# Capturing $CO_2$ is a matter of synergies

*ASCENT is a collaborative European funded project between EU and Australian researchers*

ASCENT (www.ascentproject.eu) is an EU funded project aiming at providing a robust proof-of-concept of three related high temperature processes by means of solid sorbent for the simultaneous separation of $CO_2$ during conversion of other carbon containing gases (CO and $CH_4$) into $H_2$. Each process 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 started in March 2014 and after more than forty months it is now approaching the conclusion (February 2018). 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 creating synergies between the three technologies. 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 $H_2$. In the first concept, Ca-Cu, a Calcium-Copper looping cycle matches two endothermic-exothermic reaction pairs in the same equipment. In the second concept, CSHIFT (Carbonated Shift), a highly innovative fluidized bed reactor system is used to match the heat requirements of reaction and regeneration of temperature $CO_2$ acceptor materials with pressure swing technology. In the third concept, SER (Sorption Enhanced Reforming) process, a Nickel-Calcium dual fluidized bed looping cycle is used to generate a hydrogen-rich fuel to be used in a power cycle. The ASCENT project has pinpointed several areas of research ranging from modelling to material selection and pilot testing that are relevant in advancing the state of the art of the CCS technologies. Advanced materials have been synthesised, characterised and selected for pilot testing. A detailed characterisation has been carried out to strengthen the material knowledge and understanding, and to identify areas for further final optimisation before the final proof-of-concept testing. Then the SER, Ca-Cu and CSHIFT processes have been demonstrated at the prototype scale after modification of existing test-rig. An experimental set up has been seminar presentation specifically constructed a to further study the CuO reduction/$CaCO_3$ calcination and the oxidation of Cu in a pseudo-adiabatic fixed-bed reactor. Particle and reactor models have been proposed, formulated and validated against experimental data gathered at pilot and lab scale. Techno-economic analysis and risk and sustainability assessment of the three advanced technologies will be pursued at the end of the project. The ASCENT has promoted the integration of researchers and decision makers with a substantial value added in other areas even collaboration with different countries. In order to continue the commitment to strengthen the cooperation in the field of CCS technologies, indeed, ASCENT consortium has organised a number of seminars in Australia and launched a twinning European-Australian workshop back to back to the Conference on Greenhouse Gas Control Technologies (GHGT-13) in Swiss. The workshop has been held in the Swiss Convention Centre on the 14th November 2016 in Lausanne, Swiss. This meeting has helped researchers from EU and Australia to align and harmonise their activities in the common work of making practical progress on new generation high-efficiency $CO_2$ capture process technologies. After the EU-Australia workshop, the project coordinator of the ASCENT project has been invited by the Informal Group of the RTD Liaison Offices (IGLO) to attend an IGLO meeting in March 2017 to brief decision makers planning 9th Framework programme.


Australian and European speakers at the ASCENT Workshop on the advanced carbon capture technologies