WALES & WEST UTILITIES

Delivering Innovation

2024/25

WALES&WEST UTILITIES

Welcome

Innovating for the long-term future of the gas network

At Wales & West Utilities, we continue to safely and reliably supply energy to over 7.5 million customers across Wales and the south west of England. We have a strong track record of delivering for customers rain or shine every day of the year, and our innovation programme works to make sure we can do this into the future, while supporting economic growth and meeting ambitious Net Zero targets.

The way energy is produced, distributed, stored and used is changing rapidly – and while there are uncertainties around policy and technology developments, we know that the gas network has a critical role to play both now and in the long-term.

We recognise that cost is a major concern for customers, particularly following recent rises to the cost of living and energy bills. Delivering a Net Zero energy transition must be fair and protect the most vulnerable in our communities. By investigating the role for the existing gas network in this shift, we could reduce the upfront cost of low-carbon appliances and technologies.

As you read on, you'll find that our 2024/25 Innovation Report demonstrates the breadth of our innovation activities during the last regulatory year and sets out our strategy, upcoming projects and priorities. We cannot deliver on this alone; our innovation is underpinned by collaboration, and we're proud of the partnerships we've nurtured with organisations across the UK and beyond.

Exploring green gases and assets of the future

In many industries and regions, gas is critical for safeguarding jobs and the economy. We're exploring how we can support producers to add more green gas into the system, whether that's biomethane, synthetic gas, blended hydrogen, or preparing for transition of assets to hydrogen in the future.

Innovation is also helping us understand other uses for our assets in the years ahead, informing our strategy as well as options for our customers. Flagship projects such as HyLine Cymru and the North Wales Conceptual Plan are developing options for low-carbon energy delivery to industry and commercial customers; and have been built as a result of findings from smaller innovation projects. We're also determining who our customers of the future may be – for instance, our HyDrive project is assessing the viability of hydrogen refuelling stations being integrated into the existing gas network.

Building partnerships and impact

Working with the National Energy System Operator (NESO), Welsh Government, and local authorities, by participating in the Powering Wales Renewably project we're helping to pioneer new processes which can inform future decisions. The 'Accelerating Progress' study developed options for how gas networks could bridge over 20% of the gap in meeting UK carbon emissions goals for buildings and industry in the 2030s. We led this project in partnership with Frontier Economics, IGEM Future Energy Networks and other gas networks.

Over the past 12 months we've worked with 48 unique partners and over 47% of our NIA projects have been in partnership with other energy networks, some direct and some in collaborations facilitated by IGEM Future Energy Networks.

As we plan for RIIO-3 and the outcome of our Business Plan submission to Ofgem, we're looking forward to another year of innovation and delivery. Our broad innovation portfolio will keep on addressing the key role that gas networks play today – and will continue to play in future energy scenarios.

– Graham Edwards, CEO

Contents

Introducing our innovation work

Each year at Wales & West Utilities, we invest efforts, dedication and funds into innovation. While the world navigates the future of energy distribution, we recognise our responsibility to pioneer options for our network in a range of energy system futures. This is not just to meet regulatory requirements – it's the right thing to do and is embedded in our ethos. In this report, you can read a summary of our innovation work during 2024/25, along with the strategy challenges we will address, our upcoming projects, and our priorities. You can also learn how you can partner with us to help meet our future innovation needs.

Our key achievements in 2024/25

- **With £6.3million of investment, we continue to grow our portfolio of innovation projects at pace** to help the UK Government achieve its 2050 Net Zero targets. Our work will also support customers through the transition, particularly those most vulnerable.
- **£4.3m** of the **£6.3m** investment used **Network Innovation Allowance (NIA) funding**.
- This included **36 NIA projects** which were kicked off in 2024/25.
- Working with **28 unique partners** across these new projects.
- **More than 47% of our projects** were in collaboration with other networks.
- We also detailed our vision for the 2026-2031 funding period and **submitted an ambitious Innovation Strategy to Ofgem as part of our Wales & West Utilities (WWU) Business Plan**.

Our strategic challenges for 2025/26

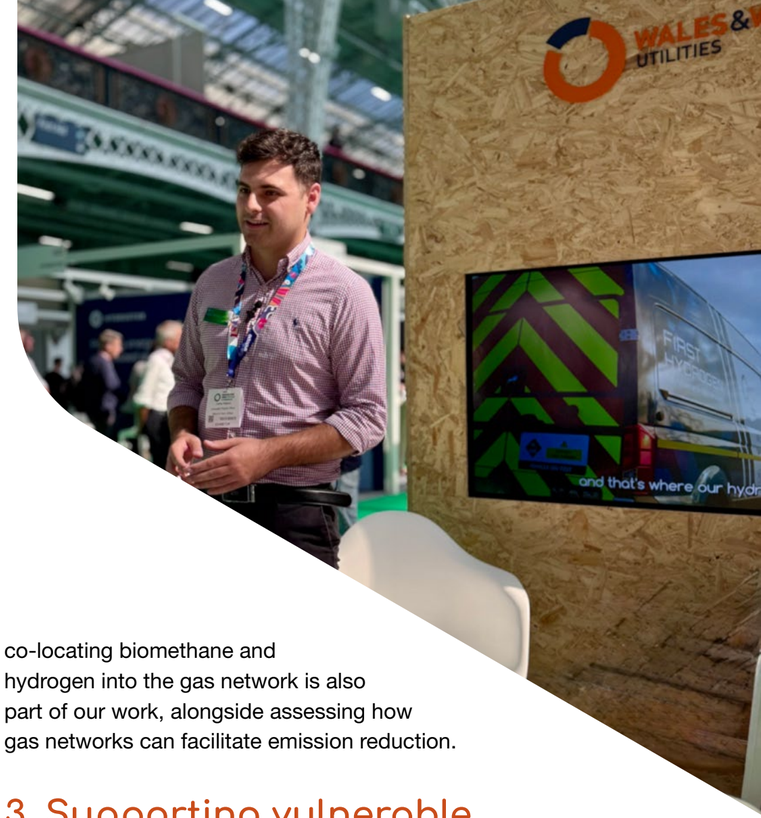
1. Planning and delivering net zero

What role can the existing gas network have in facilitating the Net Zero energy transition? How can it generate, transmit and distribute green energy? These are the questions we're seeking to answer by exploring the re-purposing of our current assets and different technology. Investigating how we can reduce emissions in our transport fleet through innovation has been a continuing priority. We intend to address the gap for ultra-low-emission vehicles that meet our operational needs, and build on findings of our first hydrogen van trial. All our innovation work toward net zero is carried out with customer bills in mind. We are mindful of long-term value for money, in addition to customer concern about energy costs.

In addition, our strategy continues to be shaped by stakeholders who support our engagement with local, regional and national governments. This work will enable key decisions to be made on direction and policy, including how we can support the National Energy System Operator (NESO) and Regional Energy System Planning (RESP) with data, modelling and new systems and processes to support a future transition – regardless of scenario.

2. Facilitating green gases

Our projects address the critical role that the gas networks play in a range of future energy scenarios, particularly in hard to decarbonise areas. This includes the contribution that green gases like biomethane can make today, to support Clean Power 2030. We are also exploring how hydrogen can be used to support the energy needs of both industrial and commercial consumers, in addition to its potential for storage and heavy-duty transport. Assessing cost-effective ways of connecting and co-locating biomethane and hydrogen into the gas network is also part of our work, alongside assessing how gas networks can facilitate emission reduction.



3. Supporting vulnerable customers

Innovating to support customers through the energy transition remains a priority for us, alongside addressing the regional challenges presented by our network – both of which our stakeholders highlighted as important issues when we consulted them on future activities. We've used innovation funding to support development of a vulnerability visualisation tool. This allows access to external data from various sources, bringing them together to enable networks to make informed decisions when planning work, specifically around the needs of vulnerable customers.

Innovation funds and how we use them

THE IMPORTANCE OF INNOVATION WORK TO SUPPORT NET ZERO

"The energy networks are critical enablers in Great Britain's decarbonisation journey to delivering a successful and rapid net zero future. The fifteen network operators across GB have an important role to play in making sure that the energy system can meet the needs of consumers in a changing energy landscape."

– Energy Networks Annual Innovation Report 2024

Network Innovation Allowance (NIA)

The NIA is a set amount that each RIIO network licensee receives as part of their price control allowance. Network licensees make the decisions as to which innovation projects they take forward with their NIA. In the RIIO-2 price control (2021-26), NIA has provided funding to RIIO network licensees. This enables us to take forward innovation projects that have the potential to address consumer vulnerability and/or deliver longer-term financial and environmental benefits for consumers, which we would not otherwise undertake within that time. For projects to be eligible for NIA funding, they must comply with the Ofgem RIIO-2 NIA Governance Document.

Strategic Innovation Fund (SIF)

The Strategic Innovation Fund (SIF) is run by Ofgem and Innovate UK. It supports new ideas that help make the UK's energy networks greener, cheaper, and more reliable. The fund gives money to projects that tackle big challenges like cutting carbon emissions and preparing for the future energy system. It encourages energy companies, researchers, and tech experts to work together on bold, useful solutions. SIF funding is given in stages—from early ideas to large trials—to help turn smart concepts into real improvements for gas and electricity networks, with long-term benefits for customers and the environment.

Other Funding

UK Research and Innovation (UKRI) and the Welsh Government are among the organisations who have supported our projects, within the past year and earlier in the price control. These funds complement and enhance our NIA and SIF funded projects, while enabling further collaboration with project partners.

We will continue to seek funding from wider sources and access new funding opportunities; including the Hydrogen Transport Business Model (HTBM), Hydrogen Allocation Rounds (HAR), and Horizon Europe.

For delivery work, including rollout of projects developed through innovation, we access Ofgem funding via the Net Zero and Reopener Development Fund. This has advanced our energy system transition work across a range of areas in RIIO-GD2.

For larger projects we also have access to additional flexible funding such as the Net Zero and Small Projects reopener.

Impacts of research and deployment

Carrying out early research and building on our foundation of knowledge is crucial to support the role of our network in the shift to net zero, regardless of scenario. Typically, we use NIA to create a robust portfolio of projects with a variety of Technology Readiness Levels (TRLs). As the gas network is in a transformative period while we work to support net zero and explore possibilities, a large proportion of projects in the last 12 months and across RIIO-GD2 are at low technical readiness levels. This early work is crucial to move forward and contribute to larger projects, and the ecosystem of innovation funding works together to enable successful innovation into deployment.

See how our projects and ideas grow and develop here >

Through this price control we have deployed two projects which are being used to support vulnerable customers and local area energy planning alongside our **Pathfinder tool**. This is our unique simulation model that works out future energy supply and demand.

Hydrogen is widely recognised as an important pillar in a net zero energy system, and gas distribution networks are preparing their infrastructure so it can deliver clean industry, power generators and homes. However, green hydrogen remains relatively expensive and the costs and impacts of the technology need to be reduced to accelerate its deployment and support decarbonisation.

