Innovation Strategy

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WALES&WEST
UTILITIES

Contents

Acronym Key

AI	Artificial Intelligence	NESO	National Energy System Operator
AGI	Above Ground Installation	NZARD	Net Zero and Re-opener Development
BAU	Business as Usual	UIOLI	Use It or Lose It
DESNZ	Department for Energy Security and Net Zero	OEMs	Original Equipment Manufacturers
ECV	Emergency Control Valve	PSR	Priority Services Register
ENA	Energy Networks Association	UKRI	UK Research and Innovation
FCEV	Fuel Cell Electric Vehicle	RDP	Regional Decarbonisation Platform
FES	Future Energy Scenarios	RESP	Regional Energy System Planner
GDN	Gas Distribution Network	SIF	Strategic Innovation Fund
GW	Gigawatt	SSEP	Strategic Spatial Energy Plan
HSE	Health and Safety Executive	SWIC	South Wales Industrial Cluster
HTBM	Hydrogen Transport Business Model	TRL	Technical Readiness Level
ISG	Independent Stakeholder Group	UKRI	UK Research and Innovation
LAEPs	Local Area Energy Plans	VCMA	Vulnerability & Carbon Monoxide Allowance
MOBs	Multiple Occupancy Buildings	NIA	Network Innovation Allowance

1. How innovation will be used to achieve RIIO-3 outcomes

We will use innovation to invest in research and technology development to support the RIIO-GD3 priority outcome to develop infrastructure fit for a low-cost transition to net zero. In doing so we aim to meet consumer expectations that we should facilitate a low cost, sustainable and low carbon energy system at pace, which is reflected in our high ambition for innovation in RIIO-GD3. This activity will support and reflect the other key RIIO-GD3 outcomes, to maintain secure and resilient supplies, provide high quality service to vulnerable customers, and deliver system efficiency and long-term value for money.

Innovating in GD3 will help WWU and its customers - alongside the wider gas sector, regulators, government and NESO - navigate uncertainty around the future role of gas infrastructure and inform strategies for the future of gas. As such, we need to innovate in a whole systems way which recognises the pace of change required under a range of potential future scenarios for gas, and national commitments such as carbon budgets and Clean Power 2030. We will build on the valuable research and technology innovation outputs developed in RIIO-GD2 to facilitate the energy system transition and ensure vulnerable consumers are supported.

Our strategy for RIIO-3 innovation is to be ambitious in supporting the development of technologies and approaches which will help decarbonise the energy system and resolve areas of uncertainty. This will support the vision and targets set out in Document 1, WWU Business Plan, Chapter 3.1, and our Sustainability Strategy and meet the expectations of national and regional stakeholders. Recent publications such as the 2024 Future Energy Scenarios the Committee on Climate Change Progress report and NESO's 2030 Clean Power advice support the need for ambition and pace, particularly where electrification may not be the most economical route to decarbonisation, and we see RIIO-GD3 as a critical time for gas network innovation to help accelerate the transition to net zero. We therefore propose to continue using the Strategic Innovation Fund (SIF) and outside funding mechanisms for innovation, such as Hydrogen Transport Business Model (HTBM), alongside an expanded Network Innovation Allowance (NIA) to innovate around three core challenges which we have identified:

1. Planning and Delivering Net Zero Operations
2. Facilitating Green Gasses
3. Supporting Customers in Vulnerable Situations

Anticipated societal benefits of our innovation plan include retention of industrial and supply chain jobs, especially in existing industrial areas, development of new decarbonisation opportunities and reduced carbon and other emissions to improve local environments, in addition to supporting vulnerable consumers through a period of immense change.

2. Funding innovation activity

In RIIO-GD3 we intend fund innovation activity through:

- The Network Innovation Allowance, as set out in this Strategy,
- The Strategic Innovation Fund, depending on appropriate strategic challenge setting, and
- Other innovation mechanisms, if applicable.

We will also seek to undertake and deploy business-funded innovation where possible.

The Network Innovation Allowance (NIA) is a flexible funding mechanism that enables us to fund energy system innovation and vulnerable customer innovation with agility and at pace. NIA ensures we have an organisational culture of innovation as it facilitates a core team of people with the skills to think creatively and drive dynamic change, to support a baseline portfolio of projects to build upon ambitiously and develop a robust innovation strategy. Our innovative research and development progresses maturity of technology readiness levels of research or innovation solutions with outcomes that either demonstrate whether innovation is successful and can be implemented or encourages fast failure which supports future innovation portfolio learning.

NIA is vital in underpinning other innovative funding as it supports a portfolio of projects that can go on to use a wide variety of funding in RIIO-GD3 for further development or implementation. This includes the competitive Strategic Innovation Funding, which will be used to develop key technology demonstration projects. An example in RIIO-GD2 is our NextGen Electrolysis - Wastewater to Green Hydrogen project which has been successful in securing Beta phase funding that continues through RIIO-GD3 and has been used in combination with NIA funding to advance a promising technology.

Innovation funding works within an ecosystem of funding that requires alignment across Ofgem mechanisms and externally sourced funding to support net zero development more widely, for example by providing opportunities to adopt and roll out based on innovation outputs. This includes the Net Zero and Re-opener Development Use-It-Or-Lose-It (NZARD UIOLI) allowance, in addition to the re-opener funding available through a successful application process for Net Zero and Small Projects (NZASP) and Net Zero (NZ) allowances, and non-Ofgem funding sources such as Hydrogen Transport & Storage Business Models. A range of flexible and responsive funding sources which complement innovation funding sources is important to allow learning to be implemented. An example of this from RIIO-GD2 is the roll out of Smart Pressure Control, which started as a successful NIA project before NZARD UIOLI funding was utilised to support the rollout of the technology (Smart Pressure Control). Our plans for the use of NZARD UIOLI funding in GD3 are set out in Document 1, WWU Business Plan, Chapter 3.1, and further referenced in this annex. We will also seek to use NZASP/NZ re-opener funding in GD3 where beneficial.

Regulatory innovation funding, particularly NIA, works successfully alongside innovation funding from other sources, helping deliver value for gas consumers across our portfolio as we leverage funds available in the wider UK innovation funding space. In RIIO-GD2 we successfully secured external funding from the UK Research and Innovation (UKRI) and Welsh Government among others, and examples of this are provided in this document (HyLine Cymru below). We intend to continue to seek such funding sources which can complement RIIO-GD3 mechanisms where possible.

Alongside energy system transition projects, our BAU innovation will support vulnerable customers, the environment, sustainability, and safety with any financial benefits derived contributing to delivery of our stretch ongoing efficiency challenge across the RIIO-GD3 plan, with any outperformance shared 50/50 with consumers to support equal distribution of innovation benefits to consumers.

3. Our network innovation approach to decarbonisation and meeting net zero

Our approach to innovation in RIIO-GD3 has been developed in response to national and regional stakeholder expectations and feedback, which demonstrates that network innovation will be critical to a cost-effective transition to net zero and ensuring this is a just transition which leaves no customer behind.

We recognise there are policy and technological uncertainties around the future of the gas network, so innovation funding becomes ever more important in RIIO-GD3 to provide optionality, agility and the ability to move at pace to meet net zero targets. Innovation allows us to continuously gain essential learning and evidence to be ready to provide options to policymakers and respond to changes swiftly. It enables us to provide choice and support for consumers, developing options which could deliver a more cost-effective pathway to Net Zero for consumers over the long term; supporting a just transition which considers the needs of vulnerable customers, and enabling the wider societal benefits that can be derived from innovation such as job retention and reduced carbon emissions.

In developing our Net Zero plans and Innovation Strategy we have followed the guidance set out in Ofgem's Sector Specific Methodology Consultation and as such will seek alternative funding approaches outside RIIO-GD3 for major dedicated hydrogen projects. However, innovation is rightly recognised as essential to the operation and development of networks, including for considerations around the potential need to prepare gas distribution assets for repurposing for hydrogen. Ofgem expects us to deliver a low-carbon energy system that is reliable, safe and efficient at a pace in line with our net zero targets, in addition to supporting vulnerable consumers and finding new ways of developing and operating our networks and finding efficient ways of decommissioning areas of the network that do not transition in the future.

Given Business Plan Guidance, we expect overall proposals on the use of Net Zero innovation to be similar to other networks, however, there are clear regional differences, especially those related to industrial decarbonisation which may impact the level of funding each network requests, and the innovation programme that each licensee ultimately delivers. Evidence relating to challenges and opportunities identified in the regions we serve is provided below.

For WWU, our Sustainability Strategy, which was itself shaped by stakeholder and customer inputs and priorities, sets out our vision and targets around our business priority to 'do everything we can to provide sustainable energy', mapped to UN Sustainable Development Goals and the Wellbeing of Future Generations Act (Wales). Our RIIO-GD3 innovation strategy will support delivery against these targets, for example, those to:

- Prepare to receive up to 20% blended hydrogen; we expect to be able to connect blended hydrogen projects in RIIO-GD3 in addition to increasing the connection of biomethane plants to increase green gases on the network.
- Invest in at least three industrial clusters, including the South Wales Industrial Cluster which is the second highest emitter in the UK.
- Proactively support local area energy planning and reflect the development of National Energy System Operators' Regional Energy System Planning function in addition to continuing to support Local Area Energy Planning.
- Choose low and ultra-low emission options for our fleet, where available & appropriate.

- Reduce operational and supply chain emissions; further detail in Document 48, Environmental Action Plan
- Make the network hydrogen-ready by 2035 in key areas and fully ready by 2040 where target dates have been changed to reflect Ofgem funding decisions and positions to date.
- Support consumers through the transition, particularly those that are most vulnerable.

4. National, Regional and Stakeholder evidence for our role in innovation

Creating the right environment for research and innovation to succeed is vital if the UK is to achieve net zero by 2050 "Support for innovation to deliver net zero (parliament.uk)". As networks, we need to be able to invest in innovation to develop learning to support critical government evidence requirements and policy decisions primarily in areas that are most likely to require transition of the network to hydrogen. This will support the decarbonisation of hard to decarbonise areas to reach 2050 net zero government targets. We also need to assess and demonstrate alternative and innovative options for industrial, commercial and domestic consumer decarbonisation in line with the Great British energy system strategy.

A recent report from the House of Commons Committee of Public Accounts Support for innovation to deliver net zero (parliament.uk), said that the Government expects delivering Net Zero will require a significant increase in investment. The government estimates £23 billion of low carbon investment in 2022 would need to increase through the late 2020s and 2030s to 2-3 times that level per year. Most, though not all of this increase is expected to come from the private sector, and energy networks such as WWU will need to play a significant role, supported by innovation and uncertainty mechanisms in RIIO-GD3 to develop the technologies and early stage net zero facilitation projects required. This will build on RIIO-GD2 where the government's Net Zero Strategy included £1.5 billion spending on innovation from 2022-25 including £450 million from Ofgem's Strategic Innovation Fund and supported by Network Innovation Allowances. Given the increased investment expected by the government, we have been ambitious in our approach to reflect the ongoing scale of research and innovation challenges to be tackled.

Innovation funding is utilised in a wider ecosystem of funding to enable innovation that could potentially deliver valuable re-use of the existing gas network and contribute to the wider UK economy. It allows networks to be agile and respond quickly to market changes, including supporting the commission for the National Energy System Operator (NESO) Strategic Spatial Energy Plan. In a recent report from the House of Commons Committee of Public Accounts Support for innovation to deliver net zero (parliament.uk), creating the right environment for research and innovation to succeed is vital if the UK is to achieve Net Zero by 2050. Gas network innovation focussed on the energy system transition, which increases the technology readiness of solutions, can help meet this challenge and provide greater confidence to private investors.

Our plan supports the UK hydrogen strategy and the Industrial Decarbonisation Strategy, with the UK Net Zero Research and Innovation Framework highlighting how important innovation is to support the timescales and estimates that a significant increase in external investment is required to deliver net zero. Investment in innovation always involves risk which is why innovation funding is so valuable to networks who would otherwise be unable to innovate effectively.

The Government has laid a draft Strategy and Policy Statement before Parliament: Strategy and Policy Statement for Energy Policy in Great Britain (publishing.service.gov.uk). This highlights how "funding allowed by Ofgem under the regulatory arrangements for networks has and will continue to be an important enabler of the necessary research and development for hydrogen" (p. 22), demonstrating that national government expects innovation in this space to continue. Gas network projects in RIIO-GD2 have provided important evidence on the role of hydrogen in Net Zero, for example providing fundamental evidence to support the development of a safety case, alongside exploring other key areas such as consumer vulnerability, data and digitisation, biomethane and other green gases, and more whole system challenges.

Our RIIO-GD3 innovation plan has been developed from the evidence gathered above alongside the development of the ENA strategy, and our Sustainability Strategy. With oversight from our Independent Stakeholder Group (ISG) we carried out extensive stakeholder engagement, gathering evidence using methods such as online Stakeholder Workshops, Feedback Panels, Online Voting Platform, Facilitated Group Discussions, Surveys, Quantitative and Qualitative Research and Consultations. Stakeholders were engaged on topics related to innovation for the net zero transition, emissions reduction, environmental sustainability, waste reduction and supporting vulnerable consumers.

Stakeholders included Local authority representatives, regulators & government bodies, industry experts including professionals from various sectors such as energy, technology, and environmental services, utility companies, academic institutions including researchers and academic experts specialising in energy, sustainability, and innovation, Non-Governmental Organisations (NGOs) including environmental and community-focused organisations providing input on sustainability and social impact, community groups, customers including residential and commercial customers, technology developers, automotive companies, fuel suppliers, policymakers, sustainability consultants, and our Critical Friends Panel members.

