Notes on Completion: Please refer to the appropriate NIA Governance Document to assist in the completion of this form. The full completed submission should not exceed 6 pages in total.

NIA Project Registration and PEA Document

Date of Submission

Dec 2021

Project Reference Number

WPD_NIA_063

Project Registration

Project Title

Flexible Operation of Water Networks Enabling Response Services (FLOWERS)

Project Reference Number

WPD_NIA_063

Project Licensee(s)

National Grid Electricity Distribution

Project Start

January 2022

Project Duration

1 year and 7 months

Nominated Project Contact(s)

Nick Devine

Project Budget

£287,729.00

Summary

The FLOWERS project will analyse the potential capacity on South West Water's network to embed flexibility capacity within the time difference (latency) between when Drinking Water and Waste Water is pumped and stored, and when it used by the system. It will explore methods of delivering latency flexibility and analyse the feasibility of implementing it on SWW's system. It will define the regulatory compliance and commercial viability requirements for creation of a latency flexibility product which can be embedded within electricity network control rooms. If appropriate, a recommendations document will be produced identifying next steps for the development of latency flexibility capacity in ED2. The project will be delivered in partnership with South West Water and Smart Grid Consultancy.

Third Party Collaborators

South West Water

Smart Grid Consultancy

Problem Being Solved

Water networks are one of the largest demands for electrical power supplied on distribution networks, estimated at 1TWh across WPD's four licence areas. However, Water and Sewerage Supply licence holders only deliver limited flexibility capacity to distribution networks to manage their electrical demand.

Water network operational processes are dictated by water supply and demand needs and do not align withelectricity network requirements. As such, there is unexplored potential to embed capacity within these processes to flexibly shift the electricity demand of water pumps to relieve constraints on distribution network for both demand and generation connections. However, neither the technical and operational requirements to deliver this kind of flexibility, nor the forecasting or commercial arrangements necessary for procuring it are well understood.

Method(s)

This project will analyse the potential for water networks to deliver flexibility to distribution networks by embedding capacity within the operational processes which manage the inherent time difference (latency) between when water is pumped and stored for Drinking Water and Waste Water functions. It will assess the technical, operational and commercial requirements for extracting latency flexibility from water networks. This work will take place in partnership with South Wester Water (SWW), and consist of 6 work packages:

LFA1. Feasibility of latency flexibility

This work package will explore methods of delivering latency flexibility and analyse the feasibility of implementing it on SWW's system. A series of workshops will be held with SWW data and process engineers to identify SWW flexible assets and processes to map against WPD constraint requirements.

LFA2. Regulatory feasibility and development of commercial and regulatory relationships

This work package will define the regulatory compliance and commercial viability requirements for creation of a latency flexibility product which can be embedded within the 1st tier of flexibility to be accessed by electricity network control rooms. WPD and SWW legal teams will be engaged to assess the legal feasibility of creating the latency flexibility product.

LFA3. Mapping and case study selection

This work package will create and implement a methodology to quantify and map the capacity for latency flexibility from LFA1 onto SWW's networks and WPD's constraint map to identify areas of greatest potential benefit. From this a shortlist of potential case study areas will be produced, from which one will be selected.

LFA4. Technical and operational system specification

This work package will document the technical and/or operational solutions necessary to implement latency flexibility. It will assess the cost of implementing these solutions across SWW's network. It will aim to specify the required revised standard operating procedures, process solutions, software solutions and (if necessary) hardware.

LFA5. Case study modelling, simulation and cost-benefit analysis

This work package will take the outputs of work packages 2-4 and model the implementation and procurement of latency flexibility in the case study area. It will analyse the capacity procured over a set time period and perform a cost-benefit analysis to identify the potential benefits of the system.

LFA6. Recommendation for follow-on project and final report

This work package will produce a report analyse the outcomes of the preceding five work packages and, if deemed appropriate, produce recommendations for the follow-on project to FLOWERS.

Scope

FLOWERS aims to increase the capacity embedded within water networks to deliver flexibility for distribution networks. Water utilities are one of the largest consumers of electrical power, about 1TWh of demand across WPD's four licence areas. South West Water contributes 300GWh of this demand. Developing new operational processes and removing commercial and regulatory barriers for water networks to deliver flexibility therefore presents a significant opportunity for unlocking of flexibility capacity which is value for money to customers.

