Department for
Business, Energy
& Industrial Strategy

Flexibility Innovation Programme – Lot 2

Title:	**Flexibility Innovation Programme:** Laboratory testing and demonstration of interoperable DSR applications in settings indicative of the real world
Tender Reference Number:	5532/12/2021
Deadline for Responses:	7th March 2022 17:00

3.1.1 Evaluation Criteria

The following evaluation criteria will be used to separately evaluate both Lot 1 and Lot 2.

Criterion	Description	Reference	Weighting
01: Understanding the requirements	**Understanding of the competition requirements and description of proposed solution**	Section 2.3 Requirements	10%

The Consortium led by Eurofins Digital Testing brings together industry leading organisations and a unique state-of-the-art facility offering a platform to accelerate the deployment and integration of energy networks and technologies. Previous engagements aligned to the requirements of this bid by members of the Consortium with BEIS, along with ongoing global work streams in the field, will demonstrate to BEIS a solid understanding of their requirements and project deliverables below:

The widespread use of demand side response (DSR) is a fundamental part of how we will evolve the UK energy system to decarbonize and be used as a foundation of meeting our net zero targets. The formalisation of DSR system components in UK national technical standards to allow for secure and widespread interoperability of electrical appliance load control is a necessary and central part of this. The attributes, functionalities, performance requirements of ESAs and corresponding DSRSP platforms have recently been defined through significant work by industry stakeholders, including some members of this Consortium, in PAS 1878/79 and, in parallel, the GB Smart Metering SAPC technical specification.

Use of ESAs and DSR control for electrical network and market services is still modest compared to the scale required to meet net zero 2050. With foundational standards in place, industry must now develop compliant devices and systems that meet the core principles and objectives agreed. Our proposed testing solution provides a comprehensive lab environment to assess device and system level conformance and performance in a comprehensively realistic test environment.

Edge Testing Solutions Ltd part of Eurofins Digital Testing and Cyber (EDT) (referred to from this point onwards as EDT). In EDTs report for BEIS "Conformance Process Outline Energy Smart Appliances operating under PAS 1878" Document Reference "EDT_BEIS_001" Version 1.0, 31st March 2021, we outlined a compliance approach to PAS 1878, which is easily extended to include the elements of PAS 1879 and the GB Smart Metering SAPC technical specification, as applicable to the requirements defined in R1-R4 of the ITT. Our recommendations included elements focussing on communications and messaging conformance, functional conformance to DSR use case testing, performance, and security testing, which we would implement under this project.

We recognise the need of this project to deliver for industry a workable conformance and performance testing program, and simultaneously demonstrate how DSR services can be delivered using the three different technical frameworks; PAS 1878/1879, Annex D and GB Smart Metering and SAPC specification. We will ensure the Core Principles set out in the ITT are assured, within the scope of this project, and that BEIS requirements

and objectives for the project, including recognising the need to adapt to changes throughout any project of this scale, are met.

Our approach (detailed below) will be to ensure that the final deliverables of the project address the key outcomes for BEIS. We also recognise that BEIS is launching this project, and its companion projects under the overall NZIP, to achieve broader goals for industry adoption, consumer adoption and ultimately the net zero by 2050 goal set by government. We well understand the importance of ensuring interoperable, conformant devices that support the use cases defined in PAS 1878/1879 and are tested in both lab and real-world scenarios are validated and demonstrated to industry. We recognise the challenges in achieving adoption of new technology across "horizontal" markets where open standards are defined to provide interoperability while also fostering competition and innovation among a range of manufacturers as our experience in several similar initiatives and other domains has always been focussed. It is our experience in analysis of technical specifications and derivation, appropriate test plans and test procedures, and then software engineering capabilities to augment these plans with tools and automation components to facilitate repeatable, robust testing procedures that will ensure the project's success.

It is our view that, further to the establishment of the conformance and performance testing plans, lab and real-world testing and demonstrations completed under this project that the Consortium and BEIS will need to look forwards to the next steps that follow. As such, it is hoped and intended those elements of this project could form components – both as pre-test steps ahead of ongoing lab and real-world testing services or of an operational conformance regime. We recommend such a scheme is backed by a consumer facing trademark logo, thereby supporting the wider goal of accelerating the adoption of DSR technology to meet the government net zero by 2050 goal.

The **Power Networks Demonstration Centre (PNDC)** is an internationally recognised smart grid test and demonstration facility, with significant capabilities including high-voltage and low-voltage test networks that can operate in parallel and islanded from the national grid.

In addition to physical test assets, the PNDC hosts extensive real-time modelling and simulation infrastructure that permits testing of future energy scenarios and edge cases. Combining physical and real-time emulated assets using a 540kVA Power Hardware in the Loop (PHIL) test setup is a unique offering in the UK and allows this Consortium to realistically test DSR solutions in wide varying energy market and electricity network scenarios. This is particularly valuable for ESA performance evaluation and particularly for the assessment of grid-stability principles. We propose to enhance the existing facility with additional and dedicated test capabilities through the creation of a "DSR Lab" for the duration of the Flexibility Innovation Programme work. This approach ensures dedicated lab access for industry for the duration of the testing programme, giving optimum flexibility for what is acknowledged as a challenging test programme schedule. Furthermore, it enables a legacy test facility to continue beyond this programme to meet the continued research, test and demonstration demands of the DSR industry, if required.

The "DSR Lab" will complement existing PNDC test capabilities by creating a dedicated space for projects and companies to test DSR solutions. A number of test bays for each ESA device type will be created provisioned with the necessary electrical, communication, and environmental facilities to test ESAs in lab and real-world like environments. The lab will host Consortium partner and project specific equipment including smart metering

infrastructure, protocol test harnesses, system and user interfaces, and ESA devices under test. This approach ensures all testing requirements outlined in the tender are comprehensively met. The use of significant existing infrastructure ensures value for money and provides us confidence in the ability to meet the stated timescales.

Our staff, particularly project lead [redacted], are familiar with DSR projects and more details of their relevant experience and knowledge of the technology landscape in which DSR operates are detailed below.

ScottishPower is contributing its expertise and knowledge about the overall UK energy technical and commercial landscape to inform and help direct the activities of the other partners to achieve industry-relevant outcomes, aligned with BEIS project objectives. Its broad group reach is ideally suited to provide the wider context, under which the DSR systems to be evaluated in this project, will operate, and therefore ensure industry relevant outcomes and context to demonstrations and reports.

As well as industry expertise we will also provide specific experience and resources to address the interaction and test requirements pertaining to the GB Smart Metering SAPC requirements, through its [redacted] MAP Test Facility (more details below). We will also be able to provide input to ensure the Lot 2 settings indicative of the real world are appropriate for the results to be meaningful to industry.

QualityLogic (QL) is the official OpenADR Technology Partner and is responsible for updating and supporting the official OpenADR Test Harness. We serve on technical and other OpenADR standard committees and have developed technical training for teams looking to implement OpenADR projects. We have worked with utilities and vendors as consultants advising on use case and system requirements.

The company has worked on numerous consulting projects with utilities to develop application specific OpenADR profiles and schema that are used by both VTN and VEN vendors to insure interoperability. Customers include Sacramento Utility District, Southern California Edison, Salt River Project (Arizona), a subsidiary of Hydro-Quebec and others. A recent project for a major utility included developing detailed use case descriptions and XML schema for OpenADR communications for those use cases. The goal was to provide the DERMS vendor and VEN vendors with detailed specifications and code for implementing the use cases to enhance interoperability. We consulted with a major utility on successfully upgrading their DR product test lab to validate OpenADR claims by vendors. Our role included training the lab team, bringing up an OpenADR test VTN, guiding development of test plans and advising on the execution of testing.

Technical Lead [redacted] advised the British Standards Institute (as a consultant to the OpenADR Alliance) in the specification of OpenADR in PAS 1878. [redacted] recommended the specific XML Code Examples in Annex G of the standard.

Department for
Business, Energy
& Industrial Strategy

Criterion	Description	Reference	Weighting	
02: Project Team – skills, expertise, and facilities	**Clear demonstration of the appropriate team, skills, and facilities.**		Section 2.7 Skills, expertise and facilities	25%

The team and facilities that make up the Consortium led by EDT can apply a wide range of testing, research, academic and industry knowledge to this project alongside the world-class laboratory facilities founded by the University of Strathclyde, ScottishPower Energy Networks and SSE Power Distribution. The team offers BEIS a wholly rounded approach to the requirements and deliverables supported by rigorous processes and procedures. CVs for the key project members identified in the following sections have been supplied separately.

Consortium Project Management and Governance

Overall project governance across the Consortium members will be provided by EDT, with the project board comprising the following 3 key EDT members of staff, plus the BEIS project manager and leads from each of the other Consortium members (shown on the organogram overleaf):

EDT Technical Team

EDT has experience of building conformance regimes for consumer products used within complex systems, comprising hardware, firmware, cloud-

based software and interfaces with other systems, across a wide range of technology domains. We have developed and implemented test regimes and conformance programs for a range of standards development organisations, such as the Consumer Technology Association and Digital UK.

As an OpenADR test laboratory and as the operator of several consumer device logo schemes - both conformance and security focussed - we are familiar with the needs of manufacturing for a robust repeatable and efficient but effective certification process. Our expertise within the early phases of validating new technology and specifications, and the challenges of supporting the first-to-market early implementations, requiring close liaison between stakeholders across the domain and with product development teams, will be essential to the success of this project. Our experience in development of test tools and in validating test materials within the constraints of early phase technology roll-out and concurrent product development, will also guide the activities of all Consortium members during Lot 2 activities.

