Denmark specific energy storage applications

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The Danish Energy Agency (DEA) has now evaluated the applications and has recommended the Minister of Climate, Energy and Utilities to award the first three (3) exclusive licenses for exploration of full-scale CO2 storage in the Danish North Sea to TotalEnergies and a consortium consisting of INEOS E&P and Wintershall DEA. The licenses are an important step towards realizing Denmark"s CCS (Carbon Capture and Storage) strategy and will kick start the plan for the development of full-scale CO2 storage in Denmark.

The Danish Energy Agency received two applications in the first round of licenses for CO2 storage in the Danish North Sea. The two applications came from TotalEnergies EP Danmark A/S and a consortium consisting of INEOS E& P and Wintershall Dea International. The two applications met the requirements, and two licenses were granted to TotalEnergies and one to the INEOS & Wintershall consortium

"Granting the first exclusive permits for full-scale CO2 storage in the North Sea is an important step into the future. CO2 capture and storage is an important element in the green transition. Today"s licenses are the result of effective implementation of the first Danish political agreements on CCS," says Kristoffer B?ttzauw, DEA"s director.

The DEA has reviewed the applications and evaluated the technical and financial capacity as well as the technical content of the work programs presented by the companies in their applications. Awarding of the new licenses takes place after the Minister of Climate, Energy and Utilities has presented a report to the Climate, Energy and Utilities Committee of the Danish Parliament explaining which licenses the minister intends to issue.

TotalEnergies EP Danmark A/S is awarded two licenses and the partnership between INEOS E& P and Wintershall Dea International is awarded one license. The licenses cover areas in depleted oil and gas fields and previously unexplored saline aquifers. All the licenses contain the necessary geological structures that are suited to serve as permanent CO2 storage locations in the future. The timing and design of the final CO2 storage facilities will depend on the upcoming exploration and research work.

The specific storage projects must be approved by the DEA before establishment. The captured CO2 will likely be transported either via specially designed ships or through existing or new pipeline infrastructure. Finally, the CO2 will be stored in depleted oil and gas fields or saline aquifers 1-2 km below the seabed, by pumping the CO2 into small pockets in sandstone or limestone layers and thus buried under thick layers of impermeable claystone.

Photo above: Two large day-to-day storage tanks at the Aved?re Plant near Copenhagen optimize the plant’s economy by allowing electricity production when prices are high and storing surplus heat for

later use.

TES systems play a crucial role in balancing the electrical grid, especially with the increasing integration of renewable energy sources like wind and solar. By storing excess heat during periods of low electricity prices and discharging it when prices are high, TES helps stabilize the grid and optimize the use of renewable energy. This is akin to functioning as a “virtual battery” for the energy system.Read what some of our most experienced experts write in this HOT|COOL article about the virtual battery.

TES enables district heating systems to operate more efficiently by reducing peak load production and optimizing the use of Combined Heat and Power (CHP) plants. This not only leads to cost savings but also extends the operational lifespan of production facilities. For instance, due to these efficiencies, the PTES system in Copenhagen is projected to provide an operational benefit of DKK 6.1 million annually by 2025. Read an article about preparations for the pit thermal energy storage in Greater Copenhagen.

By enabling the storage and use of excess heat from renewable sources, TES significantly reduces the reliance on fossil fuels and lowers carbon emissions. This aligns with Denmark’s goal of achieving a 70% reduction in CO2 emissions by 2030. Furthermore, TES supports the integration of surplus heat from industries and data centers into district heating networks, further enhancing environmental sustainability.

An accumulation tank is a flexible and proven technology that stores heat from plants that produce heat for later use. The tank is primarily used to smooth out peak loads in heat demand or production, making it suitable for short-term storage in peak/reserve load situations. Accumulation tanks are used in conjunction with other heat-producing units such as CHP (Combined Heat and Power) and renewable energy (RE) plants with fossil-free fuel sources like solar heat, biomass, and heat pumps. Read more.

The figure above: Seasonal storage systems, comparable in size to several swimming pools, are filled with water and covered with insulation to store heat for extended periods, ensuring availability during high-demand seasons.

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