Strategy, Organization and Management Systems

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Action Values and Principles

Mission

Abengoa is a technological company that applies innovative solutions for sustainable development in the infrastructures, environment and energy sectors. It is present in over 70 countries where it operates through its five Business Units: Solar, Bioenergy, Environmental Services, Information Technology, and Industrial Engineering and Construction.

The focal points of Abengoa activity are its customers, the professional development and welfare of its employees, and the creation of value for its shareholders.

Approach

Abengoa believes that a mandate for innovation in a market economy context is an efficient and necessary instrument for becoming a sustainable development company.

Values

Throughout its history, Abengoa has continued to develop on the basis of a series of shared values. These principles constitute the structure of our ethical code. Through all of its channels, Abengao promotes its awareness and applications, as well as providing control and revision mechanisms to ensure adherence and updating. The most important points underlying this set of values are summarized below.

- **Integrity:** Pride in professional performance forms part of the very identity of Abengoa and is evident in all undertakings of our staff, both on and off site. Uncompromising integrity is seen as credibility by our customers, suppliers, shareholders and other third parties with whom we have dealings. Integrity also generates value both at the individual and company level.
- **Law Abiding:** Law abidance is not just an external requirement, it is also a personal and company obligation. The law provides a secure framework for company undertakings and also serves to reduce risks in business dealings.
- **Professional Rigour:** The concept of professionalism in Abengoa is closely linked to our service culture in activity development, performance and business project involvement. All undertakings in the performance of allocated functions must be guided by professional responsibility and governed by the principles provided for by common management systems.
- **Confidentiality:** Abengoa expects discretion and caution from the people attached to its organisation when communicating and dealing with third parties. Adequate steps shall also be taken to safeguard information in the company's possession.
- **Quality:** Abengoa is committed to quality in all aspects of its performance - internal and external alike. This task is assigned neither to a specific group of people nor to senior management as it concerns all members of the organisation in a day-to-day capacity. Abengoa has specific quality standards in place, which have developed from awareness, common sense, rigour, order and responsibility.

Strategy

In Abengoa, corporate social responsibility is regarded as a strategic factor. It is one of the essential pillars which upholds our current and future strategy. We have generally incorporated this factor into our strategy through our environment, quality and human resources policies, and have also integrated it into all company management systems. In support of this strategic factor, Abengoa maintains a presence in those forums which are involved in sustainable development. In addition, in 2002, Abengoa signed with the United Nations Global Compact. The purpose of this agreement is to contribute to the adoption of shared values and principles which give the world market a more human face.

The Global Compact involves the institution of its principles in the strategy and operation of the signatory company, through a process of dialogue, transparency in information and training. These principles consist of the following:

In the sphere of human rights, adherence means to support and uphold the protection of internationally proclaimed human rights and avoid circumstances involving infringement.

In the area of labour rights, adherence means to uphold freedom of association and effective recognition of the right to collective negotiation, to eradicate all forms of forced and obligatory labour, and to eliminate discrimination in employment and occupation practices.

With regard to the environment, adherence means to support a cautious approach to environmental issues, to adopt initiatives to promote greater environmental responsibility and to encourage the development and diffusion of environmentally-friendly technologies.

Abengoa, together with the other signatory companies, actively participates in action to promote the World Pact in Spain.

Human Resource Strategy

Abengoa's Human Resource policy responds to its Mission, Vision and Values, and operational strategy and, therefore, it is oriented towards and aligned at all times with the strategic objectives and their attainment through the execution of the company's Strategic Pan.

It is our human capital that makes the attainment of the company's objectives possible and which provides the differential competitive values through talent, skill and work performance excellence. Therefore, in Abengoa, when speaking of the employee, the "suitability" factor is considered a key concept.

The pursuit of this "suitability" is, in effect, one of the basic objectives of the company's Human Resource policy; suitability of the employee in his/her position, from both a technical and generic point of view, and the suitability of his/her ambience working conditions from a material and immaterial point of view. This pursuit of "suitability" inspires the Training, Selection, work performance measurement, segmentation by posts and responsibilities, and the remuneration and conditions policies. Therefore, it is present in each the sections related to employee development.

Abengoa has decided on a human resource management model based on competencies that enables alignment between the strategic objective, position and individual (suitability) and which, at the same time, allows talent to be detected and identified.

In the current environment characterized by innovation and change, the activity of its professionals as well as the capacity to attract, develop and retain talent is the key to success for any company and, for this very reason, Abengoa has firmly decided on a Human Resource policy with a two-fold objective:

- to consolidate, exploit, transmit and manage the know-how and experience of the company's senior level professionals and guide the development of competencies.
- to continuously endow the human resource organization with suitable means, in quantity and quality, for the development and implementation of the company's strategy.

In order to meet these objectives, suitable conditions must be created and, for this purpose, the following actions put into practice: a constant study of remuneration conditions and their adjustment to results and to the market; periodic evaluation of work performance; constant training required by profile and position; and actions related with Corporate Social Responsibility.

In Abengoa, the employee's commitment, his/her initiative and proactivity, is considered to be fundamental. Therefore, it utilizes an Integral and Integrated Management System:

- Integral, given that it covers job definition, description and classification, selection and recruiting processes to attract the market's best professionals, their training and development, with the corresponding career plans, assessment, work performance and remuneration management, and internal communication and social action.
- Integrated, as it contemplates the interrelated processes. The synergies of the different processes must be exploited and continuity pursued, in spite of the autonomy of each one (Selection, Training, Evaluation, etc.). They must all pursue a common goal that is none other than to enable Strategic Plan fulfillment.

This human resource management system is the means that will enable Abengoa to overcome the challenges it has established, through constant enhancement that will allow it to maintain and develop a sustained competitive advantage by aligning its human resources with its strategy and pursuing work performance excellence.

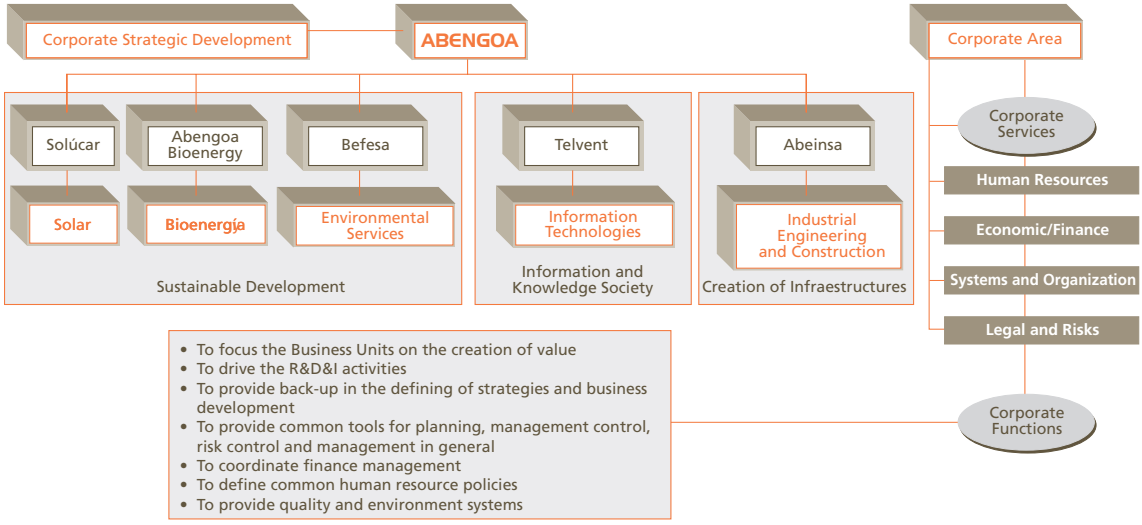
As regards the organization model, Abengoa opted to establish an in-house specialized Services Company called Gestión Integral de Recursos Humanos (GIRH), with a clearly defined mission that is none other than to offer efficient and effective Human Resource management solutions, utilizing quality and innovation, to enable the enhancement of the operativity and competitiveness of its different Companies.

