

Supergen



Testing and proving

Patricia Thornley, Director Supergen Bioenergy Hub, Director Energy and Bioproducts Research Institute (Aston University)

We work with academia, industry, government and societal stakeholders to develop sustainable bioenergy systems that support the UK's transition to an affordable, resilient, low-carbon energy future.

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Importance of testing

- Viability
- Environmental compliance
- Performance confirmation
- Quality confirmation
- System rating/load/capacity

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Short duration testing

- Viability of conversion assumptions
- Feedstock constraints e.g. moisture content, size, chemical composition,
- Product/energy quality and conformity
- Airborne emissions
- Waste composition

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Continuous testing

- Viability of commercial operation
- Explore range of feedstock envelope (physical and chemical)
- Explore impact of cumulative hours of operation (100, 1000 and more)
- Explore impact of cycling
- Explore impact of scale-up e.g. geometry, heat balance

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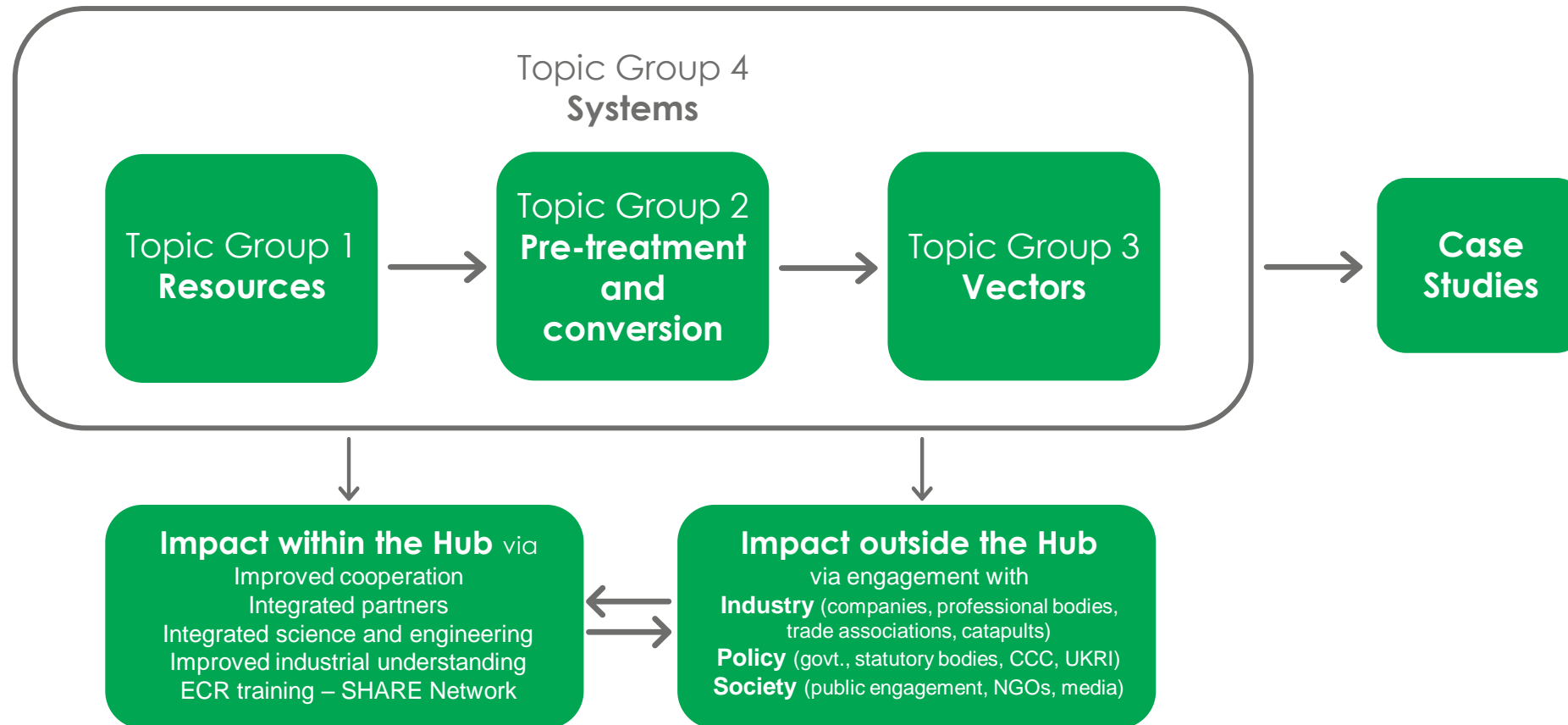
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Benefits of testing

