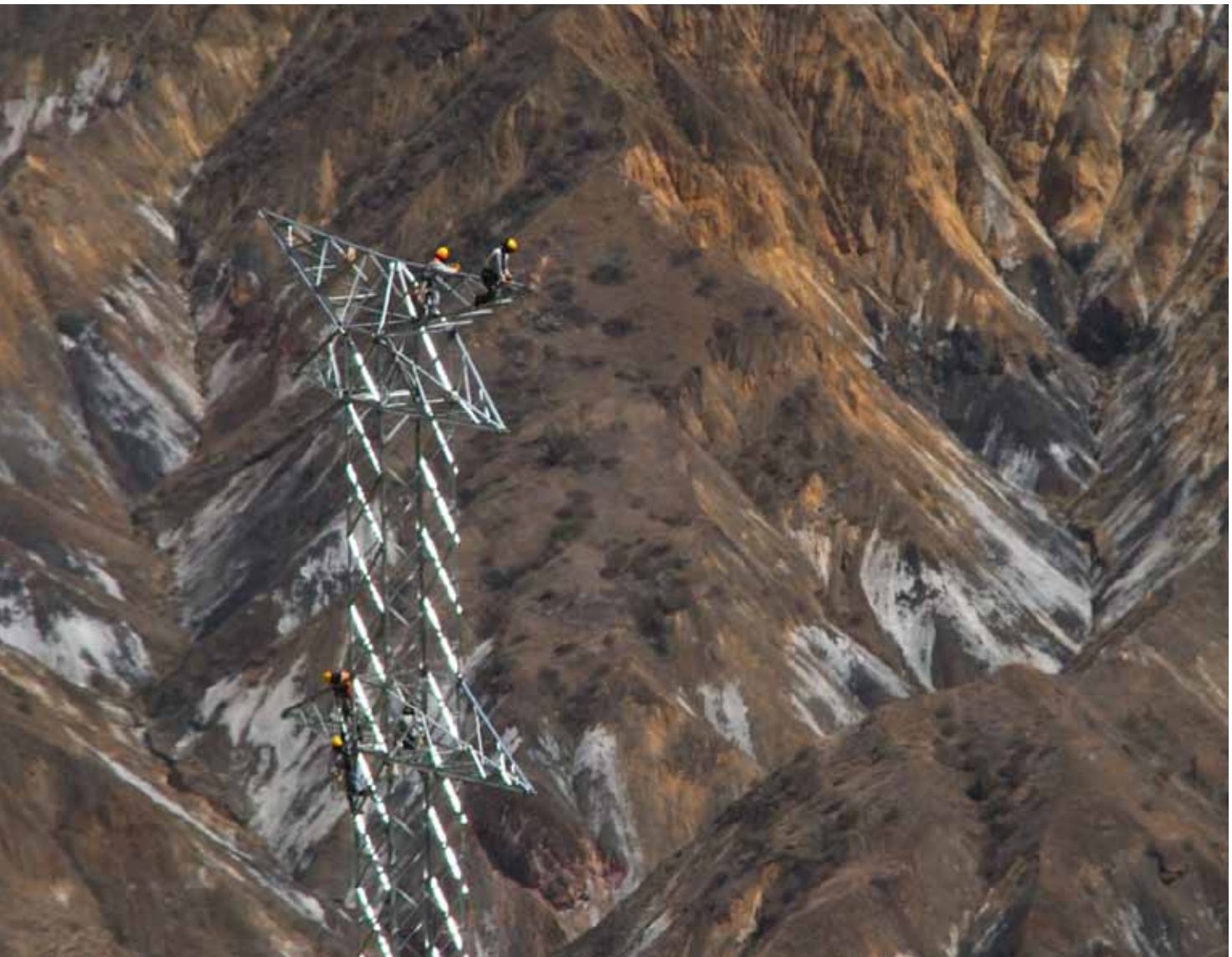
- Through Zeroemissions, Abeinsa helps to reduce emissions of $CO_2$ and other greenhouse gases, thereby working towards compliance with the Kyoto Protocol.
- Through Hynergreen, a market leader in hydrogen technology, with groundbreaking R&D projects in clean energy generation through fuel cells.
- Through the development of new technologies associated with energy efficiency.
- Through research into new renewable energies.

By following this approach, the business unit invests in markets where it can contribute to sustainable development, where technology and innovation make a genuine difference and where it can grow globally and become an international market leader in the long-term. Abeinsa defines its corporate vision as follows: To become a world leader in engineering and constructing energy infrastructures and facilities that promote sustainable development.

Abeinsa structures its affairs around six divisions or lines of business: Energy, Installations, Marketing and Ancillary Manufacturing, Telecommunications, Latin America and Abeinsa New Horizons.

Abeinsa operates in over thirty countries and on all five continents, while operating in highly diverse social, cultural and economic environments. The company applies global standards, policies and practices without overlooking local concerns, allowing it to understand and cater to the specific needs of the different communities it is involved with throughout the different stages of its business.

Power transmission line constructed by Abengoa Perú in the Peruvian Andes



Underpinning Abeinsa's growth is the proper and sound development of energy products, the construction of biofuel and solar thermal power plants, and sustained growth in infrastructures with high value-add, coupled with an impressive degree of internationalization. Mid-term development will be achieved by continuing along these lines and remaining staunchly committed to sustainable development. The company conveys this approach by improving the efficiency and minimizing the environmental impact of its processes and products, placing it on the cutting edge of technological development within the sector.

At Abeinsa, human capital is a key factor in accomplishing its objectives: By providing the necessary know-how and impetus to drive the company forward, Abeinsa employees constitute a crucial competitive advantage who benefit the company through their team work, professionalism and excellence. Abeinsa works tirelessly to ensure that its corporate strategy and human resource strategy are perfectly aligned, and in this respect it has defined four key human resource management objectives:

- Enhancing, harnessing and conveying knowledge.
- Developing talent and skills.
- Recruiting and integrating the most ideally suited candidates for each job, mission and duty in relation to both core businesses and the management teams of the various companies belonging to the business unit.
- Consolidating and permeating its corporate culture and comon management systems throughout all levels of the organization and to all commitments assumed through active policy-making, including corporate social responsibility.

Abeinsa is fully aware of the important role that all its stakeholders play in relation to its business and continued growth, including employees, customers, suppliers and the community at large. It therefore encourages open dialogue and communication through various different channels rooted in the concepts of transparency, honesty and professionalism.

Bioethanol facility in Indiana, USA, during the plant start-up stage

In accordance with the principles underpinning its policy on quality and the environment, Abeinsa knows full well that it can only provide truly excellent service to its customers if it is able to grasp and meet their current and future needs. With this in mind, and in order to gauge the demands of customers and anticipate their future requirements, Abeinsa always maintains direct dealings with them during all stages of the management process and project implementation.

As the future always heralds new challenges and opportunities, Abeinsa uses its sound strategic position to tackle the future with optimism from its sturdy current platform of market leadership, presence in high value-added sectors, geographical diversification and strategic alliances with other leading companies.

Key priorities for 2011 are as follows:

- Entrenching and expanding on technical, commercial and strategic alliances with a view to diversifying products and markets and generating new sales opportunities.
- Extending core businesses to new territories with high growth potential and developing highly promising emerging business lines.
- Launching new lines of R&D&I.
- Generating cash flow.
- Not overlooking traditional markets by developing and following specific strategic plans for these core areas.

## 2010 in Review


Abengoa Perú employee helping to construct a substation

Abeinsa remains upbeat about its future growth, for year after year the company's results have witnessed constant growth and consistently outstrip the company's own expectations. The company is pressing on with its recent drive towards international expansion and growth, while cementing its leadership in the markets where it operates.

This progress would not have been possible without the hard work, talent and dedication of its human team comprising over 11,000 workers, who constitute one of the cornerstones behind the success of its projects.

Ranked in 2010 as one of the world's leading construction firms in energy infrastructures according to the ENR ranking (Engineering New Record), Abeinsa is the largest international construction firm in power transmission and distribution, the world's third largest construction firm for electrical infrastructures and the fourth largest contractor in Latin America.

The main milestones reached in 2010 were as follows:

- Contract awarded to construct the 500 kV Chilca-Marcona-Ocoña-Montalvo transmission line and three new substations in Peru, and to upgrade a further three, including the installation of two series compensation capacitors at the Ocoña substation. The 872 km project encompasses the design, supply, construction and financing of the entire electricity system, and operation and maintenance for a 30-year term.

Abengoa Brasil employees carrying out O&M work on a power transmission line

The world's largest ISCC plant in Morocco, delivered in 2010

- Work completed on the Solnova 1, Solnova 3 and Solnova 4 solar thermal power plants, each with an installed capacity of 50 MW and all now operating successfully at full output. It is estimated that each facility will produce 90 GWh of electricity, enough to power approximately 25,000 households.
- EPC (engineering, procurement and construction) contract awarded and start of construction on what will be the largest solar thermal power plant in the Arab Emirates, namely the 100 MW Shams-1 plant. The contract was secured through an international tender held by Masdar, while the developer is Shams One Company, comprising Masdar, Total and Abengoa Solar. Thanks to just shy of 600,000 m² of parabolic troughs, the plant will generate enough electricity to supply 62,000 households.
- Contract awarded and start of construction on the EPC Solana project in the Mojave Desert (USA), the world's largest solar power plant to date with 280 MW of gross power. The facility utilizes parabolic trough technology with thermal storage achieved through molten salts to extend the hours over which the plant can operate during the day.
- Work continued on three solar thermal power plants and construction got underway on five other facilities in Spain, specifically in the municipalities of Ecija and El Carpio in Andalusia, Logrosan in Extremadura and Ciudad Real, all with an installed capacity of 50 MW and featuring parabolic trough technology.
- Completion and delivery to the client of the Integrated Solar Combined Cycle (ISCC) solar thermal power plant in Ain Beni Mathar (Morocco), the world's largest ISCC plant. The facility will produce 482 MW of total power, with the solar field contributing 24 MWe, as well as specific consumption associated with the generation of thermal power by the solar field.
- Completion and delivery to the client of three bioethanol plants, two in North America and the other in the Netherlands, with a combined capacity over 300 Mgal/year (1,160 ML/year).
- Start of construction on the 300 MW cogeneration plant in Tabasco (Mexico) for the state-owned company Petróleos Mexicanos (Pemex). The project includes operation and maintenance for a 20-year term. The new facility will be able to generate up to 800 t/h of steam to supply electricity

to the Nuevo Pemex Gas Processing Complex in Tabasco, and will export surplus power to the Mexican national power grid.

- Completion of construction work on the 200 kV high-voltage Carhuamayo-Carhuaquero power line and associated substations in Peru. The project includes 670 km of line, two new substations and five upgrades to existing substations.
- Start of construction on the 600 kV direct current Porto Velho-Araraquara power line in Brazil. This is a truly groundbreaking milestone in that it is one of the world's longest direct current transmission lines at 2,350 km.
- Abener awarded the "X Premio Andaluz a la Excelencia" award for excellence in the "Management Systems" category, a competition staged by the Regional Government for Economy, Innovation and Science with the collaboration of the Centro Andaluz para la Excelencia en la Gestión (Andalusian Center for Management Excellence).
- Abener Teyma awarded the CSP Today award for best EPC contractor of the year.
- Abengoa Perú awarded the National Prize for Quality by the Sociedad Nacional de Industrias, making it the first construction firm to receive the accolade.
- Huawei named Instalaciones Inabensa its Outstanding Technologies Partner in recognition of its development, capacity and technological cooperation, and presented it with the European Partner Award, confirming Inabensa's position as one of Huawei's leading collaborators in Europe.
- Inabensa Tianjin presented with Best Electric's Best New Supplier of the Year award.

Abeinsa's strategy of geographic and business diversification over recent years was reflected in the setting up of new subsidiaries and the acquisition of new companies in 2010:

- Agreement signed with Befesa to take over the engineering and construction business line for water and environmental projects. Following completion of the deal, which took place on January 1, 2011, Befesa is now responsible for promoting, developing and operating desalination and reuse plants and for handling the associated R&D&I, while Abeinsa is now charged with EPC performance and the remaining business activities. The transaction has enabled Abeinsa to broaden its range of products and services by penetrating a sector offering huge growth potential. It similarly cements its position in the market by incorporating an additional activity that other enterprises with a similar profile are already developing. The new activity will be carried out through Abeima (Abeinsa Infraestructuras Medio Ambiente SL), a truly international company employing close to 400 workers on four different continents.
- Acquisition of Abacus Project Management, a North American project management company operating out of Arizona and California, with excellent human capital and operational capacity focusing primarily on the western coast of the United States.
- Abratey, a company incorporated by Abengoa Brasil and Teyma and specializing in civil engineering in Brazil.

Workers constructing a power transmission tower in Chile

- Agreement for Abengoa Brasil to acquire a 50.1 % stake in Damp Electric, a supplier of key products for the business value chain, such as metallic structures, the building blocks with which to construct power transmission towers.
- Incorporation of the companies Norventus Atlántico SL and Arao Eólica SL, both with head offices in A Coruña and engaged in the promotion, design, construction and operation of electricity-generating wind farms and facilities, and also the sale and marketing of electrical power.
- Opening of Inabensa's commercial office in Doha, Qatar.

# Our Activities

Abeinsa is an international company engaged in industrial engineering and construction. Its business revolves around six divisions or lines of activity: Energy, Installations, Marketing and Ancillary Manufacturing, Telecommunications, Latin America, and New Horizons.

- Energy. Integrated solutions in the energy sector, including the development, funding, engineering, construction and operation of new power plants and industrial facilities, with special emphasis on the solar and biofuel sectors, and streamlining of existing facilities.
- Installations. Engineering, construction and maintenance of electric and mechanical infrastructures and instrumentation for the energy, industry, transportation and services sectors, as well as the installation of insulation and refractory and passive fire protection materials.
- Marketing and Ancillary Manufacturing. Marketing of products associated with the activities described above and the manufacture of auxiliary elements for the energy and telecommunications sectors.

482 MW Ain Beni Mathar ISCC plant in Morocco

- Telecommunications. Integration of telecommunication networks and turnkey projects.
- Latin America. A market in which the company has maintained a solid presence for more than forty years through local companies that enjoy full autonomy when carrying out all of the business unit's activities.
- Abeinsa New Horizons. Engaged in innovative projects relating to sustainable development: hydrogen technologies, energy efficiency, carbon credit management, $CO_2$ capture and sequestration and new renewable energies, such as ocean energy.

## Energy

This business line focuses primarily on the development, design, construction and maintenance of industrial plants and conventional energy (cogeneration and combined cycle) and renewable energy (bioethanol, biomass, solar, and geothermal) power plants.

When applied to power generation plants, the Operation and Maintenance (O&M) business line carries out preventive, scheduled and corrective maintenance of equipment and systems, and operates them to ensure that the facility operates reliably and is meeting its technical specifications, the ultimate aim being to minimize fuel consumption and greenhouse gas (GHG) emissions while maximizing the load factor (actual vs. projected electricity generation).

### Abener

Abener is a market leader in engineering and construction geared towards sustainable development. The key to the company's ongoing success is innovation, penetration of new emerging markets and its commitment to the environment.

Abener currently operates in three areas of business: solar, biofuels and generation. The company performs turnkey EPC projects using its own engineering capacity and knowledge management processes and also carries out operation and maintenance work (O&M). Abener champions sustainable development and international development through its network of engineering firms and subsidiaries, namely AG Ingeniería (Spain), Abener Poland, Abener North America, Abener India and Abener México.

The company has cemented its position in the Spanish solar energy market with the commissioning of three 50 MW solar thermal power plants at the Solucar platform (Solnova 1, Solnova 3 and Solnova 4). In tandem with this, construction work is now underway on the solar platforms in Ecija, Extremadura, Cordoba and Ciudad Real, all in Spain. All these facilities comprise two 50 MW plants utilizing parabolic trough technology, with the exception of the Extremadura facility, which features four 50 MW plants.

A major milestone on the international stage was the company's completion of the world's largest ISCC plant in Morocco (482 MW). Abener also expects to start up a further ISCC plant in the first half of 2011. These two ambitious projects have afforded Abener a position of technological leadership worldwide and underscore the company's unflinching commitment to society and the environment.

In the solar energy division, Abener secured contracts to construct what will be two of the world's largest solar thermal power plants, namely Shams-1 (100 MW) and Solana (280 MW gross), located in the United Arab Emirates and North America, respectively, and both currently under construction. The Shams-1 project was awarded under an EPC agreement through an international tender process staged by Masdar. The developer is the company Shams One Company, comprising Masdar, Total and Abengoa Solar. Thanks to just shy of 600,000 $m^2$ of parabolic troughs, the plant will generate enough electricity to supply 62,000 households.

The Solana project, the world's largest solar power plant with 280 MW of gross power, utilizes parabolic trough technology with thermal storage achieved through molten salts to extend the hours over which the plant can operate during the day and at night. The contract also envisages full EPC.

Biomass cogeneration plant in Brazil

Abener has strengthened its leadership in engineering and constructing bioethanol plants by completing work on one of the world's largest bioethanol plants in Rotterdam (the Netherlands), and two other large plants in the United States (Indiana and Illinois). As a further illustration of its commitment to innovation, Abener is currently collaborating with the client to develop second-generation bioethanol plant technology for the Hugoton plant in Kansas (USA), which will run on cereal straw instead of grain.

Abener has also enjoyed considerable success in the conventional electrical power generation market, ranging from upgrade work and simple/combined cycles to motor and cogeneration plants. The operational success of these industrial facilities is a fine illustration of Abener's formidable capacity in this area. Prime examples include the construction work currently underway on the new 300 MW cogeneration plant for Pemex, and the two 70 MW biomass cogeneration plants (bagasse and sugarcane) in Brazil, which were completed in 2010.

## Operation and Maintenance

The O&M division worked on five different plants in 2010: Four cogeneration facilities sited in Alcantarilla (Murcia), Motril (Granada), Ayamonte (Huelva) and Cuevas de Almanzora (Almeria), all in Spain, and the Ain Beni Mathar ISCC plant in Morocco. The total power output of all these facilities combined amounts to 579 MWe.

2010 also saw the O&M division select the staff who are to form part of the O&M team for the 150 MW ISCC plant in Hassi R'Mel (Algeria). This new workforce is actively involved in the start-up of the plant and is applying the wealth of experience built up by Abengoa in handling O&M work on North African plants. This know-how will be enormously useful for further developing solar power production facilities within this market, one of the strategic horizons offering the most promising opportunities for the company in terms of business operations.

In 2010, the company successfully implemented a new maintenance management system at the Ain Beni Mathar ISCC plant in Morocco, which will afford it greater management control and efficiency at the plant. The next plant to feature this same system will be the 150 MW Hassi R'Mel plant in Algeria.

## Installations

Abengoa Bioenergy Netherlands bioethanol plant in the port of Rotterdam, the Netherlands

As part of Abengoa's strategy of specializing in key areas, 1994 saw the company incorporate Instalaciones Inabensa SA, the parent company of this particular line of business, which encompasses all activities associated with electrical and mechanical installation work, instrumentation, large power lines, railroad business, maintenance, manufacture of electrical panels and cabinets and telecommunications, all of which have been core activities at Abengoa since its inception back in 1941.

# Inabensa

Inabensa operates in the industrial and infrastructure engineering, construction and maintenance market within the energy, industry and, transportation, services and communications sectors. It provides global solutions to meet the most stringent demands of its customers, who continue to place their trust in Inabensa due to the sheer quality of the services it offers.

Year after year, burgeoning business overseas has enabled the company to strengthen its position in its strategic markets through its subsidiaries and permanent establishments in Portugal, France, Morocco, Australia, India, Costa Rica, Abu Dhabi, Libya, China and Saudi Arabia.

It currently operates in the following areas.

## Electrical Installations

Inabensa's work in this field encompasses the engineering, construction and outfitting of infrastructures.

The following milestones were of particular note in 2010:

- In the industrial sector, Inabensa completed electrical upgrade work on the Ford factory in Almusafes for the Fiesta and C-Max project, and also completed the new power station for Alicante airport, with its network of distribution galleries for electrical services, both projects in Spain.
- The company completed work on remodeling the stations on line 5 of the Madrid Subway, lighting the tunnel on line 6, and upgrading the Moncloa, Manuel Becerra, Diego de León and Ciudad Universitaria stations for Metro de Madrid.
- Inabensa awarded a contract to remodel the existing power lines in northern Catalonia in order to increase their transmission capacity. For Adif, the Spanish railway infrastructure administrator, Inabensa continued work on the services affected by the high-speed Madrid-Barcelona-French Border railway line, specifically the following sub-sections: La Torrassa-Sants, Hospitalet-La Torrassa and Sants-Sagrera.

Electrical switchboard manufactured by Inabensa

## Mechanical Installations

In this particular field, Inabensa is involved in the design, supply, manufacture, assembly and testing of mechanical systems for large projects.

At present, the mechanical assembly department is collaborating with other parties to construct the Ecija 1 and 2 solar power plants, and to manufacture, supply and assemble the piping and equipment for the entire Heat Thermal Fluid (HTF) system and power island.

## Maintenance and Instrumentation

In the field of maintenance and instrumentation, Inabensa engineers, supplies, assembles, calibrates and implements process control installations, while also providing a fully-comprehensive installation and infrastructure maintenance service. Highlights in this respect include the work performed on the fuel storage facilities for CLH in Barcelona, Alcazar de San Juan, Albuixech and Torrejon, all in Spain.

## Rail

Inabensa's projects on conventional rail, high-speed rail, city rail and light rail systems include the design, construction and start-up of all electric drive systems.

Highlights for 2010 include the start of a contract awarded by Adif to construct the overhead contact line and associated systems for the new high-speed Madrid-Eastern Coast railroad access route along the Motilla del Palancar-Valencia and Motilla del Palancar-Albacete sections. In addition to this high-speed project, Inabensa was also involved in conventional railway work for Adif as work got underway to construct the overhead contact system for the Albacete-Almansa and Variante de Mojon Blanco sections on the Madrid-Alicante line, and the company also completed upgrade work on the catenary system along the Gallur-Castellon and Mataporquera-Reinosa sections.

Barcelona subway station

## Large Lines

In the large power line business, Inabensa engineers, constructs and commissions high and medium voltage power systems.

It has worked extensively with the Spanish power transmission corporation Red Eléctrica de España (REE), and has similarly taken part in numerous projects to construct new 400 kV power lines, including in particular: termination of the Arcos-La Roda, Aparecida-Tordesillas line; the Torrente electrical substation; the Udalla electrical substation; and a new section on the Soto-Penagos line in Asturias.

## Manufacturing

The company's production workshops in Seville and Alcala de Henares (Spain) and in Tianjin (China) design, manufacture and test all electrical and electronic products.

Highlights include production of rail control cabinets and ticket vending and traffic control machines for Jaen light rail system. The facilities also manufacture equipment and associated electronics to implement contactless smart technology for the transportation sector within the context of the Barik project.

