NIA Project Registration and PEA Document

Date of Submission

Aug 2015

Project Reference Number

NIA_SPEN0009

Project Registration

Project Title

Data Intelligence for Network Operations (DINO) Phase 1.

Project Reference Number

NIA_SPEN0009

Project Licensee(s)

SP Energy Networks Distribution

Project Start

September 2015

Project Duration

1 year and 11 months

Nominated Project Contact(s)

SPEN Technology Development Manager Geoff Murphy geoff.murphy@spenergynetworks.co.uk; SPEN Project Manager Fiona Fulton fiona.fulton@spenergynetworks.co.uk; SPEN Business Owner John Kirkwood john.kirkwood@spenergynetworks.co.uk

Project Budget

£850,000.00

Summary

The high level Scope of this project is to deliver a working Proof of Concept of how data can be managed and used effectively in decision support.

To deliver this SPEN has identified several discrete Work Packages to be delivered under the project:

- **WP 1: Discovery**

Fully understand the data issues/inconsistencies that exist and the problems they cause. Fully validate that the propose approach will address these problems

- **WP 2: DINO Proof of Concept (PoC) Build**

Focused on the build out of a test bed to allow operation of use cases in new data management environment

- **WP 3: DINO Evaluation**

Focused on the identifying the pros and cons of operating the business under the new data regime by comparing the PoC with current operational processes.

- **WP 4: Business as Usual (BaU) Adoption**

Focused on the identification of the necessary business changes required to adopt DINO best practices into BaU e.g. policy changes,

reference architectures, Smart IT roadmap.

- **WP 5: Further enhancements**

Focused on the identification and evaluation of further enhancements in DINO that can deliver additional DNO / customer benefits.

- **WP 6: Dissemination**

Focused on the dissemination of the project learning to UK customers, DNOs and vendors of remote sensing equipment / asset management systems to stimulate the market.

Third Party Collaborators
CGI

Nominated Contact Email Address(es)

innovate@spenergynetworks.co.uk

Problem Being Solved

This project seeks to research the two levels of "large volume data management" problems which Distribution Network Operators (DNOs) will experience more and more as they move towards a "Smart Grid":

1. **The issue of too much data**

DNO Network Management Centres (NMCs) are presently inundated with data from the network, be it analogues, alarms or events. As emerging 'smart' technology becomes more prevalent on our networks this issue will only be exasperated, be it through the integration of smart meter data, Dynamic Rating / Active Network Management (ANM) schemes or additional sensors to monitor the impact of low carbon technology. It is estimated that this increase of data could be factors of 1,000 times greater than presently received, particularly if smart meter information is considered. Hence, we need to turn large volumes of data into useful information suitable for supporting operational decisions.

This is a big problem area and in order to focus we have taken a use case led approach. This approach allows us to take a narrow route through a large problem. Hence, in this initial Phase of the DINO project we will look at the use case of handling alarms from Network Controllable Points (NCP), which represents a real "too much data" problem experienced today.

This will give us a basic understanding of concepts that we would then look to apply to other areas of monitoring e.g. smart metering, in follow on projects / Phases. Addressing this business issue would provide immediate benefit and hence, would demonstrate how to facilitate the acceptance of new data practices.

2. **The issue of data exchange/discovery**

Passing data between multiple systems and ensuring that only one current version of truth exists is an ongoing issue for all DNOs. Without solving this it is hard to understand the full context (network, asset, communications) that information relates to. As part of the process of identifying the solution for the business use cases identified in (1) we will also investigate the potential future data infrastructure required for DNOs as they build out their smart grid infrastructure.

Within the context of the business use cases outlined in (1) we would like to understand the benefits of:

- Modelling the solution in the Smart Grid Architecture Model (SGAM) framework

- The potential use of the Common Information Model (CIM) or other service oriented standards to help with data discovery and exchange

- How systems and standards will work to handle the use cases emerging from multiple data streams e.g. smart meters, substation monitors, ANM etc.

- An indication of how we could move to an improved system in a step-wise fashion, given that many legacy systems will remain in-situ

Although base technology exists to address these problems, the best methodology to do so is unproven. This project is research based as it evaluates different ways of managing, analysing and visualising data.

Method(s)

1. Chose data related use cases in key business areas (NCP alarms)

· Identify key business contacts to engage in problem identification.

· Identify any existing IFI/LCNF activity that may have attempted to address these problems and cross reference.

· Prioritise identified issues based on business impact and perceived ability to resolve.

· Use information as a basis to identify a partner with the expertise to assist in this area.

2. Analyse existing processes and innovate on how they are best solved

· Initiate workshops with chosen partner to expand issues faced in NCP use case area, and brainstorm the ideal end goal solution. End goal solutions must be innovative/novel rather than "fix the existing system" as this would be very much BAU.

· Prioritise developed use cases.

· Identify what data methodology and infrastructure is needed to solve the problem

o assessment of existing IT/OT estate

o location and structure of information

o best approach to enabling access to the data. This includes understanding the applicability of SGAM, CIM, IEC61850, new network models, service bus technology etc. in achievement of business goals

3. Data Science

· Determine novel data science/analytics/visualisation techniques to understand which methods are best suited to business needs of DNO

· Leverage other grid based analytics research

· Understand what data is available, it's reliability, what data we actually need to achieve the business goal we have set

4. Test the theory

Based on the previous steps build a test lab Proof of Concept to run business use cases. Create a functioning representation of the chosen business issues in as close to real world situations as possible.

5. Measure business improvements

Iterate through use cases to refine ideas, refine the system and produce a view of "best practice" approach

Evaluate new solution with business users to assess improvements and scope any additional functionality ideas.

Develop mechanisms for quantifying improvement, including value to customer.

