Carbon Sequestration
Technological Development
in Brazil


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(3) Pontifical Catholic University of Rio de Janeiro – PUC-Rio
Ref.: Ricardo Castello Branco in “The importance to Petrobras of R&D with focus in biodiversity” at The Biodiversity and the Oil and Gas Industry’s Seminary, Rio de Janeiro, June, 2006
The increase in GHG concentration in atmosphere is mainly caused by the population growth with unsustainable consumption standards.
Climate Change Mitigation: Why? How? So ...

• One of the major corporate social and environmental responsibility of a petroleum/energy sector is to mitigate the climate change that was in part caused, without our knowledge for many years, by fossil fuels combustion emissions.

• There are 7 ways to promote this mitigation:

  – Energy efficiency
  – Decarbonization (C/H relation): coal, oil and natural gas
  – Renewable energy
  – Hydrogen
  – Nuclear
  – Forest conservation
  – Carbon sequestration

• In the next 50 years, energy consumption will remain carbon-based. This will imply in a growing CO₂ emission scenario.

• The CO₂ atmospheric levels can not transpass the 550 ppm concentration. If this happen, Earth can reach a situation where there will be no return to equilibrium. Carbon sequestration is the key to keep the concentration near the actual 380 ppm.
Petrobras Climate Change Mitigation Approach for Energy and Mobility with Sustainability
Technology Dimension for Climate Change Mitigation: 
The 7 wedges - Socolow Approach

- Energy Efficiency
- Renewable energy
- Decarbonization of fossil fuels (coal / oil / gas)
- Hydrogen
- Nuclear Energy
- Carbon Sequestration
- Forest conservation

Less CO₂ or CO₂-free emission processes

Technology Dimension for Climate Change Mitigation: Different Scenarios

U.S. DOE Office of Fossil Energy / National Energy Technology Laboratory – NETL - Scenarios

Figure 3. U.S. GHG Emissions Scenarios... and Technologies to Fill the Gap

Different share for the technologies

Carbon Sequestration: the great option for Climate Change Mitigation

The CO₂ concentrations stabilization means radical changes in the global energy system.

**History and Reference Case**
- **History**: 280 ppm Preindustrial, 311 ppm 1950, 509 ppm 2050, 717 ppm 2100
- **Future**: 311 ppm 1950, 296 ppm 2000, 509 ppm 2050, 717 ppm 2100

**Stabilization of CO₂ at 550 ppm**
- **History**: 380 ppm Today
- **Future**: 488 ppm 2050, 547 ppm 2100

**Different share for the technologies**

Carbon Sequestration: a good option for Climate Change Mitigation

Ref.: Jim Dooley in “Overview of Issues and Need for Carbon Management at the Workshop on Capacity Building for CCS, May 2007, Pittsburgh - USA”
IEA Energy Technology Perspectives

Emission reduction by sectors

End-use efficiency 45%

Power Gen 34%

Industry 10%
- Energy & feedstock effic. 6%
- Materials & products effic. 1%
- Process innovation 1%
- Cogen. & steam 2%

Buildings 18%
- Space heating 3%
- Air conditioning 3%
- Lighting, misc. 3.5%
- Water heat., cooking 1%
- Appliances 7.5%

Transport 17%
- Fuel economy in transport 17%

Biofuels in transport 6%

CO₂ Capture & Storage (CCS) contributes 20% of total

MAP Scenario:
32 Gt CO₂ reduction in 2050

Coal to gas 5%
Nuclear 6%
Fossil fuel gen. eff 1%
CCS 12%
Hydro 2%
Biomass 2%
Other renew. 6%

CCS in fuel transformation 3%
CCS in industry 5%
Fuel mix in building 5% and industry 2%

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Petrobras Climate Change Mitigation Approach for Energy and Mobility with Sustainability
An important dimension for climate change mitigation is the SOCIAL: education and cultural changes that promotes people’s change of habits and consumers, voters and investor’s pro-active actions ...

Some possibilities:

- Individual transportation reduction
- Decrease energy and water consumption
- Consumption reduction;
- Residue’s production reduction
- Domestic waste burning extinction
- Population growth rate reduction
- Increase soil permeability in urban areas

Adapted of: Duailibi, M. in - 1st Brazilian Carbon Sequestration and Climate Change Seminar, April 2007 – Natal/RN
Petrobras Climate Change Mitigation Approach for Energy and Mobility with Sustainability
An important dimension for climate change mitigation is the policy with legislation, regulation and incentives to mitigate climate change and to reduce impacts and vulnerabilities and implement adaptation measures to combat climate change effects.
How Carbon Sequestration is considered in PETROBRAS?

