



Innovate
UK

Ofgem Strategic Innovation Fund (SIF)

Annual Report 2022



Innovate UK's work to deliver the SIF in 2021-22,
in partnership with Ofgem

The Strategic Innovation Fund is an Ofgem programme, delivered by Innovate UK.

This short report covers Innovate UK's role and progress in delivering the SIF since its launch in 2021.



58

Round 1 Discovery and Alpha projects funded



205

Unique organisations funded



£12.6m

SIF funding allocated to projects



£2.53m

Additional contributions from industry

“ I'm pleased and proud of the progress being made by the SIF. As well as the many varied and truly inventive projects to decarbonise the energy networks coming through the Innovation Challenges, we're seeing real engagement and action from the newly established Advisory Group and Expert Panels, as well as academia. Industry is also now far more focused on net zero targets and supportive of the initiatives being led by the SIF, as they can see the practical contribution of energy network innovation – delivering benefits for consumers, businesses and the planet. It's important that we maintain the momentum created by the SIF to galvanise more bodies to join and help to reshape the gas and electricity networks of the future.”

Tara McGeehan

Chair of SIF Advisory Group and President,
UK & Australia Operations, CGI

“ The SIF is already playing a vital and much-needed role in bringing together traditional network innovation with wider sources of innovation funding. The challenges we face in decarbonising our economy are too great for any one organisation or sector to meet alone, which is why the SIF's ability to open up funding to third parties to help solve the challenges we all face is so important. Reducing overall system costs and looking after our most vulnerable customers can only benefit the people we serve, but we must all play our part. UK Power Networks is hugely excited to be able to participate in bidding for SIF funding from April 2023. The energy industry is in the midst of a generational shift as we move to a low carbon future. We cannot rise to these challenges without innovating, disrupting and being prepared to upend the status quo. There has never been a more exciting time to be an innovator in the energy industry.”

Ian Cameron

Head of Customer Service & Innovation,
UK Power Networks

“ We are excited to continue to work with Ofgem and Innovate UK as we deliver the BEIS £1bn Net Zero Innovation Portfolio. Encouraging innovation in the transmission and distribution networks is hugely important, including for the range of projects we are supporting – from heat pumps, to flexibility, to hydrogen production.”

Matthew Billson

Deputy Director & Head of Energy Innovation Strategy, BEIS

“ For me, the best way to describe the SIF is as a bold, visionary investor, which delivers societal outcomes alongside some of the business benefits usually seen in a venture capital or private equity fund. Often, an idea we are seeking funding for has two issues; technically, it has never been done before anywhere; and commercially, we are unsure of the potential market. This is where innovators such as us, through the SIF, can push the boundaries of what is possible and help build the future.”

Ali Safari

CEO and founder, Farad.ai

Foreword

2022, the year when everything changed. We started to break the back of Covid, and COP26 showed a glimmer of hope in the battle against climate change. In an instant we were confronted with a war in Europe, an energy crisis, cost of living crisis, and global floods, heat waves and wild fires the likes of which we'd never seen before.

It is fair to say that we are living in a period of unprecedented adversity, and this requires unprecedented innovation in response.

In times of adversity, hope comes in many forms. Primarily, in the hearts and minds of the people who are willing to step out of their comfort zone and do something about it. That is what we have been doing with our colleagues in the energy networks, as we deliver the Strategic Innovation Fund in partnership with Ofgem. Trying something new.

In this report you'll hear more about our vision, mission, values and activities, but our purpose sums it all up simply. It is to deliver benefits to:

- People (via cost reductions and the introduction of new products and services)
- Planet (via CO₂ reductions)
- Businesses (by supporting networks to innovate and for their partners to grow and scale in the UK and beyond)

In this preliminary summary report, we outline our role as Ofgem's strategic delivery partner and look at what has been achieved in the SIF's first year. The report is meant for all in the energy sector - both for transparency, as the SIF is funded through network charges, and to encourage participation in this drive for transformative innovation.

After the launch of the SIF in May 2021, we worked with Ofgem to develop the innovation challenges for Round 1, which Ofgem published in September 2021. The challenges were: whole system integration; data and digitalisation; heat; and zero emission transport.

