

## Ofgem Innovation Narrative 2021 – 2025

### Introduction

The transition to net zero (including decarbonising power, heat and transport) and the impact of democratisation, decentralisation and digitalisation will redefine and shape the energy landscape over the next 20 years. Ofgem values innovation, and we have developed a set of innovation principles and priorities to inform markets regarding where Ofgem has identified the need for significant innovation from the marketplace over the course of the next four years.

Building on statements, recommendations and tangible actions made in Ofgem's strategic publications including the Strategic Narrative (July 2019), Consumer Vulnerability Strategy (October 2019), the Decarbonisation Action Plan (February 2020) and the Forward Work Programme (2021-2022), we consider it an apt time to express our views on innovation topic areas as innovators are targeting the net zero challenge and are responding to the need to drive economic recovery from the Covid-19 pandemic. This should also assist network companies and the ESO as they prepare to enter the RII02 price.

### Innovation Principles

We recognise that firms need to see the prospect of reasonable return on their innovation investments and note its risky nature. We therefore welcome innovation on emerging technologies, products, services, methodologies and business models with a role to play as we move toward decarbonisation and delivering a greener, fairer more inclusive energy system of the future. In addition, we are interested in exploring how existing commercial applications work at a systems level, such as enabling components to work across a system and understanding how the system reacts to those applications. Each of Ofgem's innovation mechanisms have their own principles and requirements for participation (see Annex). Even when not availing of those mechanisms, however, we encourage innovators to adopt to all of the following principles to help ensure robust and equitable insights come from their work:

- **Innovation creates value for the whole system** through genuine cost reduction in or through enabling greater value creation across the energy value chain. Through good system citizenship, innovation does not redistribute costs, but instead effects a true cost reduction.
- **Consumer focused innovation:** inclusive design that allows different types of consumer (including those in vulnerable situations) to participate in and benefit from a smart, flexible, energy system.
- **Information Dissemination:** a culture of openness and shared insights from innovation and learnings from Ofgem supported innovation must be disseminated amongst other innovators. Each mechanism (see Annex) has its respective requirements.


Net zero is not simply an energy sector objective, but a cross-vector challenge that requires multiple approaches and perspectives, where possible. Specific areas and that would benefit from innovation follow below.

## Priority Innovation


Ofgem has considered our innovation priorities alongside our Strategic Priorities<sup>1</sup> and in conjunction with the government’s forthcoming Net Zero Research and Development Delivery Plan. We are pleased to have identified alignment with the latter as well as additional, synergistic areas.

Looking ahead, we highly value the participation of innovators in helping build an evidence base to provide impartial and unbiased insights so that other potential users (energy sector players and consumers) can benefit from the experiences of individual projects. The below are the key areas where we encourage innovators to bring forward new products, services, methodologies and business models that have the potential to benefit consumers.



### Low Carbon Infrastructure

Innovation Priority	The Problem Space
 <p><b>Built Environment</b> Electrification of Heat (including heat pumps and retrofit)</p>	<p>Electrification of heating will challenge the electricity sector and increase costs. Therefore, innovation that seeks to minimise the system wide cost of electrified heating is essential. We are interested in innovations that explore:</p> <ul style="list-style-type: none"><li>• Solutions for low carbon heating that minimise network or system peaks and allow better network asset utilisation</li><li>• The use of electric heat and heat and power storage</li><li>• Investable models for the mass deployment of unregulated infrastructure required for building heat decarbonisation such as, but not limited to, heat pumps and storage solutions.</li><li>• Arrangements that enable better sharing of network capacity or more resilient networks, for instance the use of technology that responds to congestion levels.</li><li>• Other innovations that reduce costs (including that of monitoring equipment on LV networks), increase system resilience and improve the customer experience or attractiveness of electrified heat such as improved PV and wind turbine generation capability (particularly onshore)</li><li>• Small scale, safe nuclear generation plants</li><li>• Reduction and removal of SF6 from the network is also encouraged</li></ul> <p>Areas of GB that are off-gas grid are also priority geographical zones for heat electrification innovation or conversion from carbon-based fuels.</p>


