WILD HYDROGEN HII E2E DEMONSTRATION

Purification of Syngas to using Process Swing Adsorption with Purge Gas Recirculation (PSA-SPUR) for carbon negative hydrogen

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Executive Summary

Overview of the Demonstration

As the world moves to decarbonise and better secure the energy sector against climate change and global conflict, hydrogen is increasingly seen as a critical pathway to a secure and diverse energy mix. However, current hydrogen generation is highly sensitive to fossil fuel industry events, such as price shocks or supply chain issues, necessitating a broader mix of hydrogen production methods.

This demonstration showcases a suite of technologies, demonstrating the potential of the Wild Hydrogen Rising Pressure Reformer (RiPR) to generate carbon-negative hydrogen by separating carbon dioxide from other energy gases created in a RiPR using a pressure swing adsorption (PSA) system.

Key Findings:

- The project successfully increased hydrogen concentration from **30% to 70% by volume**, highlighting the potential of PSA technology for syngas purification.
- A **carbon dioxide and methane mixture** was also produced, which could be further refined using additional PSA steps or alternative separation methods.
- PSA-SPUR technology demonstrated **CO_2 capture at over approximately 95% purity**, providing an initial pathway for carbon sequestration.

Version summary

Version number	**Completion date**	**Author**	**Distributed to**	**Signed off**
2.0	25/03/2025	Michael Sims; Gareth Griffiths; Dhiya Mansing	James Milner, Connected Places Catapult	

Disclaimer

This report is for informational purposes only and is based on the best available data and methodologies at the time of publication. The findings, analyses, and conclusions reflect the results of a demonstration project conducted by Wild Hydrogen Ltd in collaboration with the University of Edinburgh and partners.

Wild Hydrogen Ltd and its partners accept no liability for any direct, indirect, or consequential losses arising from the use or interpretation of this report.

Further Information

You may reach out to the following contacts for further information about the project and proposal:

- For technical information about the demonstration, and about clear hydrogen: info@Wildhydrogen.com
- About PSA-SPUR: Hyungwoong Ahn h.ahn@ed.ac.uk

Acknowledgements

This demonstration project would not have been possible without the generous contribution from the Hydrogen Innovation Initiative. We would like to thank the Ash Gifford and Amit Mistry from Connected Places Catapult, who have supported and managed the project through the year.

We are grateful to Dr. Aleksandra Marcinek from Carbotech Gruppe for donating over 5kg of activated carbon adsorbent to Wild Hydrogen for the purpose of this demonstration. Aleksandra, was instrumental in selecting the correct adsorbent for carbon dioxide, methane and hydrogen selectivity.

Special thanks are also given to Imperial College chemical engineering student Peter Mee, who assisted in the build and design of the PSA system hosted at Wild Hydrogen as part of a summer internship program.

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Introduction

Energy security has re-emerged as a priority agenda item for world governments, due to the geopolitical impacts either side of the Atlantic influencing the supply of conventional energy sources[1]. The Hydrogen sector can play a key role in securing an energy supply for both industrial and domestic use, provided the challenges behind production, conditioning and supply are addressed at pace. Currently over 90% of hydrogen is secured from fossil fuel sources (grey/blue hydrogen), exposing the sector to volatilities in the supply of oil and gas[2]. A diverse hydrogen supply is essential for reducing risk, but the current pace of deployment remains a challenge. This slowdown hinders the transition to hydrogen as a zero-emission fuel, highlighting the need for accelerated infrastructure development, stronger policy support, and continued technological advancements to scale production and distribution effectively. For example, electrolyser hydrogen production is restricted by access to renewable electricity supply, with grid connection timings competing with electric car charging stations, and datacentres[3].

Gasification and pyrolysis technologies offer an alternative method for the production of hydrogen. Gasification plants typically operate with biomass or waste, dry material is heated to temperature above 500 °C under either oxidising or reducing conditions. The products from this method are synthesis gas (syngas), liquid hydrocarbons, ash and char. A typical gasification plant must optimise its gas yield, this is completed through hydrocarbon cracking technology, and then a syngas upgrading system (i.e. Water Gas Shift) to deliver final products – typically H_2 and Carbon Monoxide[4]. The technology in principle is mature, utilising methodology established by the coal sector. Before 1967[5] domestic gas supply was largely derived from coal gasification, supplying a hydrogen rich mixture called town gas. Town gas composition varied based on the process utilised to manufacture it. Several Town Gas compositions are outlined in Table 1.

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[1] https://assets.publishing.service.gov.uk/media/64c7e8bad8b1a70011b05e38/UK-Hydrogen-Strategy_web.pdf

[2] the-role-of-hydrogen-in-the-net-zero-energy-system.pdf – page 2

[3] Overview of electrolyser and hydrogen production power supply from industrial perspective - ScienceDirect

[4] https://www.netl.doe.gov/research/coal/energy-systems/gasification/gasifipedia/water-gas-shift?utm_source

[5] https://www.wwutilities.co.uk/media/5331/lessons-learnt-from-the-past.pdf - page 4

Biomass and waste can be exploited alongside carbon capture for low-carbon hydrogen gas supply, replicating the established town-gas model. The gas distribution network is under review for enabling up to 20% hydrogen blending[6], providing security to this opportunity.

Wild Hydrogen has developed a novel technology called a 'Rising Pressure Reformer' (GB2615574A), which enables the conversion of any type of wet biogenic or waste material into a unique syngas) comprised predominantly of hydrogen, methane and carbon dioxide. The technology uses a process called supercritical water reforming instead of gasification, producing products like those reported by Okolie, *et al.* (2019)[7]. By adding water to the process, the Rising Pressure Reformer (RiPR) produces fewer liquid hydrocarbons and upgrades the syngas *in-situ*. This reduces the processing steps required by Wild Hydrogen combining into one reactor, the following steps:

1. Gasification/pyrolysis,
2. hydrocarbon cracking,
3. and syngas upgrading

Table 1 - Town Gas compositions[8]

Non–combustible components	Producer Gas (Marischka)	Blue Water Gas	Carburetted water gas	Hall (Oil)	Coal Gas	Natural Gas
Carbon Dioxide	5.7%	5.0%	6.7%	4.1%	2.0%	0.8%
Combustible Components						
Hydrogen	10.6%	50.0%	42.7%	16.0%	51.8%	-
Carbon Monoxide	27.3%	41.0%	32.7%	2.1	7.5%	-
Methane	0.4%	0.5%	4.9%	29.3	27.0%	91.0%
Other Hydrocarbons	-	-	6.0%	4.4%	4.7%	5.5%

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[6] Hydrogen Net Zero Investment Roadmap

[7] https://pubs.rsc.org/en/content/articlepdf/2019/se/c8se00565f

[8] https://www.wwutilities.co.uk/media/5331/lessons-learnt-from-the-past.pdf - page 11

This combination provides the opportunity to reduce the size of the plant and thus its energy consumption. The syngas product from RiPR can be delivered to a gas purification system faster, forming the basis of the demonstration.

Purification of syngas products is necessary to enable the valorisation of Wild Hydrogen's syngas products. If the carbon dioxide can be removed from the gas mixture the remaining products (hydrogen and methane) would provide a valuable green energy source. If the carbon dioxide is captured and stored, the hydrogen could be classified as 'carbon negative'. Biogenic derived carbon negative hydrogen is considered by Wild Hydrogen to warrant its own colour classification as opposed to blue, green, white or turquoise hydrogen – our product is known as '**Clear Hydrogen'.** Unlike grey or blue hydrogen, which rely on natural gas and carbon capture, or green hydrogen, which depends on renewable electricity and electrolysis, Clear Hydrogen can be derived from organic waste sources using advanced gasification. This approach ensures a cleaner, more sustainable hydrogen supply while supporting circular economy principles. We have named it as such because it represents a cleaner way to produce hydrogen - prioritising carbon-negative processes that help decarbonise energy, transport, and industry.

The UK government has regarded carbon negative sources of hydrogen as having the ability to produce negative levelized costs of hydrogen (LCOH)[9], rendering the process as highly competitive with green and grey hydrogen.

A range of purification methods are available for the separation of syngas, including amines, membranes, and Pressure Swing Adsorption (PSA). Amine systems are a mature method for purification but require a high volume of chemical feedstock to drive the process and are typically energy intensive.[10] Membrane technologies such as palladium/platinum systems can deliver ultra-high purity hydrogen with low energy intensities, they are vulnerable to poisoning by trace contaminants i.e. hydrogen sulphide that can be found in syngas. PSA technology is a low energy intensity method driven by gas delivery pressure. PSA's are tuneable to different gas mixtures granting broad flexibility, however, the technology requires additional stages depending on the products and purities required. RiPR produces a high-pressure syngas stream from the reformer. Considering the benefits from the feed pressure, PSA technology was selected for the current study.

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[9] https://assets.publishing.service.gov.uk/media/611b710e8fa8f53dc994e59d/Hydrogen_Production_Costs_2021.pdf - page 30

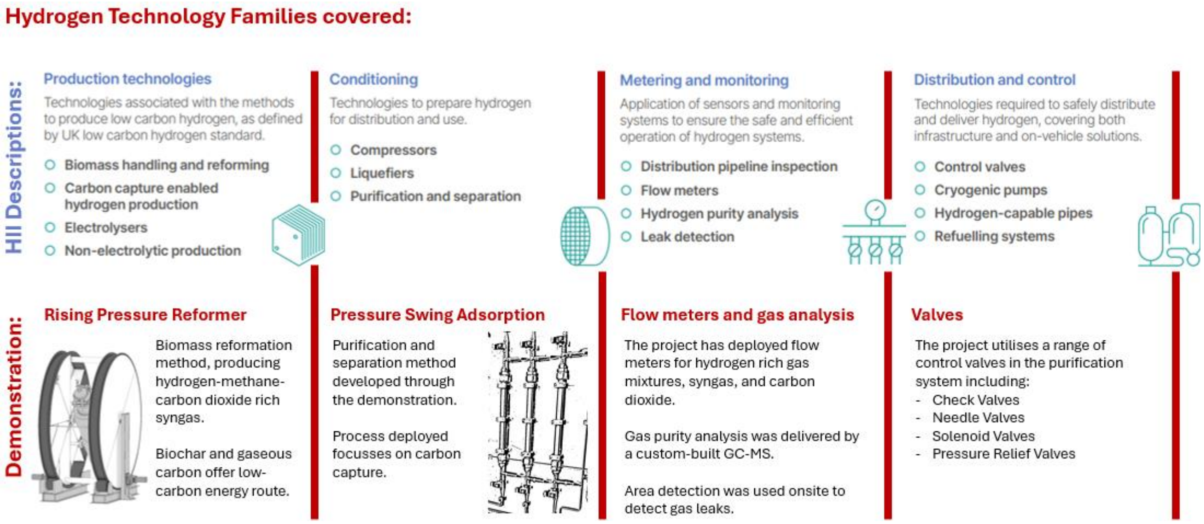
[10] https://www.eiga.eu/uploads/documents/DOC251.pdf?utm_source

The demonstration completed the following:

1. Build a PSA rig at Wild Hydrogen connected to a RiPR prototype
2. Target removal of carbon dioxide from syngas demonstrating:
    a. Carbon Capture to prove the carbon negativity of Wild Hydrogens gas products
    b. Demonstrate the potential to provide purities suitable for pipeline grades
3. Supply of hydrogen and methane mixtures as an energy resource

Project Description

Two TRL5-6 technologies were integrated as an end-to-end demonstration, proving hydrogen production from biomass with a purification step to provide energy resources. The overview of all demonstration technology sectors is shown in Figure 1, highlighting the areas where the technology discussed in this report fits.



Hydrogen Technology Families covered:

HII Descriptions:

Production technologies
Technologies associated with the methods to produce low carbon hydrogen, as defined by UK low carbon hydrogen standard.
- Biomass handling and reforming
- Carbon capture enabled hydrogen production
- Electrolysers
- Non-electrolytic production

Conditioning
Technologies to prepare hydrogen for distribution and use.
- Compressors
- Liquefiers
- Purification and separation

Metering and monitoring
Application of sensors and monitoring systems to ensure the safe and efficient operation of hydrogen systems.
- Distribution pipeline inspection
- Flow meters
- Hydrogen purity analysis
- Leak detection

Distribution and control
Technologies required to safely distribute and deliver hydrogen, covering both infrastructure and on-vehicle solutions.
- Control valves
- Cryogenic pumps
- Hydrogen-capable pipes
- Refuelling systems

Demonstration:

Rising Pressure Reformer
Biomass reformation method, producing hydrogen-methane-carbon dioxide rich syngas.