We are also the only European OpenADR Authorised Certification Lab, and as such has staff with expertise and knowledge of OpenADR conformance testing.

The key EDT technical team members for this project are:

We will provide software engineering and support for any software tools to be developed for this project, and test engineers to deliver testing projects on site at the PNDC facilities.

PNDC Team

The PNDC team worked previously on the Agile Streets project, involving £1.5m of BEIS funding to demonstrate how the UK SMETS2 smart metering system can be used to enable load control from public EV infrastructure, and enable EV smart charging use cases for public on-street infrastructure. The project was led by Samsung Research UK and included partners Connected Kerb, Octopus Energy, SMS Plc. and the Energy Savings Trust (EST) together with PNDC to develop a purpose-built optimisation platform to control on-street EV charging infrastructure.

A new on-street control cabinet housing SMETS2 HCALCS devices supplied power and load control signals via underground controllers to the charge points. This project demonstrated use of the smart metering system and a new business model to manage EV charging, incentivising EV drivers to allow a flexible charging schedule.

The team lead the test and demonstration of the developed solution in its low voltage test lab. Our low voltage network was configured to replicate an on-street EV charging deployment and used to assess the electrical and communications performance of the developed system. This testing de-risked the technology deployment for the subsequent field trial and provided valuable technical assessment and feedback to the Consortium's technology partners. We created a dedicated lab-to-lab link with three different smart meter labs (Itron, Kaifa, and Octopus Energy) to permit testing of system components distributed across the UK while taking advantage of the power network facilities at PNDC. Our team provided expertise in DNO/DSO use case requirements into the system design exercise.

Department for
Business, Energy
& Industrial Strategy

[redacted]

ScottishPower Team

ScottishPower provides a vital industry perspective to the project team, helping to understand and overcome the real-world challenges in delivering DSR at scale in the UK utilities market and meeting the Government's net-zero target by 2050. In addition, ScottishPower has facilities and experience in testing products within the UK Smart Metering architecture.

[redacted]

[redacted]

QualityLogic Team (QL)

QL is the official OpenADR Technology Partner and is responsible for updating and supporting the official OpenADR Test Harness. We serve on technical and other OpenADR standard committees and have developed technical training for teams looking to implement OpenADR projects. The company has worked on numerous consulting projects with utilities to develop application specific OpenADR profiles and schema that are used by both VTN and VEN vendors to insure interoperability. QL provided guidance to BEIS on behalf of the OpenADR Alliance regarding the development of the PAS 1878 specification:

[redacted]

Facilities for Conformance Testing, Performance Testing, and Demonstrations

The PNDC facility (map of facilities overleaf right) is one of the world's most comprehensive testing sites, with state-of-the-art assets in a real-world environment. The PNDC facility can operate in grid connected and islanded modes. Operating in islanded mode, the facility supports voltage and frequency setpoint control to enable device assessment to varied grid conditions. The PNDC also supports high-voltage and low-voltage disturbance capabilities, which permits the assessment of device and system behaviour under fault conditions. The PNDC facility enables test and demonstration

of hardware, software, and integrated systems in a safe, controlled environment. Relevant pre-existing capabilities include:

- High voltage (11 kV) and low voltage (400 V) distribution networks
- 2MW / 1MVA motor-generator set with the ability to vary loadings, voltage, frequency and perform disturbance testing
- Controllable bi-directional AC grid emulator rated at 540kVA, up to 800Vrms
- AC and DC electrical buses to test system integration and operation of distributed energy resources and controllable loads
- Indoor and outdoor low voltage test-bays for easy integration of devices under test
- Real-time digital simulator (RTDS) capable of modelling a wide variety of energy networks in varied conditions
- 4x 100kVA and 4x 50kVA resistive and reactive load banks, controllable via Modbus or programmable software
- Fast and rapid EV charge points
- EV load emulation capabilities including access to real electric vehicles for test purposes
- Extensive measurement and data acquisition systems to accurately monitor devices under test and the test environment.

PNDC facilities plan

It is proposed that a “DSR Lab” is formed at the PNDC facility to provide a dedicated space and facilities to meet the demands of the proposed DSR testing programme. The “DSR Lab” space will provide a dedicated space within the PNDC facility for use by the Consortium and test project partners for the duration of the tender. The “DSR Lab” will see the installation of additional test capabilities to complement existing PNDC facility including:

- ESA test bays pre-configured with electrical, communication, and auxiliary services (hot/cold water service & drainage) required to fully test all PAS 1878 specific device types in a real-world environment
- Additional time-synchronized power quality monitoring and data logging equipment to enable accurate performance assessment of all DSR services, including sub-second frequency response
- Additional test loads and load emulation for Smart EV Charge Point, and Electric HVAC device types.

The “DSR Lab” at PNDC will also host Consortium partner test devices and equipment, including:

- SMETS2 Smart Meter Equipment including ESME(s), Commshub(s) and SAPCs
- Protocol conformance test harnesses
- External system and data service emulation (e.g. Weather Advisory Service).

The ScottishPower [redacted] MAP Test Facility supports ScottishPower’s testing of Smart Metering equipment, including communication hubs, electricity meters, gas meters, IHDs and PPMIDs that are installed across the UK.

Department for
Business, Energy
& Industrial Strategy

The Facility has the capability to test circa 200-meter sets (~400 meters) concurrently, split across two fully functioning Laboratories. It hosts the infrastructure to simulate load on both the gas and electricity meters and has instances of both the Arqiva and Telefonica CSP WAN technologies. The lab supports enduring test requirements for both SMETS 1 and 2 devices.

[redacted]

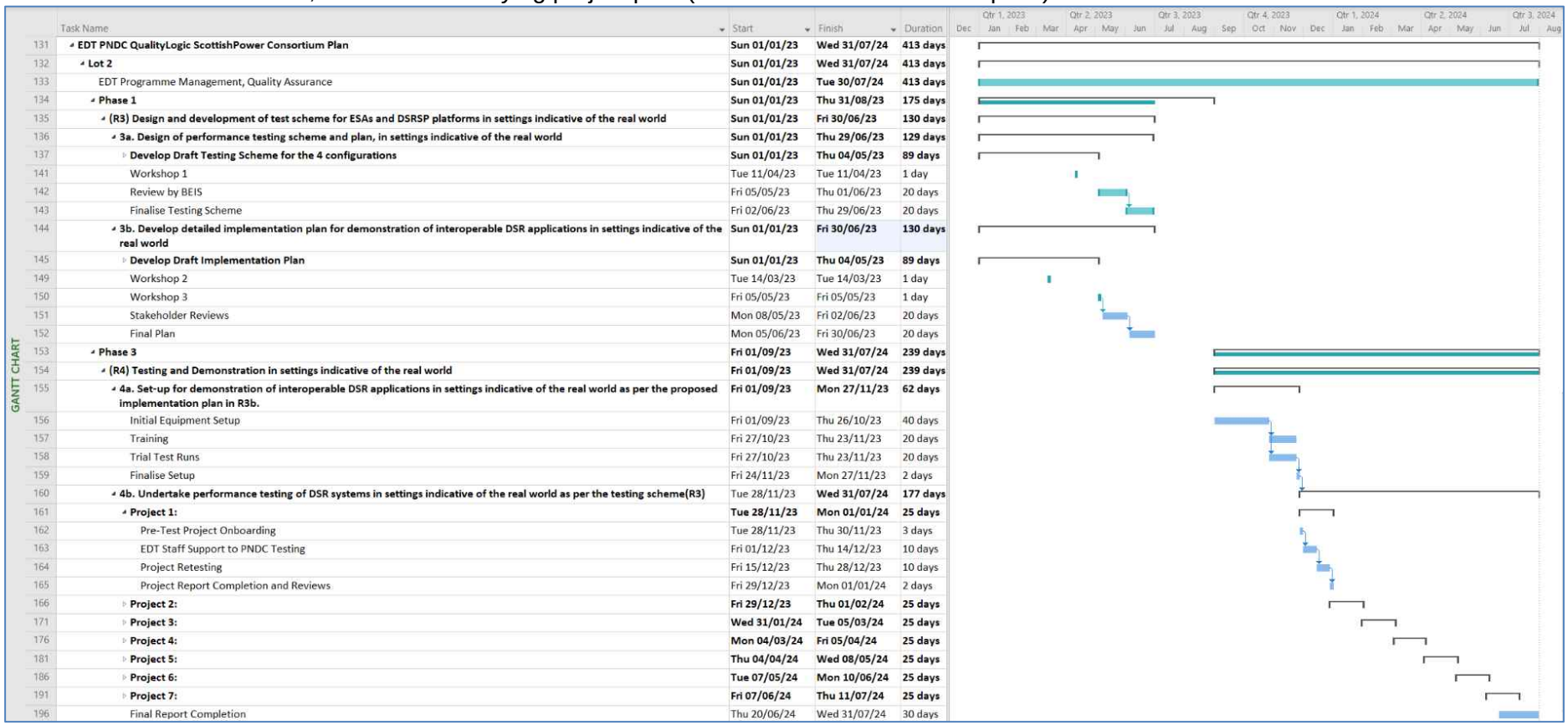
EDT has existing UK facilities which, although not co-located with the PNDC facility that would form the main test laboratory, have relevance to the performance of this contract.

- We operate the only authorised OpenADR certification test house in the UK and Europe, approved by the OpenADR Alliance in 2021. Components of the PAS 1878 conformance testing scheme are expected to be based on the OpenADR test tools
- We have laboratories in the UK accredited with ISO 17025 and expect to align operating procedures in the laboratory testing phase of this contract with the principles of ISO 17025
- We have a Cyber Security unit with facilities for assessment of devices and systems.