Our stakeholder analysis and engagement has informed us that:

- National government and energy policy stakeholders broadly support innovation as a key driver of economic growth, sustainability, and public welfare. They advocate for ongoing funding, regulatory support, and public-private partnerships to foster innovation. Politicians and others frequently highlight the importance of innovation in achieving environmental sustainability and net zero goals.
- Local Authorities and environmental stakeholders support innovation that aligns with sustainability and clean fuel initiatives, especially when considering regional energy plans. They emphasise the importance of collaboration between our network, local governments, and other utilities as a key enabler.
- Business representatives and environmental stakeholder groups emphasise the importance of operational efficiency and reducing carbon emissions. They also support sustained and long-term innovation funding to support decarbonisation efforts.
- Vulnerability groups and charity sector groups are concerned with the impact of innovation on vulnerable customers. They advocate for funding innovation if it does not detrimentally affect consumers and support initiatives that address broader issues like energy consumption reduction and financial assistance.
- Youth, educational groups and environmental stakeholders support the idea of promoting awareness about new technologies and cleaner energy sources. They emphasise the importance of diversity and inclusion within WWU's teams and the alignment of innovation with sustainability and net zero goals.

To deepen our understanding of stakeholder perspectives, we used our AI engagement analysis tool to bring together and synthesise stakeholder feedback from 77 unique engagement activities covering the topic of innovation.

We used this insight to develop Stakeholder Justification Papers (SJPs) highlighting overall views, conflicts of opinion and regional differences and how these have impacted our plans. These papers formed the basis of how the ISG scrutinised and challenged our interpretation of stakeholder feedback and our proposed RIIO-GD3 ambitions.

Stakeholders widely recognise the importance of innovation in our role as a gas network and appreciate our track record. Many participants value our commitment to innovation, viewing it as an opportunity to apply new perspectives and technologies, thanks to our accountability and involvement with Ofgem and the wider industry.

When engaged on the acceptability of our proposed RIIO-GD3 commitment for innovation, 91% of 1,401 participants (84% domestic, 11% business consumers and 5% future consumers) found our commitment to be acceptable. Projects that raise public awareness, engage hard-to-reach groups, and improve safety are valued. The commitment to net zero is seen as important, with strong support for collaborative work on clean fuel vehicles and sustainable energy planning.

Waste reduction and emission reduction initiatives are supported, and stakeholders praise the creation of a culture of innovation within WWU, noting potential cost reductions for customers. They recommend investing in a culture of experimentation to foster creativity and growth.

Overall, **WWU stakeholders strongly advocate for immediate investment in innovation to prevent higher costs and greater challenges in the future.** They emphasise the importance of a proactive, forward-thinking approach, as evidenced by quantitative research conducted on 1,405 participants (including 1,252 domestic customers and 153 business consumers. The research highlights that 89%, 81% and 79% of the group agreed that financial, social, and environmental sustainability, respectively, are priority areas for innovation. However, public awareness of low and no carbon technologies is currently low. To address this issue and prevent resistance to innovative projects, public awareness campaigns are seen as essential for maintaining a positive culture of innovation.

There are concerns about costs and the risks to meeting deadlines and targets for carbon emission reductions, which innovation can help to address, so stakeholders wish to see a balance of investment in net zero innovations with other practical and immediate solutions, such as addressing rural digital poverty and the rising cost of energy and the importance of operational efficiency to reduce bills and carbon emissions.

The ongoing policy uncertainty is seen as a significant barrier and other stakeholders urge us to take a leading role in advocating for clear policy directions and to build a compelling investment case for hydrogen and other clean energy solutions to improve the pace of choice for consumers in the future.

Stakeholder input has directly influenced our plan and ambition level and reflects the proactive approach they wish us to take, including increasing consumer awareness and engagement. This is reflected in our ambition to improve services for consumers, particularly the vulnerable, where inclusive practices such as non-digital means of communication are required.

5. Responding positively to stakeholder challenges

In our stakeholder research we also considered challenges to our approach, which also helped shape our plans. For example, a small portion of our stakeholders made up of consumers, consumer representative bodies and some business representatives believe that urgent issues like rising energy costs and gas leakages (shrinkage) should take precedence over innovation, whilst recognising that we need to deliver value for money and be balanced with priorities to support vulnerable customers and reduce emissions. There is also a split opinion on whether innovation provides good value for money with some aspects of the current innovation framework seen as limited, with calls for a faster and more transparent process. This feedback supports a portfolio approach to innovation which can address a range of challenges; an expanded role for flexible funding such as NIA, and the ongoing need for clear routes to implement successful innovation.

Points of conflict between local authorities on innovation revolve around the adequacy of funding, the effectiveness of the innovation culture, the realism of expectations, and the level of stakeholder engagement and regulatory support. Addressing these conflicts will require targeted efforts to align priorities, streamline funding processes, foster a supportive culture for innovation, and improve coordination among stakeholders. As Local Area Energy Plans are developed and delivered, it is anticipated that actions for the energy networks may require innovative approaches which are within the remit of innovation funding, which we have reflected in our plans. As set out below, we also intend to act on findings of a report on our culture of innovation.

Despite seeing innovation as integral to meeting net zero targets, Consumer & Consumer Advocacy groups are sceptical about whether the benefits of innovation are equitably distributed, with some consumers feeling left behind. Additionally, they are critical of funding favouring large corporations and are concerned that the pace of innovation is too slow to meet future energy demands and sustainability goals. An ongoing and expanded role for NIA, which is flexible and involves collaboration with third parties, can help address this in addition to working alongside other activities to support customers in vulnerable situations, such as that funded by VCMA (Vulnerability & Carbon Monoxide Allowance).

In summary, the conflicts identified above revolve around prioritising innovation and costs. Stakeholders are divided on whether innovation should be a primary focus, with some advocating for its importance in the next business plan, while others believe it should only be pursued if it reduces customer bills. Feedback highlighted concerns about the high costs of achieving net zero emissions through innovation. There were calls for realistic and achievable innovation projects, with a conflict between short-term practical solutions and long-term strategic innovations. Stakeholders emphasised the need for detailed information on current challenges and partner organisations involved in innovation. To address these conflicts, we have developed a portfolio approach that addresses various challenges, delivers value for money, and considers the needs of vulnerable customers. Innovating efficiently but ambitiously will better serve the long-term interests of both the network and consumers in the energy system transition. As previously highlighted, when tested, our consumers find this approach to be highly acceptable (91% of 1,401 participants).

The RIIO-GD3 framework is set up to protect consumers and ensure bills are kept as low as possible.

6. A plan shaped by the areas we serve

We recognise the importance of an energy system transition that works everywhere we serve, making sure that no one is left behind. In addition to the stakeholder engagement referenced above, our understanding of the population, economies and geography of Wales and the South West have influenced our plans and will shape our innovation focus through GD3.

The South West of England has several unique regional factors with a significant proportion of rural areas, which presents different challenges and opportunities compared to more urbanised regions. Innovations tailored to lower population densities, such as decentralised energy solutions or enhanced digital connectivity, are essential.

The region's economy is more reliant on specific sectors such as agriculture, tourism, and small-scale manufacturing, necessitating innovations that cater specifically to these industries but is home to key economic sectors with high growth potential, including the aerospace sector and marine industries, which require innovations in sustainable aviation fuels and maritime decarbonisation. Additionally, the region has significant potential for renewable energy generation, particularly from offshore wind and tidal sources.

The South West is home to numerous National Landscapes such as the Cotswolds and boasts over 2,100 kilometres of coastline, more than any other region in England, necessitating a focus on sustainable practices and environmental conservation. Local Authorities across South Wales and the west of England, emphasise specific goals like decarbonisation and economic growth through innovation for an economy that is expected to grow faster than any other area outside of London[1].

Wales has a unique industrial legacy, particularly in South Wales, with significant industrial bases including the UK's largest integrated steelworks and energy-intensive manufacturing plants. The South Wales Industrial Cluster is the second largest industrial and power generation emitting region of the UK[2]. Like the South West it has extensive natural landscapes including three National Parks, a long coastline and substantial renewable energy potential, including offshore wind, tidal, and marine power[3]. The economic transition in Wales from a resource extraction-based economy to a more diversified one necessitates innovative solutions to support new industries and provide alternative employment opportunities. Social inequities in Wales, such as higher poverty rates, require targeted innovation to improve living standards and social equity. This emphasises the importance of delivering our Vulnerability Strategy and innovating around protecting vulnerable customers through the energy system transition.

The Welsh Government's devolved powers over areas like planning, education, and certain aspects of energy policy allow for more localised and tailored innovation strategies. Unique legislative frameworks, such as the Well-being of Future Generations (Wales) Act 2015,[4] mandate sustainable development across all public bodies and we have mapped its goals to our Sustainability Strategy. Infrastructure development and technological adaptation in Wales also require specific innovation strategies. Cultural and educational factors, including the promotion of the Welsh language and tailored training programs, are essential for the success of innovative projects in Wales. Overall, these factors highlight the need for a distinct innovation approach in Wales that addresses its unique industrial, economic, social, policy, infrastructure, and cultural contexts.

[1] Our-plan-for-Sustainable-Growth-FINAL2-1.pdf
[2] SWIC I South Wales Industrial Cluster
[3] CSC – Celtic Sea Supply Chain Cluster
[4] Well-being of Future Generations (Wales) Act 2015 – The Future Generations Commissioner for Wales

Aligning innovation strategy with regional policies and consumer requirements ensures relevance and support from local governments and key stakeholders which has been vital in shaping the portfolio and plans for RIIO-GD3, and facilitating ongoing engagement, communication, and mutual dissemination of strategy and anticipated project outcomes. Specific regular engagement is required across industry groups e.g. Net Zero Industry Wales / South Wales Industrial Cluster and the Great Western Supercluster of Hydrogen Impact for Future Technologies (GW-SHIFT) which spans the South West of England and South Wales, is critical to connect innovation with academic, civic and industry partners to power green, inclusive growth across different regions and sectors.

This engagement shapes our innovation strategy and priorities, as is evident in our activity to date. For example,

- Hydrogen production assumptions in Hyline Cymru (see case study below) have been based on engagement with the Welsh Government, Net Zero Industry Wales, and industrial partners in the South Wales Industrial Cluster
- Engagement in Local Area Energy Planning has influenced the development of energy system modelling projects and capabilities and developed specific actions for WWU some of which we can take forward through innovation activity (see Document 1, WWU Business Plan, Chapter 3.1)
- The absence of geological storage opportunities in our region has prompted the development of projects to consider alternative energy storage options
- Our NextGen Electrolysis SIF project has responded to the distributed energy challenges and opportunities in the South West, alongside potential water constraints
- Our work on expanding capacity for biomethane entry is responding to the concentration of production plants in parts of our South West network and ongoing potential for the sector

Our understanding of the areas we serve, supported by our proactive regional engagement has and will continue to influence our plan. In RIIO-GD3 we will continue to take this into account as we develop projects, ensuring stakeholder representation and feedback is considered and directing us towards new requirements and considerations as outcomes are delivered. Existing analysis and input is reflected throughout the NIA plan, but particularly in the challenge area of planning and delivering net zero operations, where we plan to innovate to support energy system planning.

7. How external evidence has shaped our planned focus areas

As well as shaping our understanding for our role in delivering innovation in principle, external evidence and stakeholder perspectives have helped shape the specific challenges we are seeking to address through our RIIO-GD3 innovation plans. This table provides examples of direct UK and Welsh Government strategies and regional commitments which we've outlined in the national and regional net zero ambition column below; we've also added external reference links to the published documents containing the ambitions, and shown where you can see these ambitions referenced in our Innovation Strategy plan

National net zero ambition	External Reference	Reference in our plan
Develop energy system planning to support NESO's Strategic Spatial Energy Plan and Regional Energy System Plans, further Local Area Energy Planning activity, and actions identified in these plans such as for improvements to systems/data sharing and trials of new technology	NESO Strategic Spatial Energy Plan commission from DESNZ Ofgem Regional Energy Strategic Plan consultation	Challenge area: 1. Planning & Delivering Net Zero Operations by improving energy system planning
Develop at least four low-carbon industrial clusters by 2030 to deploy carbon capture/hydrogen at scale and integrate it into industrial processes, with the ambition to achieve net zero clusters by 2040, where industrial sites will operate with minimal carbon emissions; South Wales industrial cluster is second largest emitter in the UK.	Industrial Decarbonisation Strategy South Wales Industrial Cluster Plan	Challenge area: 2. Facilitating Green Gases by supporting higher volumes of blended biomethane and hydrogen, and preparing for repurposing for pure hydrogen Challenge area: 1. Planning & Delivering Net Zero Operations by preparing the business for a net zero future
Accelerate and scale up the development of new energy technologies e.g. green hydrogen to enable the UK to produce 10 gigawatts (GW) of low-carbon hydrogen by 2030, with at least 5 GW coming from green hydrogen, which is produced using renewable energy sources.	British Energy Security Strategy	Challenge area: 2. Facilitating Green Gases by supporting higher volumes of blended biomethane and hydrogen, and preparing for repurposing for pure hydrogen Challenge area: 1. Planning & Delivering Net Zero Operations by preparing the business for a net zero future
Target hard-to-decarbonise sectors such as heavy industry, aviation, shipping, and long-haul trucking as these sectors are challenging to electrify and support next generation green technology to support industrial and commercial clusters e.g. green steel production, flexible power generation and long-term energy storage.	UK Hydrogen Strategy	Challenge area: 2. Facilitating Green Gases by supporting higher volumes of blended biomethane and hydrogen, and preparing for repurposing for pure hydrogen

