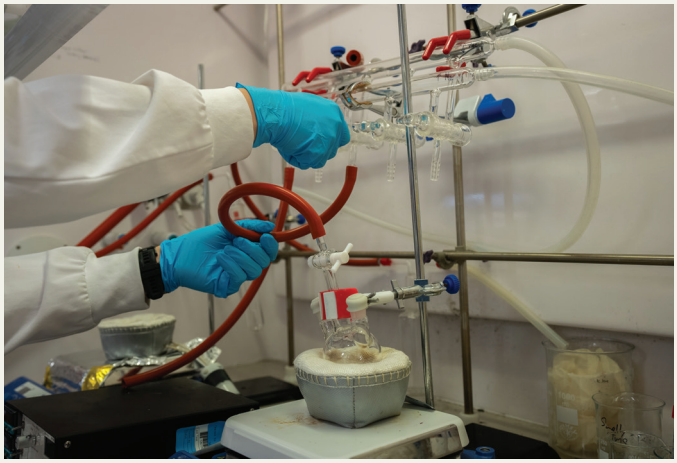
THEME 1: ENERGY AND DECARBONISATION

Our research on energy and decarbonisation encompasses a dynamic approach to address the critical challenges of energy consumption and its environmental impact. This theme is built to pave the way towards a sustainable future. Our research in renewable energy and power systems focus on innovative methods to integrate renewable energy with the grid. Our researchers are at the forefront of advancing solar energy technologies, aiming to enhance the efficiency and affordability of photovoltaic systems for widespread adoption. We are undertaking the intricate analysis of energy systems to implement efficient energy management practices. Our recent focus on emergent clean fuels, such as hydrogen, centres around producing solutions to revolutionise carbon-free and carbon-neutral energy technologies. The Energy and Decarbonisation research theme strives to accelerate the global transition towards a more sustainable and greener energy landscape through these interconnected pillars.

DYNAMIC VIRTUAL POWER PLANTS (DVPP)

We develop smart charging with DVPP for electric vehicles (EVs). The technology optimises power usage and price signals based on consumer preferences to improve grid performance. Smart charging trial data assess EV behaviour, pricing, and V2G impact through DVPP integration. The project will accelerate EV adoption, enhance grid impact and consumer satisfaction.



HIGH-PERFORMING PHOTOVOLTAIC (PV) CELLS

To capture the large environmental and security benefits of developing smart networks, we build high-performing PV cells that can harvest indoor light to power IoT devices. We develop nanoscale materials integrated into devices that meet the operation requirements under the indoor spectrum. The devices are low cost and made using low-embodied energy processes, suitable for massive deployment of next generation IoT systems.

WASTE-TO-RESOURCES CONVERSION

We have developed two-stage sorption-enhanced thermochemical technology for converting large-scale municipal solid waste into high-yield hydrogen and valuable carbon-based products. By mitigating municipal solid waste from going to landfills, this technology will create new revenue streams for waste management and generate income from the sale of valuable products from the upcycling process, contributing to the growth of the circular economy.

ADVANCED MODELS FOR ENERGY APPLICATIONS

We integrate experimental measurements, advanced computational models and probabilistic risk assessment to evaluate the consequences of hydrogen-related incidents, from hydrogen production and storage to its transportation and utilisation. Our models enable decision-makers to make informed choices for reliable design and safe operation, accounting for a wide range of environmental and operational variables.