# SIF Round 3 Project Registration

### Date of Submission

Apr 2024

### Project Reference Number

10107145

## Initial Project Details

### Project Title

Gas Volume for Embedded ElectricalGeneration Modelling

### Project Contact

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### Challenge Area

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

### Strategy Theme

Optimised assets and practices

### Lead Sector

Gas Distribution

### Other Related Sectors

Electricity Distribution

Gas Distribution

### Project Start Date

01/03/2024

### Project Duration (Months)

2

### Lead Funding Licensee

SGN

### Funding Licensee(s)

SGN

## Funding Mechanism

SIF Discovery - Round 3

## Collaborating Networks

Cadent

Northern Gas Networks

## Technology Areas

Active Network Management

## Project Summary

GDNs require a new forecasting framework to manage the increasingly disruptivedemands from flexible embedded generators, a need recognised by the 'Electricityand Gas Resilience Task Group' (EGRITG).
This project will design a notification platform for embedded generators to informGDNs of upcoming demands, combined with electricity market forecasting andadvanced machine learning techniques to refine embedded gas demandforecasts.
The Gas Trader Energy Balancing project will strengthen system resilience androbustness by creating an innovative whole system balancing approach for the UKGas Network, bringing sites, such as embedded power generation sites, intoalignment with existing balancing processes.

## Project Budget

£137,890.00

## SIF Funding

£123,830.00

# Project Approaches and Desired Outcomes

## Problem statement

The shift in generation to downstream is causing significant challenges to gas networks as offtakes fall below the regulatory capacity limits and new notification processes and forecasting techniques are required.
Gas Transporters work under the Uniform Network Code (UNC) regulations for hourly flow profiles for every offtake, the connection between NGGT and GDNs). Any change from the profile requires specific notification periods between the GDNs and NGGT depending on the flow change to manage gas supply, but Embedded power stations ('Gas Traders') can ramp up faster than these notification periods and are not required to notify GDNs of 'within day' and 'day ahead' gas demands.
This project will develop a notification platform and advanced forecasting tool to bring Gas Traders into alignment with the current gas nomination process. The platform will enable Gas Traders to notify GDNs (allowing for commercial sensitivity of upcoming demands, and combine this with electricity market analytics based on LCP Delta's Enact framework to both verify and enhance the forecasting capability using machine learning. This provides GDNs with a probabilistic approach to forecasting demand from embedded generation, protecting UK gas users and strengthening the energy system resilience and robustness. Improved forecasting is essential to support the industry net-zero ambition.
It addresses:
Industry challenge 2.2 -- Leveraging disruptive computing technologies
Other benefits include:

Closer engagement with embedded sites (e.g. for decision making during supply emergencies).
Increased visibility of cross-vector optimisation and impacts.
Potential expansion into low carbon gas injection and other reporting needs.

SGN is the lead network and is one of the largest utility companies, distributing natural and green gas safely and reliably through our 74,000km of pipes to 5.9 million homes and businesses across Scotland and southern England. SGN via Network Control monitors and controls the network in a secure and efficient manner, ensuring a safe, secure and sustainable future for the network.
LCP Delta (lead project partner), bring deep network innovation expertise, combined with exiting experience on FlexGen, and technical platforms and products in electricity market forecasting.
BEIS have openly supported this project and deem it to be advantageous for Gas Traders to share their site nomination bookings. SGN have also engaged with traders via power generators, and they believe this project is a very suitable proposal and would not be onerous to undertake on these sites.

## Video Description

https://youtu.be/QrsusP_yhas

## Innovation justification

This "Gas Trader Energy Balancing Modelling" innovation project aims to develop a highly innovative data tool which combines a reporting platform and electricity market analytics for day ahead forecasting. Machine learning will help to refine the forecasts building on gas trader inputs and market outturn, providing GDNs with the essential insight to balance the network for the first time.
The GDNs need to have a full knowledge of the system requirements for the safe and economic operation of the energy market, and currently the lack of telemetry and gas nominations from the embedded power generation sites, supplied manually, has the potential to leave GDNs vulnerable to a gas booking deficit. The outputted tool from this project will provide accurate forecasts of current demand/supply balance to the NEC, enabling better decision making and ultimately protecting consumers and their energy supplies. This forecasting capability is essential as more net-zero sources of power (and potentially injection) come online.
This new proposed system will align with already existing Gas Nomination processes being operated within industry. It builds on existing research and capabilities and the output would be adopted by all GDNs with current industry working groups supporting the roll out into BaU.
Following the completion of this Phase, our current estimated TRL is 4 as we gather all required information and data, and as we start shaping our models. We then expect to reach TRL 6 by end of Alpha to validate our models with the anticipation to fully test our models ready for rollout in the later Beta Phase.