## Insulation, Refractory and Passive Fire Protection

In this particular field, Inabensa designs, constructs and carries out maintenance work on installations, while also manufacturing its own range of products and insulation material.

The year 2010 witnessed successful completion of the insulation work on the Solnova 3 and Solnova 4 plants at the Solucar solar platform. Furthermore, the Sulphur Block plant was completed under the ACPDM project, and extensions were made to the Cepsa refinery in Huelva. Contracts were also awarded for work on the Helios I and Helios II solar power plants in Ecija (Spain).

The company Técnicas Reunidas entrusted Inabensa with the task of fireproofing and supplying the necessary material for the Galp plant in Sines (Portugal), and the company has also been kept busy supplying material to different fireproofing solution providers in the construction and industrial sectors.

## Service Concessions

The concessions division caters to the needs of modern society and is witnessing an increasing demand from various sectors for companies capable of providing operation and maintenance services and services to enhance infrastructures and public services.

For example, the parking lot at the Hospital Costa del Sol was brought into service in 2010 to coincide with completion of the hospital, thus complementing the other concessions currently in operation, such as the Hospital de Aranjuez and the court buildings in Olot, Cerdañola and Santa Coloma, all in Spain.

The photovoltaics department was also involved in projects for roof-mounted solar facilities, including extension work on the World Expo Zaragoza site, the solar power plant at the municipal swimming pool in San Roque (Cadiz) and the desalination plant in Almanzora (Almeria), all in Spain.

### Overseas

In India, construction work continued on two 400 km sections of the 765 kV Biswanath Chariyali-Agra direct current power transmission line, and work was completed on the awarded section of the 400 kV Bariapada-Bhaddrak line.

In Saudi Arabia, construction got underway on the high voltage 132 kV power line in Qurayyat for the SEC (Saudi Electricity Company). The company is also constructing the Jeddah and Riyadh GIS (Gas Insulated Substations), both 380 MW and 132/13.8 kV, again for the SEC.

The manufacturing segment also fared well thanks to the company's subsidiary in China, which was involved in projects for various different clients and countries.

## Telecommunications

The telecommunications division constructs and maintains outside plant, supplies customer loops and equipment and integrates products and services in order to deploy, install and operate telecommunication networks. This is carried out by both Abentel and Inabensa's own communications divisions.

### Abentel

During the year, the company continued to work on the 2007-2012 Global Customer Loop Agreement with Telefónica de España SAU, with implementation ongoing in the provinces of Alicante, Badajoz, Barcelona (where Abentel's initial stake of 7 % of the province has been extended to 10 %), Cadiz, Jaen, Madrid, Seville, Tenerife and Valencia. Abentel is Telefónica's chief collaborator on this particular agreement in Spain.


Abentel fleet in Spain

Over the year, 256,000 new customer subscriptions were secured for Telefónica (132,000 for voice, 110,000 for ADSL and 13,000 for Imagenio) and nearly 500,000 faults were repaired.

As part of the activities envisaged in the agreement, Abentel has been involved in the project awarded to Telefónica by the Spanish government to roll out the Iris Nova Network throughout Spain, with the scope of the network mirroring the territorial scope of the agreement. To date, a fiber optic network has been laid to link different universities and state-owned research centers, with a grand total of 1,000 km of cable containing 64 optical fibers laid in eight of the nine provinces awarded under the agreement.

Abentel is also taking part in a project to transform Telefónica's access network. The initiative entails the gradual implementation of FTTH (Fiber To The Home) networks throughout various Spanish cities. The work essentially involves preparing the trunk infrastructure and the end-user access infrastructure through fiber optic cables in order to provide Telefónica customers with the considerable bandwidths that these networks have to offer. The infrastructure deployed to date extends to 32,500 households, which are supplied through 143 km of fiber optic cable (between 64 and 256 optical fibers) for the trunk network, and nearly 200 km of 32-fiber or less cable for the end-user access network.

Telecommunications system designed and manufactured by Inabensa


## Inabensa Communications Division

Inabensa's communications projects embrace the design, supply, manufacture, assembly and testing of telecommunication systems and equipment.

Highlights for 2010 included ongoing projects with technological partners, such as Huawei and Ericsson. Thanks to Inabensa's work with Huawei, the company was named Outstanding Technologies Partner in recognition of its development, capacity and technological cooperation. It was also presented with the European Partner Award, cementing Inabensa's position as one of Huawei's most trusted collaborators in Europe. Inabensa is also continuing to collaborate with Ericsson at switching exchanges for Orange, and is similarly working with NSN on projects for the operators Orange and Telefónica, consisting of DNO maintenance and UMTS installation work.

# Marketing and Ancillary Manufacturing

Within this field, Abeinsa primarily manufactures and markets products related to the business unit's activities, while also producing auxiliary elements for energy and telecommunications.

Nicsa held on to its dominant position in the Spanish market and consolidated its international status as a supplier of electric materials, instrumentation and communications for the chemical and petrochemical industries, refineries, combined cycle, solar thermal, nuclear and thermal power plants and heavy industry in general. In 2010, the company successfully tackled a number of major projects and its subsidiaries in Mexico and North America reported very healthy results.

Abencor continues to focus its business model on the markets typically associated with sustainable development. The company was primarily engaged in creating three new areas in 2010, specifically two sales divisions (one dedicated to Spain and the other to overseas markets) and a procurement division. The Spain division is focusing on existing customers, catering to their needs and forging as close a relationship as possible, while the exports division is mainly targeting business in Latin America (Brazil, Chile, Peru and Mexico), Europe (Portugal and Germany) and the Far East (especially India). The procurement division is geared more towards relations with the company's key suppliers, while also formulating offers and seeking out and endorsing attractive new products.

In 2010, Eucomsa further cemented its standing as a prime supplier of solar structures, accounting for over 70 % of the company's total performance. It also regularly improves upon the design of parabolic troughs, thus making them more competitive within the market and affording Abengoa significant cost savings. Along with the solar energy business, highlights for 2010 include projects carried out for REE as part of the company's core tower manufacturing business.

Driven forward by the wealth of experience and know-how it has built up in exports, Comemsa remains very active in the Latin and North American markets, where it created the company Power Structures in 2009 to sell its products and provide customer service.

Comemsa is engaged in the manufacture of metallic lattice towers for power lines, structures for electrical substations and telecommunications towers. In 2010, it increased its floor and storage area to meet heavy demand and ensure full customer satisfaction.

## Nicsa

Highlight projects for 2010 include the following:

- Project to extend the Repsol refinery in Cartagena, Murcia (Project C10): Supply of power cables and instrumentation, lighting, trays, conduit, junction boxes, compression glands, control stations, power outlets, panels, capacitor batteries and direct current supply boxes.
- Fuel Oil Reduction Unit project for Petronor, Repsol's refinery in Bilbao. Fully-comprehensive agreement to supply all the electrical equipment and instrumentation assembly work for the project. The scope includes: electrical and instrumentation cables, grounding, trays, conduits, lighting, junction boxes, compression glands, switching stations and power outlets.

Repsol refinery where Nicsa is supplying material and equipment

- Reconversion of Galp Energia's refinery in Sines (Portugal), along with various combined cycle facilities, all contracted through the company Técnicas Reunidas.
- Platforms for Pemex, specifically the residential Litoral Tabasco platform and the PG-Zaap-C electrical power generation platform, both secured through Dragados Offshore, including the supply of cables, connectors, lifting equipment, winches, telecommunications system (turnkey), UPS, CSM and bushings.

## Abencor

Highlight projects for Abencor over 2010 include:

- Supply and assembly for the EDP Group of two power transformers for the Pestera substation, and a further two for the Cernavoda substation, both in Romania. Supply of power transformers for the Helioenergy and Solacor solar thermal plants.
- Milestone projects outside Spain were as follows: in Brazil, the supply of AAAC 1055 MCM conductor cable (61 alloy/3.34 mm) in the Amazon Rainforest (Manaus, Urucara and Itacoatiara) for the company Manaus Transmissora de Energia SA; in Chile and Portugal, ACSR Canna conductor cable was supplied in Antofagasta for Abengoa Chile and in Angola for Eurico Ferreira SA; in Mexico, 205 MVA principal transformers were supplied to the joint venture Abener Inabensa NP Tabasco I for the Nuevo Pemex cogeneration project in Tabasco; in Portugal, solar panels; in Algeria, measurement transformers for Electricidad Industrial Portuguesa; and in Germany, solar panels for Soellinguer and Solarsysteme Bayer.

Supply of cables for the Norte Brasil project

Tower designed and constructed by Comemsa

## Eucomsa

Highlight projects for this company include the following:

- Supplies for the Ecija 1, Ecija 2, Cordoba 1, Shams 1, Cordoba 2, Helios I and Solaben 3 solar power plants.
- Major power transmission line contracts included the Abanto-Penagos-Güenes, L/400 kV Brazatortas-Manzanares, L/400 kV Fuendetodos-Mezquita, Olmedilla-Moncada and the 400 kV Almaraz-San Servan lines for REE in Spain, along with various power lines in Northern Ireland and sundry supplies for various customers (Energy Ventures, etc.).
- Highlights in the mobile telephony segment were the towers constructed for Inabensa Maroc in Morocco and the towers for various Spanish projects of Inabensa (Telefónica, Vodafone, Adif, Aena, etc.).
- As regards testing stations, highlights included Balfour Beaty (400 kV), Inabensa (Costa Rica power towers), Ireland's ESB, and sundry towers for customers such as Eléctrica de Medellin (Siepac), Made, Jovir, Andel, and so on. Testing station equipment was also provided in order to make improvements to the new parabolic trough design. This line of business reported year-on-year growth.

The metal sheet and plate division was disbanded in 2010 and merged into the structures division, although its main product remained untouched - fiber optic cabinets for Telefónica. Part of the division's floor area was also used for welding work in 2010, the aim being to increase this activity through the introduction of new robots in 2011.

## Comemsa

The company continued to supply structures for solar power plants in 2010, on this particular occasion for the Shams-1 project in the United Arab Emirates. In the towers division, towers were successfully supplied for the 500 kV Comahue-Cuyo power transmission line, along with structures for the Nea-Noa substation, both for Teyma in Argentina. In Mexico, Comemsa supplied the power evacuation line for the cogeneration plant that Abengoa México and Abener are constructing for Pemex.

Further highlights included the supply contracts secured in the United States: Southern California Edison awarded the company segments 6, 7 and 8 under the TRTP project for a grand total of 16,500 t, while the company PSEG in New Jersey awarded segments 2, 2A and 3, totaling more than 10,000 t of supplies.

# Latin America

The Latin America business unit has created local companies to operate in the following countries: Argentina, Brazil, Chile, Mexico, Peru and Uruguay. It operates as an independent group within Abeinsa, in that it works within a specific market where the company has enjoyed a solid presence for over forty years and where the different group companies conduct all of Abeinsa's lines of business, including energy, installations, telecommunications, marketing and ancillary manufacturing, civil engineering and environmental services.

## Teyma Abengoa

Abeinsa's local company in Argentina remains a key player under the federal 500 kV and 132 kV power transmission line project.

Teyma Abengoa has also made several successful ventures into hydraulic piping and water treatment in an attempt to diversify its range of local products and services, and was similarly involved in expanding the wastewater network for the municipality of San Vicente.

# Industrial Engineering and Construction

2010 proved to be a key period for the company in terms of sales. Despite having the same corporate structure as in 2009, Teyma Abengoa managed to double the volume of bids presented to various public and private clients. Although some of the bids have yet to be awarded, the company remains upbeat about its chances, and during 2010 it managed to secure a core engineering contract from a private mining client, Vale Do Rio Doce, under which the company is to provide electrical power to the Potasio Rio Colorado mine in Malargue, Mendoza.

The main contracts performed in 2010 include:

- 500 kV Comahue-Cuyo (southern section) interconnection project to connect the Agua de Cajon substation in the province of Neuquen with the Gran Mendoza substation located roughly 707 km away in the province of Mendoza. This will require a 500/220 kV substation called Los Reyunos (currently Rio Diamante) midway between the two points.
- 500 kV high voltage power line spanning 518.6 km between the Agua del Cajon and Los Reyunos substations.
- Expansion and upgrade of the Agua del Cajon transformer station in Comahue, Neuquen province. The existing facilities will be expanded to feature a breaker and a half scheme.

Teyma Abengoa assembling transmission towers

# Abengoa Brasil

Impressive project intake in 2009, coupled with numerous concessions in commercial operation, saw the company experience dizzying growth in 2010.

Having already successfully developed the core aspects of its strategic plan, while at the same time forging strategic alliances, insourcing knowledge and diversifying business, Abengoa Brasil was able to acquire a 50.1 % stake in Damp Electric, a manufacturer of metallic structures, and also incorporate, along with Teyma, the company Abratey, which will carry out civil engineering work in the country. The company continued to diversify its range of products and services over the year by venturing into wind power and water management.

## Power Transmission Grid Concessions Division

In Brazil, the company is currently operating 2,877 km of high voltage lines (230-500 kV) and boasts a further 4,064 km of lines through new concessions currently undergoing engineering and/or construction work.

The company remains one of the country's leading private power transmission companies, and was involved in the following key projects in 2010:

- ATE IV Curitiba-Bateias line, ATE V Jaguariaiva-Itarare line and ATE VI Campos Novos - Videira, all of them brought into service in the south of the country.
- Installation permit obtained for the Orximina-Silves-Lechuga under Manaus power transmission line, and the corresponding construction work got underway.

## Engineering and Construction Division

The company has signed a commintment to forging strategic alliances in order to drive forward growth, as evidenced by its acquisition of a 50.1 % stake in Damp Electric, a supplier of key products in the engineering and construction value chain, such as the metallic structures needed to construct transmission towers.

Abengoa Brasil employees carrying out O&M work on a power transmission line

With a view to securing a better foothold in the hugely important civil construction market in Brazil, Abengoa Brasil and Teyma incorporated the company Abratey in 2010, which will harness the capacities of both its founding companies to capture business opportunities in the Brazilian civil construction and engineering market.

The company has reached the decision to use its own resources when engaging in construction work, given the strategic importance of cutting costs and in light of the financial crisis currently plaguing the companies that Abengoa Brasil used to subcontract to construct its installations. The engineering department was also consolidated over the year and now provides its services directly to assist the company with its projects.

The company remains one of Brazil's leading private power line construction firms, with key projects for 2010 including:

- Start of engineering on the 600 kV direct current Porto Velho-Araraquara power line. This is a truly groundbreaking milestone in that it is one of the world's longest direct current lines at 2,350 km.
- Construction work completed on the lines and substations needed to connect the São João and São Luiz power stations to the electricity grid in the state of São Paulo.
- Completion of construction work and start-up of the 132 km ATE V power line.
- Project initiated to increase transformation power at the ATE VII Foz de Iguaçu and ATE III Itacaiúnas substations.
- Work continued on the turnkey EPC agreement signed with Electronorte to construct the Ribeiro Gonçalves-Balsas transmission line.
- Start of construction on the 500 kV Oriximina-Silves-Lechuga power line under the Manaus project after obtaining the installation permit in November.
- The company's own engineering department started engineering work on the 230 kV Jauru-Porto Velho power line as part of the Pre-Madeira project.

## Bargoa

Bargoa specializes in engineering product development, the manufacture of thermoplastic injection molds, stamping of metallic components and final product assembly. The company mainly operates within the telecommunications sector.

Expert staff use cutting-edge equipment at the company's laboratories to carry out the necessary trials and testing to verify that the manufactured products and components are up to standard. This work is carried out at the Camarín and Lagoas plants in the state of Rio de Janeiro, Brazil.

The company comfortably met all the objectives it had set itself for 2010 by increasing its share in the Brazilian market and launching new products. It was also spurred on by renewed investment in the sector over the second half of the year. Key accounts include the operators Oi, Telesp, Brasil Telecom, Eltek and Embratel. Outside Brazil, the operators Telefónica de Chile, Telefónica de Argentina, Japan's Nobargo and Korea's A.J. World are key clients.

## Abengoa Chile

The year 2010 started out with a national catastrophe that hit the economy hard for the first few months. The earthquake and resulting tsunami had a heavy bearing on the country's investment priorities and certain important projects from the private sector were put on ice. On top of this, the country saw a change of government in 2010, with the market on tenterhooks as to how its economic policy would pan out. Yet despite these setbacks, Abengoa Chile held on to its market share.

Overhead line constructed by Abengoa Chile in the commune of Sierra Gorda

Of note among the main projects secured and performed in 2010 were the following:

- Construction completed on two overhead lines for Minera Esperanza. The first was 110 kV and 55 km in length, spanning the Chacaya substation and the Principal Puerto substation in Michilla. The second, was 2x220 kV, 82 km in length, spanning the El Cobre and Esperanza substations, is used to deliver electricity to the Esperanza Project, located in the commune of Sierra Gorda, 150 km from Antofagasta.
- Ongoing construction for Pacific Hydro Chile of the interconnection substation and modification of the Maitenes and Sauzal substations and the 2x220 kV power transmission line between the Chacayes and the interconnection substations. The work requires the company to configure the interconnection substation as a SF6 gas insulated substation (GIS), modify and extend the Maitenes and Sauzal substations and construct a 2x220 kV line between Chacayes and interconnection.
- In 2010, the client Aguas Andinas awarded Abengoa Chile a contract to renovate and install drinking water pipelines. The company was also involved in the Gran Alimentadora Valparaíso pipe relaying project along the 2,850-5,528 km section.

## Abengoa México

Abengoa México successfully overcame the economic crisis in 2010 by seizing a number of important opportunities for sustainable growth. Its strategy is currently geared towards greater involvement in projects from Pemex and other private clients. It operates while keeping energy consumption and GHG emissions to a bare minimum, thus helping to champion sustainable development.

- Electric division: despite the major slump in project intake within the electric sector, Abengoa México remains very much a market leader in the Mexican electrics market, and was awarded

a contract under the 248 SLT 1401 project to construct five substations and four power transmission lines for the Mexican Federal Electricity Board ("Comisión Federal de Electricidad").

The company is also participating in the construction of the substations and transmission lines for the cogeneration plant that the temporary joint venture Abener-Inabensa is currently constructing for Pemex in the south-east of the country.

- Oil and gas division: Abengoa México is in the process of consolidating its position in this particular market, and is now working simultaneously at Pemex Refinación, Pemex Gas y Petroquímica Básica and Pemex Exploración y Producción.
- New business development division: the division secured and performed numerous projects in 2010, including installation of the 130 kW COP16 photovoltaic system for Enel Green Power in Cancun, and the turnkey project for the La Mata substation (230-115 kV) and medium voltage network for the La Mata La Ventosa wind farm.
- Concessions of iconic buildings: construction work got underway on the Centro Cultural Mexiquense de Oriente cultural center in Texcoco, State of Mexico.

Mesteñas substation in the state of Chihuahua, Mexico

Progress was made in 2010 towards meeting the objectives set for Abengoa T&D, Abengoa México's subsidiary company in the United States. Strategic ties were forged with local companies interested in supporting the company as it performs its projects. Moreover, business opportunities were pinpointed and closely monitored both for EPC projects and concessions of power transmission lines.

## Abengoa Perú

2010 proved to be another excellent year for Abengoa Perú, which reported a year-on-year jump in business turnover and cemented its position as a key player in the power transmission, water and treatment sectors.

The main projects completed or in progress include:

- Sociedad Minera Cerro: Batch 1 and 2 Arequipa, extension and enhancement work on the metropolitan drinking water system for Arequipa, Peru's second most populated city behind Lima.
- Construction of the Baños V hydro power station in the province of Huaraz for Empresa Administradora Chungar SAC.
- Construction of the high voltage 220 kV Carhuamayo-Carhuaquero line and associated substations. The project envisages the design, supply and construction of the entire electricity system, and operation and maintenance for a 30-year term.
- Construction of the 500 kV Chilca-Marcona-Ocoña-Montalvo power transmission line and associated substations, including the installation of two series compensation capacitors at the Ocoña substation.
- Construction of the 220 kV Paragsha-Francoise & Amp. SE Paragsha II and Nueva SE Francoise power transmission line, including operation and maintenance for a 30-year term.

Peasants next to the Cajamarca substation on the 220 kV Carhuamayo-Carhuaquero transmission line in Peru

## Teyma

Teyma experienced impressive growth in 2010 both in Uruguay and overseas, with the year witnessing not only the commencement of operations in the Middle East, North America and Brazil, but also sharp growth in Spain.

### Teyma Construcción

Highlight projects completed or in progress in 2010 are as follows:

- 500 kV stations for the Administración Nacional de Usinas y Transmissiones Eléctricas. The project, currently in progress, encompasses the supply and turnkey installation of two 500 kV stations, which will effectively connect the Punta del Tigre power line with the existing Uruguayan 500 kV electricity grid.
- Extension of the Sanatorio Americano health center, entailing the construction of a new 8,000 m² building to be annexed to the existing structure.
- Structural and hydraulic rehabilitation work for Montevideo City Hall in relation to the sewage and drainage system for the Piedras Blancas-Hipódromo neighborhood and Hipódromo industrial estate.
- Completion of basic work on the Sixth Pumping Line ("Sexta Línea de Bombeo") for the Administración de Obras Sanitarias del Estado (OSE), the aim being to resolve the drinking water supply problems being experienced in the western parts of the departments of Montevideo and Canelones.

### Teyma Forestal

This company provides a wide range of services to the Uruguayan forestry sector, focusing primarily on the harvesting, extraction and transportation of wood, whether as a raw material for industrial processes or as an energy source. The company remains actively involved in numerous mechanized harvesting agreements to produce cellulose pulp for Forestal Oriental SA and Sierras Calmas SA (ENCE), and is also supplying forest biomass as an industrial energy source.

### Teyma Medioambiente

Urban waste management company that provides groundbreaking technical solutions. Operating under the name Consorcio Ambiental del Plata (CAP), it provides street waste container collection and sweeping, washing and cleaning services in a specific area within Montevideo city center.

### Teyma Internacional

Specializing in turnkey renewable energy projects, Teyma Internacional is currently acting as an executor of Abengoa's investments in new biofuel and solar power plants, effectively channeling the projects undertaken in Europe, Africa and the United States.

The company is still busily involved in the engineering management and consultancy project to construct a hybrid 150 MW solar-gas power plant utilizing parabolic trough technology in Hassi R'Mel (Algeria), and EPC construction was also completed in 2010 on two cogeneration plants for Abengoa Bioenergía in São Luiz and São Joao (Brazil).

Hybrid solar power plant in Hassi R'Mel, Algeria

### Teyma España

In 2010, Teyma Gestión de Contratos de Construcción e Ingeniería managed to double its turnover for 2009.

High levels of customer and employee satisfaction paved the way for the company to deploy workers in Algeria to wrap up the project underway in the country and in Abu Dhabi to start work on the Shams-I plant. It also successfully implemented Teyma in the United States and provided invaluable assistance in constructing the eight solar thermal power plants in Spain.

