SIF Alpha Round 2 Project Registration

Date of Submission

Nov 2023

Project Reference Number

10078792

Initial Project Details

Project Title

Powering Wales Renewably - Alpha

Project Contact

Dozie Nnabuife

Challenge Area

Preparing for a net zero power system

Strategy Theme

Data and digitalisation

Lead Sector

Electricity Transmission

Other Related Sectors

Electricity Distribution

Project Start Date

01/10/2023

Project Duration (Months)

6

Lead Funding Licensee

National Grid Electricity System Operator

Funding Mechanism

SIF Alpha - Round 2

Collaborating Networks

National Grid Electricity Transmission

SP Energy Networks Distribution

SP Energy Networks Transmission

National Grid Electricity Distribution

Technology Areas

Modelling

Digital Network

Project Summary

Pweru Cymru yn adnewyddol (Powering Wales Renewably, PWR) brings together the Welsh Government, power system users and network operators who collectively span the energy system value-chain. Together, they will collaboratively identify the innovation priorities required to support the delivery of the Welsh Government's decarbonisation plans, prepare for a net zero power system and deliver net benefits to Wales's citizens and communities.

Through delivery of a digital twin of the whole Welsh transmission and distribution system combined with other datasets, PWR will provide a digital common interface to accelerate the integration of renewable generation and decarbonised demand into the electricity system.

Add Preceding Project(s)

10060474 - Powering Wales Renewably

Project Budget

£777,909.00

SIF Funding

£499,176.00

Project Approaches and Desired Outcomes

Problem statement

Powering Wales Renewably (PWR) will continue to focus on Challenge 2, "Preparing for a Net-Zero Power System" by 2035, or before. Additionally, PWR makes a positive contribution to Challenge 4, "Accelerating Decarbonisation of Major Energy Demands".

PWR provides a vital accelerator for the Welsh Government to deliver its strategic energy transition plans and the wider energy transition. In 2019, the Welsh Government set ambitious targets to meet 70% of its electricity requirements from Welsh renewable energy sources by 2030.

Specifically, innovation is needed to provide a mechanism that supports stakeholder collaboration across the whole power system. PWR delivers an objective basis on which priorities can be jointly established and agreed.

The Welsh energy system transition, and achievement of net-zero, needs an electricity system that can host the required renewables, integrate decarbonised demand, operate flexibly, meet local needs and ownership aspirations, and coordinate local plans with regional and national plans in order to deliver decarbonisation.

PWR is designed to address three substantive problems, clarified through discovery phase consultation with system users on a bilateral and use case driven multilateral engagement basis, that need to be overcome in order to achieve the Welsh energy system transition, namely:

1. The lack of visibility, and a common understanding by stakeholders, of the whole electricity system network challenges. Data is published, but industry and external datasets are not yet catalogued and correlated to fully satisfy the needs of system users created by the energy system transition.
2. Flexibility is not yet treated as a whole system resource, nor fully coordinated between transmission and distribution.
3. Local area energy plans, network development plans, and the connections queue lack alignment, making potential synergies hard to identify.

The investment in the Discovery Phase has captured system user needs through structured dialogue with key representative stakeholders, including the Welsh Government. Key system users also include Welsh citizens, local businesses, and renewable generators and Discovery has validated and refined our understanding of the problems. The outcomes identified as important by the system stakeholders have been used to prioritise project deliverables. Specifically, the Discovery phase identified:

1. The underlying causes of challenges and improved their understanding
2. how access to a digital twin of the whole T&D electricity system, combined with sources of system user data, can accelerate progress to a net-zero electricity system,
3. the data sets required to deliver prioritised use cases, and
4. governance (policy, regulatory, codes) barriers that, when addressed, present an opportunity to better align incentives with targeted outcomes for system stakeholders. This can provide an objective basis for joint representation by stakeholders to enhance governance.

Discovery has clarified how combining data sets in this novel way can deliver value and accelerate a net-zero electricity system.

