

Abengoa Bioenergía is its holding company. The Business Unit is dedicated to the production and development of biofuels for transport, bioethanol and biodiesel, among others that utilize biomass (cereals, cellulosic biomass, and oleaginous seeds) as the raw material. The biofuels are utilized for ETBE production (gasoline additive), or for direct blending in gasoline or gas oil. Given that they are renewable energy sources, biofuels reduce CO₂ emissions and contribute to the security and diversification of the energy supply while reducing the dependency on fossil fuels utilized in the transport sector and helping towards compliance with the Kyoto Protocol.



With biomass...
we produce ecologic fuels
and animal feed

Europe's largest bioethanol producer
(340 million liter production capacity)
and fifth in the US (415 million liters)

Organization

The Business Unit comprises the management of the following companies:

Abengoa Bioenergía, S.A.
 Ecocarburantes Españoles, S.A.
 Bioetanol Galicia, S.A.
 Biocarburantes de Castilla y León, S.A.
 Ecoagrícola, S.A.
 Bioener Energía, S.A.
 AB Bioenergy France, S.A.
 AB Bioenergy Hannover, GMBH
 Abengoa Bioenergía San Roque, S.A.
 Abengoa Bioenergy UK, Ltd
 Abengoa Bioenergy Netherlands B.V.
 Abengoa Bioenergy Belgium N.B
 Abengoa Bioenergy Trading B.V.
 Abengoa Bioenergy U.S. Holding, Inc.
 Abengoa Bioenergy Corporation
 Abengoa Bioenergy Trading U.S., LLC
 Abengoa Bioenergy Engineering & Construction, LLC
 Abengoa Bioenergy of Nebraska, LLC
 Abengoa Bioenergy of Kansas, LLC
 Abengoa Bioenergy of Indiana, LLC
 Abengoa Bioenergy R&D, Inc.
 Grencell, S.A.

Europe

The main milestones achieved during the year 2006 in the European Operations scope have been:

- Biocarburantes Castilla y León start-up.
- Bioethanol Supply of 190 Ml to the European Exports Markets (France, Germany and Sweden).
- Ecoagrícola starts operating in Europe through contracts with producers in the United Kingdom and Germany.
- Abengoa Bioenergy France obtains additional tax exempt amounts of 60,000 t and 20,000 t.
- Abengoa Bioenergy France obtains the construction permit in March and Production permit at the end of June.
- The Abengoa Bioenergy France Plant begins construction in Lacq.

- Launching of the project of a biodiesel manufacturing plant within the boundaries of the Cepsa Refinery "Gibraltar" in San Roque (Cádiz), with a capacity of 200,000 t.
- New sites in Europe being identified for the development of future projects.
- Development and promotion of Flexible Fuel Vehicles FFV (e85) in Spain. Commercial agreements with Ford, General Motors, and Saab.

United States

The Bioethanol industry continues to experience rapid growth in the United States, and Abengoa Bioenergy played a significant part in this growth, achieving the following milestones in the United States during 2006:

- Plant expansion activities were completed at both Portales, New Mexico and Colwich, Kansas plants, and record daily production volumes have been achieved at each facility.
- Construction of the new Ravenna, Nebraska plant is well under way with expected start up in early 2007.
- Initial evaluation and development of several new bioethanol production projects, with preliminary permitting filed for two new projects which could start construction in 2007.
- Partnership with General Motors and Kroger Stores was initiated to supply e85 bioethanol fuel to Dallas and Houston Texas.
- Restructure of the U.S. organization to facilitate future growth was completed and effective January 1, 2007, creating separate companies for the operating facilities, the new projects, and marketing and developmental functions.
- Initiation of training partnerships with local colleges, and continued implementation of internal competency, development and compensation programs strengthen and protect key employee base.



Research and Development

Abengoa Bioenergy R&D, Inc. is a subsidiary of Abengoa Bioenergy Corp (ABC).

ABRD's efforts are focused on four high priority projects:

- Improve actual production process yields and coproduct quality at existing drymills.
- Increase bioethanol capacity and develop new feed co-products.
- Develop and demonstrate cost competitive technologies for new biomass facilities.
- Develop demonstration programs which permit an increase in the field of bioethanol utilization (i.e., e-diesel and hydrogen fuel cells).