National net zero ambition	External Reference	Reference in our plan
Assess low carbon hydrogen alternatives to petrol, diesel and kerosene or as feedstock for the production of transport fuels to support the key role expected for hydrogen in decarbonising the sector which is the largest single contributor to UK domestic GHG emissions and was responsible for 27 per cent of emissions in 2019 whilst supporting crucial early market for hydrogen, driving some of the earliest low carbon production in the UK.	UK Hydrogen Strategy	Challenge area: 1. Planning & Delivering Net Zero Operations by developing an ultra-low emission fleet
Develop strategic innovation decarbonisation projects to support regional challenges including North East Wales and South West England, in addition to South Wales (see above)	Ambition North Wales Western Gateway Plan for Sustainable Growth	Challenge area: 2. Facilitating Green Gases by supporting higher volumes of blended biomethane and hydrogen, and preparing for repurposing for pure hydrogen
Investigate the potential for hydrogen repurposing to support the deployment of hydrogen to meet demand, largely for industry and shipping and the expectation that natural gas network owners should continue to investigate the need for, design and feasibility of a hydrogen transmission network in Wales	Future Energy Grids for Wales	Challenge area: 2. Facilitating Green Gases by supporting higher volumes of blended biomethane and hydrogen, and preparing for repurposing for pure hydrogen

Stakeholder perspectives have also helped shape other challenge areas we are seeking to address through our RIIO-GD3 innovation plans which include:

- Reduce short term emissions by blending green gases onto our network and addressing leakages which are referenced in ‘Challenge area: 1. Planning & Delivering Net Zero Operations by improving data & digitisation and reducing environmental impacts’.
- Responding to consumer & consumer advocacy groups on the benefits of innovation are equitably distributed, by continuing to deliver our stretch ongoing efficiency challenge (part of the ambitious ongoing efficiency challenge) across the RIIO-GD3 plan, whilst providing options and pathways for network decarbonisation which is referenced in ‘Overview of our BAU innovation plan’ section.
- Responding to consumer & consumer advocacy groups on consumers feeling left behind in ‘Challenge area: 3. Supporting Customers in Vulnerable Situations’ by supporting consumers through the transition.
- Continually improving our processes to improve our innovation culture, and increase transparency, and engagement whilst nurturing and supporting innovators especially those in smaller organisations which is referenced in the ‘Overview of our BAU innovation plan and Innovation benefits, funding justification, and process summary’ section

RIIO-GD2 innovation allowances have been pivotal to exploring how innovation can play a role in developing the new technologies required, increasing the efficiency of delivery and ultimately in reducing the cost of this transition for consumers. In terms of the private sector, the Government estimates a significant increase in external investment to deliver Net Zero and we would see the role of network innovation increasing alongside it; although there is uncertainty about the future of the gas network, innovation can help navigate that uncertainty and provide options irrespective of future direction whether for Green Power 2030 targets or Net Zero 2050.

Our innovation plan is reflective of the trend outlined in government estimates identifying a significant increase in external investment will be required to deliver Net Zero at pace.

8. A positive culture for our business innovation plan

Having a culture of innovation that is funded to support high risk, potentially high reward innovation is vital for supporting a robust and ambitious portfolio, so to inform our planned approach to innovation in RIIO-GD3, during 2023 we participated in a Culture of Innovation project which was commissioned by UK Research and Innovation (UKRI) in collaboration with Ofgem and participating energy networks. This project was based on a series of interviews and surveys with energy networks and external industry stakeholders at all levels of the organisation. The report findings challenge myth-based mindsets that are potentially limiting individual organisations, and the wider industry, from enhancing innovation culture and how regulation can help support a successful innovative culture. The report showcased what an exemplar innovation culture to help meet net zero targets would look like Innovation culture: There's no stopping you I PA Consulting.

We not only assessed ourselves as a network against the key elements of an innovation culture – leadership, relationships, stories and symbols, values and behaviours, organisational structures and capabilities, and governance and controls – but also completed a follow up project to understand how we could best set ourselves up for success in the short and longer-term through RIIO-GD3. We generally rated well for our culture of innovation but had a few areas of focus we took away to develop and improve.

We focussed on stories and symbols (which take the form of formal and informal innovation related communication from leadership and teams) and undertook a comprehensive review of our internal communications process and now have a plan in place to increase engagement across all levels of the organisation to encourage creativity and pace. We also reviewed organisational structures to set ourselves up for success through the remainder of RIIO-GD2 and into RIIO-GD3. We continually tighten our governance and processes as standard and have embedded these into our leadership conversations to ensure strategic alignment.

The outputs of this work underpin our innovation strategy, our people and skills, and resultant business planning activity to support the future energy system transition, vulnerable customers, and our approach to Business as Usual (BAU) innovation.

For BAU innovation, the focus is safety and compliance challenges, there will be no tangible cost savings linked to this approach and all innovation savings to date are already embedded into our Totex cost base.

The table below outlines where innovation is referenced in other parts of the business plan:

BAU Innovation Area	Funded Innovation Area
Document 48, Environmental Action Plan, 1.8, Environmental Opportunities Document 59, Cost Assessment and Benchmarking, 3.3.4 BAU innovation already embedded in our GD3 plan Document 62, Vulnerability Strategy, 7. Supporting Customers During our Core Activities Document 1, Business Plan Main Document, Chapter 4.1	Document 1, WWU Business Plan, Chapter 3.1 Document 48, Environmental Action Plan Document 51, Digitisation strategy Document 59, IT & Telecoms Strategy Document 1, WWU Business Plan, Chapter 2.1 Document 50, Workforce and Supply Chain Strategy

9. Our GD3 Network Innovation Allowance plan

Our RIIO-GD3 Network Innovation Allowance (NIA) will, subject to funding, be committed to the future of the energy network including preparing our network for repurposing in a range of decarbonisation scenarios, supporting vulnerable customers, and increasing energy system resilience.

Throughout this innovation strategy annex, we've outlined each stage of thinking and justification to support our plan, detailing relevant evidence and extensive stakeholder feedback. Innovation is inherently uncertain, high risk, and developing at an increasingly fast pace, so in most cases identifying specific named projects in a business plan is not realistic. However, we can identify the key challenges which innovation can help solve, and the overall outcomes we expect to deliver, and have set out our plans to use the Network Innovation Allowance (NIA) in RIIO-GD3 on this basis.

Summary of planned RIIO-GD3 Network Innovation Allowance Activity	Total NIA Cost (£m) 37.90
Innovation is inherently uncertain and high risk, but we have identified key areas of focus for our NIA funding during RIIO-GD3 which meets the criteria of facilitating the energy system transition and/or vulnerable customers. We've outlined our plan below that will be committed to the future of the energy network, including preparing our network for repurposing in a range of decarbonisation scenarios, supporting vulnerable customers, and energy system resilience. In addition to this, we plan to use the Strategic Innovation Fund in RIIO-GD3 to develop large scale, high impact projects, as we have in GD2, and support third parties through this process.	

10. Approach to identifying areas for innovation

Each high-level innovation area is summarised, and then broken down into further levels of detail to show the problems that need to be solved, where we derived evidence of the problem, what outcomes we expect to deliver, and how our cost estimates have been derived.

Our detailed plan has been estimated based on our extensive innovation portfolio experience gained from previous price controls and has taken a robust, ground up approach to the identification of the challenges, evidence and both external and internal stakeholder feedback.

Cost estimates for each area are based on and justified via evidence provided from previous price control innovation projects, where considerations such as the size of the anticipated evidence gap, similar sized technology demonstrators, and how many projects of what type and what size are expected in each area.

The challenges we intend to address through our NIA activity are:

Challenge	NIA Cost (£m) 37.90
1. Planning and Delivering Net Zero Operations	22.75
2. Facilitating Green Gasses	13.70
3. Supporting Customers in Vulnerable Situations	1.45

We have provided a breakdown of activity areas within each of these challenges, including the basis for the funding we have proposed.

11. Challenge 1: Planning and Delivering Net Zero Operations

Planning & Delivering Net Zero Operations	Summary	NIA Cost (£m) 22.75
Improving Energy System Planning	Enables us to play our role in developing the data and tools which will help deliver effective national, regional and local area energy planning.	5.35
Preparing the business for a net zero future	Enables us to evolve the business, processes and systems to prepare for a net zero future, as outlined in the Net Zero Strategy 'Preparing for our future: Business Evolution' workstream.	5.55
Improving data & digitisation	This enables us to support a central theme for Ofgem and in the industrial innovation strategy which is under increasing stakeholder and regulatory scrutiny requiring opportunities to increase efficiency over the long-term energy transition.	4.50
Developing an ultra-low emission fleet	Enables us to plug gaps in existing technology, particularly around rurality and range, on-board power requirements and tow weight.	3.90
Reducing environmental impacts	New technologies and techniques to improve operational transition, reduce venting, emissions, and embedded carbon.	3.45

11.1 Improving Energy System Planning

Why? Establishment of National Energy System Operator (NESO) and its Regional Energy System Planning (RESP) function demonstrates that increased activity will be required in this area. Alongside activity set out in the Net Zero section of our Business Plan, we intend to use innovation to support new ways of delivering information, collaborating, and developing projects to explore technologies informed by both regional and local planning.

What will it deliver? Innovation outcomes in this area are expected to further develop principles established within our RIIO-GD1/RIIO-GD2 implemented Pathfinder tool, further developing whole energy systems modelling tools, This could include increasing the options for modelling approaches, for example analysing pre-defined scenarios, and refining designs for energy system options that will be required to align with Future Energy Scenarios (FES), support NESO and RESP development and ambitions.

Supporting evidence Stakeholders want us to provide further evidence on consumer and local choices, particularly in response to Local Area Energy Plans (LAEPs); this would be alongside decision support tools, and development of technologies and platforms to capture key data requirements.

Detailed breakdown – Total Cost £5.35m

Areas	Problems identified	Evidence of problem	Expected outcomes	Cost £m	Proof of estimate
Scenario models and tools to support future planning, local development and local ownership of LAEPs	Future planning scenarios are inconsistent; future LAEP and NESO requirements are uncertain; tools such as WWU's Pathfinder model require updating for future use; WWU and other networks need to better understand how data can be provided to support third party processes	Scenarios such as FES are regularly updated; sources and evidence need updating; new tools and approaches could support data sharing or provide new insights; expectation of WWU playing an ongoing role in LAEPs, and supporting NESO SSEP / RESP	Improved energy system modelling capabilities, for example, to use pre-defined scenarios as well as designing bespoke energy systems, to align with FES and support NESO and RESP development and ambition	2.25	Estimates based on previous projects in RIIO-GD1/GD2; we expect there to be an increase in effort to include additional scenario modelling for gas scenarios to support RESP / SSEP ambitions.
Uncertainty on heat policy and domestic customer choice	Technology choices are uncertain; new technologies need to be understood	Local area energy plans have begun to define the role of retrofit in reducing demand on energy systems within a local area but have not started to tackle the potential for network demand in the future. Local area engagement suggests desire for WWU to play a role in exploring new options	Further evidence on low carbon technologies, consumer and local choices with accompanying decision support tools	1.00	Estimate based on previous projects in RIIO-GD2 at a similar volume in RIIO-GD3.
A need to understand and demonstrate the range of options and new technologies for the transition to support regional planning will impact the gas network and the wider energy system	Impact of development of technologies and take up of heat pumps, microgrids, islanded energy, industrial/agricultural technology need further evidence and understanding to support management of the transition	Local area energy plans, local development plans, stakeholder engagement groups and conferences have identified a range of challenges and opportunities	Development of technologies and platforms to capture key data requirements e.g. appliance installations, to enable a smoother planning process when considering large- or small-scale conversion, including support for key delivery partners to support future transition	2.10	Estimate based on previous projects in RIIO-GD2.

11.2 Preparing the business for a net zero future

Why? Preparing our business for a net zero future requires us to review and update our processes, develop and adapt systems and new technology in addition to understand resource requirements and skill development. Innovation will support the workstream 'Preparing for our future: Business Evolution', as outlined in the Net Zero Strategy.

What will it deliver? Innovation will help reveal the challenges and opportunities to improve business processes and aid delivery of net zero at a faster pace, with the right systems and skillsets; progress through RIIO-GD3 is likely to reveal further innovation challenges that will then form the basis of RIIO-GD4 as we understand more on the likelihood of differing national or regional scenarios.

Supporting evidence This evidence gathered in this area is based on internal analysis of the changes required to safely operate the gas network and deliver our licence obligations regardless of future energy scenarios, through the Business Evolution workstream explained above. All evidence of the identified challenges was collated from an end-to-end business series of extensive and in-depth internal workshops. This evidence not only shaped the innovation strategy but also the plans for utilisation of NZARD UIOLI funding as outlined in the Net Zero strategy part of the business plan.

In addition to this analysis, we engaged with a wide range of stakeholders and consumers such as consultants working on LAEPs, domestic and business consumers, consumer body representatives and academic researchers. Using our AI Engagement Insight tool, we synthesised feedback from over 140 distinct engagement activities. This feedback tells us that stakeholders expect WWU to take a proactive, collaborative, and transparent approach in preparing for a net zero network. This includes working closely with local authorities and other utilities, leading innovation efforts, future-proofing infrastructure, addressing consumer and colleague concerns, and supporting vulnerable customers.

