



Press release

The Linde Group and Vattenfall enter into a technology partnership for carbon dioxide separation in coal-fired power stations

Munich, 22 September 2008 – The technology group The Linde Group and Vattenfall Europe Technology Research GmbH, a subsidiary of the Vattenfall energy group, have entered into a wide-ranging technology partnership for carbon dioxide separation in coal-fired power stations. The aim of the collaboration is to test the oxyfuel combustion process for lignite and anthracite and to develop the technology for subsequent use in large power stations.

The tests are being conducted at the research facility for a coal-fired power station using carbon dioxide capture technology in Schwarze Pumpe in Brandenburg, Germany, recently officially inaugurated by Vattenfall. Linde has built an air separation plant and a carbon dioxide liquefaction plant for this pilot power station. Linde is supporting Vattenfall via a technology partnership, providing extensive scientific and technical expertise during the first trial phase to the end of 2011.

"This promising collaboration with Vattenfall can provide an important impulse to climate protection," said Dr Aldo Belloni, a member of the Executive Board of Linde AG. "Our professed aim is to use our technologies to contribute towards a reduction in emissions. Our activities therefore range from continually improving the efficiency of our plants through CO₂ separation technologies and adopting sensible recycling concepts to producing environmentally friendly fuels."

At the research facility, a huge variety of tests and experiments will be conducted during the operation of the pilot plant. These will create a better understanding of the entire oxyfuel combustion process and of the reaction of individual components within the process chain. In the oxyfuel process, the coal is not combusted with air from the environment, but in an atmosphere of recycled flue gas and pure oxygen. The carbon dioxide can then be separated from the flue gas stream by a process of condensation and liquefied by applying pressure.

Under the technology partnership, Linde will moreover take delivery from Vattenfall of around 4,000 tonnes of liquefied CO₂ per annum from the research facility and market it. Both companies also intend to work together to develop further possible applications for the separated liquefied CO₂ which is not required for the storage projects. Rather than being stored, the separated CO₂ could be channelled into another constructive application, which would avoid expending large amounts of energy on manufacturing the product for that application.

About Vattenfall's CCS project

On 9 September 2008, Vattenfall officially inaugurated the first pilot plant in the world (30 megawatts) for a coal-fired power station with CO₂ capture technology on the Schwarze Pumpe site. At this plant, carbon dioxide produced by the power station is not released into the atmosphere, but almost entirely separated, liquefied and treated so as to ensure safe underground storage of the gas over a long period of time. The development of carbon capture and storage technology (CCS) will make a significant contribution to the reduction in CO₂ emissions, especially as coal will continue to play a major part as a source of energy in the global energy mix for a long time to come. The Linde Group is also heavily involved in this project. The Linde Engineering Division provided its expertise in the initial stages of the plant planning process. It provided Vattenfall with support in the areas of cryogenic air separation, CO₂ separation and the process engineering design of the entire plant. In the spring of 2006, we were awarded a contract to supply Vattenfall with an air separation plant and a CO₂ liquefaction plant.

About The Linde Group

The Linde Group is a world leading gases and engineering company with more than 50,000 employees working in around 100 countries worldwide. In the 2007 financial year it achieved sales of EUR 12.3 billion. The strategy of The Linde Group is geared towards sustainable earnings-based growth and focuses on the expansion of its international business with forward-looking products and services. Linde acts responsibly towards its shareholders, business partners, employees, society and the environment – in every one of its business areas, regions and locations across the globe. Linde is committed to technologies and products that unite the goals of customer value and sustainable development.

For more information, see The Linde Group web site at <http://www.linde.com>

About Vattenfall

The Vattenfall Group is the fifth largest producer of electricity and the largest producer of heat in Europe. The company currently has business operations in Denmark, Finland, Germany, Poland, Sweden and the UK.

Vattenfall is actively involved in the entire electricity value chain (generation, transmission, distribution and sales). In addition, Vattenfall plays an active role in the trading of electricity. Vattenfall also produces, distributes and sells heat. The Swedish government is the sole owner of the parent company, Vattenfall AB. Vattenfall Europe is one of the leading energy companies in Germany, combining under one roof the production and conversion into electricity of low-cost domestic lignite, the generation of electricity from hydroelectric and nuclear power, and energy transportation and trading.

For more information, please see Vattenfall online at <http://www.vattenfall.com>

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