<sup>1</sup> <https://www.ofgem.gov.uk/publications-and-updates/forward-work-programme-202122-consultation>

Innovation Priority	The Problem Space
<p style="text-align: center;"><b>H<sub>2</sub></b></p> <p style="text-align: center;"><b>Gas &amp; Hydrogen</b></p> <p style="text-align: center;">Feasibility and safety</p>	<p>Hydrogen has a role to play in the net zero energy system. We are therefore interested in innovation that targets:</p> <ul style="list-style-type: none"> <li>• Innovation and trialling of hydrogen in a wide range of applications such as heating, storage and transport; where trialling is involved, leverage locations where hydrogen usage is more likely to be enduring such as in industrial clusters</li> <li>• Blending of hydrogen or other green gas into the gas networks (including connections, capacity and access)</li> <li>• Commercial and regulatory models that consider the impact of gas transition on the consumers and that ensure protection for industrial and domestic users, particularly consumers in vulnerable situations</li> </ul> <p>Other innovation to ensure that hydrogen can be transported safely on the network.</p>
 <p style="text-align: center;"><b>Local</b></p> <p style="text-align: center;">Localised approaches to decarbonisation</p>	<p>Low carbon infrastructure development must account for local systems, needs and preferences. We expect that articulation of local system challenges, and local stakeholders' role and involvement will grow. Therefore, we welcome innovation in the following:</p> <ul style="list-style-type: none"> <li>• Solutions that reflect the differing challenges of GB's various regional net zero targets</li> <li>• Identified network constraints and locational characteristics that impact the range of possible solutions</li> <li>• Integrated solutions to local energy needs (heat and energy efficiency, transport, and power) that result in lower whole-system decarbonisation costs</li> </ul> <p>Best practice in joining up tailored local or regional solutions in line with devolved and central government approaches</p>


**Full Chain Flexibility**


Innovation Priority	The Problem Space
 <p><b>Smart Energy and Energy Storage</b> system and market flexibility, flexibility technologies, and energy storage</p>	<p>Flexibility, smart energy and energy storage are essential components of our net zero energy system. Key priority areas of innovation are those which test and develop new system planning and operational approaches incorporating non-build solutions, including:</p> <ul style="list-style-type: none"> <li>• New network management models (such as dynamic network operation, development of new ancillary services, and network and control) and managing synergies and conflicts in the operation of transmission, distribution and cross-border interconnection functions of the system</li> <li>• Data-centred business model innovation to drive energy efficiency and smart home systems</li> <li>• Business models allowing prosumer participation such as demand side response to unlock peak load shifting and evolved supplier models to facilitate the use of local grids</li> <li>• The role of smaller, aggregated distributed energy resources installed behind the meter to increasing flexibility, reducing network costs including, for example, batteries, heat storage (including phase change long duration storage) and heat pumps</li> <li>• Responding to locational and time of use price signals for flexibility, or working directly with suppliers, including its effect on consumer behaviour and on the grid</li> <li>• Demonstration of smart controls and grid-aware systems, including self-regulating grid edge technologies and charging devices</li> </ul> <p>The role of long duration energy and heat storage and energy efficiency in enabling flexibility</p>
 <p><b>Electric Vehicles (EVs)</b> Electrification of Personal Transport</p>	<p>All new cars and vans will be zero emitting by 2035. This shift to electrified personal transport not only presents power supply and network challenges, but also opportunities. Innovation can help explore:</p> <ul style="list-style-type: none"> <li>• New ways of ensuring the electricity system is prepared for the uptake of EVs (eg new approaches to strategically planning or operating the system).</li> <li>• The use of electric vehicles (EVs), including vehicle to grid (V2G), to manage network loading and aid security of supply</li> <li>• The development of new EV-related products and services.</li> <li>• Investable models for mass deployment of unregulated EV infrastructure such as, but not limited to, EV chargepoints and controls.</li> </ul> <p>Improvements in the safe, secure use of data to accelerate the efficient integration of EVs within the changing energy system. Other innovation to ensure that hydrogen can be transported safely on the network.</p>

