

WALES & WEST UTILITIES

Delivering Innovation

2022/23



Welcome

I'm delighted to introduce our Network Innovation Report for 2022/23. This report marks the next stage in our journey to becoming a [sustainable business](#), bridging the work that is already underway and the exciting new developments on the horizon, and innovation plays a key part in that journey.

This year's annual report showcases our innovation work for 2022/23, outlining some of the exciting projects we've delivered over the last 12 months. We've invested a total of £2.2m to support the government's 2050 net zero ambitions, which includes £1.5m of Network Innovation Allowance (NIA).

Over the last year, we've started 19 innovation projects, around half of which were collaborative, each building knowledge and delivering evidence of the role the gas networks can play in decarbonisation.

The report has been informed by the collaborative Energy Networks Innovation Strategy. The strategy gives direction for network innovation projects and will continue to underpin the work we do. Crucially, it has also been shaped by our own business priorities, looking at how we can use innovation to keep delivering a safe and reliable energy system that is fit for the future.

Within those priorities, we're focusing on how we can become a more sustainable business whilst still providing value for money and the service our customers expect. In the last year, the UK Government has published several reports outlining their plans for the future of energy in the country. This means doing things differently. Our society, economy and energy system will need to undergo significant change if we're to fulfil our ambitions. The decarbonisation vision will include a variety of low-carbon solutions, including hydrogen, electrification, nuclear, and green gases.

The cost-of-living crisis has impacted all our customers and continues to affect those who are most vulnerable in our communities. Now, more than ever, it's clear that we need an energy transition that minimises costs and leaves no customer behind. This is particularly true for decarbonising heat, where low-carbon solutions will still need to deliver value for money, as well as energy safety and security.

As a business, our vision is of an energy system that is secure, cost-effective and deliverable. Currently, our communities rely on fossil fuels for transport, industry, to heat our homes and feed our families. As a network that transports gas, it is our responsibility to look at how decarbonised gases such as hydrogen and biomethane, can be used to deliver this transition, using our existing infrastructure, helping to minimise costs and disruption to our customers. It also means looking at how we fuel our fleets, manage our sites and reinvest back into our natural environment.

Innovation will help us deliver this vision with new ways of thinking and working. It's not just a technical challenge: innovation also means engaging our consumers and stakeholders in changes to the energy system and options for the future, ensuring that no one is left behind. We work closely with our Customer Engagement Group and other key stakeholders like our Citizens Panel, businesses, government, local authorities and industrial clusters.

We also want to be proactive in generating fresh partnerships across both existing and unexplored areas, as we recognise the value of different perspectives and embracing new ideas. We continue to welcome new ideas and new innovators and partners to [work with us](#) in such an exciting and fast-moving environment.

WWU will play a full part in delivering a decarbonised energy system and looks forward to continuing to engage customers as we deliver this journey.

– Graham Edwards, CEO



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Introduction to innovation

During 2022/23 we've expanded and accelerated our innovation project portfolio to address the urgency required to meet the UK Government's ambitious 2050 net zero targets.

There is a growing realisation of the need for hydrogen to meet industrial and commercial consumer requirements and we have significant projects covering this area. While there is uncertainty on the future shape of our energy system and the extent of the role for hydrogen in domestic heat, we're exploring this area to provide evidence to allow the UK Government to make key decisions on policy and understand the role of the gas network in supporting the transition.

We want to make progress in the short as well as the long term. Our projects have been exploring hydrogen blending into our network as well as increasing biomethane, with a policy decision on blending expected late 2023. Others like our [Redcar hydrogen village project](#) with Northern Gas network, are exploring hydrogen as an option for heating, aiming to give Northern Gas Networks consumers options and choice.

Our aim is to create a robust and balanced portfolio of Energy System Transition and Vulnerable Customer projects, including hydrogen, biomethane, transport, hybrid heat, data modelling/digitalisation, in addition to ensuring a just transition for vulnerable customers.

Showing value on our investment in innovation is vital, so this year we've introduced a new 'project builder' section that shows how project learning is continually built upon, influencing future direction and strategy. We've also introduced a new way to view our portfolio more easily with the [systemic building blocks](#) page. Every innovation project is assessed for its benefit to the transition, impact on vulnerable customers, and novelty; avoiding duplication across projects better enables us as networks to explore change efficiently and collaboratively.

Innovation key drivers are:

- Our brand new [Sustainability Strategy](#)
- Our [business plan](#)
- The [Energy Network Association \(ENA\) strategy](#) – developed with all gas and electricity networks and transmission
- Our internal net zero delivery plans linked to the new [systemic building blocks](#)
- [Consumer and stakeholder research and outputs](#)

Collaboration between gas and electricity networks, transmission, and external innovation partners is key to the journey to net zero, as is taking the best global innovation and learnings from other industries. We listen to consumer feedback and review our strategy and approach with stakeholders, including our Customer Engagement Group and Citizens Panel.

Due to regionality of the networks it is vital that we work innovatively with local energy planners and industrial clusters as part of the transition. Each area has different needs and requirements regarding people, geography, energy networks and building stock, and our [Local Area Energy Planning \(LAEP\)](#) provides data to local governments and network operators to explore potential future local area scenarios to cost-effectively decarbonise.



This report summarises our activities through this last regulatory year and sets out our strategy and upcoming projects and priorities, including how you can [work with us >](#)

Project funding

We have several mechanisms available to support innovative activity: the [Network Innovation Allowance \(NIA\)](#), the [Strategic Innovation Fund \(SIF\)](#), and other regulated/non-regulated funding.

Network Innovation Allowance (NIA) is the building block of innovation funding and has helped us build a focused innovation team looking at the future of energy and decarbonisation of our network, creating a robust portfolio of projects, with a variety of Technology Readiness Levels (TRLs), often building on knowledge gained in earlier projects, or leading to further innovation in new areas, as evidenced in our [‘project builder’ pages](#).

Almost half of the innovation portfolio is in collaboration with at least one other network, but even where we lead a project without collaboration, the learning is taken and applied across all networks. NIA project outputs are [published online](#), so partners and other networks can continue to build upon the knowledge, ensuring value to customers. We also disseminate our project learnings at events, such as the [Energy Innovation Summit](#), and through groups, such as the Energy Research Plenary and Hydrogen South West.

The NIA mechanism allows networks to be agile and mobilise projects in a timely manner. This

has allowed WWU to invest £1.5m across 27 projects in the past 12 months. These projects cover a range of topics including consumer vulnerability, safety cases and storage options for hydrogen. More Information on projects can be found on [pages 11-18](#).

At the time of publication our two current [Strategic Innovation Funded \(SIF\) projects](#) have just finished Discovery Phase, and we’re always looking for innovation ideas to address the annual challenges of this application-based funding mechanism which looks to accelerate innovation from early research into demonstration stage.

We also have access to funding for larger net zero

projects through the Ofgem re-opener process and are always looking for other investment opportunities, such as DESNZ hydrogen funding, and other private investment partners.

Not all innovation can succeed, and we look to fail fast where projects are not delivering the outcomes we were expecting, such as the [LPG to Hydrogen Village: Feasibility and concept design project](#), which showcases our strong governance process.

In 2022/23 we have invested **£1.5m** across **27** NIA projects



If we think your new idea is a good fit for us, we’ll work with you to choose the best funding mechanism as we [take your idea through our process >](#)



Our innovation team

Innovation is critical to the 2050 net zero journey as it requires fast paced change and new ways of thinking and working.

Our [2021/22 innovation report](#) was focused on how we needed to adapt our strategy for the new price control period.

This year's report shows how we've increased investment and expanded our team to enable us to support a larger project portfolio.

The innovation team would love to meet innovators and partners virtually, or at any of [our events](#) to discuss new ideas, projects and collaborations. You can also [contact us here](#).

Innovation team, left to right:

Ashley Williams, Lydia Whatley,
Sian Rowlands, Geraint Herbert



2022/23 in stats

19

NIA projects
kicked off



Ideas currently
under consideration

121



47%

NIA projects
kicked off
in 2022/23 were
collaborative



Total
investment of

£2.2m

on all projects
in 2022/23
which includes £1.5m of NIA



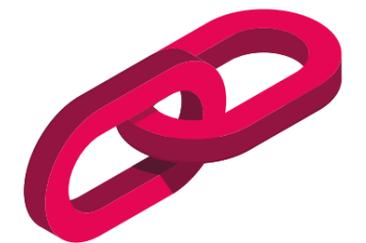
Worked
with

16

unique
partners on

16

NIA
projects



Current projects

Over the following pages you will find all the exciting project work we have undertaken over the past 12 months. These are shown as a high-level list which includes a collaborative project helping consumers in vulnerable situations navigate street works, and several in-depth case studies, including lessons that can be learnt from the last major transition from town gas to natural gas.