### Teyma USA

The year 2010 saw Teyma USA consolidate its position in North America following its incorporation in July of 2009. Its permanent offices in Phoenix, Saint Louis and Los Angeles receive and process orders for engineering, planning and permitting work from Abengoa Solar and Abengoa Bioenergy.

A collaboration agreement between Abener North America and Teyma USA was signed to construct Solana, the world's largest solar power plant located in Phoenix, Arizona.

In 2010, the company acquired Abacus Project Management, a North American market leader in the project construction and management sector.

## Abeinsa New Horizons

This line of business provides solutions geared towards sustainable development: hydrogen technologies, energy efficiency, carbon credit management, $CO_2$ capture and valorization and new renewable energies.

## Hynergreen

Hynergreen Technologies SA, Abengoa's subsidiary specializing in hydrogen technologies and fuel cells, continued to report growth both in terms of order intake and performance, and also the volume of R&D staff and investment in new technologies, with growth standing at 42 % and 20 % respectively. The company is currently acting as president of the Spanish Technological Platform for Hydrogen Technologies and Fuel Cells ("Plataforma Tecnológica Española del Hidrógeno y de las Pilas de Combustible", or PTE-HPC).

Highlight projects for the year include:

- Ongoing engineering and supply work for Navantia within the context of the air-independent propulsion (AIP) system for the new S-80 submarines.
- Construction of the prototype bioethanol processing system for the power adjustment and control systems of the AIP system.
- Start-up of the Hércules Project service station, southern Spain's first hydrogen fuel service station. In tandem with this, the company was involved in launching an electric car fitted with polymer fuel cells.

Hydrogen generation system and fuel cell for the Palmas Altas Campus

In the field of internal R&D, Hynergreen has continued to implement its strategic plan by carrying out projects and activities in two core areas:

- The production of hydrogen from renewable sources (solar, wind, biomass and biofuel), including storage and transportation.

- Electric power generation through fuel cells, embracing the entire process and including such aspects as power adjustment, control, security and user interface. Milestones in this particular area include: energy storage system for the Palmas Altas campus; studies into the use of fuel cell systems for railroad applications; and the development of new mobile systems for generating electricity from fuel cells.

## Zeroemissions Technologies

The company offers solutions to climate change by promoting, developing and trading carbon credits and relying on the company's corporate carbon strategy, voluntary emissions compensation and innovation in GHG reduction technologies.

Highlight projects for this division include:

- Heightened demand for strategic consultancy services. The United Nations awarded Zeroemissions a contract to address the national bioenergy strategy for Lebanon and to develop a financial means of improving access to borrowing for the industries taking part in an energy efficiency project in El Salvador.
- Nuevas Tecnologías, the division specializing in R&D&I projects aimed at honing technologies and knowledge that will help to curb GHG emissions, including the sale of $CO_2$ neutralization certificates from the eBay website.

Emissions neutralization certificate available from eBay


- Projects for 2010 focused on the need to monitor, reduce and harness the methane generated from the decomposition of organic waste, including studies into cooling systems that employ gases less harmful to global warming.

With regard to labeling and certification, and in addition to broadening its business in emissions inventories, Zeroemissions expanded its existing products and services further by incorporating an enhanced range of value-added services, such as analyses of product life cycles and calculations of carbon footprints, including the possibility of official certification in accordance with existing standards. The company also launched the on-line Campus Zero training platform, intended for professionals interested in learning more about the sector.

## Inabensa I+D

Inabensa is a company with an impressive and long-standing track record in the field of technological research and development. It is actively involved in the numerous initiatives promulgated by national and international governments with universities and research centers. These include the development of projects relating to energy efficiency, renewable energies, ocean energy, geothermal energy, $CO_2$ capture and sequestration technologies, and telecommunications.


# 8

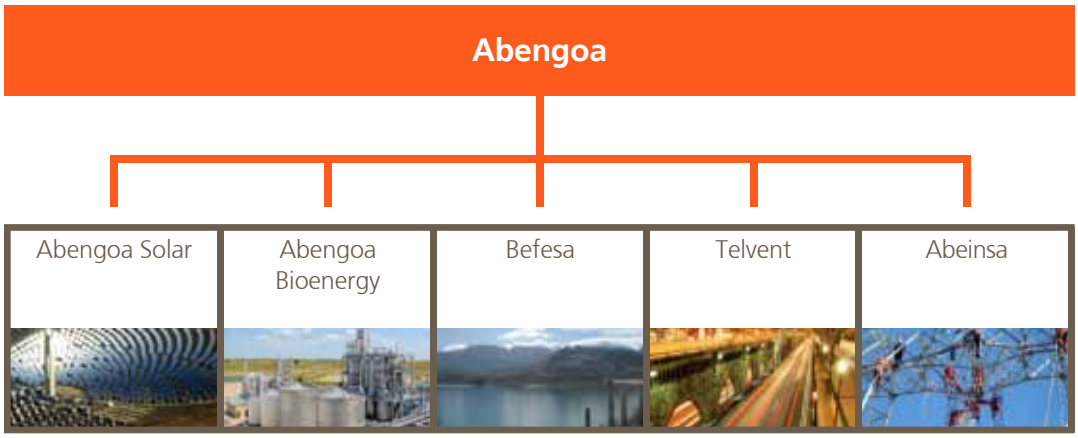
# Introduction

Abengoa is a technology company that drives its business via innovation, defined as any knowledge-based change that creates value. This chapter primarily concerns technological innovation, and the research, development and creativity it entails. However, there are other key areas of business endeavor that, though not technology-driven, call for ongoing innovative effort. Innovation in all aspects of business is a value that must guide and engage everyone in the company. An innovative culture encourages people to explore new directions and take the risks this involves. Nevertheless, for Abengoa, innovation is not an end in itself but a means of transforming society towards a more sustainable world.

Innovation is one of the underpinnings of business competitiveness, but it demands strenuous and unceasing commitment and rigorously accurate business and financial management. Competitiveness needs to be sustained over time. One way of achieving this is to broaden the range of inputs to the productive process. But it cannot be a question of quantity alone. The quality of the company's inputs and, even more, its ability to make use of them can and does lead to higher output supported by higher performance. This is the variable measured by total factor productivity, TFP, the extent to which productivity increases beyond the mere sum of conventional factors such as capital and labor. The Nobel laureate economist Robert Solow, in his study on the growth of TFP in the United States over the first half of the twentieth century, concluded that close to 80 % of United States GDP growth was attributable to TFP. After Robert Solow, technological development is regarded as the variable most contributing to TFP. According to Solow, it is by increasing TFP that technology raises return on capital.

At Abengoa, technological development is a key factor for its infrastructure, environment and energy divisions, via its five business units, and plays a key role in the achievement of its strategic objectives.

Abengoa and its business units



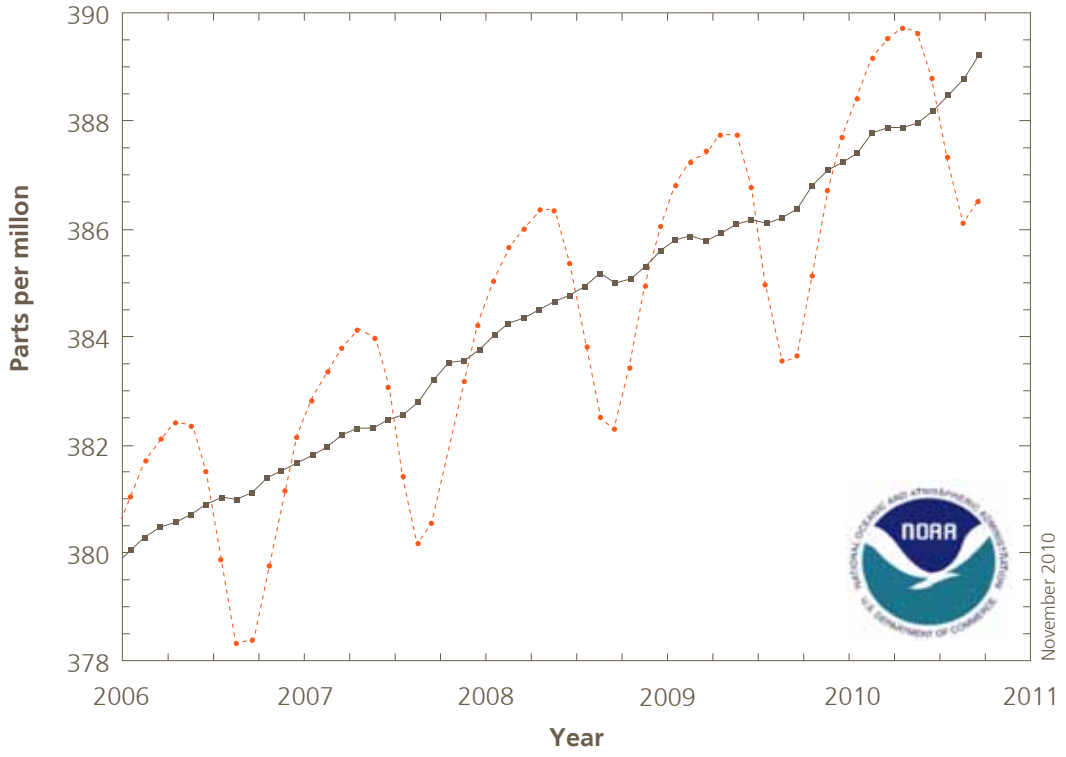

Abengoa has accordingly adopted the "innovation ecosystem" approach: The company works in partnership with universities, government agencies, public research institutes, technology centers and other private enterprises to support the creation of knowledge networks, with Abengoa as the driving force. This approach to innovation embraces demonstration projects, research and development facilities in various countries and alliances with third parties.

# Sustainability. Abengoa's Business Metrics

The economist Jeremy Rifkin has said that what is now sometimes called the "black" economy (in contradistinction to the "green") - the industrial revolution driven by oil, cars and centralized energy production - peaked in the late twentieth century. Attempts to preserve the status quo only led to distortions, like the financial and property bubble that has recently burst. So it is now time to undertake a third industrial revolution: The Green Revolution.

Global warming is caused by human activity and year after year we have raised the atmospheric concentration of carbon dioxide: In November 2010, the Keeling curve exhibited a carbon dioxide concentration of 389 ppm. This poses a serious risk to the environment and to life. It is also set to deal a harsh blow to the world economy. According to the Stern Review on the Economics of Climate Change, global warming could throw the world into a slump involving a 20 % decline in global GDP. This means the economy and society would be severely disrupted for the remainder of this century and beyond.

**Recent Global Monthly Mean $CO_2$**




Keeling curve. Increase in carbon dioxide in the atmosphere measured in ppm (parts per million). (Dr. Pieter Tans, NOAA/ESRL www.esrl.noaa.gov/gmd/ccgg/trends)

The Stern Review estimates that an investment of 1 % of world GDP is needed to allay the effects of climate change. So far, however, decision-making processes have largely disregarded industry's harmful "externalities." Environmental and social considerations are thus rarely a factor in prevailing economic practice. But by this stage, according to the Stern Review's conclusions, the only remaining question is how quickly the world can get to a zero-emissions economy.

Against this backdrop of far-reaching change, Abengoa is today a world benchmark in the development of innovative technological solutions for sustainable development. Abengoa and its business units' policies and innovation strategies seek to make sustainable use of resources and raw materials so as to harness their entire life cycles. This is why Abengoa today is an international leader in many key areas of the Green Economy. The concept of "Green Economy" was coined in the midst of the present world economic crisis as part of the Global Green New Deal, the United Nations Environment Program mooted on October 22, 2008 to address the interdependence

between economic activity and natural ecosystems, more specifically, industry's harmful implications for climate change and global warming.

President Obama used the term "Green Economy" in his speech to the United States Congress on February 25, 2009 in connection with his ambitious program of energy reform. The new scheme, popularly known as "cap and trade," aims to lower greenhouse gas emissions by 80 % by 2050 and to create millions of new, "green" jobs.

In Spain, the Council of Ministers set its seal on the new Sustainable Economy Bill on March 19, 2010. Regarded as the centerpiece of the current legislative term, the new law is intended to bring about much-needed change in the Spanish economy over the next ten years by basing it on higher value-added industries: This calls for enhanced innovation and competitiveness.

Abengoa, for its part, has been working on the challenge posed by sustainability for the past twenty years. It has honed its capacity for technological innovation as the right tool for this paradigm shift. Abengoa has invested in research, development and innovation, recruited and developed the necessary talent, and disseminated the most promising technologies on a global scale.

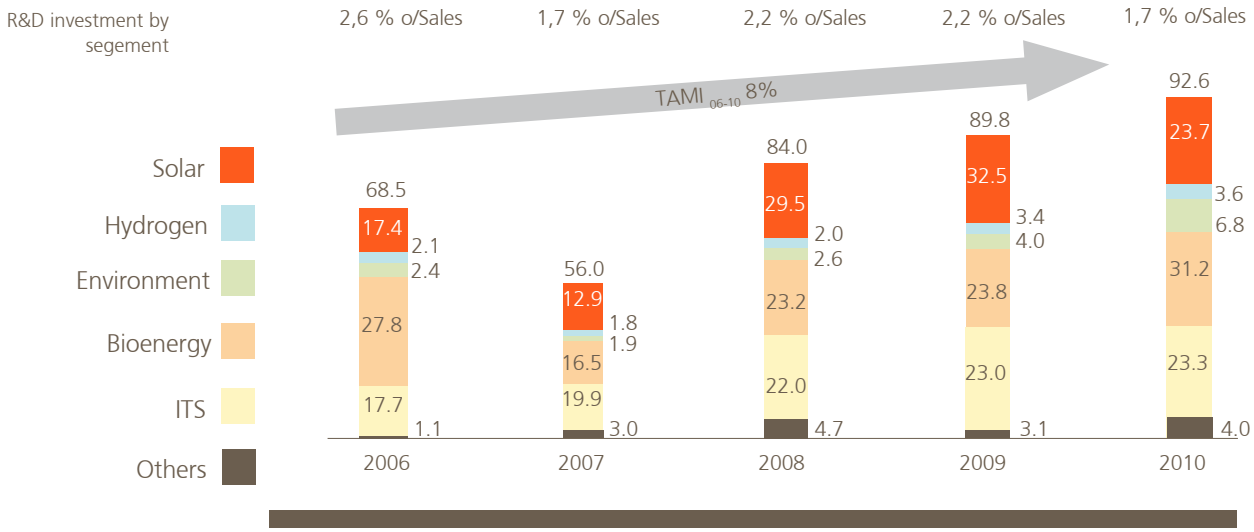
# Creating Value at Abengoa through Innovation

Its ability to generate knowledge and extract value from it has made Abengoa a leader in creating new technologies, processes and know-how designed to provide innovative solutions that help preserve the environment, create value over the long term and provide a competitive edge.

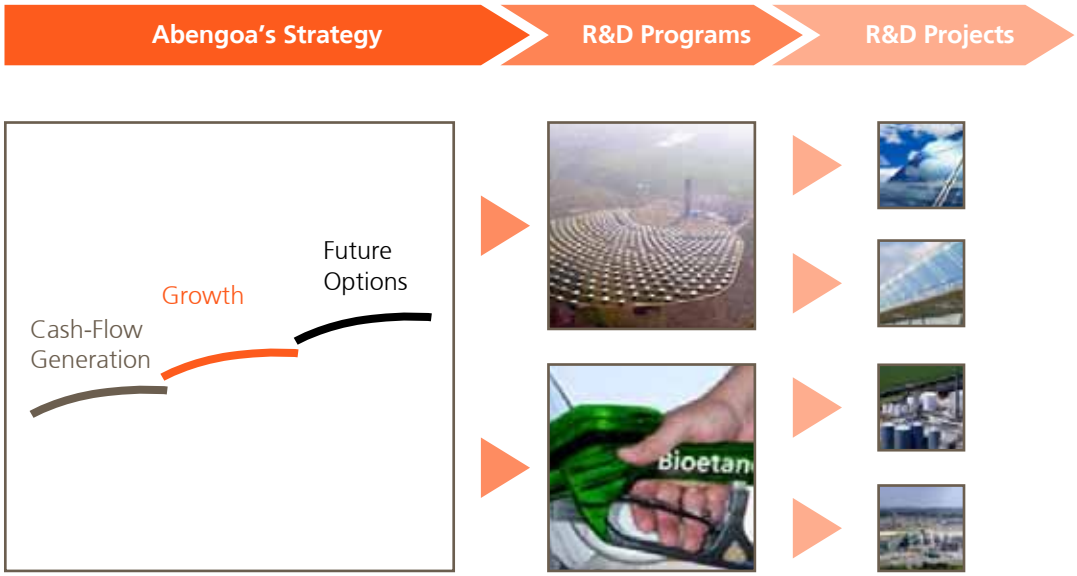
Investment in research and development makes technology the foundation of Abengoa's sustainable growth and plays a central role in its strategic objectives. Research and development is managed on business lines - result-oriented and closely aligned with strategy.

In 2010, Abengoa's investment in R&D amounted to €92.6 M, 3.2 % up on the previous year and equivalent to about 1.2 % of its total sales;meaning a 8 % annual growth rate in R&B investment during the last five years.This figure does not include investment in innovation, which, though not readily quantifiable, is a key element of Abengoa's strategy.

The table below shows how Abengoa's investment in R&D has evolved over the past few years in each distinct sector.

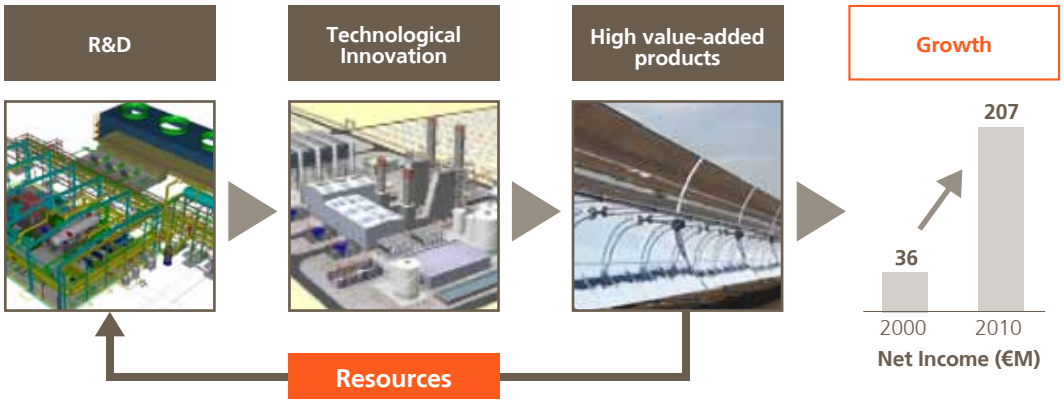


Innovation management at Abengoa is a central part of the strategy implemented by each business unit. Innovation is regarded as having three aspects: New products, new processes and improvements to existing assets. R&D&I programs are general in scope, and are tied to strategic lines of development.




Abengoa's R&D&I programs and projects are aligned with its strategy

Research and development programs take a long-term view (up to 30 years) and are undertaken as phased programs (each covering a ten-year period) and as specific projects (3-4 years). It is these specific projects that put Abengoa's research, development and innovation (R&D&I) effort into practice. At Abengoa, most R&D&I investment is channeled into applied research and the development of technological innovation geared towards the achievement of strategic sustainability goals and new products.




Research, development and innovation directed to value creation

Abengoa's focus on innovation entails a commitment to a range of initiatives. Some of these are already in progress, while others are at the preparatory stage:

- A ten-year strategic plan that clearly specifies the company's research and development activities over the coming years, setting out precisely defined targets for technological advance in terms of specific subject matter and timeframes, tied to McKinsey's "Three Horizons".
- R&D&I evaluation: Economic appraisal of research and development so as to oversee profitability and traceability.
- High-caliber research and development staff capable of living up to these new demands, with mechanisms being designed to ensure the success of their career entry and professional development.
- Major increase in the research and development budget, with funds being set aside for highly innovative projects.

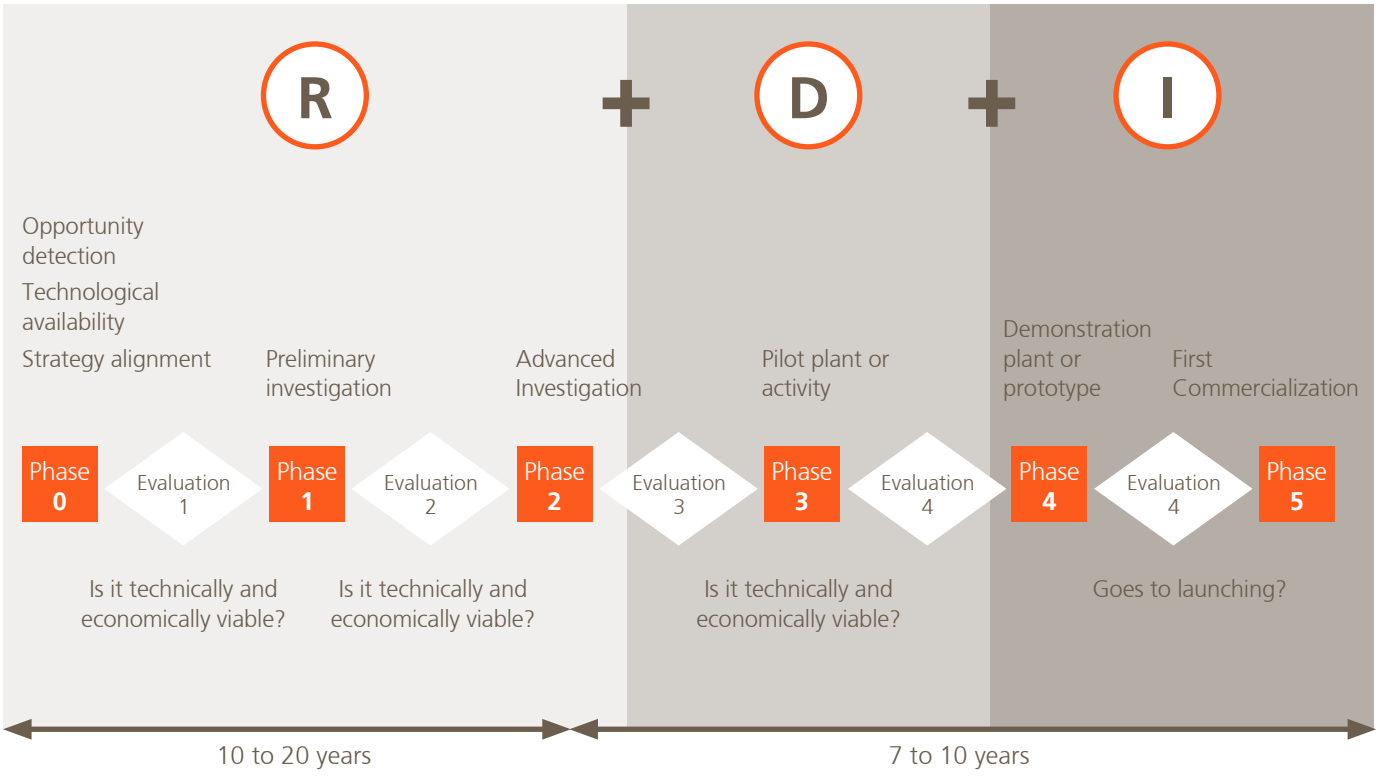
# Key Milestones in Innovation Management at Abengoa in 2010

At Abengoa, most research and development investment goes towards applied research and the development of technological innovation towards the achievement of strategic sustainability goals and new products.