PWR builds on previous investments in innovation and the learning that has emerged from programmes, including:

- WPD's (now NGED's) FALCON, CIM and INM BaU projects
- SPEN's DINO and SDIF programmes
- ESO's Virtual Energy System Programme
- SSEN's TRANSITION and TraDER programmes

PWR is radical in its ambition by addressing multiple, inter-related challenges in preparing for a net-zero power system. PWR will deliver:

- a national foundation for the representation of the whole electricity system that enables collaboration and prioritisation,
- a paradigm shift in user defined industry data exchange, stimulating additional innovation opportunities,
- a holistic approach by which constraints and flexibility requirements can be coordinated across Network Operators, multiple markets, and response providers,
- Connections and Capacity Management; visibility of upstream reinforcement, the connection queue and the relationship with

alternative local non-reinforcement technology options.

The learnings from PWR will help inform preparations for a net-zero power system across Britain.

Innovation justification

Pweru Cymru yn adnewyddol (Powering Wales Renewably, PWR) is aligned to Challenge 2, "Preparing for a Net-Zero Power System". Additionally, PWR makes a positive contribution to Challenge 4, "Accelerating Decarbonisation of Major Energy Demands".

The objective for PWR is to enable preparation for a Net-Zero Power System by accelerating integration of renewable generation and decarbonised demand into the electricity system.

PWR is use-case based, designed in collaboration with power system stakeholders and the Welsh Government. The project combines three strategic industry innovation pathways to business-as-usual, by delivering:

1. The first published view of the existing network status using multiple industry and external datasets correlated by an intelligent whole-system network model.
2. The first whole-system (Transmission and Distribution; T&D), near-real-time representation of flexibility requirements, availability and operational dispatch.
3. The first ground-level comparison of Local Area Energy Plan's, T&D network development plans, and the connection queue and its management.

PWR goes beyond incremental innovation because, enabled by the involvement of the Welsh Government, it convened stakeholders from across the electricity value-chain in a series of bilateral and multilateral workshops during Discovery. This provided a common understanding of their needs and the identification of problem barriers (as identified in our response to Question 2), that are inhibiting progress towards a net-zero electricity system. These insights have enabled the use-cases and datasets within PWR to be refined and prioritised for delivery within Alpha and to realise early value.

Based on the insights and consensus achieved, the Alpha Phase will deliver a novel ICT asset that uniquely integrates, for the first time, datasets and digital technologies to create a digital twin of the T&D networks at national scale, across Wales. The twin will address the stakeholder prioritised use-cases and prove the interoperability of the datasets between multiple digital models in the electricity sector.

PWR is unaware of this type of integration having been achieved before in the electricity sector or at this scale to meet the specific innovations listed above.

PWR leverages prior investments by ESO in the Virtual Energy System and NGED and SPEN in their integrated distribution network models. Additionally, PWR uses learning from LCNF and NIC/NIA funded projects including FALCON, DINO and INM for the network asset data and digital models. PWR builds on TRANSITION and the FleX funded TraDER project to inform the data requirements for visibility of flexibility.

PWR is targeted at improving readiness levels:

1. TRL : 3 to 5 in Alpha. Targeting 8 in Beta through the integration of multiple systems and data sources demonstrated at scale in an operational environment.
2. IRL: 3 to 4 in Alpha. Targeting 7 in Beta by proving the integration between systems and the interoperability of the relevant data sets.
3. CRL: 4 to 5 in Alpha. Targeting 8 at in Beta with the commercialisation strategy and business model agreed, and approach to scale-up established.

PWR is designed to meet the SIF objective of being able to scale for business-as-usual at the end of Beta. By targeting Wales at a national scale, the lessons from PWR are expected to enable it to scale to benefit the whole of the British system whilst delivering the targeted benefits for Wales.

Funding through SIF provides the vehicle that has enabled stakeholders from across the power system value-chain to collaborate on the common objective of accelerating decarbonisation of the power system and being prepared for a net-zero power system in 2035, or earlier.

The counterfactual of "Do Nothing" is not an option as it provides no path to the realisation of the benefits that can only be delivered through a Digital Twin solution.

