



Spanish activities in CO2

SPANISH TECHNOLOGY PLATFORM OF CO2



PTECO2 is an initiative of the Spanish industry, research centres and Universities and supported by the Spanish Government, with 160 members to date. It was created in 2006 to support the technical development in Spain related to the reduction of CO2 emissions and is the Spanish mirror of the ETP ZEP in vision as well as in objectives. Two of the main activities done to date are the "PTECO2 Vision Document" and the "PTECO2 strategic overview and R&D Agenda", including a SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats) in order to identify industries and technology centres for the development of CO2 Storage in Spain.

MAIN OBJECTIVE

The creation of an environment favourable to the R&D research, to enhance the innovation in the Spanish industry, and to raise the technological capacity in the processes of efficiency improvement, and CO₂ capture, transport, and storage.

VISION

To contribute to the improvement of the energetic efficiency and to the development of technologies of CO2 capture, transport, and storage, and the implantation in the industry, to reach the commitments of reduction of emission.

GOALS

- To advise on the technological national strategy in CO2 capture and geological storage.
- To support the R&D initiatives for the energetic efficiency in big industrial facilities.
- To advise in the legal framework.
- To study specific problems related to the reduction and CO2 capture and storage.
- To support R&D alternatives in short, medium and long term for CO2 capture, transport, and storage.
- To establish alliances that strengthen the technological necessary progress to fulfill the EU aims for 2020.

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1. CO2 CAPTURE AND STORAGE: a) R&D PROJECTS

 CENIT CO2	CO2 CAPTURE AND STORAGE: R&D PROJECTS
<ul style="list-style-type: none"> • <u>Description</u>: The project involves Carbon Capture and Storage Technologies (CCS). • <u>Main objective</u>: the research, development and validation of new knowledge and integrated solutions that allow reducing CO2 emissions to the atmosphere, generated from the combustion of fossil fuels in electricity generation processes. • <u>Spanish partners</u>: A consortium that is led by ENDESA Generación, with the relevant collaboration of UNIÓN FENOSA and the participation of other industrial partners and 16 research institutions. • <u>Funding</u>: The four-year project (2006-2009) accounts for a budget of 20 M€, from which 9.5 are funded by CDTI (Spanish Government). • Regarding CO2 storage, deep geological formations are being studied. The specific objectives are: <ul style="list-style-type: none"> ✓ Demonstration of the required technologies for CO2 injection in the formation of the storing structure and for its control and monitoring, identifying possible critical aspects. ✓ Validation of the instruments, technologies, geological, geophysical and hydrogeological tools that assure and predict the behaviour of CO2 in the storing structure. ✓ Identification and quantification of the cost parameters that have an influence on the feasibility of such storage. ✓ Study of the applicable legislation and regulation. Assessment of the social acceptability of the storing structures, with proposals for encouraging the start up of these technologies. ✓ Definition and elaboration of the methodologies and/or procedures for the monitoring of CO2 storage. 	
DYNAMIS	CO2 CAPTURE AND STORAGE: R&D PROJECTS
<ul style="list-style-type: none"> • <u>Main objective</u>: The objective of this EU funding project is to prepare the ground for large-scale European facilities producing hydrogen and electricity from fossil fuels with CO2 capture and permanent storage. • In order pursue the targeted realisation of a large-scale demonstration of CO2 capture and storage in geological formations in Europe by 2012 (HYPOGEN) the storage sites must meet the following criteria: <ul style="list-style-type: none"> ✓ To be ready when needed (especially if enhance oil recovery is to be investigated) ✓ Sink capacity above 60 million tonnes CO2, i.e.2 Mt/y. ✓ Residence time beyond a thousand years ✓ Health and local environment safety ✓ Accessible; - on any term such as regulatory, geographical, economic, public acceptance and also the distance from CO2 source to storage site • <u>Spanish partners</u>: ENDESA Generación. 	

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1. CO2 CAPTURE AND STORAGE: b) PILOT PLANT

PSE CO2	CO2 CAPTURE AND STORAGE: PILOT PLANT
<ul style="list-style-type: none"> • <u>Spanish partners</u>: The project financed by MICINN (Spanish Government), is led by CIEMAT in a consortium of 14 industrial partners, universities and research institutions taking part in it. • <u>Description</u>: The project has four lines of investigation on Carbon Capture and Storage Technologies (CCS) <ol style="list-style-type: none"> 1. 14 MWt pre-combustion CO2 capture & H2 production Pilot at Puertollano IGCC Plant. Aiming at industrial, bench and laboratory scale validation of pre-combustion carbon capture technologies in IGCC. Budget: 12 M€. Detail Engineering & Material Procurement in progress. Construction completion by 2nd semester 2009. Partners: UCLM, INCAR-CSIC, CIEMAT (leader: ELCOGAS) 2. Development of new technologies for CO2 concentration and capture in oxicomustion plants (leader: CIUDEN) 3. Basin scale Site selection and characterization for CO2 geological storage (leader: IGME) 4. Research in the social acceptance (leader: CIEMAT) 	