Plan for transition of business positive/viable solutions into business as usual.

6.Plan for next steps

Incrementally, we will add more use cases to see how system can extend and be re-used by other business areas.

In this phase we also evaluate the continued use of legacy systems versus any new systems we have trialled.

Scope

The high level Scope of this project is to deliver a working Proof of Concept of how data can be managed and used effectively in decision support.

To deliver this SPEN has identified several discrete Work Packages to be delivered under the project:

· **WP 1: Discovery**

Fully understand the data issues/inconsistencies that exist and the problems they cause. Fully validate that the propose approach will address these problems

· **WP 2: DINO Proof of Concept (PoC) Build**

Focused on the build out of a test bed to allow operation of use cases in new data management environment

· **WP 3: DINO Evaluation**

Focused on the identifying the pros and cons of operating the business under the new data regime by comparing the PoC with current operational processes.

· **WP 4: Business as Usual (BaU) Adoption**

Focused on the identification of the necessary business changes required to adopt DINO best practices into BaU e.g. policy changes, reference architectures, Smart IT roadmap.

· **WP 5: Further enhancements**

Focused on the identification and evaluation of further enhancements in DINO that can deliver additional DNO / customer benefits.

· **WP 6: Dissemination**

Focused on the dissemination of the project learning to UK customers, DNOs and vendors of remote sensing equipment / asset management systems to stimulate the market.

Objective(s)

Each discrete Work Package has Objectives:

WP 1: Discovery

· To produce a fully scoped problem definition and desired outcomes

WP 2: DINO PoC Build

· To create a "near to operational" proof of concept test bed that can demonstrate how these problems could be addressed

WP 3: DINO Evaluation

· To assess the efficacy of the data management and analysis methods employed.

WP 4: BaU Adoption

· To identify the necessary business changes required to facilitate the adoption of DINO principles as BaU and justify efficacy of doing so.

WP 5: Further Enhancements

· Identification and exploration of further enhancements with different business use cases that can deliver additional DNO / customer benefits and confirm best practice to move into BaU can be replicated across all DNO business areas.

WP 6: Dissemination

- Dissemination of project activities, scope, deliverables to UK DNOs, customers and vendors at several points within the project in order to stimulate the uptake and development

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Each discrete Work Package has a Success Criteria:

WP 1: Discovery

· The delivery of detailed problem statements for the chosen use cases.

WP 2: DINO PoC Build

· Delivery of a near operational PoC to demonstrate problem solutions and best practice

WP 3: DINO Evaluation

· Successful iteration of use cases.

· Determination if an optimal means of managing an operationally efficient solution to the problems is evident

WP 4: BaU Adoption

· The production of proposals for how BaU adoption could be facilitated.

WP 5: Further Enhancements

· The publication of a set of proposed next steps and the likely benefits they will deliver.

WP 6: Dissemination

· The sharing of experience with UK DNOs and vendors, to allow optimum support for smart grid.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

SPEN has chosen to take an iterative approach to the issue of how we use and manage data at volume given the scale and scope of the problem area. This project will attempt to take a first view of the feasibility of a data management and visualisation approach which will be consolidated by BaU activity and potentially further innovation.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL6 Large Scale

Geographical Area

This project will address SPEN's core systems and therefore has the potential to impact all of its operational areas.

Revenue Allowed for the RIIO Settlement

Until this project has been completed SPEN will not have full understanding of the potential savings to our ED1 programmes. However, an allowance for implementing the chosen Smart IT architecture was included in ED1 and it is anticipated the findings of the DINO project will allow us to make this investment in the most efficient manner.

Indicative Total NIA Project Expenditure

Total NIA Project Expenditure £850,000

SPEN 90%

SPT 10%

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)

Project DINO is a research project so the final methods and toolset are not yet confirmed. However, it is estimated it is possible to save 15-20% on implementation costs on data heavy applications through:

· Advanced Data Management techniques (Smart Grid Big data)

· Improved network management through complex event processing and correlation.

· Deployment of advanced technologies for managing real-time and slowly changing data.

· Streamlined integration through development of an Integrated Network model based on an industry Utility CIM

Please provide a calculation of the expected benefits the Solution

This is a research project

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

As all UK license operators will face the same problems with handling and using large volumes of data and the same decisions about how to use existing standards, integrate with legacy systems and rollout a solution. The output from the DINO project will be a description of a methodology and how it was proved rather than the demonstration of a particular product and hence this will have wide applicability to all other DNO.

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

Given that the toolset is not yet confirmed this is by necessity a high level estimate. We estimate a cost of £2-7m per DNO to implement a full solution based on DINO principles depending on the scale and type of technology chosen and capability of existing systems.

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

All UK DNOs will face similar issues with the increase in data volumes as more monitoring and smart meters are deployed. Although, many DNO have investigated aspects of this problem this project will show a method for operating a coherent system from data collation to visualisation which all DNO will benefit from

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

SPEN's ED1 Smart Grid strategy pointed to the need for visibility, controllability, intelligence, interoperability and new commercial mechanisms. This project will address the first four of these fundamental principles. Our innovation strategy highlighted six stakeholder priorities in addition to specific technical areas to address such as DSR,ANM, fault levels, smart meters, etc.

(http://www.spenergynetworks.co.uk/userfiles/file/201403_SPEN_InnovationStrategy_MH.pdf).

The DINO project is a fundamental enabler for the network to achieve all of these goals whilst applying our "Think Big, Start Small, Scale Fast" approach.

☑ Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees

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.

n/a

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

n/a

Additional Governance And Document Upload

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

n/a

Relevant Foreground IPR

n/a

Data Access Details

n/a

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

n/a

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

n/a

This project has been approved by a senior member of staff

☑ Yes