



IEA Bioenergy
Technology Collaboration Programme

UK Country Update

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Technology Collaboration Programme

by **iea**

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- UK ongoing projects

UK Biomass relevant programmes

- Net Zero Innovation Portfolio (NZIP); *2021*
 - Biomass feedstock innovation programme; *2022*
 - UK Hydrogen BECCS Innovation programme; *2023*
- UK Biomass strategy

Biomass Feedstocks Innovation

Programme August 2022: Announced successful projects

Up to £4 million of funding awarded for lot 1 innovation project and £5 million for the lot 2 multi-site demonstrator platform.

Lot 1 (examples)

- Project BIOFORCE (BIOmass FORestry CrEation): Creating geospatial data systems to upscale national forestry-based biomass production Led by Verna Earth Solutions Ltd
- Transforming UK offshore marine algae biomass production Led by SeaGrown Limited.
- EnviroCrops - Perennial Energy Crops Decision Support System (PEC-DSS) Led by Agri Food and Biosciences Institute (AFBI).
- Miscanspeed - accelerating Miscanthus breeding using genomic selection. Led by Aberystwyth University.
- Technologies to enhance the multiplication and propagation of energy crops (TEMPEC). Led by New Energy Farms EU Limited.
- Teesdale Moorland Biomass Project. Led by Teesdale Environmental Consulting Ltd (TEC Ltd).

Lot 2: Multi-site demonstrator platform

Biomass Connect: Biomass Innovation and Information Led by UK Centre for Ecology & Hydrology:

The Biomass Connect Phase 2 project will create a demonstration and knowledge sharing platform to showcase best practice and innovations in land-based biomass feedstock production.

Hydrogen BECCS Innovation programme

(Department for Business, Energy & Industrial Strategy: BEIS, 2023)

This programme supports innovation in hydrogen BECCS (bioenergy with carbon capture and storage) technologies with £31 million in funding

Completed projects in Category 2 - Gasification components

- Development of biomass gasification tar reformation and ash removal. Led by Advanced Biofuel Solutions Ltd.
- Micro-H₂ hub utilising biogenic feedstock for hydrogen and CO₂ production. Led by Compact Syngas Solutions Limited.
- Bio-hydrogen Produced by Enhanced Reforming (Bio-HyPER). Led by Cranfield University.
- RiPR (Rising Pressure Reformer) using SCWG (Super Critical Water Gasification). Led by Helical Energy Ltd.
- Enhancement of KEW biomass gasification technology performances through optimisation of the H₂/CO₂ separation process stage. Led by KEW Technology Ltd.
- Northeast waste wood hydrogen demonstrator (NEW2H₂). Led by Northumbria University.

Cont.

Hydrogen BECCS Innovation programme

(Department for Business, Energy & Industrial Strategy: BEIS, 2023)

Cont. Category 2 - Gasification components

- Novel plasma reforming technology for tars reduction in BECCS. Led by Queen Mary University of London (QMUL).
- H₂ production via biomass gasification integrated with innovative one-step gas shift reforming and separation (BIG-H₂). Led by Translational Energy Research Centre - The University of Sheffield.

Other projects in other categories included topics covering biomass and/or indirectly gasification

Category 3 - Novel biohydrogen technologies

- Production of biohydrogen from waste biomass. Led by CATAGEN Limited.
- Thermal catalytic conversion of syngas to carbon nanotubes. Led by The Cool Corporation Ltd.

UK Biomass Strategy

Restates government commitment to biomass sustainability

Key commitment: develop & implement a cross-sectoral common sustainability framework (subject to consultation)

Key areas:

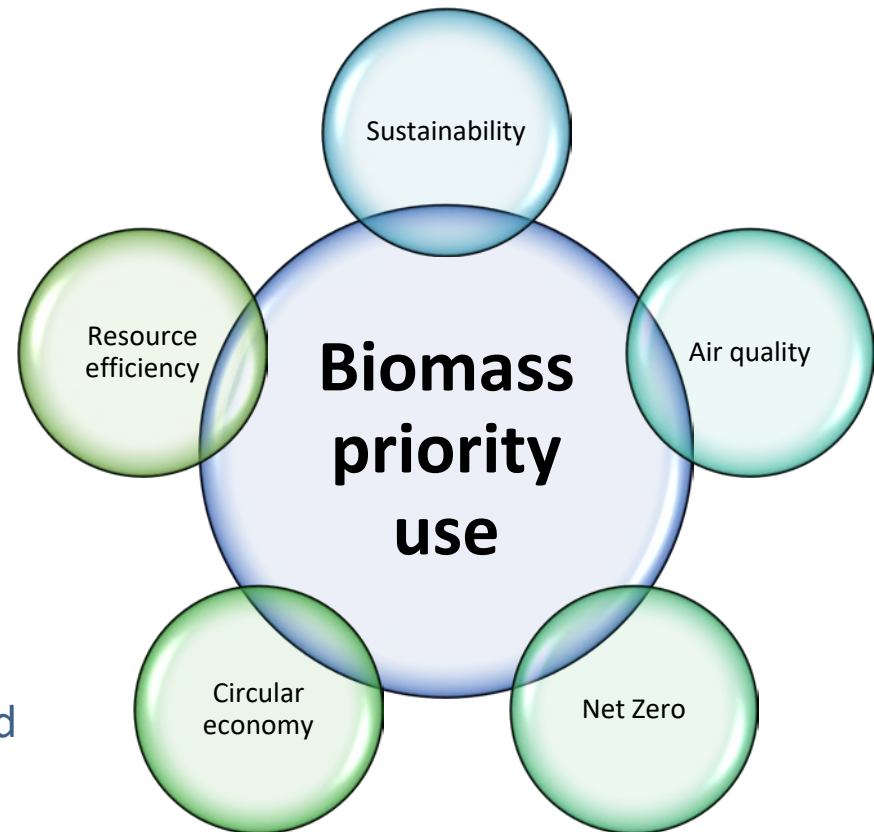
1. The new strategy outlines the role of biomass in UK's transition to net zero, with **sustainability as major theme**.
2. The document takes **holistic view** of sustainability that goes beyond carbon to consider wider economic, environment and societal risks and benefits.
3. There is a big emphasis on the role of BECCS to balance residual emissions from hard-to-decarbonise sectors.
4. Alongside the Strategy, the Government will publish a report to establish evidence-based position of the validity of BECCS as a GGR option to **DELIVER NEGATIVE EMISSIONS**

[LINK](#)

UK Biomass strategy:

Biomass use across different UK economy sectors

1. Renewable energy generation
2. Biomethane
3. Heating
4. Transport fuels
5. Industrial decarbonisation
6. Low carbon hydrogen
7. Other uses in bioeconomy: wood-based products, biochar, biochemicals, biomaterials (bioplastics).



Biomass Guiding principles

UK Supergen Bioenergy Hub experts worked closely with the Department for Energy Security and Net Zero and other government departments to provide scientific evidence, context and insight to inform the strategy

UK industry updates

1. Altalto Immingham
2. ABSL: Advanced biofuel solutions Ltd
(*Massimiliano Matterazi*)
3. KEW Technology (*Amna Bezanty*)



Altalto Immingham Waste to SAF

ALTALTO



Department
for Transport



BRITISH
AIRWAYS

- Europe's first waste-to-SAF plant, enough fuel to power over 1,000 transatlantic flights with net-negative carbon emissions
- Collaboration between Velocys and British Airways
- Technology: Fischer-Tropsch and gasifier (from Velocys)

Further to their grant award of up to £27 million by DfT, Altalto Ltd* has:

- Completed the work necessary to claim the first tranche (£7 million) of the grant up to 31 March 2023.
- The project has obtained private funding for the period from 1 April 2023 (DfT and private match funding).
- Upon completion of their Front-End Engineering Design ("FEED") stage, construction will commence in 2025 with full commercial operation expected in 2028

ABSL: Advanced biofuel solutions Ltd

Massimiliano Materazzi

FULL chain 4.5 MWth SMALL
COMMERCIAL FACILITY

Swindon Plant Status:

Plant complete and being brought online
currently

- Waste delivered to site, currently feeding woodchips into gasifier as part of start-up process with switch to oxy steam gasification shortly
- First Syngas from biomass produced
- Team of 30 engineers trained and operating the plant

All regulatory consents in place with
Environment Agency, HSE and Ofgem



ABSL (cont.)

Massimiliano Materazzi



dRTFC auction held with bids from most of the obligated parties - secured a price close to the buyout price of £0.80 equivalent to £200/MWh - 11x long term natural gas price

Gas sold to Air Liquide for use in HGV and bus filling stations.