We saw the energy networks take 40 parallel

projects into an intense two-month Discovery phase (a first for the sector), with 18 following on to the six-month Alpha phase. For an investment of £12.6 million in SIF projects so far, we've identified potential savings of £312 million* and significant carbon reductions. Across the 58 projects funded, a total of 205 organisations have been involved, in 232 partnerships.

In May 2022, after consulting widely, we supported Ofgem in setting the challenges for SIF Round 2, which opened in September 2022. These are: supporting a just energy transition; preparing for a net zero power system; improving energy system resilience and robustness; and accelerating decarbonisation of major energy demands. In defining these we responded to the cost of living crisis with speed, showing the value of agility in the SIF mechanism.

Strategically, we led the initiative to change the Energy Networks Innovation Conference into the Energy Innovation Summit, bringing the whole energy sector together to act as one team. Sharing insights, forming new partnerships and solving problems.

For a programme that is only 18 months old, I'm proud of what the Innovate UK team has achieved and I am especially grateful for the network innovation teams and their partners for their immense efforts. A big thanks to Ofgem, BEIS, the Energy Innovation Centre and the Energy Networks Association for their support too.

But to deliver unprecedented innovation across the energy sector we need it to run through every sinew of our beings and organisations, it must be in our DNA. Innovate UK's role is to help make that happen and the SIF is a critical mechanism to support that ambition.

Matt Hastings

Deputy Director, Ofgem Strategic Innovation Fund, Innovate UK

September 2022



To create the change we need is a huge challenge, but we can do it if we collaborate and take a giant leap together. Scan the QR code to watch a short film.

About the SIF

Delivering a resilient and fair net zero system at the lowest cost to the consumer

Decarbonising energy networks, with the aim of creating a net zero power system by 2035, is a huge and urgent undertaking. Rapid innovation is needed – where new ideas and approaches are tested, developed and deployed at scale, as fast as possible.

With funding of around £450 million, Ofgem’s Strategic Innovation Fund responds to the challenge and represents a major investment in the pace of innovation in the sector, funded by energy consumers through the price cap mechanism. The SIF programme is managed by Innovate UK, as Ofgem’s delivery partner.

The vision of the SIF is:

- To support Ofgem to facilitate the UK’s transition to net zero, at lowest cost to the consumer
- To position the UK as the ‘Silicon Valley’ of energy

Innovate UK works closely with Ofgem to deliver the SIF. This alignment enhances the programme’s ability to contribute to Government’s net zero objectives, while allowing it to remain dynamic, flexible and joined up with Government, industry and consumers.

Innovation strengths

Innovate UK uses its reach and experience to ensure that the SIF is as effective as it can be in driving energy network innovation. It manages the innovation process, strategically and operationally, from start to finish. Working with Ofgem, this includes engaging with a wide range of industry partners; bringing in innovators and academics from the energy sector and beyond; fostering collaborations and ideas, managing funding competitions; and communicating the programme’s vision and progress.

Overall, Innovate UK’s aims in managing the SIF are to:

- Deliver a resilient and fair net zero energy system at the lowest cost to the consumer
- Deliver a responsive and agile programme based on insights
- Foster a world-leading energy innovation ecosystem
- Deliver a high standard of innovation
- Demonstrate network innovation at scale with a clear route to market
- Increase innovation alignment

You’ll see these themes echoed through this report, as we review Innovate UK’s role in the first full year of the SIF.



VISION

In delivering the SIF, Innovate UK’s vision is to:

- Support Ofgem to facilitate the UK’s transition to net zero, at lowest cost to the consumer
- Position the UK as the ‘Silicon Valley’ of energy



MISSION

Innovate UK’s SIF mission has three pillars:

- Alignment
- Responsiveness
- Commercialisation



VALUES

Our values in managing the SIF are:

- Quality
- Urgency
- Collaboration
- Change
- Growth

Responsive and agile

Delivering a responsive and agile programme based on insights

We have designed the Strategic Innovation Fund's operation to be agile and responsive at heart. The programme encourages innovators to take risks and trial different ideas, helping to prove their credibility and capability in delivering value and impact for consumers.

Earlier this year we developed the 'Giant Leap Together' process, a new sector-wide agile model for the SIF which fosters successful innovation through key stages – setting challenges, identifying and developing ideas, incubating partnerships and exchanging knowledge, and accelerating the best proposals towards commercialisation.

The acceleration, or funding and project development stage, also has agility built in.