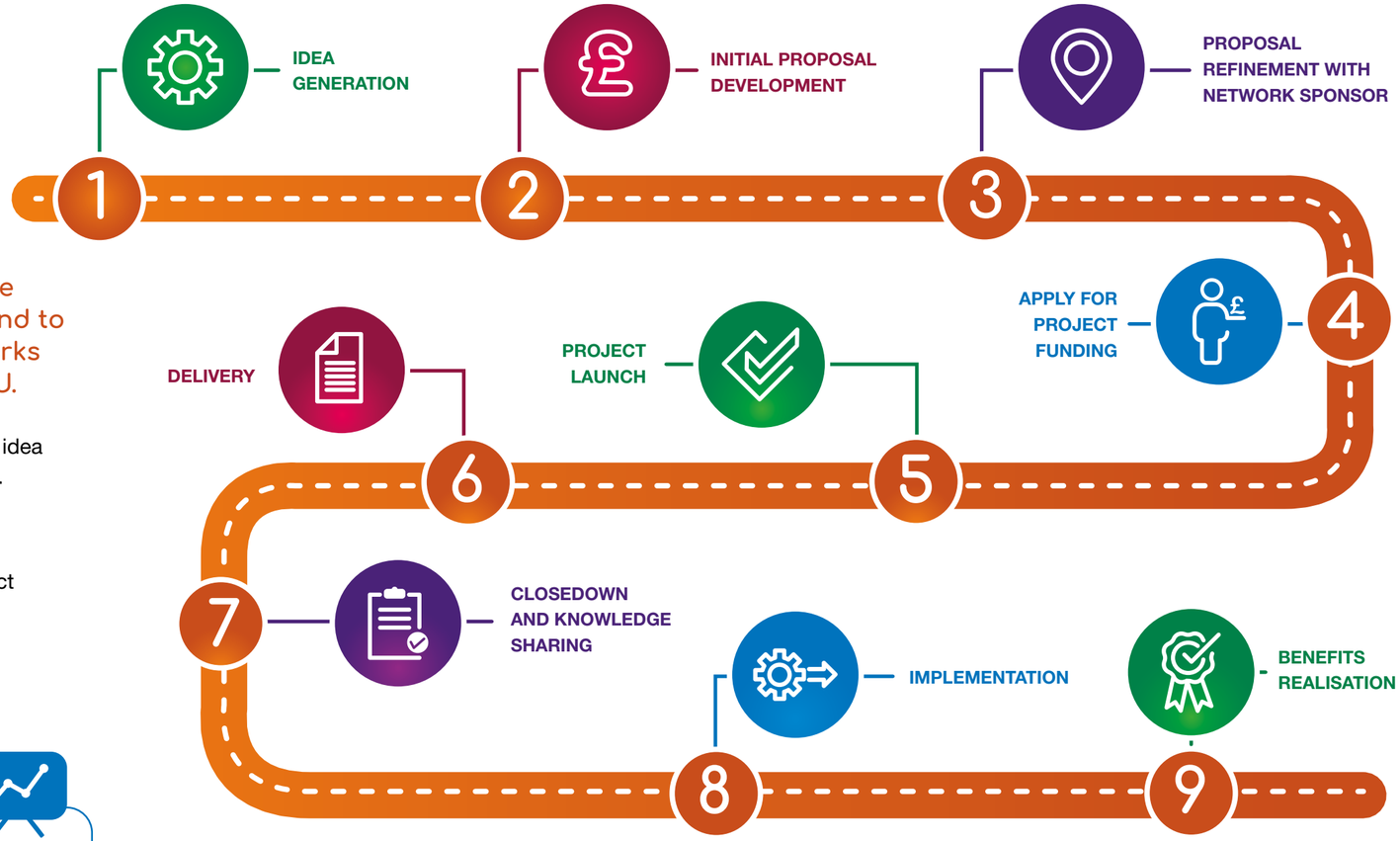
1. Our learning is informing larger scale transformational change in projects such as **HyLine Cymru**, which we detail in a case study on **page 17**. Here, NIA funding has enabled us to progress our plan for a new hydrogen pipeline to support the **South Wales Industrial Cluster (SWIC)**.

2. In the last year we also secured funding for our **NextGen Electrolysis SIF project** which you can read more about on **page 18**. This will demonstrate co-located blending and 100% hydrogen using wastewater, that could be distributed via our network to consumers.

Innovation process

Why not follow the example set by our innovation project partners on the previous pages? Here's our handy guide to working with us as we respond to the challenges of the future. You can also view the Future Energy Networks Innovation Process Document **here**, which complements process at WWU.

1. **Idea generation** – review this report, particularly the strategic areas of interest, to make sure your idea aligns with one of our priorities in addition to the themes and focus areas that we need to address.
2. **Initial proposal development** – review funding opportunities and eligibility criteria to see which innovation funding might best fit your idea.
3. **Proposal refinement with network sponsor** – you can either **contact us** directly or you can direct your idea through one of the national routes (**SNP**, **UKRI**, **KTN**) where other networks can also assess the ideas (networks can agree to collaborate at this stage).
4. **Apply for project funding** – after working out the best funding route, the next step is to apply for project funding with us.
5. **Project launch** – successful proposals will have a kick-off meeting and both NIA and SIF projects will be registered on the **FEN innovation portal**.
6. **Delivery** – work with us (and any other network sponsors) to deliver the project, being sure to record your project information and learning.
7. **Closedown and knowledge sharing** – project wrap stage, validating outcomes against objectives, before sharing information, learning and results with all stakeholders.
8. **Implementation** – help us implement the project into business-as-usual operation.
9. **Benefits realisation** – benefits will be tracked by the network.



DID YOU KNOW?

36 NIA projects kicked off in 2024/25

WHAT OUR PARTNERS SAY

While our start-up organisation benefits from individual colleague expertise and experience, we are relatively early in our journey as a group, progressing our patented idea. Working with WWU to navigate innovation funding has enabled us to become familiar with the processes. The team guided us through the NIA funding process, which we are using to further our technology. If results of this project are positive, it will act as a stepping stone to produce a tuneable blend of biogenic methane and hydrogen, which supports the decarbonisation of gas networks.

Wild Hydrogen

How to work with us

We're always looking for new innovative ideas that align with our strategy and aims. If you think you have something of interest, please read the following two pages in full and submit your idea to us for review using the option that's best for you.

If we think your idea is a good fit, we'll assess the project against the different types of funding that we could potentially use.

These funds include NIA and SIF, which work alongside each other in addition to regulated and non-regulated funding in the ecosystem that supports innovation and the journey to net zero – see figure 1 below.

If we want to progress your idea, we will share the project with the other distribution networks, both gas and electricity, to ensure we're not duplicating previous innovation. This also makes sure collaboration and shared learning remain key components of our innovation.

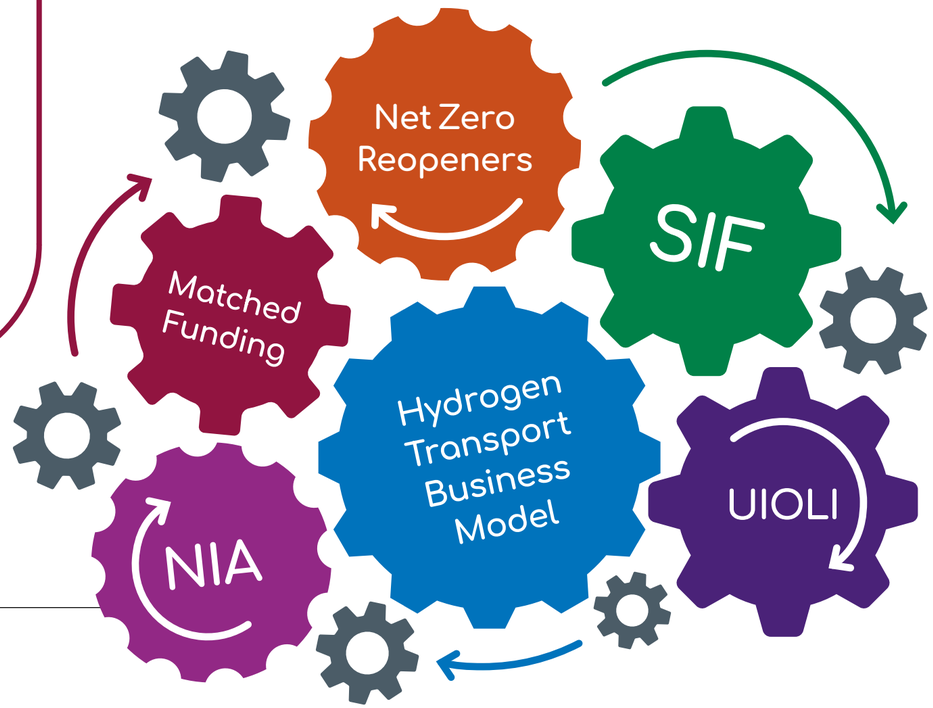


Figure 1

Project areas commissioned in 2024/25

Over the last 12 months, our projects have covered a wide range of topics which you can read about in more detail later in this report. These include:

- Building evidence and learning to support government decision making and policy
- Researching how gas control systems would be impacted by any transition
- How we can support whole energy system transition with flexible energy conversion
- Protecting vulnerable consumers with new types of alarm systems
- Retrofitting homes for hydrogen
- Assessing infrastructure for industrial demand
- Looking at ways to reduce the cost of hydrogen production and co-location benefits to blend hydrogen into the network

If you have any ideas that could follow on from these projects, please visit the contact page to get in touch.

Future Energy Networks (FEN) Innovation Portal

Introducing, our new portal for registering and publishing our project scope and outcomes.

As of 1 January 2025, we've had a new **Future Energy Networks (FEN) Innovation Portal**, where all new projects are registered and published. The location of our innovation project information prior to 31 December 2024 will remain on the **ENA Smarter Networks Portal** as before.

During the past 12 months, the gas distribution and transmission networks have exited the Energy Networks Association (ENA) and are now represented by FEN, a company within the Institution of Gas Engineers and Managers (IGEM). They believe in an equitable and affordable transition to net zero for all, with the energy networks playing a fundamental role in enabling this to happen. FEN will lead this change by bringing together the expertise of stakeholders across the energy industry.

We continue to have a close and collaborative relationship with the ENA and electricity networks as we work together on innovation projects and share learning.

Get in touch – we're easy to work with

Sharing our learning and outputs from innovation projects is an important part of our year. We're active members of groups such as the Energy Research Partnership and Institute of Gas Engineers & Managers (IGEM) and regularly attend events. Please reach out if you'd like to find out where we'll be next, and where you can meet us in person. Our contact information is at the end of this report.

Don't forget, you can view all the innovation projects completed, commencing or upcoming – including progress and closedown reports that detail the benefits generated by the projects. Find them in the following places:

- **Projects from 1 January 2025** – on the FEN Innovation Portal
- **Projects up to 31 December 2024** – on the ENA Smarter Networks Portal

Here are the ways you can submit your idea.

1. Click on the buttons below to submit your ideas via our web portal:

Submit project idea > Submit product idea >

2. Sign up to our mailing list to receive calls for innovation and project updates:

Let's connect >

3. Email your ideas directly to: innovation@wwutilities.co.uk >

We look forward to hearing from you.

WHAT OUR PARTNERS SAY

When we started working with WWU, our ALCHEM project – or Advanced Low Carbon Hydrogen Energy Management – was at Technical Readiness Level (TRL) 3; we are incredibly pleased it is now at TRL 5. The project focus is on reducing the energy input needed for electrolysis and increasing its flexibility to match the renewable generation profile. WWU introduced us to different avenues of funding to progress our idea, guiding us through applications for SIF and the full NIA process. As a start-up organisation, we were new to innovation processes and learning from and being supported by WWU has been invaluable.

KI Hydrogen

Current projects

Over the following pages you'll find all the exciting project work we have undertaken over the past 12 months. We have shared these through a comprehensive list and several in-depth case studies.

WHAT OUR PARTNERS SAY

Our collaboration with WWU, and other networks, highlights the need to consider societal impacts in the future of energy in addition to the scientific. We are part of a project with WWU which is about supporting consumers in vulnerable situations. Initial discussions were with SGN, and we've since been supported by WWU, Cadent and NGN. The Centre for Energy Equality (CEE) is a social enterprise, and it's very important that connected, knowledgeable partners support our work making sure that new, low-carbon technologies have the widest possible benefit. The commitment from the four gas distribution networks to energy equality advocacy is very positive for UK communities, and their access to affordable and sustainable energy.