Impact and benefits (not scored)

Financial - future reductions in the cost of operating the network

Financial - cost savings per annum on energy bills for consumers

Financial - cost savings per annum for users of network services

Environmental - carbon reduction – direct CO2 savings per annum

Impacts and benefits description

Value

- Net Benefit across Wales in 10 years following start of ED2: £182m (NPV)
- Net Benefit across GB in 10 years following start of ED2: £1.89bn (NPV)

Sustainability

- CO2e emissions reduction across Wales to 2035: 2.13 million tonnes
- CO2e emissions reduction across GB to 2035: 21.2 million tonnes

1. Financial - future reductions in the cost of operating the network

Reduction in the overall cost of flexibility services:

- Baseline: Baseline costs of flexibility will be established from Licence Condition 31E reporting, ENA Open Networks from procurement of flexibility services and from innovation projects including CrowdFlex and TRANSITION.
- Benefits: Cumulative net benefits will be calculated as a delta to the baseline with stated assumptions on how the Powering Wales Renewably solution will drive reduction in the cost of flexibility services through improved visibility and coordination leading to increased liquidity and competition in the markets for flexibility services.
- Metrics: Financial (£) based on £/MW and £/MWh dispatch.

Reduction in Constraint Payments:

- Baseline: Baseline will be established from the current levels of Constraint Payments.
- Benefits: Cumulative net benefits will be calculated as a delta to the baseline with stated assumptions on how the Powering Wales Renewably solution will reduce curtailment by identification of locations that benefit from deployment of alternate solutions, such as energy vector transformation and storage, once deployed. (£/MWh)
- Metrics: Financial (£) based on a reduction in Constraint Payments

2. Financial - cost savings per annum on energy bills for consumers

Reduction in wholesale electricity costs:

- Baseline: Baseline wholesale cost electricity will be established from market data.
- Benefits: Cumulative net benefits will be calculated as a delta to the baseline with stated assumptions on the price differential between fossil fuel generation and renewable generation that displaces it.
- Metrics: Financial (£) based on £/MWh and volume consumption for Wales.

Gross Benefit: £44.2m (Wales); £438.1m (GB) to 2035

3. Financial - cost savings per annum for users of network services

Improved utilisation of existing network capacity:

- Baseline: Baseline costs of Load Related Expenditure from business plans.
- Benefits: Cumulative net benefits will be calculated as a delta to the baseline with stated assumptions on how the Powering Wales Renewably solution will drive reduction in and deferral of Load Related Expenditure.
- Metrics: Financial (£) based.

Optimisation of T&D new network capacity:

- Baseline: Baseline costs of Load Related Expenditure from business plans.

- Benefits: Cumulative net benefits will be calculated as a delta to the baseline with stated assumptions on how the Powering Wales Renewably solution will drive an equivalent reduction in Load Related Expenditure through additional headroom.
- Metrics: Financial (£) based.
- Gross Benefit: £15.7m (Wales); £248.3m (GB) to 2035

Reduction in customer contributions for connections:

- Baseline: Baseline customer contributions from business plans.
- Benefits: Cumulative net benefits will be calculated as a delta to the baseline with stated assumptions on how the Powering Wales Renewably solution will drive reduction in customer contributions.
- Metrics: Financial (£) based.
- Gross Benefit: £11.2m (Wales); £20.0m (GB) to 2035

4. Environmental - carbon reduction -- direct CO2 savings per annum

Timely and economic connection of renewable generation:

- Baseline: Baseline plans for connection of renewable generation.
- Benefits: Cumulative net benefits will be calculated as a delta to the baseline with stated assumptions on how the Powering Wales Renewably solution will increase the connection of renewables.
- Metrics: Carbon (tonnes CO2).
- Net Benefit: 2.1m tonnes CO2e (Wales); 21.2m tonnes CO2e (GB) to 2035.

Teams and resources

All the Discovery Phase project partners have committed to participate in the Alpha Phase. Additionally, two new partners have agreed to join the Project. This will help the Project deliver its objectives for Alpha and prepare for BAU adoption post-Beta.

During Alpha, we will build and trial the foundational technical elements of the transmission and distribution digital twin, applying the principle of "learn by doing". Alpha leverages the collaboration and progress made during Discovery to grow the digital community around the Project and increase inclusivity by expanding the stakeholders involved.

A key principle of the project is to leverage the investment and progress made by the Network companies on digitalisation and data. The Project innovates by combining for the first time existing datasets to create a digital twin of the whole electricity system. By building on the existing investments of the Networks partners, the SIF funding will primarily be used by the lead and technology partners.

The Discovery Partners will perform the following roles in Alpha (new or modified roles are highlighted in bold):

Electricity System Operator (ESO), Lead Partner:

- Project Management and main problem owner
- Project Governance and reporting
- Stakeholder Management and building engagement
- Strategic alignment with ESO's Virtual Energy System (VirtualES), other associated Digital Twin initiatives, communities and innovators
- Provision of (ESO) electricity industry expertise to steer PWR development of Beta Use Cases and workshop participation.