ABRD is leveraged by grants from the U.S. Department of Energy, the European Union and various ministries within the Spanish Government. Grencell, our affiliate in Spain, is responsible for the management of our European activities, reporting to ABRD.

Operations in Europe

Introduction

Abengoa Bioenergy is the European leader in the production of bioethanol for use as a biofuel, and currently operates with three plants in Spain, Ecocarburantes Españoles, in Cartagena (Murcia), Bioetanol Galicia in Teixeiro (La Coruña), and Biocarburantes Castilla y León (Babilafuente), which have a total installed capacity of 150, 176, and 200 million liters annually, respectively. It has also begun the construction of its fourth plant in Europe, through Abengoa Bioenergy France, in the Petro- Chemical Complex in Lacq, Pyrénées Atlantiques (France).

Ecocarburantes Españoles

Ecocarburantes Españoles, S.A. is the holding company of a bioethanol production plant in Escombreras, en Cartagena (Murcia). This company is owned 95% by Abengoa Bioenergía, S.A., and 5% by the Instituto para la Diversificación y Ahorro Energético IDAE (Institute for Diversification and Energy Saving).



The main facts of this plant are:

- 70 million euro investment.
- Began operating in the year 2000.
- The produced bioethanol is destined to the production of ETBE
- Annual installed capacity of 150,000 m³ of bioethanol and 110,000 t of Eco-protein.
- 300,000 t of cereal consumption annually.

Bioetanol Galicia

A second plant, property of Bioetanol Galicia, S.A., is operating in Teixeiro (La Coruña), with an annual bioethanol production capacity of 176 million liters. This company is owned 90% by Abengoa Bioenergía, and 10% by Xes Galicia.

Below are the main facts for the facility:

- 85 million euro investment.
- Begun operating in the year 2002.
- The produced bioethanol is destined to the production of ETBE
- Annual installed capacity of 176,000 m³ of bioethanol and 120,000 t of Eco-protein.
- 340,000 t of cereal consumption annually.

Biocarburantes de Castilla y León

The third plant, property of Biocarburantes de Castilla y León, S.A. in Babilafuente (Salamanca), with an annual bioethanol production capacity of 200 million liters, of which 5 millions will be obtained from the conversion of cereal biomass into bioethanol by means of a new technology under development by Abengoa Bioenergy R&D.



This plant will be the first of its kind in the world with the possibility of producing bioethanol from biomass, in particular from cereal straw, with Enzymatic Hydrolysis technology.

The company Biocarburantes de Castilla y León is owned 50% by Abengoa Bioenergía, S.A., and 50% by Ebro Puleva, the largest nutritional group in Spain. The startup with grain took place on April 7th, 2006, passing the working capacity tests in the month of July.

Below are the main facts for the facility:

- 170 million euro investment.
- Began operating in the year 2006.
- The produced bioethanol is destined to direct-blending with 5% bioethanol (e5).
- Annual installed capacity of 200,000 m³ of bioethanol and 120,000 t of Eco-protein.
- 585,000 t of cereal consumption annually.

Abengoa Bioenergy France

Abengoa Bioenergy France has been conceived as a Specific Purpose Company for the promotion, construction and production of a bioethanol manufacturing plant from corn and alcohols of lower quality (wine alcohol, and others), located in the Petro-Chemical complex in Lacq. Abengoa Bioenergy France is owned 64% by Abengoa Bioenergía; 8% by Oceol, grouping of the main regional agricultural corporations and industries; 35% by Euralis and Maisadür; and 1% by AGPM.

The main facts of this plant are:

- The total capacity of the projected annual production is 197,500 t of Anhidric Ethanol, on a 335 days per year production basis, of which 158,000 t will use corn as raw material, and 39,500 t derived from the distillation of lower quality alcohols (wine alcohol and others).
- Estimated annual cereal consumption (corn) around 500,000 t.
- Estimated annual consumption of wine alcohol and other alcohols around 40,000 t.
- Estimated annual Ecoproteine production around 145,000 t.