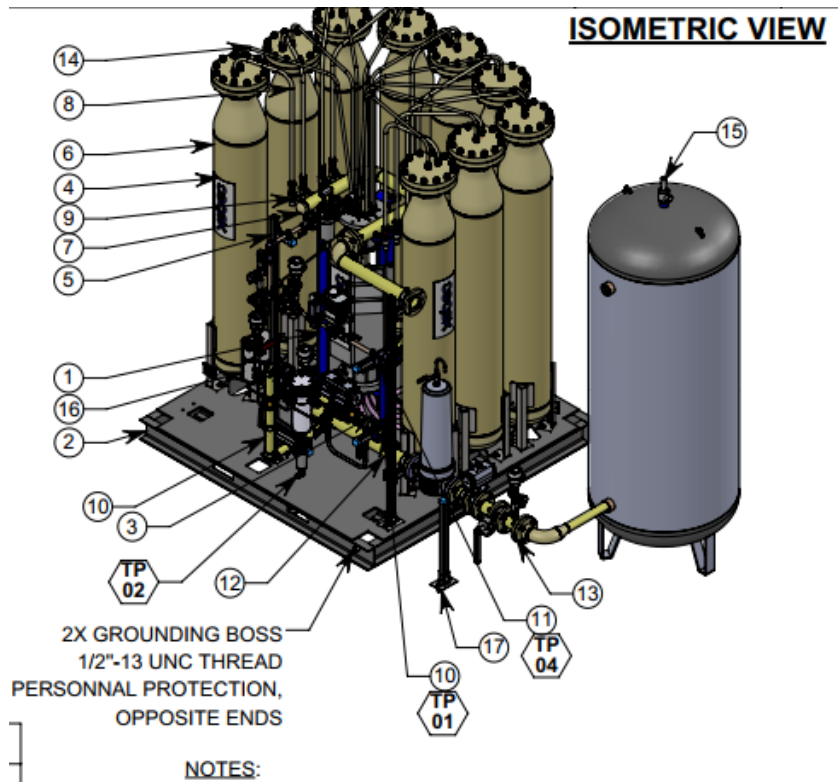
Carbon dioxide sold to Air Liquide for use in industry.

Over £5m of grants secured to develop hydrogen sale or offtake capability



ABSL: Biohydrogen project

Massimiliano Materazzi



Conventional System

Slipstream of hydrogen rich syngas taken after water gas shift reactor.

Transferred to Xebec PSA which produces high purity hydrogen stream and hydrogen rich tail gas.

Tail gas recycled into the process.

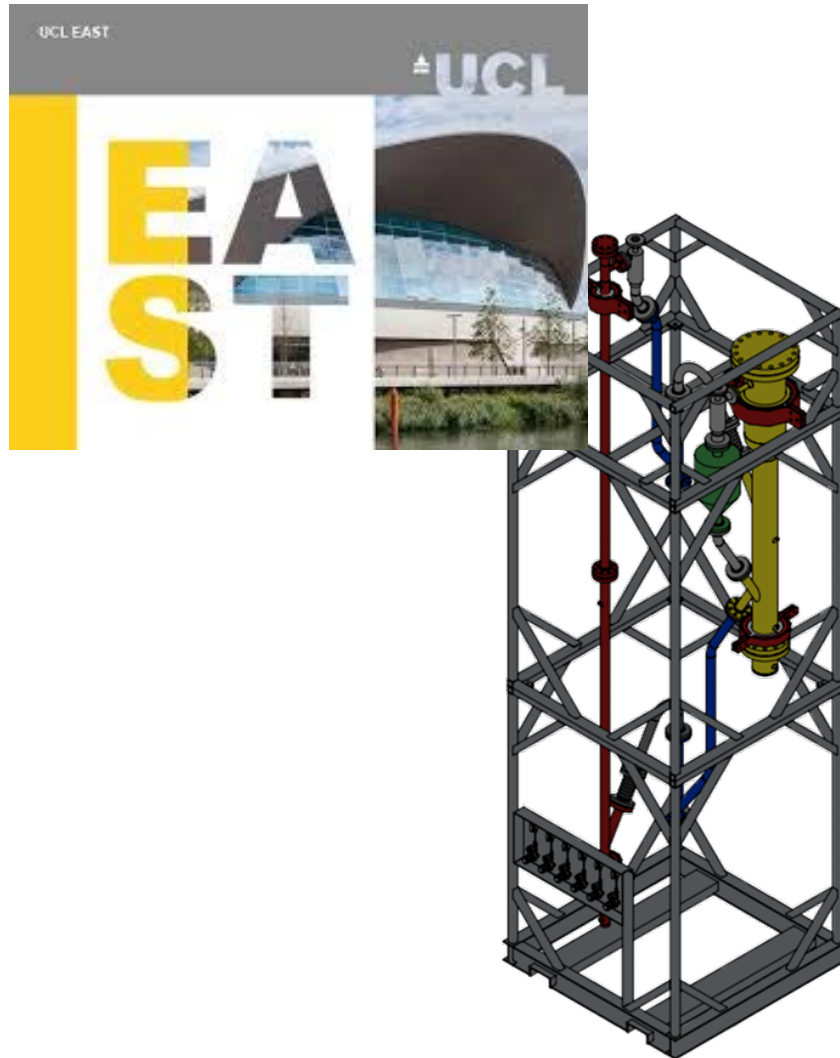
Hydrogen metered into gas bottles for use in transport.