Biochar and gaseous carbon offer low-carbon energy route.

Pressure Swing Adsorption
Purification and separation method developed through the demonstration.

Process deployed focusses on carbon capture.

Flow meters and gas analysis
The project has deployed flow meters for hydrogen rich gas mixtures, syngas, and carbon dioxide.

Gas purity analysis was delivered by a custom-built GC-MS.

Area detection was used onsite to detect gas leaks.

Valves
The project utilises a range of control valves in the purification system including:
- Check Valves
- Needle Valves
- Solenoid Valves
- Pressure Relief Valves

Figure 1 - Demonstration technology families characterised against the main technologies roadmap from the Hydrogen Innovation Initiative. The core demonstration focussed on production and conditioning, with added value provided in the fields of metering, monitoring and control.[11]

Wild Hydrogen's Rising Pressure Reformer (RiPR) formed a primary component of the demonstration. The prototype Micro (Figure 2) was deployed, enabling production of live

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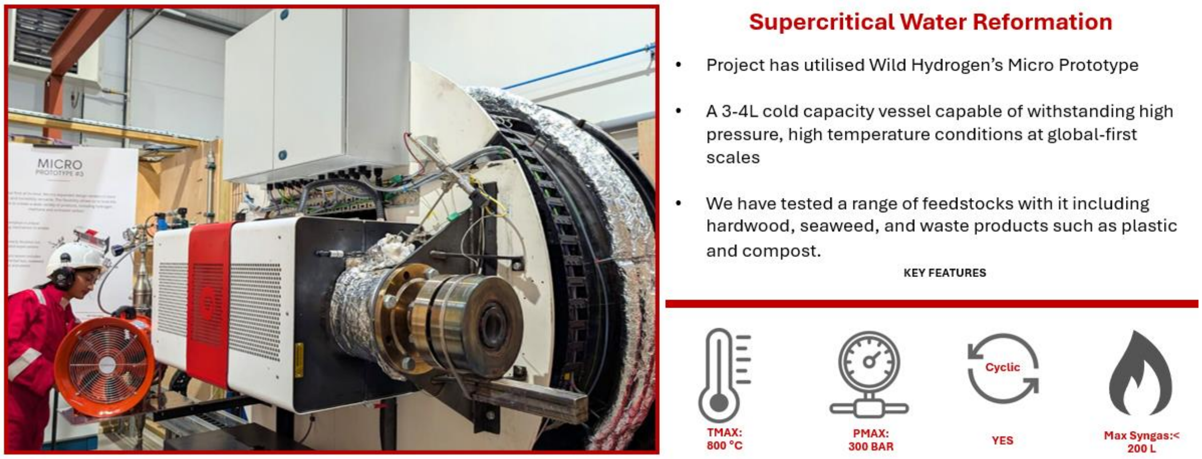
[11] https://hydrogeninnovation.co.uk/wp-content/uploads/2024/04/Hydrogen-technology-roadmaps.pdf

syngas for conditioning. The reactor is a batch mode system combined with an ‘Once Through Steam Generator’ (OTSG), and a condenser for materials recovery. The reactor system was first designed and built by Helical Energy Ltd in 2023 and was modified in 2024 by Wild Hydrogen with support from the Manufacturing Technology Centre (MTC). The technology falls under the category for non-electrolytic hydrogen production[12] as a biomass reforming system (Figure 1).



Supercritical Water Reformation

- Project has utilised Wild Hydrogen’s Micro Prototype
- A 3-4L cold capacity vessel capable of withstanding high pressure, high temperature conditions at global-first scales
- We have tested a range of feedstocks with it including hardwood, seaweed, and waste products such as plastic and compost.

KEY FEATURES

Figure 2 - Wild Hydrogen’s primary gasifier utilised for the current demonstration, “Micro” offers the opportunity to produce repeatable gas results at scale informing the kinetics and chemistry behind the core process. Gas from this prototype was supplied for the final demonstration.

The RiPR was attached to a newly built Pressure Swing Adsorption (PSA) rig, enabled by the funding provided through HII. The system was based on the design for a Korean patent (1020250012824) held by the University of Edinburgh for Process Swing Adsorption with Selective Purge Gas Recirculation (PSA-SPUR). The technology represents a ‘conditioning’ process (Figure 1), and for the current demonstration was used to remove carbon dioxide from syngas. PSA-SPUR differs from conventional systems as it recycles effluent gases back into the feed system, reducing heavy component losses and enhancing recovery[13]. The technology was initially developed for carbon capture from flue gas and has been demonstrated in the maritime sector through collaboration with the HD Korea Shipbuilding and Offshore Engineering Co[14].

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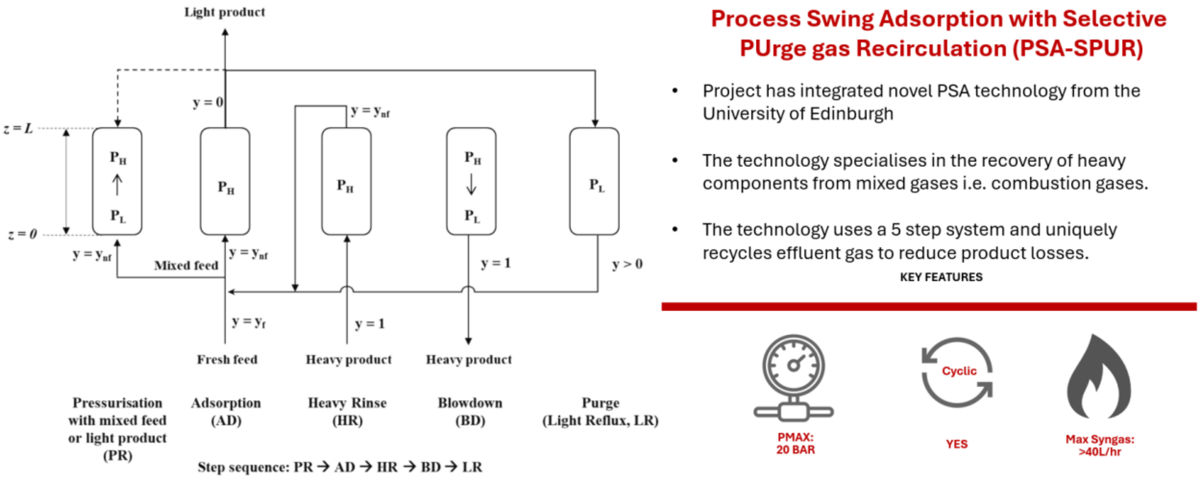
[12] https://hydrogeninnovation.co.uk/wp-content/uploads/2024/04/Hydrogen-technology-roadmaps.pdf
[13] https://www.sciencedirect.com/science/article/pii/S1383586624040954#f0005
[14] https://www.sccs.org.uk/latest/news/edinburgh-researchers-win-funding-ship-based-carbon-capture

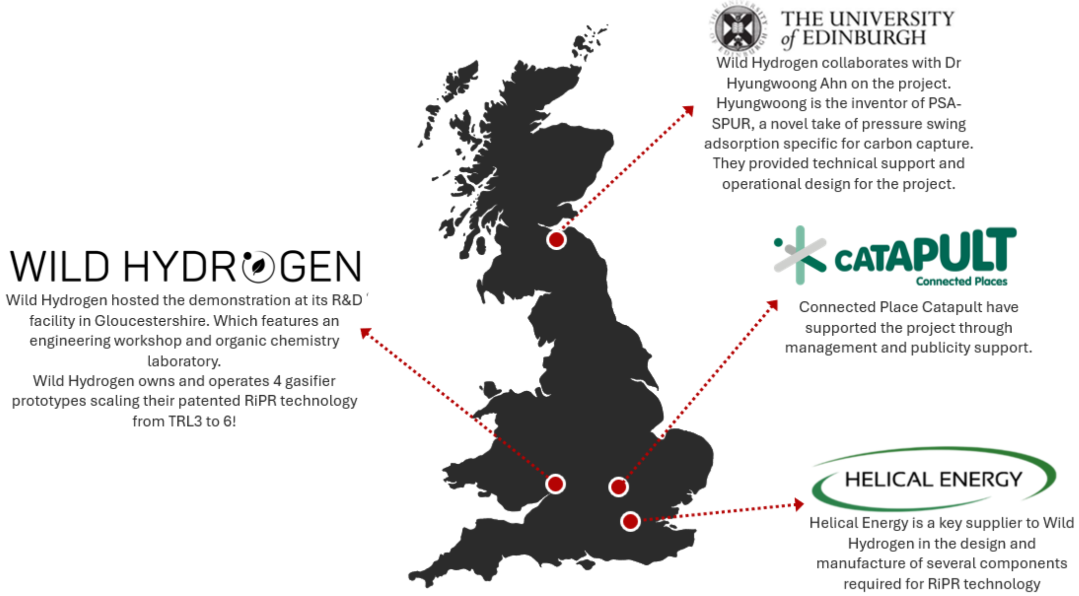


Process Swing Adsorption with Selective PUrge gas Recirculation (PSA-SPUR)

- Project has integrated novel PSA technology from the University of Edinburgh
- The technology specialises in the recovery of heavy components from mixed gases i.e. combustion gases.
- The technology uses a 5 step system and uniquely recycles effluent gas to reduce product losses.

Figure 3 - To convert syngas into carbon negative energy products Wild Hydrogen has collaborated with the University of Edinburgh to explore a novel approach to carbon capture using PSA-SPUR.

Location and partners involved



Wild Hydrogen collaborates with Dr Hyungwoong Ahn on the project. Hyungwoong is the inventor of PSA-SPUR, a novel take of pressure swing adsorption specific for carbon capture. They provided technical support and operational design for the project.

Wild Hydrogen hosted the demonstration at its R&D facility in Gloucestershire. Which features an engineering workshop and organic chemistry laboratory.

Wild Hydrogen owns and operates 4 gasifier prototypes scaling their patented RiPR technology from TRL3 to 6!

Connected Place Catapult have supported the project through management and publicity support.

Helical Energy is a key supplier to Wild Hydrogen in the design and manufacture of several components required for RiPR technology

Figure 4 - Map of the core collaboration locations.

WILD HYDROGEN

Wild Hydrogen is an innovative UK-based company specialising in producing clean hydrogen through Supercritical Water Reforming (SCWR) technology. This advanced process utilises water at extremely high pressures and temperatures to convert biomass or waste into hydrogen, offering a sustainable, low-carbon solution. By leveraging renewable feedstocks and cutting-edge technology, Wild Hydrogen aims to scale hydrogen production efficiently and cost-effectively. The company is focused on accelerating the adoption of hydrogen and bio-methane with carbon capture as a clean fuel for industries like transportation, energy storage, and manufacturing, contributing significantly to global decarbonisation efforts and the transition to a low-carbon economy.

THE UNIVERSITY of EDINBURGH

The University of Edinburgh is highly regarded, offering a wide range of undergraduate and postgraduate programs in areas like electrical, mechanical, civil, and chemical engineering. The university's School of Engineering is known for its cutting-edge research and strong industry links, ensuring that students gain both theoretical knowledge and practical experience. The Department of Chemical Engineering at Edinburgh is internationally recognized for its pioneering work in sustainable engineering, process design, and energy systems. Research areas include renewable energy, carbon capture, chemical reaction engineering, and advanced materials. The department's state-of-the-art laboratories and close collaboration with industry ensure that students receive hands-on learning and are well-prepared for careers in academia, industry, and research. With its world-class faculty and facilities, the University of Edinburgh continues to be a leader in engineering education and research, shaping the future of engineering innovation.

Figure 5 – The University of Edinburgh team

HELICAL ENERGY

Helical Energy is a world leader in combustion and gasification systems for biomass and waste fuels, specialising in fluidised bed technology. With deep expertise in advanced thermal processes, Helical Energy plays a critical role in the design and development of next-generation energy solutions. Their innovative approach enables the efficient conversion of challenging feedstocks into valuable energy and carbon capture products.