**Future of Retail**

Innovation Priority	The Problem Space
 <p><b>Consumer</b>                      Consumers' role and acceptability of products and solutions</p>	<p>Scaling technological innovation to achieve decarbonisation will involve greater consumer participation and action from all consumers. Some consumer-related touchpoints are covered in other sections allowing this one to lend some focus on innovation to promote consumer engagement and understanding of how their energy choices and behaviours relate to decarbonisation:</p> <ul style="list-style-type: none"> <li>• Provision of compelling, transparent and easy to understand information (service, cost, benefits) to help inform consumer choice and encourage engagement in decarbonisation</li> <li>• Products and services that suit consumers' needs and which effectively engage consumers in flexibility opportunities arising from demand following electricity generation, such as automation and smart usage</li> <li>• Inclusive design and consumer acceptability of such products and services including accessibility, affordability and ongoing engagement</li> </ul> <p>Innovation dedicated to solving the needs of consumers in vulnerable situations to ensure that they have access to the benefits of decarbonised and digitalised sector</p>

**Data & Digitalisation**

Innovation Priority	The Problem Space
 <p><b>Cyber Security</b>                      prevention, detection and recovery from cyber attacks</p>	<p>Cyber security is a growing concern in many industries and in society as a whole. It is of particular concern within the downstream gas and electricity subsector due to its potential to disrupt essential services to consumers. Decarbonisation can further raise the cyber risks if increasingly decentralised control systems become accessible to cyber-attackers. For these reasons Ofgem is keen to explore</p> <ul style="list-style-type: none"> <li>• Emerging techniques specific for preventing, detecting and recovering from cyber-attacks.</li> <li>• Quantifying the cyber risks to essential consumer services</li> <li>• Model based security engineering</li> </ul> <p>The point of contact specific to cyber topics is Chris Few, Head of Cyber Research &amp; Development; <a href="mailto:chris.few@ofgem.gov.uk">chris.few@ofgem.gov.uk</a>.</p>

Innovation Priority	The Problem Space
 <p><b>Energy Data</b> innovation aligned with the Modernising Energy Data Programme</p>	<p>As part of our Joint Data &amp; Digitalisation Strategy with BEIS, we are aligned with the progress made by the Modernising Energy Data suite of initiatives thus far and value greater transparency of market and system over time-data and data across markets (energy + transport + health + others) to support whole systems, local energy planning. We expect data and digitalisation to be interwoven among all innovation categories, but in particular we consider the following as innovation priority needs:</p> <ul style="list-style-type: none"> <li>• Information services to improve system planning through transparency about the energy system and providing insights about grid characteristics, such as system constraints</li> <li>• Integrating data for more efficient investment planning across the range of systems of GB infrastructure that comprise net zero and the wider economy</li> <li>• Creating new cross-sectoral services that enable new opportunities amongst electricity and gas, water and transport, such as cross sector flexibility markets, or that provide services that apply energy data as a tool for monitoring peoples' health</li> <li>• New services that enrich data by applying artificial intelligence (AI) and data science methods, such as Machine Learning, to complex challenges (e.g. urban planning and energy system frequency response, system balance response services and flexibility)</li> <li>• Better end-consumer services built on portable consumer data, enabling targeted and adaptable retail services, such as through integration with home finances</li> <li>• The data and technology that would permit the ESO to operate the system carbon-free by 2025</li> <li>• Innovation in communications and data platforms as well as digital services such as for asset registration and mapping</li> </ul>

## Alignment with Other Public Innovation Bodies

Ofgem works alongside government and other public innovation bodies to ensure a greater degree of alignment to support the transition to net zero. By working through the Net Zero Innovation Board<sup>2</sup>, we endeavour to ensure complementary innovation priorities, non-duplication when funding innovation and for each innovation body to invest where best suited.

Further innovation alignment is achieved through Ofgem's environmental programmes and in particular the Energy Company Obligation (ECO)<sup>3</sup>. ECO is an energy efficiency scheme to help reduce carbon emissions and tackle fuel poverty. Within ECO3, energy suppliers are able to deliver up to 10% of their obligation through installation of innovative measures to eligible households including insulation, heating solutions and connections to district heating systems (new and upgrades)<sup>4</sup>. The Department for Business, Energy and Industrial Strategy sets the

<sup>2</sup> The Net Zero Innovation Board will soon replace the existing [Energy](#) Innovation Board

<sup>3</sup> <https://www.ofgem.gov.uk/environmental-programmes/eco>

<sup>4</sup> <https://www.ofgem.gov.uk/environmental-programmes/eco/installers-and-industry>

overarching framework and scheme rules, while Ofgem has an implementation role. Specifically, Ofgem is responsible for assessing applications made through the innovation route and have established a Technical Advisory Panel to help facilitate this process.