The project builds on an NIA project delivered by National Grid ESO to investigate the potential flexibility capacity in storm drains and wastewater catchments, which quantified capacity but did not create a commercial model for accessing it. It will expand the search for capacity on water networks, quantifying the available capacity across both wastewater and drinking water systems within the inherent latency of their pumping operations. As such, it is expected to uncover a greater level of capacity and also develop a cost-saving commercial model for its delivery.

It is conservatively estimated that this project can deliver 0.25% of water network demand as flexibility. This amounts to 750MWh of capacity extracted from South West Water's Network yearly. Replicated across the breadth of the four licence areas, this could unlock upwards of 2.5GWh of flexibility capacity on water networks. These capacities could, respectively, deliver £2.5m and £8.5m of value to customers.

Objective(s)

Assess the technical and legal feasibility of embedding flexibility on water networks within the latency of their internal pumping operational processes.

Quantify and map water latency flexibility capacity to understand the alignment between availability and network constraint zones.

Determine the commercial arrangements necessary to procure flexibility capacity within water network processes.

Understand the technical and operational requirements of the system that would trigger latency flexibility.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

N/A

Success Criteria

Details of how the Funding Licensee will evaluate whether the Project has been successful. This cannot be changed once registered.

A business case and cost-benefit analysis for using water network latency as a flexibility source will be created.

The high-level specification of a latency flexibility system will be documented for implementation in an appropriate follow-on project.

The capacity for latency flexibility on SWW's network will be quantified, with a methodology that can be replicated by WPD or other DNOs for other water networks.

A commercial proposal will be submitted to Ofgem and Ofwat for the implementation of the latency flexibility.
product

Project Partners and External Funding

South West Water - £84,700 contribution (23% of total project costs)

Smart Grid Consultancy

Potential for New Learning

The assessment of the feasibility of latency flexibility will provide learning of the additional capacity for flexibility that exists within water networks beyond conventional flexibility procurement. This will be of financial value to customers. Furthermore, it will develop understanding of the commercial and regulatory barriers and solutions for collaboration between regulated industries on innovation projects. It will increase knowledge sharing between electricity and water networks and facilitate understanding of further opportunities to solve Whole System challenges in RIIO-2.

Scale of Project

This is a desktop based project based in the South West licence area.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL6 Large Scale

Geographical Area

The geographical area covered by this project will be the area of overlap between WPD's and South West Water's respective networks. This is entirely located in the South West licence area.

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

Total project cost: £372,429

Agreed Partner Contribution (South West Water): £84,700 (23%)

Sub Total: £287,729

WPD Contribution: £37,243

Funding from NIA: £250,486

Project Eligibility Assessment Part 1

There are slightly differing requirements for RIIO-1 and RIIO-2 NIA projects. This is noted in each case, with the requirement numbers listed for both where they differ (shown as RIIO-2 / RIIO-1).

Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations (Please complete sections 3.1.1 and 3.1.2 for RIIO-2 projects only)

Please answer **at least one** of the following:

How the Project has the potential to facilitate the energy system transition:

N/A

How the Project has potential to benefit consumer in vulnerable situations:

N/A

Requirement 2 / 2b

Has the potential to deliver net benefits to consumers

Project must have the potential to deliver a Solution that delivers a net benefit to consumers of the Gas Transporter and/or Electricity Transmission or Electricity Distribution licensee, as the context requires. This could include delivering a Solution at a lower cost than the most efficient Method currently in use on the GB Gas Transportation System, the Gas Transporter's and/or Electricity Transmission or Electricity Distribution licensee's network, or wider benefits, such as social or environmental.

Please provide an estimate of the saving if the Problem is solved (RIIO-1 projects only)

It is anticipated that this project will develop a capacity for embedded flexibility with water networks. As noted above, it is conservatively estimated that this project can deliver 0.25% of water network demand as flexibility. This amounts to 750MWh of capacity extracted from South West Water's Network yearly. Replicated across the breadth of the four licence areas, this could unlock upwards of 2.5GWh of flexibility capacity on water networks.

WPD's procurement of flexibility in RIIO-1 has so far deferred more than £40m of reinforcement for more than 509MWh of flexibility. Using this ratio, an alignment of only 5% of the unlocked flexibility capacity with constrained zones would deliver an estimated £2.5m of value to customers from South West Water's network, and £8.5m from all water networks in WPD's licence areas

Please provide a calculation of the expected benefits the Solution

N/A

Please provide an estimate of how replicable the Method is across GB

The Method is replicable across DNOs, with the value of savings relative to the total demand of water networks per licence area. As water networks supply the same set of customers as distribution networks, it is reasonable to assume that the demand will be a similar significantly high proportion in other licence areas.