SEWGS System

UCL to host SEWGS system at Manufacturing Futures Lab (UCL East). *Cont.*

ABSL: Biohydrogen project

Massimiliano Materazzi



SEWGS System (cont.)

Simulated syngas based on experience from Swindon plant will be injected into system.

Dual fluidized bed operation. Absorber operated at 300-400C, 5 bar. Desorber operated at 600-700C, 1 bar.

SEWGS offers significant advantages over conventional WGS coupled with carbon advantage. Far lower GHG emissions associated with process.

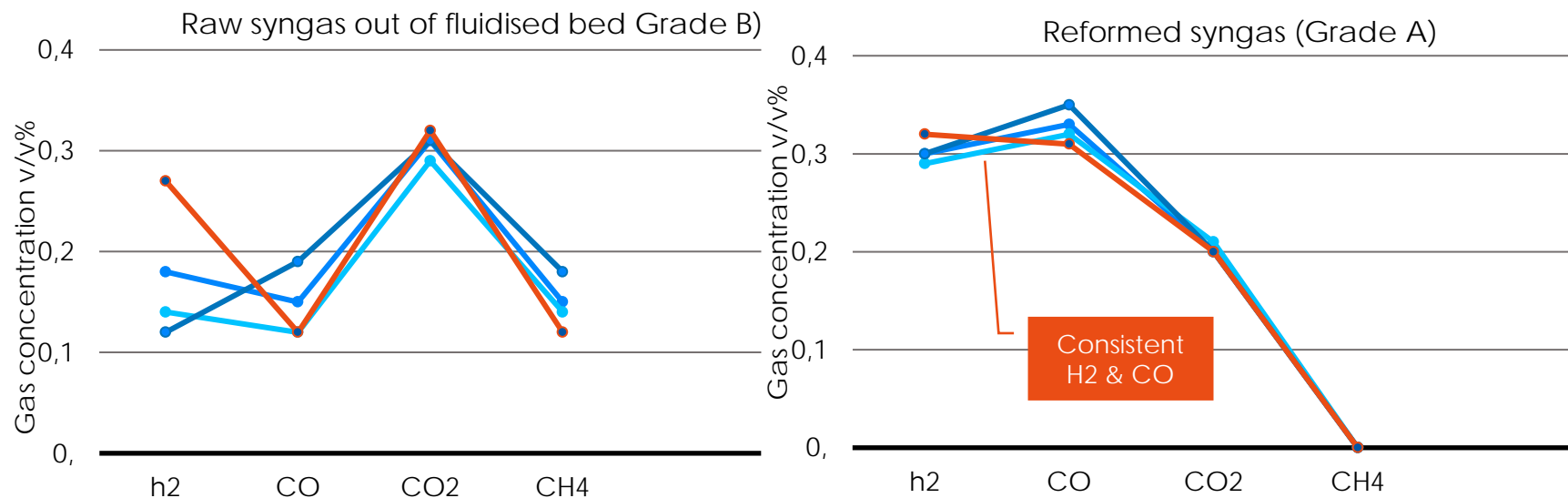
Project Timelines

Installation through 2023, commissioning in H1 2024, operational in H₂ 2024.