Detailed breakdown – Total Cost £5.55m

Areas	Problems identified	Evidence of problem	Expected outcomes	Cost £m	Proof of estimate
Understanding the requirement and developing our technology to support safe and efficient operation, through a range of future of energy scenarios	Captured issues that would be seen in processes if we were to transition to future of energy scenarios today - including blending and a fully green gas network e.g. hydrogen or decommissioning	Analysis of current capabilities and gaps for the systems used for: -Network analysis - Mapping - Emergency management - System operation - Pressure management.	New systems and technology will be required in RIIO-GD3, to provide new functionality to support higher levels of blending and early hydrogen adoption. We expect to develop further solutions for the future through the price control	2.00	Based on previous experience with systems development projects
Systems to manage and optimise the transition away from natural gas.	We do not have systems or processes to support an extensive transition away from natural gas.	A system is required to manage / optimise the transition considering: - Readiness of networks - Customers - External stakeholders and - Workforce availability.	Develop systems to support transition in RIIO-GD4 or later. This area is likely to include solutions which support engagement with other external stakeholders.	1.00	Based on previous experience with systems development projects

Areas	Problems identified	Evidence of problem	Expected outcomes	Cost £m	Proof of estimate
Gas purging	The current process for purging natural gas from the network to prepare for repurposing or decommissioning would have significant environmental emissions if carried out at scale as part of a major transitional activity. Therefore, other solutions need to be developed.	Captured issues that would be seen in processes if we were to remove natural gas from our network today, to support transition to a fully green gas network e.g. hydrogen.	Development of options to reduce risk and environmental impact to support a range of transition scenarios	0.75	Cost based on a small research project, followed by a larger system related project which could then develop into a SIF or NZARD UIOLI demonstration project
Review of tools and equipment e.g. PPE, hydrogen detectors and other equipment used by engineers	Ensure appropriateness of tools and equipment for use with hydrogen.	Gaps in knowledge were captured.	Understanding replacement requirements for tools and equipment in hydrogen scenarios.	0.50	Based on engineering and other process management projects in RIIO-GD2 and number of areas impacted
System to record supply chain and consumer readiness	We are likely to need new systems to store new data that record readiness levels of supply chain and consumers.	We will need to understand our customers' readiness levels to move away from natural gas to support the development of our transition plans.	A cohesive system that records everything in readiness for transition. This system will feed into a transition optimisation and management system. This may involve receiving information from other industry parties e.g. suppliers on behalf of customers.	0.50	Based on engineering and other process management projects in RIIO-GD2 and number of areas impacted
Regulatory and financial frameworks, structures and analysis techniques	There are no firmly established processes to establish how we should treat existing assets in the future in terms of regulatory and financial frameworks for parts of the network that may be repurposed or decommissioned	Captured issues that would be seen in existing processes if we were to transition to a fully green gas network today e.g. hydrogen	It is likely we will need to transfer parts of our network to new businesses under the HTBM and/or decommission some parts of the network. We need to develop tools to value the financial worth of the network, to a sufficient level of granularity	0.50	Cost based on a typical regulation related project in previous price controls

Areas	Problems identified	Evidence of problem	Expected outcomes	Cost £m	Proof of estimate
Customer and stakeholder support through any network transition	We will need significant engagement with Local Authorities / Police / Emergency services / Social services / Major house builders / to provide support as we transition the network away from natural gas.	Expert support may be required for customers with specific cultural needs and vulnerable customers. We will also need to coordinate with other utilities who may be working in the area, critical users, and businesses who continue to need access.	Improved understanding of customer and stakeholder requirements and agencies we may seek to collaborate with for support	0.10	Price of a very early small research project
Network transition impacts	We need a process to deal with unexpected occurrences e.g. issues accessing meters / unexpected metallic/internal pipeline failure/access issues/appliance faults and repairs, and theft of gas discoveries.	Captured issues that would be seen in existing processes if we were to transition to a fully green gas network today e.g. hydrogen	An established process for dealing with unexpected occurrences during a network transition.	0.10	Price of a very early small research project
Network transition impacts	Dealing with redundant assets in transition from natural gas in an environmentally responsible and efficient way.	No experience of widespread repurposing or decommissioning	Appropriate methods developed and tested regardless of scenarios or decisions on network transition through RIIO-GD3 and beyond	0.10	Price of a very early small research project

11.3 Improving data & digitisation

Why? As highlighted in the Digitisation and IT & Telecoms section of the business plan, data remains a focus area in RIIO-GD3 as we continue to progress on our work on the RIIO-GD2 SIF project, 'Powering Wales Renewably' developing a digital twin of the Welsh energy system and we plan to follow on this vital work expanding this model to the rest of our network to support the UK energy network digital twin.

What? We plan to use digitised systems to reduce network emissions and utilise use of pressure reduction to deliver zero emission asset stations and data to support the UK energy network digital twin.

We need to explore opportunities to utilise AI / Large Language Models and Machine Learning to improve the quality of analytics to help us and others make the optimum decisions on investment for a wide range of scenarios.

Protection of our critical assets, particularly in response to climate change, will also be a focus for this area. Examples include satellite and movement sensors that would improve regular assessment of potentially dangerous activity in the vicinity of our assets and automated assessments to prevent human error, increase the pace of risk analysis, more safely and for more assets than can be done today.

Supporting evidence Consumers including those in vulnerable situations and energy industry representatives see data and digitalisation as fundamental to advancing environmental sustainability and addressing energy transition challenges. They emphasise the importance of accurate data collection to identify and support vulnerable customers on the Priority Services Register (PSR), using data analytics to understand customer needs and presenting information in accessible formats. Transparency, accessibility, and timeliness in data provision are crucial, with support for open data and clear reporting using visual infographics.

Detailed breakdown – Total Cost £4.50m

Areas	Problems identified	Evidence of problem	Expected outcomes	Cost £m	Proof of estimate
Digital twin	We need to expand the digital shadows of our current network to our entire gas asset portfolio and build in asset health, risk and future energy scenario assessment. This 'digital twin' will form part of a digital twin of the entire UK energy network.	This requirement is set out by Ofgem and is necessary for the success of NESO and development of their plan to get to net zero. We are partners in the initial planning stage of NESO's project to develop a digital twin of the UK-wide energy system We expect the Powering Wales Renewably project to identify gaps for further innovation.	A digital twin of the entire WWU gas network that can be integrated into NESO's digital twin of the UK-wide energy system.	1.50	Experience from previous Digitalisation projects
Pressure Reduction Installation (PRI) and network emissions	Our buried pipe and AGI sites emit methane, while PRIs both emit and burn methane through their operation, contributing to our carbon footprint. They also require significant maintenance and investment due to their criticality in delivering a reliable network. We seek to develop technologies to measure and prevent methane emissions, reduce maintenance visits and ensure 'just in time' investment to minimise costs.	We have strong stakeholder feedback that states reducing emissions is among their priorities. For our network to be net zero, we need to act on these buried pipe and AGI sites. There is also strong stakeholder feedback for data to support the Net Zero transition / a requirement from NESO for a UK energy network digital twin / and specific Ofgem expectation to explore Digital Platform for Leakage Analytics (DPLA). Gas shippers also want better emission measurement.	An investment plan to deliver zero emission stations and data to support the UK energy network digital twin	1.50	Estimates from engagement in DPLA and previous work on assets
Exploring the opportunities to use AI / Large Language Models and Machine Learning	There are numerous processes and RIIO-GD3 focus areas that could benefit the use of AI - Asset health assessments: - Detecting infringements on pipelines - Understanding vulnerability and planning to support -Driving efficiency through removal of manual tasks -Improving predictive and prescriptive analytics helping us to plan and optimise investment -The customer experience- Planning for net zero	There is a requirement from Ofgem to continuously improve performance. We also have many manual tasks that could be improved through automation, to improve the quality of analytics and decision-making. This also offers insight to Net Zero planning which is required by DESNZ and NESO.	Tools that can be put into production that reduce costs, improve quality of analytics and help us and others make the optimum decisions for investment now and for the future	1.00	Experience from previous IT projects

Areas	Problems identified	Evidence of problem	Expected outcomes	Cost £m	Proof of estimate
Protecting our assets with the use of innovative technology e.g. satellites and movement sensors	Our network sustains a significant number of third-party damages each year. To try to minimise this we operate a plant protection process and fly high pressure pipeline surveys to look for infringements and work activity in their vicinity. We fly every two weeks so there is a chance a problem could start just after the flight and not be discovered for two weeks.	Analysis of current plant protection processes.	More regular assessment of potentially dangerous activity in the vicinity of our assets. Automated assessments to prevent human error and analyse much quicker. Enabling risk assessment for many more assets than flying HP pipelines. Ultimately this improves safety through reduced third-party damage.	0.50	Experience from previous asset protection projects

11.4 Developing an Ultra-low emission fleet

What? Environmental impact and ongoing risk related to the activities performed by us as a network is under increasing scrutiny from investors, regulators, customers and stakeholders and delivery of an ultra-low emission fleet will be critical to meet not only net zero targets but also to meet the net zero emission vehicle mandate set by the government. 80% of new cars and 70% of new vans sold in Great Britain will now be zero emission by 2030, increasing to 100% by 2035 which causes operational delivery challenges to networks and where innovation will benefit delivery by helping to find new technologies and techniques to improve outcomes in this area.

Why? In the area of ultra-low emission fleet, we maintain and deliver services required to support a gas network which includes the 365/day/year gas emergency service. Based on research during RIIO-GD1/2, we know we have a gap in our vehicle fleet profile: <50% of current van journeys can be met by a battery electric van (BEV) – and then only by assuming that overnight recharging at the employees' home is possible (which is a key caveat), but 95% of current van journeys could be met by a hydrogen FCEV if daily refuelling is available. No commercially available hydrogen vans are available at this time, but innovation in this area would support our Environmental Action Plan strategy and allow us to explore these gaps, and support appropriate understanding across the industry and Original Equipment Manufacturers (OEMs). It would also help us understand the implications for alternative operation and fuelling costs which would enable us to continue to provide the right operational fit, regardless of future scenarios, and not just for us as a network, but for any energy network with similar operational needs.

Supporting evidence The Hydrogen Storage for Zero Carbon Fleet Transport NIA project produced a heat map based model, based on real world data to estimate routes that would pose difficulties for Battery and Fuel Cell vehicles to complete, along with recommendations for locations to install fuelling stations as part of full fleet conversion to hydrogen. The report indicated a market gap in small work vans, especially in the utility services work van market, as battery electric vehicles do not currently have the range or battery storage capabilities to meet the needs of gas networks, especially for vehicles requiring Power Take Off (PTO).

Stakeholders and consumers have also praised our hydrogen Fuel Cell Electric Vehicle trial, which took place in 2024 and there is broad support from all stakeholder groups for WWU's efforts to reduce fleet emissions.

Detailed breakdown – Total Cost £3.90m

Areas	Problems identified	Evidence of problem	Expected outcomes	Cost £m	Proof of estimate
Understand whether Hydrogen Combustion Engine Vehicles (HCEV) could be a useful interim technology for diesel vans	Burning hydrogen in an internal (spark ignition) combustion engine is less efficient than using it to generate electricity in an FCEV. Use of HCEV may be a useful interim technology while OEMs pursue development of hydrogen FCEVs and support development of infrastructure.	RIIO-GD2 NIA and other research	Demonstration of conversion of existing diesel operation vehicles to run on hydrogen, plugging an existing market gap in light commercial operational vehicles. This would enable interim zero emission on-board power generation for operationally critical towing capacity that forthcoming FCEVs cannot provide.	2.00	Experience gained from RIIO-GD2 hydrogen van trial and fleet related research projects
Deliver zero emissions with minimum impact to operational delivery model	Meeting zero emission vehicle mandate without impacting operational delivery.	RIIO-GD2 NIA and other research	Developing a realistic pathway for vehicle replacement that considers practicality of operational delivery with current and future markets.	0.75	Experience gained from RIIO-GD2 hydrogen van trial and fleet related research projects
Understanding the on-site/auxiliary energy needs associated with vehicle fleet enables us to provide energy usage data to OEMs to inform specification of future H2 vehicle model development	WWU vehicles with 'onboard power' have a 'switch' in the tracking system which identifies when the on-board power is selected and deselected. This is an expensive and unusual feature in terms of commercially available van stock.	RIIO-GD2 NIA and other research	The information gained would be shared with major OEMs who otherwise are unlikely to see a need for this option as it will require adaptation of the vehicle HV system, which has a smaller market share. However, development of a multi-fit vehicle installation is of fundamental importance to energy network operation.	0.50	Experience gained from RIIO-GD2 hydrogen van trial and fleet related research projects
Future capital cost impacts for alternatively fueled vehicles e.g. hydrogen	New fleet modelling approaches may be required to support adoption of ultra-low emission vehicles	RIIO-GD2 NIA research. Capital cost of hydrogen FCEV not yet known but is expected to be greater than BEV and parity with diesel is expected to be >10 years away. Future vehicle replacement strategy planning needs to be understood on an 8-year horizon to ensure adequate Capex funds are available to maintain the required fleet age profile.	Understand ongoing capital costs for alternatively fueled vehicles to maintain an efficient age profile across our fleets.	0.35	Experience gained from RIIO-GD2 hydrogen van trial and fleet related research projects

Areas	Problems identified	Evidence of problem	Expected outcomes	Cost £m	Proof of estimate
Future operating cost impacts for alternatively fuelled vehicles e.g. hydrogen	Currently green hydrogen and other alternative fuels are only available in small quantities and are more expensive than diesel fuel.	RIIO-GD2 NIA research	Understand refuelling infrastructure, locations, availability and costs associated with alternatively fuelled vehicles	0.30	Experience gained from RIIO-GD2 hydrogen van trial and fleet related research projects

11.5 Reducing Environmental impacts

This area will also focus on environmental impacts and delivery of net zero related activity, supporting our Environmental Action Plan and Supply Chain Strategies, which will likely see scrutiny on Health, Safety and Environment increase, with greater efficiency likely to benefit delivery in these areas, with innovation finding new technologies and techniques with which to improve outcomes.

