



Department for
Business, Energy
& Industrial Strategy

Hydrogen BECCS Innovation Programme

Supplier Engagement Workshop
23rd November 2021

This event will be recorded by BEIS to generate an anonymised Q&A to publish with the competition guidance.

The recording will not be shared, but slides will be made available after the event.



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Business, Energy
& Industrial Strategy

Today's Agenda

Item	Subject	Timing	Presenter
1.	Objectives of the session	10:00	Mark Pullen
2.	Overview of BEIS innovation funding	10:05	Charlotte Powell
4.	Hydrogen BECCS Innovation Programme	10:15	Katherine Woods
5.	General procurement procedure	10:40	Julie-Anne De Thomasis
6.	Policy context	10:50	Dr Carly Whittaker, Ben Harrop
	Coffee Break	11:00	
7.	Testing facilities	11:10	Prof Patricia Thornley
8.	Main Q&A and feedback session	11:25	Mark Pullen
9.	Next steps / Wrap up	11:55	Katherine Woods
	End	12:00	

Objectives



Introduce Energy Innovation at BEIS



Outline the Hydrogen BECCS Innovation Programme



Explain how to apply and how the competition will work



Collect questions



Outline the next steps

Unleashing Innovation:

NET ZERO INNOVATION PORTFOLIO

NET ZERO
Project
Delivery

Head of Bioenergy & Carbon Removals - Energy Innovation
Science and Innovation for Climate and Energy

Charlotte Powell

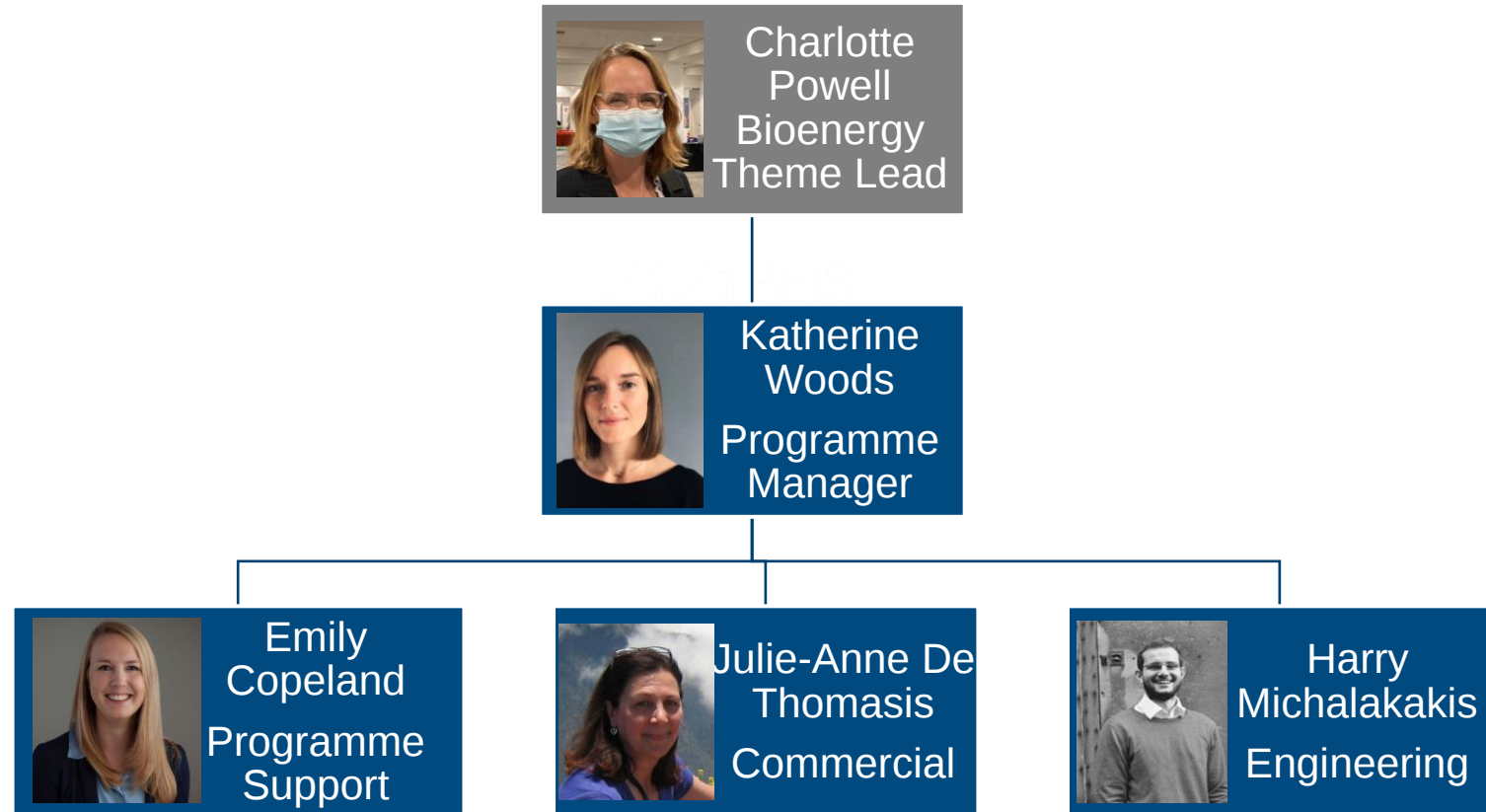


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H2 BECCS Programme Team



PM's 10 Point Plan

Point 10: Green Finance and Innovation

- Unleashing innovation and developing new sources of finance are fundamental for further developing the green technologies for net zero.
- To accelerate the commercialisation of innovative low-carbon technologies, systems and processes in the power, buildings, and industrial sectors, we will launch the **£1 billion Net Zero Innovation Portfolio**.



What is in the Ten Point Plan?



Point 1
Advancing Offshore Wind



Point 2
Driving the Growth of Low Carbon Hydrogen



Point 3
Delivering New and Advanced Nuclear Power



Point 4
Accelerating the Shift to Zero Emission Vehicles



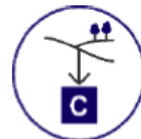
Point 5
Green Public Transport, Cycling and Walking



Point 6
Jet Zero and Green Ships



Point 7
Greener Buildings



Point 8
Investing in Carbon Capture, Usage and Storage



Point 9
Protecting Our Natural Environment



Point 10
Green Finance and Innovation



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NET ZERO INNOVATION PORTFOLIO

2021-25

- Taking a whole systems approach
- Which technologies, business models and consumer innovation most needed for future Net Zero ambitions?



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Net Zero Innovation £1Bn Portfolio 2021-2025

10 priority themes

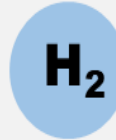
Net Zero Innovation Portfolio – priority areas



Nuclear
Advanced
Modular
Reactors



Floating
Offshore Wind



Hydrogen



Bioenergy



Industrial Fuel
Switching



Advanced
CCUS



Homes



Disruptive
Technologies



Direct Air
Capture

& GGR



Energy Storage
and Flexibility

Methodology to select priority areas

A mixed-method methodology combining data modelling, technical expertise, external consultation and policy alignment underlies the technological themes prioritised in the portfolio.

The Energy Innovation Needs Assessments (EINAs) take a whole-system view of the energy sector and provide evidence and analysis on:

- the role of different technologies in the UK's future energy system - Energy System Modelling Environment (ESME)
- potential domestic and export growth opportunities
- where innovation support and investment for those technologies could deliver the greatest benefits

An initial innovation screening exercise, undertaken across 12 technological themes, was used to create a shortlist from an initial database of ~600 potential innovations.