Organization

Abengoa is organized into five Business Units: Solar, Bioenergy, Environmental Services, Information Technology, and Industrial Engineering and Construction, and a corporate services area. All the company's social action is channeled through the Focus-Abengoa Foundation.

The corporate area provides Management Control, Financing, Risk Control, Strategy, Human Resource, Legal Counsel and Systems services with the aim of capturing management synergies and providing a common management philosophy by:

- Focusing the Business Units on the creation of value
- Providing back-up in the defining of strategies and business development
- Driving the R&D&I activities
- Providing common tools for planning, management control, risk control and management in general
- Coordinating finance management
- Defining common human resource policies
- Providing quality and environment systems



Management Systems

Commitment to Quality

Since its founding, Abengoa has been convinced of the need for its processes, products, services and systems to pursue full customer satisfaction.

The current common management system was introduced in 1997. It is structured around a set of compulsory internal rules designed to unify the managements of the companies making up Abengoa. Quality systems have also been put in place in all companies of the group as a strategic objective which goes beyond certification.

In accordance with standard ISO 9001:2000, there must be a mechanism in place that controls the mandatory design and implementation of quality management systems. Based on solid management leadership, these systems provide the training and resources necessary for employees to contribute to constant improvement in their day-to-day activitites.

The principles that underpin this Quality policy are:

- Rational use of resources, error avoidance and minimisation, through implementation of constant improvement programs and goal and objective setting.
- Promotion of active and responsible involvement of all members of the organisation and provision of adequate ongoing training, allowing for participation in the constant improvement process of the system.
- Fostering of team work and sharing of necessary information, for raising the quality of our activities.
- Compliance with regulations currently in force and any other commitment subscribed to by the company.
- Reinforcement of innovation, new ideas, new methods and updating of resources, which are vital components of the constant improvement process, the results of which are threefold.
- Customer satisfaction: identification of key attributes and minimisation of failure rates; process control and improvement.
- Employee satisfaction: development and training programs; responsible participation; and achievement recognition.
- Improvement of economic results: increase in earnings via differentiation; reduction in the resulting cost of poor quality and an increase in competitiveness in the markets in which Abengoa operates.

Structure and Quality Organisation

Each company under the Abengoa umbrella is capable of structuring and organising itself according to its needs. The determination of resources necessary to implement the company's commitment to quality is the responsibility of the management teams.

As an instrument for developing this commitment, each company is specifically organised in view of its needs and dedicated to the development and maintenance of the Quality Management System. The reporting flow in each company is targeted directly at the applicable management team, on either a company or business group basis. In each case, the management team is comprised of fully qualified personnel with the appropriate academic and specific training in the relevant areas.

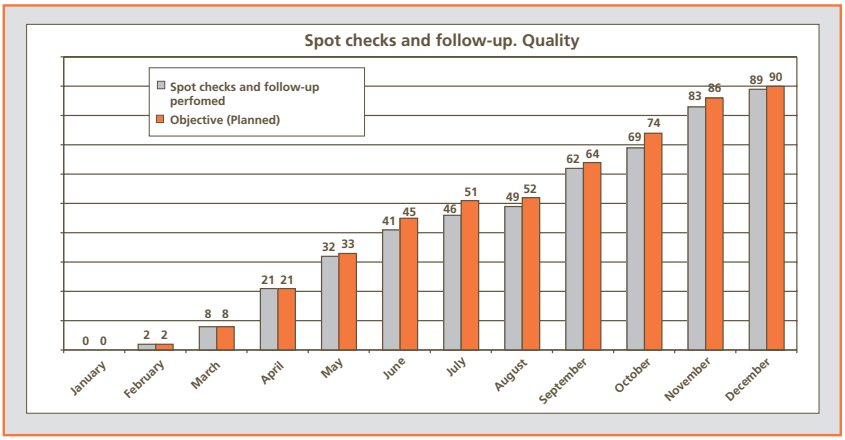
The companies devoted to engineering and industrial construction have a decentralised structure, with activities in specific works or projects, both on the permanent site (branch or regional management) and in the main office (which reports to general management).

At the company level and reporting directly to the Abengoa Chair, there is a corporate management structure for organisation, quality and environment, each with its own resources. In the sphere of quality, the purpose of this area of responsibility is to inform the Abengoa Chair as to the evolution and position of the quality management systems in the different companies of the group. This supervision is led by the general coordinator for quality and environment, who verifies attainment of these objectives and capitalisation on synergism through spot checks and follow-up.

The functions of the environment and quality organisations mainly consist of managing and developing the documentation of the systems; keeping it updated as required under applicable national and international standards; proposing and developing the annual plan for internal audits; assuming the role of secretary to the quality and environment committee, where the objectives, indicators and goals are proposed for the company, areas and departments; responding to consultations and requests for advice from the areas and departments; collaborating on training programmes; evaluating suppliers; acting as supervisor in the application of problem solving (PSR) and improvement action (IA) initiative; and collaborating with general management on the annual revision of the systems, in order to determine proposals for improvement.

Quality Management Systems

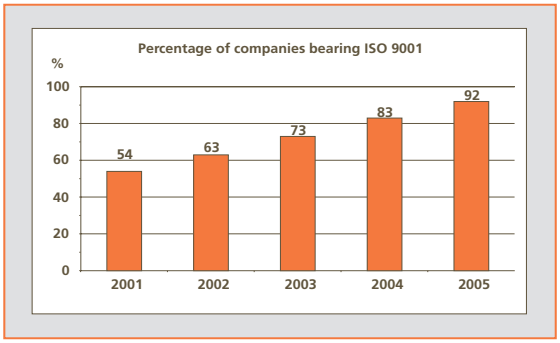
The progressive introduction of the quality management systems in the Abengoa group of companies is one of the strategic objectives of the group's commitment to quality. This objective revolves around the quality management model which conforms to ISO 9001 and ISO 9004 and the EFQM model of excellence.

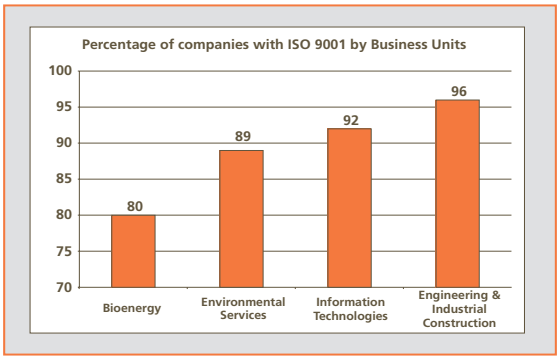


UNE-EN ISO 9001 and 9004

These international standards are used by Abengoa as a basic reference for the development and introduction of Quality Management Systems.