In recent years, Abengoa has sought to create an environment in which research, development and innovation all move forward in harmony. In 2010, the Stage-Gate-based application first introduced in 2009 became a fully fledged system to manage research and development projects within an overarching framework of excellence, in alignment with Abengoa's strategic objectives.

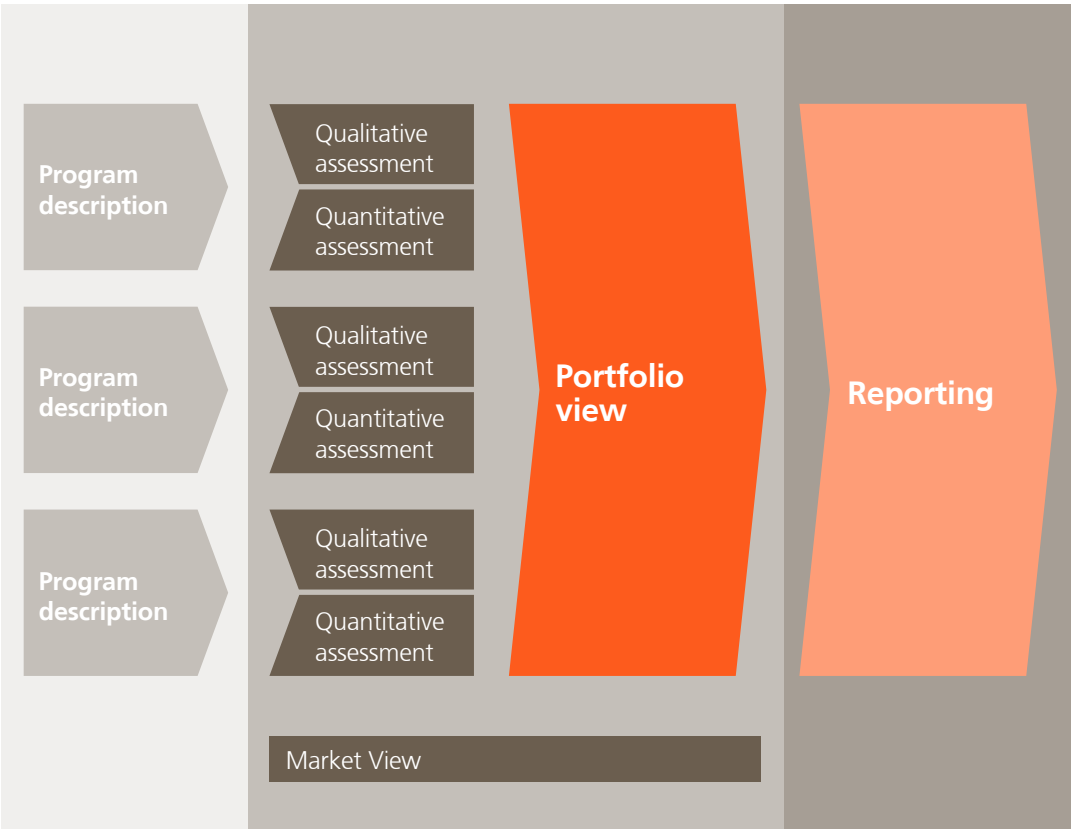
The Stage-Gate methodology specifies key actions to be taken in preparing and implementing a research and development project within Abengoa business units' project portfolio. This ensures a standard approach to research and development projects using a common methodology to define processes and maximize the value contributed by research and development projects to Abengoa's businesses, while minimizing the risks.

Stages of an integral R&D&I project




## R&D Valuation

In 2010, research and development management has taken a further step by implementing a project to evaluate research and development efforts in both qualitative and quantitative terms, in parallel with the introduction of an application for managing Abengoa's research and development portfolio of research and development programs. The research and development assessment methodology tracks research and development investment from its source to its final implementation in a commercial process; this approach measures the improvements contributed by research in terms of profitability and efficiency to Abengoa's processes in the field of technological innovation. Evaluating research and development is a vital step in setting priorities within the process of innovation decision-making in accordance with corporate strategy.




R&D valuation methodology

The implementation of a common evaluation methodology underpins the whole of Abengoa's research and development strategy so as to enable a global overview of how the various programs are progressing.

# Abengoa Solar

## Abengoa Solar and Innovation

For Abengoa Solar, innovation and the development of new technologies are key priorities. The company's goal is to offer technologies that generate clean energy at a cost that can compete with fossil fuels.

The solar energy sector is a relatively young and highly technology-dependent industry. Innovation is therefore a key factor, enabling the emergence of better technologies capable of competing with fossil fuels on price (taking account of carbon dioxide emission costs). Two main drivers will combine to lower costs: increased market volume and more efficient new technologies. This is precisely where innovation has a vital role to play.

Abengoa Solar's development of proprietary technology within its research and development department affords it a competitive edge. This fact is particularly significant given the company's role at various different stages of the value chain: manufacturing technological components, operating as a plant developer and maintaining assets, inter alia.

Abengoa Solar's unflinching commitment to research, development and innovation is thus characterized by:

- A global presence: The company employs a team of more than 100 people at research sites across the world - Seville and Madrid in Spain; Denver in Colorado, USA.
- Abengoa Solar cooperates with leading institutions, such as Ciemat in Spain; NREL, the University of Rochester and the University of California, Merced, in the United States; and DLR and Fraunhoufer ISE in Germany.

- Programs are funded by two distinct yet complementary sources. The company itself makes a major investment effort; in addition, it seeks public subsidies in Spain, the European Union and the United States. Major awards of public funds secured in 2010 under innovation support schemes included:
  - In Spain, the company continued the Cenit Consolida project into its third year, with a total budget of €24 M. Moreover, in photovoltaic technology the company is involved in the Cenit Sigmasoles and the Cenit Liquion projects.
  - In Spain, work has continued on three projects funded by the CDTI.
  - In the United States, Abengoa Solar has won a new research and development project awarded by the Department of Energy to develop a new solar power technology. Work is also continuing on four other contracts for the same department.

## Abengoa Solar Innovation Highlights of 2010

In 2010, the R&D&I team continued to grow, further honing its capabilities in its core research areas and building pilot facilities to put new technologies to the test at a small scale but under real operating conditions.

Abengoa Solar operated several demonstration plants over the year to showcase its strategy in the field of new technologies. The company develops and tests its technologies at small-scale pilot plants with a view to subsequent application using large commercial facilities.

Abengoa Solar develops its technology research and innovation via the Stage-Gate methodology so as to achieve excellence in project development and management, and to bring its efforts into alignment with the organization's strategic goals. Under this R&D&I management procedure, projects evolve by consecutive stages (Stages), subject to assessment milestones (Gates) at which the company assesses the extent to which it has achieved its objectives and overall project potential.

At the initial stage, the project to be undertaken is defined and preliminary research work completed. Next, the team conducts a thorough analysis and theoretical and practical modeling of the solution. This stage also includes searching for suppliers, signing cooperation agreements, and so on. At the next stage, a prototype or demonstration plant is built and brought into operation. The final stage consists of analyzing the pilot plant's operational data in order to validate the demonstrated system with a view to undertaking large-scale commercial development.

Pilot plants help Abengoa Solar to face emerging technological challenges, which can currently be described as (i) raising the efficiency of converting solar energy into electricity, and (ii) bringing down costs. Specifically, pilot plants enable the company to test the following features:

- Higher operational temperatures. The key benefit is to increase the efficiency of solar energy conversion into electricity by enhancing the performance of the power cycle.
- New materials to withstand the high temperatures and steep temperature gradients involved in each operating cycle. Such materials are either insufficiently developed or would be too expensive for commercial use under present conditions.
- New thermal storage systems to facilitate energy supply management so as to deliver power to the grid over the desired periods. This is one of the key advantages of solar thermal technology - other renewable energy sources are not manageable in this way. A storage system raises the availability and capacity of the plant and makes for fewer turbine start-ups and shutdowns.
- Use of new heat-carrying fluids, such as water, for direct generation of steam, thus avoiding the need for expensive heat exchangers - which entail a loss of performance - or molten salts to achieve higher operating temperatures.
- Improvements in plant control and operation to enhance efficiency and reliability.
- Developing concentrating photovoltaic technology for competitive power generation at plants located in the sun belt.
- Integrating photovoltaic solutions with buildings and distributed generation centers.

- Power storage that brings photovoltaic generation into balance with electricity use, so improving the integration of photovoltaic power with the grid.

Parabolic trough demonstration plant hybridized with a coal-fired thermal plant in Colorado, USA

In response to these challenges, the company has continued to operate several pilot plants as part of the Solucar platform (Sanlucar la Mayor, Seville, Spain) over the course of 2010. The projects have validated a range of key innovative concepts:

- Operation of a tower plant at higher temperatures. Unlike the PS10 and PS20 models, the Eureka tower operates with superheated steam generated in a second receiver and reaching temperatures in excess of 500° C. The plant was commissioned in early 2009.
- In 2010, Abengoa moved forward with the engineering of new concepts for third-generation central receiver plants, with a view to starting to build pilot plants in 2011.
- Water certified as an alternative to oil in parabolic trough loops. The company's direct steam generation plant, also commissioned early in 2009, is validating the control system developed by Abengoa Solar, thus meeting one of the main challenges of this technology.
- Validation of thermal storage. The operation of a molten salts demonstration plant in 2009 provided invaluable experience in the use of this fluid to store energy in the form of sensible heat and to quantify the overall performance of this storage mode.

As with CSP technology, PV technology faces the challenge of developing systems that generate power at a cost that can compete with both other renewables and conventional sources.

Aerial view of the Solucar platform (Seville, Spain), with some of the R&D&I facilities visible

Developing and operating certain efficient PV technologies represent an important goal for Abengoa Solar. In 2010, the company carried out the following projects:

- Development of a new high-concentration PV module that achieves very high efficiency at lower cost.
- Development of groundbreaking PV technology in terms of new materials at the Seville R&D center.
- Development of an experimental application to analyze the power generation cost associated with various technologies and configurations..

As a result of this R&D&I work, Abengoa Solar now owns patent-protected proprietary technology. The company owns rights to exploit a number of major inventions in the solar industry, making for 25 patent applications in 2010.

## R&D Programs

The research and development program in the Solar's business unit rests on four main pillars:

### Central Receiver and Tower Technology

Abengoa Solar's research focus on central receiver and tower technology is what sets it apart from its competitors.

One of the internationally recognized hallmarks of Abengoa Solar is to use tower and heliostat technologies in its quest for efficiency, particularly in the solar component of the plant.

In 2010, besides operating the Eureka plant for the production of superheated steam, the company undertook research and development relating to one of the main components of a solar plant: The receiver.

The Eureka project was intended to address new challenges in tower technology, now that the start-up of PS20 has amply confirmed its reliability. This second-generation solar tower achieves higher temperatures by producing superheated steam, thus enhancing the overall efficiency of the steam cycle. The plant consists of 35 heliostats and a 50 m tower mounting the experimental superheating receiver. The approximate power of the plant is 3 MWth.

In the field of tower technology, the company's research and development was not confined to steam. Two new projects were initiated in 2009 to focus on two very different fluids: Molten salts and air.

The CRS Molten Salt project, co-financed by the Spanish CDTI, involves the engineering and manufacture of a tower solar receiver prototype in which the heat-carrying fluid is a mixture of molten salts. The purpose of the exercise is to appraise the technical and economic viability of a large-scale plant based on this technology.

In addition, the Solugas project (co-financed by the European Union's Seventh Framework Program), got underway in 2008 and is intended to demonstrate the functioning of tower technology at higher temperatures, employing air as the heat-carrying fluid and a gas cycle instead of steam.

The engineering phase has been taken forward in both projects, with a view to starting construction of demonstration facilities in the near future.

In 2010, the company has developed a new heliostat that is set to reduce costs by almost 30 %.

Eureka, a high temperature tower technology pilot plant which has been operational since 2009 at the Solucar platform, Seville

## Parabolic Troughs

Parabolic trough technology offers great potential for improvement in a wide range of its components, including its structure, mirror-fixing methods, tubing and interconnections. Abengoa Solar is researching all of these components. At its prototype facilities at the Solucar platform, it tries out many different configurations in an ongoing search for an optimum that secures the utmost efficiency at a competitive cost.

Since 2007, the company has operated an experimental loop comprising four collectors and using thermal oil as the heat-carrying fluid. Potential optical and thermal improvements have been assessed and all the key components of the technology have now been identified. This unique test bench has afforded the company a practical familiarity with the functioning of the plant, and the know-how acquired has been passed on to commercial plants now in the process of construction and operation.

2010 also saw continued operation of the direct steam generation plant. This plant comprises three loops and uses steam as the heat-carrying fluid. By removing the need for an oil-steam exchanger, the technology enhances overall plant efficiency. Yet this direct generation technology requires a far more critical degree of control than thermal oil; the coexistence of two phases of matter in the receiver tube makes for higher instability.

The company is also developing two new types of collector using different materials so as to sidestep commodity price risk.

The Cenit Consolida project is also continuing its research into improving components and transfer fluids. Here, the sought-after qualities are maximum durability and minimum environmental impact.

Trough at the parabolic trough direct steam generation pilot plant, which has been operational since 2009 at the Solucar platform, Seville

## Storage Technologies

The technology underlying CSP plants is now reaching a state of maturity that positions solar power as a strong candidate to supersede conventional thermal plants. However, some major issues still have to be resolved, however. One difficulty is the seasonality of the energy source, meaning sunlight. This means that energy has to be stored in large accumulator systems;

Depending on the type of heat transfer fluid, oil or steam, the energy storage system will be designed accordingly to latent or sensible heat storage.

Steam stores heat in latent form, while oil stores it in sensible form. A hot body (e.g., a heat-carrying fluid) is brought into contact with a cooler liquid, solid or gaseous medium in which the heat is to

be stored. As a result, the storage medium heats up. Using the sensible heat of the material, the medium stores energy as and when its temperature rises.

This technology has continued to be tested in 2010 at an experimental plant. The experience provided a highly valuable lesson in operation and optimization for the construction of forthcoming commercial solar plants with attached storage systems, such as the 280 MW Solana plant to be built in Phoenix, Arizona.

Where heat is exchanged with a fluid that, in that same process, undergoes a change of phase - becoming steam - the storage technology makes use of the energy associated with the change of phase of the material or mixture of materials. This technology is at a very early stage, but Abengoa Solar has already taken part in several research projects relating to storage with a change of phase. For example, the Distor project led to a prototype that underwent trials at the Almeria Solar Platform.

Abengoa Solar has also undertaken numerous projects to produce hydrogen using thermal and photovoltaic solar power, which can be used as an energy storage medium.

Molten salt storage pilot plant, operational since 2009 at the Solucar platform, Seville

## Photovoltaic Technology

### Concentrating Photovoltaics (CPV)

In partnership with NREL and several North American universities, the company is developing new concentrating photovoltaic concepts. Highlights include a new generation of Fresnel lens photovoltaic concentrators, a semi-static low-concentrating system and other innovative technologies. These concepts are expected to become, in the medium term, the drivers of new photovoltaic systems capable of generating power at a competitive cost.

The company has made a major effort to develop solar trackers for concentrating photovoltaic applications. It has successfully installed several CPV devices at a 400 kW plant at ISFOC (Instituto de Sistemas Fotovoltaicos de Concentración), Ciudad Real, Spain.

### New Materials Technologies

Abengoa Solar is planning  to build an R&D&I technology center in Seville province, Spain. The center will be the setting for applied research on new materials, photovoltaic cells, and thin-film photovoltaic prototypes and technologies. The knowledge thus generated will lead to proprietary and competitive technologies in support of Abengoa Solar's future industrialization projects.

### PV Laboratory

The PV laboratory built in 2008 has tested and measured the performance of a wide range of PV systems under real operating. Based on the data thus gathered, the laboratory has developed an experimental software application to analyze the cost of generating energy using different technologies and configurations.

Different photovoltaic systems in the R&D&I area of the Solucar platform, Seville

# Abengoa Bioenergy

## Abengoa Bioenergy and Innovation

Abengoa Bioenergía Nuevas Tecnologías (ABNT) was formed in early 2003 with the goal of positioning Abengoa Bioenergy as an innovative leader in the bioenergy industry. ABNT's mission is to develop innovative technological processes to produce bioethanol and its coproducts.

ABNT engineers and scientists, in cooperation with research and development centers, universities and industrial partners, develop innovative processes to raise the performance of bioethanol via dry mill technologies, improve coproduct quantity, develop new coproducts, and evolve technology to convert biomass into ethanol and improve its coproducts. In addition, the team leads conceptual design and regulatory oversight as regards sustainability throughout Abengoa Bioenergy's three territories.

ABNT's business strategy involves developing and registering intellectual property rights to provide technology to third parties under management agreements.

## Abengoa Bioenergy Innovation Highlights of 2010

Abengoa Bioenergy New Technologies's mission is to engage in scientific and innovative endeavor to develop and demonstrate sustainable technological solutions that fulfill the aims of Abengoa Bioenergy's strategic plan:

- To develop biomass technologies and bring them to the market at competitive prices.
- To raise the value-added of existing coproducts and develop new coproducts.
- To improve on current dry mill technologies.
- To define management systems (procedures and technological solutions) that assure compliance with biofuel sustainability requirements.
- To encourage the development of energy crops.
- To develop the biomass market.
- To develop biofuel end-use programs.
- To develop and improve new enzymes for cellulose breakdown.
- To develop carbon capture technologies using microalgae.

For the use of new raw materials as sources of carbon, the company's efforts focus on enzymatic hydrolysis, gasification and catalysis processes.

The company has conducted extensive research on enzymatic hydrolysis at its pilot plant in York, Nebraska. Having acquainted itself with the process and operating procedures, Abengoa Bioenergy New Technologies has set in motion a second-generation 1.3 Mgal (5ML) ethanol demonstration facility at Babilafuente (BCyL). The data thus collected is critical for developing the design of the first industrial facility using this technology, now being implemented as part of a project funded by the United States Department of Energy.

In the field of gasification and catalysis, over the course of 2010 the company continued its ambitious program to develop heterogeneous catalysts for converting synthesis gas into ethanol. The company has filed applications for two Spanish patents over groundbreaking catalysts that have improved on the prior art. It has continued to develop technical and economic models and analyses for various configurations of thermochemical conversion of biomass, and to explore the different options for introducing biomass gasification technologies.

The company's pilot plants are constantly evolving. It has introduced improvements to the starch-based production process so as to raise the performance of ethanol/grain conversion, and is also experimenting with new enzymes to assess potential improvements to performance and reductions in impact. Major progress has thus been made in output performance as measured by liters of ethanol per ton of grain.

Abengoa Bioenergy has also worked on the development, evaluation and validation of new processes to recover value from the coproducts of cereal-based bioethanol production, with special emphasis placed on improving coproduct consistency, enhancing protein digestibility and concentration, and developing pig and free-range poultry feed.

In the sustainability and strategic consultancy area, a highlight has been the design, development, and subsequent application for approval from the European Commission, of Abengoa Bioenergy's

own voluntary scheme (RBSA) by which to demonstrate compliance with statutory requirements under the Renewable Energy Directive 2008/29/EC. In addition, work continues on designing and improving sustainability management and strategic development systems and supporting interaction with stakeholders.

According to data compiled by the Joint Research Center (JRC), raw materials account for 60 to 70 % of the production cost of biofuels, and 30 to 40 % of greenhouse gas emissions over biofuel life cycles. Abengoa Bioenergy is working on four distinct projects in the field of raw materials: Analyzing and identifying the most sustainable raw materials at the global scale; assessing potential local supply of biomass to Abengoa Bioenergy's facilities in Europe; developing software to track and assign greenhouse gas emissions and monitor the additional sustainability indicators for the raw materials used in the biofuel production process; and selecting the most suitable species for both first- and second-generation technologies.

Fully aware of the environmental benefits of using biofuels, the company is undertaking e85 and e95 demonstration programs and research aimed at developing stable ethanol-diesel blends to satisfy the requirements of gasoline and diesel engines. These demonstration programs for new applications of ethanol as the end product have focused on implementing the use of ethanol diesel blends (or e-diesel) in captive fleets of heavy vehicles: Buses and worksite machinery. Fuel analysis has focused strategically on obtaining knowledge on the stability of blends, performances on engine bench and durability of the engine components when e-diesel is utilized. The various studies and demonstrations using e-diesel have shown a reduction of up to 70 % in visible smoke, up to 40 % in particulate matter, and up to 30 % and 6 %, respectively, in carbon monoxide and nitrogen oxide emissions.

Another concept the company's efforts are focusing on is biorefining, through which products with market value will be obtained from biomass. The company is developing integrated concepts that combine first- and second-generation technologies to identify and select high value-added products that can be derived from biomass and to integrate enzyme production and microalgae-based carbon capture facilities within bioethanol production plants.

The significance of biocatalysts - or enzymes - in the biochemical route to biomass-based ethanol production has led the company to dedicate a specific line of research to developing optimized enzymes more effective at reducing consumption and thus cutting costs. The company is working on isolating and achieving the expression of the genes underlying enzymatic activities, isolating and improving producer microorganisms, characterizing and optimizing enzymatic mixtures, optimizing operating conditions and raising productivity. These lines of research are all geared towards lowering production costs and reducing enzyme dosage. The enzymes now in development are achieving outstanding performance and offering the lowest costs on the market per liter of ethanol output.

After preliminary assessment of the potential for using microalgae cultures to capture the carbon dioxide generated by prevailing production processes, the company set in motion an ambitious development program to isolate, improve and select carbon capture and biofuel production microorganisms, develop laboratory-scale techniques to cultivate and process these microorganisms in biofuel settings, optimize production systems so as to attain viability, develop post-cultivation processes of conversion into target products, and, finally, integrate the productive process with industrial activities. The company has already started up the first operational pilot reactor at its Cartagena plant.

# Most significant projects

## Cenit I+DEA

Abengoa Bioenergía Nuevas Tecnologías is leading the I+DEA (Spanish "Investigación y Desarrollo de Etanol para Automoción") initiative, funded by the CDTI as a Cenit project.

The goal of this project is to position Spanish industry as a leader in the production, use and technology of bioethanol as a biofuel. As a result, the company will seek to introduce bioethanol into the Spanish fuels market as a key step towards compliance with the objectives set by the European Commission in Directive 2003/30/EC of 8 May 2003, and later in the Renewable Energies Directive.