Hydrogen and Net Zero

Low carbon hydrogen identified as key to achieving net zero

5GW ambition for low carbon hydrogen production capacity by 2030



Hydrogen Strategy – published August 2021

Consultation update for £240m Net Zero H2 Fund and H2 business models due spring 22

Driving the growth of low carbon hydrogen could deliver...		
Support for up to 8,000 jobs by 2030, potentially unlocking up to 100,000 jobs by 2050 in a high hydrogen net zero scenario	Over £4bn of private investment in the period up to 2030	Savings of 41MtCO₂e between 2023 and 2032, or 9% of 2018 UK emissions

“the difference [between existing targets and net zero] is striking. Low-carbon hydrogen moves from being a useful option to a key enabler. Updates to policy alongside adoption of our recommended target should reflect that”
CCC, Net Zero

Role of bioenergy in Net Zero

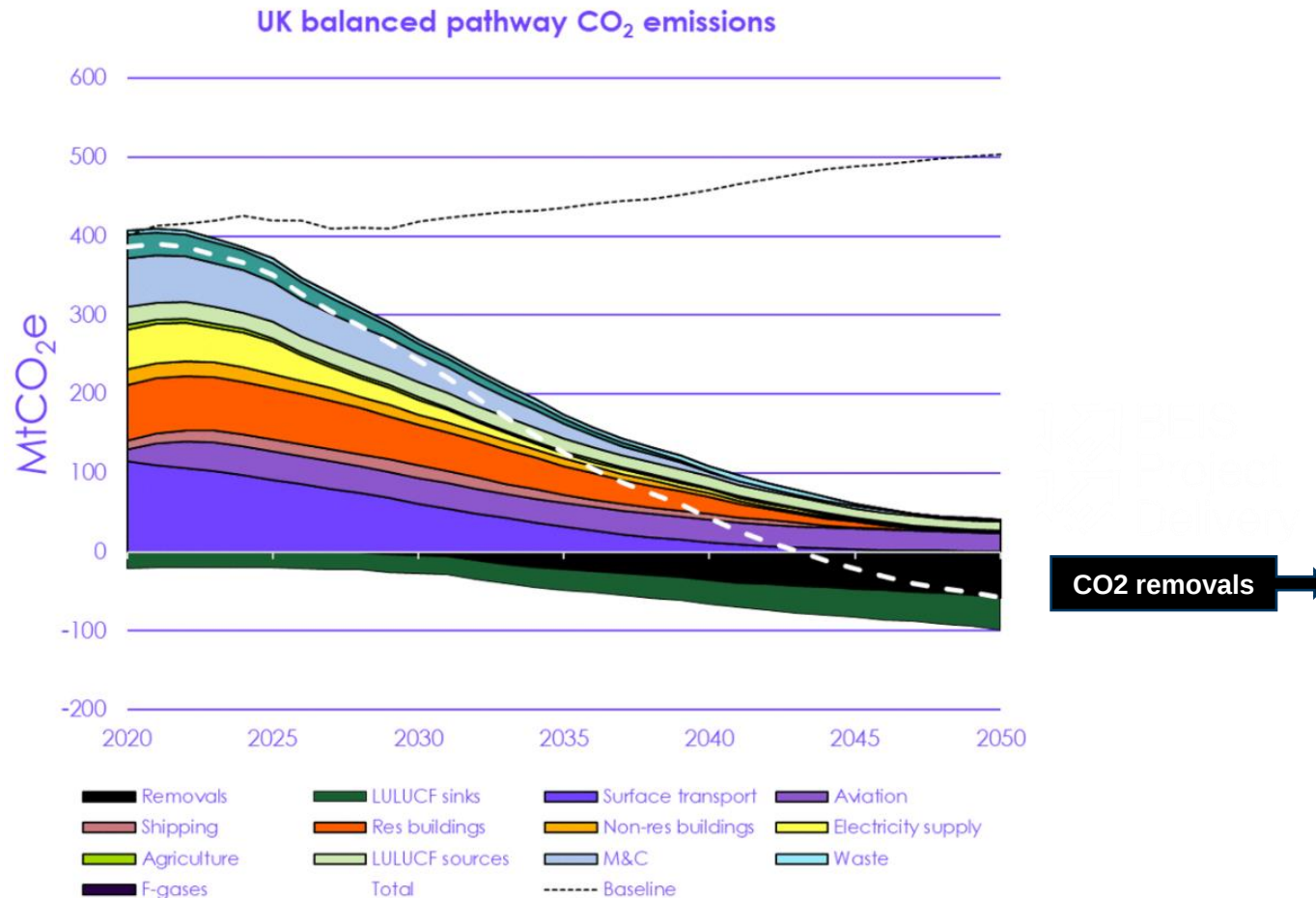
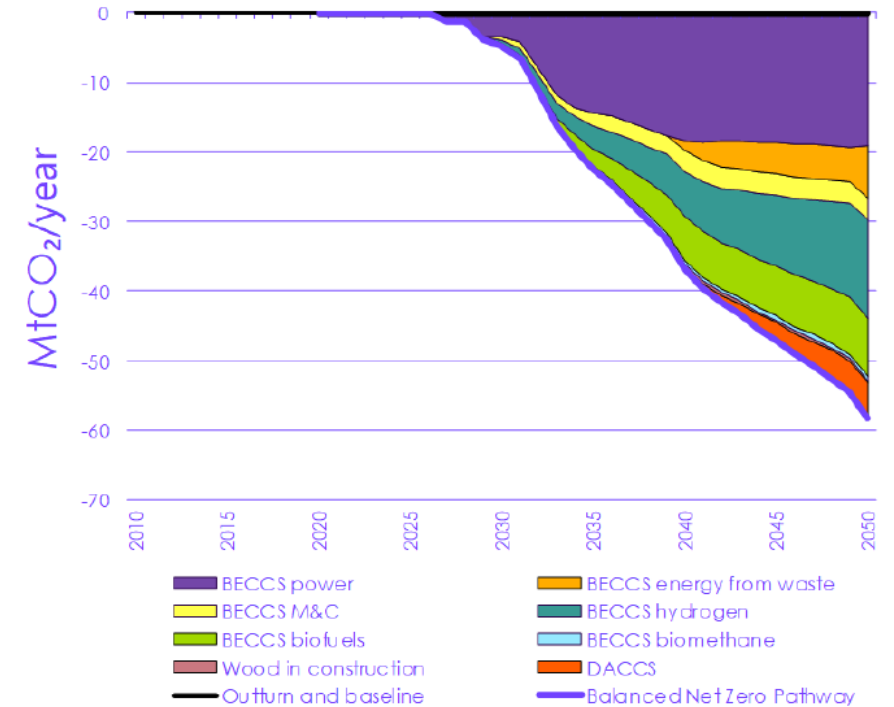


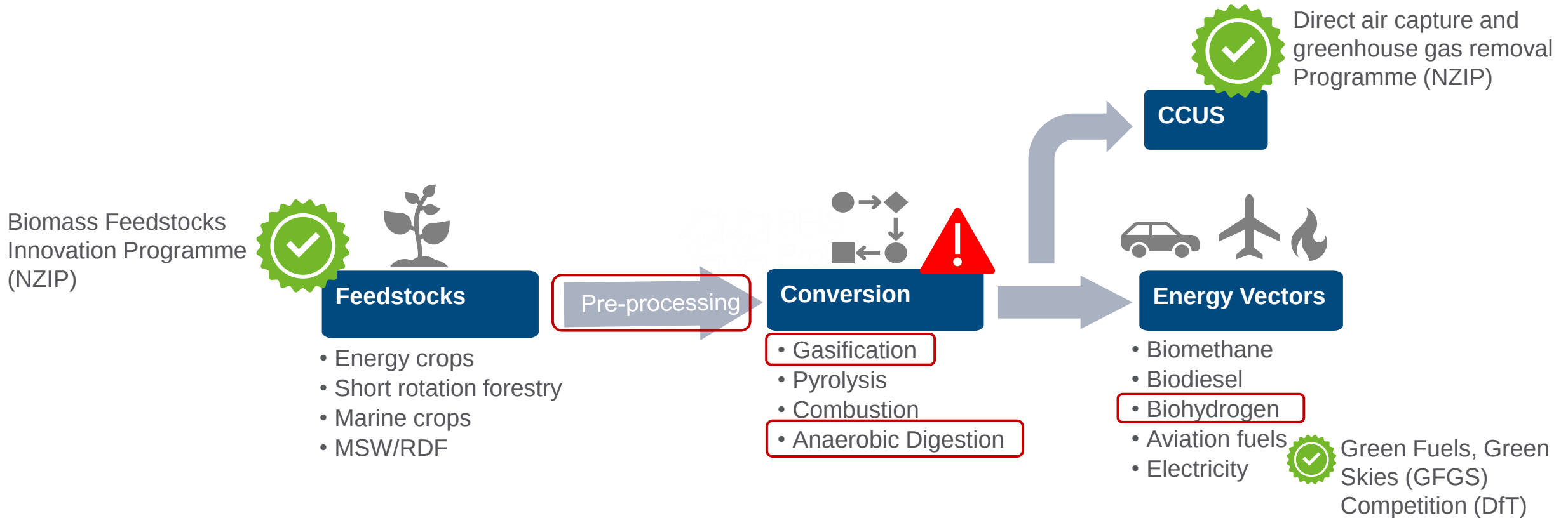
Figure 3.11.a Sources of abatement in the Balanced Net Zero Pathway for the GHG removals sector



Source: BEIS (2020) Provisional UK greenhouse gas emissions national statistics 2019; CCC analysis. M&C = Manufacturing and Construction.