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Systemic building blocks

This is our new systemic building blocks diagram showing our network positioned in the end to end gas distribution process that will take us to 2050.

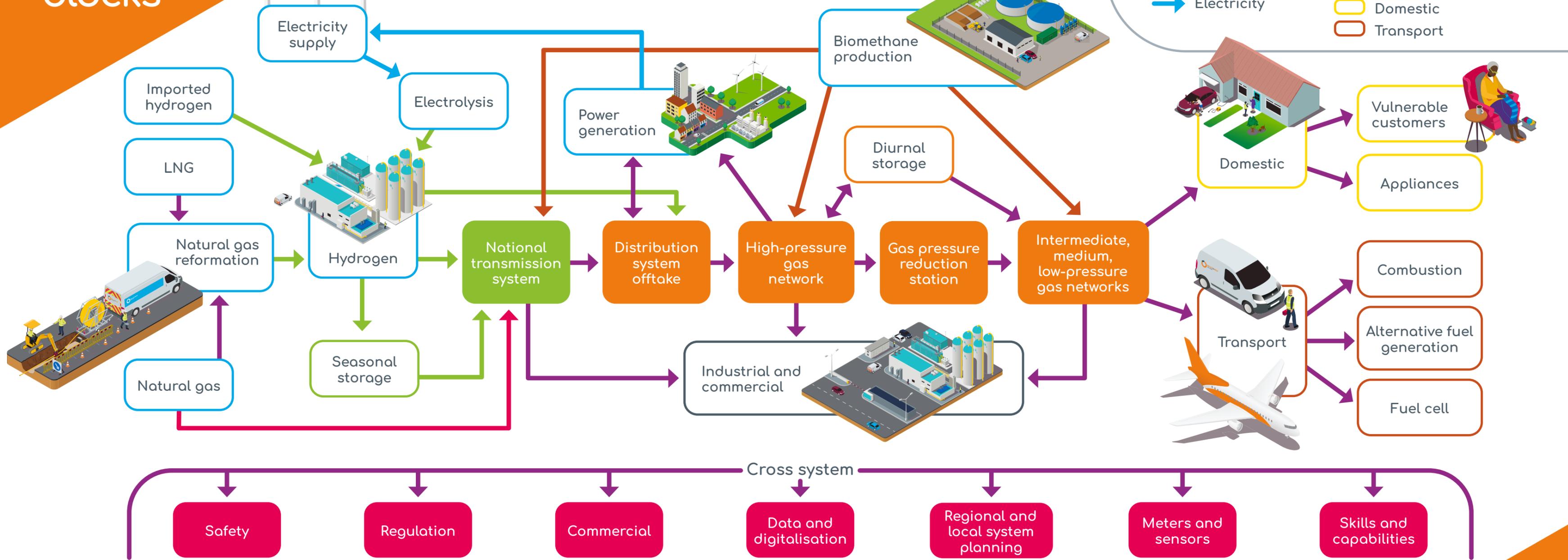
Each project in this report is aligned to these building blocks, so we can easily see how our projects spread across our network and address the needs of our customers.

Click on any of the blocks to see our projects grouped to these themes.

Key:

- Natural gas
- Hydrogen
- Biomethane
- Any/all gases
- Electricity

- Upstream gas production and generation
 - National gas system
 - Distribution system
- Customer:**
- Industrial and commercial
 - Domestic
 - Transport



Live project portfolio

Part 1-of-3

The following pages outline our live and planned project portfolio, 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
NIA_CAD0079	GD2-14 Functional Specification: Hydrogen Blending Infrastructure	Development of a generic specification, that will set out the functionality requirements for a hydrogen-to-grid blending facility.	Dave Lander Consulting and Thyson Technology	
NIA_SGN0025	Interventions for Hydrogen by Asset Groups GD2-15	Part of BEIS Network Safety & Impacts programme to evaluate network evidence and research, identifying potential gaps for specific asset groups.	DNV	
NIA_WWU_2_15	Hydrogen Village Regulation Project - GD2-58	Demonstrate hydrogen blending into a rural below 7Bar network using established industry processes, applicable to a wide range of rural areas considering community energy projects or Smart Local Energy Systems.	Frontier Economics	
NGNG_NIA_346	ATEX Equipment & SR/25 Modification Assessment GD2-10	Hazardous area assessment to determine variation in zoning and suitability of existing electrical and instrumentation equipment and connections following conversion to 100% hydrogen.	Fingleton White	
NIA_NGGT0185	NSIB Skills & Competencies GD2-24	Develop methodologies for skills training and development of hydrogen competencies in the UK gas industry (transmission and distribution).	EU Skills	
NGN_NIA_344	H21 Ignition Consequence Research GD2-07	Investigate the limitations of existing knowledge when it comes to natural gas as a fuel and how introduction of hydrogen into domestic settings might change this.	DNV	
NIA_NGN_414	Legislative and Regulatory Analysis GD2-122	Assess commercial and regulatory impact of transitioning circa 2,500 customers in Redcar as part of the Hydrogen Village Trial.	Element Energy	
NIA_WWU_2_08	SWIC - Hydrogen Peaking Plant Feasibility Study GD2-1	A project to develop a study to assess the interaction of gas-fired peaking plants connected to WWU network, when the plant is converted to hydrogen.	Costain	
NIA_NGN_302	H21 - Wider Impacts of Hydrogen GD2-120	A project to assess the impact of the transition from natural gas to hydrogen on the distribution networks, with a focus on the characteristic differences between the two gases.	NEL	
NIA_CAD0073	Common Future End States	A project to assess the key strategic gas system options, impacts, barriers and opportunities in order to support policy decisions on whether to proceed with a transition to hydrogen for domestic, commercial and industrial heat production.	Element Energy	
NIA_CAD0076	GD2-13 Hydrogen Blending: Functional Spec for Commercial Frameworks (Phase A)	This project seeks to explore and recommend adaptations to the existing commercial frameworks to enable hydrogen blending into the UK gas networks from industrial clusters.	Frontier Economics	
NIA_WWU_2_04	Tools of Engagement Phase 2	A project to engage with a group of potential stakeholders to test the Energy Systems Toolkit that was created in GD1, in real-life situations.	Delta-EE	

Distribution system offtake Understanding changes to the interface between national and local systems during the transition.

NIA_WWU_2_07	SWIC: Assessment of potential hydrogen demand in 2030-2050	A project to identify the main sites for supply and demand of hydrogen, together with an outline layout for hydrogen infrastructure, within the South Wales Industrial Cluster (SWIC).	Progressive Energy	
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If you have an idea that aligns with our key themes, please [contact us >](#)

Seasonal storage Assessing options for longer term energy storage in the gas system.

Project reference	Project name	Description	Partner	Link
NIA_WWU_2_10	Potential for salt cavern storage of hydrogen in and near South Wales GD2-33	Identify suitable locations for salt cavern development for hydrogen storage.	Progressive Energy	

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

NIA_WWU_2_12	EUSE - Ventilation Within Buildings GD2-20	Investigate if conversion from natural gas to hydrogen creates new issues with regard to the existing ventilation within properties.	KIWA	
NIA2_SGN0030	HyCompact Testing GD2-27	Carry out a series of laboratory tests on the HyCompact unit and Passiv Systems control systems to understand how future gas usage may change.	KIWA	
NIA_WWU_2_13	EUSE – Hazardous Areas Within Buildings GD2-21	Investigate the safety implications associated with conversion to hydrogen and use of the existing infrastructure within homes.	KIWA	
WWU_02_01	Cartrefi Hydrogen Homes	Demonstrate low-carbon heating alongside fabric retrofit, using a range of different technologies. WWU is a project supporter/advisor.	KIWA	
NIA_NGN_338	Street Score 2 GD2-121	A project to continue the understanding of the challenges for vulnerable customers travelling through street works and to develop a range of prototype solutions to minimise disruption to these customers.	Steer Energy	
NIA_WWU_2_05	Safely switching vulnerable consumers to hydrogen	A project to inform the design of a safe way to switch vulnerable WWU customers to hydrogen.	ESC	

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

NIA_WWU_2_09	GD2-17 Industrial Fuel Switching Phase One	Research feasibility of fuel switching at two sites in North Wales.	Apollo	
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Industrial and commercial Supporting the energy system transition for major energy users, businesses and other organisations.