Criterion	Description	Reference	Weighting
03 – Project Approach and Delivery	**Clear demonstration of how the project will be successfully delivered and risks managed.**	Section 2	35%

Department for
Business, Energy
& Industrial Strategy

EDT has extensive experience of delivering large-scale long-term projects for its customers, focussing on delivering customer goals and value, and being reactive to stakeholders, changing circumstances and managing ongoing risks and issues as they arise. Our project plan is set out in a high-level view Gantt chart below, which the underlying project plan (which can be shared on request) drives:



GANTT CHART

	Task Name	Start	Finish	Duration
131	**EDT PNDC QualityLogic ScottishPower Consortium Plan**	**Sun 01/01/23**	**Wed 31/07/24**	**413 days**
132	**Lot 2**	**Sun 01/01/23**	**Wed 31/07/24**	**413 days**
133	EDT Programme Management, Quality Assurance	**Sun 01/01/23**	**Tue 30/07/24**	**413 days**
134	**Phase 1**	**Sun 01/01/23**	**Thu 31/08/23**	**175 days**
135	**(R3) Design and development of test scheme for ESAs and DSRSP platforms in settings indicative of the real world**	**Sun 01/01/23**	**Fri 30/06/23**	**130 days**
136	**3a. Design of performance testing scheme and plan, in settings indicative of the real world**	**Sun 01/01/23**	**Thu 29/06/23**	**129 days**
137	**Develop Draft Testing Scheme for the 4 configurations**	**Sun 01/01/23**	**Thu 04/05/23**	**89 days**
141	Workshop 1	Tue 11/04/23	Tue 11/04/23	1 day
142	Review by BEIS	Fri 05/05/23	Thu 01/06/23	20 days
143	Finalise Testing Scheme	Fri 02/06/23	Thu 29/06/23	20 days
144	**3b. Develop detailed implementation plan for demonstration of interoperable DSR applications in settings indicative of the real world**	**Sun 01/01/23**	**Fri 30/06/23**	**130 days**
145	**Develop Draft Implementation Plan**	**Sun 01/01/23**	**Thu 04/05/23**	**89 days**
149	Workshop 2	Tue 14/03/23	Tue 14/03/23	1 day
150	Workshop 3	Fri 05/05/23	Fri 05/05/23	1 day
151	Stakeholder Reviews	Mon 08/05/23	Fri 02/06/23	20 days
152	Final Plan	Mon 05/06/23	Fri 30/06/23	20 days
153	**Phase 3**	**Fri 01/09/23**	**Wed 31/07/24**	**239 days**
154	**(R4) Testing and Demonstration in settings indicative of the real world**	**Fri 01/09/23**	**Wed 31/07/24**	**239 days**
155	**4a. Set-up for demonstration of interoperable DSR applications in settings indicative of the real world as per the proposed implementation plan in R3b.**	**Fri 01/09/23**	**Mon 27/11/23**	**62 days**
156	Initial Equipment Setup	Fri 01/09/23	Thu 26/10/23	40 days
157	Training	Fri 27/10/23	Thu 23/11/23	20 days
158	Trial Test Runs	Fri 27/10/23	Thu 23/11/23	20 days
159	Finalise Setup	Fri 24/11/23	Mon 27/11/23	2 days
160	**4b. Undertake performance testing of DSR systems in settings indicative of the real world as per the testing scheme(R3)**	Tue 28/11/23	**Wed 31/07/24**	**177 days**
161	**Project 1:**	**Tue 28/11/23**	**Mon 01/01/24**	**25 days**
162	Pre-Test Project Onboarding	Tue 28/11/23	Thu 30/11/23	3 days
163	EDT Staff Support to PNDC Testing	Fri 01/12/23	Thu 14/12/23	10 days
164	Project Retesting	Fri 15/12/23	Thu 28/12/23	10 days
165	Project Report Completion and Reviews	Fri 29/12/23	Mon 01/01/24	2 days
166	**Project 2:**	**Fri 29/12/23**	**Thu 01/02/24**	**25 days**
171	**Project 3:**	**Wed 31/01/24**	**Tue 05/03/24**	**25 days**
176	**Project 4:**	**Mon 04/03/24**	**Fri 05/04/24**	**25 days**
181	**Project 5:**	**Thu 04/04/24**	**Wed 08/05/24**	**25 days**
186	**Project 6:**	**Tue 07/05/24**	**Mon 10/06/24**	**25 days**
191	**Project 7:**	**Fri 07/06/24**	**Thu 11/07/24**	**25 days**
196	Final Report Completion	Thu 20/06/24	Wed 31/07/24	30 days

Under this project and as Consortium lead, EDT would be responsible for:

1. Overall Project Management, Governance and Quality Assurance, including

(a) Allocating an experienced project manager to this project for the duration, tracking key activities, the work of the other Consortium stakeholders as those contribute to the project deliverables, and managing the risks and issues
(b) Supplier management, stakeholder liaison and management of product testing process, such as preliminary test questionnaires, and report sign-off and subsequent test challenges through issue tracking and management software
(c) Overall assurance for the deliverables, such as reviewing test plans and test reports under Lot 2 activities

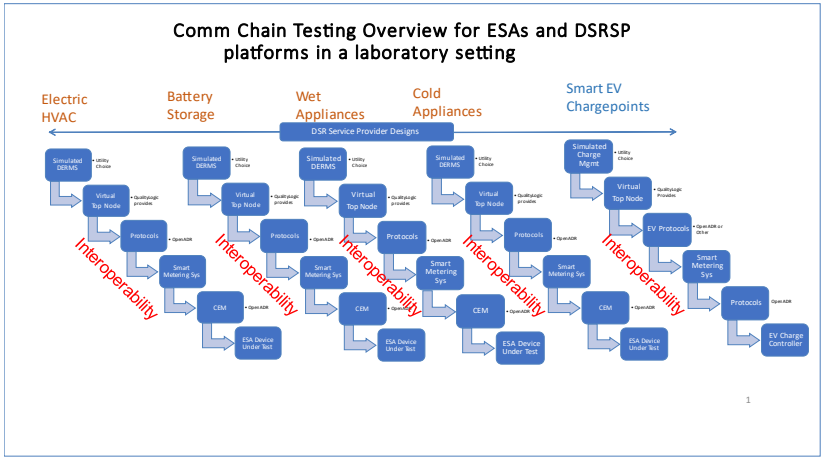
2. The design and development of the testing scheme for ESAs and DSRPs performance testing in settings indicative of the real world, drawing extensively on the expertise and input from the consortia members in their respective fields of experience.
3. Providing Test execution resources to support the performance testing in settings indicative of the real world in addition to those of PNDC, QL and ScottishPower, as required by the schedule and to accommodate flexibility in timescales as necessary.

EDTs extensive experience in specification analysis and test plan development will be applied within Phase 1 and we will schedule regular stakeholder workshops with BEIS and the manufacturers providing ESAs and DSRPs into the project. This ensures all stakeholders can both contribute to the early identification of key test requirements, scope and approaches, and review the early drafts of, for example, templates for pre-test checklists, test plans and template test procedures before they are more broadly expanded. Following completion of the initial draft and additional workshops to review this, and a period of offline review by BEIS and its project partners, we will then accommodate all comments into a final draft.

Communications Protocols

As an expert on the OpenADR communications protocol, QL will provide the following:

1. **Planning for the real-world functional testing with Eurofins and PNDC**
   (a) **R3 General Planning Steps Real-World Testing**
   (b) As shown in diagram ___ "Comm Chain Testing Scheme for ESAs and DSRSP platforms in a Lab Setting" (Figure 2), QL will assist with the use case development for each DSR service and support any missing items not included in the OpenADR tools. Testing will start at the DSRSP/DERMS level by verifying compliance that OpenADR commands are appropriately issued by the DSRSP system and converted at the CEM level to verify ESA is compliant with DSR service objectives. Testing will work forwards down the chain from the DSRSP platform level looking at interoperability along the chain and command performance compliance to assure functional tests achieve objectives and expected outcomes.



(c) QL will work with Scottish Power, BEIS and Eurofins to clearly define use cases for the DSR services to be passed to each CEM/ESA.
(d) QL will monitor the protocol testing operations and identify issues with coding for any extensions to the OpenADR PAS Test Harness or separate test tool that meets PAS requirements.
(e) QL will interpret the DSR services actions from PAS 1878/79 and assure a quality conversion from DSR outcome expectations into specific OpenADR actions transferred to CEM/ESA. This will assist PNDC in identifying exactly which sensors and monitoring will be needed to verify functionality of each ESA towards meeting the DSR service objectives.
(f) QL will develop a set a pre-condition requirements for the ESAs/CEMs to meet before they can participate in any DSRSP tests to reduce the retesting of systems.
(g) QL will develop a data packet/payload monitoring approach to track commands from DSRSP to CEM/ESA to aid in debugging communications issues along the communications chain from DSRSP to CEM/ESA.
(h) QL will assist Scottish Power with issues related to Zigbee commands transferred via the GB Smart Metering system to CEM/ESAs and assist partners with comparisons of latency and performance between direct OpenADR commands vs. GB Smart Metering.
(i) If applicable, QL will add functional rule checks and/or schema extensions to facilitate validation of payloads and message exchange interaction patterns between OpenADR and GB Smart Metering via Zigbee pathways. If an additional tariff report is needed or results vary between systems, QL will help identify issues and assist with recommendations for correction.
(j) At this stage, test cases will focus on validating functional behaviour of DSRSP commands
(k) The deliverables will be the written specifications of OpenADR commands and anticipated results expected from the CEM/ESA. These will assist PNDC in setting up the lab environment with proper sensors and measurement for data collection, particularly related to comparison of GB Smart Metering and OpenADR.