- 200 million euro total investment.
- First Phase starting date of commercial production using wine alcohol and other alcohols early in 2007, and the plant as a whole by mid 2008.

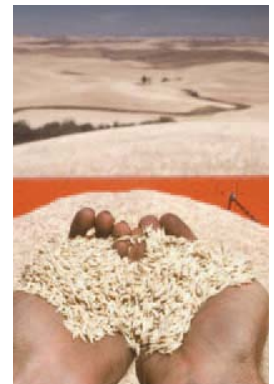
Abengoa Bioenergía San Roque

Abengoa Bioenergía San Roque, S.A. has begun the construction of a new biodiesel plant in San Roque (Cádiz), in an area adjacent to Cepsa's Gibraltar Refinery, with the objective to produce 200,00 t annually. The plant will be operative in 2008 and will consume 200,000 t of vegetable oils (rape, soy, and palm)

Ecoagrícola

Ecoagrícola is the company within the Abengoa Bioenergy Business Group, dedicated to the management of grain purchases and DDGS commercialization (proteic animal feed), which acts as a cereal receiver (wheat, barley, and corn) to convert it into Bioethanol and proteic feed in Abengoa Bioenergy's plants (currently Ecocarburantes Españoles, Bioetanol Galicia, and Biocarburantes Castilla y León, and later AB Bioenergy France y other future plants in Europe).

For the past eight years Ecoagrícola has contracted the cereal supply for the plants, both by purchases in the Free Market, and by direct contracts with farmers in accordance to the CAP programs. In particular, this last approach started offering contracts for Set-Aside Lands and continued with



contracts for Energy Crops, since the policies regulating these were not in place up until the year 2003.

Hence, Ecoagrícola has accumulated a wide experience in the different fields, both in large cereal purchases in the market, and second, in establishing contracts directly with the farmers, thereby ensuring the cereal supply to the business group plants. It also holds a great knowledge of the applicable policies in order to proceed legally within the EU legislation.

Since Ecoagrícola started purchasing cereal in 1998, the growth in contracts has been progressive, and since nowadays the Abengoa Bioenergy Business Group is the European leader in Bioethanol production, Ecoagrícola is equally the European leader in Cereal Contracts for energy use, offering farmers the possibility to benefit from the special incentives established by the recent Common Agricultural Policy. In the same manner, Ecoagrícola contracts production from the lands farmers leave uncultivated by imperatives in the CAP, these are referred as Set-Aside Lands.

Ecoagrícola guarantees farmers a harvest purchase price through a contract and offers necessary technical assistance through its purchasing cooperators.

Ecoagrícola has been developing its activity in Spain since 1998, and has recently initiated operating in Europe. The numbers below clearly reveal its leading position in the cereal market under the EU incentives programs

Cereal Supply 2006

Purchases (t)	Free Market		Set-Aside Lands		Energy Crops		Total Cereal
	Wheat	Barley	Wheat	Barley	Wheat	Barley	
Spain	575,000	164,800	11,000	64,000	48,000	212,000	1,074,800
Europe	-	13,200	300	-	7,000	-	20,500
Total	575,000	178,000	11,300	64,000	55,000	212,000	1,095,300

DDGS Commercialization 2006

Sales (t)	DDGS		Total DDGS
	Wheat	Barley	
Ecocarburantes Españoles	-	130,000	331,000
Bioetanol Galicia	114,000	-	
Biocarburantes Castilla y León	87,000	-	

- Ecoagrícola has lead for years cereal contracting for biofuel production in Spain, proof of this the 10,000 farmers that currently contract directly with the company.
- Equally relevant are the offered services, since it is present in all 41 provinces in Spain, apart from United Kingdom and Germany, altogether coordinated through its own network of cooperators to a total of 140 agents.
- Ecoagrícola holds a vast knowledge of international cereal markets, which allows the company to forecast the prices the farmer will receive should the harvest be destined to biofuel production, hence guaranteeing him a production final price and future income, even before planting the crops.
- Ecoagrícola controls each and every single operation necessary for the execution of the contracted goods, from the origin to its destiny in the plants warehouses, offering services for the whole process: land and sea transport, storage, quality controls, etc.