It is a process with three progressive parts: Discovery (feasibility studies), Alpha (proof of concept projects) and Beta (full-scale demonstrator projects).

At the Discovery phase, many projects are funded. The process then refines them down to the few projects with the greatest potential, which are awarded much higher funding to move towards rollout and commercialisation.

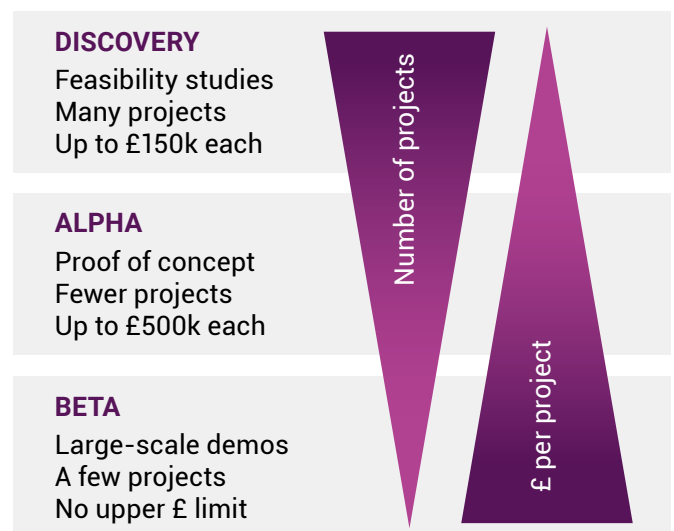
In running a responsive and flexible programme, we also ensure that review, reflection and refinement are built into everyday processes. Each month and quarter, the team at Innovate UK undertakes a 'retrospective review', reflecting on what went well and where there are opportunities for development. This year, to ensure the programme delivers its objectives efficiently and effectively, reviews have included SIF internal processes, governance and communications.

Our agile approach goes wider than delivery and development of the SIF itself. We also look at how the insights and reflections from SIF projects and stakeholders can inform future energy innovation. For example, we continuously review both how the learnings from SIF projects can unlock energy system advancements now, and what information is needed to develop and support learning in the future. Over time, this will help us measure

the overall success of the programme and the impacts achieved.

Though the transition to net zero might seem daunting, the SIF's focus on delivering an agile and responsive programme is helping the energy sector to go further and faster towards its net zero goal.

The projects pathway, from Discovery to Beta



Why does energy system innovation matter for both consumers and the drive to net zero?

Follow the Bright Spark podcast to find out more, and meet some of those pushing to transform UK energy networks.

The Silicon Valley of energy

Fostering a world-leading energy innovation ecosystem

Creating the 'Silicon Valley of energy' in the UK isn't just a slogan to measure our ambition, it's an objective that underpins the SIF strategy and permeates every activity we undertake.

While such a task is formidable in scale, and not something we can do alone, we are tackling the challenge head on. From simplifying how innovators can engage with their customers, to delivering a network innovation investment platform, we are working on identifying the barriers and creating solutions.

Innovate UK has a critical role to play in supporting a world-leading energy innovation ecosystem, and the delivery partnership with Ofgem is a great example of how value creation can be amplified by joining up missions, expertise, funding and commercialisation.

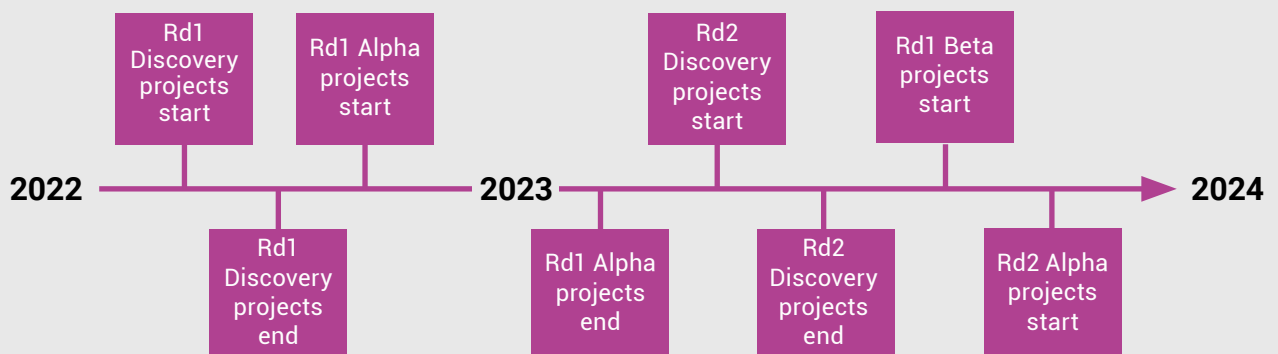
This blended approach makes the SIF much more than a 'spend' function. We want to influence the economy by supporting a diverse and vibrant innovator base and see more SMEs scale up and export to new territories. We want to inspire an evolution and deliver positive impacts for every network user. And we want to reduce systemic barriers which restrict the supply chain and deter commercial finance from effective participation in network innovation.