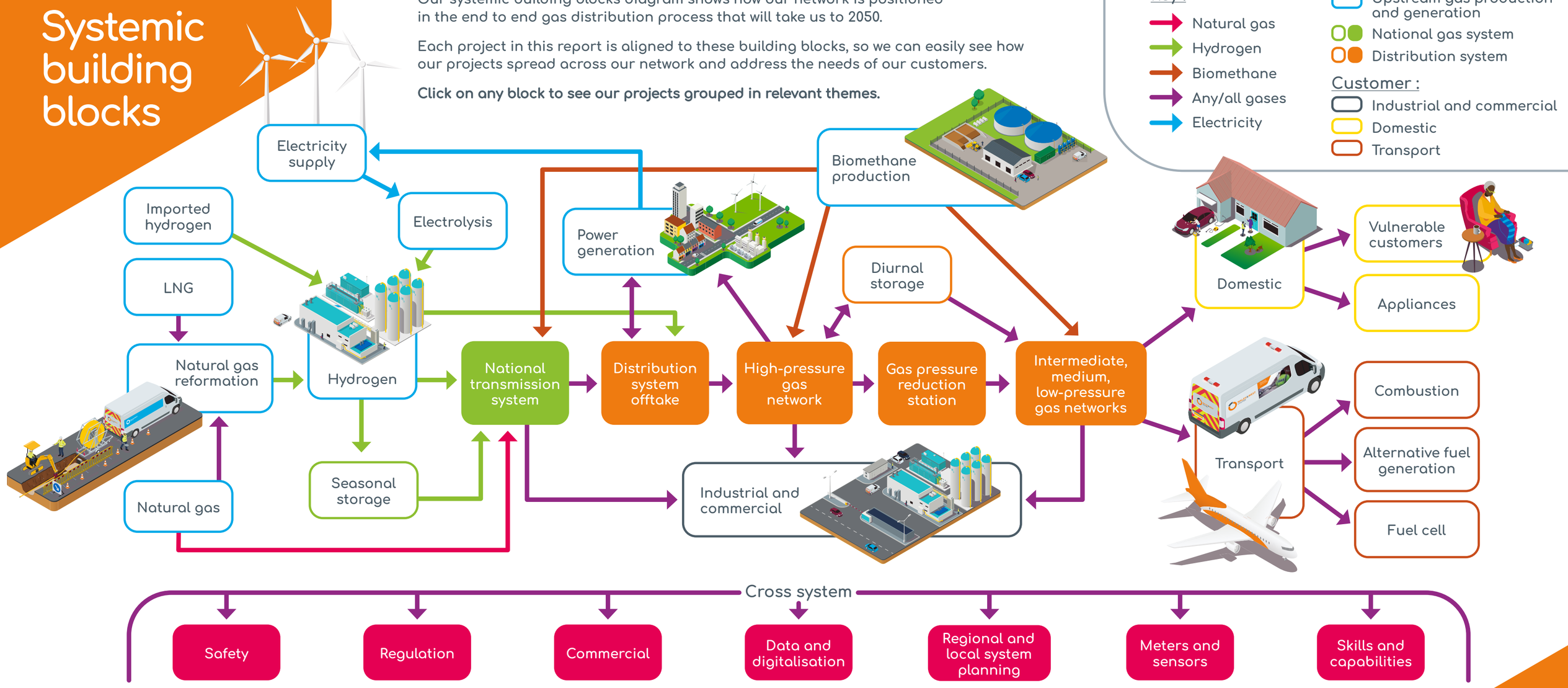
Centre for Energy Equality

Systemic building blocks

Our systemic building blocks diagram shows how our network is positioned in the end to end gas distribution process that will take us to 2050.

Each project in this report is aligned to these building blocks, so we can easily see how our projects spread across our network and address the needs of our customers.

Click on any block to see our projects grouped in relevant themes.



Live project portfolio

Part 1-of-5

The following pages outline all projects that were live in 2024/25, with case studies showing how each project aligns with a key theme, how partners have worked with us, how we've collaborated with other networks, and which funding mechanism was used.

If you have an idea that aligns with our key themes, please contact us >

Cross system

Projects that support the transition across different parts of the system

Project reference	Project name	Description	Partner	Link
NGN_NIA_344	H21 Ignition Consequence Research	This project is assisting networks to understand ignition consequences of hydrogen in weak structures, the ideal routes of mitigation and validation of previously completed modelling.	DNV	
SIF_WWU_2_3A	NextGen Electrolysis - Wastewater to Green Hydrogen Alpha	Working on reducing the cost of hydrogen production by tackling the real-world operational constraints of electrolytic production. Specifically, the need for high-purity water, by using less pure/wastewater sources to reduce demand on pure mains water. Cost savings will be passed to end consumers.	HydroStar	
NIA_WWU_02_44	Pathfinder Development GD2-76	Redeveloping the existing WWU Pathfinder model to provide a new impact assessment tool for housing stock owners to assess the carbon impact within the energy system (i.e. grid and generation). This would provide information about the impact of investing in different retrofit interventions at a property or properties.	LCP-Delta	
NIA_NGT0229	GD2-170 Network Policies and Procedures	Aligning the UK Gas Networks' policies, standards and procedure and develop a roadmap resulting in a hydrogen-ready document suite for each network. This project has been identified through the Network Safety Impact Board (NSIB) and aligns with our strategic theme of 'cross system'.	QEM Solutions	
FI_0049	IGEM Downstream Hydrogen Standards Development	Delivering three work packages to focus on evidence relevant to the scope of IGEM's H/2 and H/3 technical standards for domestic and non-domestic hydrogen installations.	KIWA	
NIA_WWU_02_39	Transitioning and Repurposing Oil Pipelines for Hydrogen (TROPHy)	With the aviation sector work gaining traction, and the potential for widespread hydrogen demand, options to repurpose all types of existing transportation assets are being explored through this project.	Rosen	
NIA_WWU_02_61	NextGen Electrolysis – Producing Green Hydrogen from Contaminated Water	Focusing on how treatment of industrial manufacturing process wastewater containing elevated levels of contaminants (heavy metals/fibres) and microplastics can – expand water types available for electrolysis; increase co-location of electrolysis citing at industrial clusters; reduce risk of fast passivation of electrodes to reduce ongoing maintenance costs – with the resultant water used to reduce cost, and increase availability of green hydrogen production.	HydroStar	
NIA_WWU_02_63	OptiFLOW	Seeking to provide credible industrial research-based evidence about the cost benefit to the demand-side consumer and savings that could result from green hydrogen generating FLOW projects in the Celtic Sea.	ARUP	
NIA2_SGN0056	Interventions for Hydrogen by Asset Group Phase 3	Assessing any new evidence since phase one and two. The format of the database will be enhanced to: enable easier access to the key points, to review the scoring using a new weighted average method, and to improve accuracy.	Arup & DNV	
NIA2_SGN0046	RTSM Phase 1	Developing an integrated solution for the processes of characterising, settling, and billing gas in a multi-gas energy system ahead of the introduction of green gases such as hydrogen and unpropanated biomethane to help decarbonise the UK's gas grid.	BIP, Correla	
SIF_WWU_2_3B	NextGen Electrolysis - Wastewater to Green Hydrogen Beta	Working to reduce the cost of hydrogen production by tackling the real-world operational constraints of electrolytic production. Specifically looking at the need for high-purity water, by using less pure/wastewater sources to reduce demand on pure mains water and pass cost savings to end consumers.	HydroStar, NGED, Welsh Water, YeoValley	
NIA_WWU_02_68	Accelerating Progress	Identifying potential options for reducing emissions from gas transmission, distribution and usage. Developing a framework to analyse the cost, benefits and impacts of these options under different scenarios.	Frontier	
NIA_NGN_458	Customer Vulnerability Visualisation Tool Phase 3 / Open Maps	Developing a vulnerability visualisation tool. This will allow access to specific data queries from various sources, enabling the user to understand the overlap between existing internal data and public data.	Egnida	
NIA_WWU_02_71	Situational Awareness	Researching the latest developments in Human Machine Interface (HMI) theory and Human Factors (HF) to make sure any new process and systems design relating to the control room systems is user centred.	Frazer Nash	
NIA_WWU_02_76	Pathfinder Enhancements	Adding new functions to the Pathfinder tool, to reflect more current underlying data and to improve functionality.	Progressive Energy	

Live project portfolio

Part 2-of-5

Domestic customers

Supporting the energy system transition for domestic heat and other energy use in the home

Project reference	Project name	Description	Partner	Link
NIA_CAD0097	Dispersion of Helium releases in domestic properties	Providing real data showing dispersion of gas in a range of real ‘as lived in’ properties ranging in size, shape, layout and age.	KIWA	
NIA_CAD0095	Homeshield	Home Shield will have the capacity to detect a number of alarms and onwardly communicate those hazards to the occupier and a ‘key contact’ of the occupier leading to proactive action to make the situation safe. Home Shield is a ‘fit for all’, inclusive, battery or mains powered alarm.	UIS	

High-pressure gas network

Managing the transition of high-pressure gas network assets to carry decarbonised gases

NIA_WWU_02_58	Biomethane and Hydrogen Interactions	Exploring how biomethane can be managed and used in areas of the gas network which will be converted to 100% hydrogen.	ARUP	
NIA_WWU_02_49	Hydrogen Blending with LPG Feasibility Study	Follow on from LPG Village to understand if H2 can be blended into LPG.	Frazer-Nash / Frontier Economics	

Hydrogen

Understanding the impact of hydrogen production technologies and business models on the transition of our energy system

NIA_WWU_02_42	Hydrogen Storage Feasibility Study GD2-73	Seeking to understand the feasibility of using the existing grid structure to store hydrogen for distribution through the network. Also, optioneering ideas for future storage options.	NCC	
NIA_NGN_425	Hydrogen Compatibility of Components: Phase 2/3 Further Analysis	The output of NIA_NGN_276 highlighted a range of materials that, through assessment of relevant literature, have been categorised as having a high potential for degradation in hydrogen, rendering the asset assembly unsuitable for use with hydrogen without further mitigation. The aim of this project is to undertake follow-up review of the outputs and results from the subsequent network assessments, including recommendations to undertake further evaluation of materials of construction, risk mitigation options and propose a testing plan for certain materials.	HSE SD	
NIA_WWU_02_60	GD2-152 Development of Microgrids	Identifying the data required to establish the size of a microgrid, along with the equipment to run it. Also understanding the feasibility of owning, maintaining and operating the site by a local authority or third party.	Frazer Nash	
SIF_WWU_3_2	ALCHEM - (Advanced Low Carbon Hydrogen and Energy Management)	Assessing how future networks could use innovative biomass electrolysis technology, which uses liquid waste biomass to produce green hydrogen and green chemicals with no oxygen, using 75% less energy than conventional water electrolysis.	Ki-hydrogen	
NIA_ WWU_02_202	Green Hydrogen Production Impacts on Water Usage	Exploring the amount of water required to produce the necessary volume of green hydrogen, and the impact this could have on our modelling in future.	HydroStar	
NIA_WWU_02_22	Gas Separation within UK Gas Networks	Demonstrating where gas separation technology can strengthen the case for large scale network blending, and how this can also provide flexibility to customers in early cluster projects.	ERM	
NIA_CAD0105	International Evidence Gathering	Gathering evidence from six international hydrogen trials, and compiling findings into a report to be submitted to the HSE.	DNV	
NIA_CAD0108	Air (oxygen) ingress in isolated installations	Developing understanding and any mitigations required around the potential for air ingress in isolated hydrogen installations.	Steer, Enertek	

If you have an idea that aligns with our key themes, please contact us >

Continued >

Live project portfolio

Part 3-of-5

Hydrogen (cont.) Understanding the impact of hydrogen production technologies and business models on the transition of our energy system

