SIF Beta Round 5 Project Registration

Date of Submission

Aug 2026

Project Reference Number

NPG_SIF_026

Initial Project Details

Project Title

Fractal Flow (Beta)

Project Contact

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Challenge Area

Enhanced system visibility and control

Strategy Theme

Data and digitalisation

Lead Sector

Electricity Distribution

Project Start

01/09/2026

Project Duration (Months)

24

Lead Funding Licensee

NPg - Northern Powergrid (Northeast) Limited

Funding Mechanism

SIF Beta - Round 5

Collaborating Networks

Northern Powergrid

Electricity North West

UK Power Networks

Scottish and Southern Electricity Networks Distribution

SP Energy Networks Distribution

National Grid Electricity Distribution

National Energy System Operator

Technology Areas

Comms and IT

Control Systems

Digital Network

Distributed Generation

Project Summary

Fractal Flow (FF) provides a core digital capability for the UK electricity system, creating a shared, near-real-time digital twin to improve visibility and coordination across the transmission-distribution boundary. As Distributed Energy Resources (DERs) grow, FF gives DSOs and NESO trusted insight into assets, constraints, flexibility services, and emerging conflicts, strengthening control room decision-making, coordination, and situational awareness. By improving DER utilisation and reducing unnecessary curtailment and balancing actions, FF lowers system operating costs, supports reducing consumer energy bills, increases access to revenues for flexibility providers, and drives low-carbon outcomes. FF establishes foundational infrastructure for resilient, efficient, and data-driven network operations.

Add Preceding Project(s)

NPG_SIF_R3A-FractalFlow - Fractal Flow Alpha R3

Add Third Party Collaborator(s)

Oak Tree Power Ltd

ElectraLink

Frazer-Nash Consultancy

Project Budget

£9,312,560.00

SIF Funding

£7,947,286.00

Project Approaches and Desired Outcomes

Animal testing (not scored)

- ○ Yes
- ◉ No

Solution statement and solution focus

Fractal Flow (FF) provides a core digital capability for the UK electricity system, creating a shared, near-real-time digital twin to improve visibility and coordination across the transmission-distribution boundary. As Distributed Energy Resources (DERs) grow, FF gives DSOs and NESO trusted insight into assets, constraints, flexibility services, and emerging conflicts, strengthening control room decision-making, coordination, and situational awareness. By improving DER utilisation and reducing unnecessary curtailment and balancing actions, FF lowers system operating costs, supports reducing consumer energy bills, increases access to revenues for flexibility providers, and drives low-carbon outcomes. FF establishes foundational infrastructure for resilient, efficient, and data-driven network operations.

International Collaboration (not scored)

Does your proposed work involve any international collaboration or engagement?
Fractal Flow Beta Phase project does not require any international collaboration or engagement.

All partners are UK-based including:

Northern Powergrid (NPg), Lead Partner,
National Energy System Operator (NESO),
SP Electricity North West (SP ENW),
Scottish and Southern Energy Networks Distribution (SSEN-D),
National Grid Electricity Distribution (NGED),
UK Power Networks (UKPN),
Scottish Power Energy Networks (SPEN),
Frazer-Nash Consultancy (Frazer-Nash),
ElectraLink,
OakTree Power (OakTree).

Trusted Research And Innovation

Trusted Research and Innovation
Fractal Flow Beta Phase project does not relate to UKRI's Trusted Research and Innovation (TR&I) Principles.

Innovation justification

How does your Project demonstrate novel and ambitious innovation in the energy networks?
Innovation Justification

Fractal Flow (FF) addresses SIF Round 5 Challenge 5: Improve control room capabilities and coordination, Theme 2: Enhancing control room operations. It delivers a first-of-its-kind operational-timescale system that links network data, forecasts, and network actions to detect conflicts, assess Balancing Mechanism (BM) and flexibility procurement effectiveness, and coordinate decisions in DSO/NESO control rooms.

FF meets the challenge theme by:

Enabling near-real-time (half-hourly), distribution-level, network and asset activity visibility across the transmission-distribution boundary, including constraints, interactions with active network management (ANM) systems, and primacy rules.

Providing data-driven analytics and combined forecasting to improve situational awareness and support more confident, effective BM and flexibility procurement.
Improving control room capabilities and transmission-distribution coordination through a digital twin that helps manage growing grid complexity.
SIF Learning

Discovery (NPg, NESO, Frazer-Nash) identified an industry-wide gap in near-real-time distribution-level visibility and cross-network situational awareness. Alpha (NPg, NESO, Frazer-Nash, SP ENW, ElectraLink, OakTree) demonstrated how a knowledge graph of network assets and actions can contextualise power-flow as it evolves half-hourly, enabling evaluations of flexibility/BM effectiveness and identifying ANM/BM conflicts up to 24-hours ahead. Engagement with control room and DSO teams (including SSEN-D and UKPN) confirmed FF can provide operators with necessary context and shared understanding across organisational boundaries.