The Sixth Carbon Budget The UK's path to Net Zero. Committee on Climate Change, December 2020

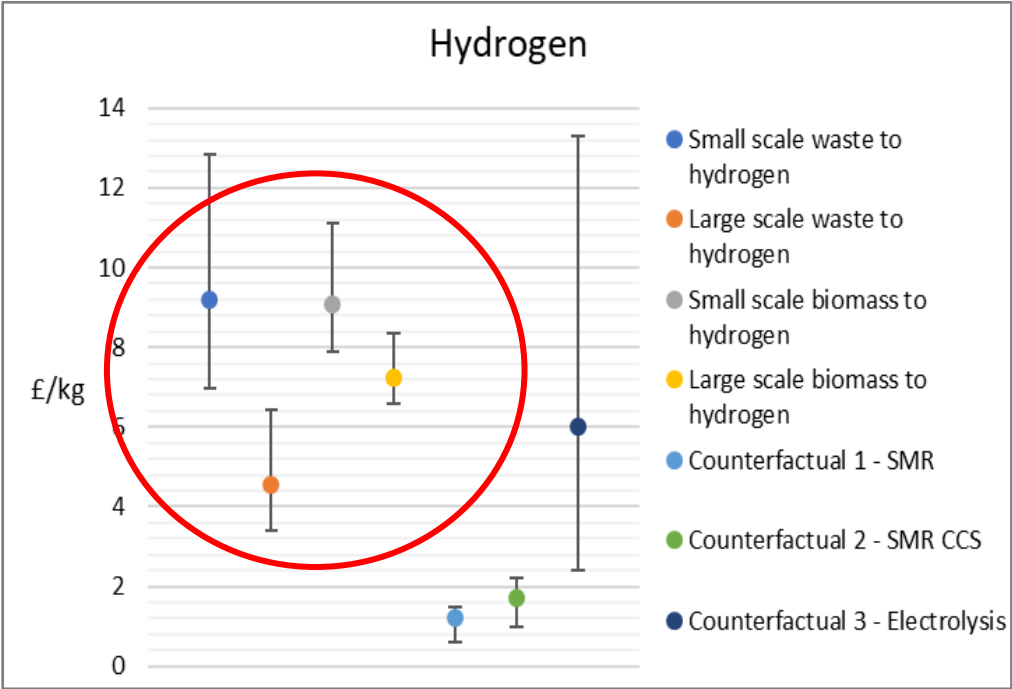
Bioenergy value chain: Innovation needs for H2 BECCS



Advanced Gasification Technologies - Report



Levelised Cost of H₂ (LCOH) Production
with CO₂ capture



Gasification with
CO₂ captured

Base year for all costs = 2025.
Source: BEIS-commissioned
Advanced Gasification
Technologies study (2021).

BEIS Net Zero Innovation Portfolio: **Hydrogen BECCS Innovation Programme**

Katherine Woods
Programme Manager
Science and Innovation for Climate and Energy
BEIS



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What is the Hydrogen BECCS Innovation Programme?

It is....

- An innovation competition supporting the development of novel technologies with the potential to produce hydrogen from biogenic feedstocks while capturing CO₂ (TRL 4-7)
- Small Business Research Initiative/ Pre-commercial procurement – will fund 100% of eligible project costs, to develop, build and trial innovations

It is not....

- Low Carbon Hydrogen Supply 2 competition (NZIP)
- CCUS Innovation 2.0 competition (NZIP)
- The £240m Net Zero Hydrogen Fund
- A fund to support the development of end to end bioenergy projects/ non-innovative projects

This competition will only support projects where the core technology being developed has not been previously operated widely or in a commercial environment

Note: We are taking feedback from this session so some details may change by the time the ITT published. Applicants are advised to read the ITT, which will be one of the schedules in the contract.

Small Business Research Initiative

What is an SBRI?

- Small Business Research Initiative (it is open to organisations of any size)
- Pre-commercial procurement – aimed at solutions which are not yet ready for the commercial market
- Projects must be 100% funded by BEIS
- Sharing of risks and benefits – suppliers receive financial support and retain arising IP (certain rights of use retained by BEIS). SBRI contracts are therefore expected to be priced below market rates, reflecting these benefits to the supplier

What type of projects will be supported by this competition?



CATEGORY 1

Feedstock pre-processing: The development of low cost, energy & material efficient pre-processing technologies to treat biogenic (including biomass and waste) feedstocks for use in advanced gasification.



CATEGORY 2

Gasification components: The improvement of advanced gasification components, specifically syngas treatment and upgrading for hydrogen generation with CCS.

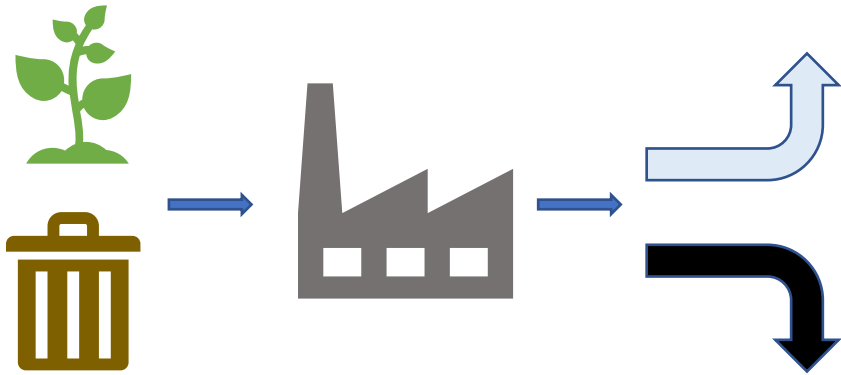


CATEGORY 3

Novel biohydrogen technologies: The development of novel biohydrogen technologies which can be combined with CCS. E.g. dark fermentation, anaerobic digestion, waste water treatment.

Objectives

Overall: To support development of technologies which will enable the **commercialisation and deployment of H2 BECCS at scale** to achieve negative emission and hydrogen production targets.



Reduce the levelised cost of hydrogen production and improve efficiencies associated with H2 BECCS technologies.

Develop feedstock pre-processing technologies which will **reduce costs and improve gasification process performance**.

Improve syngas treatment technologies to effectively control contaminant concentrations to **improve gasification process performance**.