Please provide an outline of the costs of rolling out the Method across GB.

The project will include a cost-benefit analysis of the full BAU rollout of latency flexibility and will ensure the cost effectiveness of the product is calculated before recommendations for implementation in BAU or further NIA projects.

Requirement 3 / 1

Involve Research, Development or Demonstration

A RIIO-1 NIA Project must have the potential to have a Direct Impact on a Network Licensee's network or the operations of the System Operator and involve the Research, Development, or Demonstration of at least one of the following (please tick which applies):

☐ A specific piece of new (i.e. unproven in GB, or where a method has been trialled outside GB the Network Licensee must justify repeating it as part of a project) equipment (including control and communications system software).

☐ A specific novel arrangement or application of existing licensee equipment (including control and/or communications systems and/or software)

☑ A specific novel operational practice directly related to the operation of the Network Licensees system

☑ A specific novel commercial arrangement

RIIO-2 Projects

☐ A specific piece of new equipment (including monitoring, control and communications systems and software)

☐ A specific piece of new technology (including analysis and modelling systems or software), in relation to which the Method is unproven

☐ A new methodology (including the identification of specific new procedures or techniques used to identify, select, process, and analyse information)

☐ A specific novel arrangement or application of existing gas transportation, electricity transmission or electricity distribution equipment, technology or methodology

☐ A specific novel operational practice directly related to the operation of the GB Gas Transportation System, electricity transmission or electricity distribution

☐ A specific novel commercial arrangement

Specific Requirements 4 / 2a

Please explain how the learning that will be generated could be used by the relevant Network Licensees

The outcomes of this project will generate learning on latency flexibility that can be used by any Network Licensee. The capacities investigated in this project are attributable to all Water Supply and Sewerage Supply areas, as the processes involved are carried out by all water utilities. Learning on the operational, process and technical requirements will be adaptable by Network Licensees to implement within their own processes and that of the water utilities within their licence areas.

As such, the cost benefit of the outcomes of this project will be applicable across the UK. Any policy or standard techniques will be shared with other LNOs/LSOs.

Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

n/a

Is the default IPR position being applied?

☑ Yes

Project Eligibility Assessment Part 2

Not lead to unnecessary duplication

A Project must not lead to unnecessary duplication of any other Project, including but not limited to IFI, LCNF, NIA, NIC or SIF projects already registered, being carried out or completed.

Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

This is the first time a project with this methodology has been undertaken between a DNO and water network.

If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

NGESO “Enhancing Energy Flexibility from Wastewater Catchments Through a Whole System Approach” examined flexibility in water networks. Focus was constrained to headroom in rare weather event water catchments. Conversely, FLOWERS will look at opportunities for flexibility across DW and WW pumping activities and take a system interoperability approach with an array of potential triggers and processes.

Additional Governance And Document Upload

Please identify why the project is innovative and has not been tried before

This project will investigate creating an innovative flexibility product embedded in water network processes. This has only been attempted previously with rare weather event water catchments by NGESO, and did not investigate the wider variety of potential opportunities described above. It will develop an innovative commercial relationship between two utilities to deliver value for money on flexibility.

Relevant Foreground IPR

The Relevant Foreground IPR is:

- All report deliverables as described in section 2.2.
- A combined flexibility capacity and constraint map.

Relevant Background IPR required to produce this is:

- WPD network assets and constraint maps
- South West Water network maps
- South West Water MPAN demand data
- South West Water pumping process policy and techniques
- South West Water pumping asset information

Data Access Details

South West Water asset and demand data will be obtained to facilitate LFA3 and LFA4. This data is confidential to South West Water and can only be released to interested parties with South West Water consent.

Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

We would not normally fund the investigation of new methods of flexibility procurement in BAU. The methodology described aims to unlock a new kind of flexibility capacity, as opposed to adding new sources of conventional flexibility.

Please identify why the project can only be undertaken with the support of the NIA, including reference to the specific risks(e.g. commercial, technical, operational or regulatory) associated with the project

Water network latency is an unproven method for delivering flexibility to electricity networks. There is an inherent risk that the method will prove unfeasible for technical or regulatory reasons. The development of latency flexibility requires external knowledge of water networks not inherent to WPD, and an innovation trial with key specialist skills is the most sensible approach.

This project has been approved by a senior member of staff

☑ Yes