Petrobras 2015 Strategic Plan

MISSION
Operate in a safe and profitable manner in the oil, gas and energy industry in Brazil and abroad, with social and environmental responsibility, providing products and services that meet client’s needs and that contribute to the development of Brazil and the countries in which it operates.

2015 VISION
Petrobras will be an integrated energy company with a strong presence in the international market and as a leading force in Latin America, focusing in profitability and social and environmental responsibility.
Petrobras and Climate Change

- Acknowledges that climate changes are strongly affected by GHG emissions;

- Acknowledges that the need for energy supply is growing, and the need to provide this energy without raising climate instabilisation is necessary;

- Determines strategies, limits and GHG avoided emission goals in the Strategic Plan;

- Develops projects with companies and scientific community in Brazil and abroad.

Ref.: Petrobras – Gestão de emissões Atmosféricas – Relatório de Desempenho, dez/2005
PETROBRAS and Climate Change

We reached the total of 2,03 millions of tons of CO$_2$ eq. avoided in 2006.

<table>
<thead>
<tr>
<th>Year</th>
<th>CO$_2$ eq. (Millions of tons)</th>
<th>Total 2006-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>1.13</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>1.79</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>3.56</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>4.15</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>3.93</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>3.93</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>18.50</td>
</tr>
</tbody>
</table>
PETROBRAS Strategic Plan – 2020

- To invest in research, development and demonstration of technologies for climate change mitigation and reduction of the carbon risk of our activities, including technologies of carbon sequestration.

- To invest in research to improve the climate change global themes comprehension, providing scientific support to the decisive processes, allowing the anticipation of adaptation measures through Petrobras activities potential impacts and vulnerabilities.

- To develop methodology to evaluate the environmental performance of our products on their life cycle.

And since August 2007....
CO$_2$ and Carbon Sequestration Capacity Building
Process and Technological Development (I)

- Petrobras experience with CO$_2$ injection and management for EOR since 1987
- Brazilian Universities - PUCRS, UNIFACS – CCS Knowledge and R&D activities since 2003
- CO$_2$ sources and sinks for CCS in Bahia State – UNIFACS in 2003
- Petrobras Research Center Carbon Sequestration and Ecosystem Conservation activities (since 2003)
- Petrobras Research Center R&D CO$_2$ capture in partnership with Regina University/Canada in 2003
- Petrobras Research Center and Brazilian Academia R&D carbon biomass fixation in different Brazilian Ecosystems (since 2003)
- Brazilian participation on the Carbon Sequestration Leadership Forum (CSLF) (since 2003)
CO₂ and Carbon Sequestration Capacity Building Process and Technological Development (II)

- Petrobras affiliation to the Joint Implementation Project CO₂ Capture phase 2/UK (2005)
- Brazilian CO₂ sources and sinks – evaluation of Brazilian Geological Storage Potential - PUCRS in 2006
- Petrobras Research Center CCS group (since 2006)
- Petrobras Research Center Climate Change and Carbon Sequestration Technologies Network (2006)
- Carbon Sequestration Capacity building on May 2007 in Pittsburgh/USA, with the visit to the DOE’s National Energy Technology Laboratory
CO$_2$ and Carbon Sequestration Capacity Building Process and Technological Development (III) Short term actions:

- Establishment of PETROBRAS Strategic and Technological Program on Climate Change Mitigation with focus on CCS - PROCLIMA (Sept/2007)
- Petrobras, Pontifical Catholic University of Rio Grande do Sul and Brazilian Coal Association agreements with DOE/NETL (in negociation)
- Implementation of four R&D centers for CO$_2$ Capture (absorption and chemical looping), geological storage, and carbon biomass fixation in UNIFACS, INPE, PUCRS and UFPR (2007-2008).
- Petrobras 2$^{nd}$ Carbon Sequestration International Seminar - Sep/2008
- Petrobras Pilot and Demonstration CCS in Aquifer, Petroleum Reservoirs and Coal Seams (to be started in 2008)
World Technological Development Stage
(CCS projects)