- Identify appropriate materials
- Engineer mitigations
- Consider viability and practicality of commercial operation
- Benefits are maximized with:
 - Appropriate (realistic) test designs
 - Prompt results/analysis
 - Time to consider design implications
 - Detailed independent analysis



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Some (academic) test centres

- List not exhaustive
- Need to do your own research to ensure suitability

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Organisation	Aston University
Category	Pre-processing/syngas treatment & upgrading/other biohydrogen technologies
Key facilities	Feedstock compositional analysis, ASTM ash and moisture analysis; fuel water content and ageing studies, ph/conductivity, viscosity; on-line gas analysis (GC-FID , GCMS, TCD)
Scale/size	Pyrolysis reactors (< 7 kg/h), CFB gasifier, auger reactors (<0.3 t.h), pyroformer (20 kg/h), Hydrothermal liquefaction, biological reactors
Relevance, potential, capability	All thermochemical (gasification, pyrolysis and hydrothermal), catalytic (including upgrading) and some biological components
Further information, contact details	Patricia Thornley p.thornley@aston.ac.uk

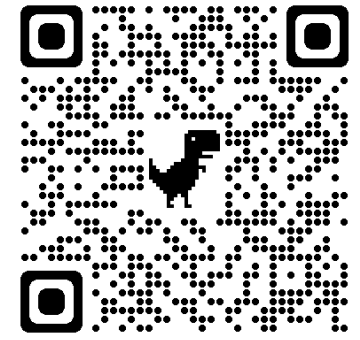


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Organisation	Biorenewables Development Centre
Category	Our multi- disciplinary team can provide support in: (1) Biogenic feedstock pre-processing; (3) biohydrogen technologies (specifically AD and dark fermentation)
Key facilities	<p>Processing: A broad range of pre-treatment & processing facilities including mechanical, thermochemical and chemical/biochemical pre-treatments of biomass and biowastes. Novel (e.g. microwave) and conventional technologies covered. Associated downstream separation facilities.</p> <p>Bioscience innovation: Cat II labs, microbiology, fermentation (up to 30L), AD (up to 1m³),</p> <p>Analysis: Broad range of complimentary analysis facilities</p>
Scale/size	Pilot/demonstration scale - 1 – 1000 kg Easy access fully serviced warehouse space for evaluating businesses' new technologies and equipment innovations
Relevance/ potential/ capability	<p>Open access, pilot scale processing capabilities, supporting researchers & businesses to convert plants, microbes and biowastes into profitable biorenewable products, de-risking innovation</p> <p>Delivered over 850 projects to over 300 separate clients</p> <p>Flexible project funding, specialist sector business advice (e.g. market research, B2B & B2C), networking (e.g. AD special interest group), project management, communications & marketing</p>
Further information/ contact details	http://www.biorenewables.org/ email: info@biorenewables.org , tel: 01904 32 8040 @BDC_org



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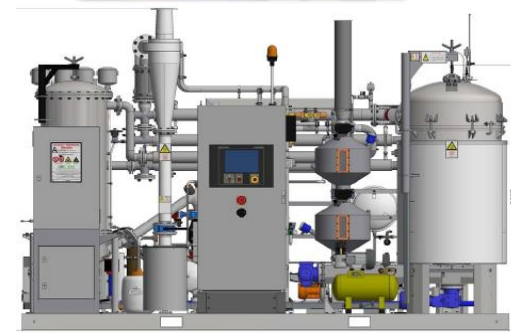


