SCIENCE AND INDUSTRY ENDOWMENT FUND

CASE STUDY OF IMPACT
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Ensuring the effective capture and use of energy waste

Energy Waste Roadblock project identifies multiple commercial applications for captured energy waste

The challenge

Energy generation creates considerable waste output (particularly carbon dioxide – CO_2) which has significant negative environmental impacts. Annual global emissions of CO_2 have increased by approximately 80% since 1970, largely due to our increasing and unabated dependence on fossil fuels for energy generation. As atmospheric concentrations of this ubiquitous greenhouse gas have grown, so too has international concern of the effects of CO_2 in the atmosphere, making this issue one of the most critical environmental concerns about our age.

While the effects of the atmospheric change have now been well established, technologies for reducing our dependence on fossil fuels generating CO_2 have not been developed rapidly enough to avoid significant changes to our climate and oceans.

Substantial benefit would be realised from the development of new materials and processes that could mitigate climate change by selectively removing CO_2 from waste gas streams including from industries such as coal-burning power stations.

Metal-organic Framework materials research provided five important commercialisation avenues for captured energy waste.

The response

The SIEF-funded Energy Waste Roadblock project initially aimed to develop new materials and processes for the capture and utilisation of CO_2, especially new Metal-Organic Framework materials (MOFs) that could be used to separate CO_2 efficiently and cost-effectively from the exhaust gas of a coal or gas burning power station. MOFs are one of the most promising class of materials for this purpose as their properties make them ideal candidates for gas storage, separation, and catalysis. The project also has a clear focus on the use of MOFs in industrial applications.

This project involves a range of disciplines from theoretical chemistry (molecular modelling) to chemical engineering. The project's collaborators are drawn from multidisciplinary research teams from seven institutions; The University of Sydney, The University of Melbourne, Monash University, The University of New South Wales, The University of Adelaide, CSIRO and ANSTO. This depth of expertise has also been augmented by a dozen early-career researchers and over 20 postgraduate research students.

While the research identified that the CO_2 capture process currently remains uneconomic, a number of other important commercialisation opportunities emerged through the research process. Substantial contribution was also made to the fundamental science of MOFs that has catalysed further international research in this field.

The research team are now working with partners in the aeronautical, defence, and chemical sectors to further advance the commercialisation of their research in areas such as anti-corrosive coatings, toxic gas filters, breathing apparatuses, the controlled release of enzymes, and enhanced plastic piping.

The impact

Multiple avenues for commercialisation of the technology which resulted from this Research Project are now being pursued with partner organisations, thus realising both significant economic and environmental benefits from the effective capture and use of energy waste.

Based on conservative valuations, the net present value of the Energy Waste project is $144.3 million. The project has a benefit-cost ratio of almost 21[1].

[1] ACIL Allen Consulting. 2016. SIEF Impact Case Studies. Canberra: ACIL Allen.

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This case study was developed by ACIL Allen and CSIRO in 2016 as part of an overarching review of SIEF's Impact.