2. **Conducting functional testing of ESA devices with Eurofins and PNDC.**
   a. **General Steps R4**
   b. A direct comparison of performance between direct OpenADR and the GB Smart Metering SAPC will inform DSRSP operators of the performance benefits and limitations of each system. For example, a battery system with inverters may create communications issues due to inductive forces on the comm lines, that may not be present with other ESAs. Depending upon the ESA, issues will likely be different between the GB Smart Metering path or direct OpenADR path.
   c. QL will provide the testable requirements for each DSRSP system and each type of ESA device.
   d. The deliverables for this work will be testing reports of the DSR service under GB Smart Metering and direct OpenADR. Each test will be clearly documented so that test lab will have the rules to follow to test for each real-world functional retest required.
   e. **R1 General Planning Steps - Functional Test Planning**

f. Functional testing is more challenging because it requires lab designs/setups that are unique to ESA equipment and to the ESA's different responses to DSR service commands. It also requires the introduction of additional systems, such as GB Smart Metering SAPC technical specification and each of the DSRSP devices/systems to be tested. For example, the setup for a battery system is distinctly different than the lab set up for HVAC equipment or wet appliances. DSRSP responses are also different between ESAs. QL will work closely with our lab partners EDT and PNDC which have excellent capabilities to do these unique testing requirements and lab setups.

g. QL will provide this support by helping pull together the testable functional requirements for each DSRSP system and each type of ESA device and lay out the actual DSR functional test cases for each requirement. QL has done similar work related to the IEEE 1547 standard.

h. The deliverables for this work will be modification of the OpenADR PAS Test Harness developed in Phase 1 Lot 1 (as required) for use in testing the DSR service requirements to each type of ESA. QL will work with the team to investigate the feasibility of automating the functional testing of the DSRSP and ESA's because of the complexities of these tests, we would need to investigate the feasibility of developing an automated test harness within this scope; however, functions will be automated as much as possible within time and budget constraints. and where it proves cost-effective. Each test case will be clearly documented so that test lab will have the rules to follow to test for each function and ESA responses that meet testing criteria whether done manually or with test automation.

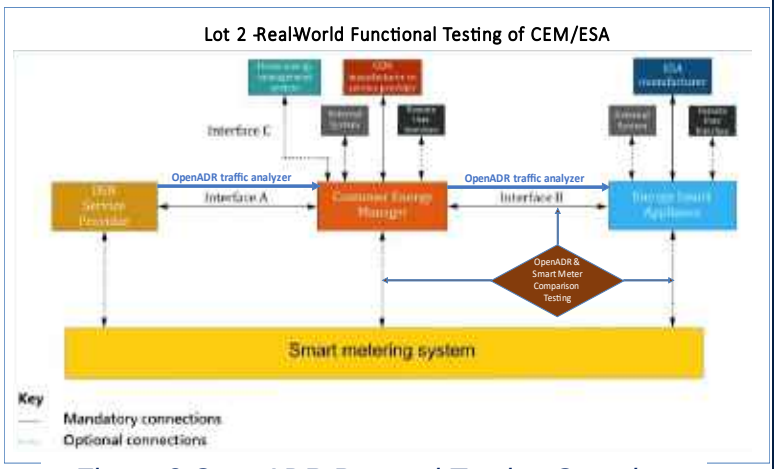


Figure 3 OpenADR Protocol Testing Overview

Proposed Test Environment and Supporting Infrastructure

Eurofins Digital Testing - Project Specific Test Tools: EDT will provide any additional tooling where the test protocols defined in the Phase 1 stage identify a need for additional test stubs or supporting software. For example, to represent user inputs, automation of test steps, fand to simulate additional external inputs to the system.

Power Networks Demonstration Centre (PNDC) – "Real World" Test Environments: The PNDC will host and provide access to the majority of the physical test infrastructure to test future flexibility solutions. The PNDC proposed to create a dedicated "DSR Lab" for the purposes of this scope to provide a dedicated space to test that leverages existing PNDC capabilities and newly procured dedicated test equipment.

The existing power network and communications infrastructure at PNDC provides a baseline capability that meets many of the device testing

Figure 4: Test environment

requirements. This includes a configurable three-phase four-wire low voltage electrical test network and test bays, controllable AC power supplies with fine control frequency and voltage setpoints, and extensive measurement and data acquisition systems. Electrical test networks can be energised in grid connected mode or using a voltage source grid emulator that will permit testing of local voltage and frequency droop-based DSR control.

The PNDC test capabilities will be extended to meet the specific test requirements of this programme and of specific future test projects as required. A dedicated test environment capable of testing all five device types in a representative “real-world” test environment will be built and made available for the during of the test programme. This will include auxiliary electrical power and other services to device test bays (including water and drainage).
Each device type test bench will be specially built to provide the expected electrical, communication, auxiliary services and environment capabilities to fully test each type of energy smart appliance. A short description of each test bench follows. Capabilities to test up to five devices of each of the 5 PAS defined ESA types will be provided:

- Battery Storage [5]: test bench will consist of electrical connections to each battery storage appliance. Single-phase and three-phase devices will be supported. Monitoring and data logging of the power, current and voltage profile at each appliance will be supported.
- Appliance [5]: test bench will consist of electrical connections to each cold appliance. Single-phase and three-phase devices will be supported. An environmental chamber as outlined above will be made available to test one or more devices. Monitoring and data logging of the power, current and voltage profile at each appliance will be supported. External and internal appliance temperature data logging will be supported
- Electric HVAC [5]: test bench will consist of electrical connections to each electric HVAC appliance. Single-phase and three-phase devices will be supported. An environmental chamber as outlined above will be made

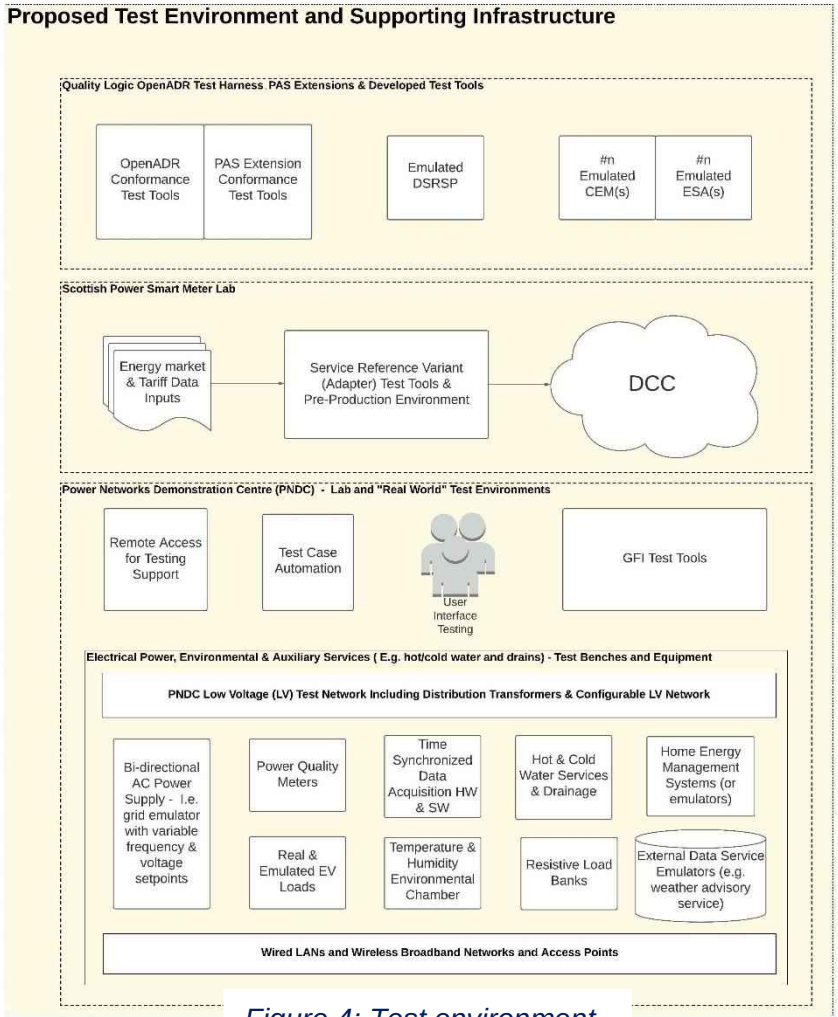


Figure 4: Test environment

available to test one or more devices. Monitoring and data logging of the power, current and voltage profile at each appliance will be supported. External and internal appliance temperature data logging will be supported.

- Smart EV Charge Point [5]: test bench will consist of electrical connections to each smart EV charge point. Single-phase AC and three-phase AC devices will be supported. Monitoring and data logging of the power, current and voltage profile at each appliance will be supported. EV loads will be emulated using a combination of full EV electrical and communication emulators and EVSE Handheld Testers with resistive loads.
- Wet Appliance [5]: test bench will consist of electrical, water and drainage connections to each wet appliance. Single-phase AC and three-phase AC devices will be supported. Monitoring and data logging of the power, current and voltage profile at each appliance will be supported.