NIA_WWU_2_16	Hydrogen for Industrial Estate Heating GD2-68	Investigate feasibility of new Thermal Plasma Electrolysis technology to create hydrogen that has a small footprint and on-demand usage.	Apollo	
NIA_WWU_2_08	GD2-1 SWIC - Hydrogen Peaking Plant Feasibility Study	Develop a study to assess the interaction of gas-fired peaking plants connected to WWU network, when the plant is converted to hydrogen.	Costain	



If you have an idea that aligns with our key themes, please [contact us >](#)

Intermediate, medium, low-pressure gas networks

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

Project reference	Project name	Description	Partner	Link
NIA_NGN_301	GD2-22 Failure Modes and Permeation Testing of PE	Assess impact of characteristics of hydrogen from natural gas on distribution networks for various scenarios.	Radius Plus	Link
NIA_WWU_2_17	Lessons from the Past: What can we learn from past energy transitions in the Gas Industry GD2-59	Review the challenges faced by the British Gas industry from nationalisation in 1949 onwards so lessons learnt can be applied to current hydrogen switching process.	WSP	Link
NIA_WWU_2_11	LPG to Hydrogen Village: Feasibility and concept design GD2-18	Different methods of supplying hydrogen to customers in villages currently supplied by liquified petroleum gas (LPG).	Tutis Energy	Link
NIA_WWU_2_02	Regional decarbonisation pathways	A project that will provide a strategic plan and decarbonisation roadmap for the WWU network, focusing on individual regions and how these link together and a conceptual plan that will illustrate the gas network end state and transition pathway.	Costain, Energy Systems Catapult	Link

Transport

Developing options for the use of decarbonised gases in transport.

NIA_WWU_2_14	Hydrogen for Aviation across the Western Gateway GD2-34	Report to detail the strategic and technical evidence base for potential role of hydrogen in aviation and future development opportunities within the sector and wider aerospace supply chain.	ARUP	Link
SIF_WWU_2_2	Integrated Hydrogen Transport Hubs Discovery GD2-71	Determine if hybrid hydrogen and district heating systems can support the decarbonisation of transport and heat at the lowest cost for customers.	Guidehouse	Link
NIA_WWU_02_19	Integrated Hydrogen Hubs - GD2-09	Determine if hybrid hydrogen and district heating systems can support the decarbonisation of transport and heat at the lowest cost for customers.	Guidehouse	Link
SIF_WWU_2_01	HyPark	HyPark aims to support the rollout of electric vehicles, using smart technology to identify the best way to charge the vehicle, while keeping the impact on the electricity grid to a minimum. The gas grid connection means that, in the future, the fuel cell will be converted to run on hydrogen, while HyPark will also enable the fuelling of hydrogen vehicles.	Passiv, Easee	Link

Hydrogen

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

SIF_WWU_2_3	NextGen Electrolysis Discovery GD2-64	Reduce the cost of hydrogen production by tackling the real-world operational constraints of electrolytic production, specifically the need for high-purity water.	Hydrostar	Link
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Lessons learnt from the past

While the industry has investigated the potential implications of switching to hydrogen on the gas infrastructure, it has not yet drawn on its own experience of converting from town gas to natural gas in the period just after nationalisation. With such a rich vein of documentation from that era available, this project seeks to discover what lessons can be learnt from that energy transition.

Project breakdown

HOW: Gap identification

WHO: Wales & West Utilities

PROJECT PARTNERS: WSP

FUNDING MECHANISM:
Network Innovation Allowance



Need

Reducing greenhouse gas emissions to net zero by 2050 means providing decarbonised heat and power for industry, homes and transport, which future energy modelling shows as being achievable with hydrogen.

This project is reviewing previous transitions, notably the switch from town gas to natural gas. It is hoped the lessons learnt from this review can be applied to the current proposed process of switching to hydrogen.

Approach

The research team, WSP, undertook a deep dive into the published literature of the time, sourced from books, industry reports, journals and wider media such as newspapers, films and television footage.

The team's remit was to investigate a range of different topics, including:

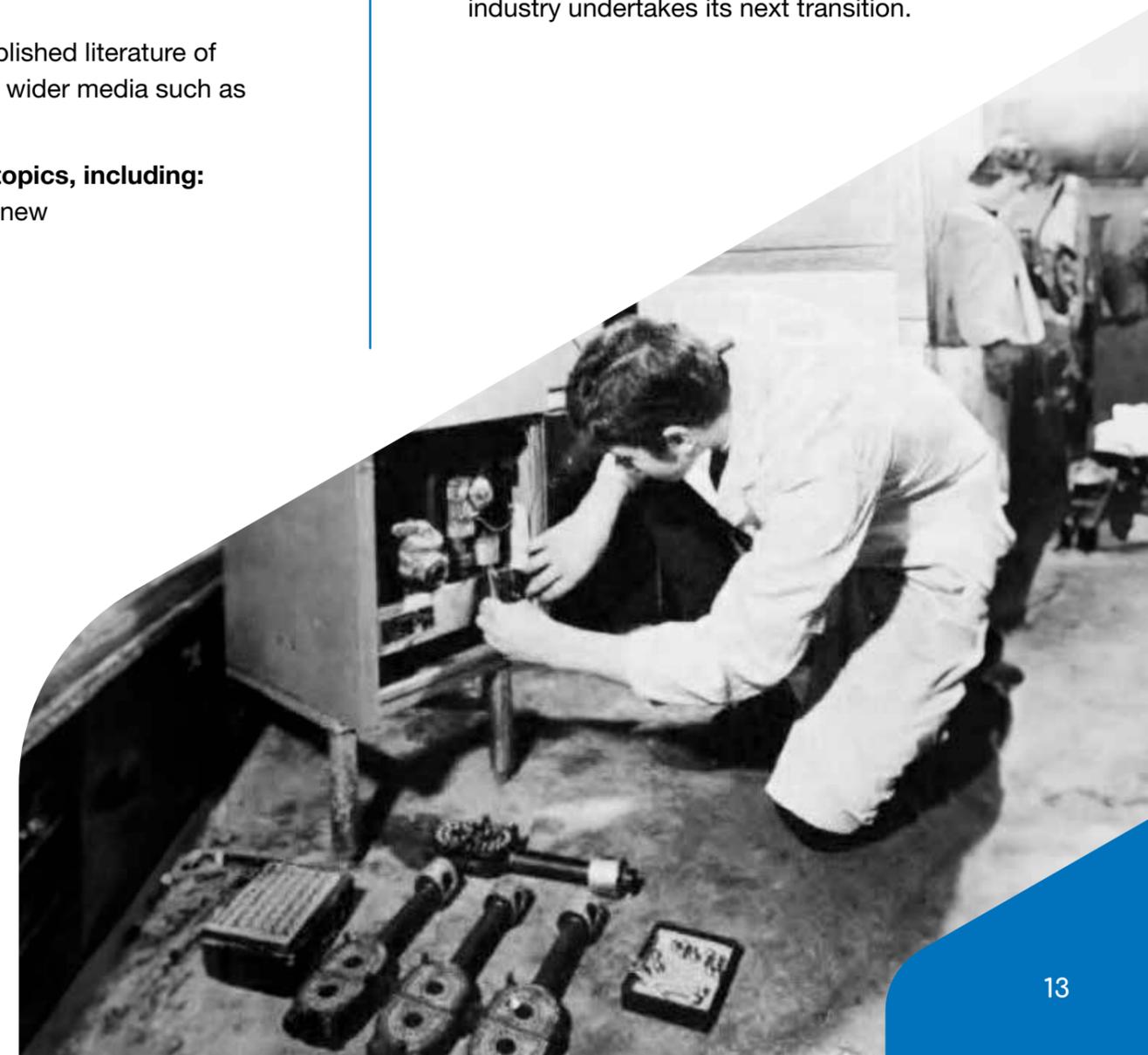
- How the industry managed turbulence and change to find new ways of producing and obtaining gas
- How new gases were introduced
- The decision for converting to natural gas
- How the industry restructured itself to enable it to undertake the conversion programme
- Conversion of gas appliances
- Safety and regulatory influences
- How the conversion programme was financed and what it cost.

Once complete, the findings will be discussed with current and former gas industry employees with experience of that era to gauge whether it corresponds with their own recollections of the events before being compiled into a final report.

An independent production company is also producing a film that details the findings and includes archive footage and interviews, to help disseminate material from the project.

Benefits

The findings of the research will be used to inform the gas distribution networks and the wider gas industry of the processes employed and the reasoning for the decisions as customers transitioned between energy sources. The lessons learnt aim to inform the rollout of low-carbon hydrogen as the industry undertakes its next transition.



CASE STUDY:

Hydrogen for aviation

Hydrogen for aviation

Hydrogen could play a role in decarbonising the aviation sector, not only as a direct fuel source for aircraft but also for the production of Sustainable Aviation Fuel (SAF) and in the supply chain.