The percentage distribution of the companies bearing Quality certificates by Business Group is detailed in the attached graphics:





It is important to stress that the need to integrate the Quality, Environment and Occupational Risk Prevention Systems has been established as a medium term objective. Accordingly, six companies have developed and implemented integrated Quality, Environment and Occupational Risk Prevention Systems to date, which have been certified by the international certifying entity and, a further three companies have integrated the Quality and Environment systems.

EFQM Model

The EFQM model of excellence is a voluntary framework designed for the sustained achievement of excellence of an organisation, based on the following principles: customer satisfaction, employee satisfaction and positive impact on society. These principles are attained through leadership in policy and strategy, proper personnel management, the efficient use of resources and an adequate definition of processes, eventually leading to excellence in business results. These principles are developed through nine criteria which permit a comprehensive evaluation in order to determine the organisation's progress towards excellence. This model has already been introduced in the Information Technologies Business Group, and is in the final stages of implementation in the remainder of the Business Groups.

In the Information Technologies Group, EFQM self-assessments were continued throughout 2004 in all Abengao companies in Spain, using the simplified tool, "profile" with licences from the quality management club. The comparative results were published and improvement actions with better synergism prospects and mutual convergence were prioritised. The initiative to validate self-assessments with licence-holders from the quality management club has also continued, the self-assessment of the Traffic and Transport area of Telvent having received validation.

The initiative to receive external EFQM assessments based on the "REDER" tool has also continued, having been awarded in the Energy and Environment area of Telvent the certificate of "European Excellence" (Silver Seal) by the Quality Management Club, scoring 401 out of a possible 500, as well as the certificate Recognised for Excellence in Europe awarded by the EFQM.

As regards participation in competitions of renowned prestige, Telvent has presented the candidatures of the Traffic and Transport area for the "Asturias Business Quality" award, the Energy and Environment area for the "Prince Philip Industrial Quality" award, and the Traffic and Transport area for the "Andalusia Excellence" award.

In addition, in the Industrial Engineering and Construction Business Unit, Instalaciones Inabensa has entered for the fourth edition of the Iberdrola Best Services Provider of the Year Award in the Large Companies category. In 2004, it was a finalist in this same competition and also in the fifth edition of the Aena Prize for Excellence and Best Practices, Airports.

Commitment to the Environment

Abengoa is fully conscious of the fact that its services, systems, processes and products must be environment-friendly in order to meet current-day needs, and that it must identify and control the associated activities and possible environmental impacts in order not to endanger the capacity for meeting future needs.

This commitment to the environment is reflected by the very structuring of the business. Two business groups, environmental services and bioenergy actively work for the environment. Together with the environmental perspective of the remaining areas, the group has a clear environmental orientation.

The Environmental Management Systems are supported by solid leadership from management, who provides training and necessary resources so that all Abengoa employees can help to improve the environment through their day-to-day activities.

The principles underpinning Abengoa environmental policy are:

- Compliance with legal standards in force from time to time, requirements occurring within the company, demands made by our customers or interested parties and goals and objectives set
- Prevention and/or minimisation of harmful or negative repercussions on the environment
- Reduction in consumption of energy and natural resources by using, to the greatest extent possible, sources which can be renewed or regenerated
- And finally, constant improvement of environmental behaviour

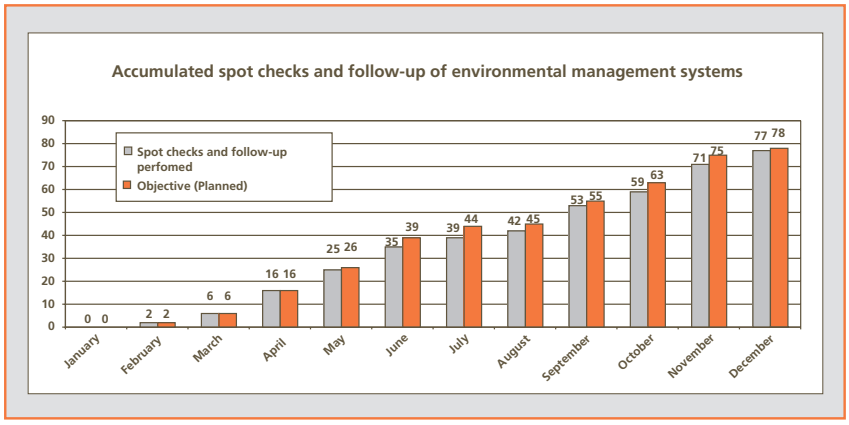
Structure and Environmental Organization

For the Abengoa group of companies the following obligations, pertinent to structure and environmental organization, flow from the development of internal management standards:

- Constitution of a quality and environment committee, representative of the whole organisation and presided over by company management. Its function is to be the governing body of the environmental management system.
- Provision of structure and environmental organisation necessary for fulfilment of the environmental commitment expressed in the standard. The application of this standard, which is the responsibility of management, must be in proportion to the needs of the company.

Each company is specifically organised to suit its needs and is dedicated to developing and upholding the environmental management system. As a general rule, these organisations report directly to the Managements of the companies, or in some areas to a specific management of the business group for this area. In every case, fully qualified personnel with the necessary academic and environmental training make up the teams that are responsible for the environmental management system. Likewise, these teams are responsible for specific environmental management activities such as: identification of legal requirements; proposal and development of annual plans of internal auditing; assumption of the role of secretary to the quality and environment committee, where objectives, indicators and goals are proposed for the company, areas and departments; response to consultations and requests for advice from the areas and departments; collaboration on training programmes; evaluation of suppliers; assumption of a supervisory role in the application of problem solving (PSR) and improvement actions (IA); and collaboration with general management on the annual revision of the systems in order to determine proposals for improvement.

The organisation of the environmental management systems is the basically the same as the quality management systems.

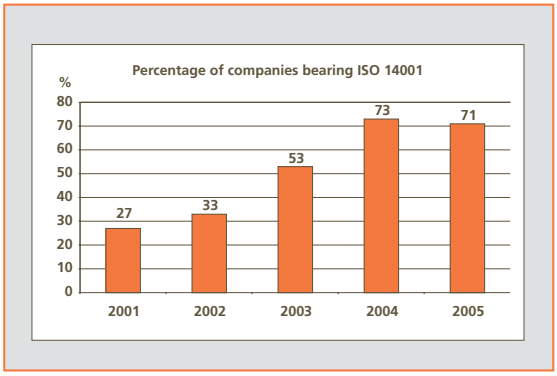


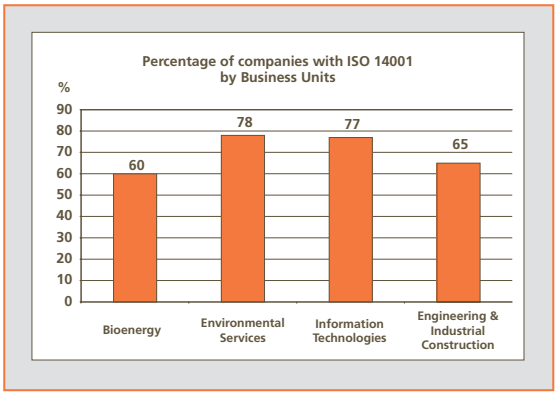
Environmental Management Systems

The progressive introduction of the Environmental Management Systems in the Abengoa group of companies is one of the strategic objectives included in the commitment to the environment of the group. The objective revolves around two environmental management models: the international standard ISO 14001 and the Eco-Management and Audit Scheme (EMAS).