Detailed breakdown – Total Cost £3.45m

Areas	Problems identified	Evidence of problem	Expected outcomes	Cost £m	Proof of estimate
Delivering an efficient transition	Developing efficient ways of managing operational delivery to assist network transition or decommissioning activity.	Colleague engagement workshops. Preparing for hydrogen repurposing and/or significant decommissioning are completely new activities so inherently uncertain.	Innovation technologies and solutions to aid a more efficient transition or decommission.	1.80	Based on previous price control experience with operational projects
Updating hazardous areas within operational site boundaries for hydrogen blending	A different hazardous area profile is anticipated as hydrogen is blended into the network e.g. venting, emissions and vent stacks.	H21 NIA project report; uncertainty on implementation of HyDeploy learning	Approaches for managing and reducing venting and emissions of hydrogen underway or in development.	1.10	Based on major hydrogen programme projects
Reducing embodied carbon	Suppliers need to provide accurate, honest, verified carbon data about their products and services but they don't have the resources/knowledge to calculate their footprints.	Frequently cited as challenge in business forums and by the Carbon Trust. Reduction in scope 3 emissions is hard to achieve as they are beyond the immediate control of the organisation e.g. waste arising in supply chain, and full cataloguing of broader value of land assets.	Reduced embedded carbon in our purchases or a reduced amount of material we consign to waste.	0.55	Based on similar environmental initiatives in RIIO-GD2

12. Challenge 2: Facilitating Green Gasses

Facilitating Green Gasses	Summary	NIA Cost (£m) 13.70
Supporting higher volumes of blended biomethane and hydrogen, and preparing for repurposing for pure hydrogen	Replacing the natural gas in our pipes with biomethane and blended low carbon hydrogen reduces environmental impacts from our network and customers today. It can also support delivery of Net Zero related activity, improving the processes and systems which will allow us to connect increasing volumes of biomethane and hydrogen into our network and respond to policy and technology developments. This area can also help provide insights on repurposing of our network for a range of scenarios including hydrogen at 100%	13.70

What? Our network currently distributes natural gas with a blend of biomethane. In RIIO-GD3 we expect increasing demand from biomethane producers to expand plants or connect new facilities to the network, alongside blended hydrogen connections.

Why? We need to increase the volumes of green gases in our network by increasing the blending of biomethane and preparing and readying our network assets for potential repurposing for use with blended hydrogen and for future use at 100%. The use of these green gases is seen as critical technology for net zero and is recognised in the government strategies we've evidenced as part of our innovation ambition and justification; however, there are still significant uncertainties which need to be addressed which is where innovation can play a vital role on the path to net zero as supporting new technologies development and emergence, evidencing and reacting to policy decisions and future decisions on the best routes to decarbonisation for a wide variety of consumers, including domestic, industrial and commercial.

Supporting evidence Work on blending of hydrogen has already begun, with all gas networks collaborating in a RIIO-GD2 Hydrogen Blending programme. During RIIO-GD2 we are continuing work to develop market frameworks and operational readiness for blending at the same time as the HSE are due to review HyDeploy evidence related to the safe transportation and use of blending at blends up to 20%. All GDNs are also collaborating on a Real Time Settlement Methodology project led by SGN, which is required to allow us to blend higher ranges (over about 5% volume depending on flow rates and network topology).

As we complete these projects, we will have more clarity on the nature and impact of changes we will need to make to our network, processes and systems for full implementation of blending during RIIO-3.

Green gas related innovation research formed the most significant part of our RIIO-GD2 innovation portfolio. These projects have provided a base of evidence on the potential role of the gas network in a net zero future, but consumers and stakeholders continue to raise further questions about green gas, particularly the potential for repurposing networks for hydrogen, which innovation can help address, especially for hard to decarbonise areas such as industry and long-term storage.

21 biomethane sites currently inject into our network, providing the only current green gas on our network and demonstrating that we can decarbonise gas. The government issued a call for evidence on future policy support for green gas in early 2024, and further plants may be looking to connect. With plants often concentrated in rural areas, capacity is already a challenge, especially in summer, and this is an area where we see innovation as an enabler to help overcome these challenges.

Our plan for RIIO-GD3 will evolve and build on previous innovation knowledge gained during RIIO-GD2 and progress to provide demonstrative technology and pathways regardless of future energy scenarios. Our innovation outcomes within network decarbonisation in RIIO-GD3 are expected to deliver the following:

- Potential continuation of the Hydrogen Grid Research and Development Programme which includes work beyond the government's expected 2026 hydrogen heat decision as challenges and opportunities emerge. This would include any research identified in or after the Health & Safety Executive (HSE) Comprehensive Formal Assessment (CFA) of hydrogen evidence, to address any gaps required to facilitate potential repurposing of the gas distribution networks.
- Undertake projects to support the implementation of hydrogen blending and solve specific challenges that may arise in that area.
- Assessing new and innovative means of achieving industrial decarbonisation to meet government targets and providing pathways for enabling early adoption.
- Generate further knowledge and research development to build on our RIIO-GD2 learning for to prepare for repurposing or decommissioning within our network geography, and how that interacts with other domestic heating decarbonisation technologies and the wider energy system.
- Provide supporting evidence on the decarbonisation of domestic heat and help provide increased consumer certainty - through techno-economic analysis, development of needs cases, assessing new technologies and their energy system impacts, and demonstrating solutions.
- We also plan to explore new physical injection approaches and commercial implications and new operational approaches to increase biomethane flows and impact of lower gas demand on biomethane entry alongside impacts and options for legacy sites.

Detailed breakdown – Total Cost £13.70m

Areas	Problems identified	Evidence of problem	Expected outcomes	Cost £m	Proof of estimate
Hydrogen technical evidence	Evidence for repurposing networks for hydrogen and associated impacts on customers will need to evolve further to fill gaps.	UK government Net Zero and Hydrogen strategies may require further evidence; RIIO-GD2 innovation project experience.	Continuation and continuous improvement of hydrogen safety and feasibility evidence and expected gap filling, preparing for potential repurposing of networks.	4.00	Estimates based on experience of RIIO-GD1/GD2 Hydrogen programme
Assessment on the practical delivery of repurposing parts of our network to 100% hydrogen	Evidence is needed for repurposing the network to hydrogen industrial roll-out and potentially heating	UK government Net Zero and Hydrogen strategies may require further evidence; RIIO-GD2 innovation project experience.	In depth understanding of implications of 100% hydrogen rollout for regional geography and interaction with other decarbonisation methods; development of new assessment techniques	3.00	Based on estimates for work under GD1 / GD2 hydrogen programme
Industrial and commercial transition to hydrogen	There is a need for mapping of demand, infrastructure planning, and understanding impacts on potential network repurposing	Industrial cluster plans demonstrate an overarching need to research and develop new solutions.	End user certainty, techno-economic analysis, needs cases, and offtake agreements.	2.10	Based on RIIO-GD2 South Wales Industrial Cluster (SWIC) related costs for similar work
Blending Implementation	Network Readiness for hydrogen blending	Next steps from HyDeploy projects and blending implementation collaboration, supporting government policy for blending in distribution networks	To be in a position to provide comprehensive evidence for the implementation of hydrogen blending and solve specific challenges as research is developed	1.50	Based on Hydeploy and hydrogen blending implementation project costs
Demonstrating industrial and commercial transition	Evidence for infrastructure requirements in specific industrial and commercial settings e.g. blending and/or deblending	Industrial cluster plans demonstrate an overarching need to research and develop new solutions.	New and innovative means of achieving industrial decarbonisation	1.00	Approximate cost for a previously scoped industrial project
Demonstrating a domestic transition	Evidence needed for infrastructure requirements in specific domestic settings e.g. decentralised production, storage, and balancing; need to assess impact of these on potential network repurposing	Uncertainty on heat decarbonisation requires innovation; UK government Net Zero and Hydrogen strategies may require further evidence; RIIO-GD2 innovation project experience.	Demonstration technology to support decarbonisation of domestic heat	1.00	Experience with RIIO-GD2 projects including HyRES and Cartrefi projects
New approaches required for biomethane hubs and injection models	Concentration of development of biomethane means regional constraints are seen on the network already – could increase if new capacity is supported	Engagement with biomethane producers	Research and develop new physical injection approaches and understand commercial implications	0.55	Costs based on related feasibility studies on technical and regulatory / commercial models

Areas	Problems identified	Evidence of problem	Expected outcomes	Cost £m	Proof of estimate
Overcoming operational challenges for biomethane sites	Issues with managing grid capacity; low flow areas; break through new constraints for hot spots (100% biomethane network)	Engagement with biomethane producers	New operational approaches to increase biomethane flows or deal with impact of lower gas demand on biomethane entry	0.40	Similar costs to projects on digitalisation and systems development
Dealing with legacy biomethane sites	Older biomethane sites are coming to end of life and implications of this are not clear	Internal workshops	To have gained understanding of impacts and options legacy biomethane sites	0.15	Costs based on related feasibility studies

13. Challenge 3: Supporting customers in Vulnerable Situations

Customer Vulnerability	Summary	NIA Cost (£m) 1.45
Customer Vulnerability	Enables us to support consumers through the transition using information from sources such as regional and local area energy planning and stakeholder feedback, to ensure those considered vulnerable are not left behind in any future energy system scenario, while also continuing to support their day-to-day safety and concerns.	1.45

What? Supporting consumers with innovation through routes such as regional and local planning and ensuring those considered vulnerable are not left behind in any future energy system scenario.

Innovation outcomes for RIIO-GD3 are expected to include:

- Non-digital means to communicate with consumers and therefore consider those consumers who experience barriers to technological fluency.
- We aim to understand more about impact on consumers living in multiple Occupancy Building's (MOBs) and the difference between different housing types alongside options for heating and transition.

We also see a need to continue investigating options for consumers in the event of gas supply interruptions particularly for: the elderly; those with health issues, and young children. This work will involve assessing options and providing support and advice for the third sector in the following ways: comprehension and mental health, improving registration of vulnerable consumers on the Priority Services Register (PSR), and understanding what tools are in existence to support those with challenges relating to sight, hearing or sense of smell challenges.

Why? Our stakeholder feedback in the business planning process strongly supports action on vulnerability. RIIO-GD3 activity in this area supports our Vulnerability Strategy, where innovation can help by improving processes, developing technology and facilitating positive outcomes for vulnerable consumers.

Supporting evidence The role of innovation in developing better outcomes for vulnerable customers has been illustrated by the VCMA and innovation activity through RIIO-GD1/GD2 which has clearly demonstrated its role by implementing new toolsets. NIA innovation activity in this area will continue to work alongside VCMA funding and new for RIIO-GD3, we've requested additional funding in the business plan of £1.0m to support implementation of proven vulnerable customer innovation developed in RIIO-GD1/2.

Detailed breakdown – Total Cost £1.45m

Areas	Problems identified	Evidence of problem	Expected outcomes	Cost £m	Proof of estimate
We need to address ways of communicating with digitally poor consumers, especially through the energy transition	Digital exclusion is a challenge for communication with consumers	Stakeholder input	Non digital means to communicate with consumers	0.50	Priced as two small research projects and one medium project from RIIO-GD2
To support consumers living in multi-occupancy buildings (MOBs) we need to understand how their options and experiences may differ from those in other housing types	We need further consideration of technical solutions and risks of putting hydrogen into MOBs including suitability of steel / PE / mapress riser systems and to understand options for heating and any additional safety measures required, particularly for managing transition from gas and mitigating impacts of interruptions	Stakeholder input	To understand more about impact of consumers living in MOBs in addition to the differences between houses with appropriate options for heating and transition	0.25	Priced as per a medium project from RIIO-GD2
More support is needed for the elderly, those with health conditions and those with young children to keep warm during supply interruptions	Keeping vulnerable consumers warm during gas supply interruptions	Extended durations likely during an energy transition – given limited impact of solutions today and concerns on costs of electricity	Options for vulnerable consumers during gas supply interruptions	0.20	Priced as two small projects from RIIO-GD2
More transition advice is required for elderly consumers and for those with comprehension or mental health challenges	There is a need to understand the energy system transition among elderly consumers, and the options and support available to them	Third sector asking for clear and simple advice they can provide to customers	Options and support advice for the third sector	0.20	Priced as two small projects from RIIO-GD2
Continue to improve Priority Services Register (PSR) registration	There is a need for greater ease in registering for the PSR and a greater awareness and understanding of the services vulnerable consumers are entitled to	Lots of evidence for a common centrally run PSR providing single point of registration, update and comms pushed to customers	Improved registration of PSR and greater understanding of services vulnerable consumers are entitled to	0.10	Priced as one small project from RIIO-GD2
More support is needed for vulnerable consumers with sight, hearing, and reduced sense of smell challenges	Limited ability to see/hear/smell is an issue when combined with living with a gas supply and potentially not being able to sense problems	RNIB demonstrated many tools on phones and other technology at care & repair conference in 2024	For vulnerable consumers to understand what tools are in existence and could help them	0.10	Priced as one small project from RIIO-GD2
More advice is needed for vulnerable consumers to understand how they can reduce energy consumption in their homes	Limited consumer understanding on how they can effectively reduce energy consumption	High levels of Citizens Advice calls are received on this topic as smart meters only identify how much energy is used, with no understanding of how or why	Provide support and advice to Citizens Advice Bureau	0.10	Priced as one small project from RIIO-GD2

14. Deploying previously proven innovation to support vulnerable consumers

We plan to utilise the innovation implementation funding allowance for deploying previously proven NIA innovation in RIIO-GD3. We plan to roll out several vulnerable customer related innovation projects to deliver consumer benefits that as a network we would be unable to fund outside of uncertainty mechanisms.

Previously Proven Innovation	Summary	Total Deployment Cost (£m) 1.03
Increase safety at StreetWorks	Enables us to support wheelchair using customers, and those that are visually impaired or require assistance	0.36
Vulnerability support	Enables us to implement a data visualisation tool into business processes	0.13
Gas safety	Enables us to provide technology to understand different alarms and provide alerts within the home and send messages directly to a family member or a carer	0.25
UK energy transition	Support customers and their agents to ask questions in their own language and get answers and advice to support the UK energy transition	0.29

We are requesting funding to implement a range of innovation projects that will support vulnerable consumers to deploy better ramps, lighting and signage for StreetWorks, support customers or representatives to understand environmental decisions and energy options for their home or area, including costs, grants and installers, and roll out of smart alarm hubs.

