



[Carbon gas capture – the challenges]

- Proving its feasibility, acceptability and reliability.
- Need for new regulations and legislation.
- Extraction and production may consume too much energy.

Money for old gas

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The commercial opportunities for developing and perfecting carbon gas capture and sequestration are considerable, Jean-Michel Gires of Total tells Jim Banks. But there are also benefits for the environment.

By the beginning of 2009, Total will be capturing carbon from a gas-fired power plant near Pau, France, treating it and transporting it 30km along an existing gas line to a depleted gas reservoir in the Lacq Field, one of France's major gas properties. Here, the CO₂ will be compressed and injected 4,500m deep.

One of Total's partners in the €60 million (\$83 million) project is Air Liquide, which is bringing the technology to replace air with oxygen in the combustion process. The other scientific partners are the French Petroleum Institute and the French Bureau of Geological and Mining Research.

'It is one of the first demonstrations of an integrated project of its type in the world,' says Jean-Michel Gires, executive vice-president of sustainable development and the environment. He is also a member of the Group Management Committee at Total, which is promoting the pioneering Lacq carbon capture and storage project.

Gires notes that a number of oil and electricity companies and equipment manufacturers, including Alstom and General Electric, are working in the same carbon capture field.

'There is a lot of effort in this area,' he says. 'But promoting the demonstration project is difficult because it costs a lot of money and you always take a risk when you are doing something that has never been done before.'

Complete proof

Nor is it simply a matter of getting the technology to work. 'The concept is pretty easy to understand,' Gires says. 'It is more difficult to prove that it can be done safely, that it is acceptable to external stakeholders and that it is economically sound. Most of us are confident about the technical feasibility, but economically and politically there is still a lot to prove concerning what we are working for. Because of that,



The control room of Total's carbon sequestration facility at the Lacq Field, France.

many of the Lacq results will be shared with the rest of the players. We hope we will help to answer the question: "Is it feasible, acceptable and reliable enough?" because the key question – Can we rely on carbon gas sequestration as a long-term option? – cannot yet be answered.'

Lacq is also highlighting the need for new regulation and legislation at both national and EU levels, according to Gires. 'In France, as in everywhere else in Europe, we have no pre-existing legal framework for such a project,' he says. 'Reinjection of CO₂ for storage purposes has never been considered before. We have the French administration and European directives where it must be properly considered – even as a demonstration project rather than a full industrial project.'

While the current carbon capture R&D is adequately funded, financing the first full-scale industrial projects may be tough.

Total has been careful to run a wide-ranging voluntary consultation process with all stakeholders including environmentalists. The inclusion of the French Bureau of Geological and Mining Research demonstrates the need to address concerns that underground storage of CO₂ poses longer-term environmental hazards.

Reviewing the 'acceptability' of the Lacq scheme, Gires comments: 'Initially, all these projects are exciting because they are new, but later all the questions come back: Is it dangerous? Do you really know what you are doing? Therefore, you need to share your confidence with all your different stakeholders, and not all of them will be pleased with the initiative. It is pretty heavy work. It represents a very strong commitment, even for Total, which is the leading industrial group in France. I am confident that we will succeed, but it is a lot of work.'

Gires accepts that some of the technology that will emerge from the Lacq project is likely to earn Total and Air Liquide income. 'However, we are not working on purely private

commercial considerations. There is an important public element in what we are doing.'

It is also his view that while the current carbon capture and sequestration R&D worldwide – including demonstration ▶

[Zero flaring]

Total is aware that flaring contributes to carbon gas emissions. In December 2001, the company committed to a zero continuous flaring policy with any new field that it brought on stream. It then looked to existing fields. The problem in both cases is that flaring only takes place where there is no commercial alternative – where the associated gas cannot be re-injected or where there is no economic way of gathering and marketing it.

'For example, in Angola we have a significant element of associated gas from deep offshore oil,' says Gires.

Here, some gas is re-injected but, in a \$4 billion project led by Chevron and Sonangol – in which Total is a minority partner with BP and ENI – the remaining gas will be piped ashore for liquefaction. The first onshore train will produce 52 million tonnes of LNG annually when the Bechtel-built plant comes on stream in 2012. Total is also involved in projects to pipe gas in Nigeria, the Yemen and potentially the Democratic Republic of Congo for use in electricity generation.

In 2006, Total made a voluntary commitment to reduce the existing flaring of its operations by 50% between 2005 and 2012.

'It's going to be a tough job to reduce flaring from existing fields when you have commercial outlets that are not so easy to access,' says Gires. 'However, between all the different measures – electricity generation, LNG options and re-optimisation of the field by re-injection of the gas – to enhance oil recovery we should be able to halve our current level of flaring. Initially our people took this as a constraint because it would be so much easier for them to do what we did in the past. Now we say: "Sorry, you cannot flare any more, certainly for new projects and for existing projects, you are going to sit with me and reconsider all the available alternatives".'

Total is looking for new ideas to optimise its processes. 'We are going to find different schemes far more efficient than what we used a few years ago,' says Gires. 'Overall, this programme should have a reasonable cost and from it new opportunities will emerge.'

In principle, Gires agrees that the zero flaring policy is a production investment rather than an environmental cost. 'I would rather say that we will be looking for the minimisation of the cost of the overall programme,' he says. 'But in a few cases, we expect a return on investment because of the new gas marketing activities. We want to create opportunities out of these constraints.'

projects – is adequately funded, he warns that financing the first full-scale industrial projects may be ‘very tough’.

Energy consumption

Gires says that one of the major challenges facing Total is not just the company’s emissions from all its industrial operations, including controversial flaring of associated gas (see Zero Flaring box, page 15) and the production of N₂O from its fertiliser operation, where Total is improving the production process and changing the catalysers; it needs to cut its own energy consumption. Extraction and production are being addressed, but Total wants to promote energy saving in its refining and petrochemical activities.

The challenge of energy consumption and emissions arguably comes most strongly with the exploitation of non-conventional oil, such as Canada’s Athabasca oil sands or the extra heavy oil in Venezuela where Total is involved. ‘To get it out of the ground, you need to inject more energy into the process,’ says Gires. ‘In Canada, it’s being achieved through a steam-assisted process and producing steam results in greenhouse gas emissions, so how can you mitigate this extra emission needed for extra heavy oil?’

Gires is not complacent about the problems Total faces. ‘We are not perfect – nobody is,’ he admits. ‘We are always working harder in order to improve our performance, and it always takes longer than we would expect because of the size of our systems and the number of people and partners involved.’ ●

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‘In the past, oil companies have thought that auto-consumption energy was practically free for them because they were producing it and fuel gas was just part of the process,’ he says. ‘Now we appreciate that we do not want to emit greenhouse gases, and that all the energy we save, we can sell. So we understand the benefits of energy saving. We needed to produce a business model where it would make sense to save energy in order to either produce more gas or to sell more oil.’

[Jean-Michel Gires]

Jean-Michel Gires is executive vice-president of sustainable development and the environment for Total. He began his career in 1980 as a production engineer with Saint-Gobain. Gires then joined the French Industry Ministry in 1982 as head of the nuclear construction inspection bureau, before moving to the department of renewable energies and rational energy use. He joined Total in 1988 as planning and economic studies manager for petroleum product distribution at Total Oil Great Britain, before holding a number of senior management positions in France, Spain and Portugal in the oil distribution segment. In 1994, he was appointed strategy, planning and financial control manager for Total Exploration and Production. In 1998, he became head of the North Sea Division of TotalFina Exploration and Production. From 2000 to 2002, he was president of TotalFinaElf in Venezuela.



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