

SCOTTISH HYDRO ELECTRIC POWER DISTRIBUTION PLC
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Date: 07 October 2024

Dear Scottish Hydro Electric Power Distribution PLC,

SIF Project Direction ref: SHE/SYSMET/SIDNADSPS/Rd3 Alpha

Scottish Hydro Electric Power Distribution PLC submitted SYSMET - System Strength Measurement and Evaluation (the Project) to be considered for funding through the Alpha Phase of round 3 of the Strategic Innovation Fund (SIF). As explained in greater detail below, this Project previously received SIF Funding and completed a Discovery Phase for round 3 of the SIF. In our¹ SIF Funding Decision issued on 07 October 2024, we selected the Project² for conditional funding for the round 3 Alpha Phase and as a result we are now issuing this SIF Project Direction to implement that decision.

Scottish Hydro Electric Power Distribution PLC must comply with the conditions contained in this SIF Project Direction as a condition of the Project receiving funding through the SIF. These conditions can be found in the Schedule to this document.

Progression through SIF Phases

The SIF consists of a multi-phase approach for Projects in order to mitigate the risk associated with innovations. The Discovery Phase focuses on feasibility, the Alpha Phase on experimental development, and the Beta Phase on deployment and demonstration.

The Project previously received SIF Funding for the round 3 Discovery Phase³ and submitted an Application for the Project to be considered for SIF Funding for the round 3

¹ The terms 'we', 'us', 'our' refer to the Gas and Electricity Markets Authority. Ofgem is the office of the Authority.

² Unless otherwise specified, defined terms in this SIF Project Direction have the meaning given to them in Appendix 1 of the SIF Governance Document.

³ The Project Directions for round 3 of the Discovery Phase are available at: <https://www.ofgem.gov.uk/publications/strategic-innovation-fund-round-3-discovery-projects-approved-funding>

Alpha Phase of the SIF. As stated above, the Project has been selected by Ofgem to receive SIF Funding for the Alpha Phase of round 3.

Role of UK Research & Innovation (UKRI)

As per Chapter 1 of the SIF Governance Document⁴ the role of UKRI is to deliver the SIF in line with the SIF Governance Document - administering the funding programme, monitoring the delivery of Projects, collating data from Projects on benefits, making recommendations to Ofgem on operational matters, supporting third-party innovators and, where possible, successful Projects to become 'business as usual' activities. To support the success of the Projects and the SIF programme, we expect that the Funding Party and Project Partners collaborate with Ofgem and UKRI.

SIF Project Direction

Paragraph 5.14 of the SIF Governance Document states that a SIF Project Direction will:

- Set out the Project-specific conditions, to which the Funding Party is committing in accepting SIF Funding.⁵
- Require the Funding Party to undertake the Project in accordance with the commitments made in the Application. Where appropriate, the SIF Project Direction may therefore include extracts from the Application or refer to specific sections of the SIF Application.⁶
- Where applicable, set out conditions (such as Project stage gates) linked to milestones and deliverables, which Projects must meet.⁷
- Set out the SIF Approved Amount for the Project, that will form part of the calculation contained in the SIF Funding Direction issued by the Authority under chapter 7 of the SIF Governance Document.⁸
- Set out the Project budget that the Funding Party must report against and how variations in the Project budget will be reported.⁹
- Where applicable, set out special information sharing requirements applicable to the Project.¹⁰
- Set out the mechanism for the Funding Party receiving the SIF Approved Amount as set out in the SIF Funding Direction.¹¹

⁴ <https://www.ofgem.gov.uk/decision/updated-sif-governance-document>

⁵ 'Project specific conditions' detailed under Point 3 – 'Condition President' of this SIF Project Direction.

⁶ 'Project specific conditions' detailed under Point 3 – 'Condition President' of this SIF Project Direction.

⁷ 'Project specific conditions' detailed under Point 3 – 'Condition President' of this SIF Project Direction.

⁸ 'SIF Funding Amount' detailed under Point 5 – 'Condition President' of this SIF Project Direction.

⁹ Annex 1 – Project Budget.

¹⁰ 'Project specific conditions' detailed under Point 3 – 'Condition President' of this SIF Project Direction.