Detailed breakdown – Total Cost £1.03m

Theme	Project name	Description	Deployment Tasks	Development Cost
Safety at Streetworks	Ramp Up / Streetscore	Implementation of better ramps to enable access for people in wheelchairs, mobile scooters, and those who walk with assistance	Develop new ramp prototype with approved supplier. This includes initial purchase of new accessible ramps for each area, with roll out support	0.17
Safety at Streetworks	Streetscore - improved lighting	Implementation of better lighting for streetworks to guide customers through a safe route at night	Purchase new lighting equipment and rollout to depots with roll out support	0.12
Safety at Streetworks	Streetscore - improved signage and information	Deployment of improved signage to guide people through streetworks	Produce templates for signage with accompanying WWU branding and roll out support	0.07
		Total implementation funding to increase safety at StreetWorks - £0.36m		
Vulnerability	Data visualisation tool	Implementation of the data visualisation tool developed with Egnida into business processes to support the customer and environmental decisions	Obtain licenses for the new visualisation tool with development of APIs to connect to our geospatial systems, including roll out support	0.13
		Total implementation funding for vulnerability support - £0.13m		
Gas safety	Easy Assist ECV	Deployment of Cadent's easy Assist ECV to work on the insulated ECVs used by WWU and develop a roll out process to customers with restricted hand strength /movement	Modify ECV for insulated models and make initial purchase for initial trial roll out	0.11
Gas safety	Homeshield	Following through current project to manufacturer and usage by GDN VCMA partners and other organisations. Smart hub is trained to understand different alarms. Upon detection provides alerts within the home and can send message to family member or a carer	Send Homeshield development to production, and purchase an initial trial batch of devices for roll out	0.07
Gas Safety	H2 Detector	Production of a prototype hydrogen detector for domestic homes ready for installation in households that are early adopters of hydrogen	Purchase detector device to supply to early adopters of hydrogen	0.07
		Total implementation funding to improve gas safety - £0.25m		
UK energy transition	Hyfair / Fair Warmth	Implement solution with WWU, partners and customers of the Hyfair platform - which allows customers or representatives to understand energy options for their home or area, plus costs, grants and installers. Would also allow WWU to better plan for the UK energy transition by tracking local plans for heat networks, electrification or hydrogen	Licence purchase and support for roll out	0.29
		Total implementation funding to support the UK energy transition - £0.29		

15. Innovation benefits, funding justification, and process summary

15.1 Benefits and monitoring

Innovation ideas are nurtured through an innovation funnel with successful innovation measured not only in terms of directly implemented innovation, but to the cumulative benefits of iterative learning, dissemination, and fast failure, which should form part of the innovation benefit tracking cycle.

Innovation success should not be measured just in terms of deployment or rollout in the same way that success quantification should not just be about direct financial benefit as the only applicable measure of success. Innovation in RIIO-GD2 for the gas networks has outlined how valuable early research can be in creating knowledge, options and pathways to support future government decisions and policy, and support major transformational change. This is of particular importance when considering the wider energy system transition with regards to social return on investment, reduction of emissions, supporting the future economy and markets, local communities and jobs.

We will continue to monitor innovation benefits in RIIO-GD3 using the existing RIIO-GD2 Innovation Measurement Framework which will be developed in the final year of RIIO-GD2 to ensure we have a robust and consistent measurement tool across the networks that is suitable for measuring benefits of all types of RIIO-GD3 innovation regardless of whether financial, social, or research based benefit is derived.

Our focus as a network is to create pathways and options for consumers regardless of potential future energy scenarios, that can utilise a repurposed, decarbonised, gas distribution network, to aid a cost-efficient transition for all, providing options for consumers, particularly in hard to decarbonise areas and those that could be left behind due to vulnerability

15.2 Funding and cost justification

Ofgem's RIIO-3 SSMD restricts investment in net zero activity in base allowances due to perceived uncertainty. Innovation spending is therefore proposed for funding via the NIA and SIF, which Ofgem has signalled will continue subject to justifications from networks on its proposed use.

To this aim, we require £37.9m of NIA funding across the RIIO-GD3 price control, to support our ambitious future of energy and vulnerable customer innovation business plan that also meets the NIA eligibility criteria to facilitate energy system transition and/or benefit consumers in vulnerable situations. This will support a core team to govern and deliver the NIA innovation portfolio outcomes and is based on a balance of 75% external project spend and 25% internal resource project spend profile. This is an increase on RIIO-GD2 NIA awarded funding (£13.3m) and reflects our ambitious plan to support the energy transition and vulnerable consumers.

Innovation, particularly to support the net zero energy transition and vulnerable customers, is high-risk and transformational activity that doesn't always lead to a solution that derives direct consumer or network benefit. To give some context to this, to date in RIIO-GD2, we have led 29 NIA projects, where 25 of these moved from Technical Readiness Level (TRL) 2-3 and four projects moved from TRL 3-4.

In a regulated environment base totex allowances are used to fund outcomes that are more certain; innovation is outside of those parameters, which is evidenced in our RIIO-GD2 portfolio. Consistent with the approach in RIIO-GD2, we assume that NIA will cover 90% of these costs, with a 10% contribution from our shareholders, demonstrating our commitment to innovation and as a fair reflection of the level of risk involved.

In addition, we will look to develop energy system transition Strategic Innovation Fund projects and source alternative external funding routes during GD3, such as through HTBM. Based on our experience in RIIO-GD2, we will develop a pipeline of SIF projects to support the ongoing competitive elements of the funding mechanism; these roles would also source alternative funding outside of Ofgem funding mechanisms to ensure best value for consumers. Consistent with the approach in RIIO-GD2, we assume that SIF will cover 90% of these costs, with the RIIO-GD2 minimum 10% contribution from our shareholders and supporting partners, demonstrating our commitment to competitive innovation.

15.3 Network collaboration

NIA ensures value for consumers with its collaborative approach to innovation, avoiding unnecessary duplication, facilitating learning between networks, and removing competitive barriers.

In RIIO-GD2, network collaboration has been key to innovation success and partnerships an integral part of our innovation process. We worked with 22 unique partners across the last 12 months including a variety of innovators and energy networks and collaborated in over 60% of our projects with other energy networks which is referenced in our annual innovation report.

The RIIO-GD2 Hydrogen Research and Development Programme was a research and development programme where the gas networks shared the portfolio of projects between them. The funding of these projects was covered by the lead network alone but ensured collaboration in the overall portfolio and the delivery of each element of the evidence. Each of the other networks worked alongside the lead network to contribute resources and information to the projects attending various project meetings, and steering boards and contributing and reviewing reports and submissions to both the HSE and DESNZ. This approach was replicated across other programmes with another example the National Skills and Competency programme which included projects such as Asset Interventions and Hydrogen Ready Components and required networks to share various datasets, time and resources.

We expect our strong collaborative approach will continue in RIIO-GD3, furthering the positive culture we have built with other Distribution and Transmission Energy Networks.

15.4 Avoiding unnecessary duplication

We have made sure that governance of our innovation portfolio - the system that gives structure to managing its processes and direction - is strong. This means projects not only follow strict guidelines outlined in the conditions of our licence as a distributor of gas; they line up not only with management of internal processes but also with external peer reviewed processes with the other energy networks. The avoidance of unnecessary duplication is currently managed through Energy Networks Association groups e.g. the Gas Innovation Governance Group (GIGG), and the process is also referenced in our published Energy Network Innovation Process (KTN) document.

As the gas networks exit from most activity with ENA, alternative appropriate governance will be developed to continue to meet these requirements and expectations. This avoids unnecessary duplication and supports the sharing of learning from in progress and completed projects across licensees, and with third parties, this will include the continued sharing of project notifications before any project is initiated.

Each project has a single page outline shared pre-project initiation, between the networks, to check for unnecessary duplication and log collaboration opportunities. Each project is currently published on the ENA Smarter Networks Portal with project information published and publicly available including key information like scope, cost, technical readiness level at start/end, outline business benefits and other important recorded data. Each project also has a closure report published on the portal (and an interim report if a project is in progress through an annual regulatory report cycle). All projects can be assessed at any point and can be audited to ensure compliance to funding guidelines with allowances removed for non-compliant projects.

15.5 Dissemination

We initiate direct engagement with partners and have a detailed dissemination plan to support the sharing of our project learning both internally and externally across different media channels whilst generating new ideas. We utilise our direct mailing list with over four hundred registered third parties who we communicate with regularly on our latest work, tenders, and in particular, dissemination events.

Key dissemination materials are our annual innovation report and the annual collaborative innovation report which we publish externally and utilise to facilitate dissemination. These reports, particularly our innovation report case studies, are built upon and added to throughout the year to increase the number of case studies that we then display at our collaborative gas network stand at the Energy Innovation Summit alongside project models to engage stakeholders in different ways. This event is the main annual dissemination event for all energy networks and we also present in-depth dissemination for projects, giving stakeholders the opportunity to ask questions and engage with us further either post talk or on the gas network stand.

We also use other industry events such as Innovation Zero/Infrastructure Zero and Utility Week Live to share learning from projects with even wider audiences on an annual basis. At these events we typically host a company stand with information from projects and deliver presentations or seminars. In addition to disseminating our learning, these events increase our understanding of other projects and technologies and make new contacts, which can lead to new projects; these events increase our understanding of external projects and technologies and enable us to increase the breadth of stakeholder engagement which can lead to new project development.

Regionally, we work with groups such as South Wales Industrial Cluster, Hydrogen South West and the newly formed Great Western Supercluster of Hydrogen Impact for Future Technologies (GW-SHIFT) programme. We are involved in wider strategic projects such as the Milford Haven Energy Kingdom and Ambition North Wales. This allows us to both share learning and gain information on the priorities of regional stakeholders and developments in the wider innovation ecosystem.

We also have a close relationship with the Welsh Government innovation and wider energy related teams, engaging monthly to discuss strategic direction and project updates and outcomes. This allows us to both share learning and gain information on the priorities of regional stakeholders and developments in the wider innovation ecosystem.

We intend to continue this approach in RIIO-GD3, primarily through NIA and SIF funding.

15.6 Third-party engagement

We make significant efforts to engage third parties and flexible funding allows time and space to foster relationships with third parties, who can bring ideas across a wide range of topics at times that fit the evolution of their products and services, rather than fitting into competition windows. We, in collaboration with other networks, have a range of tools and approaches to engage third parties which resulted in a substantial number of projects developed from third party ideas. In FY24, in the annual collaborative innovation report, 92 projects originated from external collaborations, highlighting the value of diverse partnerships in driving innovation, and RIIO-GD2 has seen a total of 500 partners engaged in various projects, indicating a growing ecosystem of innovation across the networks with organisations of every size.

As networks, we also attend the annual Energy Innovation Summit where we had 1,137 attendees from 340 organisations in 2023. We also have our own annual innovation report which we publish and disseminate widely in addition to the annual whole network innovation report. We also engage and present to different types of partners at a regional and national level through different events throughout the year.

We foster direct engagement with partners and have a detailed engagement plan to support innovators across different channels to understand how they can engage with us and submit ideas. Our annual innovation report is a great example of how we engage externally; we also have a direct mailing list with over 400 registered third parties where we communicate regularly on our strategic areas of interest, upcoming tender events and previous project dissemination.

We issue our innovation problem statements widely through the Bravo platform and via Find-a-Tender. We also engage with the Strategic Innovation Fund (SIF) process via UK Research and Innovation (UKRI) to meet new innovators and third parties and generate new ideas. We introduced the new Basecamp Event in RIIO-2 organised through the ENA where networks generated 53 problem statements and received 273 proposals from innovators, and we expect to build on the success of that format through the remainder of RIIO-2 and into RIIO-3.

It's also vital that we continue to be a part of developing early-stage innovation, e.g. working in partnership with universities and start-up organisations. We have strong relationships with numerous universities and start-up organisations through various channels e.g. UKRI, KTN, Welsh Government Innovator Support teams, and through direct approach via events and dissemination opportunities, where we encourage and support early innovation to develop either with early TRL research or via knowledge building on how to work effectively with energy networks and how we can fund and support their ideas.

We aim to build upon our successful engagement in RIIO-GD3 by developing closer relationships with existing third parties and increasing new third party partner opportunities e.g. start-up's. We will improve our reach of dissemination of project innovation, our innovation strategy and call for ideas by:

- Increasing registrations to our regular mailing list, maintaining quality of registrants with a supporting bi-monthly communication plan
- Introducing quarterly external webinars to give further opportunities to third parties to engage with us and understand how they can work with us no matter their location, supported by regular in-person events
- Increasing integrations with existing organisational events outside of the networks e.g. Welsh Government Collaborative Research Innovation Support Programme (RDP)
- Increasing the number of registered pre-qualified partners for upcoming innovation tender events

16. Implementation and roll out evidence

We have rolled out proven innovation in a variety of ways through RIIO-GD1/GD2 and have a wide variety of examples of why deployment of proven innovation into BAU should not be considered the only measure of a successful innovation outcome, in the same way that financial benefit should not be the only method of benefit quantification and measurement.

We've listed nine examples of innovation below that outline different ways innovation has been rolled out and/or has achieved benefit and/or successful outcomes to for a wide range of projects, consumers and stakeholders, including those that are planned for RIIO-GD3 and beyond.

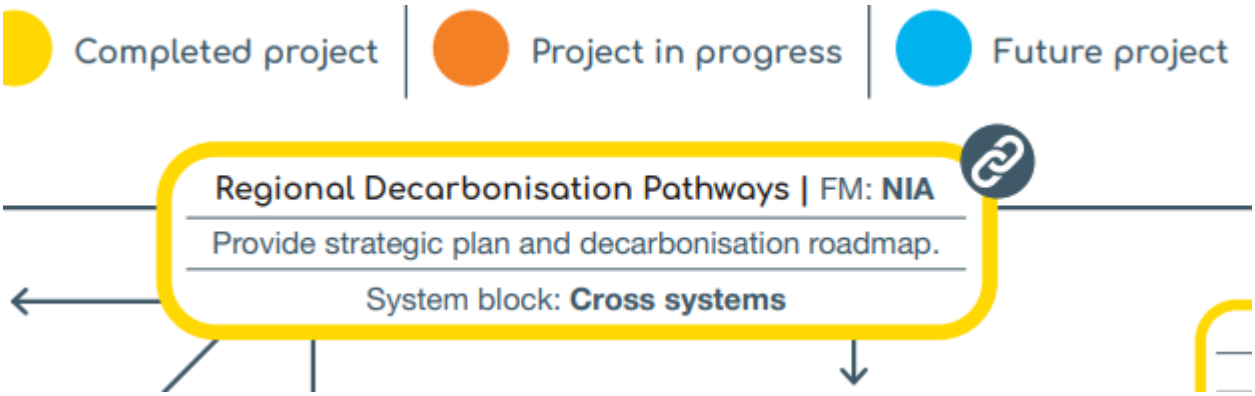
1. Projects in RIIO-GD2 that created foundational learning to support government policy and wider transformational change

Regional Decarbonisation Pathways (RDP)

Provided evidence on the long-term role of the gas distribution network in Wales and Southwest England against a range of future scenarios, outlining the potential role of the gas network in a high hydrogen scenario, a high electrification scenario and a balanced scenario, which followed on from engagement within the South Wales Industrial Cluster (SWIC).