 CIUDEN	CO2 CAPTURE AND STORAGE: PILOT PLANT
<ul style="list-style-type: none"> • <u>Description</u>: financed by the Spanish Government • The Ciudad de la Energía foundation is carrying out two programs related to CCS: <ul style="list-style-type: none"> ✓ Test facility for CO2 capture Technologies El Bierzo: Coal fired - Oxycombustion Pilot Plant of 20MWth Pulverised Coal & 30MWth Circulating Fluidised Bed integrated with full train of flue gas cleaning and CO2 treatment and compression. ✓ Geological storage of CO2 Program. Objectives: to demonstrate through the construction and operation of an injection pilot plant that geological storage of CO2 is technically feasible and environmentally safe, to implement and development technologies, to model the behavior of CO2 injected and to provide technical information to the Regulatory Institution. 	

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1. CO2 CAPTURE AND STORAGE: c) COMMERCIAL DEMO PROJECTS

	OXYCFB500MWe	CO2 CAPTURE AND STORAGE: COMMERCIAL DEMO PROJECTS
<ul style="list-style-type: none"> • <u>Description</u>: The project will be the first Endesa power plant with CO2 capture and storage and it is expected to be in operation by 2015 • <u>Main objective</u>: The project scope is to develop a 500 MWe oxycombustion Atmospheric Circulating Fluidised Bed. This project aims to be a candidate for one of 10-12 Demonstration Plants that should contribute in the development and future expansion of these technologies in Europe. • <u>Spanish Partners</u>: Endesa Generación • The project program has established two intermediate basic milestones: the initial scale-up of the technology on the already in operation small scale pilot plants (≈ 1 MWt), and the intermediate size (20-30 MWt) test period in CIUDEN. 		

LA ROBLA	CO2 CAPTURE AND STORAGE: COMMERCIAL DEMO PROJECTS
<ul style="list-style-type: none"> • <u>Main objective</u>: This project aims to develop a new power plant with CO2 capture (based on postcombustion technology) in the range of 500 MWe and storage. The project, is planned to be developed at the site of La Robla (León), well connected by rail with Gijón port, where the company has currently two thermal coal based groups. This project would fit the known criteria of the Flagship Programme in Europe • <u>Spanish partners</u>: Unión Fenosa (leader). 	

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2. CO2 STORAGE: a) R&D PROJECTS

 GEOCAPACITY	CO2 STORAGE: R&D PROJECTS
<ul style="list-style-type: none"> • Description: Theoretical capacity evaluation, considering suitable geological formation and emission sources. The GeoCapacity project will comprise all or parts of the sedimentary basins suitable for geological storage of CO2 and located within the EU and the Central and Eastern European new member states and candidate countries. • Main objective: to Assess the European Capacity for Geological Storage of CO2. Also a priority is the further development of innovative methods for capacity assessment, economic modelling and site selection criteria. • Spanish partners: Instituto Geológico y Minero de España (IGME - Spanish Geological Survey Institute) and ENDESA Generación as industrial partner. • Funding: The project is co-funded by the EU within FP6 - the 6th Framework Programme of the European Community for Research, Technological Development and demonstration activities, contributing to the creation of the European Research Area and to innovation (2002 to 2006). • STORE CAPACITY: Within this project, after a definition of most adequate methodology, first estimations suggest a CO2 storage capacity of 14 Gt in saline aquifers, 200 Mt in coal seams and 50 Mt in oil & gas depleted deposits. Further local estimations are needed. 	

2. CO2 STORAGE: b) PILOT PLANT

CASTOR	CO2 STORAGE: PILOT PLANT
<ul style="list-style-type: none"> • Description: CASTOR, "CO2 from Capture to Storage", is an European initiative grouping 30 partners (industries, research institutes and universities) coming from 11 different European countries (included SPAIN) and partially funded by the European Commission under the 6th Framework Program. • Main objective: to develop and validate, in public/private partnerships, all the innovative technologies needed to capture CO2 and store CO2 in a reliable and safe way.. • Spanish partners: Repsol YPF. • CO2 GEOLOGICAL STORAGE in SPAIN (Repsol YPF): The Casablanca oil field is situated offshore northeastern Spain. This carbonate oil field at a depth of approximately 2500 m below the sea floor has reached its production tail, and production will soon cease. Repsol considers to use this field for storage of approximately 500 000 tonnes CO2 per year, which is to be captured at the Tarragona refinery at 43 km distance from the field. 	