Our IRL sits at 4 with the view to remove uncertainties of integration with Networks' risk management models to reach IRL 6 by end of Alpha.
Finally, our CRL is estimated at 4 due to in-depth working knowledge of Gas Trader Energy Balancing and the expertise being brough on to the project. We aim to reach CRL 6 by the end of Alpha.
Due to the innovative approach, this style project would normally have a risk profile that is too high for BAU or other funding methods. In addition, if the project were funded under BAU or other methods, it would take significantly longer, and the solutions would arrive too late to support the net-zero transition. We require funding through the SIF to allow for the progression of this project to support greater energy system resilience and robustness as we accelerate to net-zero.

## Impacts and benefits selection (not scored)

Financial - future reductions in the cost of operating the network

Environmental - carbon reduction – indirect CO2 savings per annum

New to market – processes

## Impacts and benefits description

Financial - future reductions in the cost of operating the network
With the inefficiencies in the current gas booking nominations process has created an unnecessary increase in operating the network in a reactive planning approach. Therefore, having a robust forecasting process will allow GDNs to place the correct gas booking nominations with the NGGT, helping Gas and Electricity Networks to provide an efficient and secure way of operating the energy networks.
Combining this with the expanding number of sites being added to the already constrained energy networks, emphasises the importance of having an accurate and cost-effective solution to help better manage gas supply during the industries ambitions to reach net-zero.
This therefore creates a proactive system and process/system which will increase efficiencies and drive down costs of operating the network.
Environmental - carbon reduction -- indirect CO2 savings per annum

Currently there is a lack of quality data communicated to the Gas Transporters, which makes it difficult for Gas Networks to ensure that appropriate gas bookings are being made with the NGGT thus creating the potential for a supply deficit should multiple embedded power generators come on simultaneously.
By having an efficient forecasting model, we aim to ensure that all parties are furnished with the most up to date information, helping to create a safe and economic operation of the energy market, which overall will reduce environmental impacts by proactively forecasting demand rather than reactively.
Overall, this improved network efficiency will also ensure that all aspects of Network Control are capable of safely transitioning to a net-zero future with multiple energy mixes.
New to market - processes
There is currently a large interest across the industry both in the Gas and Electricity sector to deliver accurate forecast demand models given the future changes regarding embedded sites and the additional energy mixes expected to enter the Gas Network. With working groups such as RIGSSE we look to have regular engagement with all interested parties during each phase (Discovery, Alpha and Beta) to support its implementation. Once implemented following Beta Phase, SGN will be using these working groups to solicit feedback and monitor progress of the solution.
Following completion of Beta and beyond, metrics will be put in place to embed this new process developed from this project. A framework for continuous improvement will also be created as we develop the project outputs to ensure maximum rollout of the new processes.

## Teams and resources

SGN operates via a Network Control which includes monitoring of system performance, transmission assets, ensuring compliance with regulatory requirements, security monitoring and coordinating with key stakeholders to ensure supplies are maintained. Similar operations are carried out across the GDNs with Cadent and NGN supporting this project. Utilising these resources will ensure successful delivery of the project.
Our delivery partner, LCP Delta a research, technology, and data specialist, have extensive experience in delivering changes to the energy industry. LCP Delta successfully deploy new solutions, products and services or changes to existing systems using

repeatable processes, many times a year with multiple industry participants.

LCP Delta have a strong reputation for delivering robust and highly regarded market research, forecasts and data on the evolution of gas and electricity demand for the UK (and European) gas and electricity network operators, the ENA, DESNZ. This is built upon granular and robust forecasting of technology deployment on the customer end of the energy value chain for a range of industry players. We have a strong track record for meeting and exceeding client expectations in delivering compelling insights. In particular LCP Delta provide:
Experience of flexible generation, having led the WWU FlexGen NIA research.

Data and tool/platform development with the capability to produce and host the technical solution.
Day-ahead electricity marketing with their "Enact" tool being used by electricity traders. This provides the basis for the tools verification and learning functionality to translate the gas traders nominations into accurate and probabilistic forecasts for GDNs.

All partners have experienced understanding of the subject matter in detail after many years of deep operation in this area and have extensive knowledge of the industry and its participants. Combined with have many years of experience in delivering both small and simple, and large and complex industry programmes, working collaboratively with multiple industry participants and stakeholders. A stakeholder engagement plan will identify the range of potential users (gas traders, gas injectors), GDN operatives, electricity market specialists, and associated policy and regulatory representatives to help define the specification. The partners have well established project teams through experiences from other funding routes such as NIA, NIC and SIF and have developed good working relationships with key business areas These project teams will consist of Project Managers who will use these working relationships to gather information, complete stakeholder engagement and dissemination of learning into the business to ensure successful delivery of each work package.

# Project Plans and Milestones

## Project management and delivery

We will maintain weekly management calls and monthly knowledge dissemination meetings amongst all members and key stakeholders. At strategically planned points during the project, we will hold a face to face progress meeting and open it to relevant external organisations such as HSE, DESNZ, Ofgem and UKRI, as well as other network operators. These meetings will ensure reach to a wider community in preparation for the Alpha and Beta phase.