Project benefits from RDP were early research based as it became the cornerstone of our RIIO-GD2 project portfolio and led to further development of our industrial and commercial strategy, building upon this initial research to create value and pathways in follow-on projects e.g. HyLine Cymru. The image below clearly demonstrates how projects have continued to build upon the research evidence outcomes delivered by RDP and subsequent projects.

Fig. 1 Building our innovation portfolio (please see page 18 of our annual innovation report for the full image)



2. Projects in RIIO-GD2 that have utilised iterative research and development across multiple funding sources

Hyline Cymru

Overview: HyLine Cymru's vision is to deliver the low carbon hydrogen needed to support the decarbonisation of industry in South West Wales, one of the biggest clusters in the UK, 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 Wales & West Utilities (WWU) do best – expertly connecting customers to the energy they need, whilst investing wisely to create a sustainable, greener future.

Growing from the collaboration of South Wales Industrial Cluster (SWIC) partners, HyLine Cymru is a proposal to build a new 130km hydrogen pipeline across South Wales from Pembroke to Port Talbot. This pipeline will help unlock up to 3GW of offshore wind in the Celtic Sea by providing a route to market for clean energy producers, whilst transporting a homegrown low carbon energy source to WWU's hard-to-decarbonise customers and contributing to long term energy security in the region.

As well as offering value to current industry, HyLine Cymru will also attract new industry, and directly support local authorities to deliver their Local Area Energy Plans (LAEP), helping Wales achieve its vision for the future. With support from Welsh Government and local industry, the project aims to support national commitments to deliver a cleaner, greener and fairer Wales. This means changing the way energy is produced and used at home, in industry and for travel.

One of the largest and most challenging sectors to decarbonise is heavy industry. South Wales has a rich industrial heritage; it is home to industries such as cement, paper, steel, nickel, mineral wool, and chemicals. It also has a diverse energy supply sector, including power stations, onshore wind sites and Liquified Natural Gas (LNG) terminals capable of supplying over 20% of the UK's natural gas demand. The project supports this heritage by progressing the critical transport infrastructure required to move low-carbon hydrogen from points of production, to points of end use, where customers can benefit the most and where decarbonisation can be maximised at least-cost.

The project recognises the need to invest for the future to decarbonise industry whilst protecting communities, jobs and the economy in Wales and beyond. Whilst current infrastructure, such as that used for LNG imports, is needed to maintain existing supplies of energy and support our national energy security strategy, new infrastructure is needed to transition towards the ability to deliver low-carbon hydrogen at scale.

Fig. 2 Proposed HyLine Cymru route

Progress: Innovation leaning has been a critical component in the development of this groundbreaking project as has sourcing other funding which was used to complement regulatory funding. He bulleted lists blow show how NIA and NZARD UIOLI funding has been used in combination with funding available from external sources e.g. Industrial Decarbonisation

Challenge and Launchpad: net zero industry, South West Wales, clearly showing how each of the core and supporting projects were funded and how the learning was generated cumulatively to progress the project.

Core HyLine Cymru Development Projects

- 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
- Regional Decarbonisation Pathways – NIA
- Potential for Salt cavern storage of hydrogen in and near South Wales – NIA
- HyLine Feasibility 1B study – NZARD UIOLI
- HyLine Planning and Legal Delivery Strategy – NIA
- HyLine Phase 1B Offtaker agreements and pre-consenting – NZARD UIOLI
- OptiFLOW - NIA matched with externally sourced funding

Core HyLine Cymru Development Projects

- SWIC Market Accelerating Hydrogen Distribution and Storage - NIA matched with externally sourced funding
- Storage vessels - NIA
- Lessons Learnt: Past Energy Transitions in the Gas Industry - NIA
- Gas Separation within UK Gas Networks - NIA
- Sensitive I&C Users - NIA
- Application of Function Blending Specification – NIA

Benefits: HyLine Cymru will build a new 130km hydrogen pipeline across South Wales from Pembroke to Port Talbot to remove up to 10% of GB industrial emissions (3.2 MtCO2e/year), with the following anticipated benefits:

- Protect and create thousands of highly skilled jobs in South Wales and protecting communities
- Provide UK industry with a cost-effective route to decarbonisation
- Contribute £billions in Gross Value Added over its operational lifetime
- Unlock 3 GW of offshore wind generation by providing a route to market for clean energy producers
- Transport a homegrown low-carbon energy source to our hard-to-decarbonise customers such as steel manufacturers
- Help local authorities deliver their Local Area Energy Plan

HyLine Cymru has submitted a funding application to the Net Zero and Small Projects (NZASP) Re-opener to Ofgem to fund the next stages of the project which include Front End Engineering Desing (FEED) in addition to planning and consenting work before aiming to secure Hydrogen Transport Business Model funding from the Department of Energy Security and Net Zero to fund detailed design and construction stages with a targeted 2033 completion date.

3. Projects in RIIO-GD2 that supported evidence for government policy and the HSE

Hydrogen Research and Development Programme

Overview: Across the programme of hydrogen research and development, gas networks shared the portfolio of projects and supported each other through working groups. The funding of these projects would be covered by the lead network alone but ensured collaboration in the overall portfolio and the delivery of each element of the evidence. Each of the other networks worked alongside the lead network to contribute resources and information to the projects attending various project meetings, steering boards and contributing and reviewing reports and submissions to both the HSE and DESNZ.

Progress: WWU led on two of the original 10 projects around End User safety. Additional projects were identified as work was undertaken, these additional projects were jointly funded by the networks and include Ignition Consequences, Air (oxygen) ingress and provided evidence to support a national risk assessment. In addition to projects which formed part of safety evidence for HSE, WWU has also led some related projects which have generated evidence and contributed to the wider understanding of hydrogen from a techno-economic and customer standpoint; these include Switching Vulnerable Customers to Hydrogen, Emissions Mitigations, Lessons Learned from the Past in addition to a variety of feasibility studies we have undertaken.

Benefits: Project output reports were submitted as evidence to both the HSE and DESNZ to support policy and safety decision making.

4. Projects in RIIO-GD2 that continually innovate with multiple deployments

Pathfinder

Overview: Pathfinder is an energy modelling tool built to support local and regional planning providing invaluable system insights to understand the operational implications of a decarbonisation strategy allowing a variety of stakeholders to understand engineering trade-offs. It is also a great example of iterative innovation development through both RIIO-GD1 and RIIO-GD2 price controls that are continually deployed to create real world benefit post iteration completion, also supported by the dedicated rollout allowance WWU received in RIIO-GD2.

Progress: The following figures outline the iterative innovation journey the modelling tool has gone through, with each additional iteration increasing the value of the tool for energy network stakeholders.

Fig. 3 – The early RIIO-GD1 Pathfinder iterative innovation journey

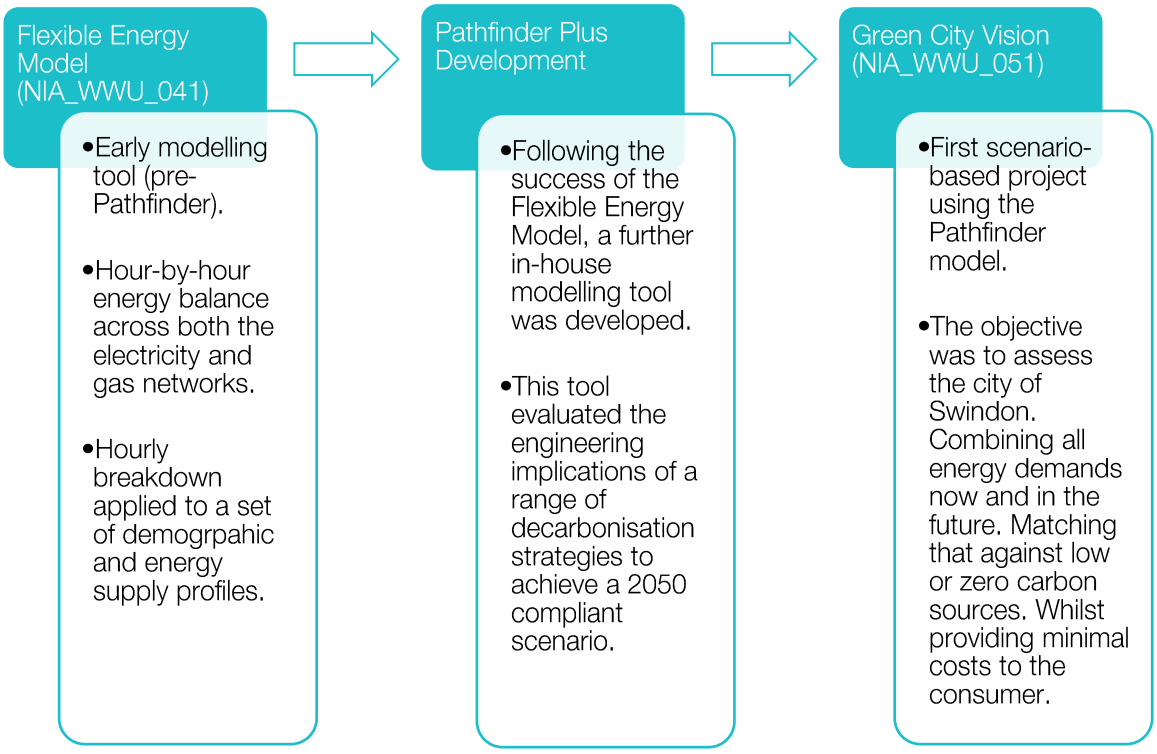


Fig. 4 – The early RIIO-GD2 Pathfinder roll out and continuing iterative innovation journey

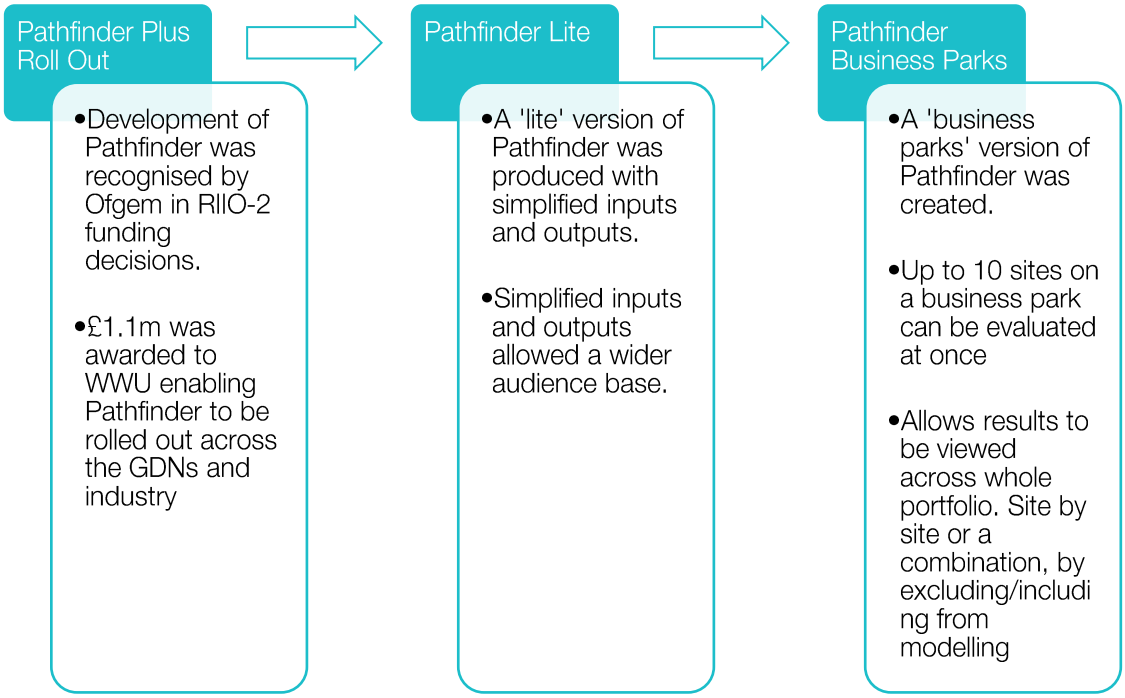
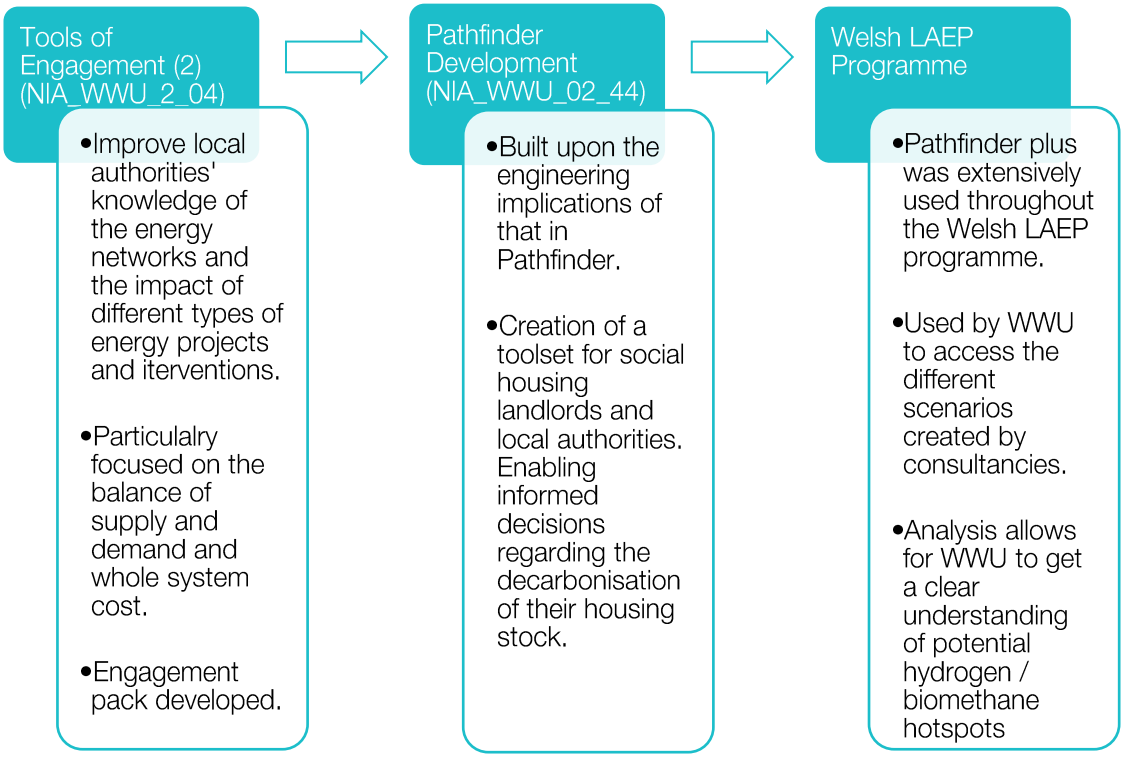