The project brings together 25 companies and 27 research centers and has a total budget of €28.2 M. Group players were selected on the basis of scientific excellence, multidisciplinary range and multi-regionality. Members are drawn from agriculture and seed production, biotechnology, energy, automobiles and transportation. The researchers and research centers involved are located across Spanish territory, and constitute a network of scientific and technological excellence.

## Cenit SOST-$CO_2$

The SOST-$CO_2$ project, funded by the CDTI's Cenit program, aims to develop sustainable industrial applications to harness the carbon dioxide generated by industry. The solutions being worked on range across the full spectrum of today's industry: Chemicals, energy, renewable energy, food, services, etc.

Under the leadership of Carburos Metálicos and the public-private hybrid center Matgas (partnering Carburos Metálicos, CSIC, UAB), the project involves a consortium of 16 companies, including some of the leading Spanish players, such as Repsol, Iberdrola, Agbar and Ros Roca, and a number of technology-based SMEs. The number of research teams in play amounts to 28, while the total budget stands at €26 M.


Urban bus using bioethanol in Madrid, Spain

Abengoa Bioenergy's role in the SOST-$CO_2$ project focuses on two key efforts that aim to transform carbon dioxide generated by fermentation processes: To develop technologies to produce bioethanol from carbon dioxide in various catalytic processes; and to transform carbon dioxide biomimetically in microalgae so as to produce biofuels and other value-added products.

## FP6 Biosynergy

The Biosynergy project is an integrated project funded by the European Union's Sixth Framework Program, and focuses on utilizing biomass for synthesis of bioproducts - chemical and/or material - together with the production of secondary energy carriers - transport fuels, energy and/or CHP - through development of biorefining. The research is focused on advanced and innovative development of fractionation and conversion processes, combining biochemical and thermochemical pathways, and development of the process from laboratory scale to pilot plant scale.

The project coordinator is ECN, and the consortium comprises companies such as Dow Europe, VTT, biorefinery.de, CRES, the Universities of Aston and Delft, among others.

ABNT's role is to develop the concept design for a bio-refinery plant to convert lignocellulosic biomass into ethanol and high value-added coproducts, based on the biomass ethanol plant that Abengoa Bioenergy is already operating in Salamanca (BCyL). The company is also in the process of producing the necessary data to evaluate various options for biomass fractionation by physical or chemical means.

## PSE ("Unique Strategic Project")

ABNT researchs on new uses of biomass

Fast-growing energy crops are used to produce biofuels or energy in various forms, such as heat and electricity. Abengoa Bioenergy intends to produce ethanol from energy crops grown in Spain, including high-starch alternative raw materials and other lignocellulosic biomass types.

ABNT is thus working on cooperation projects to develop energy crops, including a number of "Unique Strategic Projects" (Spanish "PSEs") funded by the Ministry of Science and Innovation via the European Regional Development Fund.

This project involves cooperation on producing and characterizing energy crop biomass and the logistics of biomass supply and certification, in particular, traceability and certification of biomass for producing second-generation bioethanol.

Projects such as this provide a strong boost to new energy crops, optimize the use of conventional crops for bioethanol production, and develop the energy crop market in a sustainable way.

## Hybrid Project

Abengoa Bioenergía Nuevas Tecnologías is leading the implementation of this initiative. The main objective is to design, construct and operate a 380 ML commercial biomass and starch hybrid plant.

The specific objectives of the project include:

- Demonstrating the commercial feasibility of the biomass-to-ethanol conversion process.
- Confirming that the technologies developed can be adapted to existing and future plants.

The subsidiary ABNT has been selected to design, construct and operate the US DOE's large pilot biorefinery. A grant from the DOE will partially fund the project. The biorefinery will adjoin a starch ethanol plant, forming a hybrid complex in Hugoton, Kansas, USA.

The bio-refinery will boast a processing capacity of at least 700 t per day, and will comprise two sections - an enzymatic hydrolysis (EH) section and a gasification section. The EH process will convert biomass (400 t/day) into ethanol, lignin, and livestock feed, whereas the gasification section will convert 300 t of biomass per day into syngas, which will be burned to generate steam. The steam will be used internally within the biomass plant, with any surplus being sold to the adjacent starch plant.

Milestones Achieved:

- Secured a DOE grant worth $38 M for the phase 1 contract.
- Hired staff and rented offices for the project.
- Signed property management and water supply agreements.
- Pro forma approval secured for the starch/biomass hybrid plant.
- Obtained approval for pre-construction of the project and the EPC program.
- Completed the enzymatic hydrolysis and gasification simulation model.
- Selected the starch technology.
- Selected and engaged architecture and engineering consultancy firms.
- Completed the engineering phase of the project.

## FP7 Bioref-integ

The Bioref-integ project, funded by the European Union's Seventh Framework Program, studies and develops bio-refining concepts based on existing industrial fuel production complexes in order to enhance their competitiveness with coproduction of new products. The project addresses various sectors of the market: Bioethanol, biodiesel, pulp/paper, oil refining, energy production, the food industry and the farming sector. The bio-refining concepts developed as part of the project are then assessed in terms of their technology, economic features and emissions profile.

The project coordinator is ECN, and the consortium comprises companies and institutions such as AFSG, VTT, ETC, Repsol, the University of Kent and the University of Aston.

Abengoa Bioenergy's goal is to help identify existing industrial complexes in the bioethanol sector and potential coproducts, while developing bio-refining simulation models for integration within the bioethanol sector.

The project, which was successfully completed in June 2010, identified new opportunities for developing ethanol in the field of bio-refining.

## PlanE DemoE2

The overall goal of the project is to lay the foundations for the transition to second-generation ethanol production technologies at the demonstration plant located at Babilafuente, near Salamanca in Spain, which has the capacity to produce 1.3 Mgal (5ML) of bioethanol annually from wheat and barley straw.

Specifically, the project pursues the following technological objectives:

- Demonstrating the technology to produce lignocellulosic ethanol at a commercial scale.
- Producing enzymes at an industrial scale for use at the ethanol plant.
- Undertaking technological development activities in connection with the process implemented at the Babilafuente plant (Salamanca, Spain) so as to reduce the operating and capital costs of the process, via:

2nd ethanol demonstration plant at Babilafuente, Salamanca

- Optimizing the enzymatic hydrolysis stage.
- Reducing the severity of the thermochemical treatment of biomass by wholly or partly replacing it with biological treatment.
- Developing a microorganism that co-ferments C5 and C6 sugars so as to eliminate some of the fractionation stages.

## New Projects

### FP7 LED

The Lignocellulosic Ethanol Demonstration (LED) project, funded by the European Union's Seventh Framework Program, embraces the design and construction of a bio-refinery plant to produce second-generation bioethanol using cereal-crop straw for use in public vehicle fleets, enhance the enzymes involved in cellulose hydrolysis, and utilize the lignin contained in the raw materials to make high value-added products.

Led by Abengoa Bioenergía Nuevas Tecnologías, the project involves four other companies from different countries: Green Value, from Switzerland, TNO, from the Netherlands, Communauté d'Agglomération de Pau-Pyrenées (CDAPP) and Communauté de communes de Lacq (CCL) from France.

The LED project lends the necessary continuity to the technological development required for raising the industrial production of second-generation ethanol to a commercial standard. In this endeavor, Abengoa Bioenergy has successfully completed major milestones, such as building a demonstration plant with the capacity to produce 5 ML/year at Babilafuente, near Salamanca in Spain, with the support of the European Union within its Fifth Framework Program.

The objective of the LED project is to design, build and operate a plant producing 50 ML annually of ethanol using lignocellulosic biomass. This four-partner project is led by Abengoa Bioenergía Nuevas Tecnologías.

### Cenit BioSos

The Cenit BioSos (Biorefinería Sostenible) project aims to cover the biomass value chain end to end, from generation of the resource to marketable end products, with particular focus on undertaking studies and developing tools to ensure that the proposed solutions are sustainable.

Funded by the CDTI's Cenit program, Cenit BioSos has a total budget of €27.6 M and is divided into five activity areas: Raw materials, sugar- and gas-based transformation processes, bio-product production, and horizontal sustainability analysis.

The aim is to develop a technology able to support the design of innovative, integrated bio-refining processes for energy production and bio-product synthesis, while an ancillary activity is to analyze the economic, environmental and social impact of the proposed solutions.

Abengoa Bioenergía Nuevas Tecnologías is partnered by major companies such as Ecocarburantes Españoles, Acciona, Azvi, Guascor, Green Source (Sniace), Carburos Metálicos, and Técnicas Reunidas, and small technology-based or highly specialized firms such as Neuron, Solintel, Biópolis, Gairesa, Industrias Omar and Krafft, which contribute high-caliber expertise to the project team.

### FP7 BIOFAT

Recently awarded as part of the European Union's Seventh Framework Program, the BIOfuel From Algae Technology (BIOFAT) project is currently in the process of being negotiated. The aim of BIOFAT is to demonstrate the industrial viability (at a scale of 10 ha) of algae-based biofuel

production. The bio-refining concept will be used to recover value from algae biomass fractions such as biodiesel and bioethanol. This eight-partner project is led by Abengoa Bioenergía Nuevas Tecnologías.

## PlanE BIOCAT2ndOL

The project titled "High-Efficiency Bio Catalysts for Second-Generation Bioethanol (BIOCAT2ndOL)" aims to develop high-efficiency biocatalysts for lignocellulosic biomass hydrolysis in order to optimize the second-generation bioethanol production process. Specifically, the target is to reduce the cost impact of the biocatalyst from the current €0.40 per liter of ethanol to a figure in the vicinity of €0.10 per liter.

BIOCAT2ndOL is to be completed during the timeframe 2010-2011 via three main research areas:

- Biocatalyst development.
- Production with biocatalyst development.
- Enzymatic hydrolysis and ethanol production.

The project involves the cooperation of several research centers and businesses, led by ABNT. Partners include ICP-CSIC, CIB-CSIC, Biópolis SL, and Neurón Biopharma.

## PlanE SorgoSweet

The project titled SorgoSweet ("Initiative for the Development of Sweet Sorghum Cultivation for Bioenergy Purposes") aims to evaluate the potential of sweet sorghum (Sorghum bicolor (L.) Monech) as an energy crop in farming areas in the environs of the Ecocarburantes Españoles plant near Cartagena, Murcia province, Spain. A detailed study will be undertaken on the potential for adapting the crop to the agricultural and climatic features of the area and optimizing pre-fermentation extraction techniques.

This partnership brings together two companies and two research centers, led by ABNT, spread out across various locations in Spain, thus supporting local job creation and economic development.

## PlanE ECOALGA

The project entitled ECOALGA ("Initiative for the Development of Microalgae Cultivation Systems for Bioenergy and Carbon Dioxide Capture") involves the design and construction of a pilot plant to evaluate technologies for growing microalgae and cyanobacteria as raw materials for producing biofuels and animal feed and for sequestering carbon dioxide generated by fermentation in the bioethanol production process.

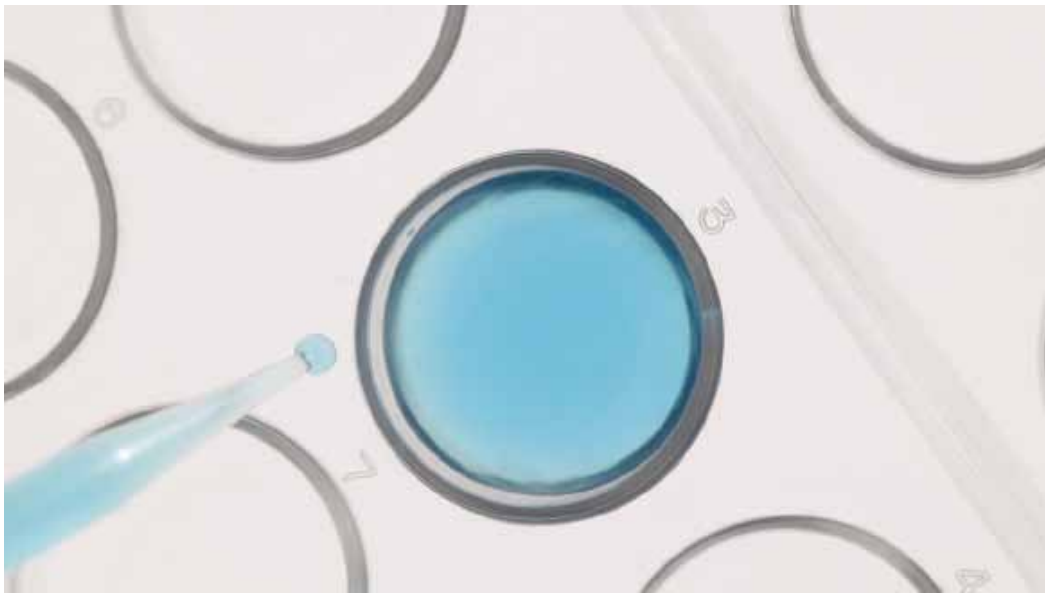
The project will be conducted on a lot owned by Ecocarburantes Españoles adjoining its ethanol plant. Carbon dioxide generated by grain fermentation for ethanol production will be the carbon source for algae cultivation.

The project involves several research centers and universities:

- The Biomass Department of the National Renewable Energy Center ("Centro Nacional de Energías Renovables").
- The Chemical and Environmental Engineering Department of the Polytechnic University of Cartagena.
- The Animal Production Department of the Veterinary Surgery Faculty of the University of Murcia.

The ECOALGA (2010-2011) project is now at the engineering stage. Construction and commissioning are scheduled for 2011.

Microalgaes offer a solution for the capture of $CO_2$ as well as for the biofuels production



# Befesa

## Befesa and Innovation

Befesa's research and development strategy is geared towards results and value creation by proposing new technologies in alignment with sustainable development.

Befesa's strategic research and development plan pursues the following objectives:

- To become a technologically competitive leader in aluminum and galvanized steel waste recycling.
- To develop new technologies for industrial waste management.
- To lead the field in desalination technology and become technologically competitive in wastewater treatment and reuse.

Research in the realm of aluminum waste recycling seeks to improve performance in the recovery of aluminum raw materials and waste, optimize operating procedures and product quality, and develop new, improved technologies in aid of sustainable development.

The steel and galvanic wastes recycling area has recently formed a new company, Befesa Steel R&D&I, SL, with a view to bringing organizational structure in line with the new model, expand the various lines of activity and widen and improve the company's range of services so as to exceed market expectations and enhance both delivered and customer-perceived value.

The industrial waste integrated management area is developing new technologies in step with ongoing change in environmental law. The company prioritizes its management methods based on a hierarchy headed by reuse, recycling and value recovery as against merely eliminative treatment. It is also diversifying into new environmental markets and widening the range of treatable wastes.

In the water area, the company's goal is to lead the desalination field, become technologically competitive in potabilization and urban and industrial wastewater treatment and reuse, and entrench its leading position in hydraulic infrastructure and water resource management models and systems.

One of the main vectors of Befesa's research and development strategy is to enter into external partnerships with institutions and universities. Major partners include the Fundación Euskoiker and the Escuela Técnica Superior de Ingenieros Industriales de Bilbao, as part of the activities conducted by the Aula Befesa higher education unit in training and research.

Befesa collaborates closely with a large number of research teams based at various universities and public research institutions, including Seville University, Cadiz University, Valladolid University, Granada University, Malaga University, Castilla La Mancha University, Polytechnic University of Seville, Gerona University, Higher Council for Scientific Research (CSIC), Energy and Environment Research Center (Ciemat), Solar Energy Research Center (Ciesol), Inasmet, Laboratorio Inatec, Insesca and Alcan, among others.

The company has also engaged in cooperation with Spanish government bodies in the form of subsidies or partnerships with the Ministry of Science and Innovation, the Ministry of Industry, Tourism and Trade (MITyC), the Ministry of Environment and Rural and Marine Affairs, CDTI (Spanish, Centro para el Desarrollo Tecnológico Industrial), the Ministry of Education PROFIT Program (Spanish, Programa para el Fomento de la Investigación Técnica), the Andalusia regional Department of Innovation Science and Enterprise (Agencia IDEA), and CTA (Spanish, Corporación Tecnológica de Andalucía).

To achieve its research, development and innovation goals, Befesa has built its own research and development center in Seville. Equipped with state-of-the-art, sustainable facilities, the center has the scientific and technological resources to position Befesa at the technological forefront of its chosen fields. The center aspires to become an international benchmark in integrated water cycle management - desalination and reuse especially - and in industrial waste treatment. The facilities, which can house 70 researchers, have a total of 3,000 $m^2$ of floor space, used primarily for testing, laboratories, workshop, offices, control room, exhibition room and multi-use room.

Befesa R&D&I Center

## Befesa Innovation Highlights of 2010

2010 was a year of entrenchment and further growth for Befesa's research and development capability. The company's total research and development outlay in 2010 came to €4 M. The firm employs a staff of 40 full-time researchers.

The highlights of 2010 for Befesa were:

### Cenit TEcoAgua

In late 2009, Spain's Ministry of Science and Innovation notified Befesa of the approval of the project titled TEcoAgua, "Sustainable Technologies for the Integrated Water Cycle", an initiative headed by Befesa Agua, in the context of the fifth annual selection round of the Cenit-E program, a government scheme in support of technological development. The TEcoAgua project, led by Befesa Agua, is backed by a total budget of €18 M. Over a timeframe of four years, the project will be completed by a partnership of ten consortium members, four of which are SMEs, and twenty-one universities, selected on the basis of scientific excellence and industrial and regional diversity.

The prime goal of the Cenit-funded TEcoAgua project is to develop sustainable technologies to generate alternative water resources. The team has integrated advanced water resource recovery technologies with regeneration and reuse of wastewater and new desalination processes, inter alia. The TEcoAgua project is one of Spain's leading research initiatives in the water sector.

Seawater pretreatment pilot plant using membranes

### Technology Funds and European Projects

In 2010, Befesa filed bids for awards under the Technology Fund Inter-Entrepreneurial Program in respect of three major projects in the field of industrial waste and aluminum recycling, with an aggregate budget of €6.8 M and involving eight partners. One of the projects aims to valorize waste and by-products as fuel and input materials in the cement industry (ValoRes); a second project involves using waste to produce biodegradable plastics (Bioplástica); while a third project aims to manufacture safety parts for the automobile industry using recycled aluminum having an iron content ranging from 0.3 to 0.4 % (Alesbap).

Within the framework of the Technology Fund and the Individual Research and Development Projects Program (Spanish "PID"), Befesa secured funding awards in 2010 for four projects with an eligible budget of €3.8 M in the fields of aluminum recycling, waste treatment and water.

2010 also saw the award of a Eureka seal to a research and development project for the application of new desalination technologies to industrial processes. The project is being taken forward as a cooperative effort between Befesa Agua and a Dutch partner, with a total budget of €2.7 M.

MBR pilot plant

### Technological Development

Following on from work performed over the past few years, 2010 witnessed the construction and commissioning of a total of six demonstration plants designed to validate technological developments in water desalination and purification and waste treatment and recycling.

At Qingdao, China, Befesa has set in motion a pilot desalination plant using membrane technology for desalination pretreatment and reverse osmosis, boasting treatment capacity of 10 $m^3$ of seawater per hour.

In the wastewater reuse field, in 2010 further progress was made in building two pilot MBR plants (membrane bioreactors), equipped with MF (microfiltration) membranes and having a treatment capacity of 1 $m^3$ of wastewater per hour.

Befesa has built a pilot plant for the etherification of crude glycerol to obtain oxygenated additives for diesel fuels. This pilot plant has a total batch reaction capacity of 120 L. At the same strategy of valorization crude glycerol, Befesa has also built another pilot plant which goal is the steam reforming through a catalytic process to obtain more than 500 NL of hydrogen per hour.

Glycerin etherification pilot plant

In 2010, Befesa's plastics recycling business saw the construction of a demonstration plant producing fiberglass-reinforced plastics, with a capacity of 1,000 kg/h.

Fiberglass-reinforced plastic demonstration plant

This technological development has brought Befesa six new patents in 2010 at various stages of registration in Spain and via the PCT route.

## Befesa's Technological Strategy


R&D&I has a key role in the Befesa's technological strategy

### Aluminum Waste Recycling

Befesa Reciclaje de Residuos de Aluminio's research and development efforts primarily seek to preserve the company's competitive edge over other market players. Befesa's research capability operates in four distinct areas:

- Ongoing search for technically and economically viable processes to recycle all types of waste generated by aluminum manufacturing, such as red sludge, casting mold resins, or the recent success story involving SPL recycling.
- The company is diversifying the range of aluminum-content input materials that its technology is capable of processing. Up to 25 % of all manufactured aluminum goes into compound domestic and urban products, which at present are only marginally recyclable.
- Ongoing improvement of internal process technologies. Befesa is working to raise the yield obtained from input materials, minimize aluminum loss, minimize and optimize salt consumption, minimize salt slag generation, lower energy consumption and achieve energy autonomy.
- Product development. Befesa's aim is to bring the mechanical performance of secondary aluminum alloys up to the standard of primary alloys so as to gain entry to new markets. The company is also developing new applications for Paval to establish it as a valid value-added product in construction and civil engineering, metal manufacturing, the rubber and ceramic sectors, and elsewhere..

A key element of Befesa's strategy is to dedicate 300 m² of its Valladolid plant to research and development exclusively. This lot adjoins a facility operated by Befesa Escorias Salinas and Befesa Aluminio's works. The availability of operating R&D&I staff and the proximity of industrial facilities producing input materials and Befesa Escorias Salinas' analysis lab - the Befesa Reciclaje de Residuos de Aluminio group's biggest - make this the ideal location for centralizing and reinforcing research and development in the chosen fields.

The R&D&I facility's starting equipment will comprise a rotary furnace having 1 t of loading capacity and fitted with a gas treatment system and an aluminum and salt slag evacuation system. Other features will be an innovative eddy current pilot plant to enrich aluminum fines and extra fines, a small impact mill and a blade mill, and a conventional eddy current separator. The project is backed by an initial budget of €60,000 and is expected to be operational by early February 2011.

Rotary furnace with 1 t of capacity to be installed at Valladolid

## Industrial Waste Management

Befesa Gestión de Residuos Industriales' strategic research and development plan seeks to entrench the company's leadership in waste management and adapt to ongoing changes in environmental law. Specific objectives include:

- Gradually replacing elimination treatments with recovery and energy value recovery approaches.
- Reinforcing technological leadership in industrial waste management by developing environmentally safe and energy-efficient treatments.
- Widening the scope of the market by offering industry new services and extending the range of treatable wastes, while diversifying into new environmental markets.

The strategic plan develops technologies that offer environmentally friendly and sustainable treatment alternatives to prevailing practices in waste management, by using the material and energy resources of wastes through recycling and value recovery processes. The technology activities associated with the strategic plan include:

- Technologies supporting the production of waste-based fuels as alternatives to fossil fuels, and obtaining substitute input materials for industry.
- Developing the best available technologies for thermal waste treatment.
- Developing technologies to diversify into new markets and seize new opportunities via new recycling processes and obtaining high value-added products.

