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Emerging CO_2 capture technologies for DAC and 'hard to abate' industry sectors

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The Australian Government research organization, CSIRO, has been developing liquid absorbent based technologies for a range of CO_2 capture applications. For point source gas streams such as gas firing flue gases, and other heavy industry CO_2 emissions like those from cement manufacturing and aluminium smelting, a unique aqueous amine based technology has been developed. This technology has progressed from fundamental research through to large scale demonstration and commercialization over 16 years (see Figure 1). Results will be presented demonstrating its excellent capture performance and outstanding resistance to degradation in oxygen containing gas streams.

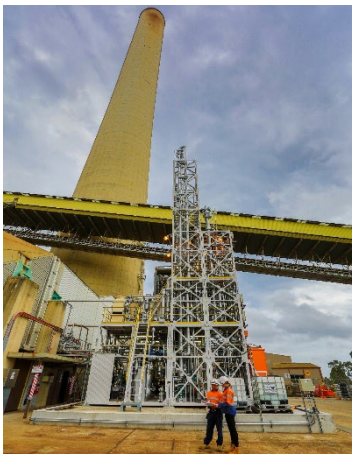

Figure 1: The PICA (PCC IHI CSIRO AGL) 150 tonnes CO_2/annum carbon capture pilot plant located at the AGL Loy Yang Power Station, Victoria, Australia.

In addition to point source CO_2 capture CSIRO has more recently started developing direct air capture (DAC) technologies based on the use of amino acid salt solution absorbents and low-cost gas-liquid contactors. Given the increasing urgency surrounding DAC deployment to address historical and unmitigated future CO_2 emissions, CSIRO has taken the approach of applying its existing expertise in gas-liquid absorption systems to fast-track DAC technology development. This technology has been demonstrated at small scale (see Figure 2) with larger scale demonstrations being planned. Techno-economic evaluation has indicated a capture cost of < \$100 / tonne of CO_2 is readily achievable. These evaluation results and those from small scale demonstration will be presented.

Figure 2: Ambient CO_2 Harvester (ACOHA) 4 tonnes CO_2/annum demonstration located at the CSIRO Energy Center, NSW, Australia.