Fig. 5 – Later RIIO-GD2 Pathfinder iterative innovation to increase capabilities



There are four versions of Pathfinder that exist today to meet the needs of our stakeholders. They are:

1. Pathfinder Plus
2. Pathfinder Lite
3. Pathfinder Business Parks
4. Pathfinder Retrofit

Pathfinder Plus

- This is the original version of Pathfinder and is the most comprehensive out of the models.
- The overarching design and methodology was created by WWU. Delta-EE have helped support further iterations to speed up processing times.
- Enables the user to model energy scenarios for any size population by inputting variables that affect electricity and gas supply and demand.
- Results include electricity and gas generation requirements, demand response requirements and carbon dioxide emissions.

Pathfinder Lite

- Acts as a more user-friendly version of Pathfinder plus. Giving wider access to the tool.
- Inputs are simplified by using a drop-down box of potential options.
- Outputs are also simplified giving high level figures (user does have option to use more granular sheets in model).
- Similar result types to that of Pathfinder Plus. Such as electricity and gas generation requirements, demand response requirements and carbon dioxide emissions.

Pathfinder Business Parks

1. Harnesses the background functions of Pathfinder plus e.g. hourly breakdowns, energy profiles.
2. Allows for business parks with multiple (up to 10) occupants to be analysed at once.
3. User can input spatial figured into model, the first version of Pathfinder that allows this.
4. Can only model commercial sites.
5. Provides similar results to that of Pathfinder Plus and Lite.

Pathfinder Retrofit

- Also leans on the background functions of Pathfinder plus.
- Suitable for both local authorities and housing associations to analyse their existing housing stock.
- User can upload their own housing stock data into tool.
- User can specify retrofit actions on their housing stock. Allowing for informed choices to be made over potential routes to decarbonisation.
- Acts as a more user-friendly

Benefits: To date, Pathfinder has been utilised as part of 33 projects which include the Welsh LAEP programme, Milford Haven Energy Kingdom and Gas Goes Green. Of the 33 projects, we have completed 213 Pathfinder 'runs' with an average of over six per project involvement. Pathfinder has been offered and shared with over 60 different organisations and local authorities which include Swansea Council, Devon Council, Northern Powergrid and DNV. Further detail for some of the major projects can be seen in the figures below:

Fig. 6 Welsh LAEP Programme key information

Welsh LAEP Programme	Key Information
The creation of LAEP's across Welsh local authorities Pathfinder was used to analyse the scenarios created by consultancies Information gathered using Pathfinder to be used in future network planning including GD3 planning	19 different local authorities LAEPs analysed Over 70 different Pathfinder runs completed Scenarios including: High Hydrogen High Demand Low Demand

Fig. 7 Milford Haven Energy Kingdom key information

Milford Haven Energy Kingdon	Key Information
MH:EK is exploring the potential of zero carbon hydrogen alongside renewable electricity to meet all energy demands across Milford Haven, Pembroke and Pembroke Dock Pathfinder was used to analyse the different energy mixes proposed as part of this project	3 key locations in Southwest Wales 15 different Pathfinder runs completed Scenarios including: Blue Hydrogen Green Hydrogen Electrified Electrified Islanded

Fig. 8 Gas Goes Green key information

Milford Haven Energy Kingdon	Key Information
A collaboration of all 5 of Britain's gas network companies The project analysed the changes needed to convert Britain's gas network infrastructure to run on hydrogen and biomethane Pathfinder was used to analyse this change in network	3 key locations in Southwest Wales 15 different Pathfinder runs completed Scenarios including: Blue Hydrogen Green Hydrogen Electrified Electrified Islanded 1 Pathfinder run completed that looked at the whole UK energy

5. Projects deployed in RIIO-GD2 that mitigate impacts of innovation on vulnerable consumers

Consumer Vulnerability Impact Assessment Tool

Overview: A new tool was developed for ensure each network was able to assess every flexibly funded innovation project in RIIO-GD2, for any potential impact those innovation projects may have on vulnerable consumers to ensure that all customers are included in the journey to Net Zero from the start, by including the most vulnerable in these assessments and how each innovation project may impact these consumers, with accompanying mitigations.

Progress: The tool was developed as part of a collaborative project between all energy networks and was the result of extensive external stakeholder feedback to ensure it represents vulnerable consumers; the tool is reviewed on an annual basis to keep the stakeholder input up to date.

Benefits: The tool ensures innovation projects are assessed up front for any impact on vulnerable consumers ensuring that vulnerable consumers remain at the forefront of innovation to support the energy system transition.

6. Innovation projects in RIIO-GD2 that are now being deployed using other funding

Smart Pressure Control

Overview: We are at the forefront of smart pressure control development - after a successful NIA OptiNet project trial outcome - we are now about to automate the control of a large distribution network to maximise biomethane entry whilst maintaining security of supply by utilising our NZARD UIOLI funding to support the roll out.

The medium pressure network runs from Swindon to Honiton and contains over 679km of gas pipes to be controlled, which is approximately 100 miles of network area as the crow flies.

Progress: This was a challenging project but was necessary to project a cost-effective way of managing green gas injection and supply to all customers fed from the network; it works by automating control of the distribution network in response to green gas entry and response pressures.

Benefits: Once the control and monitoring equipment has been commissioned at the 19 natural gas sites impacted, we anticipate being able to heat 56,000 homes in total with the currently connected and future biomethane sites; that's an equivalent carbon displacement of 123,000 Tonnes CO2e pa.

The new method is cost-efficient, secure and provides additional benefits to consumer customer experience and the environment.

7. Deployed RIIO-GD1 Projects that continue to support ongoing efficiency measures

Ductile Iron Window Cutter

Overview: Historically through RIIO-GD1 we've implemented innovation that has delivered cost efficiencies and emission reductions. One such example was a project to design and develop a 'Ductile Iron Window Cutter' tool to allow the removal of a window from a ductile iron main that had been inserted with a PE main.

Progress: The project was scoped at a cost of £87k and once implemented was assessed to generate £55k of anticipated benefits per annum across our network.

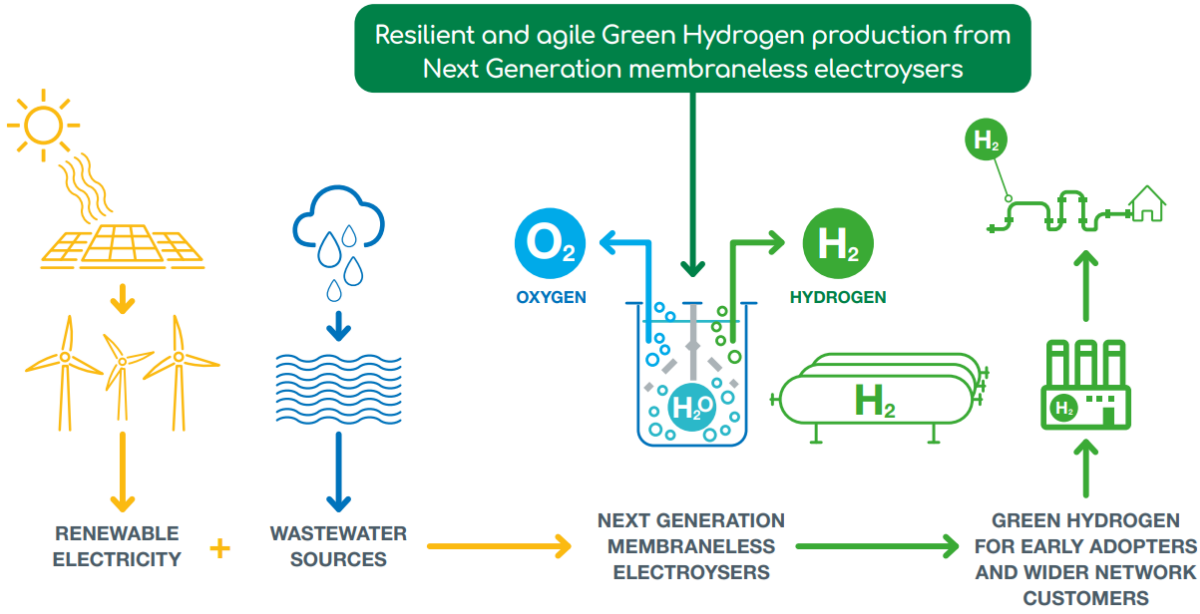
Benefits: The design after testing was deemed successful and the tool was implemented. Benefits are tracked per annum to realise savings which were higher than anticipated as the tool was implemented by other networks which increased the realised benefits for the project. Intangible benefits /outcomes of the project centred around reduction of customer disruption, and although probable future benefits will be limited by the gradual phase out of steel and ductile iron pipes as we progress with the PE pipe replacement programme through RIIO-GD3 and GD4, we continue to use ductile iron window cutters for suitable operations in RIIO-GD2 as they partially mitigate the longer operational times required for this type of activity.

8. RIIO-2 SIF Beta Demonstration Project that will continue into RIIO-GD3

NextGen Electrolysis - Wastewater to Green Hydrogen

Overview: This project aimed to develop a more affordable and widely accessible electrolyser model for green hydrogen production, focusing on enabling the use of impure water sources that can be co-located around the network. This approach seeks to reduce costs and increase flexibility in hydrogen production. The project addresses limitations of the conventional polymer electrolyte membrane (PEM) electrolysis for green hydrogen production, which requires carbon-free electricity, purified water, and expensive rare earth metal membranes. By exploring impure water utilisation, the project sought to overcome barriers to efficient and cost-effective green hydrogen production. The research focussed on developing a flexible and economically viable method for green hydrogen production across diverse environments and scenarios.

Fig 9. NextGen Electrolysis Overview Diagram



Progress: This SIF project has successfully completed both Discovery and Alpha phases and has now progressed onto the Beta phase to demonstrate the technology. During the Discovery phase, the project revealed insights into water and energy demands of current methods for green hydrogen production, identifying potential challenges in water availability and infrastructure constraints. The project demonstrated that in order to produce 1 litre of purified water for electrolysis requires 6 litres of tap water. Extrapolating this into the government's 5GW green hydrogen production target for 2030 translates to a daily water requirement of 50 million litres, raising concerns about water availability in resource and infrastructure constrained locations. Feasibility studies confirmed the technological viability of new approaches and quantified the benefits of eliminating water purification from the process entirely. Building on these insights, the Alpha phase focused on experimental development and involved the deployment of an innovative membrane-less electrolyser and green noncorrosive electrolyte. These innovations enable the use of impure water feedstock and allow for better matching to fluctuating renewable energy sources, providing an experimental demonstration of the Discovery phase feasibility studies. The project is ready to be further refined and scaled during the upcoming Beta phase.

Benefits: The project has the potential to lead to significant consumer benefits by making green hydrogen more affordable and accessible. By using impure instead of purified water, the project has the potential to reduce the lifetime cost of hydrogen (LCOH) by 19%, which can translate to direct savings for consumers. Environmental benefits are also substantial, with potential annual carbon savings of 2,345 MtCO2 compared to natural gas. By removing the need for purification, the project could save up to 8 billion litres of water per year per gigawatt of electrolyser capacity. The project suggests co-location services for water treatment and onsite gas demand production, as well as nodal hydrogen injection services for specific network locations, helping to lower the requirements of large electrical grid connections and minimising disruption to consumers while supporting reaching net zero targets.

9. Projects in RIIO-GD2 that have generated lessons learnt

LPG to Hydrogen Village: Feasibility and concept design

Of course, whilst these are great examples of innovation implementation, not all innovation can succeed, and we look to fail fast where projects are not delivering the outcomes we were expecting, which showcases our strong governance process.

Outcome: The project concluded that various items of follow-on works needed to be undertaken before any single option could be selected to undergo trial works. The follow-on works identified as part of the outcomes related to transitional implications and legislative issues that need to be addressed. There were also technical areas that should be investigated further to ensure the selected solution provided an acceptable route to the long-term corporate objective of Net Zero.

Learning: Adding a stage gate between phase one and phase two was critical in allow the project to 'fail fast', and all partners were aware that this option was available at initiation, with unanimous agreement to close the project early received; this practise is added to projects where appropriate to facilitate similar outcomes.