ASCENT consortium

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SEVENTH FRAMEWORK PROGRAMME

Newsletter 17th May 2017 – Economics of ASCENT technologies for power and H2 production

A techno-economic analysis along with mass and energy balance of the ASCENT (www.ascentproject.eu) technologies has been performed.

The primary goal of this preliminary economic analysis is to define the regions of economic competitiveness of the novel Ascent processes, where target CAPEX and OPEX areas are illustrated for the technology developers. The analysis was performed with regards to the application of ASCENT technologies in power plants and H2 production plants.

For the Ascent technologies integrated in power plants the main conclusions are below reported:

- Ca-Cu CC, oxy-SER CC and SER-SOFC power plants show efficiencies and SPECCA in line with the benchmark. Benefits over benchmark technologies should be therefore expected form the economics of the systems.
- C-Shift power plants show efficiencies and SPECCA significantly better than the benchmark. For this technology, the development of high temperature lock-hoppers and filters is needed beyond Ascent.

The economic analysis was performed in close connection with *Professor Dianne Wiley and Dr. Minh Ho of the Australian partner, the University of Sydney*. The collaboration was performed in particular during a visiting period of Dr. Matteo Romano from Politecnico di Milano at the University of Sydney in May 2016. See the section "Cooperation with Australian projects" on Ascent web site.

Based on the results obtained for the Ascent technologies integrated in H2 production plants, the following main considerations can be made:

- For the Ca-Cu process, two cases with two operating pressures of the SER stage have been compared. The low pressure case features higher hydrogen production efficiency and low CO2 capture ratio. The Specific Energy Consumption for CO2 Avoided of both Ca-Cu cases is

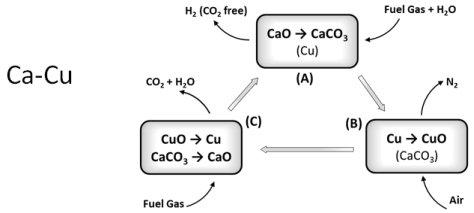

Figure 1 CaCu cycle

significantly better than the benchmark commercial Fixed Tubular Reforming (FTR) plant with capture.

- For the SER process, two cases with indirectly heated calciner and directly heated oxy-fuel calciner have been considered. The CO2 capture efficiency can be increased by increasing the S/C ratio in the reformer. CO2 capture ratio is much higher in the oxy-fired calciner case, because the carbon species which slip from the reformer are separated in the PSA and burned in oxyfuel conditions in the calciner and are therefore captured.

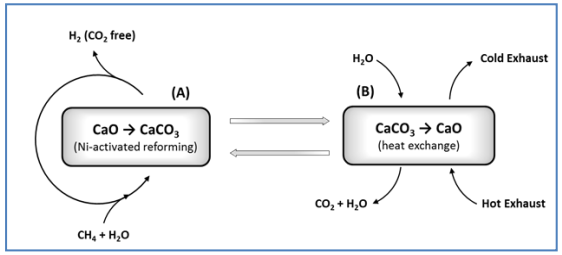

Figure 2 SER Process

- For the C-Shift plant, hydrogen production efficiency and Carbon Capture Ratio are slightly better than the benchmark. Differently from the other Ascent cases, this plant needs a primary FTR for methane conversion. As a result, CO2 capture efficiency is similar to the benchmark case and significantly lower than the Ca-Cu and oxy-fired SER cases.

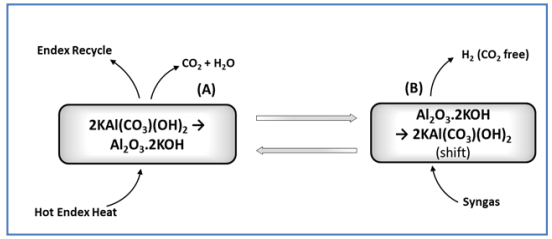

Figure 3 C-Shift process