EN ISO 14001

The former is the international standard that Abengoa has set as a reference for the development and introduction of environmental management systems. Below is a representation of the evolution of these systems, certified by certification bodies:





European Eco-management and Eco-audit Scheme (EMAS)

At present, five companies of the Environmental Services Business Unit and one from the Information Technology Business Unit have obtained the verification certificate that assures conformity of the Environmental Management System with the requirements of the European Eco-management and Eco-audit Scheme (EMAS).

Over the coming fiscal periods, several companies in this Business Group and other areas of the business will be preparing to obtain this same verification designation.

Constant Improvement

Abengoa bases its evolution on constant improvement in the development of its management systems and the following instruments, which it considers to be strategic: Six Sigma, Problem Solving Report (PSR) and Improvement Actions.

Six Sigma

In 2003, Abengoa opted for Six Sigma as a tool for constant improvement in the important processes of the business with an irregular or unsatisfactory track performance. Six sigma is a methodology that applies statistical techniques from project management to control and reduce variables affecting global performance; the results of which are threefold:

- Customer satisfaction: the identification of the key attributes of their demands, minimisation of failure rates and better control of processes
- Employee satisfaction: through participation in development and training programs which allow individuals to participate responsibly and gain recognition for achievements
- Improvement of economic results: increase in earnings by differentiation and reduction of the costs associated with of poor quality output

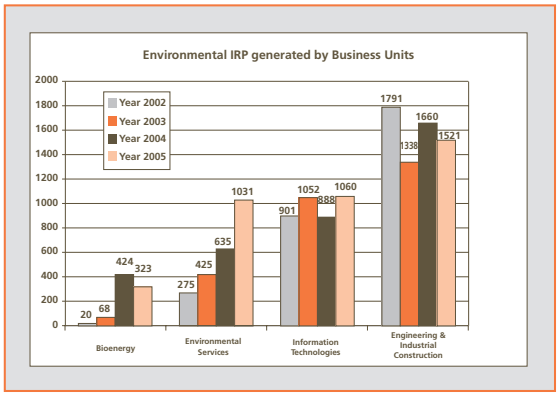
Since 2004, as a consequence of the above, each Business Unit has commenced the preparation of human teams of "Black Belts" and "Green Belts", managers that act as Champions, and different projects that have now been completed were undertaken. During this trade year, work continued on the application of this improvement tool for the processes identified as improvable.

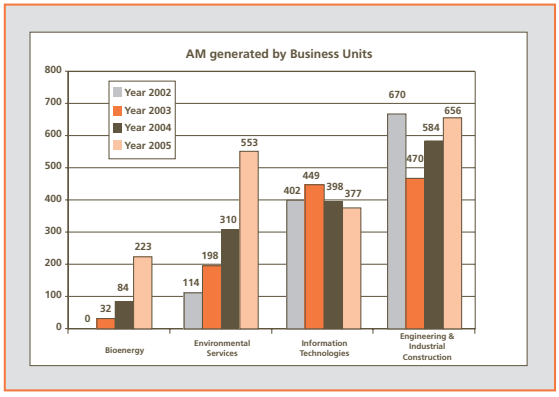
Trouble-Shooting Report and Improvement Actions

As strategic tools for improving Management of Quality and Environmental Management Systems, new versions of two computer applications have been installed in all Abengoa companies, one for management and Trouble-Shooting (IRP) and the other for processing Improvement Actions (AM).

The essential aspect of these applications is that problem management and solution and improvement actions alike can be proposed at the most relevant level to the problem, in such a way that problem detection (IRP) and solutions or improvement proposals (AM) go from "low to high". Full utilisation of these tools can be enormously advantageous in the day-to-day handling of problems. This type of constant improvement is designed tp be redundant in view of the efficiency of the system.

Below is the comparison, broken down by business group, of the results obtained in 2002, 2003 and 2004 relative to problem detection and proposals for improvement actions, as well as the distribution of the problems detected and proposed improvement actions.





Commitment to the future. R&D&I

In Abengoa, we believe that the innovative company within a context of global change and competitiveness is an efficient and necessary tool to enable advancement towards a sustainable development society. Innovation is not an end in itself, as Research can be in many cases. Innovation has an essential role to play and that is to lead society towards a better world. The objective is to make our socioeconomic system, which is not sustainable or for everyone, evolve into one that is sustainable and also for everyone. This is our commitment to the future.

2005 was a year of special importance for the push given to R&D&I at all levels. Of note in the European Union was the intention of doubling the R&D&I budget for the period 2007 to 2013.

In May, a Symposium of the Spain, Italy and Portugal Cotecs was held in Rome. It was chaired by the Heads of State of the three countries and the objective was to coordinate a Mediterranean R&D strategy that promotes the adapting of European R&D policies to the context and needs of this geographical area. A second edition of the Symposium is to be held in Madrid, in February 2006.

In June, the President of the Government presented the Ingenuity Program aimed at technologically strengthening the Spanish economy. Of note therein are the Cenit Projects focused on Technology Tractor companies. Abengoa is participating actively in this program.

On the other hand, in December, the EU published the Scoreboard with a Ranking of the European companies that invested most in R&D&I in 2004. Abengoa is listed as eighth among the Spanish companies.

Also in December, the Framework Agreement between Abengoa and the University of Seville to regulate and promote multiple collaboration activities, especially those related with R&D and Human Resources, was signed.

Innovation Strategy

Abengoa's policy focuses on the creation of value and its sustainment. Innovation is focused on results, in pursuit of three groups of tangible objectives: diversification, through the development of new products and services, differentiation, through improvement and adaptation of existing products, and services for the improvement of processes.

In addition, the intangible objective pursued in Abengoa is the acquisition of essential skills, and above all, the generation of future options. This last point is especially related to value through prospects of growth and development of new businesses.

Innovation is carried out in Abengoa in several forms. It is put into practise internally, and designed to provide specific customers with solutions or integrated into their own development efforts. It is also put into practise externally based on collaboration agreements with universities, research centres, and third parties, with the execution typically shared between the participants. On other occasions, technology is acquired, and additionally, as has taken place in the past strategic shareholdings have been acquired in technology firms.

With regard to financing, Abengoa also has external resources (taxation, grants, universities –research centres, shared or customer R&D) and well as its own internal resources.

