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

Nov 2014

Project Reference Number

NIA_NGET0155

Project Registration

Project Title

Open Source Interconnector Modelling: Phase 1

Project Reference Number

NIA_NGET0155

Project Licensee(s)

National Energy System Operator

Project Start

December 2014

Project Duration

0 years and 7 months

Nominated Project Contact(s)

Karan Monga

Project Budget

£174,000.00

Summary

There is a spectrum of possible model enhancements that NG might contemplate to model interconnector flows. The prevailing treatment fixed price within ELSI is at the simple end of the spectrum, whereas the fully specified model which forecasts system marginal price of each European member state is at the other extreme. Between these two extremes, we sketch out below a number of options:

1. Modelling of thermal supply/demand in mainland Europe. The power markets to which GB is connected could be represented more fully in ELSI, representing each with a simple supply curve and hourly (or half hourly) demand, while not pursuing a fully specified dispatch.

2. Modelling of the impact of RES. Undertake a correlation analysis of RES (Renewable Energy) output, demand and interconnector flows across (at least) GB, France and the Netherlands (could extend this to include Belgium and Germany). Use this analysis to develop a “richer” assessment of interconnector flows given demand/RES output for use in ELSI.

3. A combination of 1 and 2 together.

4. Fuller modelling of thermal and RES in mainland Europe. Finally, a more complete modelling of interconnected regions (both thermal and RES) could be included in ELSI.

The overarching scope of the project is to improve interconnector modelling in ELSI, which allows users to calculate system marginal price of member states in Europe, in a similar way as the GB. The detailed scope of the project will be agreed through competitive tendering, which will result in selection of the preferred consultancy to deliver the project. The detailed scope can be made available at a later date.

Nominated Contact Email Address(es)

box.so.innovation@nationalgrid.com

Problem Being Solved

Drivers for interconnector modelling

In light of the European Commission's and key stakeholders' objective to facilitate creation of a Single Energy Market across Europe, accompanied with an aspirational target of achieving at least 10% interconnection for every member state, the significance of interconnectors for the GB market has increased considerably. This growing significance is further emphasised by Ofgem's recent Interconnector Cap and Floor consultation, which invites developers to submit cases for approval for projects which can be delivered by December 2020. Some of these projects may also receive PCI (Project of Common Interest) status through the Europe wide Ten Year Network Development Plan.

Furthermore, Ofgem's recently published ITPR consultation document states that under an enhanced System Operator role, National Grid would need to provide additional economic analysis on possible future interconnection development.

As interconnectors grow in significance within the GB market, the need to understand their impacts on the operation of the network increases simultaneously. These clearly drive the need for improved interconnector modelling for the GB network.

Our current capability

Flows on an interconnector result in operational cost implications for the GB network. Forecasts of interconnector flows are a function of the energy price differential between the interconnected member states.

Our current capability to model interconnector flows and their implications on the operational costs of the GB network is not suited for scenarios with significant increased interconnector impacts on the GB Network. Our in-house tool, ELSI (Electricity Scenario Illustrator), which is freely available to industry stakeholders, provides a good starting point. However, it has a key drawback. In particular, ELSI can forecast the GB system marginal price for all 365 days (by four periods) of the year up to 20 years for Future Energy Scenarios. In comparison, ELSI adopts an annual price forecast for interconnected member states. Such an approach can distort the analysis outputs significantly. As the significance and deployment of interconnectors increases, the distortion could start to exceed the modelling margin of errors.

In light of the above, we need to considerably improve our understanding of the operational cost implications of interconnectors.

Way forward

NGET currently has an established tool for long term operational cost forecasts: an excel based tool, available to download for free in the public domain – ELSI. This allows the industry e.g. other TOs, generators etc, to access the tool and undertake analysis. However, as highlighted above, the model's ability to forecast interconnector flows and their implications on operational costs is limited.

An approach which seeks to purchase an off the shelf market models e.g. PROMOD, BID or POWRSYM have a considerable one off set up cost (e.g. £250,000 - £500,000). Equally, there is typically a requirement to pay a annual licence fee to maintain and operate such models (e.g. £3,000 per annum per user). As the intellectual property of the model is maintained by developers, we will not be able to make commercial model available other users.