Project reference	Project name	Description	Partner	Link
NIA_CAD0102	Hydrogen Blending Implementation	Developing implementation plans for blending, aligned with the safety evidence submissions sent to the HSE during 2024. This will allow blending to be expedited and delivered in 2027 assuming a favourable outcome of the HSE review.	KPMG	
NIA_WWU_02_65	Lined Rock Caverns for Flexible Hydrogen Storage	Assessing the role that Lined Rock Caverns (LRC) could play in supporting the developing hydrogen sector, and the needs of electricity network storage. Also, defining the implications for gas and electricity network planning.	ERM	
NIA_WWU_2_64	Alchem	Demonstrating the commercial feasibility of KI Hydrogen's innovative biomass electrolysis technology through experimental validation and third-party assessments.	KI Hydrogen	
NIA_WWU_02_70	DASH – Decentralised Alliance for South West Hydrogen	Exploration of a radically decentralised green hydrogen driven gas network, whereby hydrogen is produced at sites with grid head room or constraint renewables.	Arup	
NIA_WWU_02_62	Lessons Learnt: Phase Two	Expanding on the extensive work carried out in our Lessons Learned from Phase 1. Following the dissemination of the document among various parties, particular interest was raised by OFGEM and DESNZ. They requested a deep dive into the upstream and downstream conversion for industrial customers to take forward to future hydrogen use.	WSP	
NIA_WWU_02_66	Project GaIN	Rolling-out higher efficiency gas appliances such as thermally driven heat pumps and fuel cells. Both as an immediate means of reducing carbon emissions without impacting the electricity network, and as a more deliverable solution in some homes. Undertaking some initial modelling to assess the impacts of this on carbon budgets.	LCP-Delta	
NIA_CAD0107	Strategic Education Roadmap for Hydrogen Awareness	Creating a strategic roadmap for bringing hydrogen awareness and education into schools, colleges, and universities.	Skewb	
NIA_WWU_2_72	The Impact of District Heating on our Network	An investigation into the potential impacts of district heating on the gas network. Understanding if it is viable for the network to support district heating and the re-purposing that would be required.	Apollo	
NIA_WWU_2_74	Demonstrating Downstream Procedures For Hydrogen	This project involves a comprehensive set of tasks aimed at implementing and validating a domestic safety system for hydrogen use, including excess flow valves.	KIWA	
NIA_WWU_2_73	Rising Pressure Reformer Study	Assessing the application of Rising Pressure Reformer (RiPR) technology to produce a tuneable blend of biogenic methane and hydrogen; and support the decarbonisation of gas networks.	Wild Hydrogen	
NIA_WWU_02_75	Determining future energy demand of B&R Team vans with full on-board power	Assessing our onboard power cability to inform our future power needs for alternative fuel.	Cenex	
NIA_WWU_02_74	H2 Rail	A baseline study to analyse current rail transport demands, projection of future demands and cost analysis of transforming a train depot for hydrogen refuelling. We will identify future opportunities and provide information which can be used in regional energy planning.	Frazer Nash	
NIA_WWU_02_78	Energy Plan Translator	As the work on local area energy planning increases, translating the outputs from each plan into tangible network forecasting and infrastructure building will be crucial. Using the data from the Wales LAEPs we intend to turn this into a visual network demand; also identifying key locations where the network will be required in future, and for what purpose.	Frazer-Nash	
NIA_WWU_02_24	Application of Functional Blending - Testing a Market-led Approach	Conceptual design work illustrating how the functional blending specification can be applied in three key areas of LTS development: for hydrogen blending at offtake; blending into existing LTS and blending into new LTS.	Wood	
NIA_WWU_02_79	Future Hydrogen Safe Control of Operations (SCO) Procedures	Following work on the Policies and Procedures project by QEMS, we have identified the need to update and re-vamp our existing Safe Control of Operations (SCO) procedures. These are used by our network to support delivery of upcoming projects.	QEM	
NIA_WWU_02_80	Hydrogen Rollout Assessment	Gaining understanding of the considerations for 100% hydrogen rollout at a town scale, to inform future preparation for repurposing. Areas will be chosen to represent different networks, housing stock and demographics, requiring different approaches and engagement.	Arup	

If you have an idea that aligns with our key themes, please contact us >

Live project portfolio

Part 4-of-5

Industrial and commercial

Supporting the energy system transition for major energy users, businesses and other organisations

Project reference	Project name	Description	Partner	Link
NIA_WWU_02_37	HyVoltage	Assessing the viability of introducing flexible vector conversion links between the gas and electricity distribution networks.	Frazer-Nash, Cornwall Insight, Imperial College, Bristol University	
NIA_WWU_02_25	Sensitive I&C Users for Strategic Hydrogen Network Planning	Understanding how to assess the impact of blending and pure H2 on industrial users, tool creation and a case study.	Costain	

Intermediate, medium, low-pressure gas networks

Managing the transition of intermediate, medium, low-pressure gas network assets to carry decarbonised gases

NIA_NGT0210	Lower Cost Excavation and Repair for Hydrogen Pipelines	Identifying the differences between excavating and repairing a high-pressure natural gas pipeline as we do today; with a hydrogen transmission pipeline in the future.	Jacobs	
NIA_WWU_02_40	Emissions Mitigations - Purging for a Hydrogen Future	Investigating the elimination of natural gas emissions both from current operations and a large-scale hydrogen conversion programme.	Steer Energy	
NIA2_SGN0051	Hazardous Areas Impact Mitigations (HAIM) Phase 2	In this second phase of the project, we will engage widely with stakeholders; refine experiments to incorporate the impact of wind on releases; map additional vent types like angled vents, and conduct larger scale tests to validate Phase 1 findings across all pressure tiers.	Steer, DNV	
NIA_WWU_02_35	Understanding future energy loads from Data Centres	Data centres are growing in their demand on energy networks. The scale and nature of demands have also impacted capacity for other users in some areas. Here, we aim to understand the current status of data centre demands; future projected growth (including where this may be targeted); options for meeting demand from the gas and electricity systems, and Net Zero options for the sector.	Apollo	
NIA_WWU_02_69	Enhancement of the anaerobic digestion process for bio-methane production	Seeking to address the challenges that biomethane production plants face technically and operationally through the injection of green hydrogen into the AD process. We will look at the specific quantities and specific times that bring issues within the digestion process.	HydroStar	

If you have an idea that aligns with our key themes, please contact us >

WHAT OUR PARTNERS SAY

We are a global collective of over 12,000 dedicated professionals in more than 35 countries and 200 locations. At Kiwa, our core business is in Testing, Inspection and Certification (TIC), plus training and consultancy. It's part of our mission to contribute to innovative organisations and help them add value to society. So, we're delighted to be collaborating with WWU on their journey toward a more sustainable energy system. Having successfully secured several tenders with the team, we'll be working together on projects including demonstrating full domestic safety systems for hydrogen. We look forward to nurturing and expanding our partnership with WWU and the wider group of GDNs.

Kiwa

Live project portfolio

Part 5-of-5

Seasonal storage

Assessing options for longer term energy storage in the gas system

Project reference	Project name	Description	Partner	Link
SIF_WWU_3_1	Hydrogen Storage in Aquifers	As the use of hydrogen increases, the requirement to match supply and demand will require storage at scales from linepack (MWh scale) through salt caverns (GWh scale) to geological structures (TWh scale). At present, most work on the largest stores addresses depleted gas fields. This idea recognises that the geological storage of hydrogen in aquifers may be a cheaper option for large scale storage than use of depleted gas fields. Modelling studies we have undertaken indicate that cushion gas requirements may be lower.	Progressive	
NIA_WWU_02_67	Hydrogen Storage in Aquifers	Our objective is to extend the earlier concept work undertaken for the project, *Hydrogen Storage in Aquifers SIF Round 3 Discovery* (SIF_WWU_3_1) into a pre-feasibility study relating to a small number of specific structures.	Progressive	

Transport

Developing options for the use of decarbonised gases in transport

NIA_WWU_02_59	HyDrive	Investigating the feasibility of Hydrogen Refuelling Stations (HRS) being connected to the current gas network.	Costain	
NIA_WWU_02_77	Commercial Vehicle Fleet – Development of Total Cost of Operation Model	Creating a Total Cost of Operation (TCO) model for our use at WWU, addressing our specific operational requirements. It will make sure that plans and investment decisions are grounded in real-world technology assessments and our operational fleet data.	Frazer-Nash	

If you have an idea that aligns with our key themes, please contact us >

DID YOU KNOW?

We advanced our future of energy innovation by investing

£6.3m

in SIF and NIA projects in 2024/25

Case study:
Hyline Cymru

Hyline Cymru

Vision

HyLine Cymru will build a new 130km hydrogen pipeline from Pembroke to Port Talbot. The vision behind the project is to deliver the low-carbon hydrogen needed for decarbonisation of industry in South West Wales, which is currently responsible for a substantial proportion of Wales' carbon emissions. This groundbreaking project will enable the development of hydrogen production and industrial fuel switching by doing what WWU does best – expertly connecting customers to the energy they need, while investing wisely to create a sustainable, greener future.

Partners in the South Wales Industrial Cluster (SWIC) collaborated to create the project. SWIC recognise the need to invest in the future – to decarbonise industry and to protect communities, jobs and the economy in Wales and beyond.

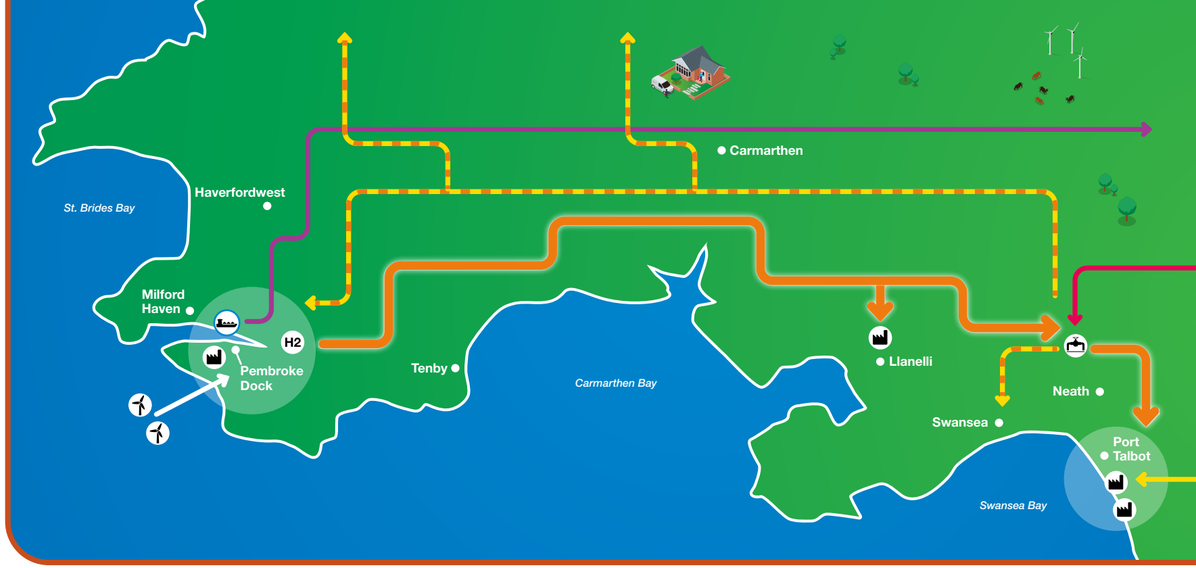
Built on Innovation

Cumulative innovation learning has been a critical component in the development of this ground breaking project. Sourcing additional investment to complement regulatory funding has also been key.

The timeline below shows how NIA and NZARD UIOLI funding has been used in combination with external sources, for instance, funding competitions such as the, 'Industrial Decarbonisation Challenge', and 'Launchpad: net zero industry, South West Wales'.

Benefits

It is anticipated that HyLine Cymru will remove up to 10% of GB industrial emissions (3.2 MtC02e/year) in addition to the following benefits:



- Protecting and creating thousands of highly skilled jobs in South Wales. Protecting communities by facilitating the transition to low-carbon energy while minimising disruption and providing additional support to vulnerable customers.
- Providing UK industry with a cost-effective route to decarbonisation
- Contributing £billions in Gross Value Added over its operational lifetime
- Unlocking up to 3GW of offshore wind generation by providing a route to market for clean energy producers
- Transporting a homegrown low-carbon energy source to our hard-to-decarbonise customers such as steel manufacturers
- Helping local authorities deliver their Local Area Energy Plans

Project timeline

2021 - 2022

- Regional Decarbonisation Pathways project to model different approaches NIA
- SWIC Hydrogen Supply Pipeline Infrastructure – NIA matched with externally sourced funding
- SWIC Assessment of potential hydrogen demand in 2030-2050 – NIA matched with externally sourced funding
- SWIC Market Accelerating Hydrogen Distribution and Storage – NIA matched with externally sourced funding

2022 - 2023

- Potential for Salt cavern storage of hydrogen in and near South Wales – NIA
- HyLine Planning and Legal Delivery Strategy – NIA
- Hydrogen Storage Feasibility Study – NIA
- Sensitive I&C Users – NIA
- Application of Function Blending Specification – NIA

2023 - 2024

- Transportation agreements and pre-consenting UIOLI
- HyLine Phase 1B Offtaker agreements and pre-consenting – NZARD UIOLI
- OptiFLOW – NIA matched with externally sourced funding
- Lessons Learnt: Past Energy Transitions in the Gas Industry – NIA
- Gas Separation within UK Gas Networks – NIA

2025 - 2028

- Front End Engineering & Design (FEED) and Planning, Public Consultation and consenting (funding tbc)
- Post FEED stage gate decision (funding tbc)

2028 - 2032

- Construction Phase (funding tbc)

HyLine Cymru is assessing funding options to progress the next stages of the project.

Case study:
NextGen Electrolysis

NextGen Electrolysis – Wastewater to Green Hydrogen

While gas distribution networks are preparing their infrastructure to deliver hydrogen to power industry and heat homes, green hydrogen production cost is currently high due to the energy and water purification standards required. Having proven the feasibility of a new technology to produce the green gas from wastewater in previous trials, we now need to demonstrate how this could work in practice at scale.