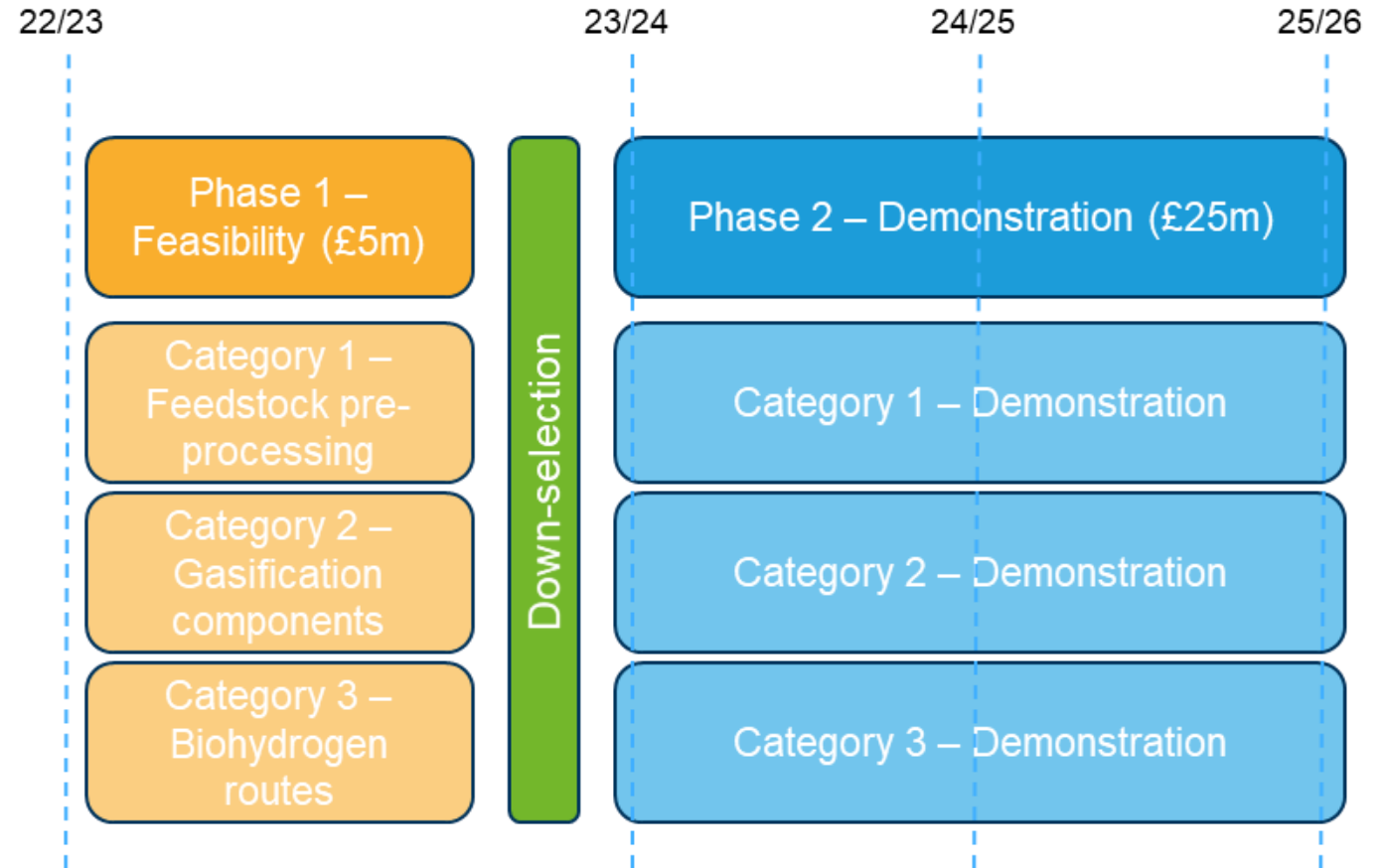
Develop **syngas upgrading technologies**, which can be combined with CCS, to **improve the levelised cost of hydrogen production**.

Progress TRLs of novel bio-hydrogen conversion technologies, which can be combined with CCS.

Overview

Programme design

- SBRI competition with 3 Categories and 2 Phases.
- Phase 1: Approx. 20 feasibility studies
- Phase 2: Approx. 5-10 demonstration projects (down-selected from Phase 1 projects)



Phase 1: Feasibility Study

Phase 1 –
Feasibility (£5m)

Category 1 –
Feedstock pre-
processing

Category 2 –
Gasification
components

Category 3 –
Biohydrogen
routes

May 2022 – October 2022

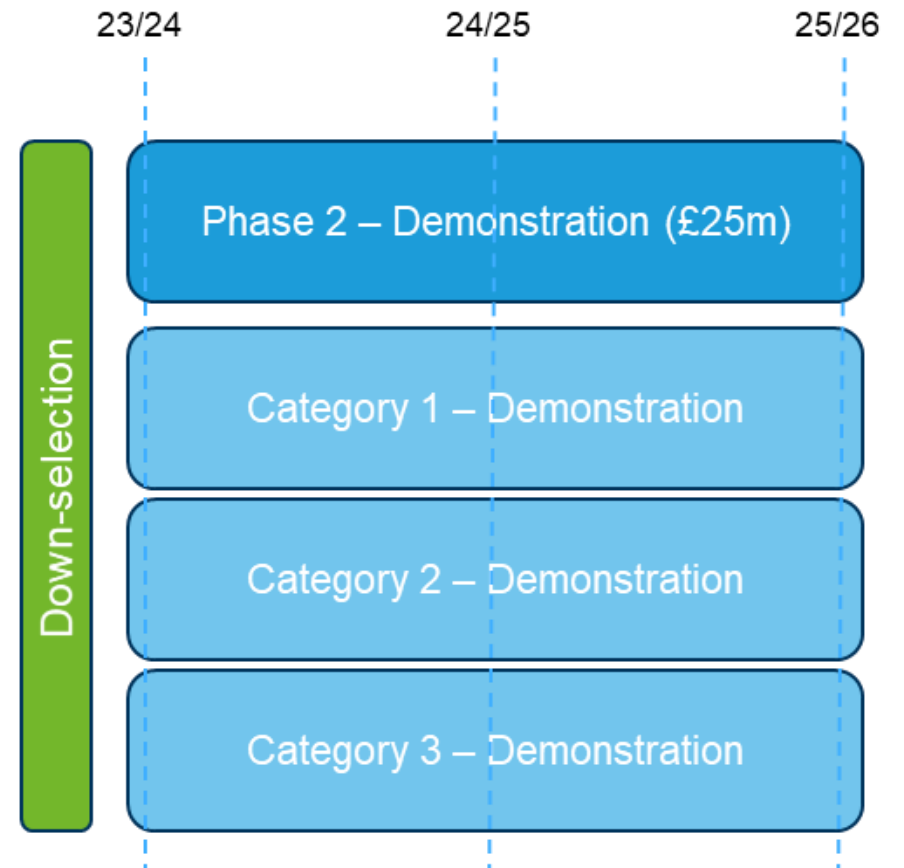
- Develop the Hydrogen BECCS technology concept.
- Deliver a carbon life cycle assessment, engineering design and commercialisation plan for the technology, and a detailed costed plan for the Phase 2 demonstration project.
- **Maximum £250k** funding available per project.
- **Total funding £5m** available.
- Award of contracts **in May 2022**.
- Projects to be completed **by end Oct 2022** (TBC).

Funding will be split equally between categories and assigned to projects ranked in order of merit and scoring above the pass rate. Any remaining budget in a category will be assigned to remaining projects in other categories by order of merit and as evenly as possible to ensure a balanced portfolio of technologies to meet the programme's objectives.

Phase 2: Demonstration Study

Feb 2023 – Mar 2025

- Only those applicants who have been successful in Phase 1 and have completed their feasibility studies can apply for Phase 2.
- Demonstration and testing of the physical technology, an updated commercialisation plan and a final report.
- **Maximum £5m** funding available per project.
- Projects to be completed by **end March 2025**.



Funding will be split equally between categories and assigned to projects scoring above the pass rate. Any remaining budget in a category will be assigned to remaining projects in other categories by order of merit and as evenly as possible to ensure a balanced portfolio of technologies to meet the programme's objectives.