## Sharing Learning

Ofgem supports a culture of openness and shared insights from its innovation resources. We already publish case studies from the Innovation Link<sup>5</sup>, and as sandboxes ramp up, Ofgem is considering how best to disseminate information and learning from them. We will also endeavour to work collaboratively with other innovation bodies to ensure that learning from publicly funded innovations is efficiently and effectively shared.

The Energy Network Association's (ENA) Smarter Networks Portal<sup>6</sup> is a repository for network consumer funded innovation project learning, news and events. Furthermore, potential project partners to an innovation project can register their interest, capabilities and offering as well as establish communication with network companies through the Network Innovation Collaboration Portal<sup>7</sup>. The ENA also hosts an annual conference to disseminate information and report on network innovation benefits

## Going Forward

This document covers a brief period and does not seek to engage a longer-term time horizon because much will change, and we expect innovation to be a driving force within that. This narrative establishes a desired direction of travel for the next 3-4 years. Within that period, we will review our priorities and issue updates as the landscape changes. This short period can only be navigated successfully through wider collaboration and open discussions around innovation and the technological as well as social solutions they unlock toward a decarbonised world. For that reason, Ofgem seeks to be increasingly engaged in this dialogue on the necessary research and our priority innovation activities. To discuss further, you may contact Ofgem's Strategy & Decarbonisation Team at [StrategyFeedback@ofgem.gov.uk](mailto:StrategyFeedback@ofgem.gov.uk)

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<sup>5</sup> <https://www.ofgem.gov.uk/publications-and-updates/innovation-link-case-studies>

<sup>6</sup> <https://www.smarternetworks.org/>

<sup>7</sup> <https://www.nicollaborationportal.org/>

## **Annex**

### **How Ofgem Enables and Supports Innovation**

One of Ofgem's role through policy reform is to create a regulatory environment more conducive to and permissive of innovation. Ofgem encourages competition, making markets more attractive and allowing the entry of new innovators. We also expect the market to bring forth business model and technological innovation that will change how consumers interact with energy. Where there are gaps that markets cannot otherwise fill because of regulatory barriers or where monopoly companies operate, and therefore there is a need for Ofgem to support innovation actively.

Ofgem offers two innovation delivery vehicles – the Innovation Link (IL) and RIIO network innovation stimulus. IL and RIIO seeks to align to the principles and priorities in this document, and each of these will apply the principles and priorities according to their own distinct rules and governance.

#### **Innovation Link**

We invite all energy innovators to utilise the Innovation Link's services. The Link can help innovators operating in any corner of the energy sector, although the vast majority of innovators we support are currently interested in the retail electricity market and deploying distributed energy resources. The Link's role is to help innovators navigate what is a complex sector with challenging regulatory requirements consistent with an essential service. The Link can help organisations understand the regulatory implications of their propositions and, where necessary, how to adapt their approach for today's markets.

This could include services such as new retail products, buying energy service offerings, selling services to the grid or directly to other consumers, or other significant shifts in the relationship between consumer and traditional suppliers. As well as supporting innovators through our Fast Frank Feedback service, the Link will increasingly focus on broadcast services which will have greater reach and impact on more innovators and consumers; broadcasts will include 'how-to-guides' and webinars on common issues that innovators encounter.

The Link also offers the Energy Regulatory Sandbox, a service for innovators that want to trial or bring to market new products, services or business models but require some regulatory relief. The Sandbox was refreshed in July 2020<sup>8</sup>, expanding the tools available to innovators. It is an on-demand service, led by innovators' aspirations and needs. The Link helps to inform our policy thinking about potential barriers to innovation and whether reforms are needed, and in time, Ofgem may commission policy-led Sandboxes or innovation challenges where we would invite innovators to pursue innovation projects of particular scope. A full description of the Innovation Link and services offered can be found on our website<sup>9</sup>, and we endeavour to continuously improve our service offering to maximise the effectiveness of our support to innovators.