The PNDC will host a number of test assets provided by Consortium partners including DCC provided GFI test tools to help configure and communicate with SMETS2 infrastructure locally (Figure 5). The PNDC will also host "external system" emulators and "external data service" emulators to provide the necessary inputs to local devices under test and user interface and user override testing will be undertaken at PNDC using local user interfaces provided by testing organisations.

The PNDC test environment will provide several secure, configurable local area networks (LANs) and wireless networks. Remote access and site-to-site communications with cloud hosted infrastructure, other Consortium partner labs, and companies providing solutions under test will be supported using IT best practices including VPNs, firewall whitelisting, and GSM APNs.

Existing PNDC test infrastructure is costed using a day-rate facility charge as required. Enhancements and modifications required for this specific test programme will be calculated and priced as an upfront cost.

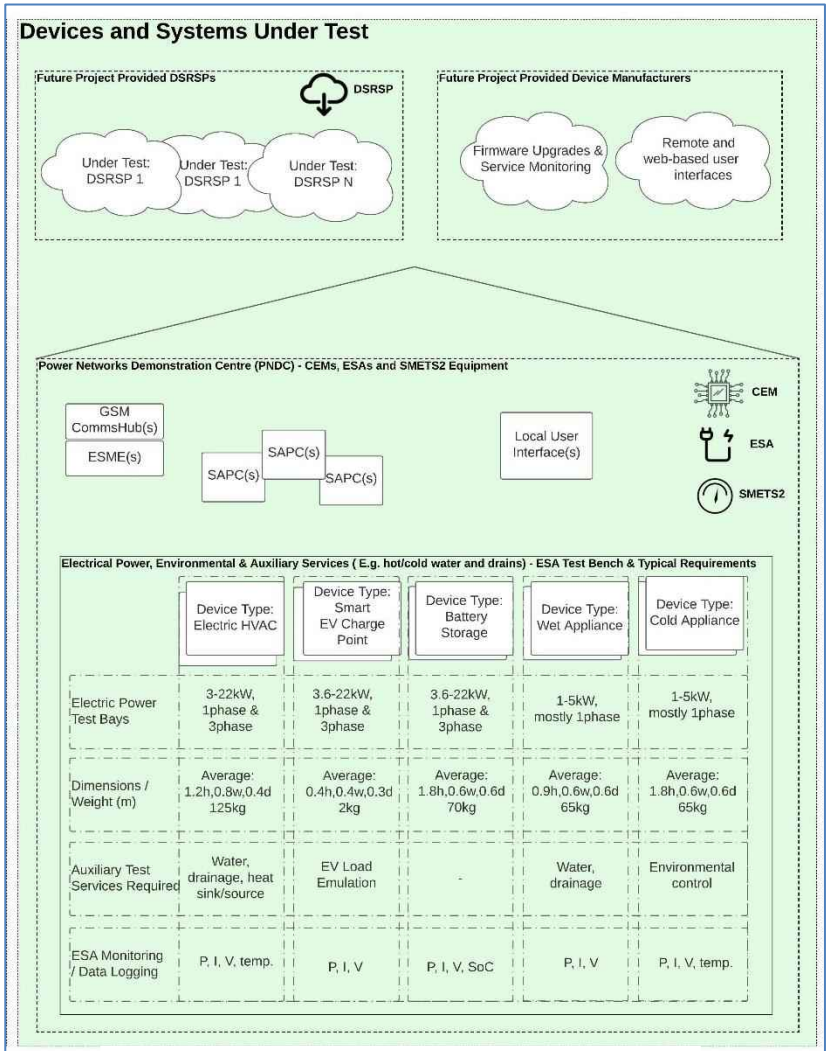


Figure 5: Devices and Systems under Test

ScottishPower - Smart Meter Lab: The ScottishPower smart meter lab will host and provide access to software and hardware test systems that enable the configuration of and communication with SMETS2 infrastructure included in any test project. This includes communication adapters to send Service Request Variants (SRVs) through the DCC User Integration Test (UIT) environment and the processing of any asynchronous responses or alerts, we have no connection to the production environments. The Smart Meter Lab will also provide energy market and tariff data developed for specific test cases using the significant experience and expertise of the ScottishPower metering and digital solution teams.

QualityLogic (QL) - OpenADR Test Harness, PAS Extensions: QL will provide and host protocol test harnesses and associated tools to automate test cases for the protocol compliance elements of the overall scheme. This infrastructure will be operated at the PNDC facility by EDT conformance testing experts, (EDT is the only European OpenADR Authorised Test Lab). Where appropriate access to other test infrastructure and devices under test will be enabled using networking best practices includes site-to-site VPNs, network firewalling and address whitelisting with support from PNDC IT Support staff. This infrastructure will be used for protocol conformance testing. Where necessary, and where partial system testing is required, modified test tools based on the same test harnesses will be used to emulate DSRSPs and one or more CEMs and ESAs.

Devices and Systems Under Test - Future Project Provided DSRSPs

It is assumed that future project provided DSRSPs for Lot 2 will be hosted remotely by the supplying organization at their own facility or in the cloud.

Future Project Provided Device Manufacturers

We propose to provide remote CEM and ESA device access to future project providers who want to remotely access their devices at the PNDC during testing. This is expected to be necessary for firmware upgrades, service monitoring, enabling testing of “remote user interfaces”, and to support troubleshooting during testing. Remote access will be enabled using wired LAN and wireless broadband, and in-built GSM communications.

Power Networks Demonstration Centre (PNDC) – CEMs, ESAs and SMETS2 Equipment

The PNDC will host future project provided CEMs, ESAs and SMETS2 equipment in dedicated test benches for each of the five ESA device types defined in PAS 1878.

It is assumed that a maximum of 20 CEMs/ESAs will need to be supported and tested at any given time over all phases. It is provisionally assumed that no more than 5 devices of each PAS device type will be tested at any one time.

The PNDC will host a set of SMETS2 equipment provided by ScottishPower for the duration of the project, to be made available as required to future test projects. This will include Comms hubs, electricity smart meters (ESMEs), and SAPC devices. Where required, the PNDC will install and host

project specific SMETS2 equipment provided by future test projects. It is expected this will be limited to a maximum of 20 Comms hubs, ESMEs, and SAPC devices at any one time.

For the lab setup phase of the Lot 2 activity, where the facilities are configured for performance testing projects, as a risk mitigation to maximise the readiness of the facilities ahead of the commencement of projects, we recommend, if possible, this setup be started before the completion of Phase 1. Noting the phase 1 stage gate requirement, we note that BEIS would be in a position to bring this decision point forwards if necessary and acceptable if (a) the initial draft phase 1 deliverables are provided on schedule and without major review comments by end July 2023; and (b) the products comprising the projects to be tested within the performance testing projects are also expected to be ready in December 2023. Our project plans allow some contingency between completion of Phase 1 steps and Phase 2/3 to allow this.

Our proposed approach for the Performance Testing Projects – Lot 2 – will be as follows:

1. Engagement with each DSR project undergoing performance testing will start well before the arrival of equipment and personnel at the PNDC “DSR Lab” (see description elsewhere in the response):
2. The Consortium will share the agreed Implementation Plan and associated test processes with the project team. This will include an introduction to the PNDC lab facilities, health and safety requirements, points of contact and change processes to follow.
3. A pre-performance testing questionnaire (like pre-conformance testing questionnaire) will be shared with the project team to ensure they meet minimum set criteria that suggests they are ready for performance testing and are likely to meet.
4. If agreement is reached by the test project team and the Consortium that preparations are sufficient, then test dates will be agreed for the specific test project. It is estimated that test dates will be approximately 4-weeks for each project, from receipt of the DSR system delivery to decommissioning.
5. After test dates are agreed and entered into the “DSR Lab” facility planner, a project specific test plan will be generated. This will follow a standard format produced by the PNDC team with modifications to account for project and device specific requirements, e.g. the number and type of each ESA type under test, or the inclusion of SAPCs or external systems. The project specific test plan will include a detailed test project schedule agreed by all parties.
    a. Project specific equipment will be shipped to the PNDC “DSR Lab”. The system will primarily be installed by the PNDC technical team, under the guidance of project partners as necessary. Project partners will then commission and configure their test systems, working closely with PNDC R&D engineers as necessary.
    b. The PNDC team will then execute the agreed test plan, working closely with project partners and staff from fellow Consortium members. PNDC staff will lead monitoring and data logging to ensure performance testing can be adequately analysed and reported upon.

c. Should initial indications during testing suggest that the DSR system performance is not as expected, or could be improved upon, the project partners will be given the opportunity to make bug fixes and minor modifications with the system still in place at the “DSR Lab”
d. After scheduled tests are complete, project partners and PNDC staff will decommission the test setup and return the “DSR Lab” to its normal configuration, awaiting the next project.
e. The PNDC R&D team, with support and input from Consortium partners, will fully analyse the DSR system performance. A Test Report will be produced for each project, briefly summarizing the results of all tests. Raw test data will be hosted on a secure shared server with access credentials provided to project and Consortium partners as appropriate.

Under Lot 2 activities the testing in real world indicative situations would both validate the overall DSR requirements are met by conformant systems and that the "workbench" tools and tests are effective in assuring the end device compliance with the DSR system requirements.

EDT recognises the need to carry forward from the findings under real world performance testing to feed back into the conformance testing plan and tools to refine these deliverables.

Agility and flexibility to handle uncertainties around numbers of tests to be conducted within the timescale.

The Consortium members collectively have access to substantial resources and procedures to manage uncertainty and rapid change in testing and demonstration projects. We have additionally addressed this in our volume-based pricing and within the risk register.