During its innovative history, Abengoa has received recognition in multiple business and academic forums on account of its R&D&I activities. Some of the prizes it has received over the last ten years are listed below:

- Best of European Business for Innovation. Abengoa Bioenergy. Roland Berger and the Financial Times. 2005. **Bioenergy**
- "City of Seville" Prize. Mention of Honor for Hynergreen. Seville City Council. 2005. **Engineering and Industrial Construction**
- National "Mare Nostrum" Computer Science Prize. Telvent. Ministry of Education and Science. 2005. **Information Technologies**
- Prize for Best Energy Website, The Web Marketing Association, USA, 2004, **Bioenergy**

- Prize for Excellence and Practical Improvements in the Area of Technological Innovation, AENA, 2003. **Information Technologies**
- ComputerWorld Prize for Technological Innovation in Andalusia, 2003. **Information Technologies**
- Nebraska Business Innovation Prize, USA, 2003, Abengoa Bioenergy Corporation, **Bioenergy**
- Prize for Technological Innovation in the Sector of Recovery 2000, Spanish Recovery Federation, 2003. **Befesa**
- Prize for the Best Project of the Year, Hynergreen Eight Grove Fuel Cell Symposium, 2003. **Engineering and Industrial Construction**
- Dilectae Academia Prize (First Edition), in recognition its innovative career, Abengoa, Engineering Academy, December 2002
- AEC Prize, for R&D&I to Protect the Environment, AEC Spanish Association of Scientists (AEC), Madrid, November 2001.
- Prize for Most Valuable Innovation, Telvent Velflex product, European Wind Energy Conference, Copenhagen, June 2001. **Information Technologies**
- European Union Prize for the Best Industrial Initiative in the Use of Renewable Energies, for the project on utilization of bioethanol within the programme Renewable Energy for Europe, Camping for Take-Off, Abengoa, Repsol-YPF and Cepsa, European Union, Toulouse, October 2000. **Bioenergy**
- Prince Felipe Prize for Business Excellence, in the category of Business Competitiveness: Energy and Industry Ministry and the Commerce and Tourism Ministry, March 1996.
- Prince Felipe Prize for Business Excellence, in the category of Technological Effort:: Energy and Industry Ministry, March 1996

Innovative Tracking Projects

Abengoa believes that demonstration projects are key to implementing an innovation policy for the development of new products aimed at the market. Demonstration projects achieve operational validation of a product, system or innovative process and market testing. They also provide knowledge about anticipated cost so that an initial budget can be set, which can be later lowered through the experience curve. On the other hand, demonstration projects produce a real demand in the public R&D system which enables science to respond to the needs of society.

Once again, this year, we must highlight the project for the Production of Bioethanol from lingo-cellulosic biomass. This project is designed to convert straw from corn and other cereals into bioethanol, as well as other agricultural waste. This will give rise to new benefits for farmers, as production costs will be lowered bringing them closer to the price of gasoline and the greenhouse effect will be lessened through absorption of CO^2 by plants – a raw material in the production of bioethanol – through chlorophyllic function. With investment scheduled for fiveyears of US$35,478,765, this project has received major non-returnable assistance from the Department of Energy (DOE) of the Federal Government of the United States for a value of US$17,739,38, accounting for 50% of investment.

We here-below offer a selection of other innovation projects our companies have been carrying out throughout 2005.

Bioenergy:

- **Advanced Biorefining of Distillers Grain and Corn Stover Blends**. In 2003, the United States Department of Energy (DOE) and Abengoa Bioenergy R&D signed a 4-year contract to develop the biorefining technology for the project. Abengoa Bioenergy R&D heads the work group for the development of the novel biomass derivatives process technology, which utilizes the advanced biorefining of distillers' grain and corn stover blends to obtain a greater production of bioethanol while, at the same time, maintaining the protein nutritional value. This technology is going to enable a more sustainable and economic industry, will reduce the petrol consumed per liter of produced bioethanol, and augment the availability of bioethanol. DOE Financed.
- **BCyL demonstration plant**. The world's first commercial-scale biomass plant built by Abengoa Bioenergy to demonstrate the biomass to ethanol conversion technology. It will process 70 tons per day of agricultural waste, such as wheat straw, to produce more than 5 million liters of fuel ethanol per year. The end objective is the development of production technologies that are gasoline competitive. Subsidy under the EU's 5th Framework Program.
- **E-diesel. Abengoa Bioenergy is researching the utilization of e-diesel**. E-diesel is a carburant that is obtained by adding ethanol to conventional gas oil at a percentage that can vary between 5 and 15%, plus an additive that ensures the stability of the blend. It can be used in any diesel engine. Collaboration with the Cidaut and the United States e-diesel Consortium. Funding from the Ministry of Education and Science.
- **Agrobihol**. Energy crops are fast growth crops that are utilized specifically to produce energy (electricity or liquid fuels) from all, or part, of the plant. The objective of Abengoa Bioenergy is to produce fuel ethanol from crops grown in Spain, be it from cereals with a high starch content, lignocellulosic matter such as cereal straw, or from other herbal or lignose crops. Under the Agrobihol project, Abengoa Bioenergy is researching the feasibility of producing bioethanol from sweet sorghum and Jerusalem artichoke. In addition, this project proves the use of bioethanol as an alternative fuel, in

ethanol-gasoline and ethanol-gas oil blends, in conventional vehicles, and also the production of hydrogen for fuel cells. Funding from the Ministry of Education and Science.

- **Ethanol reforming**. Abengoa Bioenergy is making an important effort in development to bring hydrogen generating from bioethanol systems to perfection. For this purpose, it is working on ethanol reforming, a chemical process in which hydrogen is generated through a reaction with steam and in the presence of a catalyst. To this end, it is participating in research projects that have led to the obtaining of an ethanol reforming catalyst and the construction of two pilot plants that have already been in operation for thousands of hours. A demonstration facility is currently being developed for this technology. It will facilitate the gaining of in depth knowledge on the design, operation and costs associated with this technology and will determine the aspects that have to be dealt with for optimization purposes. The project has received funding through the Spanish Navy.
- **ACES**. A research project that is being carried out in collaboration with the CSIC in the ICP's (Catalysis and Petrochemical Institute) facilities, in Madrid, where other ABRD projects are also being carried out. The main objective of the ACES project is to develop a catalyst capable of producing ethanol from syngas, consisting basically of hydrogen and carbon monoxide. This step is the key to the thermochemical conversion of biomass to ethanol. Fully financed by Abengoa Bioenergy.
- **RENEW**. The objective of the RENEW project is to develop, compare, demonstrate (partially) and prove a range of automotive fuel production chains. This project is coordinated by Volkswagen AG (Germany), and Abengoa Bioenergy is one of the key partners. Its contribution is to optimize the production of bioethanol from biomass via two processes: 1) enzymatic hydrolysis, and 2) gasification and thermochemical catalysis, and the production of coproducts. The Chemical Engineering Department of Aicia, University of Seville, is collaborating with Abengoa Bioenergy on these tasks. The project is financed by the European Commission's 6th Framework Program.