¹¹ 'SIF Funding Amount' detailed under Point 5 – 'Condition President' of this SIF Project Direction.

All SIF Project Direction requirements are detailed in the Schedule to this SIF Project Direction.

Decision

Provided the Funding Party complies with the SIF Governance Document and with the Schedule to this SIF Project Direction, the Project is deemed to be an Eligible SIF Project¹².

This SIF Project Direction constitutes notice pursuant to section 49A (Reasons for decisions) of the Electricity Act 1989.

Marzia Zafar

Deputy Director, Decentralisation & Digitalisation

For and on behalf of the Authority

¹² The meaning 'Eligible SIF Project' is described in Chapter 2 of the SIF Governance Document.

Schedule to SIF Project Direction

1. PROJECT DETAILS

SIF Project Direction reference: SHE/SYSMET/SIDNADSPS/Rd3 Alpha

Application number: 10129395

Project title: SYSMET - SYstem Strength Measurement and EvaluaTion

Innovation Challenge/Project Phase: Novel Approaches to Deliver a Secure Power System / Alpha Phase round 3

Project start date: 07 October 2024

Project end date: 30 May 2025

SIF Approved Amount for SIF Funding: £478,612

2. PREAMBLE

This SIF Project Direction is issued by the Gas and Electricity Markets Authority (the "Authority") to Scottish Hydro Electric Power Distribution PLC (the "Funding Party") pursuant to the SIF Governance Document issued pursuant to Special Condition 9.9 of the Electricity Distribution Licence. It sets out the conditions to be complied with in relation to SYSMET - SYstem Strength Measurement and EvaluaTion (the "Project") as a condition of it being funded under the SIF Funding Mechanism.¹³

Unless otherwise specified, defined terms in this SIF Project Direction have the meaning given to them in the Licence or Appendix 1 of the SIF Governance Document.

References to specific sections of the Funding Party's Application in this SIF Project Direction are, for ease of reference, made by referring to the section number in the Funding Party's Application.

3. PROJECT SPECIFIC CONDITIONS

In accepting funding for the Project, the Funding Party is subject to the following Project-specific condition(s):

Condition 1

The Funding Party must not spend any SIF Funding until contracts are signed with the Project Partners named in Table 1 for the purpose of completing the Project.

¹³ The SIF Funding Return Mechanism is defined in the SIF Governance Document.

Table 1. Project Partners

IMPERIAL COLLEGE LONDON
NATIONAL GRID ELECTRICITY TRANSMISSION PLC
NPL MANAGEMENT LIMITED
SSE RENEWABLES DEVELOPMENTS (UK) LIMITED
UK POWER NETWORKS (OPERATIONS) LIMITED

Condition 2

The Funding Party must report on the financial contributions made to the Project as set out in its Application. Any financial contributions made over and above that stated in its Application should also be reported and included within the Project costs template.

Condition 3

The Funding Party must make reasonable endeavours to participate in all meetings related to the Project that they are invited to by Ofgem, UKRI and DESNZ during the Alpha Phase.

Condition 4

Alpha phase will last for a period of 8 months from the date the Project Direction is issued, the Project will be allowed a flexible start date within the 8 month period. The Project must provide the monitoring officer with the start date and must complete within 6 months of the start date and cannot be completed after the 8 month period has ended.

4. COMPLIANCE

The Funding Party must comply with Special Condition 9.9 of the Electricity Distribution Licence, the SIF Governance Document and with this SIF Project Direction.

5. SIF APPROVED AMOUNT

The SIF Approved amount of £478,612 (as detailed under Section 1: Project details of this Project Direction) will be recovered by National Grid Electricity System Operator from GB customers and transferred to the Funding Party. The Funding Party is responsible for notifying National Grid Electricity System Operator of the bank account details to which transfers must be made, in addition to completing Annex 2 of this SIF Project Direction. If a Funding Party is required to return funding to National Grid Electricity System Operator, the reverse applies. The Funding Party must provide bank account details to National Grid Electricity System Operator within two weeks of accepting this SIF Project Direction.

6. PROJECT BUDGET

The Project Budget is set out in Annex 1 of this SIF Project Direction.