Helical Energy recently completed the design, manufacture, and installation of a 1.5 MW pilot plant at Cranfield University, delivering a breakthrough in hydrogen production with carbon capture. This innovative project utilises GTI Energy's SERCH technology to produce blue hydrogen from natural gas. When paired with biomethane, the process can even become carbon negative, offering a compelling pathway to decarbonisation. The plant integrates Helical's COTSG and CALCINER technologies, enabling high-temperature steam and natural gas mixing for efficient reforming and CO_2 separation. For further details, Cranfield University's HyPER website provides more insights into this pioneering initiative.

Helical Energy continues to lead the way in developing scalable, high-efficiency energy systems, supporting the transition to a low-carbon future through innovation, collaboration, and cutting-edge engineering.

The Connected Places Catapult is a UK-based innovation centre dedicated to advancing the development of smart cities, transport systems, and digital infrastructure. As one of the government-backed Catapults, it plays a critical role in accelerating the adoption of innovative technologies that improve the sustainability, efficiency, and connectivity of urban spaces. The centre works closely with businesses, local governments, and academic institutions to drive research and innovation in connected places, with a focus on mobility, urban infrastructure, energy systems, and the digital transformation of public services.

The Catapult fosters collaboration between private and public sector organizations to solve complex urban challenges. It brings together innovators, entrepreneurs, and government bodies to co-create solutions that address issues like congestion, air pollution, and aging infrastructure. By bridging the gap between research, technology development, and real-world applications, the Connected Places Catapult is helping to reshape cities to be more resilient, sustainable, and people-centric.

The Hydrogen Innovation Initiative (HII) is group which consists of industry, government and academia to advance the development of hydrogen technology. Their mission is to place UK technology at the forefront of the global hydrogen economy to help transform UK industry into a net zero powerhouse. HII provides collaborative research and development, bringing together key stakeholders to create innovative hydrogen technology, the support companies into bringing hydrogen products and services to market to help with the global hydrogen economy. In collaboration with the education sector, they promote awareness and understanding of hydrogen technology. With these efforts the HII aim to establish the UK as a leader in hydrogen innovation while contributing to sustainability and a swift transition to a low carbon future.[15]

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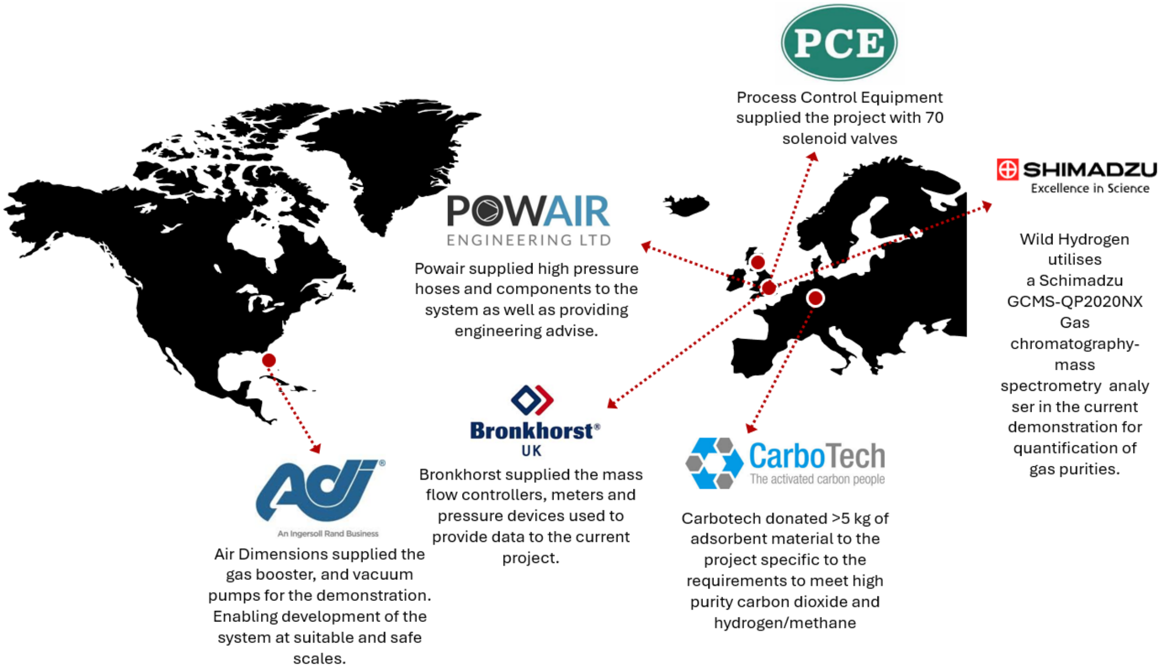
[15] https://hydrogeninnovation.co.uk/about-us/

Key Suppliers



Process Control Equipment supplied the project with 70 solenoid valves

Powair supplied high pressure hoses and components to the system as well as providing engineering advise.

Wild Hydrogen utilises a Schimadzu GCMS-QP2020NX Gas chromatography-mass spectrometry analyser in the current demonstration for quantification of gas purities.

Bronkhorst supplied the mass flow controllers, meters and pressure devices used to provide data to the current project.

Carbotech donated >5 kg of adsorbent material to the project specific to the requirements to meet high purity carbon dioxide and hydrogen/methane

Air Dimensions supplied the gas booster, and vacuum pumps for the demonstration. Enabling development of the system at suitable and safe scales.

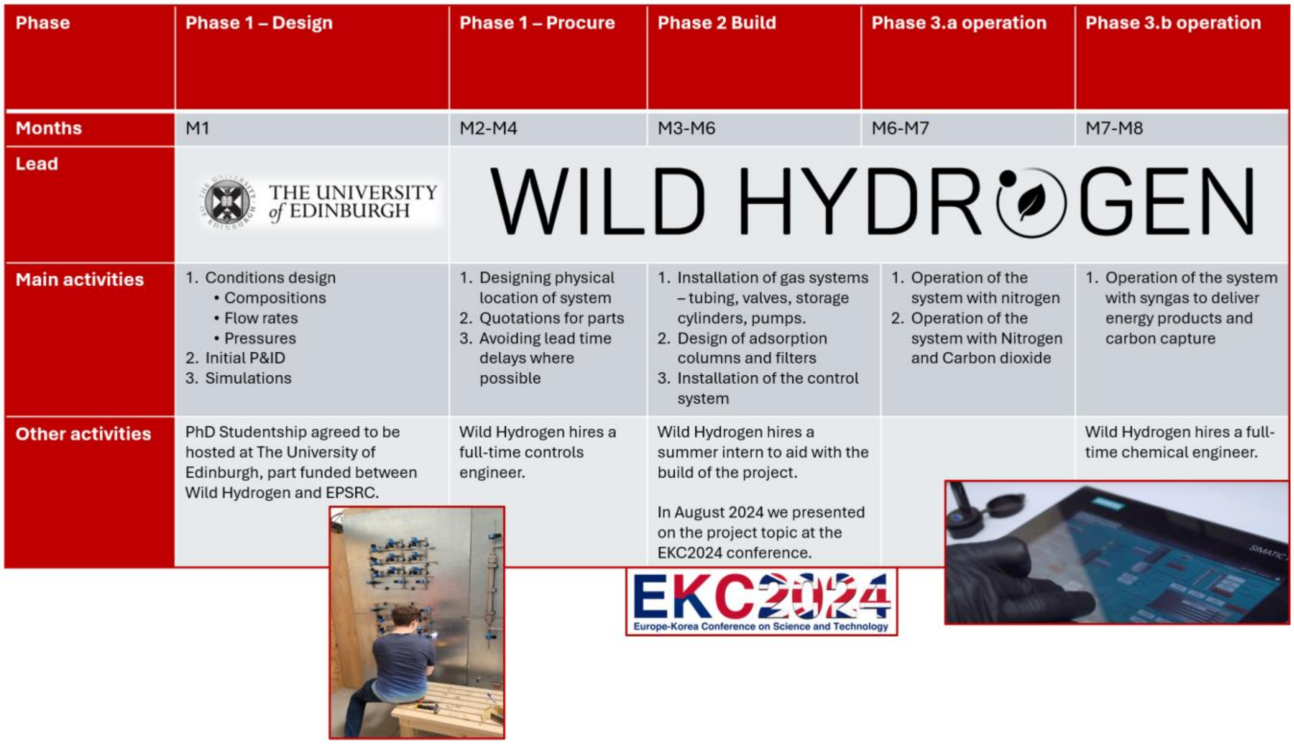
Figure 6 - Map of the supplier locations who provided specific components that have enabled the current demonstration.

- Air Dimensions - Air Dimensions is a leading provider of precision air and gas handling solutions, specializing in custom-built blowers, compressors, and pumps. The company serves various industries, including medical, industrial, and environmental sectors. Air Dimensions focuses on delivering high-performance, energy-efficient products tailored to meet specific customer needs and applications.
- CarboTech Gruppe - Carbotech is a global leader in the development and manufacturing of advanced carbon-based materials and filtration solutions. Specializing in activated carbon products, the company provides innovative solutions for air, water, and industrial purification. Carbotech focuses on sustainability, offering efficient, environmentally friendly technologies for various industries, including water treatment and environmental protection.
- Bronkhorst - Bronkhorst is a leading provider of precision flow measurement and control solutions. Specializing in instruments for gases and liquids, the company serves industries such as chemical, pharmaceutical, and energy. Bronkhorst offers advanced, reliable products for accurate flow control, contributing to efficiency and innovation in various industrial processes worldwide.
- Powair Engineering Ltd – are a multidisciplinary engineering firm specialising in the design, supply, installation and servicing of Vacuum, Low, Medium and High

Pressure Compressed Air and Gas systems and controls. They are based in Gloucestershire, close to the demonstration site.

- PCE – Process Control Equipment (PCE) is a family-run, independent stockist of valves, actuators, instrumentation, and automation packages based in North-East England.
- Shimadzu - Shimadzu is a leading global provider of advanced analytical instruments and scientific solutions. Specializing in areas such as chromatography, spectroscopy, and mass spectrometry, the company supports industries like healthcare, environmental monitoring, and pharmaceuticals. Shimadzu's innovative technologies enable precise, reliable testing and measurement for research, development, and quality control applications.

Timeline of the demonstration



Phase	Phase 1 – Design	Phase 1 – Procure	Phase 2 Build	Phase 3.a operation	Phase 3.b operation
Months	M1	M2-M4	M3-M6	M6-M7	M7-M8
Lead	THE UNIVERSITY of EDINBURGH	WILD HYDROGEN			
Main activities	1. Conditions design • Compositions • Flow rates • Pressures 2. Initial P&ID 3. Simulations	1. Designing physical location of system 2. Quotations for parts 3. Avoiding lead time delays where possible	1. Installation of gas systems – tubing, valves, storage cylinders, pumps. 2. Design of adsorption columns and filters 3. Installation of the control system	1. Operation of the system with nitrogen 2. Operation of the system with Nitrogen and Carbon dioxide	1. Operation of the system with syngas to deliver energy products and carbon capture
Other activities	PhD Studentship agreed to be hosted at The University of Edinburgh, part funded between Wild Hydrogen and EPSRC.	Wild Hydrogen hires a full-time controls engineer.	Wild Hydrogen hires a summer intern to aid with the build of the project. In August 2024 we presented on the project topic at the EKC2024 conference.		Wild Hydrogen hires a full-time chemical engineer.

Figure 7 – Timeline of the 8 project months given to the current demonstration, and activities undertaken by Wild Hydrogen in support of the project.

Demonstration Activity

The demonstration activity connected the Micro Rising Pressure Reformer (RiPR) reactor system to a Pressure Swing Adsorption rig, capable of following the Pressure Swing Adsorption with Selective Purge Gas Recirculation method provided from the University of Edinburgh. The total process flow is illustrated in Figure 8, highlighting the individual steps that Wild Hydrogen built into the demonstration.