Environmental Services. Befesa:

- **Change of raw material treatment process**. Befesa Aluminio. Objective: To remove organics from profiles, trimmings, turnings and other complex raw materials that are difficult to recycle. In-house financing.
- **Fusion perfectioning**. Befesa Aluminio. Objective: Study of an optimum performance flux for the rotating kiln. In-house financing.
- **Improvements in aluminum pouring process**. Befesa Aluminio. Objective: Improvement and redesign of automatisms for ingoting. In-house financing.
- **New filter powder waste treatment process**. Befesa Salt Slags. Objective: Design and install a pilot plant for routine processing of sleeve filter powders. With the collaboration of the Inasmet and Inatec laboratories. In-house financing.
- **End Product Chlorine Content Reduction**. Befesa Zinc. Project objectives: To establish the conditions and causes by which the chlorine content increases in the product and establish the optimal conditions under which the lixiviation process minimizes the chlorine content in the end product, taking the quality of the effluent into consideration. In-house financing.
- **Vitrification**. Befesa Gestión de Residuos Industriales. Studies to perform the hazardous industrial wastes thermal treatment process by means of plasma Vitrification. Financed under the "National Scientific Research, Development and Technological Innovation Plan 2004-2007 (Pladit)".
- **Experimental plant for the reutilization of industrial wastes of an organic nature**. Albega. The project comprises the construction and start-up of an alternative fuel production plant utilizing wastes, for the cement and ceramics industries, and the production of inorganic subproducts capable of substituting some of the raw material used by these industries. Profit Program Funding.
- **Application of low-content Magnesite in Environmental Technology. Befesa Gestión de Residuos Industriales**. The project consists of the utilization of Magnesite as a waste absorbent to achieve stable waste behavior, transforming wastes of a hazardous nature into those of a non-hazardous nature, by preventing the lixiviation of metals. Profit Program Funding.
- **Production of fiber glass reinforced thermoplastic compounds**. Befesa Plásticos. Industrial facility for the production of fiber glass reinforced polypropylene, using recycled materials. In-house financing.
- **Prototype of a PFRV Sand Filter for desalination**. Befesa CTA. Design, construction and validation testing of a real-scale prototype of a sand filter made of fiber glass reinforced polyester (PRFV) to be utilized in desalination plants. This type of material will solve the corrosion problem that is currently arising with steel filters in desalination plants, which is shortening their expected useful life and resulting in additional costs. In-house financing.
- **Submerged bed biological reactor feasibility study**. Codesa. Development of the activated carbon technology, specifically lignite coke, in combination with biological reactors for utilization in the treating of high biological toxicity liquid industrial wastes. Regional Government of Andalusia Funding.

Information Technologies:

- **Icaro**. Centralized urban traffic control system that combines artificial vision with calculation-specific algorithms, an expert system for traffic optimization and the implementation of a communications process between modules. Funding from the Ministry of Industry of the Regional Government of Catalonia.
- **SatTOLL**. Design and development of a new toll system based on positioning via satellite (GNSS) and cellular telephony (CN). Intek, Basque Government and Profit Program funding.
- **InTrasy**. Advanced modular structure urban traffic control and management system, capable of adapting to very different operational specifications. In-house and Regional Government of Catalonia Financing.
- **VisiTraf**. Image viewing and treatment system for traffic systems with the reading of license plates being the fundamental technology. Funding from the Madrid Regional Government.
- **SaReF**. Design and development of an integrated on-line railway traffic regulating system, employing in-house technology, for joint use with CTC systems that enable optimal global operation of the lines under criteria. Madrid Regional Government Funding.
- **Genio**. Development to provide transport ticket vending machines with an oral interface that enables the requesting of any product or service by means of a natural language dialogue. Financing from Fagor and Intek and the Basque Government.
- **ValTick**. Design and development of a driver desk, on-board equipment with an interface for transport ticket sale, card recharging, and ticket validation functions… Intek, Basque Government, and Profit Program Funding.
- **WebPark**. Internet-based advanced parking lot management system.
- **Avandis**. Project to develop Advanced DA/DSM Infrastructures for Efficient Electricity Distribution Network Management. It is a project aimed at exploring and demonstrating the benefits from using advanced DA/DSM (Distribution Automation/Demand Side Management) functions. Profit Program Funding.
- **GasCAT**. Remote telecontrol station adapted to the needs of the Oil and Gas sector, including flow computer (with certified calculations for custody transference) and valve control functions.
- **Opera (Open PLC European Research Alliance)**. Project aimed at offering low cost broadband access services through the most widespread universal infrastructure, the electricity networks. Funded by the European Commission through the IST program.
- **Merced**. Project aimed at developing a work framework that enables the reutilization of software components for real-time embedded (RTE) systems. Eureka Program Funding.
- **OpenRTU**. Project aimed at developing a real-time embedded system that enables its flexible and versatile use as a core technology of Remote Terminal Units (RTUs) for application in industrial control systems. Financed by the Ministry of Industry, Tourism and Trade.
- **Metap (Applied Meteorology)**. Project to design and develop an array of meteorological systems and applications that will shape the prototype of an Applied Meteorology System. Funding from the Regional Government of Andalusia.
- **Terwis**. Project to develop a global real-time information system that will predict the influence the weather will have on road transport. Profit Program Funded.
- **Osmose**. "Open Source Middleware for Open Systems in Europe". Project led by Telvent in which the R&D centers of leading European companies (Bull, France Telecom., Philips, Telefónica, Thales, etc), and research institutes and universities (Charles University, EPFL, INRIA) are participating. The aim is to develop an open platform for distributed systems that will be validated on a broadband residential services gateway. Profit Funding/ Eureka Program.
- **Osiris**. Integration of services oriented technologies, components, and architectures (web services, etc.) to avail of flexible infrastructure value-added services. Profit Funding/Eureka Program.
- **SmartClient**. Development project to enhance the deficiencies resolution capacity of systems through the integration of Microsoft's Smart Client technology.
- **Program Certification**. Certification of the OASyS-DNA for SAP, National SCADA Test Bed (INEEL), OSIsoft Pt and Windows Gold Partner.
- **EmComPAs**. Multiannual program in which fifteen companies and five countries are collaborating. It is an open initiative aimed at accelerating the deployment of broadband networks through the development of advanced products and applications for the residential environment, creating new multimedia services, home automation and remote control, security and monitoring, developing international standards and processes. Profit Funding. Eureka Program.
- **Families**. Consolidation of the CMMI (Capability Maturity Model Integration) standards, security in dynamically deployable distributed systems, quality variability techniques in the dynamic derivation of applications, case studies on the development of suites based on Model Driven Architecture (MDA), suite integration processes, recovery of third party assets based on open source. Profit Funding/Eureka Program.

- **Cosi**. Project aimed at specific architecture and software modules different to the commodity-type software based on open sources, and applying them to enhance organization and business processes. Eureka/Profit Program Funding.
- **Passepartout**. Project aimed at the convergence of systems and digital applications in the domestic environment. Eureka/Profit Program Funding.
- **Technology Platform**. Development of advanced methodologies for the design of systems and software, wireless connectivity middleware, service reliability, security and quality. Profit Program Funding.