Welsh Government

- Consulting on alignment with policy, communities and industry priorities
- Access to expert resource from across the Welsh Government itself and from their stakeholders to steer PWR development of Beta Use-Cases and workshop participation.

National Grid Electricity Transmission (NGET)

- Consulting on available and planned-to-be-available datasets
- Provision of sectoral (TNO) expertise to steer PWR development of Beta Use-Cases and workshop participation.

National Grid Electricity Distribution (NGED)

- Consulting on available and planned-to-be-available datasets
- Provision of sectoral (DNO/DSO) expertise to steer PWR development of Beta Use-Cases and workshop participation.

CGI IT UK Ltd

- Design and development of Foundation Twin prototype
- Design and development of up to three products aligned to identified stakeholder priorities:
  - **Interoperability of PWR Twin***- Simplified interaction with the twin for non-expert users through the adoption of Natural Language Processing*
- Visualisation of the Whole Electricity System for Wales
- Use-Case development plan for Beta, including Cost Benefit Analysis
- Stakeholder management, workshop facilitation and alignment with partners

Additional project partners for Alpha include:

- *Scottish Power Energy Networks (SPEN)*. SPEN support the project goals and aims and will provide access to the distribution network datasets for the North of Wales. This will enable complete distribution and transmission coverage for the whole of Wales.
- *CENIN Renewables Limited*. CENIN own Wind, Solar and Anerobic generation plant in S.Wales and are an Asset Owner, meeting the SIF Alpha requirement.

The new partners will perform the following roles in Alpha:

Scottish Power Energy Networks (SPEN)

- Consulting on available and planned-to-be-available datasets.
- Provision of sectoral expertise to steer PWR development of Beta Use-Cases and workshop participation.

CENIN Renewables Ltd

- Provision of project relevant system user experience to steer PWR development of Beta Use-Cases and workshop participation.

The project team has also spoken to Sero Group, Energy Local and EDF Renewables, all are very interested and supportive of the project. All three companies have previously interactions with Welsh Government and we intend to continue engagement during Alpha as potential Beta partners.

The PWR project has provisioned for the necessary resources, equipment and facilities, including cloud IT compute and storage for the development of the PWR Demonstrators, travel, and meeting room facilities to reflect the longer duration and detailed scope of Alpha, and the expanded number of partners involved.

Project Plans and Milestones

Project management and delivery

Delivery will be achieved via five themed Work Packages (WPs). WP1 and WP2 will primarily use workshops and structured interviews to obtain information to support the subsequent WPs and the creation of the specification and cost benefit analysis for the Powering Wales Renewably: Beta phase.

Project Management, using an agile approach with fortnightly scrum-style updates, will assess progress and define the work programme for future sprints, while keeping aligned to the required outputs.

WP3 and WP4 will enable Demonstrators to be produced in order to support the validation and refinement of requirements for Beta through stakeholder attended demonstrations. Benefits Dependency Frameworks were produced within the Discovery phase to inform the focus for these, and are included within the Project Management Book Template.

A Gantt chart, showing timings, is also included within the Project Management Book Template.

Participants:

Stakeholders, including representatives and subject matter experts (SMEs) from partner organisations, will be engaged in the tasks, as required.

WP1: Project Management and Governance [£64,488; Lead: ESO]

Outputs:

- Establish, maintain and complete project operation

WP2: Business Process Engagement and Dissemination [£173,743; Lead: ESO]

Outputs:

- Maintain external communication and information flows to interested parties
- Obtain stakeholder driven use case definitions
- Cost-Benefit Analysis

WP3: Technical Provision [£92,171; Lead: CGI]

Outputs:

- Provision of an electricity network digital twin platform populated with network data and other useful datasets (Foundation Data Platform)

WP4: Product (Demonstrator) Development [£91,873; Lead: CGI]

Outputs:

- Provision of a series of applications that demonstrate the value and usefulness of the Foundation Data Platform

WP5: Report Findings and Future Planning [£76,901; Lead: ESO]

Outputs:

- Documentation of findings and future activity planning

Deliverables & Milestones

Deliverables:

- WP1-D1 -- Signed Contract [02/10/23]
- WP1-D2 -- End of Phase Finance Report [31/03/2024]

- WP2-D1 -- Stakeholder driven use case definitions [31/03/2024]
- WP3-D1 -- Demonstrator Platform [08/12/2023]
- WP5-D1 -- Mid-point Review Show & Tell webinar presentation [22/12/23]
- WP5-D2 -- End of Phase Show & Tell webinar presentation [12/04/24]
- WP5-D3 -- End of Phase Report including CBA [31/03/2024]

Milestones:

- WP1-M1 -- Project Kick off [02/10/2023]
- WP2 -M1 -- Product-focussed stakeholder workshop 1 [08/12/2023]
- WP2 -M2 -- Product-focussed stakeholder workshop 2 [19/01/2024]
- WP2 -M3 -- Product-focussed stakeholder workshop 3 [16/02/2024]
- WP3-M1 -- Demonstrator Platform Built [08/12/2023]
- WP4 -M1 -- Demonstrators shared with key stakeholders [16/02/2024]
- WP5-M1 -- End of Phase Report Prepared [31/03/2024]
- WP5-M2 -- Project Completion [31/03/2024]

Risk Management Strategy

Risk Management will be a continuous process, monitored and actively maintained by the Project Manager. An Identify, Assess, Control, Record approach will be used. Risks will be a standing item in the regular progress meetings and at the Project Steering Group. Mitigation activities, owner assignment and progress will be discussed. Escalation, with appropriate management, will be considered, where required.

During the Alpha phase we have targeted key risk areas, including:

- Enduring stakeholder collaboration
- User adoption of the digital twin
- Avoiding unintended consequences of the provision of a digital twin, including cyber security and data protection

A key learning from the Alpha phase will be to quantify and determine mitigation methods for these risks, informing the Beta phase.

The initial risk table is included within the Project Management Book Template.

This project does not require any planned or potential unplanned supply interruptions for consumers.

The Project is designed to ensure that consumers have access to the energy services and connections they require through the provision of the digital twin. We have expanded the stakeholder group to include wider representation of energy consumers and have ongoing support of other consumer groups, e.g. EnergyLocal, Sero Group and EDF Renewables.

Key outputs and dissemination

Powering Wales Renewably (PWR) will inform and accelerate the engagement and adoption of Digitalisation solutions at scale. Using Wales as a focused pilot area, the approach can be scaled up to operate across the whole of the GB electricity system. The key project output is an electricity network twin that will inform and establish an integrated digital representation of the Welsh electricity system, across both Transmission and Distribution (T&D), thereby enabling enhanced network capacity utilisation and coordination across Wales.

To meet this goal, the plan identifies five work streams, with specific objectives, to enable rapid development towards a BAU implementation. We appreciate the need for swift progress, having identified through the Discovery work, the absence of a consolidated T&D twin that delivers the Energy Digitalisation Taskforce (EDiT) recommendations. With this scope in mind, we have designed the Alpha Phase plan to achieve the following:

Work Stream 1 -- Project Governance and Management, led by ESO

Work Stream 2 -- Business Process Engagement, led by ESO, with support from project partners

- Identification of and engagement with interested parties and existing business processes.

- Continuous activity to promote PWR's capability, vision and (critically) further define stakeholder / customer driven use case requirements.
- Expand the CBA.
- Interface with ESO's Virtual Energy System (VirtualES), Ice Breaker One and other Energy Twin projects to demonstrate interoperability.
- Dissemination and evangelise twin benefits, to drive enterprise and transition to net-zero through outreach with stakeholders, existing and emergent.

Work Stream 3 -- Technical Foundation Twin Establishment, led by CGI

- Establish Foundation Platform.
- Design and implement an initial twin of T&D network (11kV upwards).
- Demonstrate interoperability and design for ingestion with LAEP, Data Map Wales, and other datasets.

Work Stream 4 -- Use Case Demonstrator, led by CGI, with support from project partners

- Prototype visualisation for representation of the foundation twin.
- Generate data exports from the Foundation Platform.
- Investigate potential for a prototype natural language interface to interrogate network.

Work Stream 5 -- Report Findings and Future Planning, led by ESO, with support from project partners

- Document Stakeholder business adoption vision.
- Apply learnings, report demonstrator development path, and prepare Beta submission.
- End of Phase Report / Show and Tell.