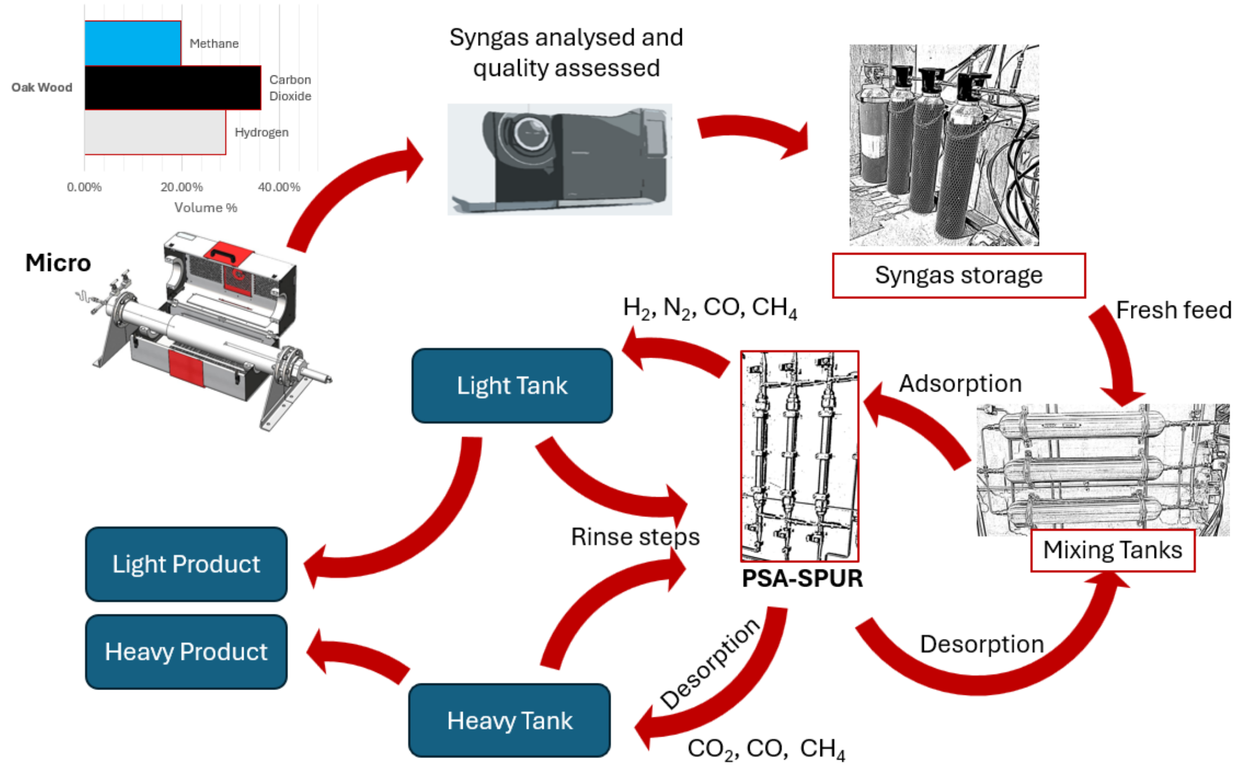


Figure 8 - Process flow illustration for the syngas distribution and purification steps used by the project.

Equipment

Micro

Micro was operated in a closed system, batch mode. Feedstock was mechanically loaded into the reactor alongside water. This was heated to the setpoint temperature, once the pressure of the reactor had achieved a minimum of 221 barG then the batch was held for a residence time to ensure conversion to controlled products. Gaseous products may be tuned by the reactor temperature to favour certain products. Okolie, *et al* (2019)[7] proposes that below 500 °C the syngas will favour methane, while higher temperatures favour hydrogen and carbon dioxide production. Wild Hydrogen operated this demonstration with a mean syngas composition of 30% hydrogen, 30% carbon dioxide and up to 25% methane. Carbon monoxide was also present in the gas stream.

Nitrogen was used as a purge gas and is present in the final gas stream as a trace component.

Prior to analysis or purification, gases were first cooled in a condenser removing process water. This effluent can be collected, analysed and purified, providing an understanding of the co-products and demonstrating re-use of process materials. Gas product then passed a mass flow meter to understand the volume of syngas produced.

For the demonstration, hardwood pellets were used. These were selected as they provide a standard composition from which to baseline results against. Wood is often utilised by gasification, and pyrolysis processes as a base case for their process. By using biogenic derived material we can confirm the carbon we capture is contributing to atmospheric carbon sequestration.

Gas Analysis

Gas analysis followed the flow in Figure 9. Gas for analysis from Micro or the PSA were distributed via a multiplex gas sampling panel, developed in-house enabling fine control of the gas pressure and sample purity. All gases for the current demonstration were spot sampled, using either a gas tight luer syringe or sampling bags.

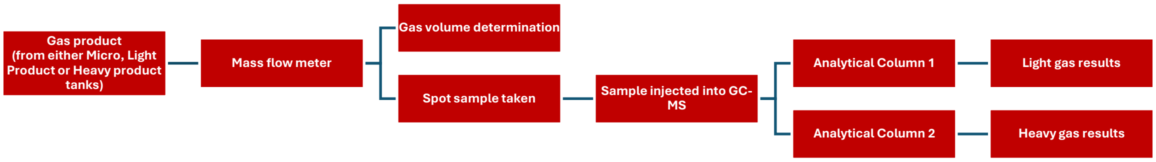


Figure 9 - Gas analysis method

Gas analysis was completed using a Shimadzu GCMS-QP2020 NX modified with a Valco multi-port gas injector. The system enables a single gas sample to be split into two aliquots utilising two separate GC columns. One aliquot represents the light components: hydrogen, oxygen, nitrogen and methane. A second aliquot of carbon monoxide, carbon dioxide and hydrocarbon gases are supplied through column 2.

Gas components were identified using Shimadzu's gas analysis software, GCMSsolution[16] The Mass Spectrometer was run in Selected Ion Monitoring mode for quantification of gas species. Quantification was taken against peak height, calibrated against Restek gas standards, and 'premier grade' gases supplied from Air Products.

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[16] GCMSsolution : SHIMADZU (Shimadzu Corporation)

PSA-SPUR

The PSA rig at Wild Hydrogen was built to accommodate the PSA-SPUR methodology in Dr Hyungwoong Ahn's Korean patent. PSA-SPUR operates as a 5 step sequence, illustrated in Figure 3. The individual steps as designed for flue gas separation are described in detail by Chen and Ahn (2025)[13], and these have been modified for the demonstration project to handle the specific gas mixture.

A key modification was the use of activated carbons, instead of zeolites. Activated carbon was selected as it offers suitable recovery of carbon-based molecules in pressurised gases (Figure 11), making it ideal to handle the pressurised syngas feed from the Rising Pressure Reformer. Activated carbons prior to use were regenerated at 150 °C overnight in a laboratory furnace, the columns were packed as a fixed bed configuration and purged with pure nitrogen before every new operational cycle.

Figure 10 - Picture of Shimadzu GC-MS showing the Lead Chemist servicing the GC columns. The silver loop is a guard column to filter out gases harmful to the separation columns. The yellow and orange loops to the back of the oven are the GC separation columns providing light and heavy components.

The PSA system operated as a PSA-SPUR design 5-step sequence as shown in Figure 3 and Figure 8, as follows[7]:

- **Feed –** Syngas is fed from the mixed tank through a forward pressure regulator and into the adsorption column. Effluent gases from the top of the column are recovered through passive flow into a light product tank. The gases breakthrough the column in order of increasing adsorption amounts shown in Figure 11, with hydrogen eluting first. Excess gas from the step is flowed through a mass flow meter, and either sampled for gas analysis or removed from the system – this represents the supply of light product.
- **Heavy rinse –** Heavy gases stored in the heavy product tank are circulated through the column, displacing light products adsorbed on the activated carbon. The effluent from this step flows back to the mixed tank for re-use on the next sequence cycle.

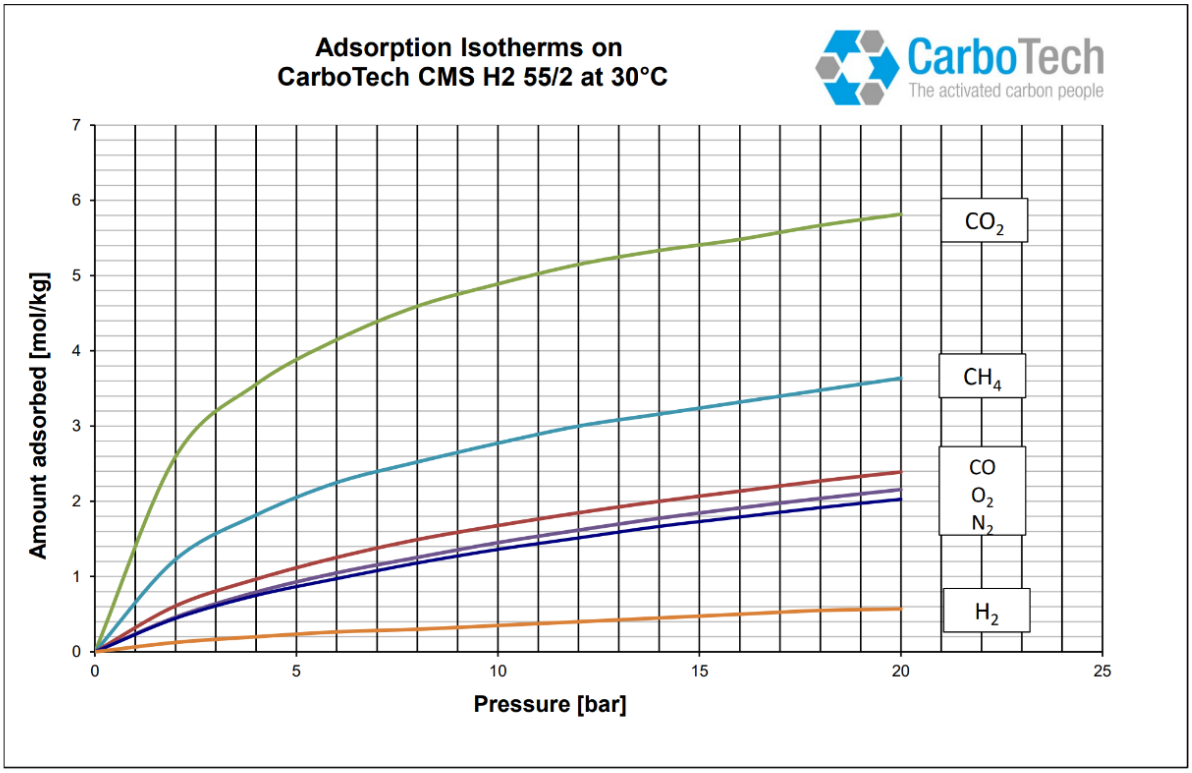

Figure 11 - Carbotech Gruppe's adsorption isotherm data for the activated carbons used in the current study. Different adsorbent materials can be used with the technology and are selected based on the desired end products.[17]

- **Blowdown –** A vacuum pump is used to drain the column to the desorption pressure required to remove carbon dioxide from the adsorbent. The initial product from this step is stored in the heavy product tank, and is re-used for the heavy rinse step on the following sequence cycle. The rest of the heavy product passes a mass flow meter and is sent for analysis or removed from the system, representing the provision of carbon capture.
- **Light Rinse –** Gases stored in the light product tank are flowed through the column to regenerate it, returning it to a condition to enable carbon dioxide adsorption.
- **Pressurisation –** Mixed feed gases or light product tank gases are used to return the column to adsorption pressures. Once completed, the feed step then begins, starting a new cycle.

During operation of the PSA system two key variable parameters were altered to improve the performance of the system. Firstly, the step time for the feed could be changed to

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[17] CarboTech AC GmbH, *Adsorption isotherms on CarboTech CMS H2 55/2 at 30°C*, Internal documentation, Unpublished.

enable different products to break through the column. Secondly, the rate of flow through the column could be varied, speeding the gas mixture and reducing the ability for certain components to be adsorbed.

Health and Safety

Wild Hydrogen has a strong health and safety culture having recently successfully registered as an ISO45001 business. The company employs a health and safety officer who engaged early in the project to identify and mitigate any potential risks. The officer identified that several team members required additional training on gas safety and this was actioned as part of the preparation to deliver the HII project. The delivery team also undertook a Risk Assessment for the build and commissioning of the prototype PSA to ensure safe working practices were followed throughout. Build of the PSA requires several hundred compression fittings to be assembled, this comes with a higher risk of leaks if there is an error in the pipe work. To ensure a safe working environment, additional LEL gas safety monitors were installed at the Wild Hydrogen site where the PSA was operated.