Industrial Engineering and Construction:

- **Project Wi-Pac**. Developed in collaboration with APIF Moviquity, S.A., the University of Castilla-La Mancha, and Intercentros Ballesol, S.A. This innovative project will improve the quality of life for those suffering from Alzheimer's in hospitals, geriatric or similar centers, through the development of a wireless location and control management system. The project is being financed by the Ministry of Industry, Tourism and Trade.
- **Project Esteriplasma II**. Development of a microwave produced plasma sterilization system for treating medical and pharmaceutical materials. The ICMSE-CSIC and the University of Seville are participating. Partial Funding under the Ministry of Education and Science's Profit Program.
- **Project Plasma-Air II**. Development of a Barrier Discharge Non-thermal Plasma Reactor for air purification and the elimination of microorganisms in indoor environments. GreenPower Technologies, S.L. and the ICMSE-CSIC are participating in the project. Profit Program Funding.
- **Project Res2H2**. The main objective of the Res2H2 project is the integration of renewable energies with hydrogen production and its utilization in different sectors. On this project, which is part of the European Commission's 6th Framework Program, the University of Las Palmas de Gran Canaria, the INTA, OWK GmbH, Solantis Energy AG, Unelco-Endesa, Compañía Transportista de Gas de Canarias, S.A., IDS AG, CRES, FIT, Electricity Authority of Cyprus, C. Rokas, S.A. and PLANET GbR are participating.
- **Project Fresnel PV-5x**. Development of the Medium Photovoltaic Concentration Concept at Values between 5x and 10x. This project, developed by Solúcar, Gamesa Solar and the University of Lerida, has received funding from the Ministry of Industry, Tourism and Trade, the Andalusia Development Institute (now the IDEA Agency) and the R&D Programs of the Regional Government of Andalusia.
- **Project CAC-30x**. Development of a Controlled Atmosphere Photovoltaic Concentrator of around 30x. As part of the project, in which the Ciemat, Fachhochschule Gelsenkirchen and Solartec are participating, two prototypes have been manufactured; one is being tested in Gelsenkirchen (Germany) and the other in Seville. Funding is under the 5th Framework Program.
- **Project Hicon PV**. Development of a High Concentration Photovoltaic Concentrator (1,000x). A prestigious group of European companies and institutions are participating. They are coordinated and led by Solúcar. They include RWE Solar Space Power, EdF Electricité de France, the German aerospace institute DLR, the Fraunhofer Institute for Solar Energy Systems (ISE), the German center PSE Gmbh–Forschung Entwicklung, the Spanish energy research center Ciemat, and the Universities of Ben-Gurion (Israel) and Malta. 5th Framework Program Funding.
- **Project Abahelio**. Large-size 200 m^2 Heliostat that lies on the ground. Profit Program Funding.
- **Project Medcal**. Systems to Improve the Precision Sun Targeting and Increase Solar Power Plant Efficiency. Profit Program Funding.
- **Project Aznalcóllar TH**. 80 kW Solar Thermoelectric Plant with Parabolic Dish Reflectors and Stirling Motors. The Project is being supported by the Regional Government of Andalusia through its Renewable Energies Incentives Order.
- **Project Repow PS10**. Repowering of the PS10 plant through the Contribution of Steam from a Loop of Parabolic Cylinder Collectors. In collaboration with the Ciemat.
- **Project Almería Solar GDV**. 5 MW Plant comprising Parabolic Cylinder Collectors and Direct Steam Generation, in Almeria, with the collaboration of the Ciemat, Iberdrola, Sener, IDEA and the University of Almeria.
- **Project Eureka**. The objective of the Project, in which the Ciemat and the College of Superior Engineers of the University of Seville are also participating, is the development of a GDV (Direct Steam Generation) technology steam superheater receiver module that, upon it being independent of the saturated steam generation receiver module, allows temperatures up to 460 °C to be reached in the steam generated in tower technology plants.
- **Project EPiCo**. Development, in Spain, of PEM type Fuel Cells. Financed as a Singular Project of a Strategic Nature by the Ministry of Education and Science's Profit Program. Other participants in this project are Cegasa, Ajusa, David Fuel Cell Components, the Cidetec Foundation, and the INTA.
- **Project Revcell**. Autonomous energy production systems based on reversible fuel cells as long-term storage devices for isolated photovoltaic systems and

UPS. The objective of the project is the development of a reversible polymer fuel cell (RFC) capable of functioning as an electrolyzer (producing hydrogen and oxygen from water), and as a fuel cell itself. Inabensa, Fraunhofer-ISE, Nedstack FC Technology BV, ECN, Stockholms Universitet, Chloride España S.A.U., Univ. Duisburg-Essen and Nedstack FC Components BV are also collaborating on the project which is funded by the European Commission's 5th Framework Program.

- **Project PlasmaGen**. Development of a Clean Hydrogen Production Process with plasma reactors. The ICMSE-CSIC is participating and funding is by the Regional Government of Andalusia.
- **Project SolTerH**. Generation of clean and renewable hydrogen utilizing high temperature Solar Thermal Energy employ, for this purpose, an iron oxide based thermochemical process. Participants are Hynergreen, Ciemat and Solucar.
- **Project Homecell**. Design and development of a 2 kW electric energy generating system, based on PEM type fuel cell, for the domestic market. The participants are Hynergreen, Inabensa, the Andalusia Industrial Research and Cooperation Association (AICIA) and the University of Seville. Developed with Funding from the Regional Government of Andalusia.
- **Project Microcell**. Its objective is the development of a portable and reliable compact electric energy producer system based on a 50 watt polymer fuel cell. The project contemplates the safe and compact transportation of hydrogen. It is funded under the Ministry of Education and Science's Profit program, and by the Regional Government of Andalusia. The participants are Inabensa, the Andalusia Industrial Research and Cooperation Association (AICIA) and the University of Seville.
- **Project Mahres**. The objective is the design and development of a national map for hydrogen production using renewable energies by applying multi-criteria techniques. In addition, the aim is to advance and develop a possible infrastructure to favor the transition to the hydrogen economy, where this energy vector would coexist with other traditional forms of energy production based on the electric vector. The University of Pablo de Olavide of Seville is also participating in the project.

Innovative Lines. Important Tracking

At present, there are five important innovative lines in Abengoa: Bioenergy, Solar Energy, Hydrogen Technologies, Information Technologies and Desalanization.

Bioenergy This business group works on enhancing innovations, improving efficiency, such as waste starch conversion, "Fiber Conversion" or DGS recovery, as well as on radical innovations to transform the business, such as ligno-cellulosic biomass, fuel cells, E-diesel or biorefinary.

In this line, state funding is received from the Department of Energy of the United States Government, the European Commission via the Framework Programme V, and the National R&D Plan.

This table shows the R&D Plan in the area of Bioenergy for the years 2003-2006.