We will produce a Project Management document that will outline strategy, success criteria, activities, deliverables, timeline, risks, and detailed project plan. This Project Management document and risk register will be maintained as a living document, reviewed weekly to ensure alignment of all members and scrutiny of fund spend. This will provide a governance framework which will be managed by SGN as the lead partner.
No regulatory risks have been identified for the discovery phase, and a regulatory work package will aim to identify and address any emerging findings to feed into alpha and beta. As a GDN operations support tool, there will be no direct or indirect impact on gas consumers.
Work packages (defined in detail in the Project Plan worksheet) include (LEAD participant):

WP 1: Review of existing process and capability (£12,000) (LCP Delta)
WP 2: Stakeholder engagement (£22,000) (LCP Delta)
WP 3: Tool specification - scoping of a proposed solution (£32,000) (LCP Delta) WP 4: Cost impact analysis (£20,800) (LCP Delta)
WP 5: Regulatory impacts (£12,000) (SGN)
WP 6: Delivery plan (£12,000) (LCP Delta)
WP 7: Project management and knowledge dissemination (£13,030) (SGN)

As a desktop scoping exercise, we are confident that the delivery risks are low and a number of the work packages can be run consecutively. The only external risk is on the engagement activities and therefore the stakeholder engagement plan and process will be initiated in the first week.
We believe the technical risks are low due to LCP Delta having extensive data and technical capability in delivering platforms and tools, and in-house electricity market modelling capabilities though the Enact tool.

## Key outputs and dissemination

In the Discovery phase, SGN and LCP Delta will work together to identify and agree requirements of the new process/system/tool for Trader energy balancing before turning these into a solution definition for delivery through Alpha and Beta phases.
The Discovery phase is essential to understand the different user requirements, define methods to manage commercial sensitivities in the trader's decision making, and identify suitable platforms and methods for delivering the tool so as not to undermine the development of competitive markets. Our objective is for the tool to provide a platform which supports both GDNs and traders, providing two-way data visibility and valuable forecast verification and analysis through the electricity market forecast module. Commercial sensitivity will be considered from the outset both in terms of the process design, and technology implementation.
All partners are well adverse in successfully running innovation projects and have appropriate steering groups in place to direct the project, helping to secure adoption of any learning and outputs of the project.
The dedicated SGN Innovation Project Manager will be responsible for the implementation of this project and will be supported by LCP Delta leading on the technical research. SGNs Innovation team are well established through experiences from other funding routes such as NIA and NIC and have developed a good working relationship with key business areas to ensure successful implementation.
Project dissemination will be via direct deliverables (tool specification document, report reviewing approaches, and analysis of solution, and roadmap for alpha and beta), alongside a range of dissemination activities.
Learnings will be applied to other licensees through providing regular project updates, generally expected to occur upon completion of key tasks, along with the production of final reports for sharing with the wider licensee. The adoption of any project learnings will be supported by maintaining effective levels of communication with relevant stakeholders and interested parties through regular update and showcase meetings/forums.
Deliverables
Deliverables for this Discovery Phase will be:

A report reviewing the existing approaches and detailing the design of the proposed gas nomination database/engine and comparing the approaches to identify their costs, impacts and relative benefits to the UK energy system.
A proposal for the database/engine to trial and the appropriate scale of a pilot demonstration to be developed in Alpha and Beta Phase projects.
Detailed roadmap for Alpha and Beta Phase projects.

# Commercials

## Intellectual Property Rights (IPR) (not scored)

For SIF projects, each Project Partner shall own all Foreground IPR that it independently creates as part of the Project, or where it is created jointly then it shall be owned in shares that are in proportion to the work done in its creation. The exact allocation of Foreground IPR ownership will be determined during the contractual negotiations with the Project Partners on the agreement for the project. We intend to ensure each Project Partner will comply with Chapter 9 SIF Governance Document through the contractual terms governing the project. However, precisely how this is done will be subject to contractual negotiations with the Project Partners on the agreement for the project.

## Value for money

Our total project costs for the Discovery phase of this project will be £137,830. The 10% compulsory contribution of the total project costs will be funded by LCP Delta.
We are requesting SIF funding of £123,830 of which the costs for the lead partner SGN will be £4,164. LCP Delta will be £ 117,700 and GDNs collective costs will be£1,966.
The costs for the Discovery phase have been optimised to deliver the stated work packages in an efficient and considered manner. We have been able to leverage the extensive knowledge and experience already available in LCP Delta for the gas nomination systems and process, leading to a more aligned and robust solution definition being delivered.
Successful selection of not only this Discovery phase, but also Alpha and Beta, will see:

an improved industry capability to provide increased accuracy to gas nominations
significantly reduce the risk to imbalance in system supply, and
support the growing number of embedded power generations sites coming online in support of net-zero

In addition, this project will also help to ensure that the energy infrastructure successfully evolves as low carbon energy is introduced into the network, emphasising the importance of integrating this within network energy control.
While our forecasting regime has served GDNs and our customers extremely well, we recognise the UK's energy infrastructure will be undergoing significant changes to facilitate a low carbon future and therefore requires us to understand the role we will play within the energy mix.

## Supporting documents

### File Upload

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### Documents uploaded where applicable?

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