Project breakdown

HOW: SIF proposal from supplier

WHO: Wales & West Utilities

PROJECT PARTNERS: Hydrostar, Yeo Valley, Welsh Water, National Grid Electricity Distribution

FUNDING MECHANISM: Strategic Innovation Fund

Need

Production cost of green hydrogen is high due to the barriers presented by the current technology in use; which involves not only sources of carbon-free electricity such as solar or wind power but also pure water and purification equipment. It also requires expensive membranes made from rare metals to carry out the necessary electrolysis. We have already proven innovative membraneless technology can produce green hydrogen from less pure water sources, but we need to carry out further trials to see how this technology can be deployed at scale and in the context of a GDN.

Approach

The beta phase of this project involves running two separate trials – one at a Welsh Water treatment facility near Cardiff and another at the Yeo Valley production site in Cannington.

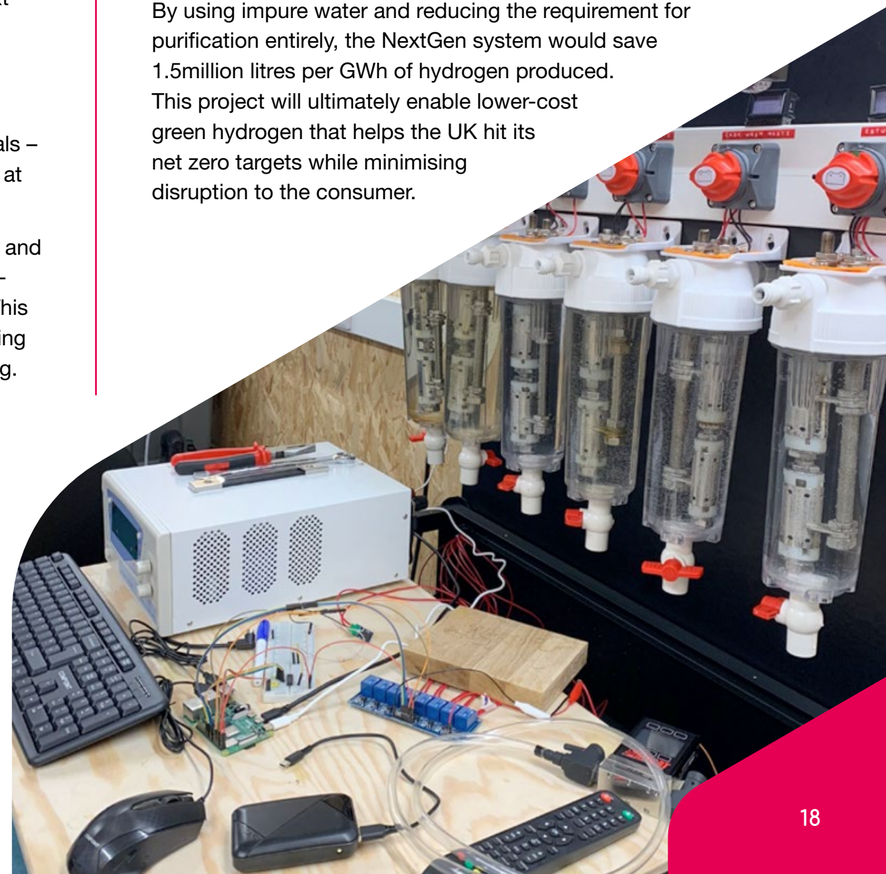
With Welsh Water, we will be using effluent water and sea water and the company's existing solar power to produce hydrogen for on-site office heating and hot water via a Worcester Bosch boiler. This will give the team the opportunity to assess an industrial site using 100% hydrogen for heating and hot water for their office building.

At Yeo Valley, our team will use the company's on-site solar power and various sources of water, including that used in the production process, captured rain water and borehole/river water to produce hydrogen. We are investigating using on-site blending equipment to combine up to 20% hydrogen with natural gas to the existing boilers used in the process for producing yoghurts. This will give us the opportunity to assess near-term use of hydrogen for an industrial customer and better understand the operational and safety requirements for blending technology and future network integration.

Benefits

Testing the distributed hydrogen production model will give us a much better understanding of how early adopters can decarbonise and could reduce the operational barriers for smaller scale hydrogen production. Not only that, excess hydrogen could be blended into the local gas network in the future, while this technology may offer cost savings due to co-location and through using the heat and oxygen produced in the process for other applications.

By using impure water and reducing the requirement for purification entirely, the NextGen system would save 1.5million litres per GWh of hydrogen produced. This project will ultimately enable lower-cost green hydrogen that helps the UK hit its net zero targets while minimising disruption to the consumer.



Alchem

ALCHEM is highly innovative project that could deliver a new, cheaper approach to green hydrogen production. It proposes using a unique biomass electrolysis technology that requires half the electricity to produce green hydrogen compared to the conventional water electrolysis process.

The discovery phase of this project proved biomass electrolysis reduces the cost of production considerably. This stage, which built on learning from an initial SIF project, seeks to further understand how the technology could develop and integrate with the gas system.

Project breakdown

HOW: SIF proposal from supplier

WHO: Wales & West Utilities

PROJECT PARTNERS: KI Hydrogen

FUNDING MECHANISM: Network Innovation Allowance

Need

The UK Hydrogen Strategy underlines the role of green hydrogen in achieving Net Zero targets, particularly in sectors such as heavy industry, transportation and power. The government has ambitious targets to deliver 2GW of low-carbon hydrogen by 2025 and 10GW by 2030, but significant cost reductions are vital if they are to be met without increasing the burden on industry, taxpayers or energy customers.

The only current viable technology for producing green hydrogen is water electrolysis, which is energy intensive and struggles with the unreliability of solar or wind power. Commercially viable biomass electrolysis would address both of these challenges and networks need to understand how this would integrate with repurposed or new infrastructure.

Approach

In a lab-based study at the Tyseley Energy Park in the Midlands, researchers from project partner KI Hydrogen developed and tested a pre-industrial pilot scale biomass electrolysis unit and scaled the biomass pretreatment process.

The trial included sourcing biomass waste from industrial partners; integrating the biomass electrolysis unit with monitoring and control systems, and carrying out the electrolysis under controlled conditions.

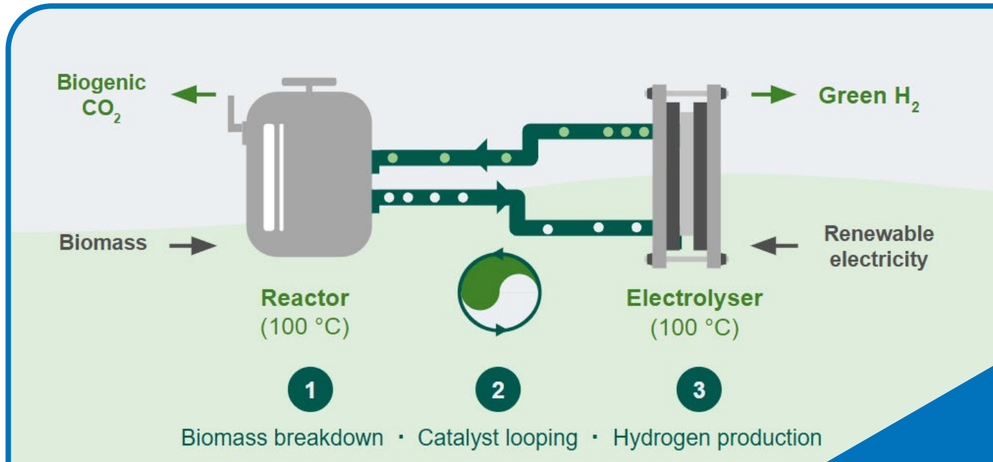
Throughout the trial, the project team collected data on energy consumption; hydrogen and CO2 production rates; purity, and other relevant metrics. They also analysed this data to build a clearer picture of the efficiency and cost-effectiveness of the process.

This data fed into the economic model the team used to assess the costs and benefits of scaling up this technology and compare it with conventional hydrogen production methods. The team also carried out safety assessments to identify and mitigate potential hazards and ensure the process would meet all relevant safety standards and regulations.

Benefits

The biomass electrolysis process used by KI Hydrogen offers a range of potential benefits. These include reduced energy requirements, significant cost savings and a valuable by-product – biogenic CO2 – that could be used to manufacture Sustainable Aviation Fuel (or SAF). Deployment at scale could help overcome the significant barriers to the UK achieving its green hydrogen production targets.

Cost savings could be made with the implementation of the technology, which would otherwise need to be met by consumers, producers and taxpayers in the UK market. Although initial focus is on industry, if successful, this type of production could benefit rural customers who otherwise would not have access to hydrogen. As it requires less energy, the process would also reduce pressure on the electricity grid.



Case study:
Situational Awareness

Situational Awareness

GDN control centres in the UK use complex systems. They meet current needs and human factors standards. However, they have not been designed to enable the country's transition to net zero. These changes include the introduction of hydrogen as a blend, transition to full hydrogen and potential decommissioning of parts of the network.

This project builds on previous work (NIA_WWU_02_27) on the latest developments in human machine interface (HMI) theory and human factors. It makes sure that any changes to systems and processes are designed to support system users and the management of significant changes in operation and network configuration.

Project breakdown

HOW: Gap identified: Tendered for partner

WHO: Wales & West Utilities

PROJECT PARTNERS: Frazer-Nash

FUNDING MECHANISM: Network Innovation Allowance

Need

Our initial NIA project (Gas Control System – Impact Assessment (Future requirements) NIA_WWU_02_27) confirmed the additional flexibility needed in our systems to safely deliver transition and meet new industry arrangements. It also highlighted risk of a degradation of situational during changes to the physical network and systems used to manage it. Key findings included potential impacts on situational awareness, fatigue and supervision requirements, particularly for our 24/7 control centre teams.

The system operation function is an integral part of the gas network and, as new forms of energy such as hydrogen start to enter the market, we need to ensure all systems and procedures are fit for purpose including operator need being taken into account.

Approach

The largely desk-based study was split into five different work packages:

WP1: Familiarisation – project partner Frazer-Nash carried out a document review and site visits to the participating GDNs to gain a better understanding of current and future practices and systems. The next step was to consider existing and future operating scenarios on which they could base human factors areas of interest.

WP2: Literature and industry review – the team reviewed relevant human factors literature on a range of issues such as situational awareness, fatigue, competence, capability and control room design. They also explored industry standards from various organisations and interviewed stakeholders who have experience of significant changes to operations and operating systems.

WP3: Review and assess – following WP2, Frazer-Nash developed a conceptual framework to outline which issues should be considered at different points throughout the anticipated transition.

They also made recommendations to manage the risks associated with each issue in the 'Human Factors Risk Register' and identified issues where more detailed recommendations are needed.

WP4: Develop and validate – the team proposed novel approaches to address the gaps identified in WP3. Next, they held a one day in-person workshop with us at WWU and other stakeholders. The 'Human Factors Risk Register' recommendations were validated and discussed to make sure they are practical and appropriate.

WP5: Report – finally, the team detailed their methodology, findings and recommendations in a report and executive summary.

Benefits

This project is one of many steps to support our teams through the energy transition, making sure system design minimises the risk of human error and adverse impacts on colleague wellbeing. As a result of these upgrades, the process and systems design for control rooms now considers human machine interfaces and human factors, in what is sure to be a rapidly changing environment. Much of the learning from this project may also be of benefit to other parts of the GDNs and wider industry.

While there is still much ongoing work to identify the most effective route to meet net zero in the UK, this project is one of many supporting the transition. Repurposing the gas networks to transmit hydrogen would not only support the challenge of achieving net zero; it also has the potential to save millions of pounds thanks to lower disruption to consumers when compared with other decarbonisation solutions.

Case study:
Accelerating Progress

Accelerating Progress

The UK has legally binding targets to reduce carbon emissions by the 2030s on its path towards achieving net zero by 2050, but there is growing concern about whether the country is on track.. This project identified potential measures for cutting emissions from gas transmission, distribution and usage – options that could reduce the gap between projected emissions levels and those required to hit targets. It also looked at the policy and regulatory changes needed to accelerate these reductions.