Technology Exclusions

Funding will **NOT** be provided for projects where the technology development focuses on:

- Technologies generating hydrogen from non-biologically derived sources
- Technology that has previously been operated commercially (in UK or Internationally)
- Power generation, or generation of any fuel other than hydrogen
- CCUS technologies which aren't intrinsically linked into the biohydrogen production process

Eligibility for Funding (1 of 3)

Item	Subject	Eligibility
1.	Technology Categorisation	The technology must be in scope for the category applied for
2.	Innovation and technology readiness	TRL 4 to 7 at the start of the project
3.	Retrospective Work	BEIS is unable to fund retrospective work on projects
4.	Additionality	Evidence must be provided to show that innovation would not progress without public funding

TRL 1 – Basic Research	Scientific research begins to be translated into applied research and development.
TRL 2 – Applied Research	Basic physical principles are observed, practical applications of those characteristics can be 'invented' or identified. At this level, the application is still speculative: there is not experimental proof or detailed analysis to support the conjecture.
Applied research and development	
TRL 3 – Critical Function or Proof of Concept Established	Active research and development <u>is</u> initiated. This includes analytical and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
TRL 4 – Laboratory Testing/Validation of Component(s)/Process(es)	Basic technological components are integrated to establish that the pieces will work together.
TRL 5 – Laboratory Testing of Integrated/Semi-Integrated System	The basic technological components are integrated with reasonably realistic supporting elements so it can be tested in a simulated environment.
Demonstration	
TRL 6 – Prototype System Verified	Representative model or prototype system is tested in a relevant environment.
TRL 7 – Integrated Pilot System Demonstrated	Prototype near or at planned operational system, requiring demonstration of an actual system prototype in an operational environment.
Pre-commercial deployment	
TRL 8 – System Incorporated in Commercial Design	Technology is proven to work - actual technology completed and qualified through test and demonstration.
TRL 9 – System Proven and Ready for Full Commercial Deployment	Actual application of technology is in its final form - technology proven through successful operations.

Eligibility for Funding (2 of 3)

Item	Subject	Eligibility
6.	Contract size	Maximum funding requested must be £250k or below (minimum of £50k) for Phase 1 and £5m or below for Phase 2.
7.	Eligible project costs	Projects requesting funding for commercialisation activities are not eligible. SBRI funding only available for R&D activities of an innovative process, material, device, product, or service prior to commercialisation.
8.	Project end date	Phase 1 final reports must be submitted before end of October 2022 (date TBC) Phase 2 demonstration projects must be completed by end March 2025
9.	Risk benefit sharing	Projects receive financial support and retain any intellectual property generated, with certain rights of use retained by BEIS. Project outputs are also expected to be shared widely and publicly and project teams are not permitted to include profit in the eligible project costs.
10.	Applicants and projects team make-up	Projects are expected to be delivered by a project team or consortium. A single project application must be submitted by the lead project member. Lead company must be registered in the UK and more than 50% of the work carried out in the UK.

Eligibility for Funding (3 of 3)

Item	Subject	Eligibility
11.	Delivering multiple projects	If project consortium member(s) are part of multiple successful applications they must be able to deliver on them and they must not have applied for funding for the same piece of work more than once
12.	Multiple applications	If the intention is to submit multiple applications, lead organisations may only enter one application into each Category as the project lead. A technology provider/OEM are limited to one application for a particular technology/solution requiring development per Category.
13.	Prompt Payment	For Phase 2, where contracts are £5m, if you intend to use a supply chain for this contract, you must demonstrate you have effective systems in place to ensure a reliable supply chain.

Invitation to Tender and Application Process

- **Phase 1 ITT and application form will be** published **mid-January 2022**; Application deadline will be **early March 2022**.
- Applications will be entered via an online form, you **will need to register** to gain access to the online form. We will circulate registration details as soon as registration opens.
- Previous correspondence or attendance today does **not** result in automatic registration.
- We recommend drafting your application in the downloadable Word template, then uploading your answers to the online form when you are ready to submit.
- All applications must be submitted via the online application form with any supporting documents uploaded. **Further details will be provided in the ITT.**
- Don't leave it to the last minute to upload your application, the online form asks some further information that requires completion.

Applicant Guidance



Applications from project teams or consortia are welcome



A single project application must be submitted by the lead project member



Only one submission for each separate project bid is permitted, and all consortium partners are required to sign the completed application form



Consortium members/sub-contractors may be part of multiple applications



The lead organisation to manage any arrangements with regards to conflict of interest

Assessment Criteria

Criteria	
1	Innovative Hydrogen BECCS solution: The merits of the innovation, its technical feasibility, scalability and the commercial opportunity that exists
2	Cost reduction, emissions and environmental impact: How development of the innovation will contribute to reduced costs, emissions and environmental impacts
3	Social Value: UK job/skills creation and supporting regional economies
4	Project costs: To ensure that all proposed costs are eligible and represent a fair market value
5	Project delivery: The proposed approach to delivering the Phase 1 project, including Project Plan, Testing of Innovation, Project Team and Organisation

To be eligible for funding – Applicants must score **60% or higher in their application**

GENERAL PROCUREMENT PROCEDURE

Julie-Anne De Thomasis

Commercial Lead

Science and Innovation for Climate and Energy

BEIS

SBRI Procurement Process

Terms and Conditions

- Phase 1 and Phase 2 projects will each have slightly different T&Cs.
- Standard termination clauses will apply (including termination at convenience by either party with 28 working days' notice).
- Suppliers retain the rights over any IP arising from the project, however BEIS reserves the right to take up arising IP if it has not been “commercially exploited” by the supplier within 5 years of contract commencement.
- For Phase 1: Liability is limited to twice the contract value (Except in relation to death or personal injury).
- For Phase 2: Liability will be increased to £4m or twice the contract value, whichever is greater.

Review and Moderation

All applications will be assessed by **three separate assessors and scores moderated**. BEIS will use a third-party external consultancy to support this process.

Applicants that **fail any of the eligibility criteria** will not be assessed further.

Feedback to applicants will be provided by **end April 2022***

* These dates are dependent on the number of eligible applications received

Transparency

In the interests of fairness, today's questions and answers will be **anonymised and published with the respective ITTs**

No commercial-in-confidence information will be shared

Terms and Conditions

Although BEIS SBRI T&Cs are expected to form the basis of the contract, we will **publish the final version of the T&Cs at the same time as the ITT**

They will be final and any applications submitted on condition that T&Cs are amended will be effectively submitting a non-compliant application

If you have questions about the T&Cs you can **ask them today or during the ITT Q&A window** (details on ITT Q&A window to be included in the ITT)

All Q&A raised during the ITT publication period will be **anonymised and published on the competition website and Contracts Finder**



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Hydrogen BECCS: Policy context

Dr Carly Whittaker

Biomass Innovation and Deployment Lead
BEIS

Ben Harrop

Hydrogen Production Policy Lead
BEIS



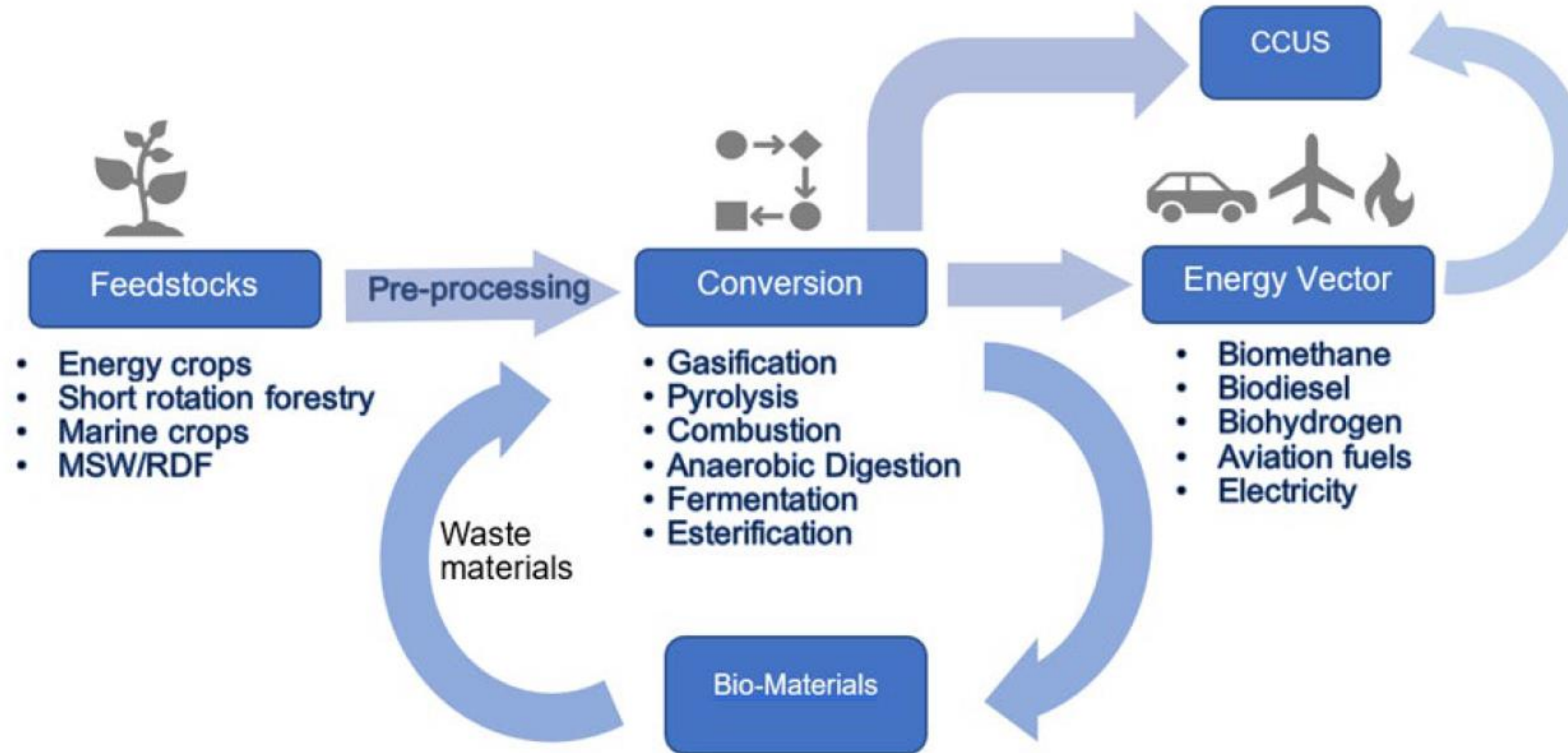
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Energy White Paper 2020