As regards the upcoming new projects and the Bioenergy business group's expected growth in forthcoming years, its become utterly necessary Ecoagrícola's presence in the cereal originating countries to ensure a regular supply for the plants, since the purchases needs in the next few years will be considerably increased. Therefore, the knowledge of the raw material markets from its origin to our plants shall reinforce Ecoagrícola's position within the business group as the main source of origin and imports of cereal from EU countries. This practice has already been started during the year 2006.

Abengoa Bioenergy Trading

Abengoa Bioenergy has incorporated in 2006 the company Abengoa Bioenergy Trading (ABT), 100% owned by AB, to articulate the bioethanol marketing through a trading company with European wide activity, integrated service, risk management and infrastructures capabilities.

ABT is incorporated in The Netherlands with offices located in Rotterdam.

ABT will provide services to Abengoa Bioenergy (AB) in Europe by:

- Marketing bioethanol produced by AB and by any third party with whom it has previously signed a marketing agreement (volume mix).
- Managing on behalf of AB's facilities in Europe the contracts for exceeding capacity over LT contracts and those LT or spot contracts which are not linked to special detax regimen, under pool system.
- Supplying & pricing management based on same average CIF price for customers (pool). Invoicing to be made and controlled by each production company directly to customers.
- Originating bioethanol for trading purposes and raw alcohol to be processed in Europe.
- Managing the control and coordination of the logistics involved in the marketing of the bioethanol, including freights and storage/handling.
- Developing terminals to improve logistics capabilities.

Achieved Milestones

Industry

- Exports of bioethanol to France, Germany, and Sweden of 190 million liters.
- Development and promotion of Flexible Fuel Vehicle FFV (e85) fleet in Spain. Commercial agreements with For, General Motors, and Saab.

Legislation

- Approval of mandatory objectives and/or tax exemptions in Spain, Netherlands, United Kingdom, France, and Italy.
- Development of mandatory objectives and/or tax exemptions in Germany, Sweden, Belgium, and Poland.

Internal

- Biocarburantes de Castilla y León Plant in Salamanca start-up.
- Beginning of construction of the Abengoa Bioenergy France Plant in Lacq.
- Launching of the project of a biodiesel manufacturing plant within the boundaries of the Cepsa Refinery "Gibraltar" in San Roque (Cádiz).
- Agreements towards the development of Energy Crops and Set-Aside Lands in Europe by Ecoagrícola.
- World Biofuels Conferences took place for the fifth year, consecutively.

Operational Results

Operational results of the plants (bioethanol, DDGS, and production of electricity).

Production	Ecocarburantes	Bioetanol Galicia	Biocarburantes Castilla y León
Bioethanol (m ³)	129,678	159,675	106,907
DDGS (t)	124,967	119,287	89,061
Exported Electricity (Mwh)	144,256	165,011	88,311

New Projects

Abengoa Bioenergy's Business Plan includes the promotion and construction of a new bioethanol plant in Bilbao's Harbor, in the town of Zierbana, under the company named Bioener Energía, S.A., owned 50% by Abengoa Bioenergy, and 50% by



the Basque Energy Entity (Ente Vasco de la Energía). The project is in the phase of promotion and shall be operative in the year 2009.

Furthermore, Abengoa Bioenergy's Business Development Plan in Europe includes the promotion and construction of three new bioethanol plants from cereal, which are currently in the phase of permits acquisition. The new production capacity will be installed in countries where the demand and the legislation allow a fast and effective bioethanol development, under the approved guidelines in the European Directives for Promotion and Taxation of Biofuels.

Environmental Studies

The transportation sector is responsible for 25% of the world's energy-related greenhouse gas emissions.

In 2005 the Spanish Government published an audit of the life-cycle greenhouse gas emissions of bioethanol from Abengoa Bioenergy's first two bioethanol plants in Spain, and compared them with the emissions produced from petrol made in a typical Spanish oil refinery. It presented the results by comparing the emissions of a representative car running on pure petrol, with the same car using a 5% bioethanol blend in petrol (e5) and also with an 85% blend of bioethanol with petrol (e85). Under its base case scenario the results were as follows:

- Pure petrol emits 206 grams of Greenhouse gases (fossil CO₂ equivalent) / kilometer;
- e5 blend emits 198 grams of greenhouse gases / kilometer (a 3% saving); and
- E85 blend emits 61 grams of greenhouse gas / kilometer (a 70% saving).