The Funding Party must report on expenditure against each line under the category total in the Project Budget and explain any projected variance against each line as part of its detailed report which will be provided, in accordance with Chapter 7 of the SIF Governance Document. The Funding Party must report variations in the Project budget as outlined in Chapter 6 of the SIF Governance Document.

7. PROJECT IMPLEMENTATION

The Funding Party must undertake the Project in accordance with the commitments it has made in the Application and with the conditions of this SIF Project Direction. These include (but are not limited to) the following:

- (i) undertake the Project in accordance with its Application,
- (ii) complete the Project on or before the Project completion date as detailed under section 1 of the schedule of this SIF Project Direction, and
- (iii) disseminate the learning from the Project at least to the level described in chapter 3 of the SIF Governance Document. Dissemination of learning must be carried out whether the Project was concluded successfully or otherwise.

8. REPORTING

Ofgem and UKRI may issue guidance (and amend it from time to time) about the structure and content of the Project reporting required by Chapter 6 of the SIF Governance Document. The Funding Party must follow this guidance in preparing the reports.

As set out in chapter 6 of the SIF Governance Document, the Funding Party may be required to submit an end of Phase report to the UKRI monitoring officer for the round 3 Alpha Phase. An end of Phase report is required for the round 3 Alpha Phase if the Project is not planning on submitting an Application to the round 3 Beta Phase and, if the Funding Party submits an Application for the Project for the round 3 Beta Phase but is not successful. Within this report, the Funding Party must submit information related to questions on Project delivery as detailed in chapter 6, table 6 of the SIF Governance Document.

9. MONITORING

The Funding Party must comply with any reasonable request for information by its monitoring officer at UKRI and related deadlines. Ofgem, with the support of UKRI, will together monitor Project delivery, impacts and benefits. Throughout the term of the Project, progress is monitored by UKRI through a monitoring officer. The monitoring officer is the first point of contact for official notifications, queries and correspondence with UKRI and the Authority, unless otherwise required by this SIF Project Direction.

As detailed in Chapter 6 of the SIF Governance Document, meetings with the monitoring officer will take place at regular intervals, as advised by Ofgem or the monitoring officer during the delivery of the Project, and at the end of each Project Phase.

10. EVALUATION

The Funding Party has acknowledged when it submitted its Application for this Project, that reporting information and data gathered during the Project's timescales (as detailed in Section 1 of this SIF Project Direction) will be used to evaluate Project performance. In addition, the Funding Party may be required to provide requested information outside of the Project timescales and, in particular, for the period from the Project end date to the end of the SIF Programme. Further data and reporting information may be requested (frequency and method based on requirement) outside of standard monitoring and reporting requirements as deemed necessary. Further data and information requirements must be complied with by the Funding Party and Project Partners.

11. DATA SHARING

As set out in Chapter 3 of the SIF Governance Document, the Funding Party must follow Data Best Practice Guidance with regards to all data gathered or created in the course of a Project. We expect the Funding Party to document any reasons, such as commercial sensitivities, for desensitising data. As defined by, and in accordance with, Data Best Practice Guidance, Funding Parties must have a data triage process. Where multiple Project Partners are collaborating on a Project, the consortium must adopt a consistent Open Triage Process for the data related to the Project. Ofgem may require that Project information and data is also shared with other specified parties, such as parties working on complementary innovation funding programmes (subject to redaction of sensitive data).

12. CYBER SECURITY

It is the responsibility of the Funding Party and all Project Partners to implement and maintain appropriate security measures to protect personal data in accordance with The GDPR (General Data Protection Regulation)¹⁴ and DPA (Data Protection Act) 2018¹⁵. Protection of computer systems from unauthorised access or being otherwise damaged or made inaccessible must be in place alongside effective working practices. These must be maintained in line with the Funding Party's IT Management Strategies and policies.

13. PROJECT MILESTONES

The Funding Party must provide an outline in its end of Project Phase meeting with its UKRI monitoring officer that verifies the Project milestones have been achieved or explains why they have not.

Project milestones are outlined below in Table 3, based upon details contained within Question 7 and Appendix Question 9 in the Funding Party's.