The project will adopt an agile development approach, focused on iterative advances, through dedicated work streams. Any learnings on interoperability, and other aspects of digital twin development, will be shared with other digital twin programs, including Digital Spine, VirtualES and the National Digital Twin Programme. ENA Open Networks and Icebreaker One will be engaged to share learnings for a System Visibility Interface and support industry wide initiatives to deliver this, while ensuring alignment to open data timetables.

Additionally, the Foundation Platform may be used to support coordination of emergent Flex markets, connection queues and communicate constraint issues. Work Stream 2 will form user groups and gather feedback, as well as share through demonstration sessions, the progress and lessons learnt. This will be shared with the VirtualES, Universities, other twin projects and appropriate industry events, to build cross-project learning in an inclusive and constructive manner.

Alpha will deliver these key benefits:

- Enable customers to view, from their connection point, relevant T&D system network status.
- Externally published datasets correlated against T&D system network model to create intelligent twin.
- Early indication of which distribution connections have transmission dependencies.
- Proactive indication of network areas with additional potential for renewable DER, or local decarbonisation.
- Learnings on the scale of difficulties in populating a digital twin with data from diverse organisations.
- Production of a more detailed approach to the delivery of the additional Use Cases.

To be captured in the Business Impact Assessment supported by the CBA.

Commercials

Intellectual property rights, procurement and contracting (not scored)

Powering Wales Renewably (PWR) project partners will comply with the default IPR conditions set out in Chapter 9 of the SIF Governance Document. During Discovery, Partners identified and agreed background IP they expect to use in the Alpha phase. They established mechanisms to capture Foreground IP as it emerges through Alpha.

The ownership model laid out in the Discovery contract will be reviewed and agreed before the Alpha project commences. It will comply with relevant clauses in the SIF Governance Document regarding IPR. These output findings will be included in the published report.

Network partners have confirmed that they do not anticipate any IP related constraints or concerns with the PWR project. This will be reflected in a legal agreement amongst the project partners prior to beginning the Alpha project.

The lead partner, ESO, will publish project reports on the Energy Networks Association's Smarter Networks Portal. Commercially sensitive market information and Critical National Infrastructure sensitive operational information will not be included in these reports. Following appropriate and proportional data assessment, and agreement amongst the project partners, reports will be publicly accessible to share learnings widely. The intention is to use already available data sets or prospective data sets scheduled to become available during Alpha.

The foreground IP generated will be software, methods and processes. Existing background IPR mainly resides with CGI IT UK Ltd in the reuse of the Integrated Network Model CIM compliant data structures that serve Wales and were made available to the industry following the Western Power Distribution CIM project. This is a key accelerator for the creation of the Whole System Foundation model. In addition, CGI has already secured internal investment for the provision of a dynamic network model capability that will provide an accelerator for the creation of the Foundation solution. The dynamic network model will be made available to the project. Foreground IP to be developed in the Alpha Phase has been identified and IP Ownership will be captured in the project IP register. Output findings will be included in the published report.

Where findings in the report are derived from project partner's Background IP (e.g., models, data or technologies), this Background IP will not be included in the report nor made publicly available without the agreement of the IP Owner. This is to protect the IP rights of project partners, as set out in Chapter 9 of SIF governance. The project will demonstrate innovative software and techniques developed during the Alpha phase to stakeholders and fellow innovators through dissemination events.

For the Alpha phase, the project does not anticipate running any procurement events. Publicly available compute and tooling will be utilised by the project, using commercially available tools, leveraging existing enterprise agreements from the partners.

Commercialisation, route to market and business as usual

Powering Wales Renewably (PWR) will deliver a national foundation representation of the whole electricity system. It enables collaboration between stakeholders across the energy system value-chain and provides an objective basis for prioritisation of initiatives and investment.

The novel technical solution delivered by PWR consolidates datasets from stakeholders operating across the whole power system value-chain, including system users (customers). As such, the PWR solution presents a value proposition that addresses the identified needs of all network operators and power system stakeholders. The commercialisation model therefore needs to be considered in that context.