The **PNDC** R&D team schedules and executes a significant (estimated 40 - 60) industrial scale test and demonstration projects every year. Our facility and staff resource planning processes are refined from many years of experience around the types of delays and risks associated with device testing projects involving multiple external parties and dependencies. A number of existing PNDC facilities are proposed within the test setup and access to these will be scheduled during a weekly facility planning meeting held among senior research staff. The creation of a dedicated “DSR Lab” space will remove external conflicts and dependencies on the space to install and configure each DSR project. Predicted schedule changes from each DSR project will be managed using a defined process that specifies the pre-test requirements and change request process for any alterations to scope and schedule. Periodic Consortium meetings will be helping to review the schedule and the impacts of any recent change requests. PNDC would manage this through our Project Management change control processes as laid out within our procedures available on request

The PNDC R&D team is comprised of approximately 30 individuals with expertise including power systems control, DSO flexibility, protection, and communication systems. We are confident the outlined team has the skills to meet our committed role in the Consortium. Additional staff resourcing flexibility is achieved across the full team and, where required, seeking expertise from our academic colleagues across the wider EEE department at the University of Strathclyde. Access to this internationally renowned group of researchers is an asset to all the projects conducted by PNDC.

In addition, the team running test projects at the PNDC facility will be augmented by EDT test engineers. EDT currently manages approximately 400 testers and test engineers delivering digital testing projects for many UK customers across all industry segments. EDT has an in-house Academy and can leverage this to ensure availability of testers with the necessary skills to execute test projects once the project reaches phases 2 and 3.

ScottishPower has the capacity, experience, and depth across the organisation to deliver the requirements of the project. With a group reach across multiple disciplines and areas of expertise along with our developed polices and processes, that can be drawn upon to satisfy and respond to any changes in scope or delivery, we have the capability to adapt our plans and resources to ensure that all necessary activity is conducted and concluded within the timescales of the project.

As part of our planning activity, we have already engaged with key stakeholders to make them aware of their responsibilities and taken account of dependencies to deliver the objectives of the project. Our project manager will continually review requirements and any change in scope will be addressed as part of regular project reviews and which will take account of existing method-statements and risk assessments on a regular basis to forecast any changes and implement solutions to meet any changing needs of the project.

Quality Management

Edge Testing Solutions Ltd (as part of Eurofins Digital Testing and Cyber) is both ISO 9001 and ISO 27001 certified and aligns all its processes and procedures to these standards. PNDC operates a Quality Management Process which is certified to ISO 9001:2015.

EDT will develop a Quality Assurance Plan at the project inception. The objective of this plan is to detail the Approach; Objectives; Scope; Governance; Processes; Resource Requirements; Environmental Requirements; Metrics and Reporting; Timeline; Phase risks and Continuous Improvement. This approach ensures a common understanding across all parties on how Quality Assurance will be applied.

With respect to the conformance testing schemes, we will set up a quality assurance process by following the relevant sections in the ISO/IEC 17025:2017 standard. Our Global QA Manager, with 10 years of experience operating ISO/IEC 17025 laboratories, is UK based and will be appointed to set up the process.

General quality processes

1. Impartiality (ISO/IEC 17025:2017 Section 4.1): The project team will be structured and managed to undertake impartiality. Risks to impartiality will be identified, eliminated or minimized, and monitored in on-going basis.
2. Confidentiality (ISO/IEC 17025:2017 Section 4.2): Customer information will be kept confidential by all personnel and partners under a non-disclosure agreement.

3. Competence of personnel (ISO/IEC 17025:2017 Section 6.2): Competence of personnel will be assessed. The individual's performance will be regularly evaluated. If training needs are identified, appropriate training will be provided internally or externally.
4. Complaints (ISO/IEC 17025:2017 Section 7.9): The procedure will cover complaint handling and going through the non-conforming procedure as needed.
5. Nonconforming work (ISO/IEC 17025:2017 Section 7.10): Root cause analysis, correction and corrective actions will be performed for continuous improvement.
6. Control of data and information management (ISO/IEC 17025:2017 Section 7.11): Information such as customer data and testing results will be stored in validated information systems to protect data privacy and cyber-security.

Specific processes for the design and development of test schemes (R1 and R3):

1. Externally provided products and services (ISO/IEC 17025:2017 Section 6.6): When partners or vendors are used, such as for testing equipment or calibration services, a procurement process will be used to assess the suitability before acceptance.
2. Selection, verification and validation of methods (ISO/IEC 17025:2017 Section 7.2): Competent personnel will be assigned with individual "tasks" to develop the test schemes and test tools. Each "task" will then be reviewed by another team member to check that all requirements are fulfilled correctly. A test validation plan will also be designed and executed, with any defects re-worked and re-validated before delivery.

Specific processes for the laboratory testing and demonstration (R2 and R4):

1. Equipment (ISO/IEC 17025:2017 Section 6.4): This includes handling, maintenance, identification and calibration of equipment.
   A verification procedure will be designed to ensure the test setup is correct before testing is executed. Equipment will also be checked regularly to identify any defect trends.
2. Ensuring the validity of results (ISO/IEC 17025:2017 Section 7.7): Testing work will be reviewed and authorized by another testing team member before a test report can be delivered to the customer. The review process will include checking of the test equipment, reproducibility check on the test results, validity check of the testing results against the relevant testing standards, and quality check to ensure testing comments and supporting test data are clear and sufficient.
3. Reporting of results (ISO/IEC 17025:2017 Section 7.8): The report format will include information such as the details of the customer, sample conditions, testing conditions, any deviations of test methods, and testing results with supporting data or references. Amendments of reports will also be recorded to retain traceability.

Governance and Change Control

The project organisation described in Criterion 02 defines a project board, with roles and responsibilities for project governance and including senior individuals from each Consortium partner to coordinate activities across the organisation.

The EDT Project Manager will be the primary point of contact for BEIS and other project stakeholder and will coordinate all reporting and collating of information from Consortium members to facilitate the status reviews, progress meetings and other measurement of project KPIs as outlined in the Working Arrangements in section 2.11 of the ITT, and other governance processes as may be defined between EDT and BEIS at project initiation.

The project board includes senior management representation from all Consortium members, to ensure rapid escalation and resolution of any issues arising during the project. This also ensures that BEIS will have access to senior management in any of the Consortium members.

We will implement, in collaboration with all parties, a formal Change Control process, based around five key elements:

1. **Initiation** – Initiation is the stage where the Change is requested. At this point, it is important that the change is formally and correctly documented to ensure that it can be understood, there is a valid, business or functionally based reason why the change is needed and that enough information for a reasoned decision is provided
2. **Assessment** – During the Assessment stage, the Change Request is assessed to ensure that all the relevant information has been provided (from the requestor), that the Change Request process has been followed and where the request is sent out to the relevant parties for Impact Assessment (IA). The IA should consider the requirement against cost, time and impact on the overall quality of the project against not implementing the change.
3. **Analysis** - During the Analysis phase, the final decision on whether or not to implement the change is considered based on the output of all impact assessments provided by the relevant parties. Such change is usually managed through the medium of a Change Control Board. Any decision should be signed off by the key Stakeholders and the decision communicated to the project team.
4. **Implementation** – If the decision has been made to proceed with the change, it is then implemented, and the necessary changes and additional work is undertaken by each team. Any changes to the overall plan should be documented and logged.
5. **Closure** – Finally, once the Change has been applied, the Change Log is updated to show that the request is now ‘closed’. This provides a record of the change and provides a reference point for future projects.

We will ensure that a formalised Change Control Board and process is implemented including the creation of the necessary Change Request templates.

Conflict of Interest and proposed Mitigation

At the time of submitting this proposal, no Consortium member is aware of any conflict of interest in relation to this project. Members of the Consortium agree that they will continually review this and should any potential conflicts of interest arise will notify the lead partner (EDT) of this at the earliest opportunity.

EDT will notify BEIS immediately if any potential conflict of interest should arise.

If a conflict of interest is conformed, then the primary mitigation approach will be to design a working arrangement whereby the project and the results of conformance testing cannot be influenced (or perceived to be influenced) by the organisation which is the owner of the conflict of interest. We will confirm the different roles which members of the Consortium play in the research or analysis, and how these can be structured to ensure an impartial approach to the project is maintained.

The identification, prioritisation, mitigation, management, and communication of project risk.

We have found that the most efficient means of addressing risks is through the adoption of a 'left-shift' strategy where potential risks are identified as early in the cycle as possible. This will be achieved through early and continued Risk Workshops supported by robust risk prioritisation and mitigation approaches and entered onto a Risk Register.

There are two Key Elements of Risk. These are: **Probability** or the likelihood of an Issue occurring; **Impact** of the Issue if it does occur.

To obtain a 'value' of the importance of a Risk, values are assigned to both Probability and Impact (usually numeric where 1 is Low and 5 is High. Both values are multiplied together to obtain an overall score:

ID	Risk	Likelihood	Impact	Residual Risk	Mitigation
1	There is a risk... Because.... That may...	4	3	12	▪ Mitigation 1 ▪ Miigation 2
2	There is a risk... Because.... That may...	2	5	10	▪ Mitigation 1 ▪ Miigation 2

This provides a means of (potentially) highlighting which risks require more careful management and provides a focus on how we can mitigate against the risks that have a higher chance of becoming an Issue. If a Risk has already materialised, it is now classed as an Issue.

MoSCoW - The application of MoSCoW (Must; Should; Could; Wont) provides a means of prioritising which mitigation actions need to be addressed ahead of any other. The MoSCoW values can and will be applied equally to any aspect of a project including Requirements/User Stories or Test.