¹⁴ https://ec.europa.eu/info/law/law-topic/data-protection/data-protection-eu_en

¹⁵ <https://www.legislation.gov.uk/ukpga/2018/12/contents/enacted>

Table 3. Project milestone¹⁶

Reference	Project milestone	Deadline	Overall objectives and key tasks	SIF Funding Request
Milestone 1	Project Management	30 May 2025	<p>Overall objective:</p> <ul style="list-style-type: none"> The successful delivery of the SYSMET Alpha project to budget, time, and quality, in compliance with the SIF governing documentation. Dissemination of the project to the wider audience. <p>Key tasks:</p> <ol style="list-style-type: none"> Maintain and track project schedule, action register, deliverables & actual expenditure against forecast. Monitor and manage the project risk register with regular reviews to track & maintain their mitigation. Organise regular (at least fortnightly) review meetings with all partners. Presentation of SYSMET as required by Ofgem/UKRI. Compilation of a project poster for dissemination at innovation and energy-related events. 	£55,303

¹⁶ As outlined in in the Application or Project Plan appendix.

			6. * Produce a conclusion report for the UKRI monitoring officer and any other specific documentation required or requested.	
Milestone 2	Specifications for System Strength Monitoring Hardware	30 May 2025	<p>Overall objective:</p> <ul style="list-style-type: none"> Identify and investigate the requirements and availability of equipment to inject signals into the grid (injection source) for frequency-dependent impedance identification. Define, identify and assess a system to measure the grid response to the injection. <p>Key tasks:</p> <ol style="list-style-type: none"> Building on networks' user requirements from the Discovery Phase, identify the use cases of system strength measurement for renewable generators such as model validation and system strength improvement. Specify requirements for injection source (rating, control of amplitude, frequency and timing). Identify and assess candidate injection-source equipment and designs. Assess how low/medium voltage injection sources can be scaled to high voltage levels. Investigate whether any existing GB grid assets can be used/adapted as injection sources. 	£82,905

			<p>6. Identify operational constraints and requirements for connection of injection devices to the HV network.</p> <p>7. Report on suitable injectors for the beta field trial, where to install and testing requirements.</p> <p>8. Define measurement system specifications (bandwidth, resolution, accuracy, data rates).</p> <p>9. Identify and assess CTs/VTs with suitable frequency response and accuracy class.</p> <p>10. Propose methods to characterise the CTs and VTs amplitude and phase frequency response.</p> <p>11. Identify and assess measurement/sampling equipment such as PMUs, fault recorders, PQ analysers.</p> <p>12. * Report on suitable measurement equipment, measurement procedures and uncertainties.</p>	
Milestone 3	Specifications for System Strength Monitoring Software	30 May 2025	<p>Overall objective:</p> <ul style="list-style-type: none"> To develop and specify a method, i.e., algorithm, and associated software requirements, to measure frequency-dependent grid impedance using an injection source. To determine practical system strength metrics and specify algorithms to calculate the metrics from the frequency-dependent impedance information. To specify how the system strength metrics will be communicated and used in BAU operations. 	£132,994

			<p>Key tasks:</p> <ol style="list-style-type: none"> 1. Specify methods and software requirements to measure impedance over the frequency range. 2. Determine prototype implementations of algorithms for calculation of impedance matrix in ABC frame and compare its accuracy with the DQ sequence frame at each frequency with suitable data smoothing. 3. Determine implementations for transformation of impedance matrix to system strength metrics. 4. Determine implementations for calculation of impedance and system-strength metrics relevant to DNOs, e.g. considering AEMO's methodology.* Determine recommendations for data protocol and communication for BAU network operations. 5. * Determine recommendations for implementation of Machine Learning (ML) methods to impedance identification considering the statistical properties of modelled and observed data and results of applying ML techniques to test data. 	
Milestone 4	Simulation Testing and Validation	30 May 2025	<p>Overall objective:</p> <ul style="list-style-type: none"> • To use system models and simulations to determine how and where to inject a signal into the network to measure frequency dependent impedance. 	£153,746