This project aims to produce the strategic and technical evidence base for the potential role of hydrogen in aviation, the implications for gas distribution networks and the future development opportunities within the sector.

Project breakdown

HOW: Procurement tender

WHO: Wales & West Utilities

PROJECT PARTNERS: Arup

FUNDING MECHANISM:
Network Innovation Allowance



Need

The aviation sector has a significant challenge to help achieve net zero, as it currently contributes 2.5% of global CO2 emissions and 7% of UK greenhouse gas emissions. Hydrogen has the potential to help decarbonise the sector by providing alternative aircraft fuel and energy for its supply chain.

With the government's Jet Zero policy demanding at least 10% of jet fuel is SAF by 2030 and with Wales & West Utilities' area being home to leading aerospace businesses, it's crucial the business understands the potential scale and timing of requirements for hydrogen for aviation, alongside potential barriers and challenges.

Approach

Our project team is assessing demand from aviation across the Hydrogen South West (HSW) and the South Wales Industrial Clusters (SWIC) areas, focusing on Bristol and Cardiff as case studies, to gain a deeper understanding of opportunities and barriers. This will inform the infrastructure requirements and any repurposing of assets for hydrogen around them, with recommendations for further steps to fill evidence gaps.

The project will:

- Undertake a baseline review of current literature and Technology Readiness Level (TRL) for hydrogen use in UK aviation, including SAF, hydrogen for fuel cell and combustion for aircraft, ground operations and supply chain
- Map stakeholders and produce an engagement plan for gathering the required demand data from a wide range of sources across the aviation sector
- Carry out case studies for potential hydrogen requirements (demand, quality/purity and other considerations) for Bristol and Cardiff airports and aerospace sectors and look at how this may evolve in different phases between 2022-2050 in the following areas: ground operations, SAF, short and long-haul aircraft and the supply chain.

Benefits

This project will give us a deeper understanding of how gas networks can support the decarbonisation of future airport operations, the wider aviation sector and its supply chain where hydrogen plays a key role.

It will enable each gas network to understand the potential demand and therefore make crucial hydrogen investment decisions while also opening opportunities for new consortia to help drive a whole-systems approach to developing robust and low-risk hydrogen supply chains.



HyLine

HyLine Cymru is a study to assess the feasibility of a pipeline network from Pembroke to the Swansea Bay area. If built, it will pave the way for commercial-scale hydrogen production in Pembrokeshire, Port Talbot and in the Celtic Sea, while also providing infrastructure for industry in the region to begin fuel-switching their processes to hydrogen.

Project breakdown

HOW: Procurement tender

WHO: Wales & West Utilities

PROJECT PARTNERS: Apollo Engineering

FUNDING MECHANISM: NZARD UIOLI Allowance

Need

Alongside the UK's ambitious net zero targets, there is strong demand from industry to decarbonise. Hydrogen can replace natural gas in industrial processes and can also be used for heating and cooking in homes, so developing the infrastructure for it is critical if we are to enable the switch to the fossil-free fuel, especially where electrification is not possible.

This feasibility study builds on our Regional Decarbonisation Pathways work to begin the development for such infrastructure – a dedicated hydrogen pipeline system running from Pembroke to our Dyffryn Clydach offtake and onwards to Port Talbot to connect hydrogen production with demand.

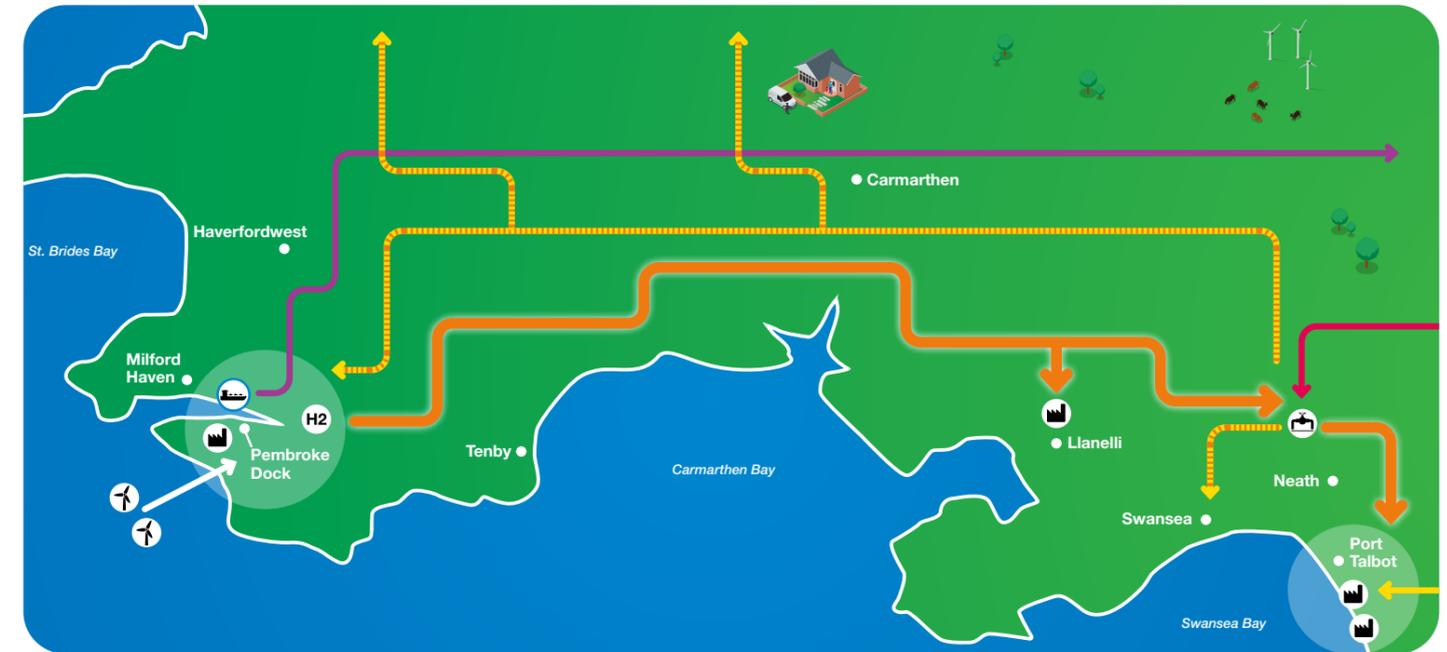
Approach

The feasibility study, conducted in collaboration with partners in the South Wales Industrial Cluster, is split into six work streams.

These are:

- Demand analysis and flow assurance – an initial assessment of low-carbon hydrogen production and demand in line with developing projects to guide the supply side and inform the scenarios
- Expansion options and storage – using the above analysis to set out the future expansion of the pipeline beyond Port Talbot, including opportunities for blending into the existing Local Transmission System and linkage with Project Union
- Planning and regulatory requirements – setting out the approach for securing all necessary consents for the pipeline and associated facilities within the necessary timescales as well as exploring the regulatory operating model for the pipeline
- Pipeline engineering design – developing a pipeline Basis of Design that includes the 'Minimum Functional Specifications' for material selection, assets and equipment that ensure safety and suitability for hydrogen transportation
- Pipeline conversion options/phasing – considering a number of alternative pipeline corridors using software such as AutoCAD Map 3D to align CAD and GIS map data to optimise the route
- Financial assessment and programme design – generating the costings for the required assets based on preferred route and demand scenarios, design basis and specification. This also includes a prospective programme for the FEED, Detailed Design, and Construction phases required to commission the pipeline in the early 2030s.

The findings will be published in a final report.



Benefits



This study is the first phase of developing a dedicated hydrogen pipeline system in South Wales that links hydrogen production with industrial demand. The pipeline would provide the infrastructure for key industrial customers to begin fuel-switching their processes to hydrogen in the 2030s and has been recognised as a key pillar of the South Wales Industrial Cluster Plan. It would also create the demand that would unlock additional planned hydrogen production facilities in the region and enable the anticipated domestic heating conversion process.

CASE STUDY:

Ventilation within buildings

Ventilation within buildings

Ventilation of domestic properties plays an important role in their design, affecting air quality, thermal comfort, and the dispersion of flammable gases in the rare event of a leak. This project aims to develop evidence on the impact of ventilation on properties using hydrogen, to support development of policy, regulation and standards.

Project breakdown

HOW: Procurement tender

WHO: Wales & West Utilities, on behalf of all GDNs

PROJECT PARTNERS: Kiwa Energy

FUNDING MECHANISM: Network Innovation Allowance



Need

To safely manage hydrogen in buildings, we need to understand how it will behave under different levels of domestic ventilation. This project will help inform the standards we need to continue with these initial hydrogen conversion trials.