**Demonstration**
- **CARSON** (4,0 mil.ton/year); 2011 – EUA;
- **HALTEN** (2,5 mil. ton/year); 2012 – Norway;
- **WEYBURN** (1,8 mil. ton/year); 2000 to 2004 – Canada
- **SALT CREEK** (1,8 mil. ton/year); since 2004 – EUA;
- **IN SALAH** (1,2 mil. ton/year); since 2004 – Algeria;
- **MILLER** (1,3 mil. ton/year); 2009 – Scotland;
- **MONGSTAD** (1,3 mil. ton/year); 2014 – Norway;
- **FUTUREGEN** (1 - 2,5 mil.ton/year); 2013 – EUA;
- **SLEIPNER** (1,0 mil. ton/year); since 2006 – Norway;

**Pilot**
- **ECBM**: 1997 to 2007 – Canada
- **ECBM**: since 2002 – China
- **CASTOR**: since 2004 – Europe
- **CANMET**: since 2004 – Canada
- **CO₂ SINK**: since 2004 – Germany
- **MEMBRANES**: 2003 to 2010 – EUA
- **ITC CO₂ CAPTURE**: since 1999 – Canada
- **CCS ON BASALTIC FORMATIONS**: since 2006 – India
- **PROJETO FRIO**: 2002 to 2003 – EUA
- **RECOPEL**: 2001 to 2004 – Poland
- **LACQ BASIN**: 2008 – France
- **ZAMA**: since 2006 – Canada

**R&D**
- **CCP II**
- **ENCAP Integrated Project**

Updated – Apr 2007
# Carbon Sequestration Technological Development Roadmaps

<table>
<thead>
<tr>
<th>Development Stage</th>
<th>Carbon Sequestration Technologic Development Roadmaps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comercial scale</td>
<td></td>
</tr>
<tr>
<td>Demonstration Scale</td>
<td>▶️</td>
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<tr>
<td>Pilot Scale</td>
<td>• World</td>
</tr>
<tr>
<td>R&amp;D</td>
<td></td>
</tr>
</tbody>
</table>

- **World**: Brazil
# PETROBRAS Carbon Sequestration Technological Roadmap

## Development Stage

<table>
<thead>
<tr>
<th>Development Stage</th>
<th>PETROBRAS Carbon Sequestration Technological Roadmap</th>
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<tbody>
<tr>
<td>Comercial Scale</td>
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<tr>
<td>Demonstration Scale</td>
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<tr>
<td>Pilot Scale</td>
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<tr>
<td>R&amp;D</td>
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</tbody>
</table>

09 Sept 2007
PETROBRAS Climate Change Mitigation Technologies Program - PROCLIMA

Goals (2007-2012) – Provide technological solutions to mitigate Petrobras activities and products influence on global climate change

Program Focus

- Carbon Sequestration
- Energy efficiency
- Climate Change: Impacts, vulnerabilities and adaptation
- Evaluation of environmental performance on the fossil fuel and renewable energies life cycles
<table>
<thead>
<tr>
<th>Main Goals of PROCLIMA related to carbon sequestration</th>
<th>MILESTONES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong> To develop technologies of CO$_2$ separation and capture that allow a significant cost reduction on current capture prices (50% reduction) to be used on the GHG avoided emissions on industrial units</td>
<td>• Demonstration: 2009 (250 tons CO$_2$/day)</td>
</tr>
<tr>
<td><strong>2.</strong> To develop CO$_2$ storage technologies, risks evaluation, measurement, monitoring and verification, assuring the geological storage security.</td>
<td>• Industrial: 2012 (900 tons CO$_2$/day)</td>
</tr>
<tr>
<td><strong>3.</strong> To implant a pilot/demonstration reforestation project to evaluate the biomass carbon fixation and attainment of carbon credits</td>
<td>• Pilot: 2008 (350 tons CO$_2$/day)</td>
</tr>
<tr>
<td></td>
<td>• Demonstration: 2012 (900 tons CO$_2$/day)</td>
</tr>
<tr>
<td></td>
<td>• Demonstration: 2009 (1,000 ha)</td>
</tr>
</tbody>
</table>
World Technological Development Stage (CCS projects)

**Demonstration**

- **CARSON** (4,0 mil. ton/year); 2011 – EUA;  
- **CAMPOS** (3,9 mil. ton/year); 2008 – Brazil (PETROBRAS);  
- **MIRANGA** (2,9 mil. ton/year); 2008 – Brazil (PETROBRAS);  
- **HALTEN** (2,5 mil. ton/year); 2012 - Norway;  
- **POTIGUAR** (1,9 mil. ton/year); 2011 – Brazil (PETROBRAS);  
- **WEYBURN** (1,8 mil. ton/year); 2000 to 2004 – Canada;  
- **SALT CREEK** (1,8 mil. ton/year); since 2004 – EUA;  
- **IN SALAH** (1,2 mil. ton/year); since 2004 – Algeria;  
- **MILLER** (1,3 mil. ton/year); 2009 – Scotland;  
- **MONGSTAD** (1,3 mil. ton/year); 2014 – Norway;  
- **FUTUREGEN** (1 - 2,5 mil. ton/year); 2013 – EUA;  
- **SLEIPNER** (1,0 mil. ton/year); since 2006 – Norway;  