- Formally announced that a new **Biomass Strategy**- would be developed
- The Strategy will review the **amount of sustainable biomass available to the UK** and how this resource could be **best utilised across** the economy to help achieve our net zero greenhouse gas emissions target by 2050.
- The Strategy will also establish the role which **Bioenergy with Carbon Capture & Storage (BECCS)** can play in reducing carbon emissions across the economy and set out how the technology could be deployed.
- We recently published a **Biomass Policy** Statement- our next step in developing the Strategy



Scope of the Biomass Strategy



Potential routes for biomass processing and use across the economy

Biomass resource assessment model

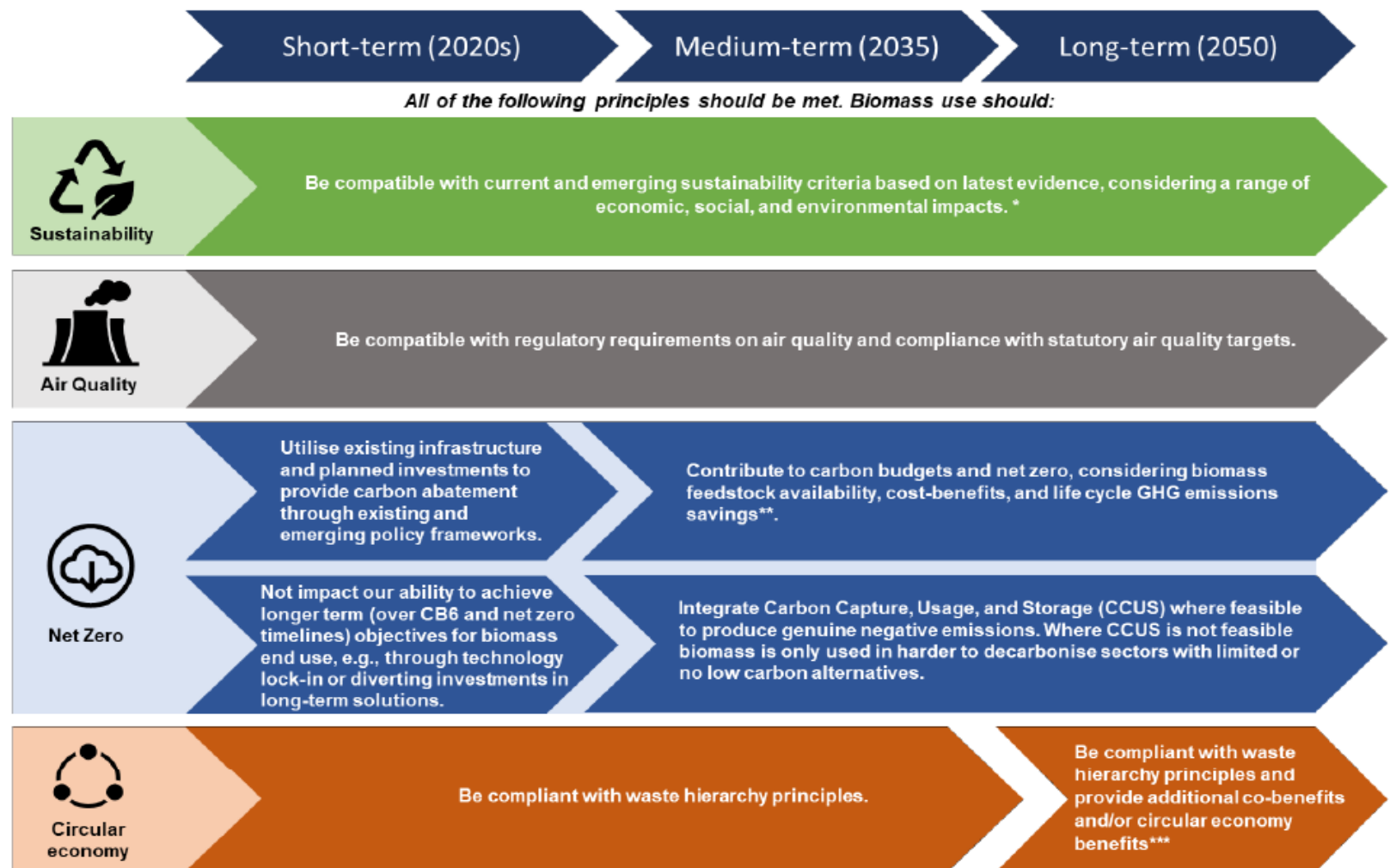
We are investing in the update of the **UK and Global Bioenergy Resource Model** to reflect the changing landscape of biomass use, ensure that it reflects the most up to date evidence base and remains flexible to the new evidence emerging in the future.

Feedstocks being considered are:

- Biogenic wastes and residues
- Domestic arable crops
- Perennial energy crops and short rotation forestry
- Forest products
- Marine-based and other novel feedstocks e.g. algae, seaweed and kelp
- UK-derived feedstocks



Priority use framework



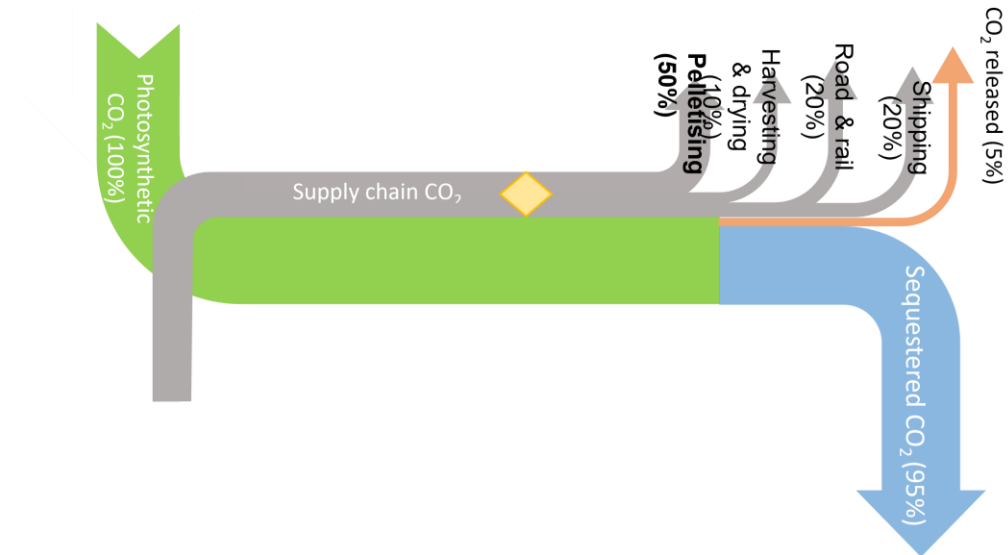
* Further work is being carried out to review the UK's existing sustainability criteria, including exploring ways to harmonise the criteria across sectors to promote fair competition. Details to follow in the Biomass Strategy.