Results and Analysis

The demonstration successfully operated sequences of both syngas production, and gas purification onsite. The PSA system was operated solely within an allowable tolerance of gas composition, to reduce the impact of feed compositional variability on the final purities – the allowable composition was 30% hydrogen, 30% carbon dioxide, 25% methane, 10% carbon monoxide, and 5% nitrogen.

The newly built PSA-SPUR system was able to operate successfully for over 100 uninterrupted continuous operating hours for the control system's latest syngas processing cycle methodology, with additional days of operation evidenced during its commissioning and through other cycle variations. The adsorbent was not degraded during the PSA cycles due to the few impurities in the system. For the demonstration a single column PSA was demonstrated, better matching the volume and flow rates of gas supply from the RiPR prototype used, 3 columns were built to enable future research work as the volumes of gas produced is scaled up.

The PSA was able to evidence a range of purification capabilities, which will be researched further. Due to the complexity of the syngas mixture, separation to pure gases (>99.9%) was not realised during the project timeline and may be addressed through further funded projects. Further research areas may include differing absorption conditions as operation took place at ambient temperatures. During the current demonstration, the collaboration was able to focus on the following cases:

High CO2 purity case

To meet the project goals the demonstration focussed on the original design specification of PSA-SPUR; to efficiently enhance the capture of carbon dioxide from mixed gases. Across 9 samples, taken over a 24-hour operational period targeting high carbon dioxide purity, the project was able to achieve consistent purities of over 95% as shown in Figure 12.

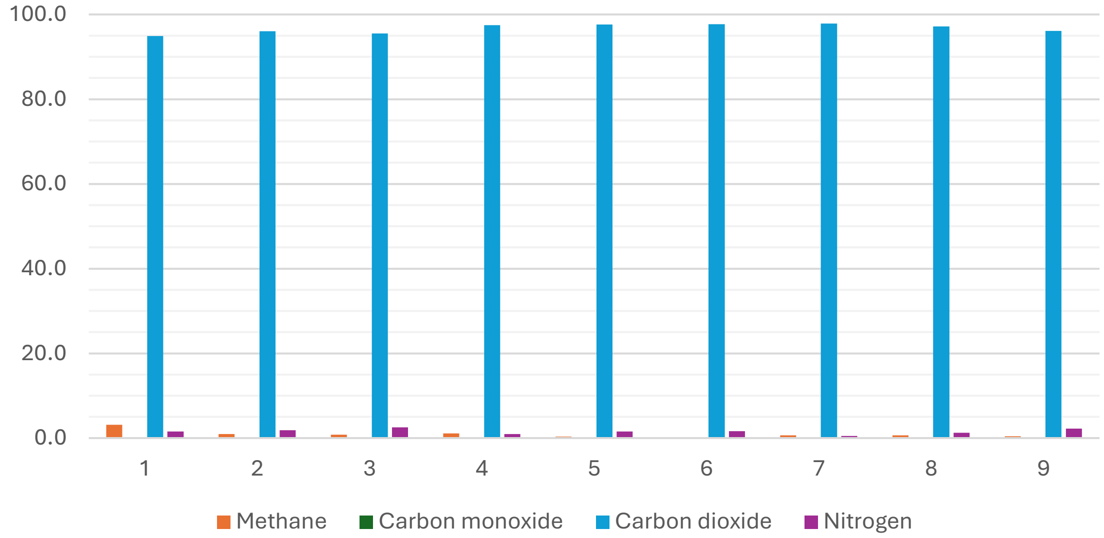
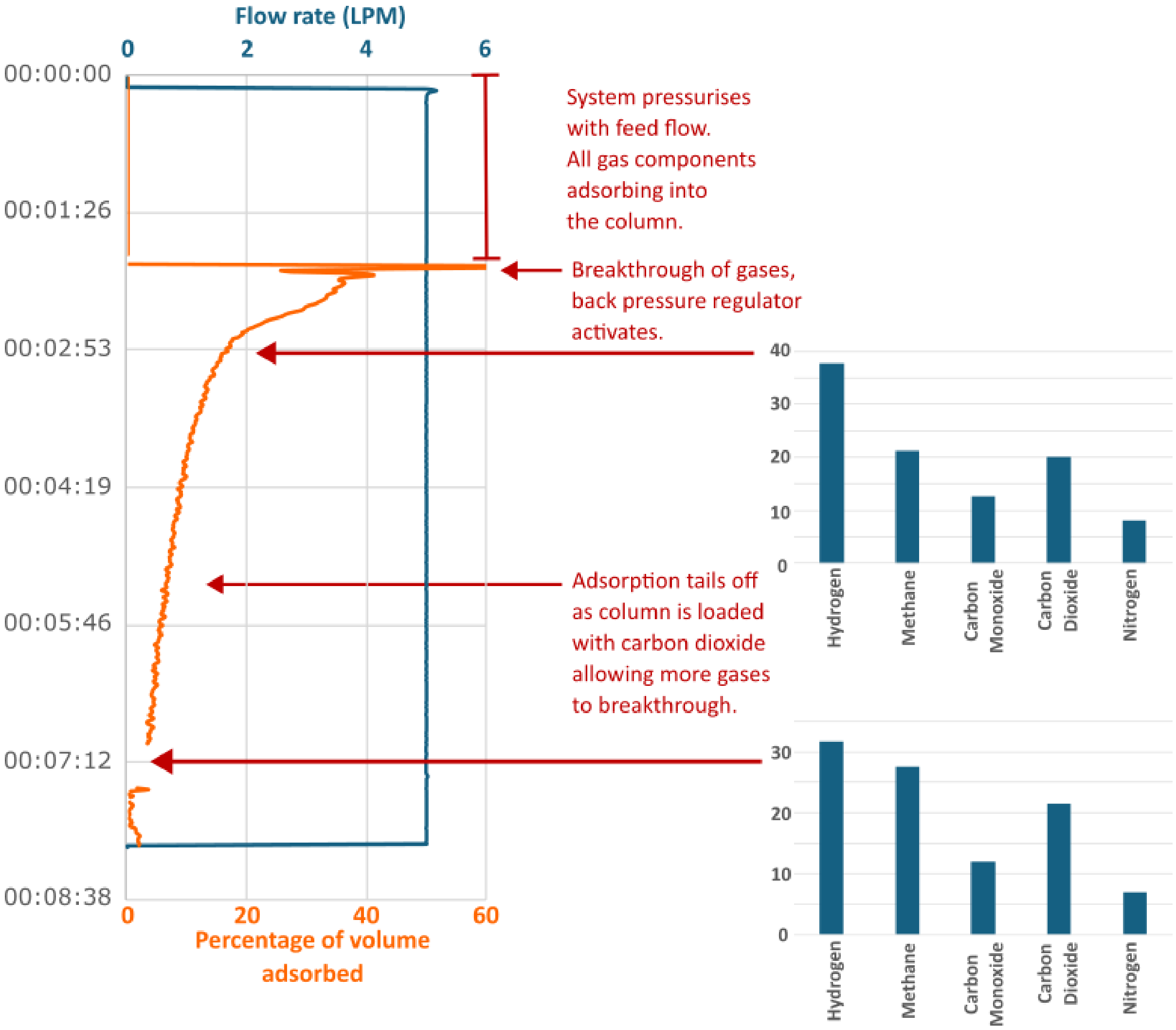


Figure 12 – Gas compositions determined through GC-MS analysis from the heavy product tank showing consistent >95% purity in the carbon dioxide. A total of nine spot samples were taken over a 24 hour period from this storage tank showing good repeatability in the results. Hydrogen is not included as it was in concentrations too low to measure.

To achieve this the column feed rate was adjusted to a high volume between 7 and 3 LPM. Figure 13 demonstrates an example of the feed flow during this step in which a total of 39.8 L of gas was flowed, a reduction of 8.44 L was seen at the outlet when accounting for gas retained in the light product tank, indicating a capture of 21% of the feed gases. As expected from the adsorption isotherms, the majority of adsorption occurred early in the step (Figure 13), where methane and carbon monoxide were also co-adsorbed. The combined increased flow rate and time for the step allowed for carbon dioxide to displace these molecules from thee adsorbent surface, causing the adsorption rate to tail off. Light products that break through are indicated in Figure 12Figure 13, early in the step hydrogen was the main component, while towards the end of the step methane became a greater component.



System pressurises with feed flow. All gas components adsorbing into the column.

Breakthrough of gases, back pressure regulator activates.

Adsorption tails off as column is loaded with carbon dioxide allowing more gases to breakthrough.

Figure 13 – Time log of the feed step comparing the flow rate of mixed tank feed gas to the percentage of gases 'adsorbed', determined as the difference between the feed flow in versus the product released out. The composition of the 'light product' gases released is indicated on the graph at the approximate spot sampling times during the step.

Recovery of the heavy product occurred during the blowdown phase, in which the PSA columns were brought to a vacuum. Prior to this step, the column was preconditioned with carbon dioxide from the heavy product tank to displace residual methane and carbon monoxide from the adsorbent and gas phases present. The heavy rinse step enables carbon dioxide purities of up to 97-98% to be obtained during blowdown. During the blowdown step, the flow of gases was controlled by a vacuum pump and compressor. The aim of the latter device is to repressurise some of the CO2 product to be used in the following cycles heavy rinse step. Figure 14 shows the heavy product flow during the phase, with 83 % of the product being recycled back into the PSA sequence with the remaining stored as CO_2 Product.

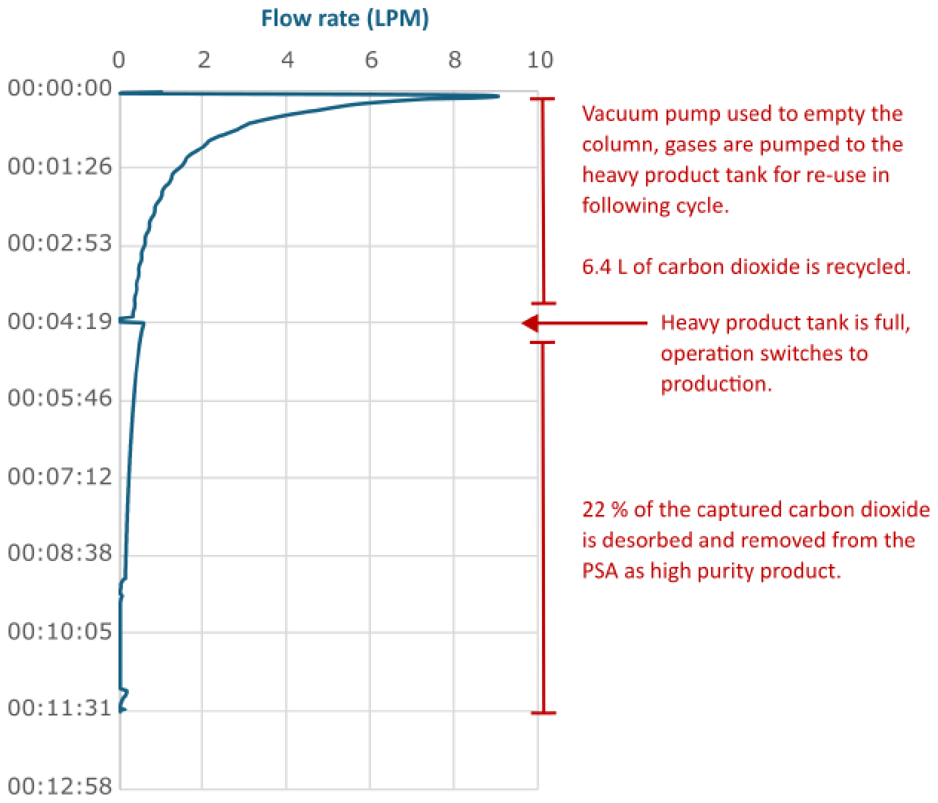


Figure 14 – Time log of mass flow during the blowdown step showing the movement of heavy product from the PSA column to either the heavy product tank or out of the system.

The case presented here targeted a high purity of carbon dioxide. The sequence flowed up to of 16 L of carbon dioxide per cycle through the system, the large volume of the gas ensured a high recovery of light products by displacing adsorbed methane with carbon dioxide. Due to the flow rates exceeding the breakthrough conditions for carbon dioxide, the light product stream contained 5-6 L of carbon dioxide representing approximately 35% of the 16 L fed in (Figure 15). Of the Carbon Dioxide fed into the system as mixed feed, approximately 50% was recovered during the entirety of the blowdown step, with 41% being recycled for the following Heavy Rinse and the remaining 9% being removed from the system. Approximately 1.6L of carbon dioxide remained unaccounted for through the balance of feed to products, making up the percentage losses reported in Figure 15.