**Pilot**

- **AQUIFERO RIO-POJUCA**; 2007 – Brazil (PETROBRAS);  
- **ECBM**; 1997 to 2007 – Canada;  
- **ECBM**; since 2002 – China;  
- **CASTOR**; since 2004 – Europe;  
- **CANMET**; since 2004 – Canada;  
- **CO2 SINK**; since 2004 – Germany;  
- **CARBOMETANO BRASIL PROJECT (ECBM)**; 2009 – Brasil (PETROBRAS);  
- **ITC CO2 CAPTURE**; since 1999 – Canada;  
- **CCS ON BASALTIC FORMATIONS**; since 2006 – India;  
- **PROJETO FRIO**; 2002 to 2003 – EUA;  
- **RECOPOL**; 2001 to 2004 – Poland;  
- **LACQ BASIN**; 2008 – France;  
- **ZAMA**; since 2006 – Canada;  
- **CARBOGIS (UCG + CCS)**; 2011 – Paraná Basin (PETROBRAS & LLNL NETL)

**R&D**

- **CCP II**
- **ENCAP Integrated Project**

**CLIMATE CHANGE AND CARBON SEQUESTRATION NETWORK**

Updated – Sep/2007
Petrobras R&D, Pilot and Demonstration Investments in Carbon Sequestration

• 2003 to 2008 - U$ 25 million (R&D)
• 2008 to 2014 - U$ 65 million (Pilot & Demonstration)
Carbon Sequestration Technological Development in Petrobras – Sistemic Project Portfolio

Biomass fixation for indirect carbon sequestration

- Potiguar Basin
- Sergipe/Alagoas Basin
- Reconcavo Basin
- Campos Basin
- Paraná Basin

Climate Change and Carbon Sequestration Network

Policies, Regulation and other issues concerning projects implementation
Carbon Sequestration Technological Development in Petrobras – the Roadmap

Development Stage:
- R&D Infrastructure development
- R&D scale projects
- Pilot scale project
- Demonstration scale project
- Commercial scale project

Capture:
- Absorption
- Adsorption
- Membrane
- Chemical Looping
- Oxyfiring

Storage:
- Oil
- Saline aquifer
- Coal seams

Biomass carbon fixation:
- Superior vegetables
- Soil
- Microalgae
CCS in Reconcavo Basin: Aquifer Rio Pojuca and Miranga Petroleum Reservoir Pilot and Demonstration Projects


CCS – Rio Pojuca
Avoided emissions potential = 43,800 ton/year
Investment = U$ 1,5 million/year (4 years)
Opportunity = Take Petrobras to the world’s technological level

Legend
- R&D
- Pilot
- Demonstration
- Infrastructure
- Commercial
PILOT CCS MIRANGA: 2008-2012 (2nd phase)

- Pilot CCS with MMV
  Avoided emissions potential ~ 135,000 ton/year
- Opportunity for carbon credits ~ US$ 1.3 million

CAPTURE
CO₂ Venting Closure
Investment = US$ 26 million*

*Estimated for capture during the field concession period, and for a 900 ton/day capacity
CCS in Reconcavo Basin: Aquifer Rio Pojuca and Miranga Petroleum Reservoir Pilot and Demonstration Projects

DEMONSTRATION CCS MIRANGA : 2012 – 2023 (3rd phase)

RLAM UGH – Coke (2012) – 500 ton/day
Avoided emissions potential - AEP : 182,500 ton/year

RLAM UGH – Asphalitic res. (2014) – 3,500 ton/day
AEP: 1,277,500 ton/year

RLAM FCC (2013) - 900 ton/day
AEP: 328,500 ton/year

CCS MIRANGA
CO₂ venting closure
AEP: 89,8 Mm³ of NG

AEP total PETROBRAS (2008- 2023) ~ 20.91 Million ton CO₂
Opportunity = Carbon credits + NG sells

1st in Latin America!