Project breakdown

HOW: Gap identified; tendered for partner

WHO: Wales & West Utilities

PROJECT PARTNERS:
IGEM Future Energy Networks, Frontier Economics

FUNDING MECHANISM: Network Innovation Allowance

Need

The Climate Change Act 2008 created legally binding carbon budgets to achieve net zero by 2050, which means significant emissions reductions are required by the 2030s on the pathway to the longer term goal.

Under the Act, the government has to set five-year 'carbon budgets' at least 12 years in advance. The fifth carbon budget (2028-32) requires a 52% reduction on 1990 emissions, while the sixth requires reductions of 78% by the end of its period (2037). The Committee on Climate Change (CCC) has already raised concern about these targets, stating it believes the previous government's policies and plans were insufficient to achieve the targets.

Therefore, further steps will need to be taken to accelerate emissions reductions. This study aimed to identify practical, cost-effective and realisable ways in which the gas networks could support the further decarbonisation required.

Approach

This desktop study sought to understand the different technical options for increasing contributions by GDNs to reducing emissions, with a focus on the 2030s targets. We worked with IGEM Future Energy Networks, other GDNs and the supplier Frontier Economics.

Split into four workstreams, this research project first considered potential opportunities for reductions across the gas value chain, focusing on measures that can be supported or delivered by the GDNs, including:

- reducing gas system emissions
- using gas to facilitate wider decarbonisation
- decarbonising gas use, for example, by using hydrogen, blended gas and biomethane.

We then estimated the scale and cost-effectiveness of emissions savings for each of these measures and compared them to 'business-as-usual' counterfactual scenarios to analyse how effective each would be.

Following this, our researchers set out the specific policy and regulatory changes that would be needed to facilitate those options and proposed further areas for investigation that could support additional 2030s emissions reduction.

Benefits

Successful completion of this project has given us a deeper understanding of the realistic, achievable and cost-effective options available to gas distribution networks to contribute to the reduction of emissions. It has also given us a clearer view of the policy and regulatory changes needed to enable the acceleration of emission reductions targets in the UK.

If carried out, the quantified measures identified by the study could tackle 23% of the gap to meeting carbon budget six emissions goals (2033-2037) for UK industry and buildings. These cost-effective, feasible decarbonisation measures would also allow for further energy system flexibility. Recognising these benefits require policy and regulatory changes to be delivered, the findings have been communicated to a range of stakeholders, including government and regulators.

HyDrive

The transport sector is responsible for a large proportion of carbon emissions, which is a source of concern for many local authorities considering how they will achieve Net Zero targets. One solution being developed is hydrogen-powered vehicles, which have a similar refuelling process to that of petrol and diesel cars but produce zero carbon emissions. However, there is a clear gap in infrastructure that currently limits the wider adoption of hydrogen vehicles.

Gas networks could help provide the infrastructure to facilitate further adoption of hydrogen vehicles, so this project investigated the feasibility of connecting hydrogen refuelling stations (HRS) to the current gas network.

Project breakdown

HOW: Gap identified, tendered for partner

WHO: Wales & West Utilities

PROJECT PARTNERS: Costain

FUNDING MECHANISM: Network Innovation Allowance

Need

The Energy White Paper (2020) identified hydrogen as a potential source of decarbonised heat in buildings, but the government requires a strong evidence base before deciding whether to give it the go-ahead. To satisfy the use case for hydrogen, we need to provide evidence on the feasibility, cost, convenience and safety of transporting the gas.

Connecting hydrogen refuelling stations on the grid could result in significant benefits, including job creation, while also providing the infrastructure to enable further adoption of carbon emission-free transport. But we need to understand likely demand and other logistical requirements to prove this is a viable option, especially since hydrogen vehicles are a relatively novel technology.

Approach

Project partner Costain undertook a review of relevant literature to understand current road transport demands in the areas served by our network. They used the data to create a baseline demand profile, which also included findings from a previous NIA project ‘Hydrogen Storage for Zero Carbon Fleet Transport – NIA_NGN_263’.

The team then interviewed a range of stakeholders on their attitudes to hydrogen being used for road transport and gathered government and transport industry data on current refuelling requirements, including analysis of vehicle type, location of existing service stations and refuelling transactions. Using this information, they generated heat maps to identify and evaluate potential locations for hydrogen refuelling stations and recommended three prime locations based on that analysis.

Following this, our project team produced an example case study for connecting a HRS to our grid on the M4 near Swansea and carried out an economic assessment that identified wider benefits such as job creation.

Results from the study led to two further innovation ideas: continuation of HyDrive and a future NIA project called H2 Rail (NIA_WWU_02_74).

Benefits

Completion of this study has provided enough evidence for us to pursue the concept of connecting a refuelling station to our network and to launch a similar study into the feasibility of using hydrogen to power rail transport.

Local authorities have also expressed interest in this project, with many having mentioned it in their Local Area Energy Plans and agreeing hydrogen would provide opportunities to decarbonise transport.

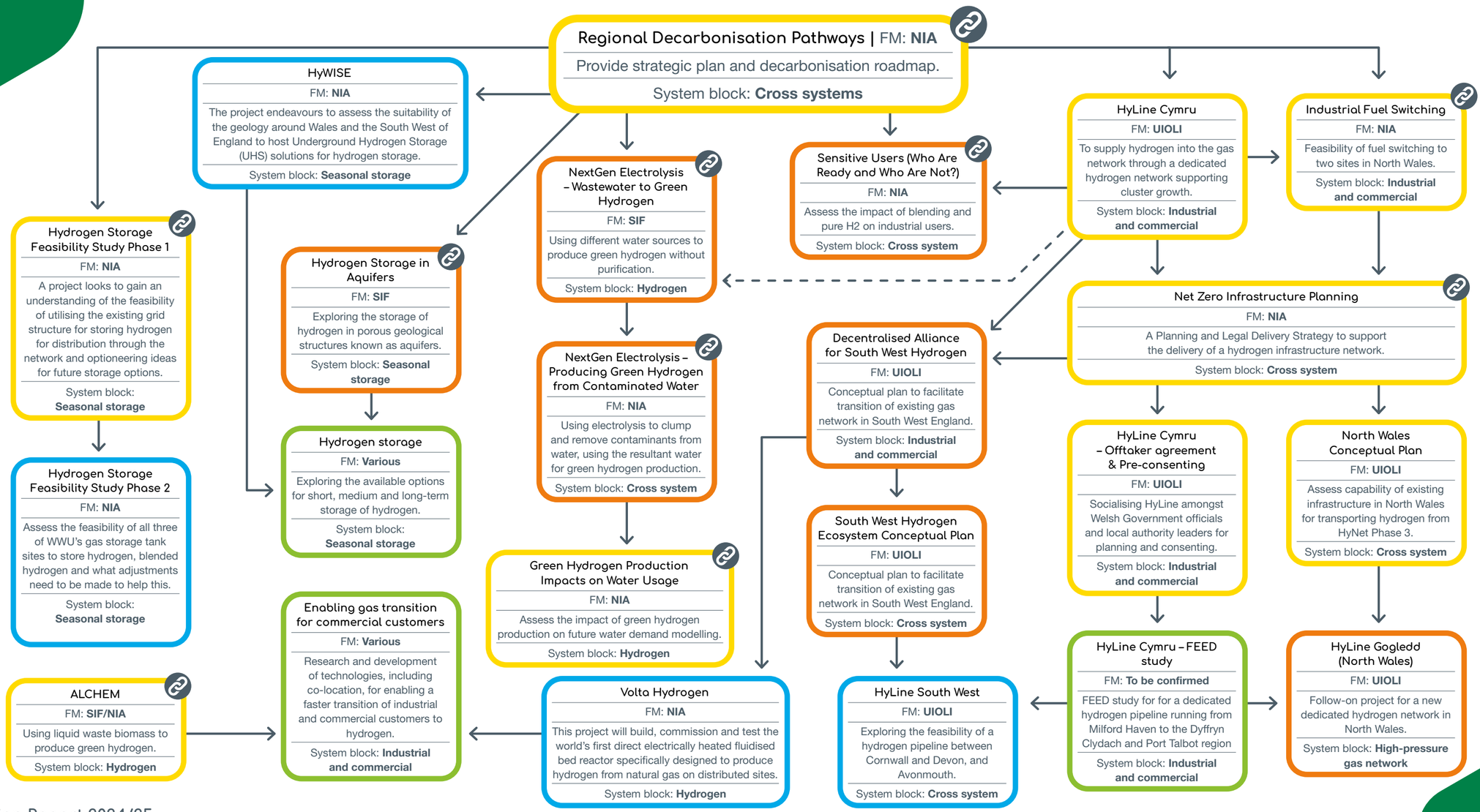
As well as offering economic benefits, the deployment of hydrogen vehicles could reduce emissions by more than 80% and prevent thousands of tons of harmful pollutants from being added to the environment. While much work remains to be done, this study adds to the evidence base for repurposing our network to run on 100% hydrogen and provide energy for homes, business and transport.

Building our portfolio

Industrial and commercial

Industrial and commercial

Here you can see how projects are building on previous project learning and the funding that enables this, as we explore energy system transition options for industrial and commercial customers.



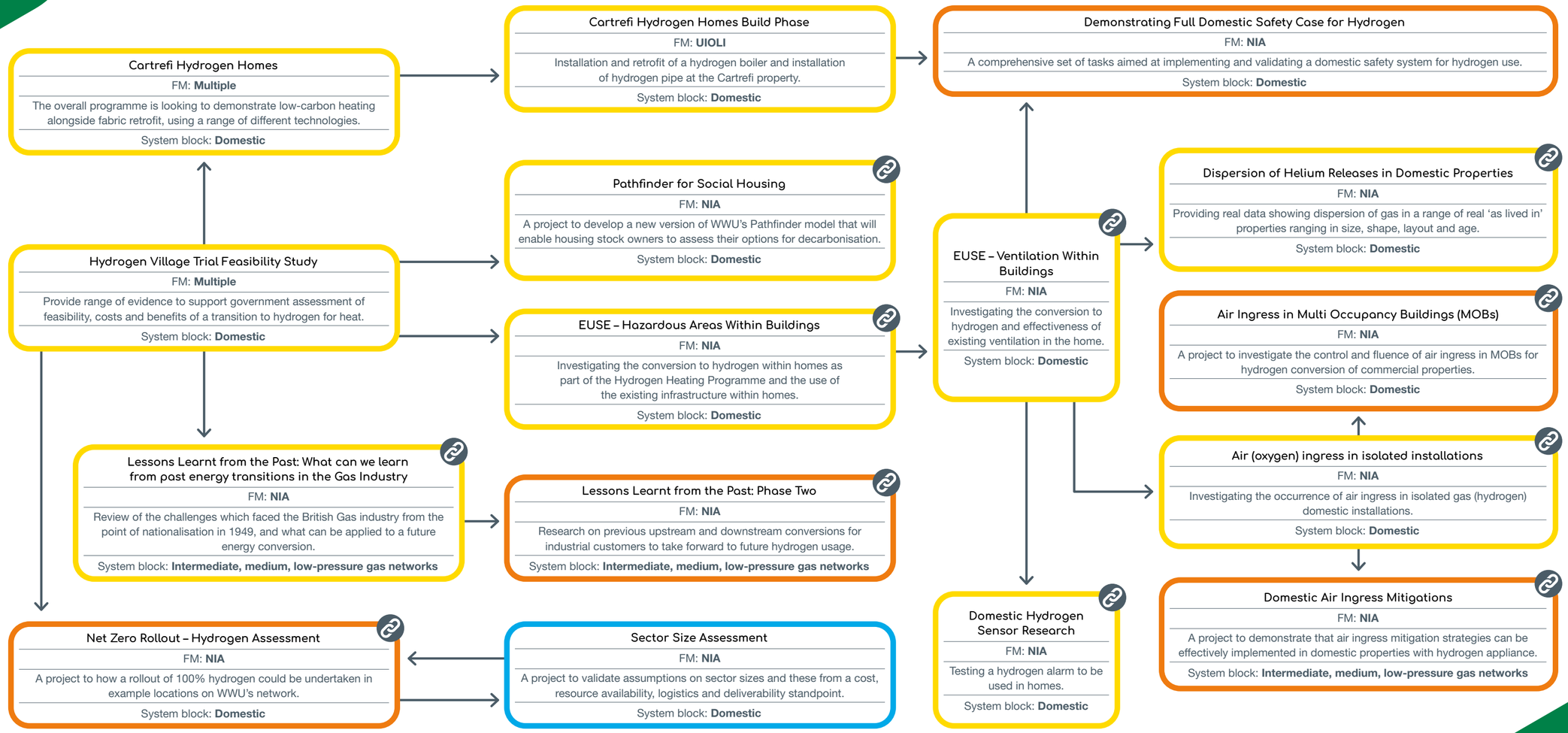
Building our portfolio

Domestic

Domestic

Here you can see how projects are building on previous project learning and the funding that enables this as we explore energy system transition options for domestic customers.