When evaluating the recovery based on the fresh syngas fed to the system, a recovery of 24% is reached. This is based on the CO2 produced by the blowdown step which is not recycled into the system, with 1.3L of CO2 being obtained as Heavy Product compared to 5.4L contained in the fresh feed.

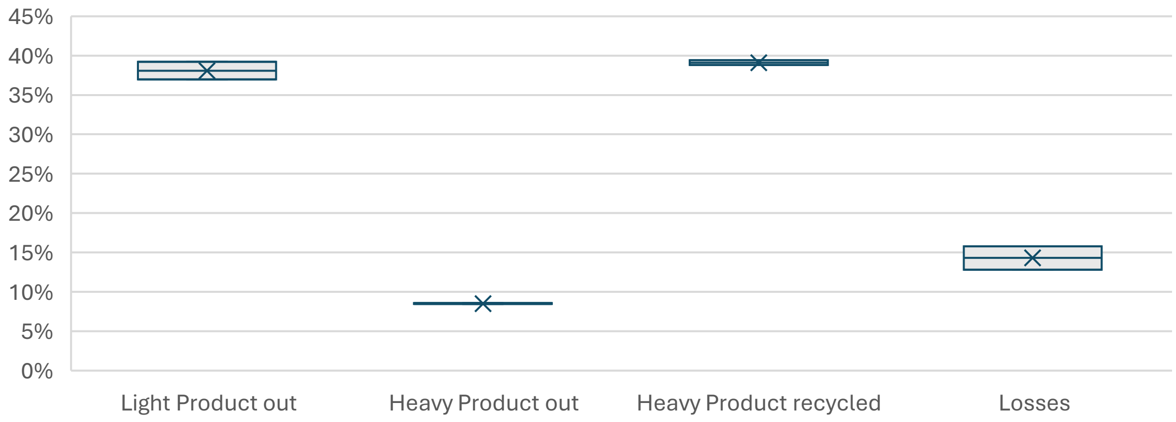


Figure 15 – Box diagram of the percentage carbon dioxide recovered through the product and purge gas streams in comparison to the 16L of carbon dioxide fed into the PSA column.

Improved carbon dioxide recovery case

To investigate enhancing the recovery of carbon from the syngas, the sequence was modified with the aim of reducing the carbon dioxide in the light product stream. The feed flow rate was reduced from 5 to 3 LPM (Figure 16) with the aim being to provide less time for carbon dioxide to breakthrough the column. The feed step flowed a total of 24.3 L of mixed feed into the PSA column, containing approximately 9.7 L of carbon dioxide. Based on a final composition of 14%$_{volume}$ carbon dioxide in the light product tank (Figure 17), the carbon dioxide in the light product was reduced by 4.2 L per cycle in comparison to the data presented in Figure 13. Additionally, during this instance hydrogen purities achieved over 40% in the initial light product gas stream, marking an improvement in the quality of the energy gases supplied from the system over those in Figure 13.

The blowdown step in this cycle behaved very similar to the earlier case as shown in Figure 14. The adjustments to the system meant that maximum pressure was achieved in the heavy product tank 43 seconds sooner than with the earlier case shown in Figure 13. This enabled 1.7L of heavy products to be supplied from the PSA, with 5.9 L of gas recycled for use in the next cycle's heavy rinse step. The composition of the heavy product however had a significant reduction in quality, with 5%$_{volume}$ methane and 2%$_{volume}$ nitrogen diluting the carbon dioxide to 92%$_{volume}$.

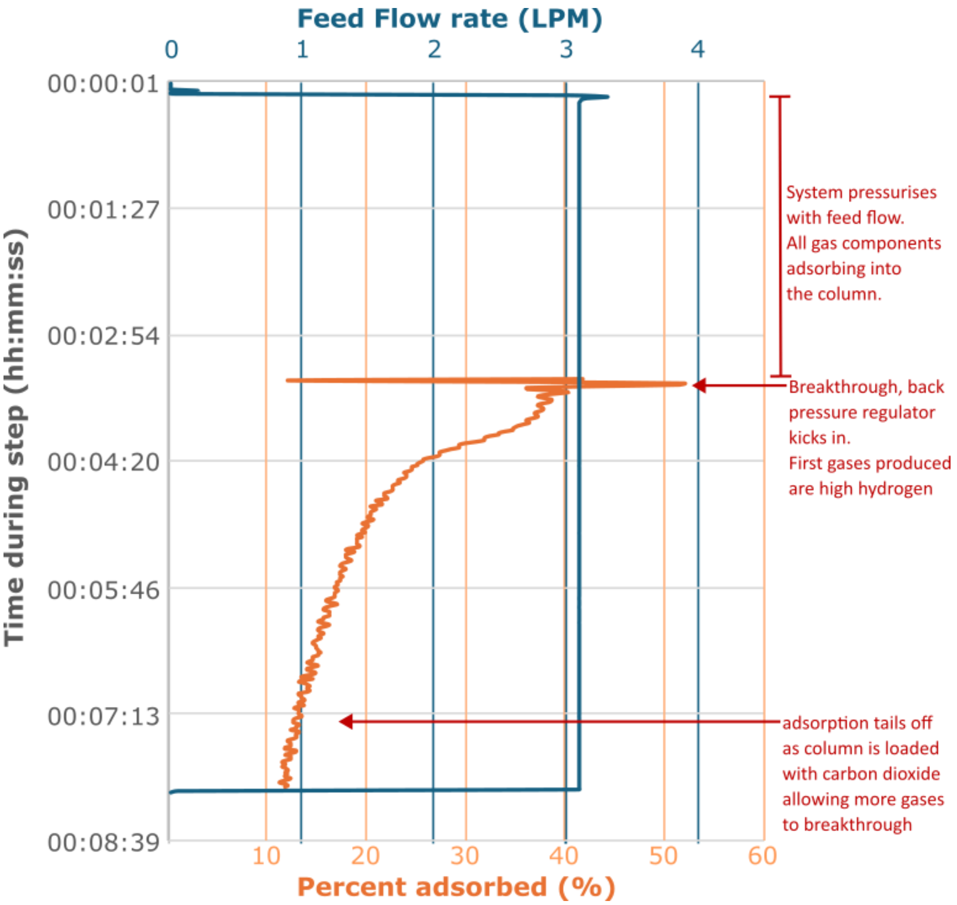


Figure 16 – Box diagram of the carbon dioxide recovered through the product and purge gas streams in comparison to the 16L of carbon dioxide fed into the PSA column.

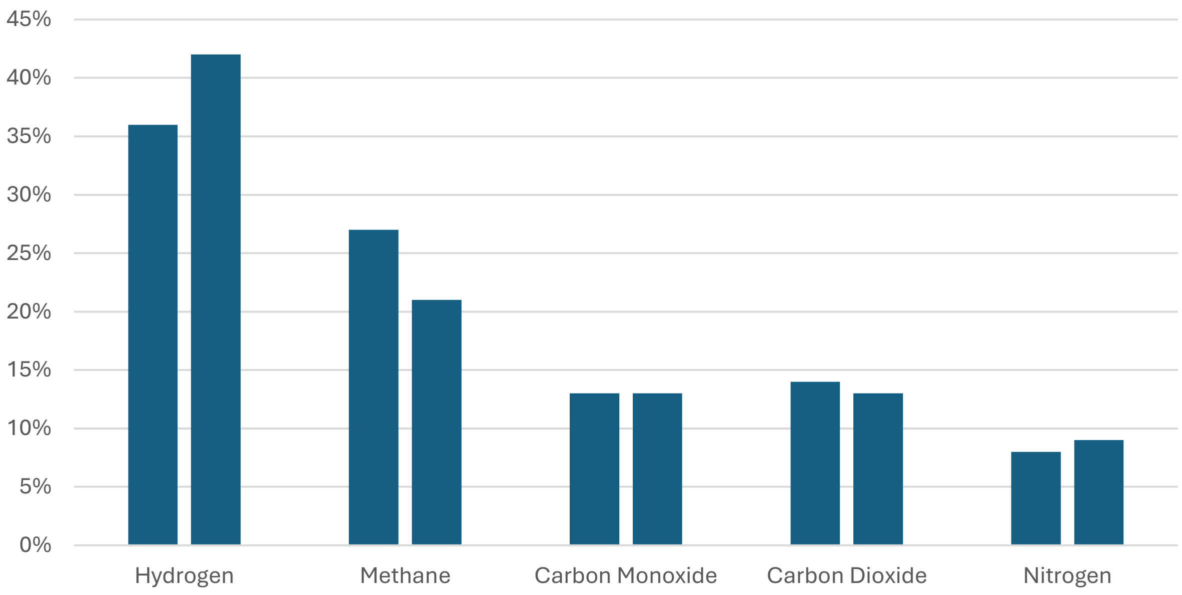


Figure 17 – Composition of the light product tank across two spot samples taken during the feed step, while targeting high carbon dioxide recovery.

The modified cycle proved that the carbon dioxide recovery may be enhanced. Figure 18 shows the improvements in terms of the percentage of carbon dioxide recovered from the feed through the different gas streams. The cycle reduced the percentage of carbon dioxide in the light product stream from almost 40% (Figure 15) to 20.8 % (Figure 18). The blowdown step recovered 55.7 % of the carbon dioxide in the feed to the heavy product tank and enabled 14.8 % to leave the system as product, equating to 1.44 L of carbon dioxide, mixed with 0.13 L of methane. The unaccounted-for carbon dioxide in the system was also reduced to less than 10%.

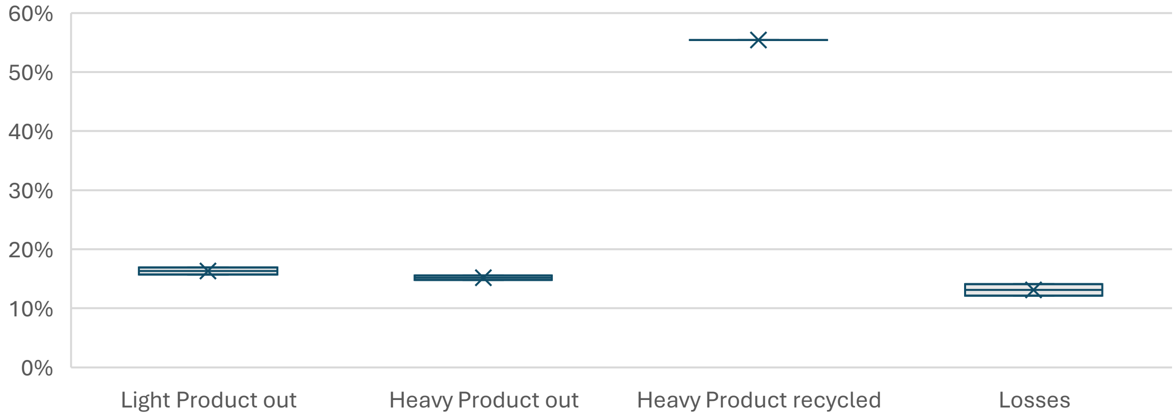


Figure 18 – Box diagram of the percentage carbon dioxide recovered through the product and purge gas streams from the improved recovery case.

This change in process configuration yielded performance benefits when considering the recovery of carbon dioxide from the fresh syngas. With the reduced feed flowrate, 2.5L of CO2 were fed into the system of which 1.44L were recovered, yielding an overall CO2 recovery of 57%, more than doubling the value from the previous case.

Improved hydrogen purity case

During the process of modifying the recommendations of Chen and Ahn (2025)[13] to meet the requirements posed by Wild Hydrogen's syngas, a higher hydrogen purity case was achieved. The process presented a lower mixed feed flow rate of 1-2 LPM, focussing on maximising the residence time of gases in the PSA column. This led to greater adsorption of carbon dioxide, methane and carbon monoxide onto the activated carbon.

The gas stream from the light product tank (Figure 19), was found to contain up to 70 $\%_{volume}$ hydrogen, mixed with 14-17 $\%_{volume}$ carbon monoxide and nitrogen. Methane was present as a trace component. The methodology yielded only 6.8 L of light product, in comparison to the 15.4 L of mixed gas fed into the system.