Legend

R&D
Pilot
Demonstration
Infrastructure
Commercial
CCS in Reconcavo Basin: Rio Pojuca and Miranga Projects
Avoided emissions potential

2.9 Million ton CO₂/year

Aquifer
(120 tons/day)

Miranga
(370 tons/day)

Miranga +
HGU coke
(600 tons/day)

Miranga +
HGU Asphaltic residue
(3.500 tons/day)

Miranga +
FCC
(3.500 tons/day)

Miranga +
HGU coke
(600 tons/day)

Miranga +
FCC
(3.500 tons/day)
CARBON SEQUESTRATION IN CAMPOS BASIN

New separation and capture process in production offshore facilities

CO₂ absorption capture data research

Modelling and simulation of natural gas purification processes with combined membranes technologies

Gas separation using membranes: Gas chain treatment in oil production aiming at CO₂ emissions reduction

GHG concentration in fixed turbines through combustion gases recirculation

R&D for an exausted gases recirculation system evaluation in microturbines
CAMPOS BASIN with CCS
Avoided emissions potential

- Reduction in burnt/losses: $8.5 \times 10^3$ ton CO$_2$/day
- Reduction in internal gas consumption: $1.1 \times 10^3$ ton CO$_2$/day
- Gas reinjection in depleted reservoir: 997 ton CO$_2$/day
- High CO$_2$ concentration gas reinjection: 308 ton CO$_2$/day

63.6 million tons CO$_2$ eq by 2023

3.9 Million ton CO$_2$/year

Millions of tons of CO$_2$
CARBON SEQUESTRATION IN PARANÁ BASIN

- Evaluation of Brazilian potential for the use of clean solid fossil fuels related with CO₂ storage in deep unmineable coal seams and in situ gasification
  The main objective of this project is to assess Brazilian potential and location of deep coal reservoirs for ECBM-CO₂ and in situ gasification.

- Carbometano Brasil Project (SOTACARBO, CEPAC)
  In order to start the R,D&D activities in the climate changeless coal technologies, it has been planned the Carbometano Project. Its objectives are:
  - Methane production from coal through CO₂ injection (ECBM);
  - Coal gasification for energy and clean fuels production.
  This project is in final negotiation with SOTACARBO.

- CarboGis Project (NETL, LLNL, CEPAC)
  Objectives:
  - To use Brazilian deep coal resources and unmineable coal seams;
  - To produce clean fuels in a sustainable way;
  - To provide another source of energy for the future Brazilian needs;
  - To develop technologies for underground coal gasification - UCG;
  - CO₂ capture and storage development in UCG.
  This project is in final negotiation with the Lawrence Livermore National Laboratory.
Coal Projects – Paraná Basin Project with CCS
Avoided emissions potential

- CARBOGIS: 140 x 10^2 ton CO₂/year
- CARBOMETANO: 140 x 10^3 ton CO₂/year

Avoided emissions potential:
- 0.28 Million ton CO₂/year
- 2.8 million tons CO₂ eq by 2023
CARBON SEQUESTRATION IN POTIGUAR BASIN

CO₂ capture in Termoaçu power plant and Petrobras Industrial Unit for EOR/CCS in Potiguar Basin
Potiguar Basin Project with CCS
Avoided emissions potential

1.9 Million ton CO₂/year

- **Termoação** (4,444 tons/day)
- **UTPF** (733.2 tons/day)
Concerning biomass carbon fixation, we act in almost all Brazilian ecosystems. From Amazonia to Atlantic Forest, typical tropical forests, to Caatinga, Mangrove and Restinga, less compact forests. We also study carbon fixation in pine-trees, fast growing vegetation and microalgae. One of the main characteristics of the carbon biomass fixation R&D projects through reforestation is the socio-economic activities inclusion, in order to maintain this vegetation. This concept also adds activities like oil extraction from native plants seeds for biodiesel production, consequently generating profit and thereby developing this renewable energy source. In addition to these projects, the soil carbon is also been studied, objecting new tillages to greenhouse gases reduction in biofuels agrobusiness.