Bioenergy R&D Plan. Objectives

Objectives	Production of ethanol at gasoline competitive prices						Widen the market		
Work Areas	Improve current performance	Ethanol production from Biomass		Increase co-product value			Demostration programs for ethanol end-uses and development of new applications		
Projects	Residual starch conversion	Gasification and catalysis	Enzyme Hydrolysis	Bio-Products	Fiber conversion	Increase proteins	E-Diesel	FFV	Fuel cells
Partners	Novozymes	University of Seville	NREL, Novozymes StakeTech	Pending	NREL, Novozymes		02 Diesel Tussan	Ford/BP Repsol	ICP/CSIC
R&D programs	DOE R&D NP	DOE 6th FP R&D NP	DOE R&D NP	R&D NP	DOE R&D NP	R&D NP	R&D NP	R&D NP	CDTI R&D NP
Goals	2,9 gal/Bu yield	2007: compete with the cereal ethanol price 2012: Compete with the fossil fuel price		Increase current profitability in our facilities			Captive fleet in 2006		Prototype
Term	Short	Long		Medium			Short		Long

Projects included under the DOE R&D NP-National R&D Program

Solar Energy. Abengoa is pursuing two lines of innovation in solar energy: solar thermoelectric and photovoltaic energy

Solar Energy

Technologies for electricity production

Thermoelectric

CCP Parabolic Cylinder

DGS Plants (Direct Steam Generation)

To advance in more efficient concepts that offer important cost reduction in generation.

Direct steam generation DSG) is considered the base technology for solar thermal development (+ efficiency, + economy, + environment-friendly)

Specialization of the available technologies is proposed, applying each one of them to the temperature margin it suits best and in which it is more efficient from an economic point of view:
- Simplified CPP technology for T<300ºC
- Advanced tower technology for T>300ºC

As the main line of development to achieve performance enhancements in solar thermal power plants, the development of superheated steam technologies at temperatures of around 500ºC is proposed.

Tower and Heliostat

Stirling Dishes

CCP Parabolic Dish Plants with Stirling Engine

To advance in more efficient concepts that offer important reductions in generation costs:

- Simpler and more economic concentrators

Photovoltaic

Tracking and Concentration

PV Plants with both Tracking and Concentration

To consolidate the know-how related to very low concentration (1.5X to 2X) PV systems.

To achieve cost reduction in very low concentration systems based on the simplification and optimization of the tracking systems and the implementation of passive cooling systems.

To advance in medium concentration (5X to 50X) and high concentration (100X to 1,000X) systems.

Solar Hydrogen

PV and TQ with Concentration

Efficient Solutions for Renewable Hydrogen Generation

To search for innovative proposals, based on the utilization of solar energy, that permit the solving of the renewable hydrogen generation problem by:

- Photovoltaic Processes
- Thermochemical Processes

The generation of solar hydrogen can be considered one of the most attractive options to achieve large-scale and long-term storage technology, not linked to the capturing origin, of the solar energy.

Hydrogen Technologies. Abengoa has two companies dedicated to driving the development of Hydrogen and Fuel Cell technologies; Hynergreen Technologies, S.A. (Hynergreen) and Greencell.

Hynergreen is a company focused on the design, development and construction of electric energy based on fuel cells and hydrogen, and on the production, handling and storage of this gas as an energy vector.

To be precise, it focuses on the development of systems that integrate fuel cells and hydrogen in the transport and portable sectors, where it develops R&D&I projects and works at national as well as international level. An ambitious plan it has under way covers electric ratings that oscillate between 30 W and 500 kW, utilizing high and low temperature fuel cells.

All these ambiences will be able to benefit greatly from the use of these technologies which, in addition to greater efficiency, present other advantages such as low emissions of pollutants, higher energy density, modularity or low noise level.

With a clear awareness of the needs to pursue new clean energy sources, Hynergreen also participates in projects related with the production of hydrogen utilizing solar energy, and in the integration of nanotechnology and microtechnology.

In this sense, the hydrogen would act as a storage system for the renewable energies, converting them into a clean fuel and with possibilities of local production. To meet its objectives, Hynergreen collaborates with public and private bodies and institutions, both Spanish and foreign, in different frameworks and programs, to combine synergies and achieve the best possible results.

Finally, it utilizes R&D&I Management Systems that allow it to offer solutions developed to meet its customers' specific requirements, with the maximum viability and based on the latest advances in these technologies and, in this way it contributes to a sustainable future.

Hynergreen is a member of the Board of Management of the Spanish Hydrogen Association (AEH2), holds the vice-presidency of the Spanish Fuel Cell Association (Appice), and is a member of Raitec as a Technology Agent. In addition, it is on the Advisory Council of the European of the European Hydrogen and Fuel Cell Technology Platform, and holds the Chair on the Spanish Hydrogen and Fuel Cell Technology Platform

Greencell's objective is the production of renewable hydrogen from bioethanol. Among other R&D&I projects, Greencell has developed, in collaboration with the Catalysis and petrochemical Institute of the CSIC, a pilot electric energy production system comprising a bioethanol reformer, hydrogen purifier and a 10 kW fuel cell. It is currently scaling this system to 300 kW.

Information Technologies. Abengoa develops its activities in this sector through Telvent, a company with multiple R&D&I fronts, especially in the wide-ranging fields of digital electronics, real-time data processing, modern telecommunications systems and internet applications. Telvent provides solutions for the Industrial, Services, Health and Public Administration sectors. In particular, we indicate one of our more complex and permanent technological development lines of activity, in which Abengoa is world leader:

OASyS DNA. Is a Supervisory Control and Data Acquisition System. An evolved SCADA System that provides the technological infrastructure that supports and integrates the different applications for the oil, gas, electricity, water and waste management sectors. It is an open-end platform that manages process control, the relations and interfaces with other internal and external systems, and superior level communication. The following are some of the specifically developed Telvent applications it supports:

- LMS: Liquid Management Suite for oil pipeline management.
- GMS: Gas Management Suite for gas pipeline management.
- GMAS: Gas Measurement Applications Suite for gas network data acquisition and processing.
- SimSuite PipeLine: Advanced pipeline operation simulation system capable of working on-line.
- Polaris Liquids: Oil pipeline integrated commercial management through internet.
- Polaris Gas: Idem for gas pipelines.
- WMS Water Management Suite for treatment plant and water distribution network management.
- Service Suite: VIP maintenance management.

Desalination. Abengoa, through Befesa CTA, aspires to becoming the global technological leader in desalination. It currently focuses its R&D&I activities on sustainable desalination through:

- The enhancement of energy efficiency by optimization of the rejected matter and the technological development of membranes.
- Desalination with Renewable Energies.
- Minimization of the environmental impact caused by brine dilution.

Abengoa Investment R&D&I

Investment R&D&I by concepts

Main Projects	2004 M €	2004 % / Sales	2005 M €	2005 % / Sales	2006 (P) M €	2006 (P) % / Sales
Ethanol efficiency enhancement (residual starch)	1.0		1.1		1.9	
Biomass to ethanol conversion	3.8		13.5		25.6	
Hydrogen Technology. Fuel Cells	0.6		2.7		3.6	
Aluminum efficiency enhancement	0.6		0.2		0.1	
Vitrification	0.8		0.0		4.0	
Environmental Technology Center	0.0		0.0		0.5	
Desalination	0.0		0.0		1.1	
Electric, environmental, oil and gas control centers	6.4		6.8		7.1	
Road and rail traffic and ticketing systems	3.7		3.6		4.0	
Public Administration support systems	1.5		2.1		2.2	
Geographic Information Systems	0.0		2.2		2.3	
Solar Energy	0.6		31.7		17.6	
Other Projects	4.3		2.0		4.5	
Total R&D&I Investment	**23.3**	**1.3%**	**65.9**	**3.3%**	**74.5**	**3.1%**