Open Working

FF has openly worked with Data Sharing Infrastructure, Operational Data Sharing Technical Working Group (TWG), and Primacy TWG. FF is a valuable use case for these initiatives and leverages their outputs. FF continues engaging with Volta, NESO's AI control room decision-making tool, and will provide distribution-level insights at BAU. Beta will use Artificial Forecasting's forecasts and data sharing lessons from Power Wales Renewably (PWR).

Why SIF Funding?

FF requires extensive cross-network collaboration to de-risk innovations, joint development, data integration, and workflow alignment across NESO and DSOs, before operational deployment. These activities fall outside BAU RIIO price-control mechanisms, making SIF appropriate for the required collaboration and scale of progress.

Innovation and State-of-the-Art

FF's novel capabilities are built on:

Knowledge graph: Defines relationships between network assets and actions helping to contextualise how network actions impact power flow.
Forecasts: Combines DNO and NESO forecasts into a unified view up to 24-hours ahead of the settlement period.
Probabilistic power-flow: Predicts possible power-flow changes through the network 24-hours ahead of the settlement period.
Primacy rules and ANMs: Applies primacy and ANM logic within knowledge graph relationships to detect conflicts.
Optimal dispatch: Produces feasible dispatch/procurement options based on network constraints and near-real-time analytics.
Current NESO and DSO control room systems lack these capabilities. Existing tools address isolated aspects of DER visibility, but none address full cross-network coordination nor form a cohesive solution. FF achieves this through unprecedented coordination between NESO and DSOs, not yet seen in the UK.

Other innovations have narrower focus:

Megawatt Dispatch (MWD) can turn DERs down to zero but lacks cross-network visibility and near-real-time situational awareness.
DSO specific tools don't offer cross-network coordination.
Digital twins like Powering Wales Renewably target long-term planning rather than near-real-time operational decision-making.
Readiness Transitions

TRL 4→7: Beta will demonstrate FF in NPg, SP ENW, and NESO control rooms.
IRL 3→5: Integration of FF into DSO and NESO environments.
CRL 4→5: Defined product, validated workflows, and clear deployment pathway.
Appropriate Scale and Counterfactual

Beta will validate FF under operational conditions for three networks (NPg, SP ENW, and NESO), enabling future expansion to SSEN-D, UKPN, NGED, and SPEN. Alternatives such as DSO-centric tools, MWD, or strategic digital twins, cannot deliver the whole-system cross-network situational awareness required for future grid operations. Without FF, operators face increasing uncertainty and operational risk as DER penetration grows, and consumers face higher bills through rising BM expenditure.

Impacts and benefits selection (not scored)

Financial - future reductions in the cost of operating the network

Financial - cost savings per annum on energy bills for consumers

Environmental - carbon reduction – indirect CO2 savings per annum

Revenues - improved access to revenues for users of network services

Impacts and benefits description

Headline

Forecasts indicate Fractal Flow (FF) will deliver \>£689m Net Present Value (NPV) and indirect CO2 reductions of \>36.5ktonnes between 2026-2045, assuming a phased rollout from 2030-2035 under the 'Holistic Transition' Future Energy Scenario (FES) 2025. This demonstrates high probability of significant whole-system benefits that will pass to consumers through Ofgem's RIIO Framework. FF will:

Reduce network operating costs through better cross-network coordination and situational awareness,
Indirectly lower CO2 emissions by minimising renewable curtailment,
Provide consumer energy bill savings through whole-system savings pass-through,
Improve revenue access for network service users through clearer GB-wide operational signals.
Probabilistic Monte Carlo (MC) analysis shows 97% likelihood of NPV\>£2bn and 71% likelihood of NPV\>£3bn over 20 years.
Recovery of total lifetime costs (to 2045) is expected within the first year of partial rollout (2030).

Pre-Innovation Baseline

Currently, DSO and NESO actions only partially coordinate. Limited real-time data sharing and fragmented coordination preserve system security but reduce operational efficiency. Conservative, siloed constraint management increases risk of:

Duplicated/counteracting cross-network actions.
Inefficient flexibility deployment.
Avoidable renewable curtailment.
Inefficiencies drive high balancing costs (£2.7bn in 2024/25, NESO 2030 forecast of £8bn). Current flexibility inefficiency and cross-network conflicts are low but expected to worsen as flexibility markets develop and Distributed Energy Resource (DER) penetration rises towards 30-35% of generation by 2050 (FES2025).

Baseline metrics include Balancing Mechanism (BM) costs, constraint volumes, flexibility dispatch costs, curtailment levels, and carbon intensity.

Project Benefits

Coordinating primacy, Active Network Management, and BM signals, reducing conflict.
Integrating DNO and NESO forecasts improving short-term demand and flexibility predictions.
Providing distribution-level analytics for NESO's Volta programme.
Demonstrating value from data sharing via ICCP.
Benefit Mechanisms

FF reduces unnecessary/inefficient operational actions. Benefits arise from increasing efficiency, achieving the same outcomes at lower cost. Mechanisms include:

Avoiding counteracting transmission and distribution actions, lowering constraint volumes.
Better-targeted flexibility dispatch.
Improved confidence and forecasting in DER availability, reducing conservativism and renewable curtailment, reducing high-cost BM actions.
The effects are quantified in the CBA, using referenced BM and flexibility market data/projections and NESO estimates of improved cross-network visibility. Uncertainty is assessed via MC simulation, with conservatism built into assumptions.

