To some it is the magic solution to the climate problem, to others a false hope. French oil company Total is trying to find out what carbon capture and storage can realistically accomplish.

Carbon sequestration: real or false hope?

by Gilles Prigent

'Of course, we would prefer not to use this technology.' Jean-Michel Gires, the Director of Sustainable Development of Total Group, chooses his words carefully. 'Nevertheless, in the list of solutions to fight climate change, an ambitious solution like CO_2 capture and storage has its place: in particular, to cut down emissions from the great industrial sites.'

Gires' statement expresses at the same time the excitement and the reserve generated by carbon capture and storage (CCS). The technique makes it possible to limit CO_2 emissions in the atmosphere that contribute to global warming. The principle is simple: to artificially capture CO_2 emitted by industrial boilers and bury it underground for thousands of years.

In their latest report published in 2007, the experts of the Intergovernmental Panel on Climate Change (IPCC) emphasised the promises of this technique, which could make it possible to capture 20% to 40% of CO_2 emissions in 2050. However, not everyone agrees. In a report titled "False Hope" that was published in May, Greenpeace observed that geological sequestration is not a proven technology in the long term and that CCS will not be ready before 2020, a too-distant deadline in a climate-urgent situation.

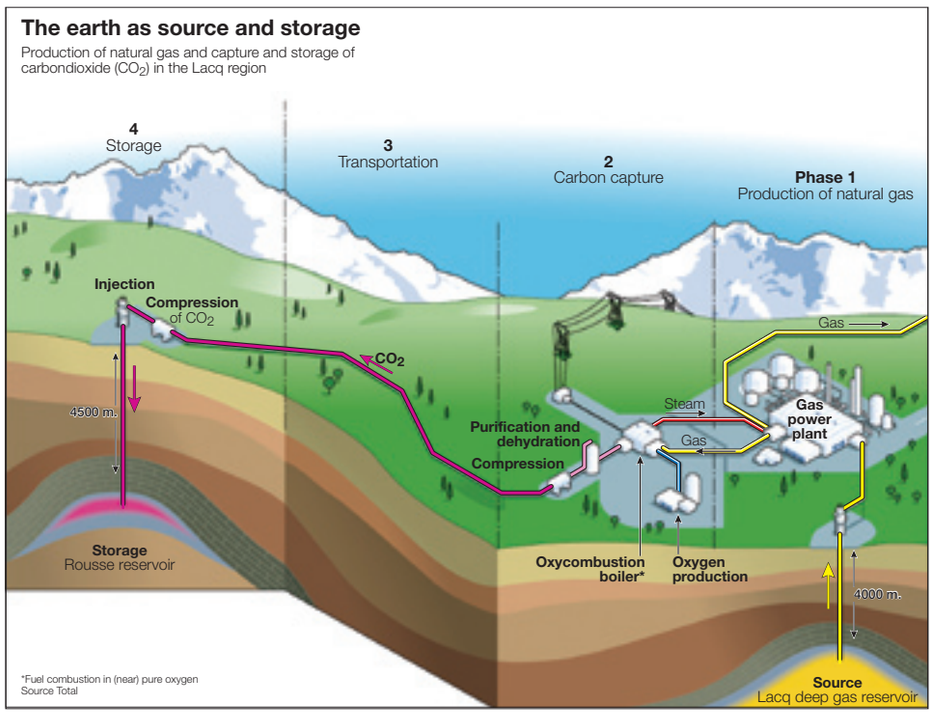
Obstacle

Carbon capture and storage emerged over a very short time: barely a decade. In 1996, the Norwegian oil company Statoil launched the first experiment on the site of Sleipner in the North Sea. At the time, the company sought a way to circumvent the carbon tax levied by the Norwegian government. Now, Statoil injects 1 million tons of CO_2 per year into an undersea saline formation.

