

Science City Research Alliance – Energy Efficiency Project equipment/facilities

Rail hybrid testing facility (Energy Systems Integration Laboratory ESIL), University of Birmingham (Custodians: Dr Clive Roberts and Dr Stuart Hillmansen). Facility manager: Danushka Meegahawatte (facility manager) T: +44 (0)121 414 2626 E:d.h.meegahawatte@bham.ac.uk

The key features of the ESIL facility are:

- Energy storage device evaluation
- Dynamometer featuring dynamic load simulation capability
- AC/DC converter evaluation system
- Hybrid energy system evaluation including duty cycle simulation.

The laboratory facilities are flexible and they will also be available for testing of hybrid electric drive systems for a range of applications including:

- Heavy good vehicles
- Buses
- Military vehicles
- Wind turbine systems
- Industrial equipment.

The lab has full ethernet capability which will enable the test facilities in ESIL Birmingham to be synchronised with other labs across the Birmingham and Warwick University campuses.

Equipment item	Equipment facility/group	Description	Location	Contact	Booking System
Test Rig AC Drive System	Test Rig	<p>This back to back test facility is used to investigate hybrid electric drive trains. The equipment consists of 2 mechanically connected induction machines. They are capable of being controlled independently of each other. One of the machines (load machine) is controlled to apply a suitable dynamic load to the other machine (drive machine) powered by the hybrid energy source such that realistic duty cycles can be controlled by an external PC based system, while the primary machine torque and speed control can be provided by the same PC based system.</p> <p>The facility has provision to interface with the DC link of the drive machine’s power converter in order to supply energy to the machine from external energy storage devices, and to recharge when the primary machine is regenerating. It is also possible to independently monitor all voltages, currents and temperatures of all power converters used in the test facility, together with machine speed and torque.</p>	UoB, EECE, NB07	Online (in progress)	Available
High power battery cycler	Battery Cycler	<p>This system is for testing batteries and other DC power devices such as fuel cell stacks and ultra capacitors.</p> <p>Evaluating performance (life cycle) of:</p> <ul style="list-style-type: none"> • Battery packs • Fuel cells • Ultra-capacitors 	UoB, EECE, NB07	Online (in progress)	Available

NI data acquisition	NI Kit	A series of data acquisition hardware (and software) for capturing data such as temperature, current, voltage and frequency from experimental work. Data capture: <ul style="list-style-type: none"> • Temperature • Current • Voltage • Strain gauges • Frequency (pulse counters) 	UoB, EECE, NB06B	Online (in progress)	Available
Battery systems	Battery Cykler	Energy Storage Devices used for experiments with the battery cykler and test rig	UoB, EECE, NB07	Online (in progress)	Available
Computer systems	Test Rig	This PC based computer system controls the equipment within the hybrid research lab.	UoB, EECE, NB06B	Online (in progress)	Available
Power analyzer (3 off)	Test Rig	The back to back test facility to investigate hybrid electric drive train consists of 2 mechanically connected induction machines. One of the machines (load machine) will be controlled to apply a suitable dynamic load to the other machine such that realistic duty cycles may be generated. The performance of the system is to be monitored with power analysers.	UoB, EECE, NB06B	Online (in progress)	Available
Cabling etc	ABC170/Test Rig	High power cables for connecting battery cykler and electrical energy storage devices	UoB, EECE, NB06B	Online (in progress)	Available
AV equipment	Security Cameras	Network cameras used to monitor the equipment (Test Rig + Battery Cykler)	UoB, EECE, NB07	Online (in progress)	Available