Future Reductions in the Cost of Operating the Network: First-centile - £1.8bn (2026-2045)

FF reduces network operator costs. The absolute minimum forecast NPV is £689m by 2045, with a median of £3.5bn. The

minimum savings from 2026-2045 independently arise through:

Reduced constraint actions: £344m (primarily NESO savings).
Better flexibility efficiency: £342m (primarily DSO savings).
Improved forecasts: £19m (NESO and DSO savings).
Network savings are assessed at whole-system level, noting all DSOs and NESO are Beta partners.

Carbon Reduction -- Indirect CO2 Savings per Annum: First-centile - 92ktCO2 (2026-2045)

FF reduces constraint management and renewable curtailment, lowering carbon emissions from fossil-fuel replacement generation. The forecast reduction absolute minimum is 37ktCO2 by 2045 and median 209ktCO2, or ~14ktCO2 saving per year of operation.

Cost Savings per Annum on Energy Bills for Consumers: Unquantified

By reducing whole-system operating costs, FF will deliver pass-through savings to consumers. For example, lower BM costs reduce Balancing Services Use of System (BSUoS) charges, wholly recovered from generators and suppliers and passed to consumers. Beta focuses on quantifying total consumer savings.

Improved Access to Revenues for Users of Network Services: Unquantified

FF will enable new revenue streams for service users and future service development, including:

Improved access to flexibility service revenues through clearer operational signals and predictable market participation,
System inertia insights through assessing embedded asset contributions.
Summary

FF is expected to deliver significant, lowIrisk net benefits through network cost savings and indirect carbon reduction, leading to lower consumer bills. Additional benefits include improved revenue access for flexibility service users.

Teams and resources

Project Team

Northern Powergrid (NPg), National Energy System Operator (NESO), SP Electricity North West (SP ENW), Frazer-Nash Consultancy, ElectraLink, and OakTree Power continue as partners at Beta.

UK Power Networks (UKPN), Scottish & Southern Electricity Networks Distribution (SSEN-D), National Grid Electricity Distribution (NGED), and Scottish Power Energy Networks (SPEN) join as partners at Beta, expanding representation to every DSO in Great Britain, progressing toward nationwide scalability.

NPg

Project Lead. Project sponsor is the Director of Digital and Innovation. NPg will provide strategic leadership, including:

Ensuring the project delivers on outcomes and objectives.
Project management, governance, and reporting.
Required datasets and control room expertise to facilitate trials on a portion of their network.
Sharing novel operational datasets via ICCP to NESO.
Operational expertise for control room cultural assessments and enterprise architecture workshops.
Steering ownership, operational, and governance model definitions.
NESO

As the national energy system operator, NESO provide a whole system perspective.

They will:

Provide required datasets and control room expertise to facilitate trials.
Process novel datasets shared from DSOs to NESO via ICCP.
Provide ENCC operator expertise for control room cultural assessments, enterprise architecture workshops, and provide user feedback.

Provide NESO stakeholder management and engagement, including ICCP stakeholders, Volta, REVEAL, and DSIVES.
Participate in defining ownership, operational, and governance models.
SP ENW

As a trial network partner, SP ENW provide diversity in DSO operations including a network-wide merit-order-based active network management (ANM) scheme.

They will:

Provide required datasets and control room expertise to facilitate trials on a portion of their network, including sharing novel operational dataset via ICCP to NESO.
Provide operator expertise to control cultural assessments, and enterprise architecture workshops, and provide user feedback.
Participate in defining ownership, operational, and governance models.
SSEN-D, UKPN, NGED, SPEN

Provide DSO expertise, including experience managing ANM schemes, operating flexibility services, knowledge of primacy market rules, data sharing capabilities, and learning from BAU and innovation projects.

They will:

Provide DSO expertise, oversight, and governance ensuring DNO scalability and compatibility.
Provide control room/DSO team expertise to control cultural assessments, and enterprise architecture workshops, and provide user feedback.
Participate in defining ownership, operational, and governance models.
Frazer-Nash Consultancy

Technical Lead. Frazer-Nash are an engineering and technology consultancy with experience delivering digital innovation projects across the UK energy industry.

They will:

Lead software development of FF at Beta.
Conduct control room cultural assessments.
Facilitate workshops and develop Beta and BAU use case plan.
Coordinate trial activities with trial networks.
Coordinate CBA.
Support project management and stakeholder engagement.
ElectraLink

Lead on cloud infrastructure requirements, and ownership, operational and governance models. As operator of the UK's Data Transfer Service (DTS), they bring proven capability in understanding platforms that manage high-volume data flows.

They will:

Develop BAU cloud infrastructure and hosting requirements and design.
Facilitate definition of BAU ownership, operational, and governance models.
OakTree Power

A leading Flexibility Service Provider (FSP) (100MW portfolio of demand response and co-located renewables).

