FACTSHEET CCS

INFORMATION ABOUT CCS – CARBON CAPTURE AND STORAGE

STORAGE OF CARBON DIOXIDE

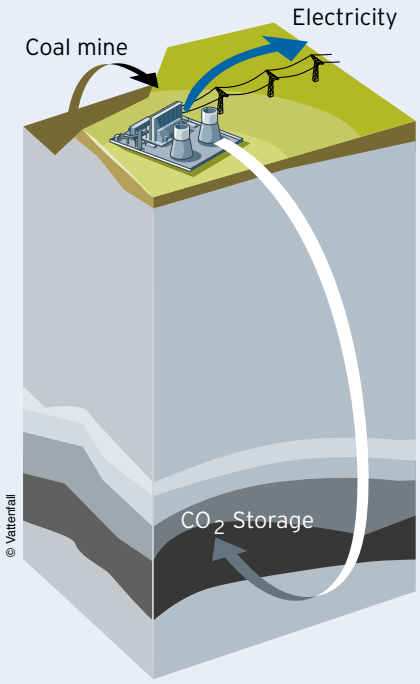
Carbon dioxide, (CO_2), has been stored naturally in the earth's crust for millions of years. The idea behind the geological storage of CO_2, as part of the CCS-chain is to replicate the conditions existing in these natural CO_2 accumulations. The injection of CO_2 from human activities into subsurface geological formations has been successfully performed since the early 1970s, primarily to enhance oil production.

Deep below the earth's surface

Different storage options, both onshore and offshore, exist but all are located at a depth of at least 800 metres below the earth's surface. Regardless of the option selected, an impermeable layer of rock, known as caprock, covers the reservoir thus preventing leakage upwards and into the atmosphere. One alternative for CO_2 storage is to use existing oil and gas fields, either depleted fields or fields where oil or gas is still being extracted.

These fields have demonstrated their ability to hold oil and natural gas over millions of years and therefore have great potential to serve as long-term storage sites for CO_2. In almost depleted fields, CO_2 can be injected to enhance the recovery of oil and gas. The CO_2 produced at Vattenfall's Oxyfuel pilot plant in Schwarze Pumpe will at some future date be used for such Enhanced Gas Recovery, (EGR), in a joint project with Gaz de France at the almost depleted Altmark gas field in northern Germany.

CARBON CAPTURE AND STORAGE (CCS)



CCS stands for the technologies used to capture and store the carbon dioxide (CO_2) generated in combustion processes, for example in a power plant. Essentially, three different processes are available: Oxyfuel, Postcombustion and Precombustion (IGCC). Today, all three technologies are available in the Vattenfall Group. The common aim of all these processes is to produce a concentrated stream of CO_2, compress it and then store it underground instead of releasing it into the atmosphere.

Another option for permanent storage is to inject the CO_2 into so called saline aquifers. These suitable geological formations are typically located at least 800 metres underground and contain salty water that is not fit to drink. The CO_2 partially dissolves in the water and in some cases slowly reacts with minerals to form carbonates, thereby permanently trapping the CO_2 underground.

CO_2 remains trapped underground by a combination of physical and geochemical processes. Extensive research indicates that injection into deep geological formations at carefully selected sites can store CO_2 permanently. The geological storage of CO_2 is performed today beneath the seabed in the North Sea, in Canada and in Algeria. Information and experience collected from these storage projects, as well as from naturally occurring CO_2 accumulations and enhanced oil recovery, indicate that it is feasible to store CO_2 in deep geological formations as a way to reduce CO_2 emissions.

Known technology

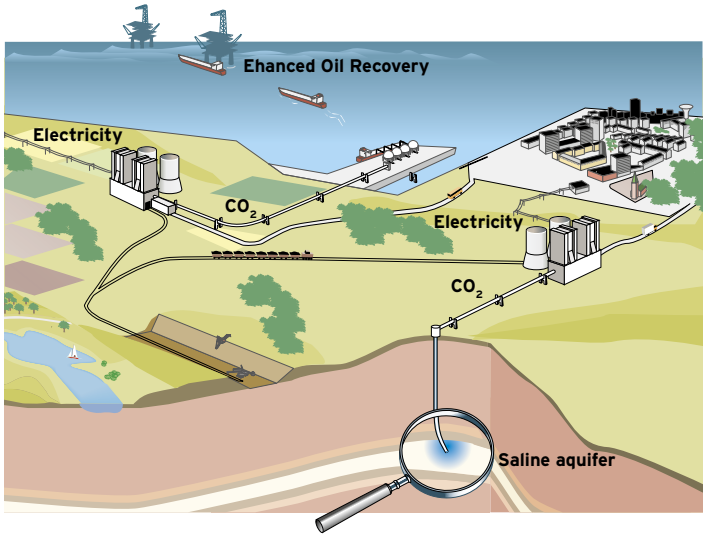
Around the world, various projects involving permanent CO_2 storage are run both by industry and scientific institutes and universities. One example is the In Salah project in South Algeria. In Salah is a gas field where the extracted natural gas contains around 10% of CO_2. For commercial reasons, this content must be decreased and the owner BP began a few years ago to separate CO_2 from the natural gas and inject it into a nearby saline aquifer. StatoilHydro uses a similar process in the Sleipner gas field off the coast of Norway. The purpose here is also to lower the content of CO_2 in the extracted gas and to avoid Norwegian taxes on CO_2 emissions.

Several R&D projects

Vattenfall is taking part in various EU-funded and national German research projects to investigate CO_2 storage. One of them is the CO_2SINK project in the village of Ketzin close to Berlin in Germany. The aim of the project is to test the geological storage of CO_2 in saline aquifers, involving for example the injection process and an extensive monitoring of the CO_2 when injected.

Considerable potential

Geologists see considerable potential for the storage of CO_2 across the European continent. Estimates indicate that Europe has more capacity than required to store all the CO_2 emissions from its coal-fired power plants.



A challenge to activities pursued in the field of CO_2 transportation and storage is posed by the absence of a legal and regulatory framework for the long-term underground storage of CO_2. Creating an appropriate legal setting is an urgent necessity at both the national and EU levels.

As at: April 2010

Read more about Vattenfall's project on CCS at www.vattenfall.com/ccs

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