

Thermal Energy Research Accelerator

Innovative techniques and state-of-the-art facilities for developing future energy systems through thermal and cryogenic technologies.



Please note, header image is purely illustrative.

About **University of Birmingham**

At the University of Birmingham our research leads to new inventions and fuels innovation and business growth.

Background

The Thermal Energy Research Accelerator (T-ERA) is one of three work streams that form the Energy Research Accelerator (ERA), a capital investment of £60million by UK Government to tackle some of the biggest challenges facing the global economy.

T-ERA is driving the development and integration of a range of thermal and cryogenic energy technologies, delivering innovation in the sector as well as collaborating with industry to convert innovation and emerging technologies into practical solutions with powerful global benefit. It will deliver jobs and apprenticeships, wealth creation and the next generation of scientists and engineers in the energy sector and emerging industries.

Tech Overview

Energy Storage:

The Birmingham Centre for Thermal Energy Storage (BCTES) and The Birmingham Centre for Cryogenic Energy Storage (BCCES) at the University of Birmingham are built around new laboratories, state-of-the-art equipment, and unique production and demonstration facilities. Research activity includes:

- Phase change based microstructured composite materials for applications between approximately room temperature and 1500°C.
- Applications through integration and optimisation with energy networks and industrial processes.
- Advanced manufacturing technologies for materials, components and devices, including scale-up.
- Novel cold storage materials.
- New thermodynamic cycles and processes.
- Systems integration, control and optimisation.
- Pilot-scale liquid air energy storage facility testing.

Smart Grids and Integration:

Advanced facilities at the University of Birmingham are being used to further understand the operation, control and management of smart grid systems powered by energy from distributed sources. Research focuses on the following activities:

- Application of power electronics.
- HVDC (High-Voltage Direct Current) in transmission and distribution systems.
- Integration of Plug-in Hybrid Electric Vehicles into power grids.
- Super AC/DC power grids for large scale renewable energy delivery.
- Protection and control of distribution networks with distributed generation.
- Micro-generation and Micro-grid.

- Smart metering and wide area monitoring and awareness.
- Analysis and control of power system stability, power quality and harmonics.

Supporting Infrastructure:

Highview Liquid Air Energy Storage Facility

To support the University of Birmingham's cryogenic research, Highview relocated its 350kW/2.5MWh LAES pilot plant to Birmingham. The technology can integrate waste heat or cold from industrial processes to increase the system's overall efficiency to over 70%. The technology could transform future energy systems, reducing the costs of integrating intermittent generation into the electricity system and ensuring power is available when it is most needed.

Smart Grid and Real Time Simulator

Unique facilities at the University of Birmingham are being used to improve understanding of the operation, control and management of smart grid systems powered by energy from distributed sources. A smart power grid and real-time simulator provides the capability to realistically simulate smart power grids with the integration of distributed power generation including wind, wave and fuel cell generation systems as well as monitoring and control for real-time information integration, protection and closed-loop control functions.

Opportunity

T-ERA are seeking to work with industry partners interested in the development and integration of thermal and cryogenic energy technologies, converting innovation and emerging technologies into practical solutions with powerful global benefit.