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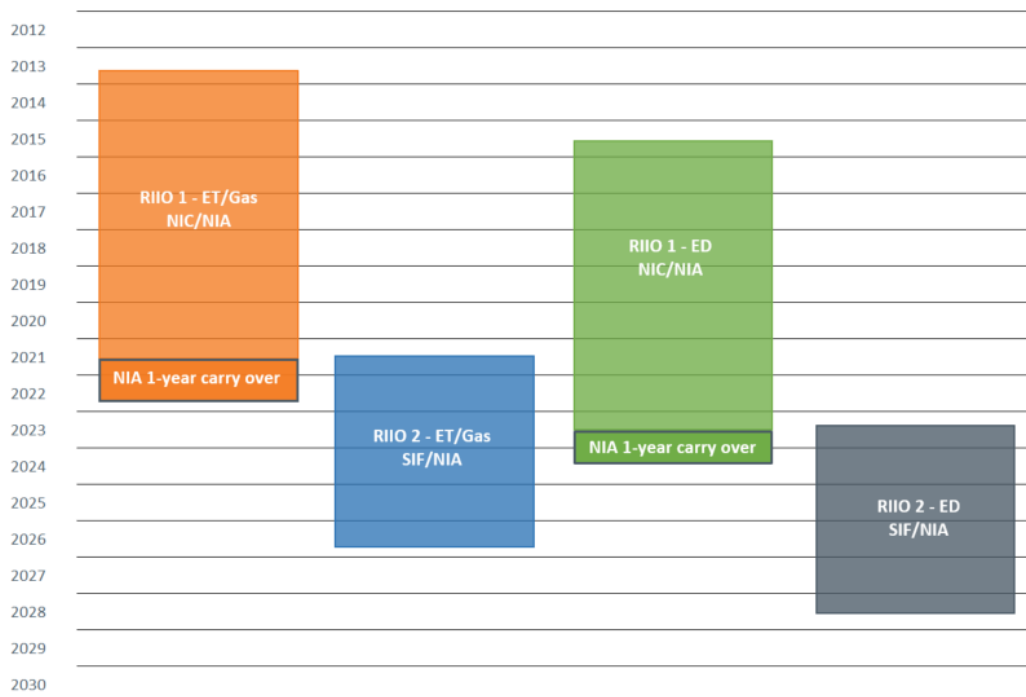
<sup>8</sup> <https://www.ofgem.gov.uk/publications-and-updates/energy-regulation-sandbox-guidance-innovators>

<sup>9</sup> <https://www.ofgem.gov.uk/about-us/how-we-engage/innovation-link>



## RIIO Price Control Innovation Mechanisms

The innovation stimuli within the RIIO price control are currently available to the licensed monopoly network companies and the ESO to incentivise network innovation projects which can show the potential to deliver a net benefit to network consumers. There are three stimuli, and the below illustration demonstrates the expected periods for the Network Innovation Competition (NIC), the Network Innovation Allowance (NIA) and the Strategic Innovation Fund (SIF).



The SIF will make available £450 million over the duration of the RIIO-2 price control for strategically important network innovation projects, and this figure can be adjusted upward according to need. The focus of the SIF is to support network innovation that contributes to the attainment of the net zero target, while taking into consideration cross-sector initiatives aiming at the same goal. We have also confirmed that the NIA, individual allowances controlled by network companies and the ESO, provides around £210 million for innovation projects that focus on the energy system transition or helping consumers in vulnerable situations. Details can be found on our website at our main Network Innovation page<sup>10</sup> and via our latest RIIO 2 publications<sup>11</sup>.

<sup>10</sup> <https://www.ofgem.gov.uk/regulating-energy-networks/current-network-price-controls-riio-1/network-innovation>

<sup>11</sup> <https://www.ofgem.gov.uk/publications-and-updates/riio-2-final-determinations-transmission-and-gas-distribution-network-companies-and-electricity-system-operator>