Key : Completed project | Project in progress | Future project | FM = Funding Mechanism



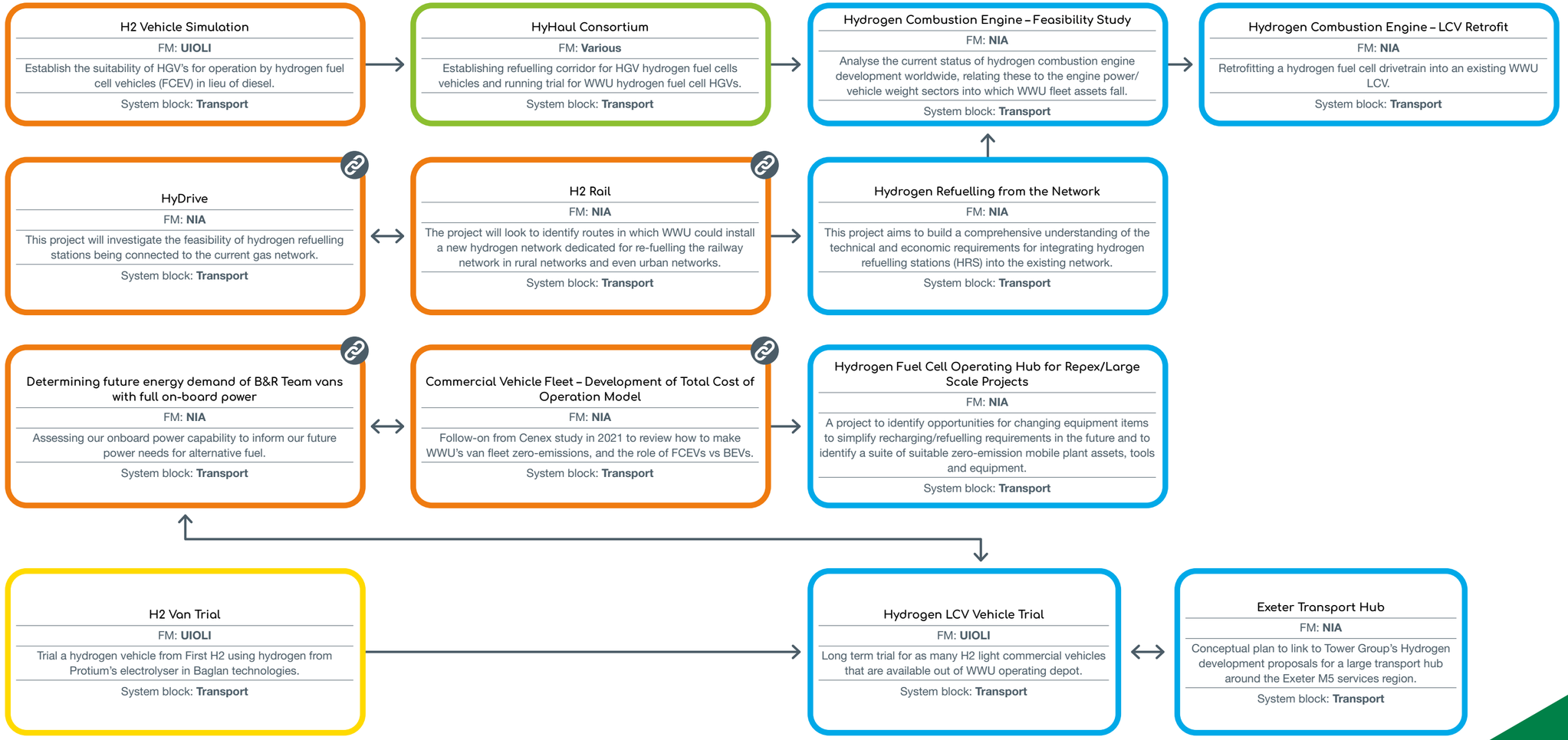
Building our portfolio

Transport

Key : Completed project | Project in progress | Future project | Future concept | FM = Funding Mechanism

Transport

Here you can see how projects are building on previous project learning and the funding that enables this as we explore energy system transition options for transport.



Future of innovation

Don’t forget – if you have an innovative idea that can help further our ambition, be sure to **get in touch >**.

WHAT OUR PARTNERS SAY

Cenex has over 20 years’ experience of working on innovative R&D programmes and have developed specialist knowledge and expertise in cleaner transport solutions. As an impartial, fully independent, not-for-profit Research Technology Organisation (RTO), we’re dedicated to reaching outcomes that are right for organisations, industry and the environment. We are partnering with WWU to assess their onboard power capability and understand how their future power needs could be met with low-carbon alternative fuels. Transport is a key piece of the puzzle for organisations to reach their Net Zero targets, and we’re fully driven to apply our knowledge and expertise to help WWU achieve theirs.

Cenex

Planned projects

Part 1-of-5

Cross system

Projects that support the transition across different parts of the system

Project name	Description
Carbon Networks - Phase 2	Defining the role of GDNs in repurposing, building, owning and operating the Carbon Capture, Utilisation and Storage (CCUS) pipeline and supporting infrastructure. Following on from Phase 1 of the SGN Carbon Networks project, this work responds to the need for regulatory and commercial clarity on the role of GDNs in developing CCUS infrastructure.
Low Carbon gas pre-heat	With the aim of shifting existing sites to low-carbon alternatives, we are identifying current gas demand on our network, through pre-heating and subsequent emissions. Our focus will be on bio-methane transported and stored on site, or hybrid gas/heat pump solutions. The cost benefit of each will be assessed alongside making sure it is future proof, based on network transition. Our aim is to roll out on all sites across the network.
Pathfinder Evolution	Developing additional features for our Pathfinder model. To inform the advances, we will draw on learnings from our Navigator project and the Energy Plan Translator. The model will be more accurate, allowing us to support the next round of LAEPs.
Sector Size Assessment	Assessment of the sectorisation assumptions for a large-scale rollout. Understanding assumptions that have been made on sector sizes and assessing the practicability of these from a cost, resource availability, logistics and deliverability standpoint. The project will take into account the GDN element as well as the link to the end user requirements. We will consider supply chain elements of the different work types to make sure they align.
Net Zero Spatial dashboard	Building a Net Zero spatial dashboard that shows all projects on our network in addition to future H2 production, connection and more.
STEM Engagement Tool	Development of a STEM engagement tool that provides education for primary and secondary school age pupils on how energy in the UK works today, and options for the future. The tool needs to be unbiased, non-company specific, using appropriate language alongside engaging facts and figures.
Mine Water Heat opportunity	Welsh government energy service have worked with the coal authority to develop studies of mine water heat and opporutnities to provide them to communities. The outputs will be looking for pilot / feasabaility studies to be carried out to support. Could the gas network be re-purposed to support this. Project will require testing.
Defining the role of storage for the distribution networks	Considering the role of GDNs in relation to storage as network uses evolve in the energy system transition.
Gas Control System Centre Phase 2	Study into what can be re-used or needs to be new in the control centre. Proof of concept modules devloped, with a reccomendation for phase 3.
Gas Control System – Impact Assessment (Phase 3)	Implementing the knowledge gathered in earlier phases to develop a full solution.

Domestic customers

Supporting the energy system transition for domestic heat and other energy use in the home

The Fairer Warmth Hub	Linking consumers, policymakers and networks by offering tailored support to various stakeholders, including households, small businesses, and local authorities, to ensure an inclusive and just energy transition.
The Warmth of Community	Working with a local housing association to deploy a hybrid heating system on a domestic scale (Using Cooll Hybrid technology not used in the UK). Also with an option for communal hybrid heating solution for larger stock areas of Wales & the south West region.
Understanding Consumer Behaviours for a Just Transition	A research project to create a holistic, technology-agnostic understanding of consumer behaviour and decision-making with regard to selection of prospective heating sources. Highlighting the barriers and drivers which can be leveraged in this Net Zero transition to deliver more effective, efficient transition plans.
Futures Close – Cross Vector Heating & Fabric Improvement Programme	Install, commission, test and monitor a series of heating systems within 9 properties on Futures Close that are archetypal representations of England's wider housing stock.
Cartrefi Technology Centre Design & Build	Design and build Cartrefi Technology Centre.

Planned projects

Part 2-of-5

High-pressure gas network

Managing the transition of high-pressure gas network assets to carry decarbonised gases

Project name	Description
High-Pressure Material Analysis	This project aims to evaluate the feasibility of using High-Density Polyethylene (HDPE) pipes for applications requiring pressures above 7bar and compatibility with 100% hydrogen. The study will include comprehensive analysis of HDPE pipe characteristics, market availability, technical performance, cost implications and potential risks.
Probabilistic fitness-for-service assessment of hydrogen pipeline girth welds	Girth welds of an unknown quality exist in the LTS and to repurpose a pipe for H2, these need to be known. The project will conduct a review of construction records to establish database of girth weld materials and their ages, also creating a statistical database for the welds.

Hydrogen

Understanding the impact of hydrogen production technologies and business models on the transition of our energy system

Project name	Description
Delocalised Hydrogen Storage	Exploring the role of decentralised hydrogen storage in supporting network flexibility and resilience during the early phases of hydrogen roll out. Also assessing suitable technologies, their feasibility, and how they could integrate into the gas network.
Volta Hydrogen	Build, commission and test the world's first direct electrically heated fluidised bed reactor. Specifically designed to produce hydrogen from natural gas on distributed sites with implications for the future use of Gas Distribution Networks.
Domestic Air Ingress Mitigations	Mitigation strategies have been identified which enable any air ingress risk to be effectively managed in domestic hydrogen installations. Work is now required to demonstrate that the identified mitigation strategies can be effectively implemented, focusing on ensuring that future domestic hydrogen appliances can be designed and certified to be resistant to flashback when supplied with a flammable hydrogen concentration.
Excess Flow Valve (EFV) Durability	Mitigation strategies have been identified which enable any air ingress risk to be effectively managed in domestic hydrogen installation. However, work is required to prove that in the worst-case scenario, ignition of a flammable gas mixture within the installation pipework, the functionality of the excess flow valve on the installation is not compromised.
Calorific value sensor Development	This project will take hardware from three technology partners and develop them from their existing Technology Readiness level to TRL 8. At which point, each technology partner will work at pace to commercialise such hardware, delivering to the UK market at a competitive price to support its wider adoption.
Air Ingress in Multi Occupancy Buildings (MOBs)	Research on air ingress to date has focused on domestic installations, with a strong understanding developed of the various mechanisms that control and influence air ingress. This understanding has enabled assumptions to be made in relation to the implications of air ingress in MOBs – these assumptions need to now be validated by experimental data to prove that air ingress does not become a barrier to hydrogen conversion of commercial properties.
Air Ingress in Commercial Installations	Research on air ingress to date has focused on domestic scale installations, with a strong understanding developed of the various mechanisms that control and influence air ingress. This understanding has enabled assumptions to be made in relation to the implications of air ingress in commercial (non-domestic) installations – these assumptions need to now be validated to prove that air ingress does not become a barrier to hydrogen conversion of commercial properties.
Project in and out	Evaluating the minimum hydrogen entry requirement for the network against the exit purity requirements. Different hydrogen production technologies produce hydrogen at different purities therefore we need to define a minimum entry standard, and understand what purity is needed at each stage, including the end user. We will also explore the impact of the network impurities on the hydrogen utilising existing work.
Gas Networks Hydrogen Awareness E-Learning	Developing a hydrogen awareness module aimed at gas network colleagues (potential roll out to project centres to bring the public along with the "whys of net zero and hydrogen being the fuel of choice"). Why are the Gas Networks having to look at change of fuel. Explain the progression of Towns Gas to Natural gas and potential move to Hydrogen. A comparison of Natural gas properties and Hydrogen. Describe the different ways to obtain hydrogen and uses. Link in completed projects for further reading.
Future Gas Training facility	The project will develop the concept of a facility suitable for training engineers on the safe use of blended gases and differences in existing appliances into a full network level system on a small scale, looking to use both blended and 100% hydrgogen for deployment in our network. With the system developed being classed as mobile, this also offers potential for movement around the network.