## Water

Befesa Agua has an ambitious R&D&I strategic plan that aims to generate the technological know-how required to secure resource availability and quality and create sustainable solutions for the integrated water cycle.

The goals of the plan can be summarized as:

- Optimizing the energy efficiency of reverse osmosis desalination; minimizing costs and enhancing sustainability while mitigating the environmental impact of the brine and moving towards the use of renewable energy to power the desalination process.
- Developing wastewater reuse by extending the boundaries of urban and industrial wastewater treatment technology, optimizing it on a case-by-case basis for each specific reuse type.
- Optimizing hydraulic infrastructure under sustainability criteria for the integrated water cycle and developing water management models that allocate natural, generated and regenerated resources with due regard to floods, drought processes and water quality.

Befesa Agua's strategic research and development plan drives forward along four main vectors of advance: (i) In-house resources, such as the research and development department and Befesa's research and development center; (ii) research and development aid and subsidies awarded by a range of public authorities; (iii) collaboration agreements with universities; and (iv) technology partnership agreements.

# R&D&I Programs

Befesa's research and development is structured into seven core research and development programs focusing on industrial waste recycling and integrated water management. The research and development programs and their highlight projects are summarized below.

## Aluminum Waste Recycling Program

Befesa Aluminio's R&D&I is implemented as a single program primarily directed to fulfill targets set by the company's afore-mentioned R&D&I strategic plan.

Some of the highlights of its research and development within this program in 2010 are outlined below.

### Obtaining Second-Meltdown Aluminum Alloys for Use in Safety Components

This project, conducted in partnership with Edertek, Fagor Automoción's technology center, and Cofundi, an SME that manufacturers die-cast parts, applies research findings to use recycled aluminum to make safety parts for the automobile and rail sectors, such as car hubs and hub carriers, still produced to-date using low-iron primary aluminum. Taking a global approach to the issue of secondary aluminum's high iron content, the project processes the melt with chemical alloying agents, liquid-state thermal and mechanical treatment, further thermal treatment, new part-manufacturing processes, etc.

### Obtaining Secondary Aluminum through a Solid-State Process

This project lies halfway between the line of research concerned with processing new raw materials and the research area focusing on processing technology. The company is looking at integrated enhancement of fines processing in the 1-5 mm range across the various processing lines operated by the unit's facilities. Input materials are derived from aluminum slag, compound scrap or other companies' recycling processes sold on the market, such as white-goods fines. A pilot plant is processing 1-4 t per day of fines for subsequent briquette manufacture at Bostlan, a company running trials at the 200-500 kg scale in a pilot rotary furnace and pot at the Inasmet technology center operated by the Fundación Tecnalia.

As a long-term goal, the company is working on the potential for raising the aluminum content of fines to a level that makes them marketable to part manufacturers as briquettes of a standard composition in accord with the desired alloying, thus avoiding the need for meltdown at an aluminum refinery.

## Waste Treatment and Value Recovery Program

The aim of the program is to develop thermal waste treatment technologies and transform wastes into fuels and input materials usable in energy value recovery and recycling processes.

Some of the highlights of the company's research and development within this program in 2010 are outlined below.

### Extracting Value from Materials through Catalytic Oxidation

The goal of the project is to design an industrial waste pretreatment process to make waste usable as a direct fuel for an industrial catalytic oxidation facility. Applied research must be brought to bear to create a thermal waste treatment technology that, marking Europe's first radical departure from conventional methods, achieves a high degree of catalysis so as to lower the flashpoint, speed up isothermal oxidation, and enable combustion gases to remain in the oxidative chamber over extended periods. The novel features of this technology allow for exhaustive control of gas emissions and ensure that slags will be inert, while achieving energy recovery via electricity production.

One of the key issues in developing this technology is to pre-treat wastes to create uniform physical and chemical conditions at the process entry point. Funded by CDTI in the amount of €1.4 M, the project is being undertaken in partnership with the Tekniker technology center.

### Producing Fiberglass-Reinforced Polypropylene

Befesa Plástico is developing an innovative technology to produce fiberglass-reinforced plastic. Recycled polypropylene and fiberglass waste is utilized to produce material that improves the mechanical performance of recycled plastics. The project involves building a demonstration plant capable of producing 1,000 kg/h per line. Domestic and European funding have made for a total budget of €5 M. The technology lowers carbon dioxide emissions by 60 % versus new raw materials.

## Alternative Treatments and New Markets Program

The goal here is to create and develop emerging, sustainable technologies that enable the company to diversify into new environmental markets and broaden the range of processable wastes.

Some of the highlights of its research and development within this program in 2010 are outlined below.

### Producing Biodegradable Plastics from Industrial Waste (Bioplastics)

One of the overarching concerns of the project is to utilize petrochemical plastic wastes, sewage sludge and other wastes to obtain medium-chain polyhydroxyalkanoates (mclPHA), a high value-added biodegradable plastic.

The scope of the project embraces the construction, commissioning and operation of the first pilot plant to produce biodegradable plastics from wastes, on the basis of the lab research completed by Bioplastech, a spin-off company based in Ireland.

The project is funded at "CDTI Technology Fund Inter-Entrepreneurial Program", and is developing in collaboration with Idesa, an Asturias-based equipment manufacturer, and Enia, an Asturias-based SME specializing in automation and control equipment. Successful completion of the project

will result in a new waste recycling technology enabling the company to broaden the range of "processable" wastes and diversify its business by entering new markets, such as bioplastics.

The overall project goal is closely aligned with Abengoa's core strategy of sustainable development by restricting raw material consumption, recycling waste, and creating biodegradable, environment-friendly products.

### Viability Study for Application of Advanced Oxidation Techniques to Liquid Effluents with High DQO (Photocatalysis)

The project is focused on the evaluation of the solar treatment techniques to detoxify the landfill's leachates and other effluents. Specifically, the goal is to assess the ability to detoxify using advanced oxidation processes, in particular, Foto-Fenton, a process that destroys the total organic load (DQO) of a liquid via oxidation with hydroxyl groups (OH) formed by exposing hydrogen peroxide to sunlight.

The study encompasses lab tests of various effluents, and trials at a pilot plant at the Almeria Solar Platform. The company has partnered with the Ciesol (Spanish, Centro de Investigaciones de Energia Solar), a solar energy research center attached to Almeria University and the project is funded by the CTA (Spanish, Corporación Tecnologica de Andalucía) and the IDEA agency.

## Desalination Program

This research and development program focuses on improving the efficiency of the reverse osmosis process and lowering its investment, operation and maintenance costs by reducing the cost per cubic meter of desalinated water.

Some of the highlights of the research and development department within this program in 2010 are outlined below.

### Seawater Pretreatment System using MF/UF Membranes

This project aims to develop an advanced seawater pretreatment system using membrane technology. The company has conducted real-site tests on seawater at the pilot plant scale to evaluate the performance of commercially available micro- and ultra-filtering systems in comparison to one another and to conventional schemes. The results have then been used to design a proprietary system based on MF/UF membranes.

The project has secured grants from the Department of Innovation, Science and Enterprise of the regional government of Andalusia and from the Spanish Ministry of Environment and Rural and Marine Affairs.

### Desalination Plant Remote Monitoring Project (CRIBA)

The purpose of this particular project is to develop a remote control system affording real-time vision of the state of operation of Befesa's desalination plants across the world. If successful, the system will be a key tool for optimizing the operation and maintenance of Befesa Agua's plants. The company has created an IT platform for remote control and monitoring, a communications system, an information management system and a control room. Now in its demonstration phase, the platform is being tested with data from one of Befesa Agua's desalination plants.

The project is funded by subsidies from the Department of Innovation, Science and Enterprise of the regional government of Andalusia and from the Spanish Ministry of Industry, Tourism and Trade's PROFIT scheme.

## Potabilization-Purification-Reuse program

This program seeks to optimize membrane-based water treatment processes so as to save energy, produce less sludge, develop sludge treatment and elimination technologies and

undertake research on supercritical oxidation.

Some of the highlights of the research and development within this program in 2010 are outlined below.

### Advanced Wastewater Treatment for Reuse (TRASOS)

The ability to reuse wastewater stands to be a key factor in sustainable development, and offers high potential as an alternative source of water. The goal of this project is to optimize wastewater treatment processes by taking account of the specific type of wastewater concerned and its intended future use. The company is researching membrane technologies such as membrane bioreactors (MBRs) and micro- and ultra-filtering systems. It has also built two pilot MBR plants equipped with microfiltration membranes, and is now developing mathematical models to describe their behavior. Experimental campaigns are scheduled for 2011.

### Wastewater Treatment Plant Sludge Removal using Supercritical Oxidation

With Befesa Agua acting as coordinator, this project has been undertaken in partnership with Emasesa. The goal is to demonstrate the technical and economic viability of supercritical oxidation technology for eliminating sludge at wastewater treatment plants. The project is now at the final experimentation phase.

The project is being subsidized by the Department of Innovation, Science and Enterprise of the regional government of Andalusia, the Technology Corporation of Andalusia, and the Ministry of Environment and Rural and Marine Affairs.

## Sustainability Program

This program seeks to optimize energy use in water infrastructure, develop hydro power and marine energy capabilities, create sustainable water management models, and develop and apply sustainability criteria in the design of the company's solutions.

Some of the highlights of the research and development within this program in 2010 are outlined below.

### Integrated and Sustainable Water Resource Management Model (MAISA)

The aim of the project is to develop a platform to manage water resources at the hydrographic basin level, taking account of factors such as water quantity, quality and energy value. Progress has been made in designing the platform and data management modules, a hydrological simulation system and demand management for irrigation zones.

The project is funded by CDTI via the Cenit TEcoAgua project, within the framework of the Cenit-E program.

## Filtration Membranes Program

Filtration membranes have become a strategic technology for water treatment processes, and are increasingly in use for wastewater potabilization and regeneration and desalination pretreatment. The aim of this program is to develop water treatment filtration membranes.

### Water Treatment Filtration Membranes Development Project

This project is concerned with developing a high-performance ultra-filtration membrane (pore size and distribution, permeability, strength, etc.) having applications in water treatment processes (potabilization, reuse, desalination).

The initiative is funded by CDTI via its research and development projects program (PID).

# Telvent

## Research, Development and Innovation 2010

Telvent's strategy focuses on developing information and communication technology-based solutions and services as a way of dealing with today's sustainability challenges. The company seeks out efficient and effective ways of managing core resources such as energy, transport, water and food, using smart networks and infrastructure.

Telvent's sustainability-oriented solutions




| | Energy | Transportation | Environment | Agriculture |
|---|---|---|---|---|
| Real-time Operations | Smart Grid & Pipelines | Smart Mobility | Water Management | |
| Supply Chain | Fuel & Gas Distribution | Interoperability & Payment | Integrated Water C | Grain Distribution |
| Information Services | Market Pricing Load Forecasting | Traveler Information | Weather Services | Market Pricing & Risk Analysis |

Telvent's sustainability-oriented solutions are divided into three main areas:

- Real-time operations. Telvent's systems are equipped with highly specialized software and hardware enabling efficient and effective management of geographically distributed critical infrastructures.
- Management systems. Telvent develops solutions that add value to the production chain in its chosen fields, aiming to integrate all stakeholders involved.
- Information services. Telvent develops and offers highly accurate information services to enhance its clients' decision-making, operations and supply chain systems.

Telvent invests in developing its SAAS (software as a service) model, in which it has a track record of over eight years in developing cloud computing components to make these solutions a reality. Telvent is confident that the SAAS model is an effective and attractive platform for many of its solutions, and is accordingly investing in planning, research and development so as to widen the range of services offered under this approach.

Telvent's ongoing bid to undertake research and development of new products and services has kept it at the international forefront of the energy, transportation, environment and agriculture markets. The company has moved on from a systems integration and outsourcing strategy to selling high value-added information services in support of operational, business and environmental decision-making.

One of Telvent's strengths is its global presence via several product and competency centers, employing over 450 technical specialists. Having invested across nine research and development

programs, co-funded by Spanish and international public authorities, Telvent has successfully achieved its technical and business targets.

Competency and Product Centers

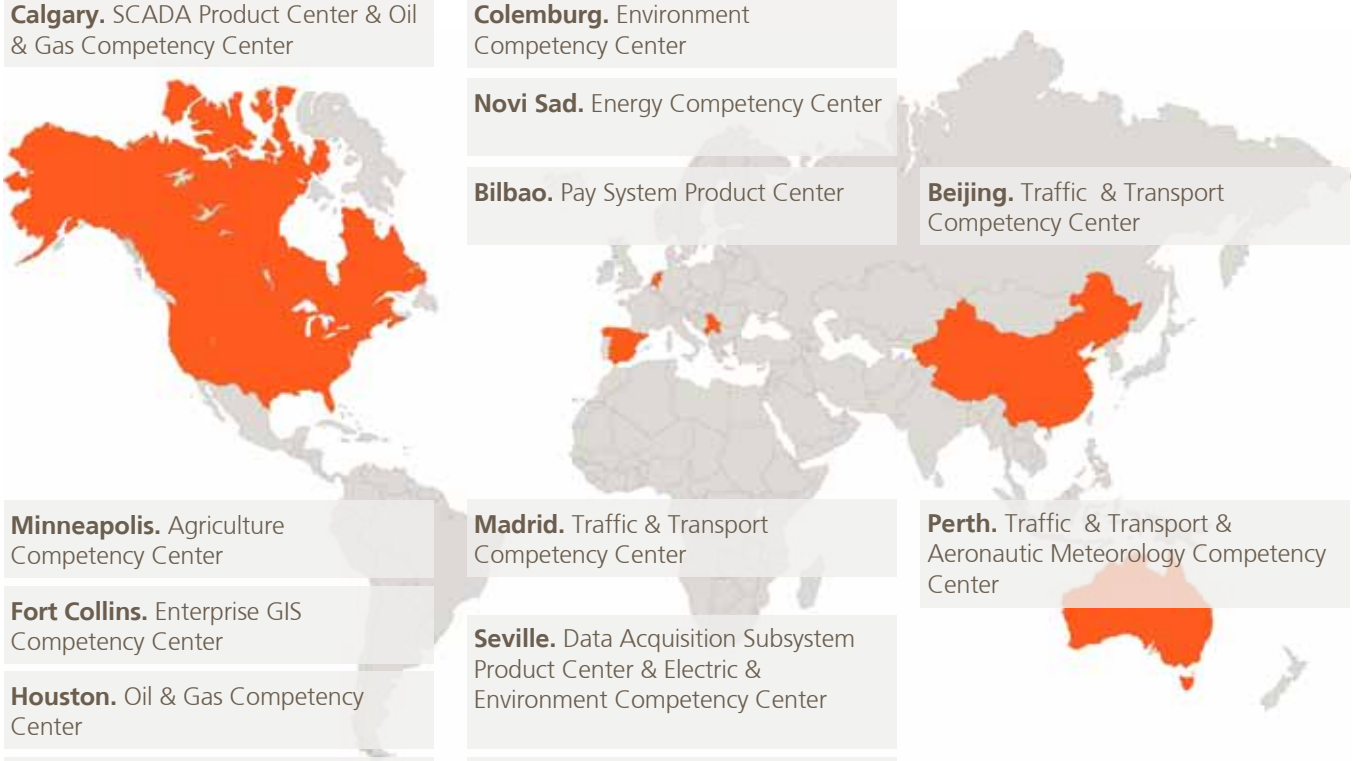
**Calgary.** SCADA Product Center & Oil & Gas Competency Center

**Colemburg.** Environment Competency Center

**Novi Sad.** Energy Competency Center

**Bilbao.** Pay System Product Center

**Beijing.** Traffic & Transport Competency Center



**Minneapolis.** Agriculture Competency Center

**Madrid.** Traffic & Transport Competency Center

**Perth.** Traffic & Transport & Aeronautic Meteorology Competency Center

**Fort Collins.** Enterprise GIS Competency Center

**Seville.** Data Acquisition Subsystem Product Center & Electric & Environment Competency Center

**Houston.** Oil & Gas Competency Center

**Rockville.** Mist Product Center & Traffic Competency Center

**Barcelona.** Traffic & Transport Competency Center

## Key R&D&I Programs in 2010

Telvent conducts its research and development at geographically distributed competency and product centers. These centers provide the technology and product infrastructure that underpin Telvent's solutions. Sometimes marketed as freestanding packages in their own right, these technologies are utilized by the company's centers to develop high value-added system architectures and advanced applications specifically aimed at each given industry.

2010 was a good year for Telvent's research and development, with highlights including:

### Energy

In the energy sector, Telvent continued to implement the following research and development programs at its Electricity Sector Competency Center, its Data Capture Subsystems Product Center and OASyS, Enterprise GIS and Refined Fuels.

#### Smart Grid

The Smart Grid program embodies Telvent's strategy for smart energy grid management, from generation to distribution, so as to turn the power grid into a two-way information and services network. These features mean that the system can be handled largely by smart automation: Usage can be managed, operated and metered to enhance energy efficiency across the grid and raise the standard of service to users, via the following technologies:

Smart management of energy grids

## Data Capture Systems

The Data Capture Subsystems Product Center operates sites in Seville, Spain, and Houston, USA. Its core business is to develop Remote Terminal Units (RTUs), especially Saitel and its two auxiliary packages, the gasCAT gas flow calculator and the subCAT power substation remote controller. Our range of remote control solutions is completed by RTU SAGE. Developed in and for the North American market, this suite has earned widespread acceptance and a broad base of installations.

In 2010, Telvent completed development of its Cross Domain Platform (CDP). The company has brought to bear the experience it has amassed in recent years in its target sectors. The project thus benefits from the latest technologies, and ranges over the whole family of equipment for real-time data capture, embracing both present and emerging trends. This means that its customers will get a highly flexible solution that they can tailor to their configuration and technology needs. As always, security is a key issue that has been considered at all stages of design and development. Some of the research areas within this project have attracted public funding, such as SEPIC (Spanish acronym for "embedded systems for critical infrastructure") and PROTECT-IC (cyber security for critical infrastructure), supported by MITyC, Spain's Ministry of Industry, Tourism and Trade.

## Power Industry Solutions

Our competency centers for the electricity industry are located in Seville, Spain, Fort Collins, Colorado, Houston, Texas, and Novi Sad, Serbia. These sites develop comprehensive solutions for smart management of power generation, transmission and distribution networks, based on standards that are readily compatible and scalable with existing infrastructure.

Our solutions are designed to provide effective support for smart planning, design and operation of power grids, ranging from real-time data capture to network planning, economic analysis and evaluation of management solution options.

In 2010, highlights included:

- Telvent developed version 3.0 of DMS (Distribution Management System) at its Novi Sad site, offering scalability and high security, based on its OASyS SCADA (supervisory control and data acquisition) system.

- Integrating Telvent's AMI infrastructure with its OMS (Outage Management System) Responder, passing interoperability tests and so obtaining CIM certification from the United States National Institute of Standards and Technology.
- Work continued on the S2G (Substation to Grid) project to build a pilot facility to test the deployment of wireless smart sensors at high- and medium-voltage substations and explore the benefits of a predictive maintenance system.
- Telvent continued its SmartCity initiative, a project undertaken in partnership with and led by Endesa, to study the planning of an operations center from which to manage the public lighting system, to be operated by Telvent. The aim is to analyze the development of a sustainable and energy-secure city from the standpoint of electricity distribution. The project will be conducted in Malaga, Spain.

### Geographic Information System

Based at Fort Collins, Colorado, USA, this product center's ArcFM suite leads the field of GIS applications for energy companies around the world.

ArcFM helps power, gas and water utilities manage their assets, work and operations to enhance quality of service and lower costs. ArcFM also supports the development and management of integrated network models, a capability increasingly recognized as the core element of automating the distribution of Smart Grid applications. With this product, Telvent has a privileged relationship with ESRI, the leading GIS software developer.

In February of 2010, Telvent launched a new version of ArcFM, with an additional service pack released in May. These versions offer the following innovative features:

- Designer Express, a design application enabling users to develop more flexible and scalable workflows.
- Staker Designer, a new application to design field work flows.

## Oil and Gas

Telvent offers industry-leading solutions for the efficient, secure and reliable operation of oil and gas pipelines. The company also develops management solutions enabling effective coordination among refining companies, oil pipeline operators, suppliers, fuel terminals, distributors and end-users, embracing the following initiatives:

Oil and gas ducts management

The Oil and Gas Competency Center is spread out across two sites, at Calgary, Canada, and Baltimore, Maryland. The center develops advanced measurement systems and business solutions for the hydrocarbon production, transportation and distribution needs of leading energy companies. Based on the OASyS DNA platform, the applications provide a centralized operating environment.

In 2010, major improvements were achieved:

- The Liquid Suite product provides pipeline operators with the tools they need to minimize the operating cost of their facilities while ensuring timely fuel supply. Telvent created an employee training simulator that enables customers to simulate system operation and predict various operating scenarios.
- A wholly revamped version of Gas Suite HMI has been launched under the name Sightline. The new suite is easily configurable and based on industry standards.

### Refined Fuels

This product center operates sites in Omaha, Nebraska, and Allen, Texas. As a leading provider of supply chain solutions, advanced information services and oil supply management solutions, its applications range over transaction management, business intelligence solutions, and advanced infrastructure for fuel suppliers, terminals, wholesale and retail end-users, and renewable energy producers.

Milestone projects carried out in 2010 include:

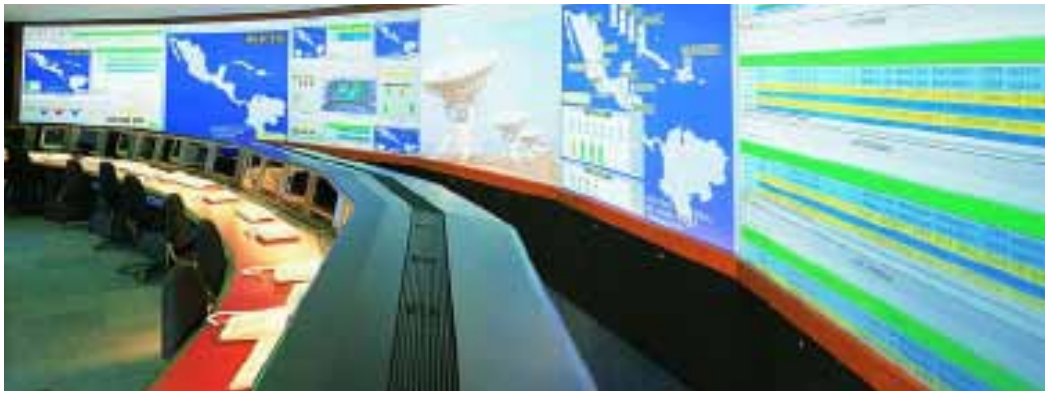
- An improved version of DTN TABS®, optimizing fuel supply and demand so as to afford suppliers higher product management security and efficiency.
- Launch of DTN Fuel Seller™, an SAAS advanced solution for defining fuel sale prices, drawing on accurate real-time data to optimize sales margins and volume.
- DTN Fuel Buyer™, a sophisticated application used by fuel wholesalers for their daily buying needs and optimizing logistics.
- DTN Guardian3® System, a centralized solution for terminal control. The tool has been further integrated with OASyS DNA SCADA.