With the right support, the UK's most innovative companies can operate in a global market. We have established international partnerships with energy network-focused industry bodies who complement the SIF remit. These partnerships are the basis for two-way innovation transfer, where our best businesses will have the opportunity to engage in international markets, and international innovators can access the SIF.

These borderless routes to market have the potential to deliver quality innovation at scale by aligning the SIF with the innovation services available across the Innovate UK family, as well as helping us report performance through a consistent impact management framework.

Finally, we are exploring opportunities to foster a strong innovation culture across the energy networks. Delivering incremental innovation is not enough to tackle the scale of the net zero challenge. We believe that a strong culture of innovation is critical to how the energy networks can deliver disruptive change, and over the coming months we will be working with them to achieve this.

The SIF timeline – 2022-23



SIF Round 1: Project examples

Delivering a high standard of innovation

The first round of the Strategic Innovation Fund competitions took place in 2021. It focused on four innovation challenges: whole system integration; data and digitalisation; heat and zero emission transport.

The competition attracted 55 eligible project applications to run a two-month feasibility study in the Discovery phase. Of these, 40 were funded, to a combined total of £3.8 million.

The feasibility studies were completed in Spring 2022, and 18 projects then moved on to the Alpha phase, a six-month proof of concept project, in

Summer 2022. With each project awarded up to £500,000, the total funding for this phase was around £8 million.

In the final phase, a few high-impact projects will be moving on to Beta – large scale demonstrators – in 2023.

In this section we look at a few of the projects funded in the Discovery and Alpha phases.

Please note that these are just examples; highlighting them does not imply that we endorse or favour them over other funded SIF projects.



PROJECT EXAMPLE

Whole system integration

There is an increasing recognition that taking a 'whole system' approach to the complex range of activity across energy networks, markets, generation, supply and demand will provide an optimised pathway to decarbonising our energy system whilst best meeting the needs of consumers and network users.

Offshore wind is usually seen as a risk to grid stability due to the intermittency of wind energy generation. The Innovative Control and Energy Storage for Ancillary Services in Offshore Wind (INCENTIVE) project, led by Scottish and Southern Electricity Networks (SEN), takes a fundamentally new viewpoint on the issue, by exploring the opportunities to use innovative hardware to control voltage, current and frequency from offshore wind farms.

National Grid's SuperConductor Applications for Dense Energy Transmission (SCADENT) project looked at high temperature superconductor materials for electricity transmission. The project found positive results for improving the efficiency of transmission, allowing more of the electricity from renewable generation to reach consumers.



PROJECT EXAMPLE

Data and digitalisation

Greater provision of reliable data for system planning, operation and integration of technologies will be essential for a fully decarbonised energy system. As we move towards net zero the energy sector will see the proliferation of diverse forms of generation and supply, as well as many new assets including storage, refuelling and smart home devices.

Data and Digitalisation was the most popular of the Round 1 challenges, with 18 Discovery phase projects – of which 11 progressed to Alpha.

A number of projects looked at the potential opportunities of creating 'digital twins' – digital representations of the energy system which dynamically change according to real-time data inputs.

The Digi-GIFT project, led by SP Transmission, found that we will need to develop novel sensing and communication hardware, and use AI-informed cyber security and defence strategies, to ensure the resilience of our energy systems as they embrace digitalisation.

FYLD, the field worker productivity and safety platform powered by AI, worked with SGN on the Predictive Safety Interventions project. By applying machine learning to site incident data, FYLD found that factors such as geographic locations and operator behaviours could be used to predict accidents before they happen.