Although few wagered on the development of CCS at the end of the nineties, the media frenzy over the battle against greenhouse gas emissions propelled this technique into the headlines. Projects have multiplied in the last few years. The European Commission has proposed to set up ten to twelve pilot sites; the United States continues important experimentation on the site of Weyburn, an old oil reservoir; and Canada, Australia and Japan also launched experiments on smaller scales. In France, Total announced at the beginning of 2007 the launch of a pilot project on the site of Lacq, aiming to demonstrate the entire process: capturing, transporting, and burying CO_2 (see below).

However, despite a favourable context, the transition from the pilot phase to the industrial phase poses a problem. CCS is expensive. For a coal power plant, the use of this technique represents a surcharge of 20% to 40%. The experiments in progress aim to show the economic viability of CCS for industrial facilities that produce more than 100,000 tons of CO_2 per year: that is to say, approximately 7,000 sites in the world. For the time being, however, the price of this experimental technology seems to be the main obstacle to its development. The European Union is having trouble in raising the €6 billion necessary to finance its twelve pilot programs. In January, the United States announced it would abandon the FutureGen project, which was intended to equip new coal power plants with advanced CCS technology, because it was too expensive. ■

> *'Lacq will be the first experiment in the world with this technical framework'*



Interview: Jean-Michel Gires

Director of Sustainable Development and Environment of Total Group, about the project.

Total is expected to start injecting CO_2 into a natural reservoir near Bordeaux at the end of 2008. The experiment to capture, transport and store CO_2 was launched in February 2007 on the site of Lacq, a place where a large natural gas reservoir had been developed underneath the city in 1951. The CO_2 injection phase is expected to last for two years. Afterwards, Total indicates that further injection could be undertaken, as the theoretical capacity of the reservoir is 'at least five times the volume of the CO_2 to be injected during the current pilot'. But nothing has been decided yet. The project will cost €60 million and is completely financed by the oil company.
We interviewed Jean-Michel Gires, Director of Sustainable Development and Environment of Total Group, about the project.

What is new about the Lacq pilot program?

The innovation of the Lacq program is that it has an integrated, step-by-step chain that includes all the components: capture, transport and storage. We will start from a true process of capture on an existing boiler, which, for the moment, emits combustion fumes in which CO_2 is completely diluted in the air's nitrogen. In the case of the experiment of Sleipner in Norway, there already existed a separation of CO_2. In Lacq, we will carry out a true capturing operation. We will also carry out an operation to purify CO_2 (to dry and to compress it) to bring it to good specifications; then, we'll transport CO_2 over thirty km; and finally, we'll monitor an operation of re-injection and storage in the substratum. All this will be done on land in a residential area, where the residents will be informed of the operation's entire process. Lacq will be the first experiment in the world with this technical framework.

Does Total see a market developing for CCS?

Before speaking about a market, let us talk about a technology that is to be demonstrated. There is a triple challenge behind the experiment of Lacq. There is a technical challenge, which consists of showing that it actually works. There is an economic challenge, which consists of carrying out these operations with sufficiently controlled and reduced costs. Finally, there is the challenge of acceptability. All aspects must be accepted by all parties involved: by the administration, our residents, and a certain number of non-government organisations that are very interested in these projects.
If all of these elements function, then yes, there can be a great number of cases of application in the Western world but also in developing countries where many installations are built that could profit from this type of technology. In order to move in this direction, we recently signed an agreement of knowledge transfer with the Indonesian government, which gives them access to the results of the Lacq experiment.

Under which conditions can this technique become economically viable?

We are obliged to work on a number of assumptions. Today, the cost of a capture, transport, and storage operation is estimated to be between €60 and €100 per ton of CO_2. It is a relatively high price. If one looks at the CO_2 market, we note that prices are in the neighbourhood of €25 per ton of CO_2. We estimate that these prices are clearly increasing since there will be more and more constraints and pressure to reduce CO_2 emissions. We think that a cost equivalent to this technology, which would really make it possible to ensure the project takes off, would be in the neighbourhood of €40 per ton of CO_2. Therefore, it is necessary for us to continue to work to reduce costs. This is one of the objectives of the Lacq pilot project: to show that one can reduce the costs of the capture operations. ■