Approach

The project team took a novel approach and used whole building ventilation interaction modelling, looking at how the whole building performs and the interaction of ventilation between rooms, storeys and cupboards.

Having reviewed the work already undertaken and associated literature, the project team undertook several modelling activities looking at a range of scenarios to assess leaks under different ventilation regimes. Their modelling has also considered the effect of mechanical excess flow devices and audible hydrogen alarms.

The team has also incorporated work from previous projects, including air tightness testing in homes. Alongside this, they held a ventilation workshop to discuss progress and get feedback on the proposed options from the wider industry.

A final report will be peer reviewed by gas distribution networks, industry experts, training providers, installers and standards bodies. Once the outputs and recommendations from the domestic ventilation project have been agreed by the industry, they will be considered on a wider programme level.

Benefits

Understanding the impact ventilation has on hydrogen in domestic properties allows us to assess the risks and any mitigations required.

Ultimately – alongside other similar projects – this helps us define the approach to safely delivering hydrogen as a low-carbon energy alternative for heat that will help the UK achieve its net zero emissions targets.



CASE STUDY:

Hazardous areas within buildings

Hazardous areas within buildings

As the gas industry looks to provide customers with low-carbon hydrogen in place of natural gas, this project aims to ensure robust evidence is in place around the interaction between hydrogen and other utilities in buildings, to allow risks to be mitigated.

Project breakdown

HOW: Procurement tender

WHO: Wales & West Utilities, on behalf of all GDNs

PROJECT PARTNERS: Kiwa Energy

FUNDING MECHANISM: Network Innovation Allowance



Need

Repurposing the UK gas networks with hydrogen to support the challenge of achieving net zero has the potential to deliver an efficient, cost-effective transition to net zero carbon emissions across the energy system.

This study seeks to broaden our understanding of the conversion to hydrogen in the context of the existing infrastructure within homes. Networks need to understand if the conversion brings about new issues regarding proximity to other existing utilities in properties. In particular, the effects of any separation distances to existing services such as electric cables are currently unknown.

The outputs of this project will be integral in quantifying the feasibility of large-scale hydrogen conversion of existing natural gas infrastructure.

Approach

The project was composed of the following three work packages:

- Assessment of existing work and the current landscape: designing the literature review architecture to identify, assess and catalogue the work that has already been done in this area for natural gas. The team then identified and collated the information that could contribute to findings in the later stages of the project.
- Literature review – hazardous areas for hydrogen: initial desktop research into relevant projects and producing a framework to analyse the outputs. IGEN/SR/25 Hazardous area classification of natural gas installation is in the process of being updated with a supplement for hydrogen and blends of up to 20% hydrogen in natural gas, so this was also reviewed alongside other relevant future roadmaps.
- Final Report: findings from the above research were compiled into a formal report to provide the necessary evidence to inform the case for safety in hydrogen conversion.

Benefits



Findings will inform decisions around the safe delivery of hydrogen to buildings, to support the decarbonisation of the UK energy system.

Ultimately, this project – alongside other similar projects – will help us build the safety case for hydrogen as a low-carbon energy alternative for heat that will help the UK achieve its net zero emissions targets.



SIF project case studies

We led on two SIF projects for Round 2 Discovery Phase and are currently in the process of applying for Alpha phase funding.

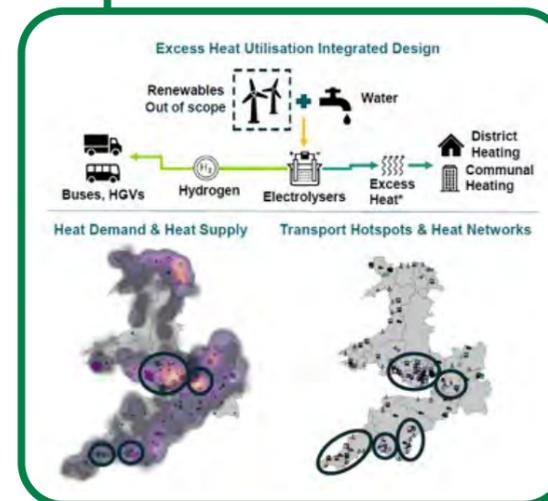
To read more about how the SIF process works, please [click here](#).

Integrated Hydrogen Transport Hubs

Project Partners: Guidehouse, National Grid Electricity Distribution, Pembrokeshire County Council, RWE

Challenge: Accelerating decarbonisation of major energy demands.

Summary: The Integrated Hydrogen Transport Hubs project seeks to explore possible sites for co-locating hydrogen fuel production with district heating at 'hydrogen hubs' on parts of the electricity grid where renewable generation is frequently curtailed. The 'hub' approach is intended to maximise the value of the hydrogen infrastructure, lower the cost of hydrogen for users, reduce emissions for district heating and accelerate the hydrogen economy in the chosen area.



NextGen Electrolysis – Wastewater to Green Hydrogen

Project Partners: HydroStar, NGED

Challenge: Improving energy system resilience and robustness.

Summary: Green Hydrogen production is primarily achieved through electrolysis, which requires green electricity and purified water. NextGen Electrolysis – Wastewater to Green Hydrogen, will lower the operational barriers by using water that is less pure, primarily harvested rainwater and well water as the key water sources, addressing real world manufacturing and operational constraints with the added benefit of cost reduction for consumers. This area is a gap in current research and will have particular advantages for the production of green hydrogen in remote rural communities and for gas consumers overall.

Round 3 2023 SIF challenges have been released and we're looking for innovation partners in these challenge areas:

Challenge 1:

Whole system network planning and utilisation to facilitate faster and cheaper network transformation and asset rollout

Challenge 2:

Novel technical and market approaches to deliver an equitable and secure net zero power system

Challenge 3:

Unlocking energy system flexibility to accelerate electrification of heat

Challenge 4:

Enabling power-to-gas (P2G) to provide system flexibility and energy network optimisation

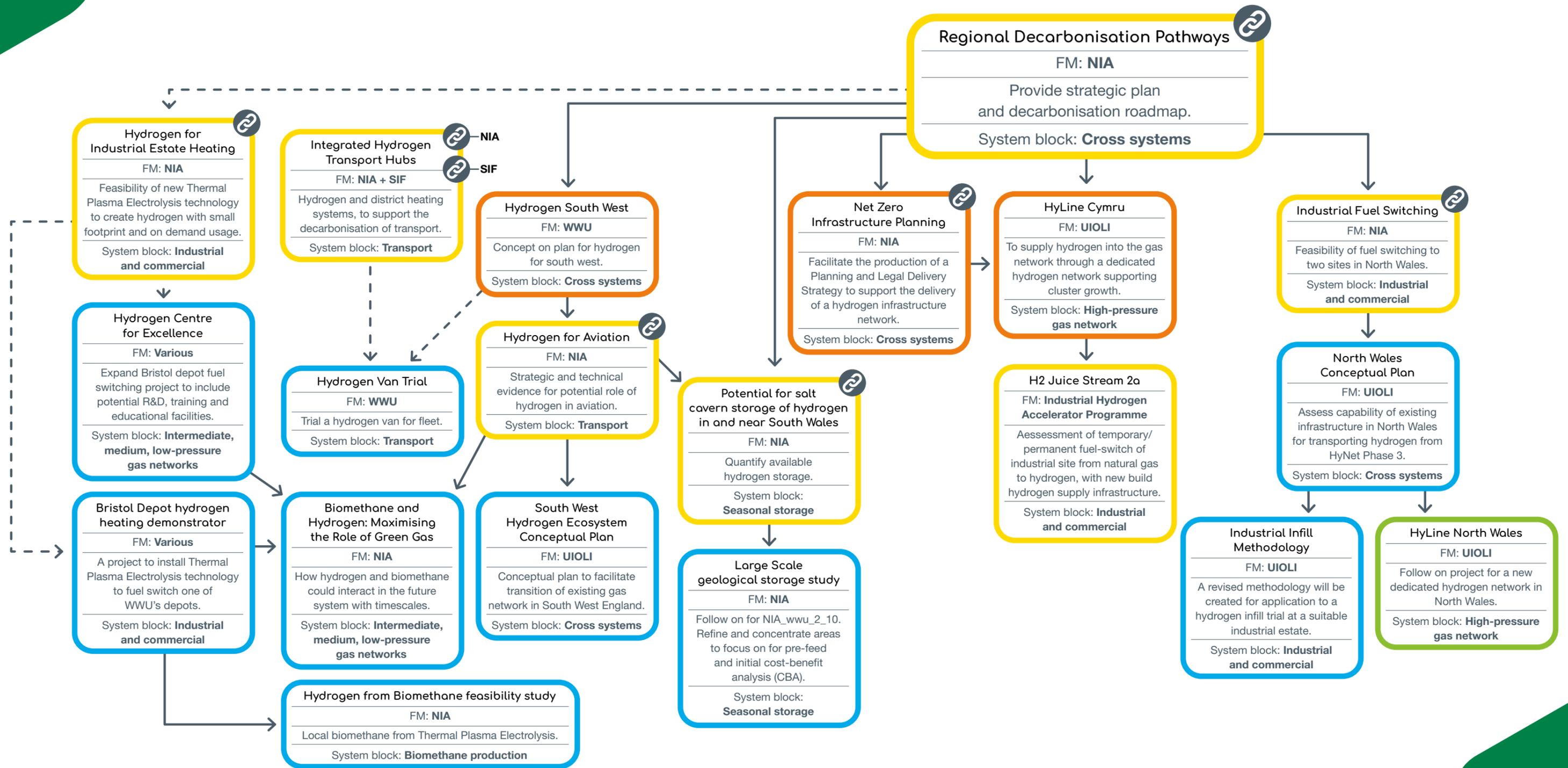
[Contact us ASAP if you have an idea that fits the challenges >](#)

Building our portfolio

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.