Risk Reporting - Equal importance is ensuring good communication of the current risk profile across the project and to all stakeholders. The baseline for this is the risk register that provides an up to date of all risks, the status and a record of all actions being carried out to mitigate the risk. The key and most high scoring risks should be reported at regular intervals via the project reporting mechanisms (e.g. weekly reports).

In addition to risk management as part of the governance of this project, Consortium members will operate according to existing risk management policies within their organisations, and risks identified through these policies will feed into the project risk register as appropriate.

For example, PNDC will maintain a risk register highlighting technical, commercial & financial risks and their associated impacts and mitigations, which will be reviewed & updated accordingly at regular review meetings with project delivery personnel. This will operate according to the wider University's Risk Management Framework which provides a systematic Risk Management Assessment Process which all Departments/Faculties/Directorates must follow. It incorporates methods of:

- Categorising risks and opportunities.
- Recording required risks and opportunities related information; and
- Assessing their impact using the impact descriptions and
- Standard risk matrix.

The consortium partners have identified the following key risks, assumptions, and dependencies:

Risks

1. Lack of qualified ESAs DSRSPs ready for testing. Mitigation: identify early potential ESA and DSRSP vendors for the project and track vendors preparing to their systems. Each vendor will be provided with draft test plans and the team will obtain feedback from the ESA vendors and testing designs.
2. More testing required than budget. Mitigation: track potential testing volumes and provide more stringent requirements for testing to reduce volume of ESA testing or document need for additional budget from BEIS, should BEIS decide to test a greater volume of ESAs than planned in this tender.
3. Modifications and procurement of additional test equipment for the PNDC facilities according to the 2-month window proposed by BEIS could hold up the start of testing. Mitigation: propose early approval to commence this work based on review of deliverables throughout Phase 1.

Assumptions

1. Each performance test project entails set-up and tear down stages for the devices under test and test equipment. Therefore, we have assumed any retesting can be performed within the individual project start and end date, to meet the required schedule. Our project plans allow some contingency, within the expected schedule set by BEIS, allowing for inevitable scheduling variance and availability of devices and equipment, but not enough is possible to complete 14 separate projects (i.e., if each re-test were rescheduled separately, incurring all the set up and tear down cost twice, and entailing a full re-test of all performance requirements).
2. In total, a maximum number of 5 devices of each of the five PAS device types will be supported simultaneously – permitting the stated 20 required in the tender document.
3. It is assumed that performance testing above 22kW is not required. Devices rated large than 22kW can be tested but they will be de-rated to a maximum power output of 22kW.

Dependencies

1. DUIS Service request 7.16 Limit APCLevel has no valid user role, this currently blocks the use of the DCC UIT environment for Route 3. It also blocks the simplest instance of the Boxed DCC solution. The DCC will effectively need to be stubbed at both sides to support testing of this Routing option currently.
2. Boxed DCC solution seems to be only real option to cover all the requirements of the tender.
3. Testing through the DCC UIT environment would be quicker and easier to implement and would be the most suitable method to closely replicate the production environment but this will not offer 100% coverage until SR7.16 is updated.
4. To deliver the project, there will require to be an agreement in place with the meter manufacturers whose devices are being used to support testing.
5. Confirmation will be necessary to confirm that there are no restrictions to deploy and use the DCC test comms hubs for the purposes of delivering the objectives and outputs of the tender.
6. Using SP UIT environment will be constrained to which version of GBCS/DUIS can be supported, these environments are shared with other parts of the business, GFI will support latest version of GBCS.
7. We only support the testing as an import / export supplier, we cannot send SRs as a Network Operator – to mitigate against this we will work with Consortium partners and provider of the Flexible Power platform, used by five of the six DNOs across the UK to develop a Network Operator role in SPAST or engage with a DNO partner to undertake the necessary simulations and tests.

Third Party responsibilities

The Consortia members will not require the use of any third parties to assist in the delivering of this project. However, PNDC will need the assistance of procurement for additional test capabilities to enhance the PNDC facility and create the dedicated DSR Lab. The PNDC follows the University of Strathclyde's procurement processes to ensure transparency, accountability, and value for money. These procurement processes will be followed for delivery of this programme of work. Recent project experience has indicated above average lead times for certain supply chains. The PNDC and Consortium propose to mitigate any risks for this test programme by specifying and procuring early in the project schedule. The lab and real-world performance testing dates Lot 2 have sufficient lead time from award and project kick-off to mitigate these risks.

Criterion	Description	Reference	Weighting
05 – Social Value (see PPN 06/20 for more context)	Describe the commitment your organisation will make to ensure that opportunities under the contract demonstrate effective measures to tackle workforce inequality.		10%
As part of this project, the Consortium led by EDT will utilise existing Social Value commitments within each organisation to ensure that opportunities			

under the contract demonstrate effective measures to tackle workforce inequality. Within the project plan described and shown above, all members of the Consortia will bring their current working practices described below at regular milestones throughout the contract and report on a regular basis to BEIS:

EDT are proud of our diverse workforce, with nearly 40% of our workforce from Black, Asian & minority ethnic (BAME) communities. From recruitment to reward and development, we take an inclusive approach with fair and equitable access to all. All colleagues receive regular development discussions with our Client Executive Managers and our Community Practice Manager. We allocate all employees a dedicated career mentor and twice a year we run promotion panels which are publicized via our quarterly 'all company' presentations and our regular newsletters. Of these, 30% of those who were promoted last quarter were from our BAME workforce.
Our action plan aimed at female representation in the workforce has helped increase our female workforce by 4% in 2021, currently 28% of our workforce are female, including our Managing Director and Operations Director – gender equality is core focus for us. In 2021 we launched our gender inclusivity group to support and provide a space for consultation and feedback, in addition to raising awareness of issues faced by females in the sector, and to support our approach to target more females to join our business.

We are committed to the ongoing refinement and deployment of fair work practices. This commitment we believe is critical to maintaining a happy healthy workforce that in turn is highly motivated and wants to work at EDT. This is underpinned by a fully structured training programme available to us and client staff, ensuring fair pay and successfully combating the industry issue of the gender pay gap and ethnicity, and allowing our staff the complete freedom to choose to align to any association they may choose. To achieve this, we believe in providing everyone with the building blocks to develop their own career.

Investment in Skills and Training

We regularly bring in new intakes into our award winning, SQA certificated Academy for roles within its Regional Test Center. Over 180 personnel have progressed through this programme in the past 7 years. This has been a career enabler allowing them to fast-track into senior test, technical and management roles. The Academy will be available as an option to BEIS. We also support:

- Graduate Apprenticeships: EDT provides Graduate Apprenticeships (GA) in partnership with the University of the West of Scotland, Napier University and Strathclyde University, helping develop their skills in a work environment whilst furthering their academic career
- Modern Apprenticeships: Employees provided with SQA Modern Apprenticeship (MA) opportunities combining work-based and classroom training over 2 years. Provides an alternative to the GA, or to use as a foundation to move onto the GA in the future
- Work experience and placements: Work experience and work placement opportunities aligned with this contract giving candidates first-hand experience of commercial IT and Digital services, the work environment and life as a test professional
- Academy Training: A six-week training programme which comprises of 17 courses focusing on the core components required for a tester to learn the building blocks for future growth. These courses can be refined to align to BEIS's own technical and test related requirements

- Training: Our employees are encouraged to further develop themselves to support career aspirations. Training time is included for every employee, with internal courses delivered by our SQA qualified trainers and external courses delivered by third-party providers.

Since 2017 we have been awarded the highest-level Gold status 'Investors in Young People' accreditation and are currently supporting the creation of the platinum award with the Investors in Young People accreditation body.

Our values are shared by everyone in the company and form the cornerstone of what we do and who we are. These are: Honesty and Integrity; Commitment to Understand; People Focused; Professionalism and Flexibility.
We remain committed to ensuring Fair Pay and equality regardless of gender, belief or cultural ethnicity and actively aligns to the Fair Work Framework.

PNDC as part of the University of Strathclyde is committed to achieving and promoting equality of opportunity in its learning, teaching, research and working environments, and to ensuring these environments support positive relations between people, and a culture of respect. As a provider of employment and education, we value the diversity of our staff and students and are committed to encouraging everyone to realise their full potential. We have numerous policies (all available online) which provide a framework for the institution and help the University to perform the duties of the Equality Act 2010. Our ambitions to continue to improve diversity, enable inclusion and promote equality are embedded within our Vision 2020-25 strategic plan and People Strategy and reflected in our shared values.

Equality Impact Assessments (EIAs) are conducted during the development or review of university policies, procedures and practices. EIA is a systematic, evidence-based process which ensures our practices are the most effective that they can be for students, staff and the wider communities they affect. The Athena SWAN charter is central to institutional change, of which Strathclyde is a member and the EEE Department where PNDC sits is a bronze award holder.

We have an Equality, Diversity and Inclusion (EDI) Plan to ensure equality, diversity and inclusion is considered in our approaches, behaviours and attitudes which sits across 2 areas: Methods of Working, and Tracking EDI stats and outcomes. Methods of working include scheduling meetings around childcare, flexible working, inclusivity and all Groups to recognise our EDI plan. The project will track its EDI statistics and outcomes, and report these through the project management group on a monthly basis.

