ASCENT will provide a robust proof-of-concept of three related high temperature processes for CO_2 separation

ASCENT (ww.ascentproject.eu) will provide a robust proof-of-concept of three related high temperature processes for the separation of CO_2 from gaseous streams; each will lead to a step-change in efficiency of carbon removal in three types of pre-combustion capture, producing the hydrogen needed for highly efficient low-carbon power production. The project brings together small and medium enterprises preparing to launch these concepts with the support of leading research institutes, universities and industrial partners.

The essential feature linking the three technologies is the use of a high temperature solid sorbent for the simultaneous separation of CO_2 during conversion of other carbon containing gases (CO and CH_4) into H_2. Each technology has the ability to provide a step-change in efficiency because they all separate the CO_2 at elevated temperatures (>300°C) providing for more efficient heat integration options not available in technologies where the separation occurs at lower temperatures. Each process matches both endothermic and exothermic heat requirements of associated reactions and sorbent regeneration in an integrated in situ approach.

The synergies between the three technologies are strong, allowing both multiple interactions between the different work packages and allowing a consistent framework for cross-cutting activities across all the technologies. Each technology will be proven under industrially relevant conditions of pressure and temperature, at a scale that allows the use of industrially relevant materials that can be manufactured at a scale needed for real implementation. This represents a necessary step to be taken for each of the technologies before setting out on the route to future demonstration level activities.

ASCENT, Advanced Solid Cycles with Efficient Novel Technologies, addresses the need for original ideas to reduce the energy penalty associated with capturing carbon dioxide during power generation, and create a sustainable market for low carbon emission power with low associated energy penalties.

The unifying concept of the ASCENT project is the high temperature CO_2 capture during production of hydrogen fuel by means of the steam-methane reforming and associated water-gas shift reaction. The conditions under which the hydrogen fuel is produced is inherently optimized for highly efficient electricity generation (both gas turbines and fuel cells).

Improved heat integration options become available than for comparable low temperature capture processes, where the possibility for simultaneous reactions will be limited

Together, these three major advantages can be usefully implemented by several competing technologies with yet another unifying concept in that reactive solid materials are needed in all cases. These materials must be able to be carbonated (or reduced) and regenerated (or oxidised) in a cyclic fashion. Lab scale experimentation under highly idealised conditions, not highly representative of industrial scale applications have shown the feasibility and advantages of all three of these technologies. ASCENT aims to provide a robust proof-of-concept of these technologies using industrially relevant materials under industrially relevant conditions.

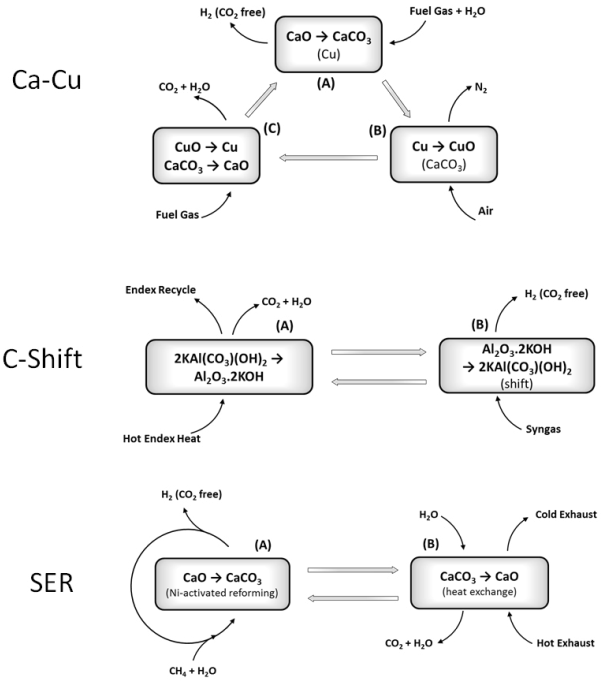

Figure 1 Conceptual cycles for the ASCENT technologies: Ca-Cu, CSHIFT and SER reaction systems respectively.