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Title: CCS and Hydrogen Projects

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- The presentation is covering the Flagship CCS and Hydrogen activities of Equinor
- Five Projects are covered. First Northern Lights, an innovative post-combustion CCS project, two pre-combustion or hydrogen projects covering the power and heat sectors, then one project in the Humber region in the UK which will enable negative emissions through capture of CO<sub>2</sub> from biomass and finally one project demonstrating how hydrogen from decarbonised natural gas can be supplied to heavy industry and other end user sectors in a test region in the Ruhr district of NRW
- **Northern Lights** is about capturing CO<sub>2</sub> from two industrial sites, liquefy it and transport it on ships for temporary storage at an onshore terminal and then injection for permanent storage in an offshore formation 2-3000 meters below the seabed
- The project is innovative as for the first time CO<sub>2</sub> will be transported over large distances. This will be a great opportunity for industries wanting to capture CO<sub>2</sub> and have access to a port – now they will have a solution for storing it permanently
- Final investment decision expected next year and operational start-up by end 2023
- **H21 North of England** is a design of how to convert the heating sector from using natural gas to 100% hydrogen.
- The area is North of England, about 1/7 of UK, and the H21 concept is an alternative to full electrification of the Heat sector.
- The purpose is to re-use the existing low-pressure pipeline system and to build massive hydrogen production facilities upstream, including permanent storage of CO<sub>2</sub> as well as seasonal storage of hydrogen
- A policy needs to be developed before a decision to build can be taken, at the earliest by 2023, with the concept being rolled out from 2028-2035
- The **Magnum** project is about converting an existing gas powerplant to burn 100% hydrogen, produced from natural gas with CCS
- The project includes hydrogen storage to enable the reformer to run baseload and the powerplant to respond with flexibility
- The concept is to only deliver power when the wind does not blow, i.e. fully complimentary to renewable solutions like offshore wind
- **Zero Carbon Humber** is the latest initiative Equinor has launched. The scope is to study capture of CO<sub>2</sub> from a power plant burning organic wood pellets, enabling negative emissions when this CO<sub>2</sub> is permanently stored, so called BECCS
- This project will also include a hydrogen demonstrator which aim at de-risking the larger H21 concept, with local Humber industry as off-takers of the hydrogen

- **H2morrow** is a joint project between Equinor and Open Grid Europe to screen opportunities and document the feasibility of distributing and delivering large amounts of H<sub>2</sub> with use of existing natural gas infrastructure within the Ruhr area, which is the defined phase 1 pilot region within NRW
- The concept is to convert L-gas transmission pipelines to run with 100% H<sub>2</sub> which will be produced in a 1 GWh autothermal reformer producing 8,6 TWh of H<sub>2</sub> p.a.
- The concept includes a full CO<sub>2</sub> value chain from CO<sub>2</sub> capture in the autothermal reformer, purification and liquefaction of CO<sub>2</sub> as well as temporary storage, barge transport on the Rhein to Rotterdam. Here the Northern Lights project takes over by reloading the CO<sub>2</sub> into large gas carriers for the transportation to the receiving terminal at Kollsnes where the CO<sub>2</sub> will be piped offshore for sequestration into a designated saline aquifer for permanent subsea storage