** Compared to GHG emissions of appropriate counterfactuals.

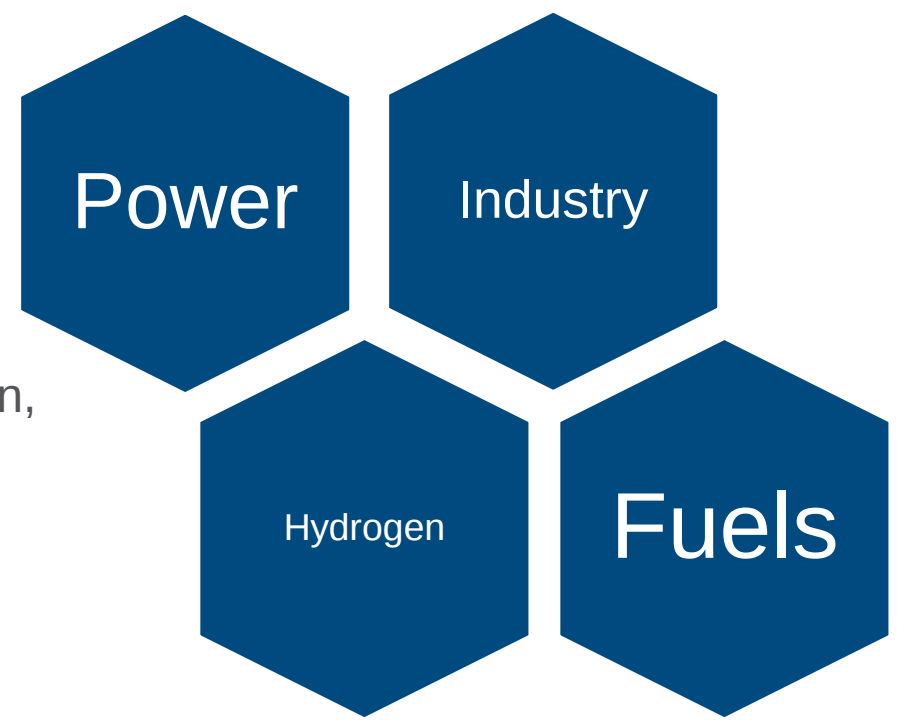
*** e.g., by-products are used to make other high value products which can be utilised elsewhere in the economy.

Bioenergy with Carbon Capture and Storage (BECCS)

- Government and the CCC modelling have found that **GGRs will be required to offset** residual emissions in sectors that are difficult to decarbonise completely.
- When undertaken **sustainably**, BECCS can deliver **negative emissions** because carbon sequestered in biogenic material is captured and stored after combustion. The Government is clear that any BECCS deployment must be **genuinely and credibly** 'net-negative'.
- To ensure that BECCS delivers genuine negative emissions, **strict biomass sustainability criteria** will be developed for BECCS.



Routes to BECCS



- BECCS can be deployed alongside various technologies, including conventional combustion technologies, gasification, steam methane reforming alongside anaerobic digestion, delivering both **low-emission energy** and fuels, as well as **negative emissions**.
- However, existing policies and emissions markets are not designed to value the negative emissions produced by BECCS projects.
- The Government has therefore committed to developing a **BECCS policy and GHG accounting methodology**, and intends on developing a business model for power-BECCS, while other routes to BECCS (EfW, H2- BECCS) also being explored.

Hydrogen Policy

- UK Hydrogen Strategy on production:
 - Twin-track** approach (CCUS-enabled and electrolytic) rather than reliance on a single technology pathway
 - Low Carbon Hydrogen Standard** to ensure hydrogen production is consistent with carbon budgets
 - During 2020s scale-up, expect main production methods will be SMR + CCS and renewable electrolytic
 - Multiple production routes** are likely to play a role in the future energy mix
- Examples opposite not exhaustive – carbon intensity and levelised cost estimates over time are major factors
- Ongoing work to consider the wider impacts of production routes e.g.
 - Competing demands** across policies/end-use sectors for process inputs (RTFO, GGSS, RHI, wider decarbonisation)
 - Sourcing** of feedstocks e.g. Is the biomass sustainable? Is the waste unavoidable?
- Further details on production strategy will be set out in 2022, informed by evidence gathered through recent consultations.

Table: Examples of production routes likely to play a role in the future energy mix (not exhaustive)

	Production method	Timeframe	Next steps
	Biomethane reformation (with/without carbon capture)	2020s	CCS infrastructure needs to be in place; position in forthcoming Biomass Strategy
	Low temperature nuclear electrolysis	2020s	Further developments expected in 2020s.
	High temperature nuclear electrolysis	2030s	Further innovation in 2020s
	Bioenergy with carbon capture and storage (BECCS)	2030s	Further innovation and position in forthcoming Biomass Strategy.



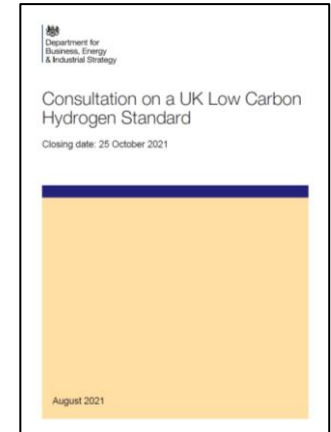
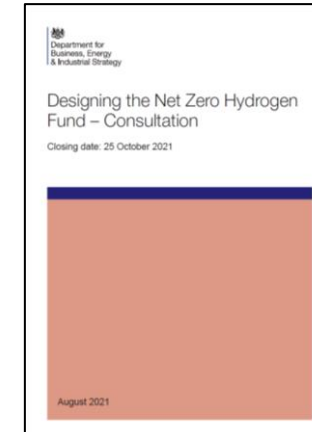
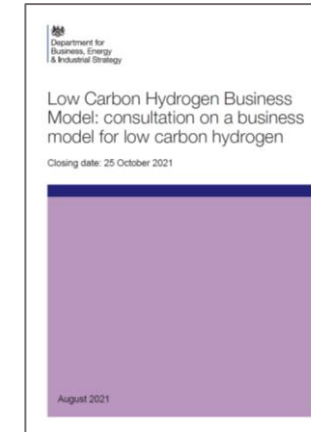
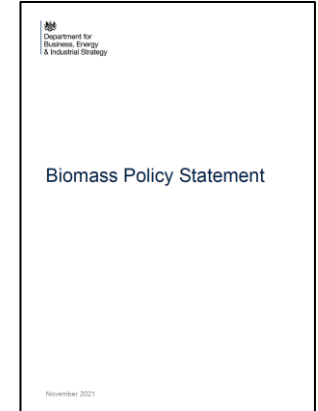
Hydrogen Policy

Strategic Position:

- **Ten Point Plan** – 5GW 2030 ambition, NZIP priorities.
- **Net Zero Strategy** – H2 in fuel supply chapter, CB6 could require 10-17GW production in 2035.
- **Hydrogen Strategy** - actions in the 2020s to meet ambition and scale up in 2030s.
 - **Low Carbon Hydrogen Standards** – finalise 2022
 - **£240m Net Zero Hydrogen Fund** – launching 2022.
 - **Low Carbon Hydrogen Business Model** – funding confirmed at SR under Industrial Decarbonisation and Hydrogen Revenue Support scheme, launching 2022.
- **Biomass Policy Statement** – hydrogen production from BECCS in wider policy.

To Come:

- Further understanding of **hydrogen production technologies** – 2022.
- **Biomass Strategy** - hydrogen production from BECCS in wider policy.





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Coffee Break

11:00 - 11:10am



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Hydrogen BECCS: Performance testing

Prof. Patricia Thornley

Director, Supergen Bioenergy Hub



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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.