Other projects, such as Network Innovation and Meteorology to BUild for Sustainability (NIMBUS) led by SSEN Transmission, looked at improving predictions for extreme weather events, and Eye in the Sky, led by National Grid Electricity Transmission, analysed impacts of weather events to improve operational responses and resume services as quickly as possible.



Image: National Grid



Scan the QR code to watch the 60-second videos from the Round 1 Discovery projects.

PROJECT EXAMPLE

Zero emission transport

People and businesses need reliable, cost-effective transportation that is readily available when demanded. The transport and energy systems are becoming increasingly integrated and dynamic with the need to decarbonise. The seven Discovery projects with this focus covered a variety of options to accelerate decarbonisation of transport.

The project on Resilient and Flexible Railway Multi-Energy Hub Networks for Integrated Green Mobility, led by SP Transmission, established that railway stations and depots could be the coupling points between renewable energy flexibility hubs and battery powered trains, to bring significant benefits to the railway passengers and the electricity customers alike.

Wales & West Utilities' HyPark project investigated the opportunities for hydrogen to provide back-up to electric vehicle supercharging hubs during periods of peak demand. The Multimodal Hydrogen Transport



Image: Wales and West Utilities

Refuelling Study project, led by Northern Gas Networks, looked at the future business models for hydrogen-powered hubs serving multiple forms of transport, including heavy goods vehicles and fleets.

PROJECT EXAMPLE

Heat

Heating accounts for over a third of the UK's overall greenhouse gas emissions, and to date has proved challenging to decarbonise. Consumers need better accessibility to low-carbon heating options which remain reliable and affordable in comparison to existing solutions.

Heat Balance, a project led by SP Transmission, investigated opportunities for using various

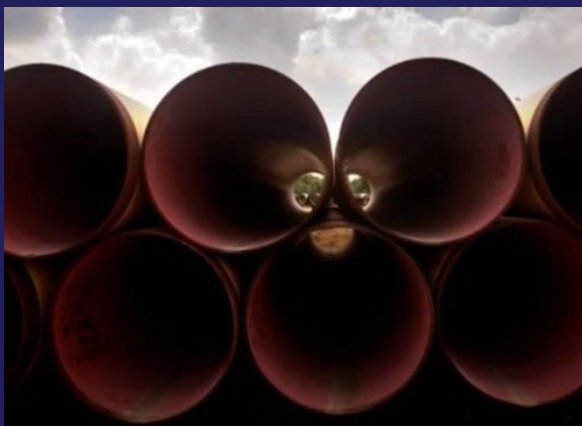


Image: National Grid

large-scale thermal energy storage sources. An estimated 4 million GWh contained in large thermal energy stores could provide flexibility, frequency and grid balancing services during peak periods to electricity networks and consumers.

National Grid Gas Transmission's Hydrogen Barrier Coatings for Gas Network Assets project investigated the best materials to be used as internal coatings for pipelines, with the aim of preventing accelerated degradation when used to transport hydrogen. Metallic coatings such as electrodeposited zinc, copper or nickel offered the best prospects, but significant barriers will still need to be overcome to achieve widespread deployment. The project, under the new name HyNTS Protection, will aim to tackle some of these issues in the Alpha phase, including developing a system for applying the coatings, verifying effective deposition, and developing a more detailed economic business case for rollout.

SIF Round 1: Alpha projects

Demonstrating network innovation at scale with a clear route to market

The ultimate aim of the Strategic Innovation Fund is to get the best innovations embedded into the day-to-day operations of the energy networks, delivering the maximum benefits to consumers and network users. Here are some projects that have already successfully moved on to the Alpha phase and have the potential to deliver real impact.

PROJECT EXAMPLE

Gas System of the Future – Digital Twin

One of the agile features of the SIF is the scope for energy networks to merge projects as they move through the phases. This offers the opportunity to explore different approaches to the same problem in the Discovery phase, and bring them together for closer collaborative working later on.

A good example is the merging of two projects led by Southern Gas Networks. In the Discovery phase, they looked at different aspects of digital twins. One explored the societal, operational, and whole-system benefits of a digital twin of the gas distribution system. The second focused on a more specific use case for digital twins, considering a future hydrogen network.

Currently, data cannot be easily and quickly shared between different energy networks and/or network users. The two projects were merged into a single Alpha phase project, combining the capabilities of the partners - IBM, Amazon Web Services, DNV, National Grid Gas Transmission and the Electricity System Operator.