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2. CO2 STORAGE: c) COMMERCIAL DEMO PROJECTS

ENDESA CO2 STORAGE DEMO PROJECT	CO2 STORAGE: COMMERCIAL DEMO PROJECTS
<ul style="list-style-type: none">• Endesa, in the scope of OXYCFB500MWe Project, is carrying out the characterization works for CO2 storage in saline aquifers in four sites. Besides, Endesa has obtained from the Spanish Government, the exploration permissions with the objective to have, at least, two CO2 storage sites before 2015.	

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3. CO2 CAPTURE: a) R&D PROJECTS


CENIT II – SOST CO2 “New sustainable industrial uses of CO2”.	CO2 CAPTURE: R&D PROJECTS
<ul style="list-style-type: none"> • <u>Description</u>: The project has three main research lines : Capture, Transformation and Exploitation. • <u>Main Objectives</u>: To develop alternative and complementary technologies to the geological storage of CO2. • <u>Spanish partners</u>: The consortium is led by CARBUROS METALICOS with the relevant collaboration of IBERDROLA GENERACION and the participation of other (16) industrial partners and research institutions. • <u>Funding</u>: The four-year project (2008-2011) accounts for a budget of 26 M€, from which almost 50% are financed by CDTI (Spanish Government). 	

NanoGloWa	CO2 CAPTURE: R&D PROJECTS
<ul style="list-style-type: none"> • <u>Main objective</u>: to develop optimal nano-structured membranes and installations for different applications in CO2 capture from power plants. The main innovation will be the industrial application of cost-effective membranes for CO2 removal from flue gases. • <u>Spanish partners</u>: ENDESA Generación. 	

CACHET	CO2 CAPTURE: R&D PROJECTS
<ul style="list-style-type: none"> • <u>Description</u>: is a 3-year, integrated research project, funded by the European Commission that aims to develop technologies to reduce greenhouse gas emissions from power stations by 90%. CACHET is a strong and diverse international consortium of highly experienced research institutes, universities, energy businesses, engineering and manufacturing companies. CACHET is co-ordinated by BP with funding from the joint industry/government CO2 Capture Project (CCP), EU, New member states, Acceding countries, USA, Canada, China and Brazil. • <u>Spanish partners</u>: Consejo Superior de Investigaciones Científicas (CSIC) and ENDESA Generación. 	


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3. CO2 CAPTURE: a) R&D PROJECTS

SOSTENER	CO2 CAPTURE: R&D PROJECTS
<ul style="list-style-type: none"> • <u>Main Objectives</u>: The research and development of new chemical sorbents to capture CO2 from industrial emissions. • <u>Spanish partners</u>: LEIA Technology Centre (leader) and University of Pais Vasco. • <u>Funding</u>: This four-year project (2006-2009) is funded by the basque Government. 	
MICROALGAS	CO2 CAPTURE: R&D PROJECTS
<ul style="list-style-type: none"> • <u>Main Objectives</u>: The research and development of CO2 capture technologies by micro-seaweeds and after, to obtain energetic bioproducts (biofuels) from these micro-seaweeds • <u>Spanish partners</u>: The leader of the project is AURENTIA S.A., with the participation of 8 Spanish partners. LEIA Technology Centre is in charge of capture line. • <u>Funding</u>: Spanish Government. 	
 MECOLIX	CO2 CAPTURE: R&D PROJECTS
<ul style="list-style-type: none"> • <u>Main objective</u>: to generate new knowledge about the potential effects of CO2 leakages on marine sediments in CS-SSGS systems by means of the analysis, modelling and assessment of the mobility and availability of metals, as well as the bioavailability, bioaccumulation and the changes of biomarkers in marine organisms due to the mobility of metals caused by CO2 leakages. . • <u>Spanish partners</u>: University of Cantabria, University of Cádiz and the ICMAN-CSIC. • <u>Funding</u>: The three -year project (2009-2011) is financed with 260.000 €, by the MICINN (Spanish Government) under the Research National Plan. Project Ref.:CTM2008-06344-C03/02/01/TECNO. 	

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3. CO2 CAPTURE: b) PILOT PLANT

 LA PEREDA	CO2 CAPTURE: PILOT PLANT
<ul style="list-style-type: none"> • <u>Description</u>: The project (2008 – 2011) is based in Carbonate Looping Post Combustion technology and includes a 1MWt Pilot Test Facility • <u>Main objective</u>: to develop a low cost CO2 capture technology applicable for current or new power station. • <u>Spanish partners</u>: ENDESA Generación, Hunosa, y CSIC. 	