			<ul style="list-style-type: none"> • To use models to understand the measurement error sensitivities and optimise injection. • To perform a trial measurement using a test rig energized by waveform data generated from the models, with the aim of testing and validating the system prior to Beta implementation and deployment. <p>Key tasks:</p> <ol style="list-style-type: none"> 1. Use existing network models with the required bandwidth to generate the V&I waveform response to simulated excitation injection. 2. Simulate different injection levels, signals, durations and repetitions rates. 3. Simulate injection and different network locations and determine spatial sensitivity. 4. Determine measurement sensitivity to real grid conditions, including background noise, harmonics, unbalance and off-nominal frequency. 5. Design and build a laboratory test rig to generate the WP3 simulated V&I injection response waveforms, as analogue signals, to be measured using a waveform measurement unit identified in WP2. 	
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			<p>6. Use the test rig results to determine the sensitivity of the WP3 algorithms to real measurement noise.</p> <p>7. Assess possible accuracy of the outcome system strength metrics for BAU-use.</p> <p>8. Assessment of requirements on data accessibility in operational environments in order to measure frequency dependent impedance.</p> <p>9. * Validation of the injection method and impedance computation algorithm in a large-scale electromagnetic transient (EMT) simulation platform.</p>	
Milestone 5	Stakeholder Engagement and Governance Processes	30 May 2025	<p>Overall objective:</p> <ul style="list-style-type: none"> Engagement with Technology Providers to further explore their capabilities and willingness to collaborate. This builds upon the activities of the Discovery Phase. Further engagement with key projects in this space such as ESO's Strength to Connect and DOME. Devise an initial framework for data governance and running a trial on the network (any such trial would occur in Beta). <p>Key tasks:</p> <ol style="list-style-type: none"> Revisit the Technology Providers identified in Discovery and undertake a fresh search to produce an up-to-date list (NPL). 	£27,559

			<ol style="list-style-type: none"> 2. Host a SYSMET webinar to share project results to date with Technology Providers, the vision moving forward invitation to have one-to-one discussions about collaboration opportunities (All Partners). 3. Hold follow-up meetings with similar projects identified in Discovery that are deemed to offer mutual benefits. 4. Capture the benefits of working with these projects and how working together could be achieved in practice. 5. Intellectual Property search and preliminary assessment of products and inventions considered similar to SYSMET. 6. * Hold network workshop(s) to discuss how a trial could be conducted, the governance processes required, and any other matters relating to compliance, Intellectual Property, and safety. 	
Milestone 6	Cost-Benefit Analysis and Beta Preparation	30 May 2025	<p>Overall objective:</p> <p>* Establish a Network Working Group to discuss and develop the various aspects of commercialisation.</p> <ul style="list-style-type: none"> • A cost appraisal of the technical solution and a trial on the network. • Develop a SYSMET roadmap to implementation. • Maturing of the CBA through the phase based on the Network Working Group's activities such that there is greater confidence in the data by the project end. 	£26,105

			<ul style="list-style-type: none"> • An updated version of the CBA that was submitted as part of the Alpha Application. • Initial scoping of the Beta Phase by project partners. <p>Key tasks:</p> <ol style="list-style-type: none"> 1. Establish a Network Working Group and Terms of Reference. 2. Network Working Group meetings to; (i) Develop an approach to estimate the cost of a technical solution and trial on the network, (ii) update the current CBA, identifying where refinement is possible, (iii) discuss the route to commercialisation of SYSMET. 3. Validation of updated CBA by key stakeholders in SSEN-T, UKPN and NGET. 4. A cost analysis of the solution and a trial on the network, noting that any trial would happen in the Beta Phase. 5. Compilation of a SYSMET roadmap running from Alpha through to implementation. 6. * Lead the planning of the Beta phase & secure agreement on whether to proceed with the application. 	
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14. USE OF LOGO

The Funding Party and the Project Partners, External Funders and Project Supporters or subcontractors¹⁷ must not use the Innovate UK/UKRI and/or Ofgem logo for purposes associated with the Project in any circumstances.

As an alternative for use of both Ofgem and UKRI logos, all external Project communications must include the following standard form of wording:

- (i) "this project is funded by network users and consumers under the Strategic Innovation Fund, an Ofgem programme managed in partnership with UKRI."

For additional guidance, refer to the communications and media guidelines for competition winners, detailed as part of your delivery pack. These guidelines are designed to help with some suggestions and encourage you to take a proactive approach to communicating about your Project.

15. SHARING OF LESSONS LEARNED

The Funding Party is required to ensure that the sharing of lessons learned and the facilitation of knowledge transfer is conducted as effectively as possible, to ensure that all parties, and therefore all consumers including future consumers, can benefit from Projects.