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

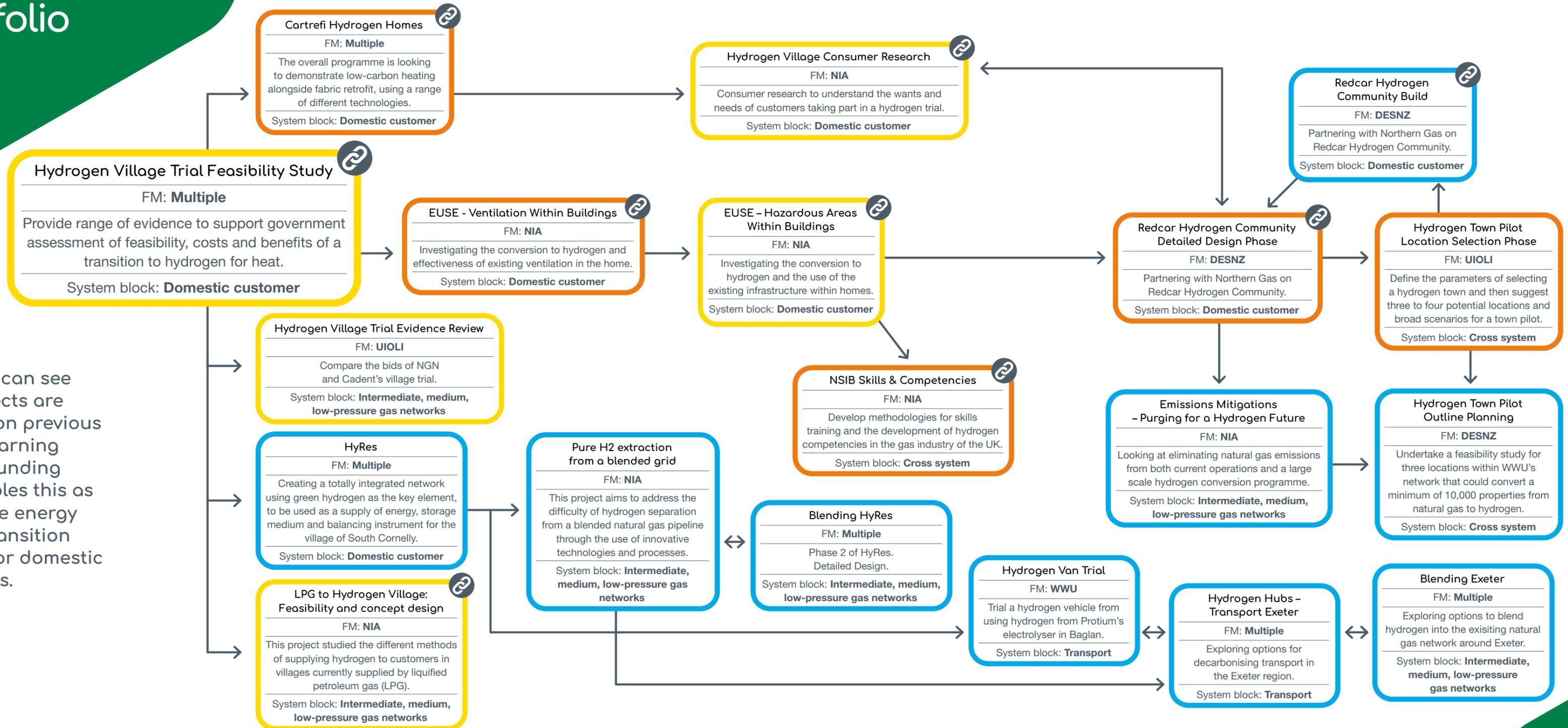


Building our portfolio

Domestic

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

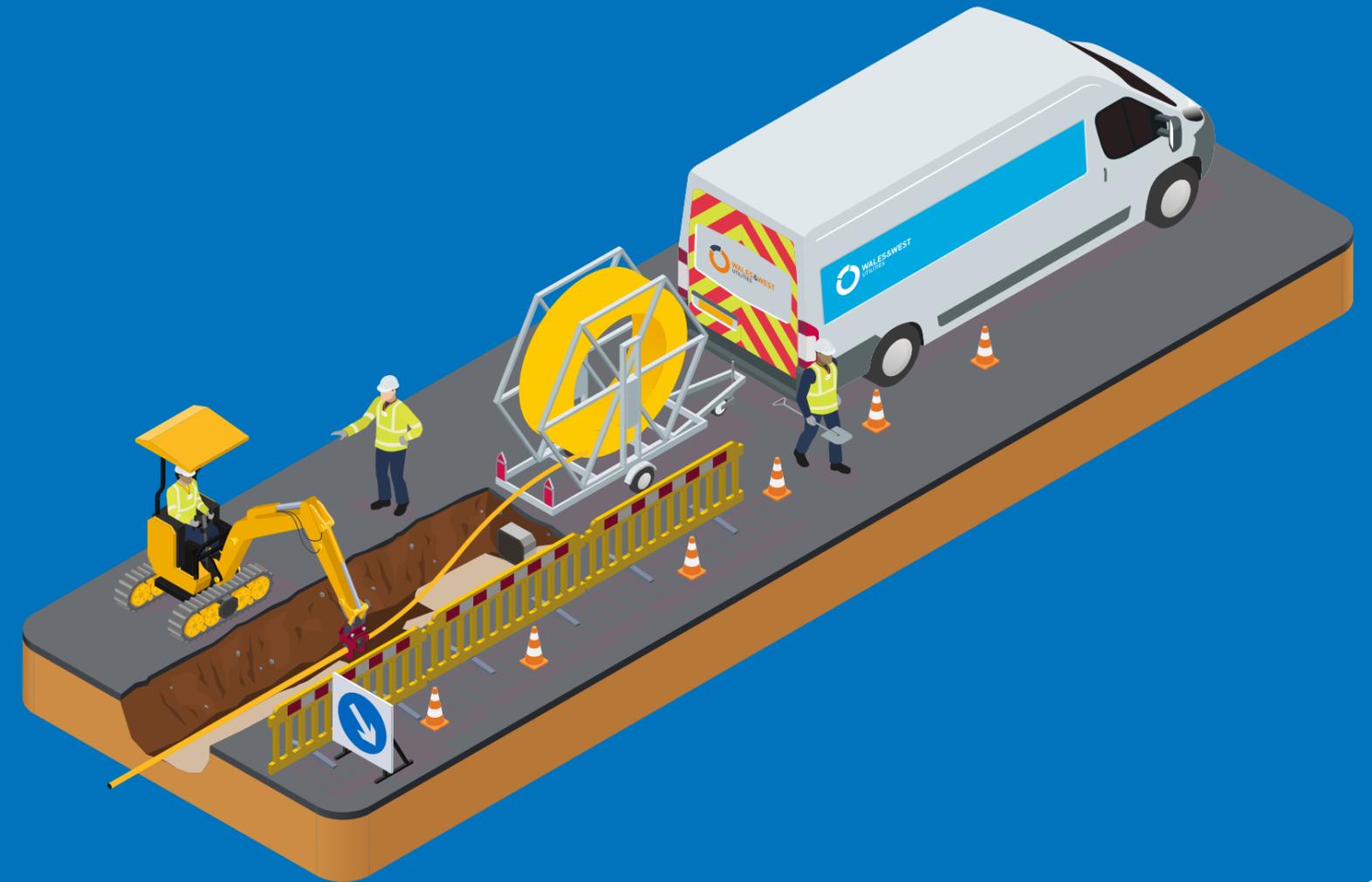
Here you can see how projects are building on previous project learning and the funding that enables this as we explore energy system transition options for domestic customers.