### SCADA and Information Management

The OASyS Product Center at Calgary, Canada, develops and maintains OASyS DNA (Dynamic Network of Applications), Telvent's main applications platform. This product is the underlying technology platform for a wide range of real-time solutions for energy, transportation and the environment. In 2010, highlight initiatives included:

- Improvements to OASyS DNA for use by major oil and gas industry customers and integration with Telvent's Smart Grid suite. In addition, the project team made further progress in adapting the solution to other Telvent markets, such as transportation and water management.
- Results were presented for the second stage of Telvent's joint research project with the Idaho National Laboratory (INL). Commissioned as part of the United States Department of Energy's National SCADA Test Bed Program, this project is concerned with researching critical infrastructure. OASyS DNA was selected for assessment at a wide range of facilities in the United States.

Pemex control center



## Transportation

The main research and development programs in the transportation sector in 2010 were SmartMobility - focusing on sustainable mobility - and SmartInformation, an advanced transportation information system.

As part of those programs, the Transportation Competency Center, with sites at Madrid and Barcelona in Spain, Rockville in Maryland (USA) and Beijing, China, develops solutions for urban and interurban road and rail traffic, including: Traffic control systems (MIST), with extensions for adaptive centralized and distributed control (Itaca, OPAC); traffic regulators; centralized railway traffic control systems (OASyS-based CTC); and traffic information systems (SmartNET).

At its development sites in Bilbao, Spain, and Austin, Texas, the company creates solutions for toll, ticketing and parking lot management. Highlights include: Toll network management systems (SmartToll), ticketing management (Mobifast) for rail and underground rail networks, ticketing management (Valtick) for road transport, and parking lot control management systems (Web.Park).

### SmartMobility

With this sustainable mobility program, Telvent meets the need for more efficient and safer use of mass transit systems: This calls for optimizing facilities and developing and managing valid data and predictions on infrastructure usage. Telvent has made highly meaningful progress in integrating intermodal transportation data in high-density cities throughout Asia, the Americas, Europe and the Middle East, achieving the following technology milestones:

- The technology upgrade completed in 2009 for high-end traffic light controllers was extended in 2010 to the entire range of traffic regulators. Telvent was the first developer to certify in compliance with the Barcelona Protocol, Spain's most advanced standard, and has also certified to NTCIP, a United States standard widely accepted internationally.
- In addition, the company has developed a mobility lab based on micro- and meso-scopic traffic simulation, integrated with Telvent's existing urban and inter-urban traffic control systems, so as to compare the performance of various regulation modes, such as time- or action-based schemes, under various regulation scenarios and traffic plans.
- 2010 also saw significant progress in the development of an integrated back-office platform for enforcement systems and transportation pay-per-use schemes (tolls and mass transit), thus offering a single overarching solution for managing customers, offenses, tags, pricing policy, collection management, and so forth.
- In the ticketing area, Telvent has opted to focus on light rail systems. In 2010, the company developed a new comprehensive solution embracing control and management applications and new onboard and station-based equipment.

### SmartInformation

This program offers mobility services as part of the future "intelligent universe", in which users can use their cell phones to access multiple services and information sources in accordance with their preferences, context and roles.

- Key research was completed in Advanced Sustainable Mobility Services via projects such as mIO!, funded by the Spanish CDTI through the Cenit program, or Smart Urban Spaces, a Europe-wide project under the ITEA seal, also funded by the Ministry. These initiatives are closely aligned with the company's new strategic line in information sales and services, and will lead to highly innovative solutions in this field.
- Also within this program, work continued on "New Smart ITS Infrastructure", oriented to future cooperative systems and vehicle-infrastructure communications. Our projects have won the support of Spain's Ministry of Development, which provided public funds for the completion in 2010 of the ViaSens project and for continued work on the Bus-Direct initiative.

## Environment

In the environment sector, the main research and development program in 2010 was Weather and Water Management Suite, a set of advanced weather prediction and data systems and hydrographic basin management applications.

### Weather

The Environment Competency Center, with sites at Seville and Madrid in Spain, Culemborg in the Netherlands and Perth in Australia, searches for advanced IT solutions to address the risks currently blighting our planet, such as pollution, climate change, water management and natural disasters. The key initiatives in 2010 arising from the company's commitment to innovation and technological improvement were:

- Further offshoots of the Illion WeatherNet project: The development of a web-based weather service that provides users with state-of-the-art forecasts tailored to their requirements and geographical location co-funded by MITyC and the European Fund for Regional Development (EFRD).
- Work also got underway in 2010 on the Prometeo Project, involving the development of a weather information system specifically capable of handling forest fire scenarios: It offers critical high-quality weather data on fires as they unfold and real-time monitoring of firefighting aircraft. This is a project subsidized by the CDTI.

The Weather Product Center, with sites at Minneapolis, Minnesota, and Omaha, Nebraska, is the North American leader in meteorological systems for decision-making support in aviation, energy and transportation, and continuously explores new solutions to position the various US industries as market leaders.

One of the key achievements in 2010 was the successful extension of the company's weather prediction solution to other Telvent markets: This was particularly significant for the Smart Grid, Aviation and Transportation markets.

### Water Management

This research area seeks solutions to rise to the challenges associated with the increasing scarcity of water: Minimizing leaks, improving energy management and optimizing water operations. A particular highlight project was:

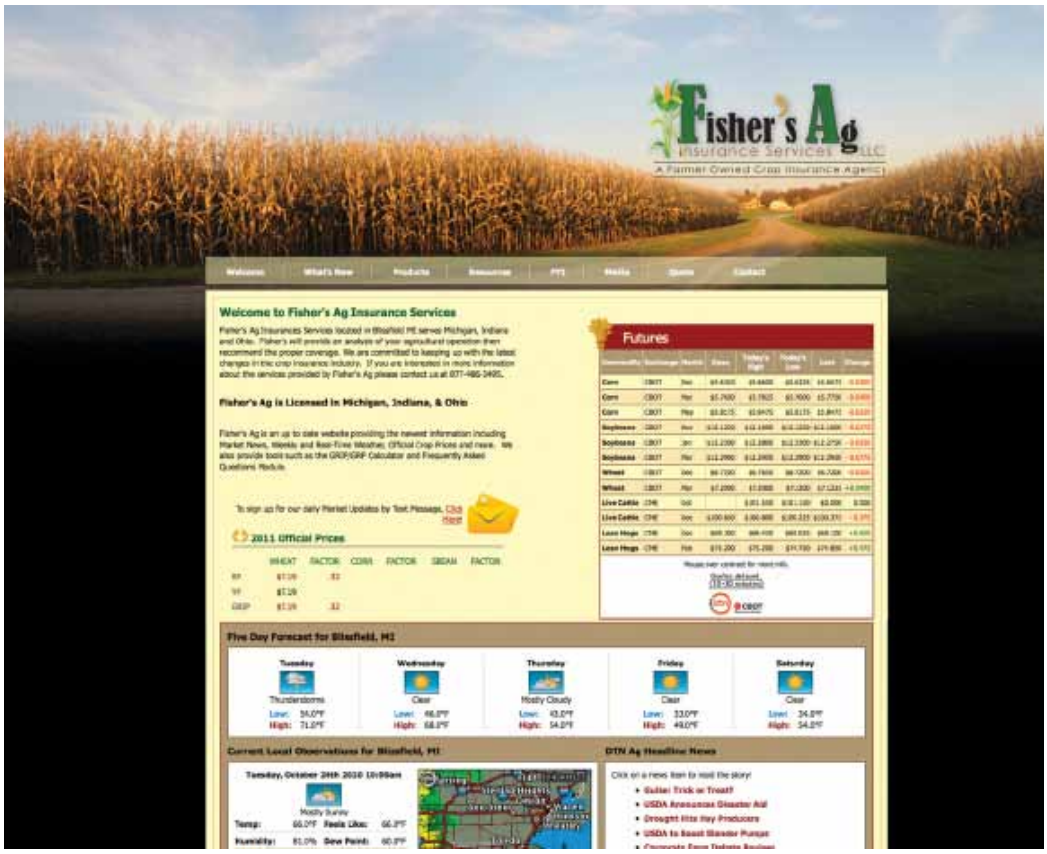
Water Management Suite (WMS). The company has started to develop a range of applications for sustainable water management in urban environments, so that water utilities can at all times assure the required service levels at each stage of the integrated water cycle, while optimizing their resources and infrastructure and lowering costs and greenhouse gas emissions.

## Agriculture

The agriculture sector focuses on developing accurate information services in support of real-time decision-making via the company's agriculture information services research and development program.

The Agricultural Product Center, based at Minneapolis, Minnesota and Omaha, Nebraska, is the leading provider of agricultural information in the United States, particularly for corn, soybean and livestock.

### Agricultural Information Services




Telvent/DTN''s agricultural information services

The overriding goal of this program is to offer advanced information services - accurate market and weather data in aid of more effective farming resource management. These services are a valuable aid to crop and livestock farmers in managing prices and costs while lowering market risk. Highlights in 2010 included:

- The Telvent Grain Portal, a data website offering a comprehensive range of information on cereal crops in the United States. In 2010, the company developed new modules for integration with other management systems widely used by farmers.
- The Ag online service is the leading online agricultural information provider for United States farmers. This year, the company made significant improvements, such as a new map viewer and a whole new generation of smart phone and Tablet PC apps.
- The Prophet X solution provides vital information to support over 4,500 farmers' decision-making on the cereal, livestock and biofuel markets.

## Other R&D&I Programs

The Healthcare and Homeland Security Competency Center has its headquarters in Seville, Spain. Its research, development and innovation activity continues to focus on Homeland Security and eHealth. In 2010, the following lines of work were highlights:

### Health Care and Homeland Security

- In 2010, Homeland Security research continued to build on its groundbreaking work in physical security, targeting immigration management and document verification.
- The second year of the Cenit Integra project, led by Telvent, was completed as planned; the venture aimed to develop innovative technologies towards an integrated system of immigration management (prevention, control and integration of migratory flows).

- In the Healthcare domain, research in 2010 continued to focus on telecare and the AmiVital project. The key aim was to create a telecare platform, a vital step towards meeting the demands of the incipient and increasingly promising telecare market, geared towards providing services and personal support for independent living, well-being and health.

## Creating Value through Technology

In addition to the above R&D&I initiatives, Telvent is committed to developing technology that creates value for its customers and shareholders through products and solutions aligned with market strategy. Telvent's aims are to:

- Develop patentable technology.
- Apply best practices in software development. In 2010, Telvent achieved level 3 CMMI certification at every one of its Product and Competency Centers.

# Abeinsa

## Abeinsa and Innovation: Introduction and Overview

Abeinsa is the Abengoa group's industrial engineering and construction division. Research, development and innovation are naturally core capabilities in this field.

Innovation at Abeinsa focuses on energy and industrial facilities. The company undertakes the bulk of its projects in Spain, Europe and Latin America. Major activities include designing and developing solar plants - particularly solar thermal - and biofuel production plants, improving conventional plants and railway facilities, designing substations and containers, and stringing major power transmission lines.

Abeinsa's research and development capability ranges over three major areas:

- Abeinsa Nuevas Tecnologías is a business-oriented R&D&I concern; it operates within each Abeinsa company, with a focus on the specific business at hand. The main lines of work conducted by Abeinsa Nuevas Tecnologías are $CO_2$ capture and valorization, energy efficiency consultancy and research, electric car development, ocean energy, and telecommunications.
- Abeinsa Nuevos Horizontes embraces companies like Hynergreen (hydrogen and fuel-cell technology) and Zeroemissions (carbon dioxide and other greenhouse gas management), independently managed businesses which concentrate on specific technologies tightly linked to research and development.
- Abengoa Research encompasses high-end innovative research and development activities and operates as an ideas nursery for Abeinsa and Abengoa, generating new research horizons. Its interests include materials, nanotechnology, fluid mechanics, solid mechanics, structures, thermal engineering, process engineering, biotechnology and power networks.

Abeinsa's research and development efforts are undertaken in partnership with numerous research institutes and universities in Spain and elsewhere. Collaboration with these centers and the academic world is one of the pillars upholding the company's development strategy.

## R&D&I Programs

The following is a list of Abeinsa's key research and development projects undertaken or completed over 2010 in each of the group's strategic lines of concern.

### Hydrogen and Fuel Cell Technologies

This strategic line of research subdivides into: Production, storage and use of hydrogen from

renewable sources; and development of fuel-cell systems. In line with established practice, the main research milestones of the year have been patented, and the company's scientific achievements have been disseminated via conferences and published articles.

## Renewable Hydrogen Production, Storage and Use

Hydrogen, a colorless, odorless gas, is both an energy vector requiring production and a form of energy storage. It is a fuel that can be produced using available resources and used as needed.

Hynergreen's hydrogen production research embraces bioethanol and biodiesel reforming at various scales and for different uses, electrolysis, and thermochemical cycle studies oriented to solar thermal energy use.

In the storage field, the year's highlights include work on metal hydrides, borohydrides, nanostructures and hydrosilanes, oriented to both portable and transportation applications and the stationary sector.


Hynergreen led the Hercules project, where a hydrogen station was installed; as well a car was adapted to use it in a fuel cell

## Fuel Cells

Fuel cells are electrochemical devices that directly convert the chemical energy present in a hydrogen molecule (or a molecule containing hydrogen) into electricity and heat to a high degree of efficiency, while offering advantages such as modularity, a low failure rate and robustness.

In 2010, Hynergreen worked on a range of different fuel-cell projects. Some of the key applications have been aimed at the portable sector, with units in the 20 W to 100 W range, and the transportation sector, with systems producing electricity for propulsion purposes in the range of 50 kW to 300 kW.

The company also worked on adapting and converting fuel cells' output capacity and on control systems and data capture networks associated with these technologies.

Projects tend to be based on polymer fuel cells (PEMFC), although the company has also worked in the high temperature sector.

## Carbon Dioxide and Other Greenhouse Gas Emissions Management

Zeroemissions' new technologies division focuses on developing greenhouse gas emission reduction technologies and on studying the impact of these technologies on the environment via R&D&I projects. The division's research program bears the title "Development of Technologies and Know-How in Emissions Reduction Techniques and Evaluation of the Environmental Impact of Human Activities."

The program encompasses a range of different research projects. Progress made in 2010 is outlined below.

### $RNCO_2$ Project

A study of new highly energy-efficient steam compression refrigeration plants using carbon dioxide as a natural cooling agent instead of HFC-type fluoride gases, thus achieving both direct and indirect emissions reductions in the field of refrigeration and climate control. ABNT is working in partnership with the Polytechnic University of Valencia and University Jaime I of Castellon.

In 2010, the company analyzed the lifecycle of different refrigeration techniques, comparing the production requirements of refrigeration equipment and gases, energy use throughout their useful lives, and emissions associated with leakage and end-of-life scenarios for equipment and gases.

The energy cost should take into consideration the emissions cost associated

### Abanilla Project

This study monitors gases produced at the Abanilla landfill, evaluates the techniques used to purify biogas, and calculates the emissions prevented by the use of landfill biogas. The project is underway in partnership with Energía Sur de Europa and AICIA.

In 2010, the company installed a device to monitor the composition and quantity of biogas generated by the Abanilla landfill in Murcia, Spain. This ongoing monitoring supports calculations of the greenhouse gas emissions prevented by utilization for energy purposes of the biogas. The company also examined the cleaning capacity of various motor filters.

### AEMEP Project

The aim of this project is to reduce, monitor and verify the reduction of total equivalent carbon dioxide emissions from livestock slurry via selection, installation and optimization of a livestock

waste treatment system capable of generating methane based on anaerobic digestion of slurry mixed with purification plant sludge and the organic fraction of urban waste for subsequent value recovery for energy purposes in the form of heat and/or electricity. The project is being undertaken in partnership with the University of Leon and Cogersa.

In 2010, the company developed a methodology to calculate the emissions prevented by co-digestion of wastes, based on methodologies and tools developed by the United Nations.

### Upcoming Projects

Ventures now at the launch stage in the field of emissions reduction techniques and assessment of the environmental impact of human activities include the Bioglicer, Watersol and Biocar projects.

## $CO_2$ Capture and Valorization

Over the course of 2010, the company made significant progress in key R&D&I initiatives relating to $CO_2$ capture and valorization.

### Mineral Carbonation of $CO_2$: Wollastonite Project

Carbon sequestration by mineral carbonation is a technology that mimics the natural weathering of calcium- and magnesium-based rock that has taken place since the formation of planet Earth.
In a carbonation reaction, carbon dioxide reacts with materials (chiefly silicates) containing metallic oxides to form carbonate and silica. These minerals include olivine, serpentine and wollastonite.

The main advantage of mineral sequestration is that the products are mineral carbonates that remain unchanged over time (millions of years) - unaffected by the environment, they are even reusable as raw materials in various processes (e.g., cement manufacturing).

Mineral carbonation, though still at the research phase, has evolved along a variety of routes in terms of experimental protocols and results at the laboratory scale. Literature published to date expresses a number of caveats, but at present this appears to be the only carbon dioxide sequestration method free of the long-term risk of gas leakage, thus removing the need for post-storage leakage control and monitoring processes.

The Wollastonite project was begun in late 2009 and will run through 2011. Conducted in partnership with the University of Seville, it is funded by the Ministry of Science and Innovation and the Innovation, Science and Enterprise Department of the regional government of Andalusia.

The project analyzes the technical and economic viability of carbon dioxide carbonation processes using silica and calcium compounds such as wollastonite, and identifies the specifications required for the design of an integrated carbon dioxide capture and sequestration system as applied to an industrial facility generating large quantities of the gas (power plants, cement manufacturing plants). In addition, applications are being considered for carbonation by-products.

### Oxy-Fuel Combustion Technologies: Avant$O_2$ Project

Oxy-fuel combustion is a new energy generation technology consisting in burning coal or natural gas in pure oxygen (instead of air), so creating a gas outflow chiefly comprising carbon dioxide and steam.

The technology requires a large oxygen input. As an estimate, a 500 MW oxy-fuel combustion plant would need approximately 10,000 t of oxygen per day; at present, this would be feasible only through cryogenic air separation. However, the technology carries a very high energy cost - a 500 MW plant operating for 8,000 h would necessitate an air separation unit consuming energy equivalent to 15 % of the plant's annual power output, making for a penalty of 10 % on the plant's overall efficiency.

Inabensa is exploring alternatives for mass oxygen production. The company is now focusing on oxygen transport membranes (OTMs), and hopes to lower the overall efficiency-loss of an oxy-fuel combustion plant to the level of 5 %. OTMs are ceramic membranes having the distinctive property of selectively allowing permeation by oxygen, thus creating a pure oxygen flow.

As part of the Avant$O_2$ project, conducted from 2008 to late 2009 with a subsidy awarded by the Ministry of Science and Innovation, Inabensa benefited from the expertise of the CSIC Chemical Technology Institute for the development of new ion-conducting ceramics to be applied in air-oxygen separation processes.

As a result, the team identified promising materials for efficient oxygen production. A second phase of the project has been launched to continue researching and improving these materials and find the best way to integrate the membranes thus developed with an oxy-fuel combustion plant.

### Bio-Sequestration using Photosynthetic Microorganisms: Cenit SOST-$CO_2$ Project

This project has made considerable headway in carbon dioxide sequestration using photosynthetic microorganisms (microalgae and cyanobacteria) for energy purposes and as biomass. A promising strain has been selected, and knowledge has improved as to the optimal conditions for achieving the highest cultivation yield.

Abeinsa works in the development of liquid absorbing $CO_2$

Forward motion has also been achieved in designing and synthesizing ionic liquids for the specific purpose of absorbing carbon dioxide as a potentially viable and competitive alternative to existing commercially available amine-based absorbent agents.

# Energy Efficiency Consultancy and Research

## Product and Plant Reengineering; Energy Evaluations

Energy efficiency in equipment and facilities used not to be a design parameter, chiefly because energy was cheap and engineers sought to optimize individual performance elements rather than take an all-embracing approach.

Inabensa is redesigning several of its products by analyzing potential performance improvements over their useful lives. All design aspects - mechanical, thermal, electrical - and manufacturing features are considered in combination, and the energy performance of the whole ensemble is evaluated. For instance, an appraisal is made of the benefits of using a more efficient component (transformer, switch, frequency converter) that, though expensive initially, reduces losses and generates less heat. In turn, given the lower thermal load, the climate control system can be smaller, consume less, and thus lead to lower costs. Improvements of this kind pay for themselves very quickly and garner environmental benefits.

Developments in the efficinecy will help to reduce the primary energy consumption

Energy assessments are not confined to equipment; the company is also evaluating entire sites: Offices, facilities, manufacturing shops and energy plants.

## Electricity Storage and Energy Management

Until recently electricity flowed from large power stations to consumers by a one-way route. This concept has now evolved, however, with the advent of renewable energy and distributed generation. Storage and management will be key issues in the emergence of a safer, more efficient and sustainable grid. In this arena, Inabensa is involved in the Sa2ve initiative, a Unique Strategic Project funded by the Spanish Ministry of Science and Innovation. The research develops storage technology via inertia wheels applied to a range of sectors, including railways. The Ferro Sa2ve sub-project stores the braking energy generated by a given train in an inertia wheel, and releases it as needed to another train, e.g., during acceleration, by returning the energy to the overhead contact line. Inabensa has designed and executed the renovation works for the power substation where the trials are being run, and has brought the various elements together: Inertia wheels, electric converters, protection systems, quality assurance, etc.

Alongside storage research, Inabensa is considering the possibility of transmitting brake energy to the power grid, thus turning substations into two-way systems.

### Electric Car Alternatives

Abeinsa is firmly committed to making progress towards sustainable mobility, a concept that emerged in response to concern about the environmental and social issues surrounding the fact that, in the second half of the twentieth century, urban transportation became based predominantly on the use of private vehicles. The drawbacks of this model are atmospheric pollution, overuse of energy, traffic congestion, and harmful effects on health. Inabensa is accordingly determined to find alternatives that mitigate the adverse consequences and lead to a new, more sustainable model. Transportation accounts for one-fourth of greenhouse gas emissions and 36 % of energy use in Spain.

Keeping faith with this commitment, Inabensa's R&D&I department has launched a new line of research under the name "Electric Car Alternatives," with the ultimate aim of creating new business models. This line of research focuses on two areas:

- Energy storage. Inabensa R&D&I is confident that the key to successfully implementing a new, sustainable transportation model is to store energy in cells and make full use of the autonomy they are capable of providing.
- Smart Metering & Smart Grid concepts, and their integration with renewable sources of energy. The aim here is to dovetail the company's efforts with research conducted in this field by other Abengoa companies.