That said, following the best practice principles of knowledge sharing embedded within ELSI, we wish to enhance interconnector modelling within the ELSI framework. Improving interconnector modelling in ELSI, which allows users to calculate system marginal price of member states in Europe, has considerable merits. In particular, the intellectual property of end product will be maintained by NGET, and this enhanced excel based model will be available to all industry participants freely to undertake their own analysis (with access to appropriate data).

Method(s)

Research and Development

It is proposed to deliver this critical improvement using competitively procured industry experts. Our approach to deliver this two phased assignment is outlined below:

Phase 1 (the focus of this round of funding, for completion by summer 2015):

- Detailed scoping exercise to outline the requirements, in consultation with in house ELSI developer and key users
- Competitive tendering process to invite external consultants with proposals
- Award contract
- Consultants develop a pilot model (manage consultant's outputs, through a study steering group)
- Phase 1 (internal) pilot testing of the model

Phase 2 (for completion by winter 2015):

- Phase 2, live testing of the model, as part of TYNDP 16 market modelling (for projects which impact GB only)
- NGET Roll out, publication of the tool in the public domain

Scope

There is a spectrum of possible model enhancements that NG might contemplate to model interconnector flows. The prevailing treatment fixed price within ELSI is at the simple end of the spectrum, whereas the fully specified model which forecasts system marginal price of each European member state is at the other extreme. Between these two extremes, we sketch out below a number of options:

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Objective(s)

The key objectives of the project are:

- Enhance open source modelling of operational cost implications of interconnectors
- Ensure that the improved model can be easily expanded to include new interconnector projects as they get developed, and details regarding impacted markets
- Test the model for selected TYNDP 2016 projects
- Share the improved model with industry stakeholders e.g. regulator, TOs and developers.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Achieving the desired improvements within ELSI environment regarding interconnector modelling and being able to share the improved model with the key stakeholders in the industry in timely fashion will be the key success criteria of this project. Success is also defined as having a refined model and having completed Phase 1 pilot testing.

Project Partners and External Funding

Project partners will be identified through a mini tender exercise.

Potential for New Learning

There is considerable potential for new learning, not least in terms of improvements in interconnector modelling, which will be achieved through understanding and applying greater granularity in the modelling process.

Scale of Project

Desk based assignment

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

The location at which the project will be undertaken will be known once succesful tender is identified. The scope of the model thatw will be developed through this project has GB (and Europe) wide coverage.

Revenue Allowed for the RIIO Settlement

No.

Indicative Total NIA Project Expenditure

Information on budget will be added after tender exercise completed.

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)

The lack of granularity in the current model could result in inaccurate estimates of imports or exports from interconnectors, this could jeopardize our decision on reinforcements which are particularly influenced by interconnector flows capital value of reinforcement could be in excess of multi-million pounds.

Please provide a calculation of the expected benefits the Solution

Potential other beneficiaries: At least 2 further TOs on the GB network, circa at least 2 developers with interconnector projects

If the new model is used by 4 additional potential users (e.g. 2 further TOs on the GB network, circa at least 2 developers with interconnector projects), it would result in at least £1,000,000 (4 x £250,000) savings for industry stakeholders.

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

GB wide zonal model, will be fully rolled out to other Network Licensees

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

Cost estimate to be developed during the course of Phase 1.

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

By the end of the Phase 1 we will share the industry good practice introduced in a new pilot model with other Network Licenses. The model itself will be made available on completion of the validation testing undertek durig phase 2. By making the final model available in the public domain, any relevant network licensee can use the model to forecast flows of a particular interconnector project. For TOs, this information can help them establish the potential need for further reinforcements on the network. For project developers, this can help them establish their business case. The SO and the system operator can forecast the operational cost implications as well as understand the likely scale of welfare benefits.

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

☑ 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.

At present there is no open source interconnector modelling currently available, which provides robust long term multi-year forecasts for operational cost implications (or welfare benefits measured in terms of impact on the system marginal price) of currently installed and new interconnectors for the GB network.

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