Organisation	University of Birmingham
Category	Syngas treatment & upgrading
Key facilities	BCES has ca 1000 m ² of well-equipped labs for both fundamental & applied energy storage (ES) research. We also have a 600m ² pilot-plant for liquid air ES integrated with heat & cold storage (350kW/2.5MWh).
Scale/size	<p>Our capabilities for fundamental investigations as well as demonstration scale:</p> <p>Thermal (heat & cold) ES (-196°C to + 1500°C); integrated gas compression heat recovery and storage system for managing peak compressed air supply, power supply and compression heat recovery and storage (100kW/500kWh); thermochemical storage based demonstrator (5kW/50kWh); composite phase change material (CPCM) based thermal management systems for a range of applications, including industrial heat recovery; efficient & cost-effective thermal management systems using CPCM and thermochemical ES; cryogenic ES based combined cooling, heating and power demonstrator; mobile heat storage demonstrator (10GJ); materials characterization facilities; multiple workstations for data-driven and physical-based process modelling, simulation and optimisation.</p>
Relevance/potential/capability	<p>The current overall energy system efficiency of H₂ is low. We propose therefore to improve this efficiency throughout the H₂ value chain, from generation to storage, transportation and end uses. This can be achieved by process integration of effective waste heat recovery, storage and use.</p>
Further information/contact details	<p>Birmingham Centre for Energy Storage – University of Birmingham Y.Ding@bham.ac.uk; M.Emziane@bham.ac.uk; A.Fivga@bham.ac.uk</p>

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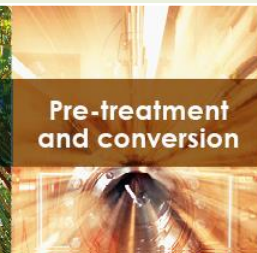
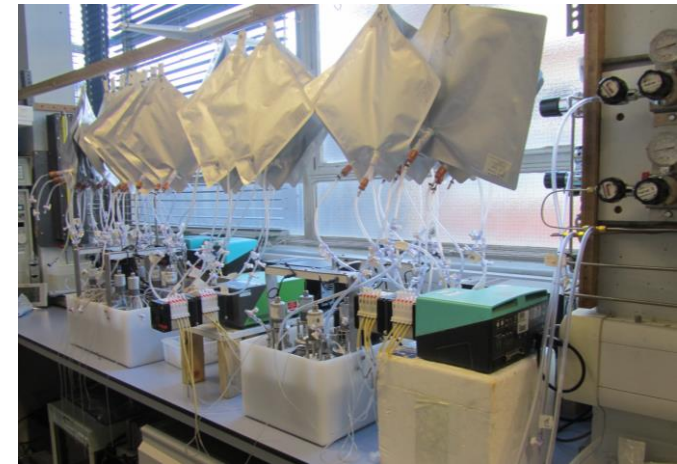
Organisation	University of Sheffield
Category	Pre-processing/syngas treatment & upgrading/other biohydrogen technologies
Key facilities	Biomass CHP gasifier (300kW), Gas cleaning system to PPB level, online ICP-OES Hydrogen Separation facilities (PSA + WGSR) Solvent based capture plants (ACP+ RPB)
Scale/size	Gasifier (300kW), CO ₂ capture Plants 1T/day Hydrogen separation technology (pilot-scale level)
Relevance/potential/capability	National pilot-scale facilities BECCS covering blue H ₂ production, gas cleaning/separation, emissions
Further information/contact details	www.terc.ac.uk Translational Energy Research Centre m.pourkashanian@sheffield.ac.uk



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Organisation	University of Southampton
Category	Other biohydrogen technologies
Key facilities	Stirred tank reactors
Scale/size	Volumes from 0.5 - 100 L
Relevance/potential/capability	These can be used for anaerobic digestion, fermentation, CO ₂ biomethanisation using H ₂ , and wastewater treatment
Further information/contact details	http://borrg.soton.ac.uk/wp-content/uploads/sites/294/2019/08/Environmental-Lab-161110.pdf Dr Yue Zhang Y.Zhang@soton.ac.uk



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