KEW Technology, Wednesbury, UK

Amna Bezanty, Head of Sustainability, ESG & Policy

KEW's technology: high-pressure modular solution with proven syngas reformation



Significant variability in gas quality from waste and low-grade biomass for all gasifiers

Transformed by KEW Equilibrium Approach Reformer® technology

Consistent, tar-free, stable hydrogen-rich gas quality regardless of feedstock

Delivering a world beyond fossil fuels

KEW Technology, Wednesbury, UK

>£50m invested in KEW's development and commercial-scale R&D Facility

Unique validation of KEW's technology credentials :

- ✓ Core technology performance validation and optimisation at our Sustainable Energy Centre
- ✓ The SEC is product embodiment (template for our modular plant product design) for the **patented and proven waste-to-syngas process, producing a consistent hydrogen-rich, tar-free syngas composition** regardless of the inlet feedstock composition. This is a critical to pathway to high value energy molecules.
- ✓ As well as being the commercial-scale demo plant producing clean syngas for ROCs accredited electricity generation, the facility is also a **Centre of Excellence** to demonstrate multiple end to end vectors from 2024 through allocating % of the syngas into **demonstrating end-to-end waste-to-X pathways such as rDME (corporate funded) and Hydrogen with carbon capture (UK Govt funded)**
- ✓ Real world operator training 'live' environment and remote monitoring



Delivering a world beyond fossil fuels

KEW Technology, Wednesbury, UK



KEW's plants are

modular

Ultra standardization of manufacturing and post sales servicing

Standardization of project development

Smaller footprint or multiple module projects

Factory built for supply chain efficiency and faster construction timeframes

Rapid reduction in levelized cost of production

Simplified performance de-risking

Enabling scalability from 20,000tpa waste capacity to >200,000tpa waste capacity

.e.g., **KEW's Teesside project as part of the Dimeta partnership, Circular Fuels Ltd, will take over 200,000tpa and produce over 5% of UK LPG demand in low-carbon form**

UK ongoing projects

HyNet project news

(1) March 2023: HyNET industrial decarbonisation

Hanson Cement, Viridor, Encyclis, Buxton Lime Zero (Tarmac) and Vertex Hydrogen,

Will create an entirely new CC sector in the Northwest of England and North Wales.

The five projects announced in March 2023, will remove about 3 million tonnes of CO₂/year, supporting the UK's net zero target.

(2) June 2023: HyNET industrial fuel switching

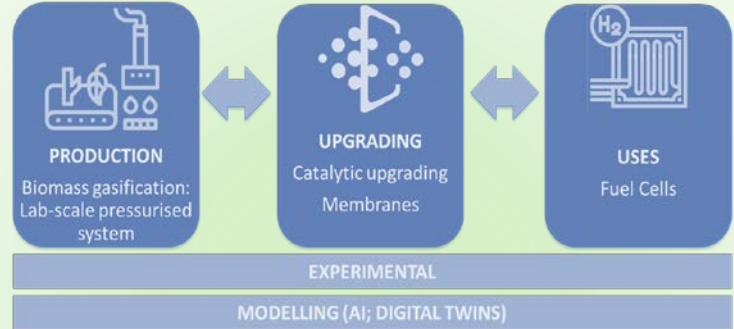
Kellogg's, Essity and Novelis have been selected to receive funding by the Department for Energy Security & Net Zero to undertake demonstrations in which they will switch their fuel to hydrogen at their Northwest plants.

<https://hynet.co.uk>



SUSTAINABLE BIOENERGY
SYSTEMS FOR OUR
LOW-CARBON FUTURE

Official Launch: 14th November, Aston University
£6M programme: 6 Cross-cutting (C) & 6
technology development (TD) projects. Inc. two
addressing biomass gasification & LCA for
biomass utilisation.



BECCS

Wolfson centre for low carbon H₂

Small-scale pressurised gasifier (up to 10bar); Syngas upgrading studies, low carbon H₂, H₂ uses. Commissioning: April 2024



Industrial Decarbonisation cluster: drafting guidelines to measure CO₂ streams with impurities.

Expected to be published soon via the Energy Institute.



HyDEX is a three-year project (until 2024) with eight Midlands-based universities associated with the Energy Research Accelerator (ERA).

[HyDEX - Accelerating the new hydrogen economy in the Midlands](#)

UK Country report updates contact:

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