Through Discovery, PWR has identified three commercialisation pathways that could provide the route to market and business-as-usual deployment for PWR. These are:

- Service model: By the end of Beta the financial model for taking to market a service based on the PWR solution will be validated, contracts secured to provide revenues, and a qualified pipeline to secure investment to scale the technical solution identified.
- Product model: By the end of Beta the financial model will be validated for taking to market a product based on the PWR solution, contracts secured to provide revenues (including licences), and a qualified pipeline to secure investment to scale the technical solution identified.

- Digital Common model: At the end of Beta, the financial and regulatory models, commercial vehicle, and the scope of services that deliver a digital common that enables a well-functioning market will be established. Services delivered by a Digital Common model would be limited to those services common to all market actors, that deliver economies of scale, that secure trust in the market, and from which market actors cannot create cost leadership nor differentiate themselves.

In addition to the lessons from commercialisation and implementation into business-as-usual operations of existing innovations in intelligent network models, the Alpha and Beta phases will provide an evidential base that will inform decisions on the most appropriate pathway to commercialise PWR and to optimise the benefits for all stakeholders.

Project partners will collaborate closely with the regulator, in consultation with local and national policy makers, to determine the most appropriate commercialisation vehicle and funding mechanism for the technical solution. The impact of other industry initiatives will also factor into determining the optimum approach to commercialisation. These initiatives include:

- The Department of Energy Security and Net Zero's Energy System 'Digital Spine' Feasibility Study.
- Ofgem's Call for Input on the Future of Distributed Flexibility.
- The establishment of the Future System Operator.

The partners on PWR all have track-records of delivering solutions and establishing commercial and funding models that support development and efficient operation of competitive markets. ESO, the transmission operator and the DNOs deliver the services that ensure people benefit from reliable access to power. CGI is trusted to deliver the digital solutions that enable competitive electricity and water markets to function effectively. Welsh Government will lead on policy aspects. The PWR Project Partners can therefore be considered ready to commercialise and scale the solution. Currently, no investment requirements have been identified for the partners.

The ESO, as lead partner, provides an executive level sponsor for Powering Wales Renewably. As sponsor, ESO is proactively engaged in the project, supporting use case definition, identifying the project's strategic potential for T&D coordination, and secured agreement from the ESO executive team for this SIF proposal.

PWR addresses barriers to the development of well-functioning, competitive markets and avoids the creation of a digital monopoly that could have the potential to undermine the creation of value by, and for, actors within those markets. It achieves this through full alignment with Open Data principles and the latest Data Best Practice guidance from Ofgem.

Policy, standards and regulations (not scored)

The Discovery Phase of Powering Wales Renewably (PWR) did not identify any policy or regulatory barriers that would require derogations or exemptions to successfully complete the Alpha or Beta Phases.

During the Discovery Phase we conducted a series of workshops with system actors from across the electricity system value chain. Through these workshops, stakeholders began to identify a number of areas of regulation or industry codes that might benefit from modifications that could facilitate the realisation of the benefits targeted by PWR in business-as-usual. These potential changes will help inform the expected learning outcomes from the Alpha Phase.

Examples include:

- Informing potential changes to regulatory obligations or industry codes to support the current activity on connection queue reform.
- When network assets qualify as regulated assets.

Barriers

PWR will leverage existing data standards and existing accessible datasets made available by actors from across the system value chain. The Project will test these standards and the integration of inter-system actor datasets in a demonstration environment. It will provide feedback on any issues that current open data and data integration approaches may raise when applied to electricity datasets. Hence, it will identify areas where greater policy and regulatory clarity could accelerate progress, including:

- Evolution of standards to facilitate data interoperability between energy system actors. This will build on the work of the ENA Data Working Group, Energy Digitalisation Taskforce, Energy Data Taskforce, the Virtual Energy System Common Framework, Centre for Digital Built Britain, the Digital Twin Hub, the Digital Spine feasibility study and Icebreaker-One Open Energy. This work is included within Work Package 3 of our plan.
- Development of market structure/architecture and mechanisms to facilitate data access by system actors. Development of roles and obligations of energy system actors will build on the output from relevant industry initiatives, which include the ESO's

initiative on connection queue reform, Ofgem's future reform to the electricity connections process, Ofgem's Call for Input on the Future of Flexibility and the relevant Department for Energy Security and Net Zero Flexibility Innovation Programme projects.