Importance of testing

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

Supergen Bioenergy Hub



Supergen
Bioenergy

EPSRC UK Research and Innovation BBSRC UK Research and Innovation

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



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

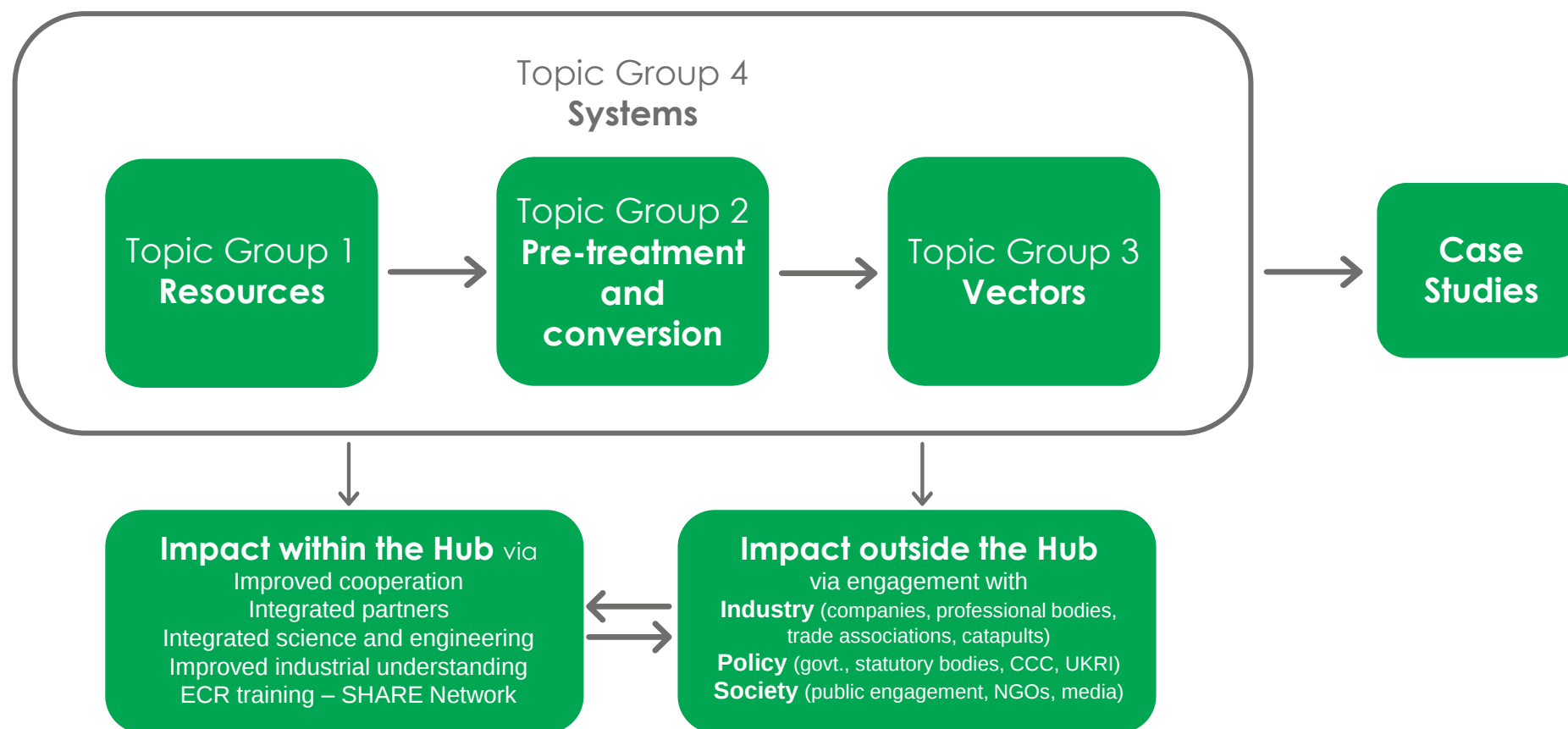


Benefits of testing

- 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



Supergen Bioenergy Hub Structure



Supergen Bioenergy Hub



Supergen
Bioenergy

EPSRC

UK Research
and Innovation

BBSRC

UK Research
and Innovation

Some (academic) test centres

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

Supergen Bioenergy Hub



Supergen
Bioenergy

EPSRC | UK Research and Innovation | BBSRC | UK Research and Innovation

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



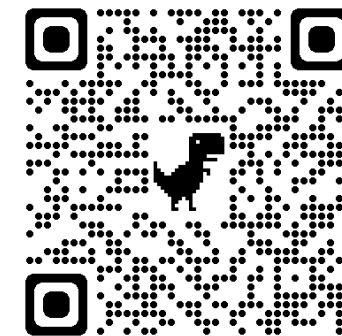
Supergen Bioenergy Hub



Supergen
Bioenergy

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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	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. Bioscience innovation: Cat II labs, microbiology, fermentation (up to 30L), AD (up to 1m³), Analysis: Broad range of complimentary analysis facilities
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	Open access, pilot scale processing capabilities, supporting researchers & businesses to convert plants, microbes and biowastes into profitable biorenewable products, de-risking innovation Delivered over 850 projects to over 300 separate clients Flexible project funding, specialist sector business advice (e.g. market research, B2B & B2C), networking (e.g. AD special interest group), project management, communications & marketing
Further information/ contact details	http://www.biorenewables.org/ email: info@biorenewables.org , tel: 01904 32 8040 @BDC_org



Supergen Bioenergy Hub



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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	Our capabilities for fundamental investigations as well as demonstration scale: 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.
Relevance/ potential/ capability	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.
Further information/ contact details	Birmingham Centre for Energy Storage – University of Birmingham Y.Ding@bham.ac.uk ; M.Emziane@bham.ac.uk ; A.Fivga@bham.ac.uk

Supergen Bioenergy Hub



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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



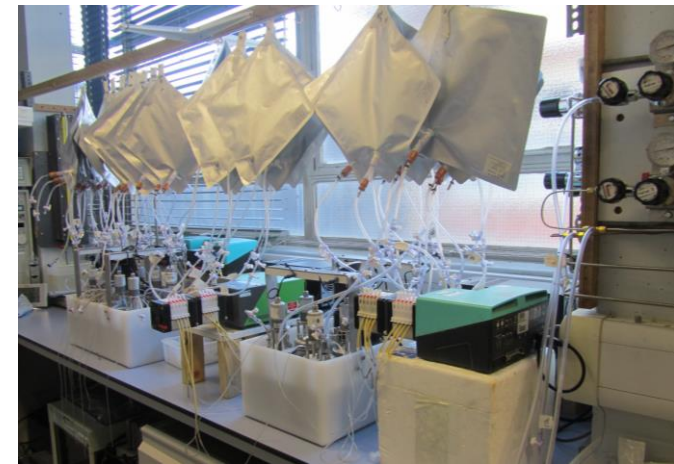
Supergen Bioenergy Hub



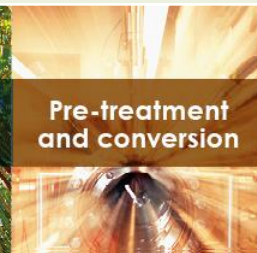
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Organisation	University of Southampton
Category	Other biohydrogen technologies
Key facilities	Stirred tank reactors
Scale/size	Volumes from 0.5 - 100 L
Relevance/potential/capability	These can be used for anaerobic digestion, fermentation, CO ₂ biomethanisation 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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NEXT STEPS: Hydrogen BECCS Innovation Programme

Katherine Woods

Programme Manager

Science and Innovation for Climate and Energy

BEIS

Next steps

- We will circulate a **survey to attendees** to help us finalise the competition design, **please have your say by Friday!**
- An anonymised account of the Q&A from this session will be published with the ITT.
- Please email any further questions to H2BECCS@beis.gov.uk by **Friday 26th November** and responses will be included in the Q&A published with the ITT.
- **ITT and application form published mid-January 2022** on competition webpage (gov.uk) and Contracts Finder
- There will be a further opportunity to ask questions following the publication of the ITT.
- Questions submitted via email, which in our judgement, are of material significance will be addressed and published on the competition website.

Thank you for attending!

H2BECCS@beis.gov.uk