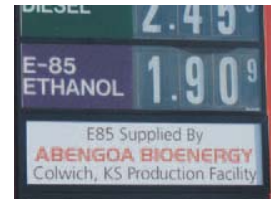
Since bioethanol contains no fossil fuel, we can deduce from these results that each liter of bioethanol made from our Spanish plants saves more than 80% of the greenhouse gases coming from petrol.

US Operations

Introduction

Abengoa Bioenergy is currently the 5th largest producer of Bioethanol in the United States. We presently have approximately 110 million gallons of installed capacity from three plants in operation and have a 4th plant under construction which is expected to add another 88 million gallons of capacity in early 2007. During 2006 we have continued to improve the strength and quality of our customer base, broadening our existing relationships and adding new customers. We still market most of our product in the form of e10, but we have developed new relationships and significantly increased sales into the e85 market. Total sales of bioethanol into these markets totalled over 102 million gallons in 2006.

In order to strengthen the U.S. organizational structure and to provide a better platform for rapid growth and development of new projects, U.S. Bioenergy operations were reorganized in 2006. The three existing plants continue to be owned by Abengoa Bioenergy Corporation, but separate companies have been created for each new project, as well as for the trading and marketing functions, and the engineering and construction divisions of the company.



Abengoa Bioenergy Trading U.S., LLC was formed to manage the critical functions of grain procurement, ethanol and DDGS co-product marketing, and hedging and risk management for all commodities, including energy needs.

Similarly, the technical development and construction supervision of new projects is seen as a key function which needs to be controlled and administered uniformly throughout the U.S. organization. Abengoa Bioenergy Engineering & Construction, LLC has been formed to accomplish those tasks.

Achieved Milestones

Industry

The U.S. bioethanol industry continued its rapid expansion during 2006 with 14 new plants coming on line and several expansion projects completed. Operating plants now total 106 in number with installed capacity in excess of 5 billion gallons. This represents an increase of approximately 800 million gallons since January 2006. Even more dramatic growth is expected during 2007 with an additional 48 plants representing additional capacities of 3.5 billion gallons per year currently under construction.

Legislation

The Energy Bill (including its Renewable Fuels Standard, or RFS) passed by the U.S. Congress in July of 2005 was a major factor driving the growth of the U.S. bioethanol industry during 2006. In late 2006 the Environmental Protection Agency (EPA) published its proposed rules for the establishment of the banking and trading program for bioethanol credits within this program, which solidifies the program and enhances the value of both cellulosic bioethanol, and ethanol produced from waste energy resources such as the landfill gas utilized at our Colwich, Kansas facility. Much additional legislation has been proposed and discussed which would further expand and enhance the RFS, and strengthen the bioethanol industry. A new Farm Bill is expected to receive high priority in the 2007 congress, and strong support for bioethanol and renewable fuels is already being considered through an Energy Title to the Farm Bill. The Democratic Party's control of both houses of the



U.S. Congress resulting from the 2006 elections is expected to continue this strong support of biofuels into the 2007 congress.

State legislation also continues to favour renewable fuels. While no new legislation was passed in 2006 to further restrict the use of MTBE, refiners moved strongly in 2006 to reduce the use of that product on a nationwide basis, primarily replacing MTBE volumes with ethanol. At the end of 2006, legislation in individual states provided the following support for the ethanol industry:

- 25 states have passed bans or restrictions on the use of MTBE.
- 4 states have adopted state RFS usage requirements
- 12 states incentivize the use of bioethanol blends and e85.
- 15 states have bioethanol production incentive programs
- 37 states have passed laws eliminating negative pump labelling requirements for bioethanol blends.

