Demonstration of a cost effective medium size Chemical Looping Combustion through packed beds using solid hydrocarbons as fuel for power production with CO2 capture

From 2011-06-01 to 2015-05-31

Objective

DemoCLOCK aims to demonstrate the technical, economic and environmental feasibility for implementing packed bed based high temperature high pressure Chemical Looping Combustion (CLC) in large-scale power plants. A medium sized (500 kW) fixed bed reactor will be designed, build and operated integrated in an existing integrated Gasification Combined Cycle (IGCC) power plant at Elcogas. The packed bed CLC will be used to convert gasified solid hydrocarbons (raw syngas) to energy. In this way the packed bed reactor technology opens possibilities of using multiple fuels (e.g. coal, pet coke, biomass). It will deliver power production with a reduced energy penalty for CO2 avoidance in a cost effective way, as compared to currently available techniques.

The DemoCLOCK project is set up to use the experience from design, operation and optimisation of the medium scale reactor to start building a pilot plant, within 1 year after this project. DemoCLOCK consists of 7 technical work packages. All tasks are related to proof of feasibility; the medium scale demonstration of a 500kW reactor, which will take place in WP4 “Commissioning & demonstration”. In WP1 VITO, SINTEF, Eindhoven University of Technology (TU/e) and ECN fully test and characterize the two selected natural, inexpensive minerals; one of them will be selected for the demonstration unit and fabricated into a selected shape in large scale by Ceramiques Techniques et Industrielles. SINTEF and TU/e will design and optimise the up-scaled reactor (WP2), after which Array Industries will build it and install it at the existing IGCC power plant (WP3 and 4).

During development and operation of the 500 kW reactor, information from WP1 to WP4 will be fed into the Technology Implementation Plan, WP5, led by Politecnico di Milano and in collaboration with Foster Wheeler Italiana, an E&C company, that will confirm the industrial and commercial feasibility of the proposed configuration. To ensure that all health, safety and environmental aspects are taken into account, while designing and building the reactor, IEIA, SINTEF and VITO perform an environmental impact and waste management assessment in WP6. In WP7, led by Foster Wheeler, all partners will work together towards the commercialisation of the technology. Before the end of the project, a business plan, comprising choices on how to exploit the IPR, will be established and the techno-economic aspects of a full-scale CLC power plant will be evaluated before the end of the project. Dissemination of the knowledge will be a natural task in WP8.
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