As contained within Chapter 3 of the SIF Governance Document, we require the Funding Party to work collaboratively to maintain the ENA Smarter Networks Portal so that all reporting and dissemination of learnings on Projects (as required by chapter 6 of the SIF Governance Document) is available via the ENA Smarter Networks Portal.

16. COLLABORATION

The Funding Party must collaborate with third-party innovators as Project Partners, as well as work closely with other parties in the energy supply chain, as set out in Chapter 3 of the SIF Governance Document.

The Funding Party must collaborate with other parties and with UKRI to organise an annual conference in a format appropriate to enabling the building of consortiums and disseminating learning widely. The conference may be a single event for gas and electricity, or more than one event, as appropriate.

¹⁷ As detailed in the Application.

17. AMENDMENT OR REVOCATION

As set out in Chapter 7 of the SIF Governance Document, this SIF Project Direction may be amended or revoked under the following circumstances:

- (i) if the Funding Party considers that there has been a material change in circumstance that requires a change to the SIF Project Direction, and the Authority agrees; or
- (ii) to reflect amendments made to the Licence.

18. HALTING OF PROJECTS

This SIF Project Direction is subject to the provisions contained in Chapter 7 of the SIF Governance Document relating to the halting of Projects. By extension, this SIF Project Direction is subject to any decision by the Authority to halt the Project to which this SIF Project Direction relates and to any subsequent relevant SIF Funding Direction issued by the Authority pursuant to Special Condition 9.9 of the Electricity Distribution Licence.

Further to the requirements in Chapter 7 of the SIF Governance Document, in the event the Authority decides to halt the Project, to which this SIF Project Direction relates, the Authority may issue a statement to the Funding Party clarifying the effect of that halting decision as regards to the status and legal force of the conditions contained in this SIF Project Direction.

NOW THEREFORE:

In accordance with the SIF Governance Document issued pursuant to Special Condition 9.9 of the Electricity Distribution Licence of the Licence the Authority hereby issues this SIF Project Direction to the Funding Party in relation to the Project.

This constitutes notice of reasons for the Authority's decision pursuant to section 49A (Reasons for decisions) of the Electricity Act 1989.

Failure to comply with the conditions of this SIF Project Direction means that Ofgem may treat all or part of the SIF Approved Amount received by the Funding Party as SIF Disallowed Expenditure.

ANNEX 1: PROJECT BUDGET

Cost Category	Total Project costs (£)
Labour	£304,321
Materials	£5,831
Subcontracting	£-
Travel and subsistence	£9,403
Other costs	£213,146
Total	£532,701

Project Partner	Total project costs (£)	Project contribution (£)	Total SIF Funding requested (£)	Project contribution (%)
SCOTTISH HYDRO ELECTRIC TRANSMISSION PLC	£57,158	£28,579	£28,579	
Imperial College London	£163,534	£16,668	£146,866	
National Grid Electricity Transmission PLC	£44,884	£4,489	£40,395	
NPL MANAGEMENT LIMITED	£223,600	£-	£223,600	
SSE RENEWABLES DEVELOPMENTS (UK) LIMITED	£10,150	£1,015	£9,135	
UK POWER NETWORKS (OPERATIONS) LIMITED	£33,375	£3,338	£30,037	
Total	£532,701	£54,089	£478,612	11%

ANNEX 2 TO SCHEDULE: TEMPLATE OF BANK ACCOUNT DETAILS TO BE PROVIDED TO EITHER NGT (BOX.GSOSETTLEMENTS@NATIONALGRID.COM) OR NG ESO (revenue.invoice@nationalgrideso.com)

Company name:

Primary Contact Details (only one contact permitted)

First Name:

Last Name:

Email address:

Mobile phone number:

Work phone number:

Address details

Address name:

Street address:

City:

State / region:

Post code:

PO box: (if applicable)

PO box post code: (if applicable)

Banking details

These should be evidenced in non-editable format. The evidence provided must show company name and bank details and it should be dated within the last 6 months.

Any of the below documents will suffice:

- Bank statement (scanned document)
- Void cheque
- Paying in slip
- Screenshot of online banking (showing a logged in account with bank account and sort code, with browser visible)