They will:

Engage with customer groups to reflect real-world market and consumer needs.
Facilitate development of market procurement workflows with networks and customer groups.
Chair market forum workshops.
Stakeholder Engagement

Alongside the project partners, the following external stakeholders have been identified as impacted by FF and will be engaged during the project:

Ofgem
Elexon Market Facilitator

DESNZ
Equipment and Facilities

No specialist equipment or facilities are required beyond access to trial networks' control rooms and use of ICCP links from NPg and SP ENW to NESO.

Project Plans and Milestones

Project management and delivery

How will you manage your project effectively?
The project will be delivered through a structured project management (PM) framework that combines a milestone-driven waterfall approach with Agile software development. This hybrid model ensures strong governance, clear sequencing of work packages (WPs), and the flexibility needed to deliver an innovative digital solution. Delivery is organised into seven WPs, each with defined outputs and milestones.

PM Approach

NPg will provide overall leadership, with Frazer-Nash responsible for day-to-day PM. Progress will be monitored using Microsoft Project, the PMT, and biweekly partner governance meetings. A shared Microsoft SharePoint site will coordinate documentation and resources across organisations.

Software development activities (WP3/WP4/WP5/WP7) will follow an Agile methodology. Two-week sprints, supported by a Product Owner and Scrum Master, will enable iterative development, rapid feedback, and continuous improvement. Azure DevOps will be used to manage sprint tasks, testing, and release cycles.

A formal stage gate after Task 3.5 (Data Sharing Trial) will assess:

Delivered network and consumer value.
Readiness for full Fractal Flow (FF) build and trial deployment.
WP Structure and Dependencies

The project plan is built around clear interdependencies enabling coordinated delivery:

WP1 provides governance, reporting, and dissemination, underpinning all other WPs.
WP2 delivers user assessments that inform software design in WP4 and trial planning in WP3.
WP3 coordinates trials across NPg, SP ENW, and NESO control rooms. Trials depend on data sharing milestones (M3.2/M3.3/M3.5) and software releases (M4.3/M4.5).
WP4 develops FF Beta software. It relies on WP2 outputs and early data availability (M3.1/M3.2).
WP5 defines BAU hosting and infrastructure requirements. It depends on trial data (M3.3/M3.5), software releases (M4.3/M4.5), and WP6 operating model outputs.
WP6 develops the ownership, governance, and operating model, and outlines BAU transition plans. It requires WP5 infrastructure specifications and WP3/WP4 outputs.
WP7 delivers the cost benefit analysis, dependent on the completion of trials (M3.4/M3.6).
The stage gate (Go/no go for FF Complete Build and EHV/HV and LV Trials) ensures that the Data Sharing Trial (M3.4) is complete before progressing to full FF functionality and EHV/HV/LV trials.

Risk Management Strategy

Project risks across technical, operational, regulatory, and commercial areas will be managed in the PMT Risk Register, with FrazerNash maintaining a dedicated software development risk log. Risks will have clear owners, defined mitigations, and scheduled review points. Risks will be updated and reviewed at biweekly governance meetings capturing emerging risks and enabling proactive management.

Top PMT risks include:

R12 (NESO-owned): Historic data analysed may not reflect the challenges FF is designed to address, limiting evidence to justify BAU rollout.
Mitigation: WP3 will select trial locations to reduce this risk, and WP7 will extrapolate findings to future grid conditions.
R16 (NESOowned): Insufficient cybersecurity/data design could block BAU rollout.
Mitigation: IT/security teams will support requirements development, and FrazerNash brings accredited assurance (ISO 9001, ISO 27001, TickIT+, Cyber Essentials+).
General mitigation strategies include:

Agile sprints enabling rapid identification and resolution of issues.
Data sharing agreements to reduce data availability risks.
Market impact forums to address compliance and market impact risks.
Continuous partner engagement to manage cross-organisational dependencies.
Supply Interruptions

FF Beta Phase software will not be used to make operational network decisions and therefore introduces no planned or unplanned consumer supply interruptions.

Consumer Access to Energy Services

All project activities are isolated from live operational systems, ensuring that consumer access to energy services remains unaffected.

Consumer Protection

WP6 engagement will ensure consumer perspectives shape governance, procurement workflows, and BAU transition planning, supporting a fair and transparent energy system. Market impact forums with stakeholders such as flexibility service providers who represent consumer perspective, will identify any downstream impacts and ensure the BAU transition does not adversely affect current or future consumers or their premises.

Key outputs and dissemination

What are the expected key outputs of your Project and your plan for disseminating them along with any lessons learned?
End-of-Beta Objectives

By the end of Beta, we will have:

Demonstrated Fractal Flow (FF) improves cross-network coordination and situational awareness through trials on NPg, SP ENW, and NESO networks using historic datasets.
Established a network-agreed ownership, governance, and operating model.
Produced a costed business case demonstrating FF delivers value for money for consumers and networks.
Secured cross-industry buy-in and agreement on the transition to Business-as-Usual (BAU).
Key Output and Dissemination Responsibilities

SIF/External Dissemination (Tasks 1.6/1.7, NPg)
FF will be disseminated across internal and external stakeholders to support smooth transition to BAU and wider energy sector and consumer awareness.

Control Room Culture Assessment: (D2.1, Frazer-Nash)
Human factors specialists will analyse network partners' control room practices ensuring FF's effective integration with DSO and NESO operations. A report will outline cross-network applicable user journeys for FF.