The outcome will be a better strategic understanding of energy production, supply and demand, to help in planning and maintaining a future system that involves blending different low-carbon gases produced in many distributed locations.

PROJECT EXAMPLE

Digital Platform for Leakage Analytics

This Cadent-led project is a great example of networks working collaboratively. Northern Gas Networks, Wales and West Utilities, National Grid Gas Transmission and Southern Gas Networks are working alongside consultancy Guidehouse. The team is investigating how to harness the power of data and cutting-edge digital techniques to identify leaks from the gas networks.

The gas system relies on thousands of kilometres of pipes, mostly buried in the ground. Over time it can be expected that they will sustain damage, whether from material degradation, natural weathering and soil erosion, or perhaps a misguided digger undertaking groundwork. In most cases leaks are not dangerous, but methane is a potent greenhouse gas which we don't want escaping into the atmosphere. Also someone has to pay for gas leaks, and at current prices the national bill could be as high as £130 million per year.

Clearly this problem is worth trying to solve, both for the planet and for consumers. There are other potential benefits too; the Alpha phase will investigate using monitoring and sensing equipment to respond quickly to damage caused by extreme weather, as well as assessing how data captured for leakage identification could be integrated with other network data and fed into a future digital twin of the system.



SIF Round 2: new challenges

Increasing innovation alignment

In May 2022 we published new innovation challenges as the focus of SIF Round 2. These built upon, rather than replaced, the Round 1 challenges – which remain valid as high-level definitions of the current need for innovation. The four new challenges were defined over several months of intense working with more than 100 individuals. They respond to current issues within the energy sector such as rising fuel bills and extreme weather conditions, as well as longer-term priorities for net zero.

The Round 2 challenges are:

- supporting a just energy transition
- preparing for a net zero power system
- improving energy system resilience and robustness; and
- accelerating decarbonisation of major demands for energy.

This is their scope and how they link together.

Round 1 challenges	Round 2 challenges	Themes
Whole system integration	Supporting a just energy transition	Novel and replicable approaches for better identification, support, and inclusion of vulnerable and disadvantaged consumers
		Supporting the decarbonisation of heat and mobility for rural, off gas grid, fuel poor and those consumer groups with reduced access to opportunities for decarbonisation
	Preparing for a net zero power system	Novel ways to reliably support low stability systems
		Accessing grid/system support from novel supply and demand-side sources
Heat / Zero emission transport	Improving energy system resilience and robustness	Novel approaches to improving resilience using multi-energy systems
		Strengthening the UK's energy system robustness to support efficient roll-out of new infrastructure
		Accelerating decarbonisation of major energy demands
Data and digitalisation	Accelerating decarbonisation of major energy demands	Approaches to effectively facilitate, manage, and integrate multiple demands and demand-side solutions, eg heat and transport; flexibility and/or energy demand reduction
		Integrating heat networks for wider energy network management
		Improving efficiency at different levels in the energy system, eg loss reduction across networks; assessing and realising value of demand reduction to the energy network

As part of the ideation process, a call for ideas ran through summer 2022, with innovators asked to submit their suggestions via the Energy Networks Association and the Energy Innovation Centre. Approximately 170 ideas were submitted, 116 of which were invited to pitch to the energy network companies, with the best ideas being developed further ready to be submitted as SIF applications in September 2022. An exciting development was the involvement of the Distribution Network Operators (DNOs), which are eligible to lead projects in the SIF from Round 2.

There will be more opportunities to submit ideas and take part in ideation workshops during 2023; to find out how you can get involved, sign up to the [SIF newsletter](#).

Looking wider, the SIF has been designed to support collaboration across different funding streams and is actively supporting businesses involved in UKRI, BEIS, or other publicly-funded innovation programmes. The aim is to help align energy network innovation, wherever it happens, to achieve truly whole-system outcomes.

Comments on the SIF? Both Ofgem and Innovate UK welcome feedback.

- To comment on the SIF programme overall: networks.innovation@ofgem.gov.uk
- To comment on Innovate UK's work in delivering the SIF: sif_ofgem@iuk.ukri.org

For more information about the Strategic Innovation Fund, scan the QR code or visit ofgem.gov.uk/sif

The Strategic Innovation Fund is an Ofgem programme delivered through a partnership with Innovate UK.

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