Policy considerations

- The obligation to procure the most economically advantageous services in the future might be supplemented by the inclusion of the value of reducing carbon emissions or the acceleration of climate action.
- It remains an open question as to how future data services are best funded. PWR will inform the approach to commercialisation of the solution into business-as-usual. We cover some of the considerations in our response to Q10.

These will be included within the Alpha phase of the project, but the focus of this project is to determine the value for each stakeholder, not how these services are to be funded.

Evidence

Industry stakeholders will continue to be actively engaged during the Alpha Phase. This will ensure the deliverables are fit for purpose and relevant to system actor needs. A report of these challenges will be compiled, including options for how they might be addressed in policy and regulation.

Derogations

As anticipated, the Discovery Phase did not identify a need for a derogation for the Alpha Phase of the project. The project's approach of federating data from known business-as-usual partner systems is compliant with current license conditions.

As the project progresses through the different stages (Alpha, Beta and into business-as-usual), continuous assessment of any (new or existing) potential regulatory barriers will continue to be undertaken and tackled through proactive engagement with the relevant stakeholders.

Value for money

Total Project Cost: £777,909

Total SIF Funding Requested: £499,176

Project Contribution: £278,333 (35.8% Project Contribution)

Allocation of SIF Funding and Contribution across Project Partners:

- ESO (lead partner). £154,029 total costs. 18% contribution (including the Welsh Government £14,400 contribution as a sub-contractor) relating to time required to provide expertise and ensuring coordination and successful delivery of the project, funded through ESO Innovation Funds.
- The Welsh Government will provide guidance for setting strategic priorities/plan for achieving Net-Zero goals and will provide a 100% contribution covering their time relating to the project, funded through the Welsh Government Clean Energy Budget.
- CGI £566,939 total costs. CGI incur a significant proportion of the costs, as they are the expert data and digitalisation partner and will provide the required expertise and digital know-how. CGI's contribution of 43.16% will be provided through contributions in kind from existing investments in background IPR, as well as a 12.18% discount in day rates. CGI will sub-contract Create Innovative Solutions for the provision of additional engineering Subject Matter Expertise and Consultancy in the area of Whole System planning and Strategy.
- There will be minimal costs for the other project partners. Their contributions will be time and expertise provided in project meetings and working groups that require minimal cash funding and are as follows:
  - NGED: £19,475 total costs. 10% Contribution funded from innovation funds.
  - NGET: £18,211 total costs. 10% Contribution funded from innovation funds.
  - SPEN: £13,375 total costs. 10% Contribution funded from innovation funds.
  - CENIN Renewables: £5,880 total costs. 10% Contribution funded from innovation funds.

The balance of costs/SIF funding across partners reflects the effort required from the partners for the delivery of the work packages/milestones (please see Question 7 Project Management Book for more details).

Value for money for the consumer

The project delivers value for money by focusing on consumer-driven use cases linked to the delivery of specific benefits that significantly outweigh costs. Primary benefits targeted include utilisation of existing and new network capacity, reduced customer

connection contributions, CO2 and cost reduction through fossil fuel generation replacement with renewables, and reductions in flexibility cost and constraint payments. This project will deliver additional value by enabling linkages to other projects that will accelerate the industries digitalisation initiatives. The project will leverage existing open datasets provided by the Network Operators and gather expanded stakeholder feedback through development of innovative Proof-of-Concepts (PoCs) that will be expanded in Beta.

Additional Funding

No additional funding from other innovation funds will be included in Alpha. However, previous projects funded under NIA and NIC will inform Alpha. These include the WPD CIM project, SPEN DINO and SSEN TRANSITION.

Existing Assets

Background IP in enhancements to the Integrated Network Model (INM) will be utilised in the foundation Digital Twin model. The original Integrated Network Model was developed by CGI on the WPD CIM NIA project. The enhanced Integrated Network Model (INM) application, a component within the OpenGrid360 suite of products, will be made available to the project at no cost. This contribution is valued at £200,000 for a commercial licence.

Associated Innovation Projects

- ○ Yes (Please remember to upload all required documentation)
- ◉ No

Supporting documents

File Upload

PWR Show and Tell v1.0 (1).pdf - 792.8 KB
ESO 738261_ESO PWR Stakeholder Priorities and Benefits Report v 1.0 (1).pdf - 862.8 KB
SIF Alpha Round 2 Project Registration 2023-11-27 2_53 - 101.9 KB

Documents uploaded where applicable?

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