Trials: (D3.2/D3.3/D3.4, NESO/NPg/SP ENW/Frazer-Nash)
Three trials will assess FF's effectiveness and impact in NPg, SP ENW, and NESO control rooms -- Data Sharing, EHV/HV, LV -- and documented in a summary report.

FF Beta Software: (D4.2/D4.3, Frazer-Nash)
Beta will deliver trial-ready software for DSO and NESO control rooms using historic data. Releases include user guides and workflow documentation to support trials.

Source Code Handover: (D4.4, Frazer-Nash)
Documented source code, training, and operational guidance will support preparation for transitioning to BAU, with outputs provided to product owners at NPg, SP ENW, and NESO. Source code will be made available to other DSOs.

Hosting and Infrastructure Specification: (D5.1, ElectraLink)
Functional, nonfunctional, security, and data requirements will support scalability, operating model, and BAU transition planning.

GAP Analysis and High-Level Design: (D.2/D.3, NESO/ElectraLink)
Prioritised gap analysis and high-level architecture, with indicative costings, will support decision-making on the most efficient

and cost-effective route to BAU.

Commercialisation Strategy: (D6.1-D6.6, ElectraLink/OakTree/Frazer-Nash)
A comprehensive strategy covering ownership, governance, operating models, policy considerations, market impacts, and a plan/roadmap for BAU transition will support a smooth transition to BAU with cross-industry buy-in.

Market Impact Forums: (Task 6.2, OakTree)
Market Impact Forums will engage external stakeholders, including regulators, consumer groups, and other Flexibility Service Providers (e.g. Equiwatt), to ensure FF supports competitive markets and benefits consumers.

Cost Benefit Analysis (CBA): (D7.1, CBA in D1.1/D1.2, Frazer-Nash)
An updated CBA and trial tool will provide evidence for the costed business case, including a consumer value case and updated benefit map.

Dissemination Plan

Our dissemination plan covers a range of mediums to ensure broad outreach, including:

ENA Smarter Networks Portal:

SIF reports.
60-second videos.
Document deliverables (e.g. reports, trial summaries, functional specifications, CBA).
Quarterly plain-language consumer summaries.
Networks:

Internal engagement and workshops with wider control room, data, and IT teams.
Online:

Show & Tell webinars.
Partner social media and website posts.
Conferences/Publications:

SIF Community Forum.
Energy Innovation Summit.
Utility Week Live.
Powering NetZero
Other:

Online Market Impact Forums engaging wider stakeholders ensuring fair market access.
Presentation at ENA, DSO, and cross-industry forums.
Regular bi-monthly online meetings with external innovation projects including DSI, Volta, Powering Wales Renewably.
Competitive Markets

Beta will engage external market stakeholders through Market Impact Forums assessing risks, barriers, mitigations, and opportunities to competitive markets. All DSOs and NESO are partners ensuring cross-network assessment of procurement strategies.

Transparent and Collaborative Working

Partners from Alpha have expanded to include every GB DSO and NESO partnering at Beta, showing FF partners continue to work transparently and collaboratively engaging stakeholders outside of the project team. Practices include outreach, presenting findings and collating feedback from external stakeholders. Bi-weekly partner meetings and bi-monthly external project exchanges continue throughout Beta to embed lessons learned.

Commercials

Intellectual Property Rights (IPR), procurement and contracting (not scored)

Intellectual Property Rights (IPR), procurement and contracting
Intellectual Property Rights (IPR)

Fractal Flow (FF) will use the default SIF IPR arrangements set out in Chapter 9 of the SIF Governance Document. All IPR generated during Discovery and Alpha phases, and planned for Beta, will be available to all Network Licensees on an unrestricted, royalty-free, perpetual basis.

Background IP (BIP)

No BIP is being claimed by any partner, or brought to the project at Beta, other than BIP that was developed and captured as Foreground IP during the SIF Discovery and Alpha phases of the project. As stated above, all IP generated during Fractal Flow (Discovery, Alpha, and Beta) will be available to all Network Licensees on an unrestricted, royalty-free, perpetual basis.

Foreground IP (FIP)

FIP generated during Beta encompasses all project outputs, including software, methods, processes, analytics tools, and related documentation (this is a non-exhaustive list). All FIP will be captured in a project IPR register, with ownership following the originating partner. All FIP will be perpetually available to all Network Licensees on an unrestricted and royalty-free basis.

Beta IPR Approach

Beta will:

Assess how Network Licensees and consumers can best extract value for money from the IP generated.
Explore the implications of the different ownership and operational model options defined in Question 14 (including cross-network consortium, lead network, stakeholder with independent operator, and third-party models) to identify the model that provides best value for money for networks and consumers and maximises the benefits delivered by Fractal Flow.
Our approach prioritises network benefits and value for money, rather than commercialisation of IP. This approach ensures the innovation remains focused on network and consumer needs, while de-risking the transition into BAU and enabling scalable deployment across all partners. IP management will be embedded within the agreed governance processes.

Procurement and Contracting

There are no subcontractors planned to support Beta.