## Ocean Energy

Abengoa is committed to developing technologies that harness renewable energy resources and so contribute to the planet's sustainable economic growth. This is why Abeinsa is involved in ongoing research towards these goals.

The ocean energy line pursued by Inabensa R&D&I is a prime example of this commitment. Ocean energy is a natural resource that, though harboring high potential, has so far been insufficiently explored.

Abeinsa has analyzed the sector so as to frame its business strategy within this incipient industry, with a view to diversifying its operational scope.

Several lines of activity are now in progress, embracing the main points identified to develop the company's business strategy:

- Wave energy: Applications for large-scale power generation.
- Market niches: Water desalination applications, other minor applications, etc.
- Auxiliary businesses.

This far-ranging analysis process has involved Inabensa in both domestic and European R&D&I projects. Exhaustive technological observation of the sector enables Abeinsa to operate at the forefront of development in an industry that is set to revolutionize the world energy scene and the marine industry.

The sea has a big energetic potential to be explored

## Telecommunications

### mIO! Project

The mIO! project, one of the ICT ventures in the mobility area, is funded for the 2008-2011 period by the CDTI's Cenit program. The objective of project mIO! (technologies for providing mobility services in the coming intelligent universe) is to realize technologies that allow ubiquitous services to be provided in an intelligent environment, adapted to each individual and to his/her context, using the mobile device as the base for interaction with both services provided by companies and with microservices created and provided by the mobility users themselves.

Taking forward the overall goals of the mIO! project calls for a technological leap that goes far beyond the present state of the art.

This leap will entail scientific and technological progress in fields as diverse as:

- Mobility service technologies created and provided by individuals: Service description models, mobile service delivery platforms, semantic technologies, advanced usability and graphical interface models, open operator, device or service APIs, advanced search technologies and proximity technologies and protocols, etc.

- Access interface technologies: Mobile devices as an advanced user interaction interface, new algorithms supporting higher device workloads, interface designs enabling immersive viewing, etc.
- Context and personalization management technologies: New mechanisms for modeling knowledge obtained from users, services and devices.
- Mobility service technologies created and provided by businesses: Integration of smart card and mobility technologies, integration of multiple smart devices with different features within a mobility environment, etc.
- Communication and connectivity technologies: Definition of communication and information exchange mechanisms among the mobile device, the user and his/her environment, support techniques for frequent transfers resulting from nomadism in an environment with intelligent infrastructures, new capacities and services deployment models via NGN and IMS architectures, etc.

### Inredis Project

As one of the ICT projects geared towards social inclusiveness and independent living, Inredis secured funding for the 2007-2010 period from the CDTI's Cenit program.

The core goal of the Inredis project (INterfaces de RElación entre el entorno y las personas con DIScapacidad) is to develop fundamental technologies capable of supporting channels for communication and interaction between people with special needs and their environment.

The technological challenges that the Inredis project seeks to address are:

- Analyzing the technological environment and identifying the state of the art in emerging technologies applicable to the interaction between people with disabilities and information society applications and services.
- Analyzing the technical, semantic and organizational specifications relevant to the development of a communication protocol supporting interoperability among existing technologies.
- Analyzing human-machine interaction technologies that offer the potential for a qualitative leap in the relationship between people with disabilities and the information society (speech processing, psychophysiology, image processing, text processing, emotional technology, haptics and intelligent textiles).
- Researching the most innovative aspects of each technology and conducting validation and checks using an experimental platform.
- Integrating the interoperability protocol developed within the project with user devices and their respective Ubiquitous Technical Applications.
- Modeling a mobile system or device that can mesh with different communication protocols and be used by functionally diverse people in a safe and intuitive way.
- Producing a white paper on the design of accessible, interoperable technology.

### Iza Project

Also within the field of social inclusiveness and independent living, the Iza project ("Intelligent System for Service Provision in a Residential Setting for People with Physical and/or Cognitive Disabilities") is funded by the Avanza R&D&I sub-program operated by MITyC (Spain's Ministry of Industry, Tourism and Trade) over the period 2008-2010.

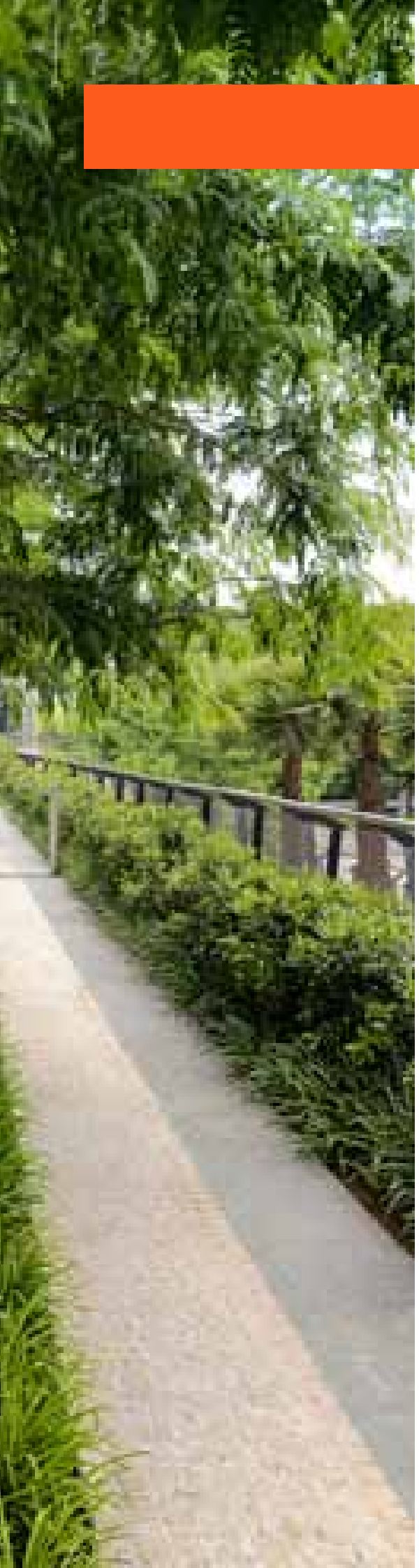
The core goal of this project is to develop an intelligent system offering ad hoc services to carers of people with physical and/or cognitive disabilities residing in nursing homes.

The carer can use a personalized interface to monitor his/her users'/residents' activities in real time, establish standard behavioral patterns, identify deviations from preset models, and achieve early diagnosis and correction of diseases signaled by known behavioral patterns, with the ultimate aim of enhancing residents' quality of life and personal autonomy.

The project provides a service platform focusing on support for people with physical and/or cognitive disabilities and their carers, who may be family members or nursing home staff. The personalized interface removes the need for the user to interact with any device manually: The environment itself captures the data and takes steps accordingly.

A major step forward with respect to commercially available solutions is a combination of emerging technologies such as ZigBee, Wi-Fi-M2M, PLC and UWB to create a single intelligent system operating autonomously.

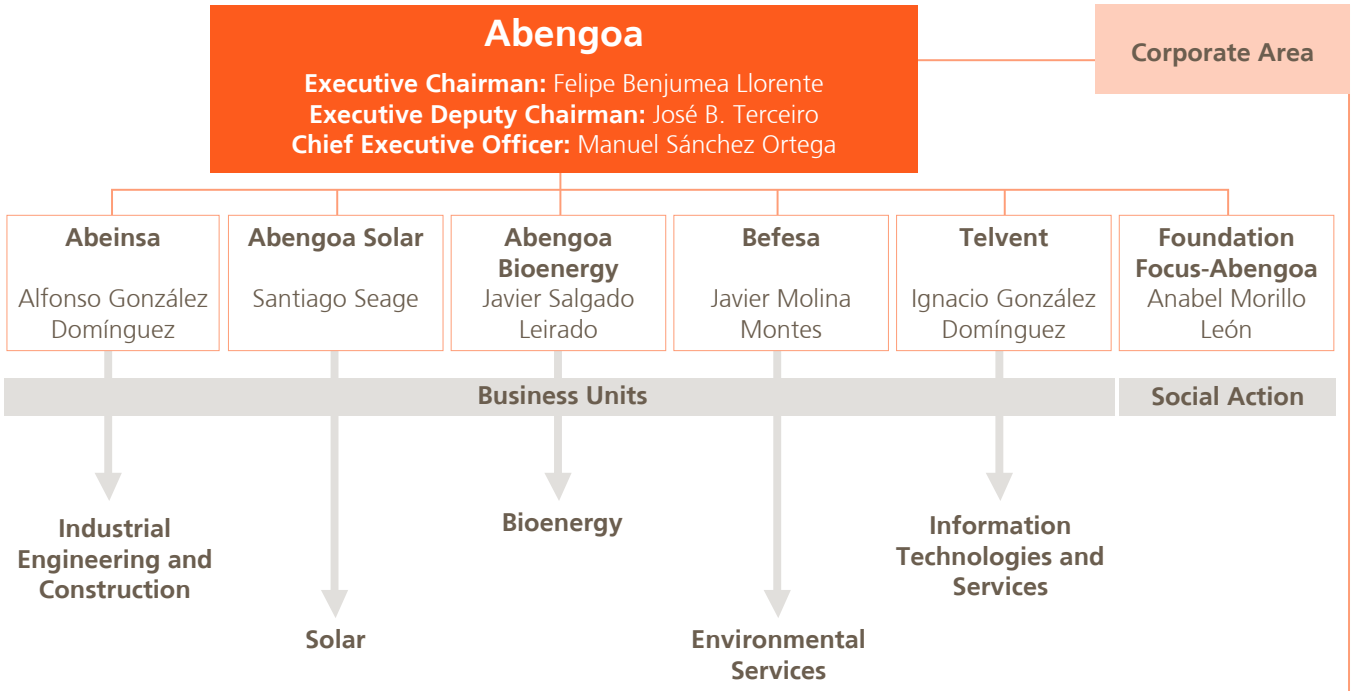
The challenge is to find comprehensive solutions that support carers dealing with the day-to-day activities of people with physical and/or cognitive disabilities.





# 9

# Abengoa Organizational Structure

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**Economics & Finance**
Amando Sánchez Falcón

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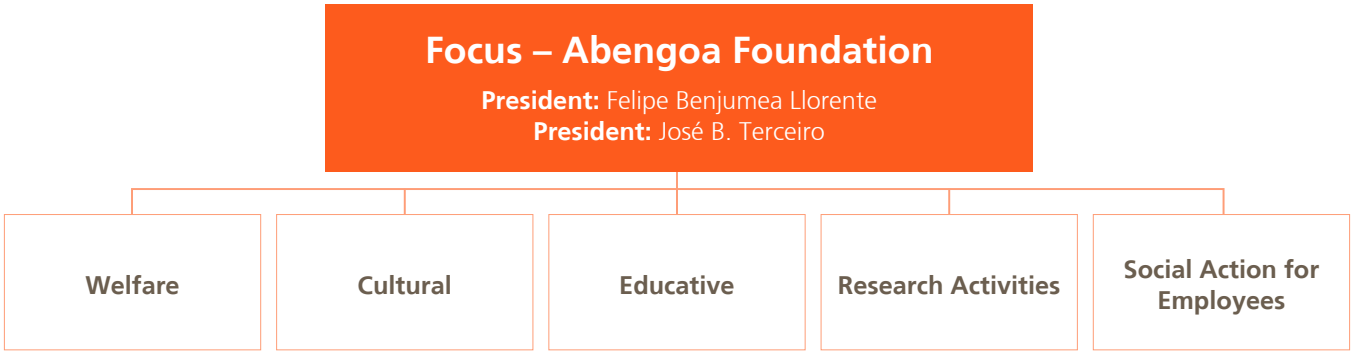
# Focus - Abengoa Foundation Organizational Structure

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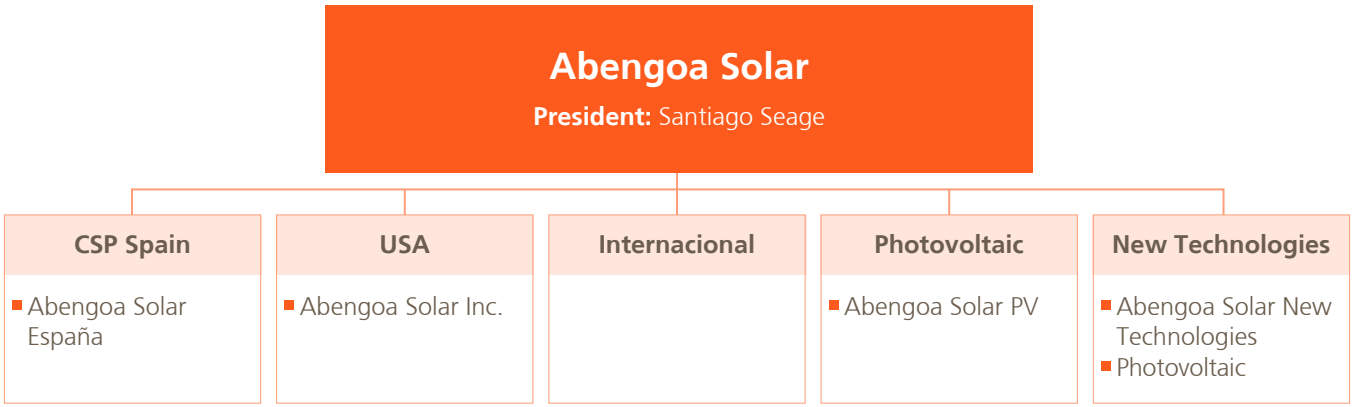
# Abengoa Solar Organizational Structure




| Board Structure | Head | Address | Phone & Fax |
|---|---|---|---|
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| Abengoa Solar PV | Antonio de la Torre Iglesias | Paseo de la Castellana, 31-5ª P. 28046 Madrid (Spain) | P. +34 954 937111<br>F. +34 913 196677 |
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# Abengoa Bioenergy Organizational Structure

**Abengoa Bioenergy**
**President:** Javier Salgado Leirado

| United States | Europe | Brazil | New Technologies |
|---|---|---|---|
| ■ Abengoa Bioenergy Corporation<br>■ Abengoa Bioenergy Engineering & Construction<br>■ Abengoa Bioenergy of Illinois<br>■ Abengoa Bioenergy of Indiana<br>■ Abengoa Bioenergy of Nebraska<br>■ Abengoa Bioenergy Outsourcing<br>■ Abengoa Bioenergy Trading US | ■ Abengoa Bioenergía<br>■ Abengoa Bioenergía San Roque<br>■ Abengoa Bioenergy France<br>■ Abengoa Bioenergy Netherlands Abengoa Bioenergy Trading Europe<br>■ Abengoa Bioenergy UK<br>■ Biocarburantes de Castilla y León<br>■ Bioetanol Galicia<br>■ Ecoagrícola<br>■ Ecocarburantes Españoles | ■ Abengoa Bioenergia Brasil<br>■ Abengoa Bioenergia Agroindústria | ■ Abengoa Bioenergía Nuevas Tecnologías<br>■ Abengoa Bioenergy New Technologies<br>■ Abengoa Bioenergy Biomass of Kansas |

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# Befesa Organizational Structure

**Befesa**

**President:** Javier Molina Montes

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| ■ Befesa Zinc Aser<br>■ Befesa Zinc Duisburg<br>■ Befesa Zinc Freiberg<br>■ Recytech<br>■ Befesa Silvermet Turkey<br>■ Befesa Valera<br>■ SYI Turkey<br>■ Befesa Scandust<br>■ Befesa Zinc Sondika<br>■ Befesa Zinc Amorebieta<br>■ Befesa Zinc Comercial<br>■ Befesa Steel Services | ■ Befesa Aluminio<br>■ Befesa Escorias Salinas<br>■ Befesa Salt Slags<br>■ Befesa Salszchlacke<br>■ Befesa Salszchalcke Sud | ■ Befesa Gestión de Residuos Industriales<br>■ Befesa Plásticos<br>■ Befesa Gestión PCB<br>■ Befesa Desulfuración<br>■ Befesa Valorización de Azufre | ■ Befesa Water<br>■ Aguas de Skikda<br>■ Myah Bahr Honaine<br>■ Chennai Water Desalination<br>■ Befesa Agua Tenés<br>■ Qingdao BCTA Desalination<br>■ NRS Consulting Engineers<br>■ Befesa Waterbuild | ■ Befesa Argentina<br>■ Befesa Servicios<br>■ Befesa Perú<br>■ Befesa México<br>■ Soluciones Ambientales del Norte |

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| Myah Bahr Honaine | Fernando Maíz | 52, Lot Bois des Cars II, Dely Ibrahim - Argel (Algeria) | P. +213 21 363892<br>F. +213 21 363892 |

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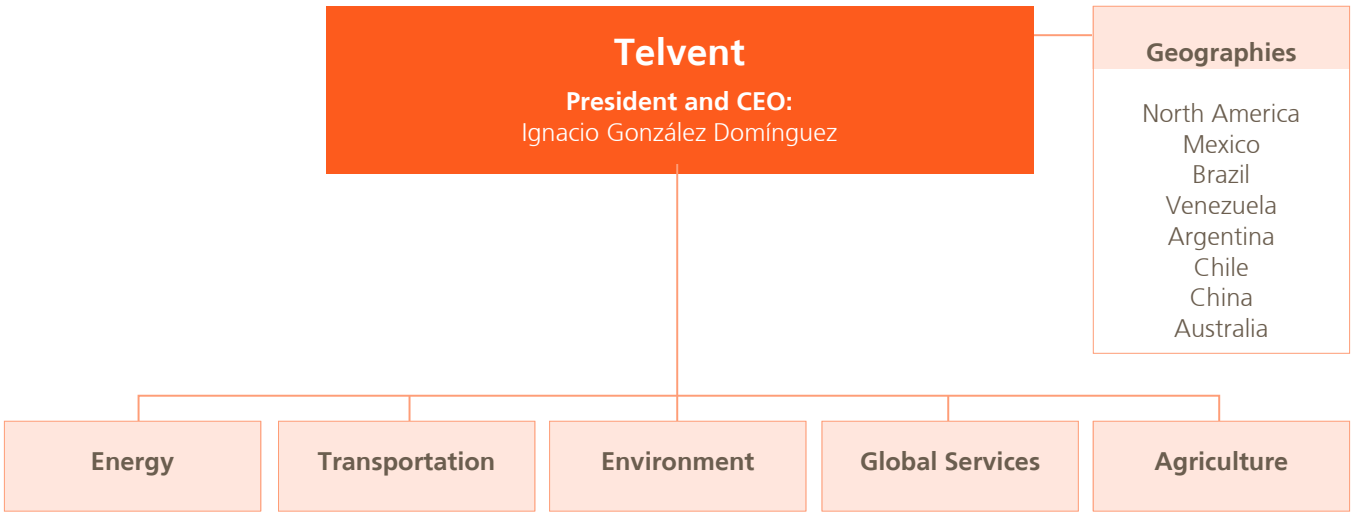
# Telvent Organizational Structure

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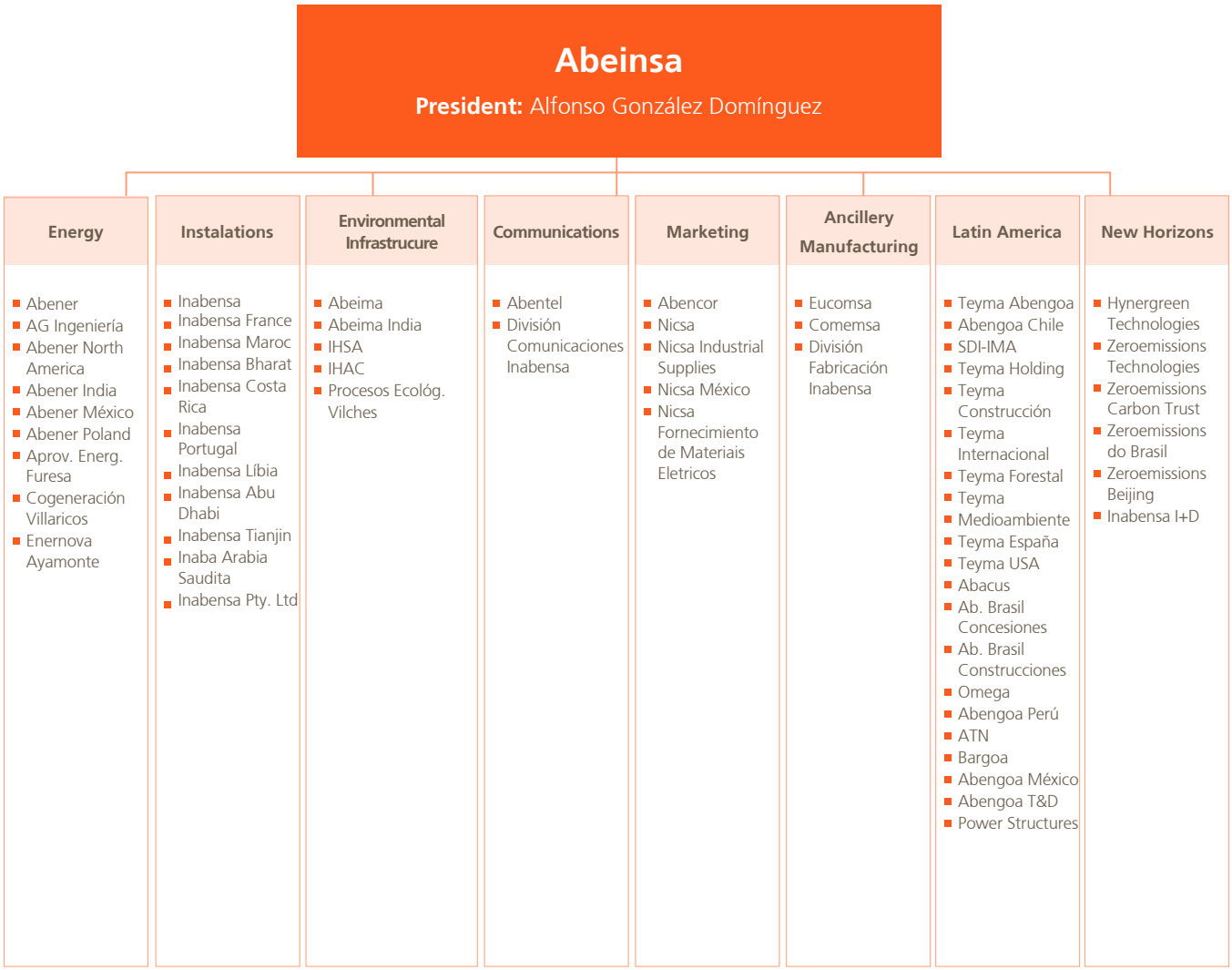
# Abeinsa Organizational Structure




| Board Structure | Head | Address | Phone & Fax |
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