Future of innovation

Here you can find our planned projects for the coming months and areas of interest where we are looking to build our portfolio. You can also find out how we are helping local authorities with their local area planning. Don't forget – if you have an idea that can further our ambition, be sure to [get in touch >](#).

Future innovation direction	22
Planned projects	23-24
Innovation and Local Area Planning	25



Future innovation direction

We have 38 planned projects for the rest of 2023 into 2024 and a significant forecast of projects that we're assessing for progress in later years. We're continually reviewing project outcomes, investigating new ideas and developing relationships with current partners. We actively seek out opportunities to work collaboratively with other networks and we're keen to meet new innovators, both in person through conferences and dissemination events, or through direct approaches from potential partners.

Our [systemic building block page](#) outlined the role innovation can play across our activity.

We're particularly looking for ideas that can help us deliver a just energy transition and accelerate decarbonisation of multiple demand areas, such as transport and heat. Improving the resilience of the energy system supply chain to support efficient rollout of new infrastructure is a crucial undertaking to support these aims.

Other areas of interest are:

Biomethane production

- Support production capacity for biomethane on our network and increasing the understanding of the role of hydrogen for net zero and within our network for blending and at 100%.

Domestic

- Better identification and inclusion of vulnerable and disadvantaged customers to support decarbonisation of heat and mobility for rural and consumer groups with reduced access to opportunities for decarbonisation.
- Consumer options and supporting development of hybrid heat solutions.

Transport

- Understanding the role of gas in transport and investigating fuel choice, with a focus on our own commercial fleet.

Data and digitalisation

- Data and modelling regarding capacity, sharing, and supporting local energy planning.

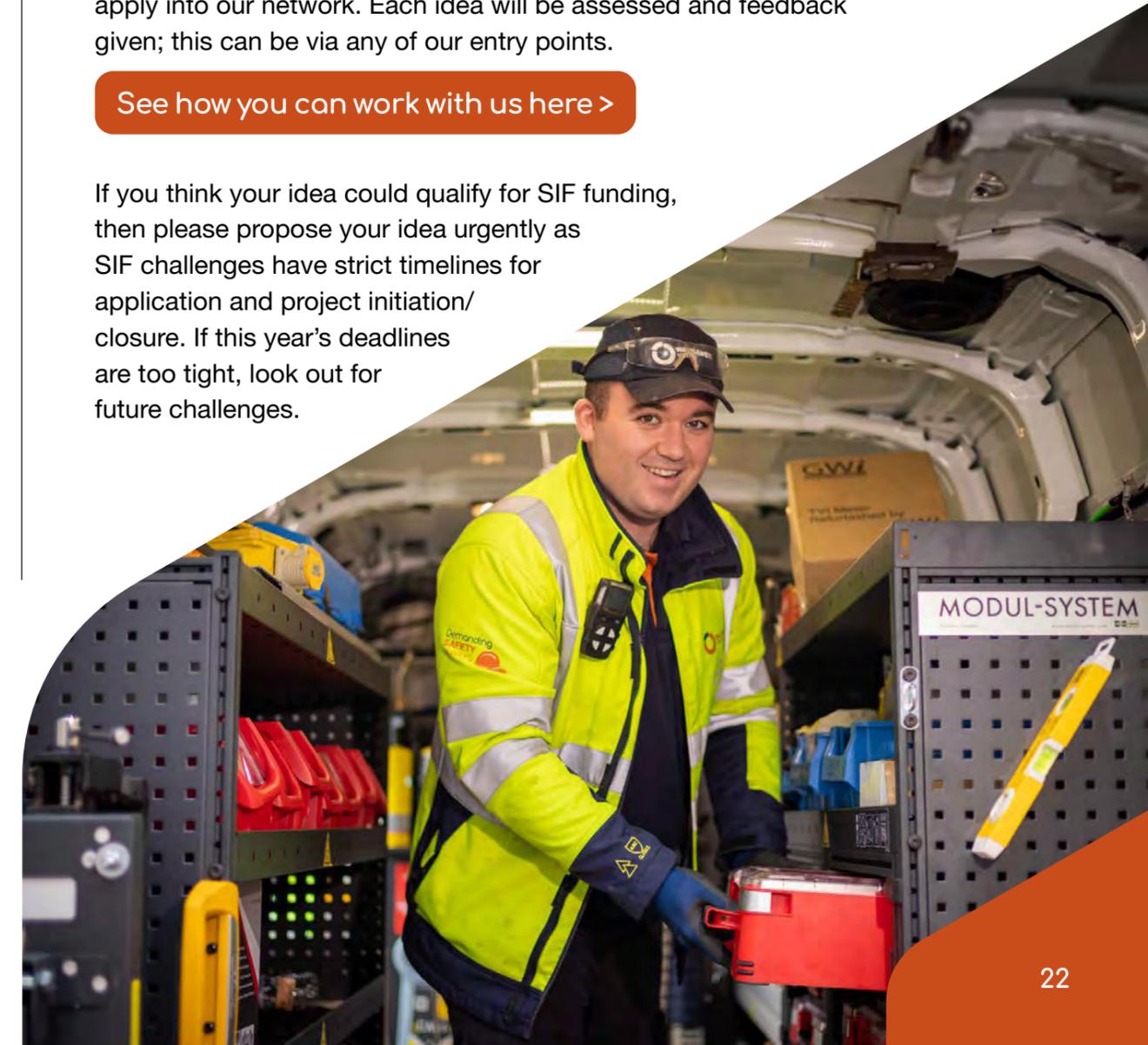
If you have an innovative idea in these areas you'd like to share, we'd love to hear from you!

[See how to share your ideas here >](#)

We're particularly interested in hearing about technology that has been proven in other industries, such as the digitalisation of banking, food delivery, and transportation mobility, that we could apply into our network. Each idea will be assessed and feedback given; this can be via any of our entry points.

[See how you can work with us here >](#)

If you think your idea could qualify for SIF funding, then please propose your idea urgently as SIF challenges have strict timelines for application and project initiation/closure. If this year's deadlines are too tight, look out for future challenges.



Cross system

Projects that support the transition across different parts of the system.

Project name	Description
European Hydrogen Distribution Insights	Comprehensive evaluation of gas distribution network case studies for hydrogen transportation and delivery including stakeholder engagement, emissions reduction benefits and policy support across key DSO projects.
Gas Control System – Impact Assessment (Future requirements)	Conduct an impact assessment to consider any new functionality and business processes required to support decarbonisation for hydrogen villages and towns, cyber and digitalisation.
Pathfinder Development	Redevelop the existing WWU pathfinder model to provide a new impact assessment tool to enable housing stock owners to assess the carbon impact within the energy system in different retrofit property interventions.
Net Zero Infrastructure Planning – Risks & Opportunities	Review current planning environment in context of new gas (and electricity) infrastructure required to meet net zero, including DCO and CPO consenting process to give recommendations to dispensation.
Hydrogen compatibility of components – Phase 2: Further analysis	Follow on from NIA_NGN_276 to review outputs and results from network assessments, including recommendations for further evaluation of construction materials, risk mitigation options and testing plans.
Pure H2 extraction from a blended grid	Address difficulty of hydrogen separation from a blended natural gas pipeline through use of innovative technologies and processes.
Visualising Demands on Local Authority Networks	Use raw data meter extracts analysis in order to determine domestic, commercial and industrial demand on our network within local authorities.
H2 Homes Ready capture	Database required to capture individual property data to identify hydrogen readiness for supply and boiler/gas safe perspective.
Electricity and Gas Generation Overview	To understand what electricity and gas generation (including hydrogen) looks like in layman's terms.
The Impact of District Heating on our Network	Understand impact district heating will have upon network.

Distribution system offtake

Understanding changes to the interface between national and local systems during the transition.

Hy-Voltage	Assessment of viability of introducing flexible vector conversion links between gas and electricity networks.
Application of Functional Blending Specification at Strategic Locations	Conceptual design work on how functional blending specification can be applied in three key areas of local transmission system (LTS) development for hydrogen.

Diurnal storage

Assessing options for day-to-day energy storage in the gas system.

Project name	Description
Hydrogen Storage Feasibility Study	Feasibility of utilising the existing grid structure for storing hydrogen for distribution through the network and optioneering ideas for future storage options.

Seasonal storage

Assessing options for longer term energy storage in the gas system.