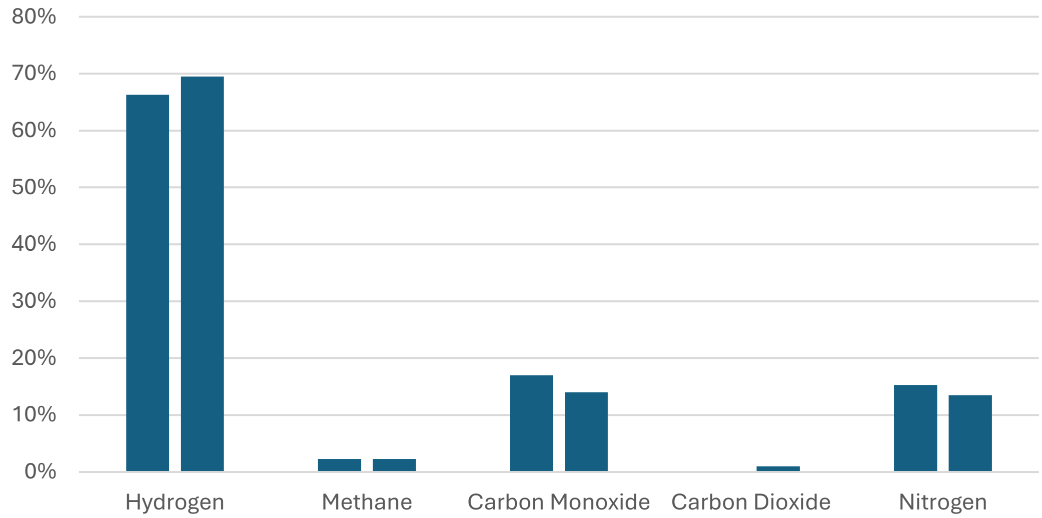
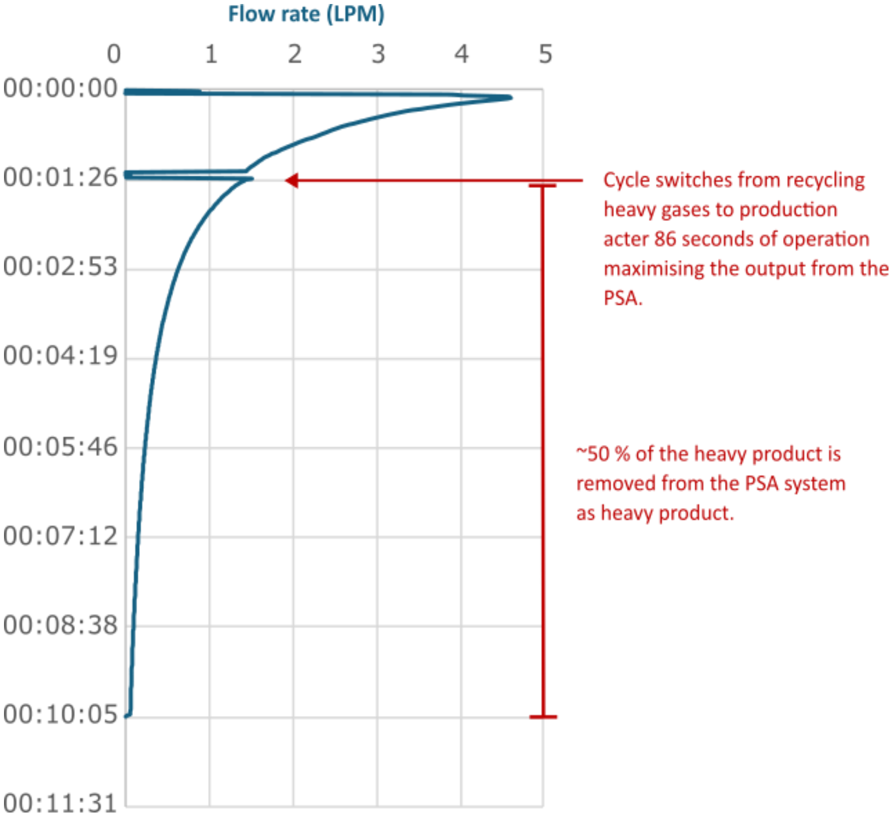


Figure 19 – Composition of the light product tank across two spot samples taken during the feed step, while targeting higher hydrogen purity



Cycle switches from recycling heavy gases to production acter 86 seconds of operation maximising the output from the PSA.

~50 % of the heavy product is removed from the PSA system as heavy product.

Figure 20 – A time log of mass flow out the vacuum pump during the blowdown step completed during the example case for a higher hydrogen purity. Graph demonstrates the faster switch from recycling heavy product which enables more heavy product gases to be yielded out of the PSA.

During the blowdown step approximately 6.2 L of heavy gases were removed from the PSA columns. In comparison to the other cases presented earlier in the report, the cycle achieved maximum pressure in the heavy product tank sooner, this is due to a lower flow of heavy product during the heavy rinse step. Figure 20 shows that the system would switch to a heavy gas production mode much quicker, enabling 2.7 L of heavy product to be removed from the system. The heavy product gas stream was comprised of a mixture of carbon dioxide and methane (Figure 19), which were strongly adsorbing in the column.

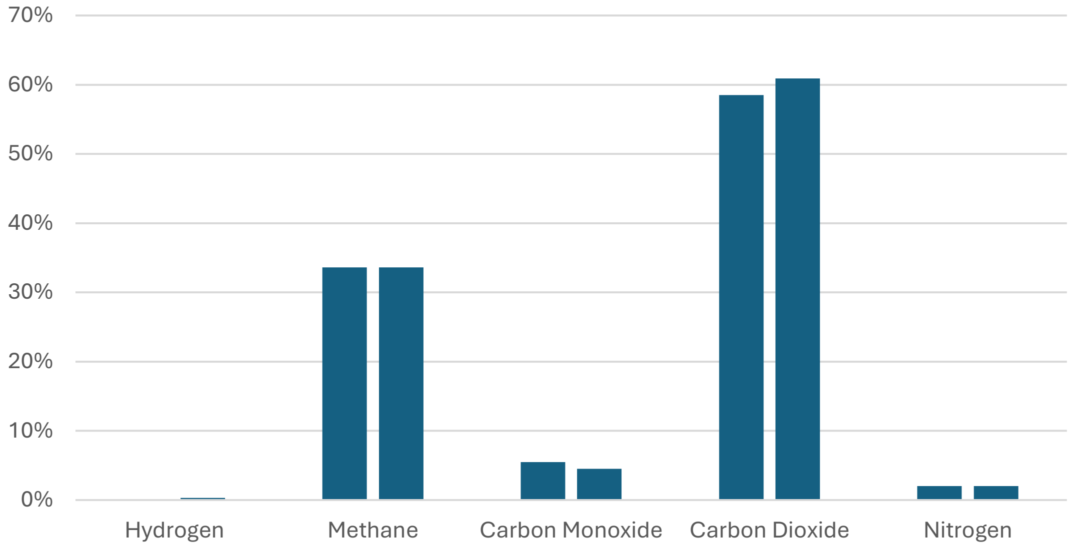


Figure 21 – Composition of the Heavy product tank across spot samples during the blowdown step, while targeting higher hydrogen purity.

Surprisingly the sequence had the best recovery of carbon dioxide, as there was no carbon dioxide lost through the light product gas stream. Over 80% of the carbon dioxide in the mixed feed to the column was recovered (Figure 21), of which approximately 50% of that was supplied as heavy product gases, with the remainder being recycled. A greater portion of the carbon dioxide that entered the system was unaccounted for, likely remaining adsorbed in the column.

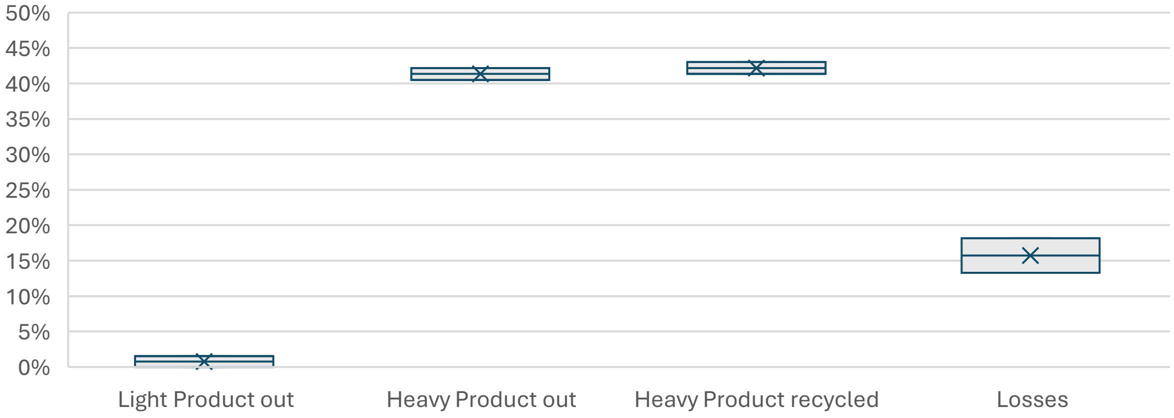


Figure 22 – Box diagram of the percentage carbon dioxide recovered through the product and purge gas streams from the improved recovery case.

Project impact

The data presented in this report represents the first attempt to use the novel Process Swing Adsorption with Selective Purge Gas Recirculation (PSA-SPUR) with syngas mixtures. It is also the first evidence of a gas purification process connected to a Rising Pressure Reformer, processing the unique syngas product. The step towards combined carbon capture with hydrogen production demonstrates that 'Clear Hydrogen' is a realistic goal.

The results in the current study propose three core modes of operation targeting either gas purity or recovery. At the time of writing, no standard grade for delivering pure carbon dioxide has been fixed through regulatory frameworks and thus currently it is up to carbon dioxide transport operators to define their requirements. The literature suggests that >95% pure carbon dioxide is acceptable[18], a grade met in high carbon dioxide purity case (Figure 11).

Directly comparing the three scenarios, Figure 23 characterises the main performance indices for the three scenarios. The project was able to achieve high purity carbon dioxide at the expense of the purity of hydrogen, the method also caused a reduction in the recovery of carbon dioxide. Based on a 30 kg/h hydrogen production plant and the data presented in the report, the high CO2 purity method would be able to capture approximately 1.3 tonnes/h of pipeline grade carbon dioxide. However, a significant portion of the carbon dioxide would remain in the light product stream requiring further purification. The cases targeting recovery and high hydrogen purity offer more ideal options, enabling a more significant portion of the gas stream to be supplied as product. In the 30 Kg/h hydrogen production case, this could amount to 2-6 tonnes per hour of carbon dioxide being provided to an additional purification step.