Where required the project will leverage existing partner enterprise agreements (e.g., software development tools).

Integration with Fractal Flow Ownership and Commercialisation Models

The open unrestricted IP strategy outlined above links directly to the planned tasks on operational and governance models described in Question 14, with the explicit intention of ensuring that commercialisation options, including potential cross-network operations or third-party delivery remain viable for future BAU deployment. This will enable FF's value for money to consumers and overall benefits to be maximised within the preferences and operational requirements of Network Licensees.

Summary

FF's approach to IPR, procurement, and contracting is therefore aligned with SIF guidance and has been developed to confer maximum value for money to consumers and Network Licensees. Beta supports innovative ownership and commercialisation models and ensures that all IP generated during Beta is clearly captured, auditable, available royalty free, and prepared for BAU adoption.

Commercialisation, route to market and business as usual

How will your idea become business as usual within your network and across the other networks after successful completion of

the Beta Phase?
Commercialisation Plan

Fractal Flow (FF) has been developed as a GB specific solution to coordinate DER dispatch between NESO and the DNOs. As such, FF is not viable as a commercial software product as the only potential customers are Network Licensees. Therefore, Beta has been planned with the intention of maximising benefits and value for money for networks and consumers, rather than with commercialisation in mind.

Alpha identified five possible ownership, governance and operating models:

DSOs/NESO joint ownership.
Joint network ownership, third-party operator.
Joint network ownership, single primary operator (a DSO or NESO).
Single network owning and operating FF.
Network Licensees retaining IP ownership but licensing it to a non-network.
All foreground IP will remain perpetually available to all Network Licensees on an unrestricted, royalty-free basis.

Alpha feedback, including the lead partner's commercial, financial, and procurement teams, favoured models where DSOs/NESO retain strategic influence but outsource operations. Beta will broaden engagement with NESO and all GB DSOs to assess the value, risk, and feasibility of each model for BAU.

Route to BAU

Beta will deliver the technical architecture for BAU transition, including data transfer protocols, hosting, and control room integration. Deployment will depend on the chosen ownership and operating model. Post-Beta operation and maintenance will be funded through BAU mechanisms.

Partner Readiness

Network partners are prepared for Beta's technical requirements, including data sharing. A key dependency is NPg's ICCP link to NESO, expected by Q3 2026. WP5 will confirm BAU technical requirements; WP6 will assess any additional investment once the governance model is chosen, with operations likely performed by a third-party.

Senior Sponsorship

FF has strong senior sponsorship across all partners. NPg (lead partner) is represented by Paul Fitton, Director of Digital and Innovation, who champions FF's BAU potential. NESO senior sponsors include Deepak Lala (TIDE Manager), Ian Dytham (Network Control Manager), and Gavin Brown (Head of ENCC Future Design), recognising FF's role in strengthening DNO-NESO coordination and delivering whole system benefits. Commercial, Finance, and Procurement teams from all partners have been engaged throughout Beta planning and will contribute through WP6 workshops.

Integration Strategy

FF aligns with major network programmes including the DSO transition and ICCP operational data sharing. It will leverage the emerging DSO-NESO data sharing agreement associated with primacy rules, requiring minimal amendments. WP2 will assess control room culture to consider how FF best supports and integrates with control room operations. Engagement with NESO and DSO IT, architecture, and data teams began in Alpha and will continue in WP5 and Tasks 2.2 and 6.5.

Scaling

Beta will provide evidence for national scaling. NESO, NPg, and SP ENW trials will assess scalability with review of requirements by UKPN, SSEN-D, NGED, and SPEN, supporting broader BAU adoption. BAU rollout timelines will be confirmed in WP5. A phased rollout approach will be adopted starting with NPg, SP ENW, and NESO in 2030 and extending to all DSOs by 2035. Recovery of total development costs to 2035 (£27.5m, inclusive of Beta funding) is expected within the first year of partial rollout (2030).

Change Management

The selected ownership and operating model will determine who leads the BAU transition (Milestone 6.6). The transition lead will be responsible for delivery activities post-Beta, including associated change management, training, and communication requirements. Task 6.5 will support the development of these activities.

Market Impact

FF improves coordination between Network Licensees without conferring exclusive commercial advantage. It does not restrict third-party participation, creates no exclusive rights, and is available to all Network Licensees on equal, royalty-free terms, in perpetuity. WP6 will assess market impacts through Market Impact Forums which will consult broadly across market participants and consumer representatives.

Policy, standards and regulations (not scored)

Do you consider there to be any barriers with respect to meeting the requirements of regulations, policy or standards?
Policy and Standards

Fractal Flow (FF) has not identified any policy, regulatory, or standards-related barriers that would prevent progression through the Beta phase or transitioning to BAU. No derogation or exemption will be required to complete the project.

The project recognises several ongoing developments that may influence system operation and integration of Distributed Energy Resources (DERs). Key considerations include the evolution of the ICCP data-sharing framework and the primacy flexibility market rules. FF's approach is closely aligned with these developments. The primacy flexibility market rules are being developed to govern conflicts between NESO and DSO flexibility services, ensuring the least whole electricity system cost to consumers while maintaining network security and fairness. Embedding these rules within FF ensures highly effective, actionable real-world insights that respect operational constraints and stakeholder priorities.