Plant Operations Results

Production	York, NE	Colwich, KS	Portales, NM	Total
Bioethanol (mm gals)	56.6	23.1	22.6	102.3
DDGS (Dry tons)	173,500	70,900	70,300	314,715

Bioethanol and Co-Product Market Overview

Bioethanol prices in 2006 were higher than expected. Significantly higher crude oil prices, concerns regarding global stocks of gasoline and other refined products (in part due to the still lingering 2005 US hurricane season, less than adequate refining capacity and tremendous global demand) have resulted in a significant improvement in bioethanol prices for 2006. This coupled with the passage of the Energy Bill in August 2005, which virtually eliminated the usage of MTBE as an oxygenate for gasoline blending component in favor of bioethanol, provided never seen before values due in part to an already constrained logistical system, inadequate infrastructure and high demand in the spring of the year both on the East Coast and Gulf Coast.

Abengoa Bioenergy has continued its strong presence in the marketplace by maintaining and growing relationships with the leading refiners and marketers in the country. We have ongoing discussions with these energy sector leaders with over 70% of our current production volume sold to these industry leaders.

We are extremely pleased with our continued 100% customer satisfaction rating in 2006 with no customer complaints and our consistent on time delivery of product. We are proud to say that we received the ultimate in support of that customer satisfaction commitment when the scheduling group at one of these energy sector leaders indicated they wished all their bioethanol supply could be purchased from Abengoa Bioenergy Corp.

Co-Product Sales and Marketing in the US continues to be an important contributor to company revenues. Distillers grains are increasing domestic market share in traditional cattle markets and making headway into hog and poultry rations. Continued improvements in quality and consistency of distillers are combining with high corn prices to increase demand.



New Projects

Construction on the Ravenna, Nebraska project has progressed substantially and the initial start-up of the 88 million gallon per year facility is still expected in the first quarter of 2007.

Additional projects are also being developed for 2007 that could further increase our presence and supply possibilities for the American Market. Several potential sites have been identified, and initial permitting proposals have been submitted for two specific sites which could be started in 2007. Our plans to strengthen our leadership position in the U.S bioethanol industry and to substantially increase our production volumes are well under way, and we expect to significantly increase our market presence in 2007, with growth in both volume and increased market penetration through our e85 programs.



Research and Development

Introduction

The mission of Abengoa Bioenergy R&D, Inc. is to develop and demonstrate new technology solutions through science and innovation to achieve Agengoa Bioenergy's Strategic Business Plan Objectives.

Main Strategic Milestones Achieved

Starch Program

Various process improvements were identified in 2005 to achieve bioethanol yield of 2.9 gallons per bushel of corn. Pilot plant experiments were conducted to validate the yield improvements in detailed experimental investigations. Due to low price of corn, process improvements are being evaluated using EBITDA model rather than purely ethanol yield. Based on the validation work, one of the process improvements is being implemented in the York facility. The process improvement will be validated at pilot scale in York facility in the first quarter of 2007. Work will continue to validate other process improvements using the EBITDA model in 2007.

In addition to process improvements, pilot plant experiments were also conducted to evaluate new enzymes and their impact on yield improvements. Work is in progress to implement better performing enzymes in plants.

ABRD also concluded all the work with wheat, rye and barley program. Based on the pilot plant work, recommendations were transferred to European plants for implementation.

ABRD is also evaluation dry corn fractionation technology as front-end processing for bioethanol plants. This work will continue in 2007.

Co-Products

Novel processing methods have been developed to enhance the nutritive content and value of distiller's co-products. To date, results are very positive with



significant improvements being obtained. Efforts are underway to secure intellectual property protection for the novel processing methods.

Biomass Enzymatic Hydrolysis

Process Development

ABRD developed an AspenPlus simulation model for the fractionation and conversion of lignocellulosic biomass to ethanol and co-products. This model forms the design basis for a commercial hybrid cereal and biomass production facility recently proposed to the US DOE.



Biomass Pilot Plant Design and Construction

ABRD develops P&IDs, process and functional descriptions, equipment layout, equipment specifications, and purchase all the equipment. A local mechanical contractor was hired to install the equipment. Phase 1 equipment (biomass preparation and pretreatment areas) and 80% of Phase 2 equipment (fractionation, enzymatic hydrolysis, fermentation, and co-product recovery) are expected to be installed by the end of 2006.