Continued >

Planned projects

Part 3-of-5

Hydrogen (cont.) Understanding the impact of hydrogen production technologies and business models on the transition of our energy system

Project name	Description
Hydrogen Storage Feasibility Study Phase 2	Assess the feasibility of all three of our gas storage tank sites to store hydrogen, blended hydrogen and what adjustments need to be made to help this.This is to include, suitable material identification and selection, and Liner testing.
Blending through existing infrastructure	A project to explore the ability to blend through our existing above ground infrastructure. The project will look at the engineering constraints of blending through an existing AGI rather than using a bespoke blending tee.
Design Principles of Repurposed Networks with Inadequate Data	Development of clear principles and procedures to follow when pipelines to be converted to hydrogen do not have a satisfactory level of historical maintenance data, installation records or shortfalls in condition survey data.
Demonstration of a Hydrogen Safety Assessment and QRA	Following work from all the safety related projects that networks have undertaken. It takes the desktop study work and starts to apply it to real-world examples, allowing networks to improve on learnings so far.
Effects of Water Ingress in a Hydrogen Network	Investigating the impact of water ingress in hydrogen gas mains, focusing on the unique challenges posed by the properties of hydrogen. Water intrusion can lead to issues such as corrosion of materials, hydrogen embrittlement, and contamination, potentially compromising safety and efficiency. The study will look at the effects of water ingress on the network and effects on hydrogen performance.
Project ADLIB (Advanced Development of Linear Infrastructure Benefits)	Designing and building a model to support the development of our HyLine assets. The model would be applied at the pre-FEED stage to help inform feasibility and justify the down selection of routes alongside upstream, midstream, and downstream connection points. This work addresses the increasingly stringent requirements set out for the justification of whole system benefits associated with new gas network infrastructure projects.
Alternative to overhead electricity cables	Investigating the opportunities of using hydrogen to move energy as an alternative to undergrounding electricity cables. This is following discussions at NICW where it was said that cabling underground is six times more expensive than via pylons. It also increases the number and size of sub-stations needed, and increases repair time.
HyRes Project in Rural Energy Systems – Build Phase	Building and installing a H2 blending injection unit as part of a rural energy grid.
HyLine South West feasibility study	A study to explore a H2 transmission pipeline based on the outcomes of our South West Conceptual Plan and Decentralised Alliance projects.
HyProximity	Assessing whether additional separation distance guidance is needed for medium and low-pressure hydrogen networks.

DID YOU KNOW?

58 ideas currently under consideration

Planned projects

Part 4-of-5

Industrial and commercial

Supporting the energy system transition for major energy users, businesses and other organisations

Project name	Description
HyLine Gogledd - Interconnection Agreement	Identifying the requirements for and establishing a draft Interconnection Agreement to support and formalise the interconnection of HyLineGogledd and HyNet. The draft agreement and learning from the work will then serve as a baseline for other potential network interconnections as part of industrial cluster development and network transition plans across GB gas networks. The need for the project has come from engagement with Cadent as part of HyLine Gogledd and HyNet discussions in North East Wales.
Low Carbon Conversion of Non-Domestic Properties Utilising Distributed Natural Gas – A Technoeconomic Study	This study facilitates the energy system transition by determining the decarbonisation options of existing non-domestic natural gas users. These users need to be properly considered by any heat policy decision that looks to reduce the number of consumers connected to the gas distribution network. This will increase costs for the consumers who remain connected or result in the gas distribution networks no longer being economically viable to operate and maintain.
End-user behaviour & Attitudes research – Industrial, Commercial & Non-domestic	Improving understanding of future plans of the broad range of industrial and commercial customers who use gas from the network, capturing perspectives which will inform future developments and innovation activity.
NEW-H2 Phase 2 Detailed Design, Planning, and Transportation Agreements	The North-East Wales Hydrogen Hub (NEW-H2 Hub) project proposal intends to implement full chain hydrogen production, transport and end use in Deeside. The project will work with the most significant established regional industrial site stakeholders and WWU as the local gas network.
NEW-H2 Phase 3 Construction	The North-East Wales Hydrogen Hub (NEW-H2 Hub) project proposal intends to implement full chain hydrogen production, transport and end use in Deeside. The project will work with the most significant established regional industrial site stakeholders and WWU as the local gas network.
NPT Net Zero Hub	Creation of a demonstrator Net Zero hub to showcase all potential domestic and commercial appliances and fuels that will could be available in the energy transition. The aim is to support understanding of local area energy plan deliverables, while intending to install hydrogen pipeline facilities to support local authority building decarbonisation.

Intermediate, medium, low-pressure gas networks

Managing the transition of intermediate, medium, low-pressure gas network assets to carry decarbonised gases

Project name	Description
Sector Valve Integration - FlowDivide	Development of an easy-to-install sectorisation valve without the need for costly excavation and large flow stopping sections. The valve is designed to be installed on PE systems via an electrofusion top tee with an additional fitting to deploy a double block and bleed valve.
Network Compass	The natural gas network currently uses a methodology for leakage classification which determines the standards for further investigation into the leak, plus the work required and completion. The leakage classification for hydrogen pipelines may need to be different. Leakage is impacted by factors such as gas readings, ground type, and age of main. Testing of leaks will be required to fully determine new standards required. Building of a new facility may be required, or there is a potential to base activity at existing WWU facilities, using helium for safety.
Enfield Biomethane Blending Tee Trial	Orbital are working with Ixora Energy who own Enfield bio entry site in the South West. Trial of the first blending tee in GB to blend biomethane with methane maintaining calorific value within the required range while reducing the propane needed and reducing the carbon intensity of the gas. Cost is to buy the tee only.

Planned projects

Part 5-of-5

Transport

Developing options for the use of decarbonised gases in transport

Project name	Description
Hydrogen Refuelling from the Network	Hydrogen refuelling directly from the gas network may be a possibility in the future, however there is a requirement to understand what additional equipment is required to facilitate refuelling directly from the network. An assessment of the requirements for both hydrogen ICE and hydrogen fuel cell vehicles will need to be looked at separately to determine purification requirements as well as compression.
Hydrogen Combustion Engine: Feasibility Study	JCB with H2 combustion engine retrofit, feasibility study.
Hydrogen Fuel Cell Operating Hub for Repex/Large Scale Projects	Investigating long duration operation sites having a fuel cell to power all ancillary equipment. Outcomes will be a literature review, feasibility study, and a TRL assessment.
Hydrogen Combustion Engine: LCV Retrofit	Centre for future clean mobility & Emotive. Retrofitting a H2 fuel cell drive train into an existing LCV. Working with the Centre for Future Clean Mobility and Emotive Group.
Hydrogen LCV Vehicle Trial	A long-term trial for as many H2 large commercial vehicles that are available. Working out of our WWU operating depot.
Exeter Transport Hub	Conceptual plan to link to Tower Group's Hydrogen development proposals for a large transport hub around the Exeter M5 services region. Links to HiiROC & AD Biomethane project at Greendale industrial estate. H2 Pipeline from Greendale to M5.
Rural transport feasability study	An investigation into the decarbonisation of transport in rural areas. Connecting with Ceredigion Council on this project.

DID YOU KNOW?

We worked with **33** unique partners on our NIA projects in 2024/25

Out and about

While we share learnings and outcomes from our projects and engage with our stakeholders all year-round, events offer more opportunities for us to get together with other innovators, industry colleagues and decision makers – to initiate or build on partnerships, to share information, and to keep the momentum moving. Here are some of the key events we attended in 2024/25.

National engagement: Innovation Zero

A conference that celebrates all forms of innovation from transformative technologies to forward-thinking policies, the 2025 Innovation Zero World took place on 29-30 April. Bringing together innovators, policymakers, investors and corporate leaders, it's aim is to encourage collaboration, shared insights, and to drive business.

This was the second Innovation Zero World our Innovation team has taken part in, and we showcased a number of innovative project case studies with learnings and outcomes which included our NextGen project that uses manufacturing wastewater to produce clean hydrogen. Delegates from all UK gas networks also attended, demonstrating our collective commitment to reaching net zero.

With 200+ individual sessions spread across 13 forums and theatres, covering themes including Energy, Supply Chain, and Infrastructure, the programme was designed to bring the 10,000+ delegates fully up to date with the latest developments in the transformation to a low carbon economy.

National engagement: Energy Innovation Summit

The focus of this year's Energy Innovation Summit was, '*Accelerating Innovation to Deliver Net Zero*.' Two of our teams – Net Zero and Innovation – headed to Liverpool to join more than 1,100 attendees on 29-30 October 2024, and share the continued work we're undertaking to decarbonise the gas network. At our exhibition stand, we showcased a number of innovative case studies across our portfolio and our whole system energy model in addition to our HyLine Cymru model which shows visitors how the project's proposed 130km hydrogen pipeline could deliver low-carbon hydrogen to industrial customers across South Wales.

Across the two days of the summit, knowledge was shared from over 100 recent innovation projects delivered by the energy networks. In addition, the summit held dedicated discussions about the energy networks' perspective on the innovation that's needed to address gaps in delivering net zero.

National engagement: Parliamentary Group for Energy Studies

Results from our Accelerating Progress study were shared with Parliamentarians and other policymakers at the Parliamentary Group for Energy Studies in the House of Commons on 4 February 2025. The project report was formally launched by IGEM Future Energy Networks (IGEM FEN) CEO James Earl, who highlighted key findings on the role of the gas networks in delivering further and faster reductions in greenhouse gas emissions to contribute to the UK's carbon budgets. The report has been published on the IGEM FEN website and continues to be referenced in industry presentations and other documents.

Out and about

Continued...

Stakeholder engagement: The Green Gas Taskforce

Over 100 industry representatives from the GB biomethane industry, the UK gas networks, and key sector groups were brought together for the launch of the Green Gas Taskforce at SGN's London office in May 2025. Our Head of Net Zero & Sustainability Matt Hindle chaired a discussion on demands for green gas.

The taskforce itself is a collaboration between 10 of the nation's largest biomethane generators, shippers and traders, all five gas networks, and four important industry groups. It aims to increase understanding of the role of green gases in our sector's transition to net zero, while boosting energy security and driving growth. As Matt summarised, "*The Green Gas Taskforce is all about collaboration, which is essential to deliver the energy system of the future*."

Regional engagement: NEWID Launch of Decarbonisation Plan

The NEWID Cluster Plan was launched as part of a one-day event at the Advanced Manufacturing Research Centre (AMRC) Cymru, on 6 February 2025. We're proud to be one of five partners to the group, whose name in full is, the *North-East Wales Industrial Decarbonisation cluster*. NEWID's goal is to substantially reduce the carbon footprint of industry in the region by 2030 – with the gold-standard of full decarbonisation by 2050. Our co-partners are SP Energy Networks, Uniper, Net Zero Energy Systems and Bangor University, and additional support is being given by key stakeholders in the region. We were delighted to be part of the launch in North Wales, one of the regions where we manage our gas networks, and we are committed to this collaboration that is working to make North East Wales a greener, cleaner place.

Regional engagement: EmpowerCymru 2025

Hosted by Net Zero Industry Wales (NZIW), EmpowerCymru is their annual conference that brings together industries, public sector organisations, academic institutions and investors to consider Net Zero strategies for Wales. Established in 2022, NZIW is an independent not-for-profit body that provides guidance and support to Welsh industries on their transition to net zero.

As part of the many discussions in Cardiff on 10 March, our Head of Net Zero and Sustainability Matt Hindle sat on a panel titled Mobilising Wales for Delivery, where he talked about our 'Accelerating Progress' study at WWU. Within this he discussed the need for a collective focus on the right infrastructure for Wales and the opportunities this can bring; in addition to the importance of placing people and skills at the centre of our Net Zero ambitions.

During the event, NZIW launched its **Industrial Strategy for Wales**. The strategy explains in detail how Wales can be a leading clean energy transition hub and a cornerstone of the UK industrial base – and we look forward to being part of ongoing collaborations to make this happen.

Please stay up to date online by following our social media channels

@wwutilities

wales-&-west-utilities

wwutilities

@wwutilities