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News

Issues and Foresight

CO2 capture, utilization and storage

CO_2 TRANSPORT AND STORAGE: HAVING THE RESOURCES TO MATCH DECARBONIZATION OBJECTIVES | AUDREY ESTUBLIER AND KATERYNA VORONETSKA

According to IEA, it would be necessary to store more than 5 billion tons of CO_2 per year in 2050 in order to achieve carbon neutrality. Do we have the storage capacities to match our ambitions? Europe already has the required capacities, as Audrey Estublier, CO_2 storage project manager, and Kateryna Voronetska, Compression, Transport, Wells project manager, both experts in the field at IFPEN, recount in this 3rd episode. The task now is to prepare the storage sites and ensure their safety for the coming centuries.

CO_2 TRANSPORT AND STORAGE: TAKEAWAYS FROM THIS PODCAST

Can CO_2 be stored? And above all, how much can be stored?

In the Net Zero Emission by 2050 (NZE) scenario, published in 2021, the International Energy Agency estimates that in order to achieve carbon neutrality, we will have to be able to store 5,000 million tons of CO_2 (i.e., 5 billion) in 2050 compared to 40 million tons stored currently per year.

The storage capacities are theorically available. First estimations lead to be **more than 500 billion tons in Europe**, i.e., the equivalent of **100 years of global emissions in 2019** distributed across offshore and onshore sites.

CO_2 can be stored in two types of reservoirs:

- **so-called "depleted" reservoirs**, i.e., oil and gas fields that are no longer in production. After more than a century of intensive operations, thousands of oil and natural gas fields are either nearing the end of their productive life or are no longer active. Some of them could allow space for storing CO_2, which, by the way, comes from these very reservoirs;
- **deep saline aquifers**, which are porous and permeable rocks containing brine, i.e., non-potable saltwater, in which CO_2 can be injected and dissolved. These geological formations, located deep underground, are thought to represent the greatest potential when it comes to storage capacity.

>> CCUS from A to Z / Deep saline aquifers (Club CO2)

Since 1996, as part of the European Sleipner project, Equinor has been injecting **1 million tons of CO_2 per year** into a deep saline aquifer, off the coast of Norway.

How can CO_2 be transported?

CO_2 is transported in the same way as natural gas and does not present technical issues. It can be transported by truck, train or by pipeline or boat when large quantities are involved.

Nevertheless, vigilance is required on two potential issues:

Deux points de vigilance sont néanmoins à maintenir sur :

- **the phenomenon of corrosion**, affecting materials used throughout the CCUS chain, and during storage in particular. Metals interact with CO_2 in its liquid and/or gas form, weakening them over time ;
- **the degree of impurity of the CO_2** (present in the gas mixture along with the CO2 following capture), which determines the level of compression of the gas prior to its transport, and hence its cost.

>> Find out more about IFPEN's corrosion solutions in the fields of low-carbon energies.

CO_2 storage: beyond capacities, a question of resources

The issue today is not a lack of storage capacities but the current **development of operational storage sites** which is too slow to meet storage requirements in the short term. It is crucial to prepare storage sites to ensure that they become available within the next 5 to 10 years at the latest.

>> To find out more, watch episode 2 - Rolling out CCUS: a question of costs and infrastructure planning

How can this be achieved?

- **fine-tune storage capacities** in order to rapidly identify the most appropriate sites;
- **demonstrate the safety of storage sites**, both in terms of CO2 injection and storage duration (very long-term, we're talking about hundreds of years);
- **Work closely with civil society**, co-construct the CO2 transport and storage projects.

Offshore storage: the Norwegian choice

In the 1990s, Norway took the decision to use offshore storage sites, under the seabed.

Safe CO_2 storage: the question of well integrity

The rocks contained in former gas fields had already demonstrated their capacity to store gases for millions of years before the oil companies came along to extract them. Although it is clearly necessary to ensure that exploitation of the fields has not jeopardized this integrity, the big issue relates to wells constructed by humans.

Can they be reused to inject CO_2 underground? **Can their integrity be guaranteed for CO_2 storage purposes over a period of several centuries?**

What is well "integrity"?

In order to start production operations of an oil gas field, it is necessary to drill a number of wells. Drilling involves cutting through the earth's crust in order to reach the reservoirs. **Well's integrity reflects its capacity to prevent CO_2 leaking or rising back to the surface**. From its design to the point at which it is abandoned, every stage in the life of a well determines its integrity.

Within the context of the REX CO_2 international collaborative project, IFPEN worked on the development of a tool to evaluate oil fields for their potential re-use for CO_2 storage purposes.

>> Find out more about IFPEN's solutions in the field of storage site safety and monitoring

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