Biocarburantes de Castilla y León

The detailed engineering design is essentially complete. Construction of the 5-million L/yr straw-to-ethanol commercial demonstration plant is in progress. Installation of the large fermentors and heat exchangers was completed. Purchasing and fabrication of the remaining equipment is in progress. Installation of the feedstock storage building, equipment foundations, pretreatment building, control room, lab, and yeast propagation building is in progress.

Gasification and Catalysis

- Accomplished activities for the development of a bioethanol synthesis catalyst under the ACES project.
- A project for bioethanol synthesis catalyst improvement selected for award by DoE.
- Process design and analysis. Techno-economical and environmental assessments.
- Synthesis reactor studies: Biocomb project, funded under the Spanish National Plan for Research and Development.
- Feasibility study of natural gas substitution by biomass gasification.

Background project information:

The technology for bioethanol production from biomass via thermochemical processes is being developed based in an integrated approach, so

that actions are targeted in process design, catalyst research and reactors studies in a parallel scheme. First, regarding catalysis development, Aces project has been accomplished, and a first screening of several metal combinations has been done. Some promising catalytic pathways have been identified.

The developed catalysts will be tested at different conditions by the Industrial Research Association of Andalucía (AICIA), in both fixed bed and slurry flow reactors, within the Renew project (funded by the European Commission 6th Framework Programme) and the Biocomb project (supported by the Spanish Ministry of Education and Science)

As for the process approach, several technologies and process configurations are designed and studied to identify the best cases and prospects of the technology, to design the production technology and to evaluate the advances in the catalysis research.

Furthermore, a feasibility study is being made, in order to assess the possibility of installing biomass gasifiers in bioethanol plants, so that the natural gas consumption is reduced. Several technologies and scenarios have been considered, in principle in the US bioethanol plants.



Fleet Demonstration (e-diesel, FFV, e95)

- Continue e-diesel laboratory and engine tests at UCLM to select stable blends
- Determine the implementation costs of e-diesel in captive fleets
- Implement e-diesel in a captive fleet

Background project information:

E-diesel is a blend of bioethanol and diesel that could be used in diesel engines without modifications, in order to improve the environmental performance of the engines and to increase the bioethanol market.

Other activities accomplished are:

- Establish agreement with the public transport of Seville (buses) to test e-diesel in several buses
- Contact with other fleet operators (Rotterdam, Azvi, Ciudad Real, Belgium)
- Project supported by the European Commission to carry out a state of the art study of bioethanol diesel blends.

Bioethanol Reforming

The target of this project was to design, construct and operate a 300 kW (at fuel cell outline) bioethanol reformer plant, with high energy integration and a gas cleaning and conditioning system associated able to produce a gas useful for PEM (polymer electrolyte membrane) fuel cells.

The initial objectives of the project have been accomplished and a second phase to design and build a compact system will be initiated next year:

- The design, construction and start up were met in accordance with all the specifications. The reformer produced high quality hydrogen with less than 20 ppm in CO content, suitable for PEM fuel cells.

Bioethanol reforming is a promising way to produce hydrogen from a renewable source using a patented catalyst, owned by Abengoa Bioenergy. This is the first time that a bioethanol reformer, at such scales (medium size), works with an integrated energy



management system at high efficiency, using the heat of the flue and process gases for water and bioethanol evaporation and reheating.

Singular Strategic Project (PSE) on energy crops

- Selection of starch energy crops for bioethanol production: new varieties of cereals
- Sugar energy crops: stalks of Jerusalem artichoke and sweet sorghum
- Lignocellulosic energy crops

Background project information:

Abengoa Bioenergy, Ecoagricola and Greencell are taking part in this project, awarded by the Spanish Government to develop energy crops for different applications (heat, electricity and biofuels).

Abengoa Bioenergy leads the development of starch crops for bioethanol production.

Other partners of this subproject are Ecoagricola and the Agrarian Technological Institute of Castilla y León. An evaluation of the subsector of herbaceous crops (cereals) for bioethanol production has been carried out by Abengoa Bioenergy with the participation of the consulting company Deloitte. Interesting and useful results have been obtained that will help the Administration evaluate the benefits and barriers of energy crops in Spain. Also under this subproject Ecoagricola has evaluated the potential of barley and wheat straw as raw material for the biomass-to-bioethanol plant in Salamanca.