Mappowder Salt Cavern Hydrogen Storage Feasibility Project	Follow on project from Salt Cavern project to refine and concentrate areas to focus on for a pre-feed and initial CBA.
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Domestic customers

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

HomesHield	A detection device product that is retrofittable, intelligent, but simple to use that will seamlessly integrate with the customer and their key contact.
Domestic Hydrogen Sensor Research	A follow on project from GD1. Testing of a hydrogen alarm, to be used in homes.
TapSOS	The digitalisation of the emergency number enabling non-verbal reporting.
Hydrogen Appliance Consumer Feedback	Market research to explore customer willingness and appetite towards utilising hydrogen gas fires and cooking appliances in homes moving into a future network.
Purging With Nitrogen Into Confined Spaces	Understand implications associated with conversion to hydrogen, understanding how to mitigate risks of inside building purging and ventilation to disperse high concentrations of nitrogen when released into a confined space.

High-pressure gas network

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

Project name	Description
Biomethane and Hydrogen Interactions	Understand challenges and opportunities for biomethane production in hydrogen rollout areas such as network development, technology requirements and future investment.
Local Biomethane Conversion to Hydrogen (HiiROC)	Following on from HiiROC, feasibility study for newly certified technology deployment at biomethane production/injection sites to convert biomethane to hydrogen.

Industrial and commercial

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

Safety - H2 Juice	Produce safety case to seek GS(M)R exemption from HSE and satisfy emergency response requirements.
Sensitive Users	How to assess the impact of blending and pure hydrogen on industrial users with tool creation and case study.
De-Blending - H2 Juice	Progress Stream 2A feasibility work through FEED to understand how gas separation (deblending) technology can be practically deployed to an industrial user or group.
Understanding future energy loads from Data Centres	Understand 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.

Hydrogen

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

NextGen Electrolysis Alpha	Use of green hydrogen from grey water to target resilience of energy systems and robustness of supply lines in gas distribution.
NextGen Electrolysis Beta	Targeting the resilience of energy systems and robustness of supply lines in gas distribution for green hydrogen production.
Water usage in green hydrogen production	Exploring water volume required to produce required amount of green hydrogen and impact on future modelling.
Penzance blending unit feasibility and design	Using solar power for industrial estate heating to blend hydrogen into Penzance gas network.

Intermediate, medium, low-pressure gas networks

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

Project name	Description
Lower Cost Excavation and Repair for Hydrogen Pipelines	Identify differences between excavating a natural gas pipeline as we do today and a hydrogen pipeline in the future.
Emissions Mitigations – Purging for a Hydrogen Future	Looking at eliminating natural gas emissions from both current operations and a large scale hydrogen conversion programme.
Repurposing of Oil Pipelines for Hydrogen (ROPH)	Repurposing old oil pipeline for proposed hydrogen LTS pipe.
Hydrogen blending in LPG Feasibility Study	Follow on project to understand if hydrogen can be blended into LPG networks.

Transport

Developing options for the use of decarbonised gases in transport.

Integrated Hydrogen Transport Hubs Alpha	Determine if hybrid hydrogen and district heating systems can support the decarbonisation of transport and heat at the lowest cost for customers.
Integrated Hydrogen Transport Hubs Beta	Determine if hybrid hydrogen and district heating systems can support the decarbonisation of transport and heat at the lowest cost for customers.
Penzance industrial estate heating and transport hub feasibility and design	Follow on project from hydrogen industrial heating using offshore solar to power electrolyser in an industrial estate.

Innovation and Local Area Energy Planning (LAEP)



As the energy system transitions to net zero, local and regional decisions play an increasingly important role in the shape of our infrastructure. We're exploring how energy system innovation can support local areas in realising decarbonisation goals for their communities and businesses.

- Our [Pathfinder 2050 modelling system](#) will support local areas to understand likely use of the gas network to support future planning for the net zero transition, supporting the deployment of renewable electricity generation and in the use of biomethane and hydrogen.
- Innovation can help by investigating novel ways of solving challenges. We have a range of projects in our portfolio including [HyLine Cymru](#), looking at introducing a new hydrogen pipeline to support the South Wales industrial cluster, a [hydrogen village project at Redcar](#) (with Northern Gas Networks) in progress and a town pilot in planning. We're also in the process of building a demonstration retrofit home in 2023 (pending work with partners and relevant approvals). Other areas of focus include microgrid technology, connection into the network, rurality and [grey water to hydrogen](#). Please visit our [planned projects page](#) for more information.
- We are working closely with other energy providers to develop a best practice guide which will be published by the Energy Networks Association (ENA) upon successful completion of the project toward the end of 2023.

Please contact us via our mailbox netzero@wwutilities.co.uk > for energy planning support, to enquire about our toolkits, and to discuss future innovation opportunities.

WWU network covers the boundaries of 41 local authorities



Out and about

We're always out and about and are actively engaged with Hydrogen South West (HSW), South Wales Industrial Cluster (SWIC), the Energy Research Plenary (ERP); we're members of IGEM and sit on their Industrial Affiliates Committee. We're also involved in projects with a range of local and regional authorities across Wales and the South West of England.



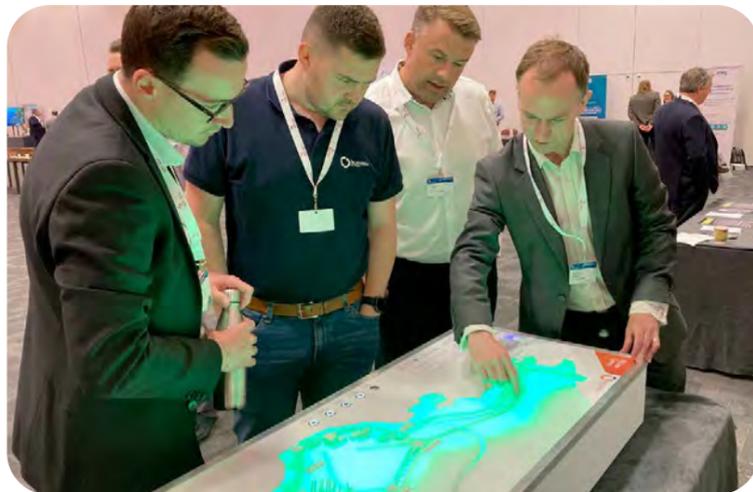
We also talk at events held throughout the year, including our flagship annual innovation dissemination at the Energy Innovation Summit (EIS).

Please [register your interest here](#)

We'd love you to get involved with the Energy Innovation Programme where all networks (both electricity and gas) come together with specific problem statements to support the transition to net zero. The [2023 event](#) is in progress and applications are now closed, but please keep an eye out for 2024 dates.

We'll be at the Round 3 Pitching Sessions for SIF later this year and we'd love to [hear from you](#) if you have a project that fits any of the the challenge areas.

And we plan to attend other events including [Innovation Zero 2024!](#)



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.

1. **Idea generation** – review this report, particularly the strategic areas of interest, to make sure your idea aligns with one of our priorities and 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 Smarter Networks portal.
6. **Delivery** – work with us (and any other network sponsors) to deliver the project, recording information and learning.
7. **Closedown and knowledge sharing** – project wrap stage, validating outcomes against objectives, sharing information, what was learned from the project journey 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.



Get in touch

–we're easy to work with

Over the past 12 months we have been busy investing money in projects to decarbonise the network and ensure consumers in vulnerable situations are not left behind, but the work doesn't stop there; we still have a long way to go and we want your help to get there.

Get in touch to submit your ideas

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 >](mailto:innovation@wwutilities.co.uk)

- For ideas that are specific to us as a network, you can engage with us by [visiting our website and contacting us](#), and our social media accounts.
- We post problem statements and ideas on [Find a Tender](#) and advise how you can submit an idea to us.
- We also have an annual [Energy Innovation Programme](#) run by the ENA on behalf of all the networks with presentation and pitching sessions run throughout the year. Applications for 2023 are closed but please keep an eye out for the 2024 event.
- Don't forget to read our [innovation strategy](#) and [business plan](#) to make sure your idea aligns to our priority areas.
- We also talk at events held throughout the year, including the annual [Energy Innovation Summit \(EIS\)](#)
- National routes include [The Smarter Networks Portal](#), which is the window into network innovation for regulatory-funded projects where you can see details on current projects, find partners and propose ideas for all network companies to review and consider.
- The [UK Research and Innovation \(UKRI\) website](#) contains details of UKRI's key funding programmes and includes a 'funding finder' tool where you can search for current funding opportunities across UKRI, research councils and Innovate UK.
- The [Knowledge Transfer Network \(KTN\)](#) is part of [Innovate UK](#) and exists to connect innovators with new partners who will work with you to refine your idea and direct you to appropriate funding opportunities.



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

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