ScottishPower is fully committed to pay the Real Living Wage to all employees. We are committed to equal opportunities for all, irrespective of age, disability, gender, race, religion or belief, sex, sexual orientation, marriage and civil partnership, pregnancy, adoption or maternity or other considerations not justified in law which are irrelevant to the performance of the job. In recognition of these values, we are committed to raising awareness and understanding of equality and diversity by endorsing and promoting the following principles:

- Compliance with all legal requirements relating to equality and diversity in the workplace and prevention of harassment and discrimination
- Focus on fairness and inclusion, ensuring that recognition, capability, and potential are the basis for all recruitment and development decisions and that employees have the relevant training and opportunities for career and personal development
- Rewarding employees in a fair and consistent manner and recognition of individual performance and potential
- Recognition of the growing diversity of individual values with the workplace
- Valuing employees' views and perspectives and ensure that everyone is treated with dignity and respect
- We are committed to having a diverse workforce and recognise that with diversity comes different needs to facilitate work life balance which is why we have several different policies to support employees. We have long standing experience of allowing employees to work flexibly through several approaches which enable employees to take ownership of their career and life choices.
- Flexible working is a key contributor to employee engagement, retention, and business performance and we extend flexible working policies to all of our employees. The "Development Break Policy" gives employees the opportunity to take a period of absence from work and, so far as possible, offer the means of returning to work.

QL provide equal employment and advancement opportunities to all individuals, from recruitment through termination, employment decisions which will be based on merit, qualifications, and abilities. We forbid all forms of unlawful discrimination, prohibited harassment, or retaliation on any basis that is forbidden by federal law or applicable laws of the State in which the applicant or employee works, such as race, colour, national origin, ancestry, sex, religion, political beliefs, gender, pregnancy and childbirth, sexual orientation, gender identification, marital status, age (40 or older), physical or mental disability, medical condition, genetic characteristics, veteran status, or any other protected classification as those terms are defined by applicable law.

We will make reasonable accommodations for qualified individuals with known disabilities unless doing so would result in an undue hardship to the company. Any employees with questions or concerns about any type of discrimination in the workplace are encouraged to bring these issues to the attention of their immediate supervisor or Human Resources. Employees can raise concerns and make reports without fear of reprisal. Anyone found to be engaging in any type of unlawful discrimination will be subject to disciplinary action, up to and including termination of employment.

Department for
Business, Energy
& Industrial Strategy

Annex 1. Pricing Schedule

Bidders are required to complete the pricing tables for Lot 1 if they are applying to Lot 1 and the pricing tables for Lot 2 if they are applying to Lot 2. Bidders applying to both Lots must submit separate bids for each Lot.

If applying for both Lots, please include an attachment titled *'Lot 1 and Lot 2 – Total Price'* which highlights the overlap of costs for Lot 1 and Lot 2 and details the total cost of Lot 1 and Lot 2 should the bidder be awarded both contracts.

For Lot 1, Phase 1 invoicing and payment cycles shall be on a milestone basis and Phase 2 and project governance invoicing and payment cycles BEIS anticipate it to be on a monthly basis. Invoicing and payment with be agreed with the successful supplier.

For Lot 2, Phase 1 invoicing and payment cycles shall be on a milestone basis and Phase 3 and project governance invoicing and payment cycles BEIS anticipate it to be on a monthly basis. Invoicing and payment with be agreed with the successful supplier.

Department for
Business, Energy
& Industrial Strategy

LOT 2 PRICING SCHEDULE

Pricing for Lot 2: Design and delivery of demonstration of DSR systems in settings indicative of the real world

Please refer to Section 2, 2.8 Deliverables / Outputs Table 8. Summary of outputs for Lot 2 requirements when completing tables.

Annex 2: Table 2.1: Fixed Costs

IMPLEMENTATION (FIXED)			
	Section 2, 2.8 Deliverables / Outputs Table 8. Deliverable/Output Reference		
	R3 3a.	R3 3b.	R4 4a.
Direct Costs			
Labour	[redacted]		
Equipment			
Subcontract Costs			
Travel & Subsistence			
Sub-Total			
Indirect Costs			
Indirect costs, e.g. HR and Admin Costs, leasehold or rent costs (%)			
Sub-total			
Total Cost			
Profit (%)			
Total for each activity			
Total	£1,070,608		

Department for
Business, Energy
& Industrial Strategy

Annex 2: Table 2.2: Testing Costs

	PERFORMANCE TESTING (VOLUME BASED)	
Section 2, 2.8 Deliverables / Outputs Table 8. Deliverable/Output Reference	Bottom end of range	Top end of range
R4 4b.	70 ESAs and 7 DSRSP platforms (x2) *to facilitate multiple testing to allow design improvements*	140 ESAs and 7 DSRSP platforms (x2) *to facilitate multiple testing to allow design improvements*
Totals	[redacted]	
Average of Totals	£481,743	

Annex 2: Table 2.3: Project Governance Rate Card

PROJECT GOVERNANCE For activities detailed under Section 2, 2.11 Working Arrangements Table 9: Working Arrangements – Regular Engagement Please refer to Section 2, 2.6 Anticipated Timeframes and 2.7 Skills, expertise and facilities				
Role Title	Summary of Role	Daily Rate (excluding VAT)	Number of days on Contract	Total
EDT: Project Manager	Project Management	[redacted]		
EDT: QA Manager	Quality Assurance			
EDT: Practice Lead	Senior Management Oversight			
PNDC: Project Lead	Project Lead			
PNDC: R&D Engineer	R&D Engineer			
PNDC: Programme Delivery Manager	Programme Delivery Manager			
PNDC: Senior R&D Engineer	Senior R&D Engineer			
Total				£290,746

Department for
Business, Energy
& Industrial Strategy

Annex 2: Table 2.4: Project Governance Non-staff Charges

Item	No. of items	Price per item (incl VAT - breakdown)	Total price
EDT: Blended daily travel & expenses for 1 person/day attending in-person meetings			
Total			£7,400

Annex 2: Table 2.5: Total Bid Price for Lot 2

Table 2.1 Total	**£1,070,608**
Table 2.2 Average of Totals	**£481,743**
Table 2.3 and 2.4 Total	**£298,146**
Sub-total	**£1,850,498**
VAT	**£370,100**
TOTAL (Sub-total + VAT)	**£2,220,598**

Department for
Business, Energy
& Industrial Strategy

Declaration 1: Statement of non-collusion

To: The Department for Business, Energy & Industrial Strategy

1. We recognise that the essence of competitive tendering is that the Department will receive a bona fide competitive tender from all persons tendering. We therefore certify that this is a bona fide tender and that we have not fixed or adjusted the amount of the tender or our rates and prices included therein by or in accordance with any agreement or arrangement with any other person.

2. We also certify that we have not done and undertake not to do at any time before the hour and date specified for the return of this tender any of the following acts:

(a) communicate to any person other than the Department the amount or approximate amount of our proposed tender, except where the disclosure, in confidence, of the approximate amount is necessary to obtain any insurance premium quotation required for the preparation of the tender;

(b) enter into any agreement or arrangement with any other person that he shall refrain for submitting a tender or as to the amount included in the tender;

(c) offer or pay or give or agree to pay or give any sum of money, inducement or valuable consideration directly or indirectly to any person doing or having done or causing or having caused to be done, in relation to any other actual or proposed tender for the contract any act, omission or thing of the kind described above.

3. In this certificate, the word "person" shall include any person, body or association, corporate or unincorporated; and "any agreement or arrangement" includes any such information, formal or informal, whether legally binding or not.

Department for
Business, Energy
& Industrial Strategy

Declaration 2: Form of Tender

To: The Department for Business, Energy & Industrial Strategy

1. Having considered the invitation to tender and all accompanying documents (including without limitation, the terms and conditions of contract and the Specification) we confirm that we are fully satisfied as to our experience and ability to deliver the goods/services in all respects in accordance with the requirements of this invitation to tender.

2. We hereby tender and undertake to provide and complete all the services required to be performed in accordance with the terms and conditions of contract and the Specification for the amount set out in the Pricing Schedule.

3. We agree that any insertion by us of any conditions qualifying this tender or any unauthorised alteration to any of the terms and conditions of contract made by us may result in the rejection of this tender.

4. We agree that this tender shall remain open to be accepted by the Department for 8 weeks from the date below.

5. We understand that if we are a subsidiary (within the meaning of section 1159 of (and schedule 6 to) the Companies Act 2006) if requested by the Department we may be required to secure a Deed of Guarantee in favour of the Department from our holding company or ultimate holding company, as determined by the Department in their discretion.

6. We understand that the Department is not bound to accept the lowest or any tender it may receive.

7. We certify that this is a bona fide tender.

Department for
Business, Energy
& Industrial Strategy

Declaration 3: Conflict of Interest

I have nothing to declare with respect to any current or potential interest or conflict in relation to this research (or any potential providers who may be subcontracted to deliver this work, their advisers or other related parties). By conflict of interest, I mean, anything which could be reasonably perceived to affect the impartiality of this research, or to indicate a professional or personal interest in the outcomes from this research

[redacted]

OR

I wish to declare the following with respect to personal or professional interests related to relevant organisations*;

- X
- X

Where a potential conflict of interest has been declared for an individual or organisation within a consortia, please clearly outline the role which this individual or organisation will play in the proposed project and how any conflict of interest has or will be mitigated.

- X
- X

Signed .....

Name .....

Position .....

Please complete this form and return this with your ITT documentation - Nil returns **are** required.

* These may include (but are not restricted to);

- A professional or personal interest in the outcome of this research
- For evaluation projects, a close working, governance, or commercial involvement in the project under evaluation
- Current or past employment with relevant organisations
- Payment (cash or other) received or likely to be received from relevant organisations for goods or services provided (Including consulting or advisory fees)
- Gifts or entertainment received from relevant organisations