### Carbon Biomass Fixation First Results

<table>
<thead>
<tr>
<th>Biome</th>
<th>Average potential value of carbon sequestration (ton CO₂/ha/year)</th>
<th>Spacing* (m)</th>
<th>Density (trees /ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon Forest (Native)</td>
<td>17</td>
<td>(5,0 x 2,0)</td>
<td>1.000</td>
</tr>
<tr>
<td>Atlantic Forest (Native)</td>
<td>18,9</td>
<td>(3,0 x 2,0)</td>
<td>1.667</td>
</tr>
<tr>
<td>Atlantic Forest (Intercropped 30% Eucalyptus e 70 % native)</td>
<td>26,2</td>
<td>Eucalyptus: (3,0 x 2,0) Native: (3,0 x 2,0)</td>
<td>Eucalyptus: 1.167 Native: 500</td>
</tr>
<tr>
<td>Amazon Forest (Intercropped 30% Palm e 70% native)</td>
<td>15,3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atlantic Forest (Intercropped 87 % Dendê e 13% native)</td>
<td>17</td>
<td>Dendê: (9,0 x 9,0) Native: (3,0 x 3,0)</td>
<td>Dendê: 135 Native: 900</td>
</tr>
<tr>
<td>Palm (Monoculture)</td>
<td>11,2</td>
<td>(9,0 x 9,0 x 9,0)</td>
<td>143</td>
</tr>
<tr>
<td>Castor (Monoculture)</td>
<td>8</td>
<td>(3,0 x 1,0)</td>
<td>3.333</td>
</tr>
<tr>
<td>Elephantgrass (monoculture)</td>
<td>12,6</td>
<td>(1,0 x 0,50)</td>
<td>20.000</td>
</tr>
<tr>
<td>Eucalyptus (monoculture)</td>
<td>43,7</td>
<td>(3,0 x 2,0)</td>
<td>1.667</td>
</tr>
<tr>
<td>Pinus (monoculture)</td>
<td>23,1</td>
<td>(2,5 x 2,0)</td>
<td>2.000</td>
</tr>
<tr>
<td><em>Hevea brasiliensis</em> (monoculture)</td>
<td>7</td>
<td>(7,0 x 3,0)</td>
<td>476</td>
</tr>
</tbody>
</table>
Policy, regulation, incentives, public acceptance communication, technological and technical management for projects related to carbon capture and storage development and implementation

Objectives:

- To implant the Climate Change and Carbon Sequestration Network
- To stimulate policies and regulation and search for sponsors for CO₂ geological storage implementation as an option for climate change mitigation;
- To demonstrate to Society through technical communications that CO₂ geological storage is ethical, safe, measurable and verifiable;
- To cooperate with the Science and Technology Ministry – MCT – aiming at the Brazilian Carbon Sequestration Technological Roadmap;
- To participate, representing Brazilian technical group, in the Carbon Sequestration Leadership Fórum – CSLF and in the G8+5 meetings about CCS;
- To participate in the technical Brazilian Delegation in the negotiations of the Conferences of the Parties (COP) and in the meetings of the Subsidiary Body for Scientific and Technological Advice (SBSTA) of the United Nations Framework Convention on Climate Change (UNFCCC);
- To collaborate with Brazilian States strategic plans to promote climate change mitigation, impacts risks and vulnerability, and establishing opportunities for CCS
Brazil doesn`t have target obligations to reduce its emissions (UNFCCC common but different responsibilities principle) but it is committed to climate change mitigation.

Indeed we have a very clean energy matrix: 95% hydroelectricity, the PROALCOOL with 24% addition to gasoline since the 70’s and now the Biodiesel in 2% added to Diesel.

Brazil has a particular emissions profile: 75% comes from deforestation and land use change and only 25% from fossil fuels. And from those approximately 15% only are from stationary sources and so CCS is not a technology to be largely implemented in Brazil.

But for Petrobras and other industries, and considering the local development that can come with CCS projects implementation (with EOR and ECBM activities, and our discussions that are beginning on social and environmental aspects of the sustainability of CCS and perhaps a sort of compensation of future hydrocarbon emissions to be used after their production on those activities) CCS is an important technology for climate change mitigation.
Conclusions

PETROBRAS, a company with environmental and social focus, is in a transition stage from oil company with CO$_2$ emissions to a clean and sustainable energy company, developing its business with profitability in a climate changeless scenario. CCS will play an important role in this transition.

The company believes that carbon sequestration brings us the possibility to accomplish this transition, becoming viable to society a sustainable energy source, that will not cause irreversible damage to the environment. A climate changeless energy and mobility world.

The proposed projects – CCS in the Recôncavo Basin, Campos Basin, Potiguar Basin and Parná Basin to be implemented until 2014, will allow an amount of almost 9 million tons of CO$_2$ avoided emissions/year, 18% of the Petrobras emissions in 2006.

In 2014, Petrobras will be managing some of the world’s biggest CO$_2$ geological storage projects, all together equivalent to almost nine times the Sleipner Project.
Thank You

For more information:

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