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[18] NPL REPORT CSSC 0001

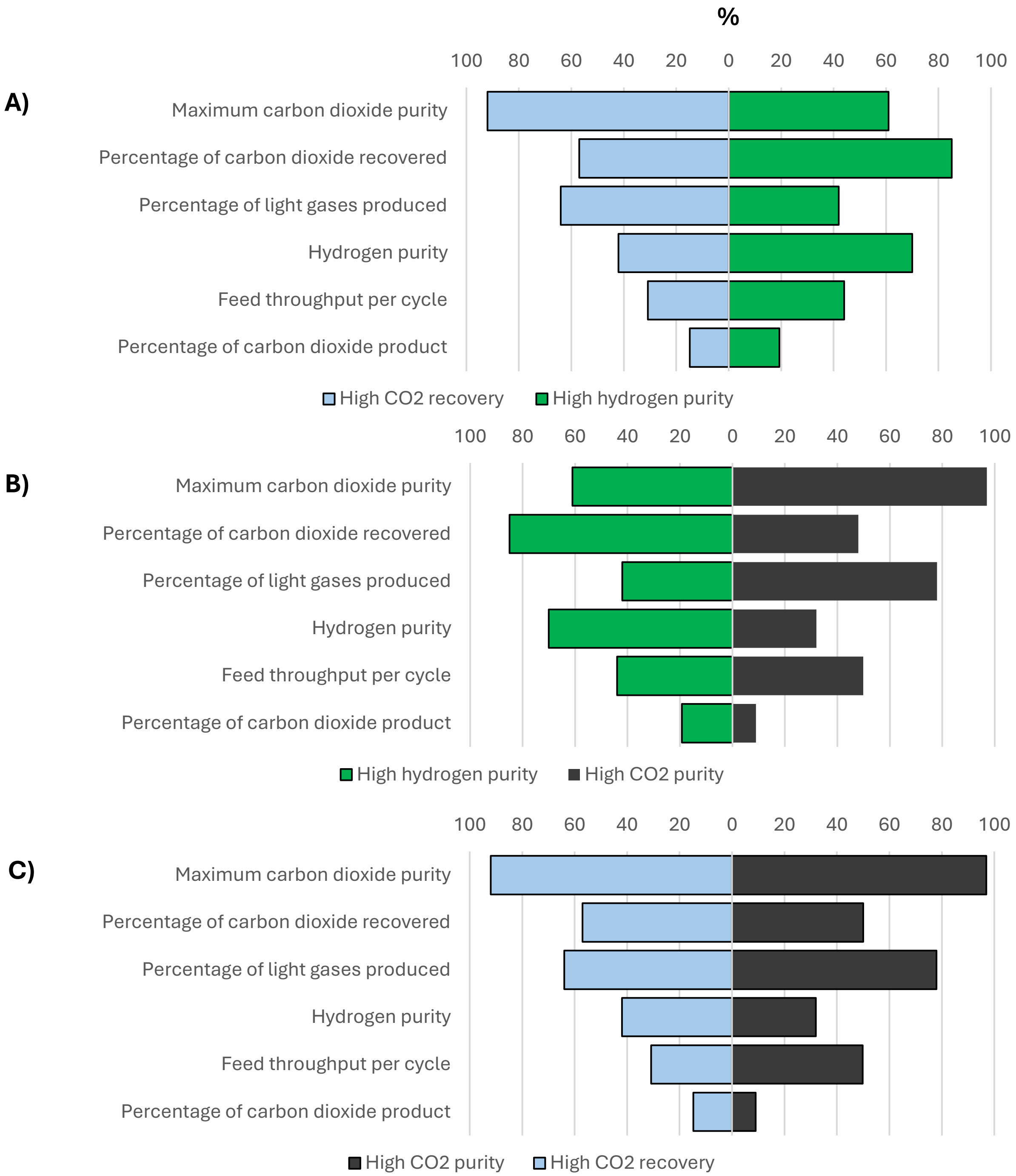

Figure 23 – Hurricane diagrams from the three cases studied in the demonstration comparing the performances of each method. All values are reported as a percentage. Gas purity data presented for carbon dioxide and hydrogen is in volume percent. The recovery and product percentages were calculated as a percentage of the gas stream in comparison to the volume of that gas in the total feed. The feed throughput was calculated as a relative percentage between the three scenarios. Product in the graphs refers to the output from the PSA, as in gases not recycled back into the system.

Key Learnings

During all phases of the demonstration project a number of key challenges arose and were addressed by the project team. The learnings, impacts and resolutions are summarised in Table 2.

Design phase

Connecting RiPR to PSA-SPUR

PSA technology has been developed to interact with continuous processes, despite the cyclic nature of the system meaning gas is processed in batches. In particular PSA-SPUR was designed for flue gas carbon capture, intended to be used with a constant low-moderate pressure flow of gases. However, Wild Hydrogen's RiPR technology is a batch system, if the PSA utilized RiPR for direct gas supply it would prevent multiple gasification batches from being run. During this time the reactor could cool down, preventing further syngas production which would prevent continuous operation of the PSA.

To overcome this, the connection between the two systems needed a buffer tank to act as an intermediary and a pump to draw gas from the RiPR. A dedicated compressor between the two systems was beyond the budget of the demonstrator and thus the mixing compressor operated for the feed-mix tank system was repurposed during the Feed cycle.

Procurement and Build phase

Component Lead times

Components for the hydrogen sector have considerable lead times due to the nascent nature of the widespread handling of gas. Small modifications to the system such as needing increased storage capabilities would generate significant (>5 week) delays to the project due to lead times.

One significant component were the gas compression and vacuum pumps. A number of UK and EU based supplier proposed 12-8 week long lead times which would not fit with 8 month project timescale set by the Hydrogen Innovation Initiative. Resolving this, Wild Hydrogen had to import pumps from a US manufacturer to reduce the impact of delays. (*Huge market potential lies in the ability to provide syngas/hydrogen pumps at pace to support future demonstration projects)*.

Similarly, even sealing solenoid valves enabling bidirectional flow were quoted with a 12 week lead time, highlighting a gap in the market for the rapid supply and management of safe and reliable valve systems.

Pump Assembly error

The vacuum pumps supplied from the US have a manifold that allows the process to connect with the pump diaphragm. During assembly it was found that the pump was provided with an incorrect thread (BSPT) rather than the drawing specified NPT thread. BSPT and NPT threads are very similar but are not compatible. The incompatibility meant that the vacuum pumps could draw atmospheric oxygen into the PSA system, posing an immediate hazard to the system. Due to the provided parts being out of tolerance a number of NPT fittings were incidentally cross-threaded while trying to manage leaks.

Operation phase

Downtime due to Solenoid

The PSA system operates through the careful management of over 70 solenoid valves, which control the flow of gases between the product tanks, pumps and the adsorbent columns.

During the procurement phase these valves were purchased with a specified functionality to enable gases to flow two-ways across the valve seat. The project was supplied with 20 barg capable two-way solenoid valves. These were bench tested using nitrogen to a maximum pressure of 3-5 barg, and were found to hold pressure.

However, during operation of RiPR and the PSA-SPUR it was found that pressures exceeding 3 barg could leak through the solenoid valve seating if the pressure was on the outlet port of the solenoid valve. Similarly light gases such as hydrogen, and vacuums could also communicate across the valve seat. This had a massive impact on the PSA system where key performance indicator of the methodology is on the purity of gases.

Future projects need to specify a ‘bidirectional’ function on the valve. During the project the lead time of such valves critically inhibited the project, and an alternative was not able to be procured. The project was able to manage by rotating the valves to align common sources of high pressure with the inlet side of the valve. At key interfaces check valves were integrated into valves to prevent significant backflow.

The leaking valves have impacted the quality of the data presented in this report. The percentage of 'unaccounted for' carbon dioxide, may be contained as pockets within the PSA system where it has been shunted through the valve seats, particular locations for unintended storage were the spare PSA columns, and valve grids. Additionally, the purities of the gases cannot be fully verified, and the high purity gases i.e. 98% may have been higher without the leaks!

Impact of gas humidity on IR sensors and other components

RiPR operates a hydrous environment to facilitate efficient conversion of organic matter to product gases. As a result, the product syngas has a high humidity. To reduce the humidity of the gas stream, moisture traps were integrated into the gas transfer lines.

Wild Hydrogen intended to use a Cambridge Sensotec RapidOx gas analyser to undertake continuous gas analysis during operation of both PSA-SPUR and RiPR. Due to the humidity of the syngas water was able to interact with infrared (IR) sensors contained in the gas analyser. The gas analyser needed to be returned to the manufacturer for repairs and was unavailable for the project. Managing this set-back, Wild Hydrogen modified a gas chromatography mass spectrometry (GC-MS) method to analyse for pure gases. The system owned by Wild Hydrogen was not suitable to be converted for continuous analysis, thus only spot samples could be taken. This has reduced the resolution of the data presented in the current study, meaning the study has missed the ability to sample highly pure gases and thus optimise the system.

Additionally, the wetted gas damaged solenoid valves, check valves and other components attached to the gas transfer system. The main PSA was not impacted by water as a filter containing both activated carbon and alumina was provided, which acted to sufficiently remove water. Strong desiccant steps, and water-resistant components will be needed for future work combining these technologies.

Positive impacts from lessons learnt

The demonstration project proved to be a valuable step forward in developing Wild Hydrogen's technology and after successfully integrating RiPR with PSA-SPUR, despite initial hurdles, showed that batch and continuous processes can work together effectively for syngas and hydrogen production. Adjustments to the gas handling system by adding buffer tanks and repurposing compressor, it provided insights into making the system more efficient and scalable. Even with challenges like solenoid valve leaks, the team found practical solutions, such as rotating valves and adding check valves, to keep operations running smoothly. The PSA system also demonstrated its resilience, maintaining gas separation performance despite minor setbacks, which reinforced confidence in its reliability. While real-time gas analysis was impacted, the ability to adapt and use GC-MS for spot sampling highlighted the flexibility of alternative approaches. Overall, these experiences not only refined the technology but also helped push it closer to commercial viability, increasing its Technology Readiness Level (TRL) by proving its capability in real-world conditions.

Table 2 - Lessons Learnt

Subject	**Effect**	**Resolution or Future Action**
Solenoids do not perform as expected	Loss of efficiency of PSA	Further work on requirements, bench testing
A single lab scale reformer has a limited gas supplier for the designed PSA	Continuous demonstrator not possible without significant gas storage.	Model the process with multiple reactors feeding a PSA system.
Humid gases pose significant risk to downstream gas systems and analysis, causing a breakage of a continuous gas analyser and corrosion of valve components	Loss of equipment during the demonstration causing delays. Reduced resolution of data from analytical equipment	Future demonstrations will need to add further desiccation steps after the condenser on the RiPR system.
Spot sampling gases does not provide resolution needed to adjust the PSA conditions, and adds additional error to results	Loss of accuracy and missed purities of gases.	Purchase a continuous gas analyser to run the process with.
Lead times exceeding 8 weeks posing significant risk to the final delivery of the project	The project had little flexibility to pivot when components failed and relied on design-phase redundancies.	Impacts to be factored into future designs, reducing the impact.
Control Systems developed in house	Rapid development cycles possible. Ease of handling control issues in house.	Further develop in house controls software methodologies to improve development cycles and purity

Conclusions

Pressure swing adsorption offers a suitable process to purify syngas. Through the demonstration Wild Hydrogen's unique syngas composition has been improved, making a key step towards the valorisation of our products. The project achieved maximum hydrogen purities of 70%, supplied alongside various energy rich mixtures including methane and carbon monoxide gases.

The project has successfully separated carbon dioxide from hydrogen, demonstrating a key carbon capture step, towards delivering 'Clear Hydrogen'. Carbon dioxide purities have achieved over 90%, reaching the 95% purity grades necessary for pipeline transportation of carbon dioxide. The recovery of such pure gases was low in the cases presented and further work must explore enhancing the recovery of carbon dioxide. Difficulties in separating methane from carbon dioxide were present in the current study, and thus work will focus on a methane separation step.

Wild Hydrogen looks to continue its collaboration with the University of Edinburgh. Through an EPSRC co-funded PhD studentship, we are committed to developing the technology over the next three years. Additionally, we look forward to collaborating with the Carbotech Gruppe to identify and develop further adsorbents for use in our process.

The demonstration project has proven to be invaluable to Wild Hydrogen, granting us the opportunity to develop a tailored solution to gas purification. The opportunity allows us to develop a tuneable separation process, alongside our tuneable core process – an ability that enables us to meet the demands of the energy sector.

Looking Ahead

Wild Hydrogen is at the forefront of the clean energy transition, advancing from our TRL6 Mini prototype to the construction of our 1MW Commercial Demonstrator in 2028. This marks a significant leap forward, proving our patented RiPR technology at scale and paving the way for full commercial deployment. Our technology delivers four commercially viable products - biomethane, hydrogen, captured carbon dioxide, and biochar - each playing a critical role in accelerating decarbonisation.

Our strategic approach ensures both immediate impact and long-term sustainability. The reality is that while hydrogen will play a dominant role in the future energy mix, the market is still developing, with infrastructure and policy frameworks evolving. Rather than waiting for full hydrogen market readiness, we're driving impact now by focusing on biomethane - an established, commercially viable solution that is already greening the gas grid. Biomethane already has regulatory approval, strong demand, and immediate industry applications.

By delivering carbon-neutral biomethane today, Wild Hydrogen can immediately reduce emissions across industry, transport, and energy networks, ensuring commercial sustainability while positioning ourselves at the forefront of the hydrogen economy. When the hydrogen market reaches full maturity, our technology is primed to scale seamlessly, enabling a smooth transition to a fully decarbonised future.

With our 1MW Commercial Demonstrator, we are setting the stage for widespread adoption, proving that sustainable, cost-effective energy solutions can be deployed at scale.