Project Plan

During Beta we will:

Explore operational compliance with standards and frameworks, including data access, asset registration, and conflict resolution both in WP4 (Fractal Flow Build) and WP5 (Enabling Functions for BAU).
Ensure regular horizon scans are performed to capture any policy or regulatory requirements in Task 6.3 (Policy and Regulatory Impacts) as part of WP6 (Commercialisation Strategy), including where regulatory clarity could accelerate adoption, without introducing blockers to progression.
Conduct Market Impacts Forums in WP6 that will seek to capture any risks or opportunities associated with using FF in market procurement processes. Key policy and regulator stakeholders, including Ofgem, Elexon as GB Flexibility Market Facilitator, and DESNZ, will be invited to attend.
Continue to engage with NESO's Data Sharing Infrastructure (DSI) and Primacy Technical Working Groups to ensure that design decisions are consistent with emerging standards and guidance. This work will also inform FF's integration with control room processes, cloud-based data hosting, and operational decision-making.
Wider Policy Alignment

FF supports government and Ofgem policy objectives, including the DESNZ Call for Evidence on Improving Visibility of Distributed Energy Assets and the Clean Power 2030 Action Plan. These recognise the need for DER visibility and optimal use of flexibility. Beta trials will demonstrate how FF's near-real-time visibility and improved situational awareness helps improve coordination and utilisation of distributed assets.

Other regulatory considerations include elements of the Grid Code (e.g., GC0117 Lower BM Threshold, GC0166 Battery State of Charge) and Licence Condition 25 (CIM/LTDS), which mandate static data reporting. FF will operate within these frameworks, while exploring enhancements to support near-real-time visibility and operational decision-making. This will inform discussions with relevant stakeholders and contribute to the development of future standards where appropriate.

Potential considerations for future BAU adoption include:

Evolution of standards for data interoperability between energy system actors. FF will test integration of NESO and DNO datasets, highlighting any gaps or challenges in current standards.
Market architecture and data access mechanisms. Beta will evaluate how FF interacts with flexibility markets, ensuring equitable access for Flexibility Service Providers (FSPs), alignment with primacy rules, and ensure that value is maximised for consumers.
Operational alignment with DER visibility and registration frameworks, informed by NESO's ICCP capabilities and ongoing data-sharing initiatives.
Summary

Overall, FF will be compatible with existing policy, standards, and regulatory requirements, and no derogations or exemptions are

required. The project's governance and work packages actively mitigate risks and identify opportunities, embedding regulatory compliance into design, and create a clear path for seamless transition into BAU.

Consumer impact and engagement

Describe how you will engage with consumers and how the Project addresses their needs and preferences. How will your Project benefit them?
Overview

Fractal Flow (FF) will deliver significant system efficiency gains (\>£689m Net Present Value (NPV) between by 2045) that will lead to lower whole-system costs thereby reducing network charges bringing benefits for all consumer groups, including low-income and vulnerable households (LIV). Benefits will disproportionately accrue to LIV, as system costs typically represent a greater portion of their energy bills.

Direct and Indirect Consumer Benefits

FF will deliver indirect consumer benefits by reducing two of the fastest growing components of consumer bills: system balancing and constraint costs. By improving whole-system efficiency, FF lowers network charges, which automatically pass-through to consumers through Ofgem's RIIO Framework. FF's forecast minimum whole-system net benefits are estimated at £689m NPV by 2045. This includes £344m from reducing Balancing Mechanism constraint actions, lowering Balancing Services Use of System (BSUoS) charges, which are fully recovered from generators and suppliers and ultimately passed to consumers. Beta will focus on quantifying consumer bills cost savings.

Indirectly, FF will benefit consumers by lowering carbon emissions (\>37ktCO2 of carbon savings by 2045) via a reduction in renewable curtailment and out-of-merit use of replacement fossil-fuelled generation.

FF also benefits consumers by:

Revealing new opportunities for domestic and industrial consumers to participate in flexibility markets and benefit from decarbonisation through grid services, including promoting consumer demand-side flexibility.
Encouraging integration of local DERs and flexible assets into DSO and NESO markets by providing confidence in dispatch availability, promoting equitable distribution of flexibility benefits.
Addressing Diverse Consumer Needs

Consumers will not directly use FF, because it is a DSO and NESO operational tool, but all consumer groups, including LIV and those with accessibility needs, will be affected by its outputs. Task 6.2 will directly seek consumer insights through the Market Impact Forums chaired by OakTree, a Flexibility Service Provider (FSP), to understand diverse consumer needs and lower consumer bills. We have already engaged and provisionally invited other FSPs with large domestic customer bases (e.g. Equiwatt) and will seek to invite consumer groups (e.g. Citizens Advice).

Equitably Benefit Distribution

FF will deliver whole-system operational savings that benefit all consumers, with a disproportionately positive impact on LIV households because system costs make up a larger share of their energy bills. FF will also provide policy-relevant insights to help maximise the social value of emerging market access to flexibility, guiding future interventions that deliver equitable outcomes across regions and consumer segments.