Abengoa Bioenergy is leading another subproject dealing with J. Artichoke and sweet sorghum as potential sugar crops to produce bioethanol. To implement these crops it is first necessary to determine crop procedures, harvesting periods and sugar yield.

New Projects

I+DEA Project

- The I+DEA project has been presented to the Cenit call for 2007-2010.
- The budget reaches 33 M€
- The Consortium is formed by 25 partners
- 27 research centers carry out part of the research work.

Background project information:

Greencell is leading the project in pursuit of three main objectives:

- Develop energy crops for both the current technology and second generation technologies
- Catalyst selection and design and integration of the gasification and catalytic bioethanol synthesis process
- Develop bioethanol market through e10, e85, e100, e-diesel and bioethanol-biodiesel-diesel blends.

The consortium is formed by important companies, such as Syngenta, KWS, Oryzon Genomics, Cepsa, Derbi, Ros Roca, Idiada...

Bioscopes

- State of the art study about bioethanol-diesel blends for the European Commission

Background project information:

The study has been awarded to Ecofys and Greencell by the European Commission with the aim to evaluate the potential of e-diesel as biofuel for diesel engines. VTT and O2Diesel are collaborators to perform the study. The final report will be published by the beginning 2007.

Biosynergy

- Advanced physical/chemical fractionation of biomass
- Conceptual design of a biorefinery plant
- Demonstration at pilot scale at Babilafuente

Background project information:

Biosynergy aims to use biomass for the synthesis of bio-products –chemicals and/or materials– together



with the production of secondary energy carriers –transportation fuels, power and/or CHP– through the biorefinery approach. The research is focused on the development of advanced and innovative fractionation and conversion processes combining both biochemical and thermo-chemical pathways, and process development from lab-scale to demonstration at pilot-scale.

The coordinator of the project is ECN and the Consortium is formed by companies such as DoW Europe, VTT, Biorefinery.de, CRES, Universities of Aston and Delft,...

The objective of Abengoa Bioenergy activities is to generate data necessary for the evaluation of various options for physical or chemical fractionation of pretreated feedstock and post-treated materials. These data are necessary for developing process configuration and selecting appropriate equipment for the biorefinery plant. Also to develop a conceptual design of a biorefinery plant that converts agricultural residues of energy crops into bioethanol and value-added co-products.

Hybrid Project

ABRD has prepared and submitted to DoE a proposal for a large Biorefinery demonstration plant. The total investment cost would be ca. \$ 200 Million, with \$80 Million (40%) coming from a potential DoE award. The biorefinery would be collocated with a starch bioethanol plant, to form a hybrid complex.

The biorefinery will have a conversion capacity of minimum 700 dry metric tons/day and consist of two parts: an Enzymatic Hydrolysis (EH), and a Gasification part. The EH part will convert biomass (400 dry metric tons/day) to bioethanol, lignin, and biomass animal feed. The Gasification part will convert 300 tons per day biomass to syngas, which will be combusted for steam generation. The steam will be used internally in the biomass facility, with the excess being sold to the adjacent starch plant.

Partnerships

New Partnerships

Dyadic Investment

As part of the Abengoa Bioenergy R&D (ABRD) strategy to develop an enzymatic hydrolysis technology to convert agricultural residues and energy crops, ABRD made a strategic investment into an emerging enzyme production company.

The present business model used by the enzymes companies in grain conversion does not provide an opportunity to capture value on the enzyme production side, an integral part of the enzymatic process and pathway to future production cost reductions. The objective of the Dyadic investment is to capture value on the future growth of the enzyme business and secure an enzyme system for the biomass process on a prefer basis.

Existing Partnerships O2 Diesel:

ABRD entered into a strategic alliance last year with O2 Diesel to provide funding and commercial support for the development of the oxygenated diesel market in Europe.

ABRD maintains numerous partnerships to achieve our strategic objectives. Some of our partners are: Novozymes (enzyme application), Genencor (enzyme supplier), Auburn University (analytical support), NREL (pretreatment, AspenPlus Model, NIR Rapid Analysis), NatureWorks (fermentation) and Taylor Biomass Energy (gasification).