Consumer Involvement

Task 6.2 will involve consumer groups and representatives (e.g. Citizens Advice) through Market Impact Forums to ensure FF is designed equitably and its benefits distributed fairly. These forums will enable FF's design to support competitive and liquid markets, capture opportunities, mitigate risks identified by stakeholders, and provide transparency on FF's role in future procurement processes. The project will continue to engage with other community initiatives, including Smart Local Energy Systems (SLES) Forums. Accessibility and equitable outcomes are central to unlocking the potential of DERs and flexible assets, and engagement with local SLES initiatives will help inform fair distribution of flexibility benefits.

Consumer Communication

Beta will communicate with consumers through two main tasks (Tasks 1.2 and 6.2). Task 1.2 covers a range of tailored dissemination activities including quarterly plain-language consumer summaries (including benefits, risks, and impacts),

conference attendance and academic publication, and attending SLES forums and community events. Task 6.2 offers two-way consumer engagement through the Market Impact Forums that will be followed by consumer summaries.

Summary

FF will provide tangible benefits to consumers: lower bills, accelerated net-zero transition, and inclusive economic opportunities. By focusing on whole-system efficiency as the primary lever, FF maximises value for money while supporting sustainable, equitable distribution of benefits to consumers.

Value for money

What are the Beta Phase Project costs and how are they proportionate to the Project delivery?
Funding Requested

Total funding requested is £9,312,560 (£7,947,286 with a 14.7% contribution).

The funding requested per project partner:

NPg: £348,700 (£313,605 with 10% contribution)
NESO: £1,118,192 (£1,006,373 with 10% contribution)
SP ENW: £409,021 (£368,119 with 10% contribution)
SSEN-D: £252,491 (£227,242 with 10% contribution)
UKPN: £107,400 (£96,220 with 10% contribution)
NGED: £305,134 (£274,621 with 10% contribution)
SPEN: £129,824 (£116,842 with 10% contribution)
Frazer-Nash: £5,416,842 (£4,441,785 with 18% contribution)
ElectraLink: £933,150 (£839,854 with 10% contribution)
OakTree: £291,806 (£262,625 with 10% contribution)
Meeting Compulsory Contribution

The total 14.7% exceeds the compulsory requirement, funded by:

DSOs and NESO through their network innovation budget.
Frazer-Nash, ElectraLink, and OakTree through reduction of standard rates.
Subcontractor Costs

There are no subcontractor costs.

Additional Funding

No additional funding from other funding sources has been sought.

This innovation sits outside current DNO and NESO business plans and involves novel, high-risk software and interoperability work. Its cross-organisational scope demands system-wide alignment, making it unsuitable for Business-as-Usual (BAU) funding or alternative innovation mechanisms (e.g. NIA). SIF remains the only viable route. Once proven through Beta, FF can progress toward BAU deployment through the most appropriate mechanisms available to maximise value for money for consumers and networks.

Pre-Existing Assets/Facilities

Beta builds directly on the Alpha proof-of-concept and leverages DNO Open Data Portals and NESO's data infrastructure. Beta will also build upon ICCP links to transfer novel operational dataset for FF and will use forecasts from Artificial Forecasting.

Legacy or Decommissioning Assets

N/A

Existing Markets (Criterion 4)

FF enhances competition by enabling increased confidence in Distributed Energy Resource (DER) and flexibility procurement. FF will enable greater system efficiency, and Beta has a dedicated Market Impacts stream in WP6: Commercialisation Strategy,

with planned consultation with a range of industry stakeholders and consumer representatives to ensure FF promotes market access, liquidity, and transparency.

Value for Money (Criterion 7)

Rates:

Partner costs represent strong value for money. NESO and DSO resources are costed at Ofgem-approved innovation rates, while Frazer-Nash, ElectraLink, and OakTree have each applied contributions of 18%, 10%, 10% respectively, to rates that they regularly use for this type of work within this industry, including during multiple prior SIF projects. In recognition of the larger proportion of funding that Frazer-Nash are receiving, they have increased their contribution above the minimum level required to assure value for money to consumers and networks.

Beta is value for money as it will deliver:

FF as a system-wide operational tool: Demonstrates technical viability of high-risk elements, lowering implementation risk for DSOs/NESO, supporting cost-effective BAU deployment and maximising consumer value.
Value from operational data sharing: Quantifies the value in sharing operational data via ICCP in a clear set of use cases.
Primacy rules testing: Controlled environment for all networks to assess operational impacts of primacy rules.
Behavioural insights: Evaluates control room readiness for FF, identifies barriers, and mitigates risk of adoption.
Integration and value from other innovations: Builds on and enables value from innovation projects such as Artificial Forecasting, DSI, Volta, and REVEAL.
End-of-project

FF Beta solution will be delivered to networks. Post-Beta work will seek to integrate the solution with live operational data streams to support operational decision making.

Associated Innovation Projects

- (•) Yes (please remember to upload all required documentation)
- ( ) No (please upload your approved ANIP form as an appendix)

Supporting documents

File Upload

SIF Beta Round 5 Project Registration 2026-08-10 11_35 - 99.3 KB

Documents uploaded where applicable?

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