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NIA Project Registration and PEA Document

Date of Submission

Jan 2014

Project Reference Number

NIA_NGET0131

Project Registration

Project Title

iTesla

Project Reference Number

NIA_NGET0131

Project Licensee(s)

National Grid Electricity System Operator

Project Start

April 2010

Project Duration

5 years and 7 months

Nominated Project Contact(s)

Andrew Kensley

Project Budget

£16,200,000.00

Summary

The pan European transmission grid will have to be reengineered progressively in order to accompany the electric system decarbonisation, shaped by a first set of intermediate targets in 2020. This long term transition will make transmission networks more and more complex with impacts on normal and emergency operations.

1. Much larger power transfers over longer distance
2. Predicting accurately the scheduling of power plants across Europe will become more difficult, which, in turn, will require conventional generators to balance the whole system.
3. With the rapidly increasing penetration of renewable electricity generation and the difficulty to build new overhead power lines, each TSO in Europe will no longer be able to comply with the classical preventive N-1 security standard year round.
4. When operating a power system close to its stability limits, unstable dynamic phenomena may appear after contingency. The standard static security assessment based on power flow calculations is no longer sufficient.

Nominated Contact Email Address(es)

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Problem Being Solved

Pan-European transmission system security issues are likely to become more and more challenging in the coming years due to:

- the growing contribution of less predictable and intermittent renewable energy sources,
- the introduction of new controllable devices,
- a partially controllable electricity demand,
- the increasing difficulty to build new overhead transmission lines,
- the progressive construction of a single European electricity market.

These constraints will result in more complex system operation, a grid working closer to its operational limits and therefore a need for a major revision of operational rules and procedures. As a consequence, coordinated operation initiatives have already emerged for different regions of the pan-European electricity transmission system (cf. CORESO and TSC). These coordination initiatives will not be fully efficient without a common toolbox, allowing the different TSOs to increase coordination and harmonize operating procedures.

The purpose of the iTESLA project is to develop such a toolbox which will support the future operation of the pan-European electricity transmission network.

Method(s)

Research

- WP1 – Tool box architecture and use cases
- WP2 – Data needs collection and management. The optimisation challenges require to access data in line with the use Cases defined in WP1. Data collection and management encompasses data for the dynamic behaviour of the system and data for the modelling of probabilities of contingencies.
- WP3 – Off-line validation of the dynamic models for the Pan European system. The approach proposes to take into account dynamic phenomena. The stimulation of these phenomena requires dynamic models of each components of the system. These models must be validated in order to ensure the reliability of security assessment at the system level.
- WP4 – Off line definition of security rules at Pan European level. On-line security assessment (as described in WP5) requires inputs such as the probability of occurrence of a fault, uncertainty definition, simplified conservative criteria and threshold can be assessed either by static or dynamic computations.
- WP5 – On-line security assessment. The screening method is based on the Worst Case State (WCS) approach, following early conclusions of the PEGASE project. It relies on the construction and analysis of the worst states for each contingency, so that costly preventive actions are minimised by taking into account all possible corrective actions.
- WP6 - Defence Plan and Restoration
- WP7 - Integration and global validations of the resulting modules.

Scope

The pan European transmission grid will have to be reengineered progressively in order to accompany the electric system decarbonisation, shaped by a first set of intermediate targets in 2020. This long term transition will make transmission networks more and more complex with impacts on normal and emergency operations.

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Objective(s)

The overarching goal of the iTESLA project is to develop and validate an open interoperable toolbox able to support the future operation of the Pan-European grid.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project success criteria are set out in the specific work package deliverables. These are summarised below and further information about each of them can be found at <http://www.itesla-project.eu/deliverables>

WP1 Objectives, methodology, toolbox architecture and use cases

- Deliverable D1.1 Formalization of the overall problem encountered by TSOs

- Deliverable D1.4 Definition of use cases for WP7

WP2 Data needs, collection and management

- Deliverable D2.1: Definition of required external data needs
- Deliverable D2.3 Conversion tools from external formats to internal formats
- Deliverable D2.4 Modelling of uncertainties for offline and inline security assessment

WP3 Off-line validation of dynamic models

- Deliverable D3.1 Part I: Requirements for validation of Phasor Time domain simulations
- Deliverable D3.1 Part II: Limitations of current modelling approaches

WP8 Dissemination

- Deliverable D8.2.1: Workshop materials and training materials for the use of the toolbox

WP9 Management

- Deliverable D9.3: Quality Management Plan

Project Partners and External Funding

This is a International consortium, consisting of RTE, ELIA, Energinet, National Grid, Red Electrica, REN, HTSO, RSE, Imperial College, KTH, KU Leuven, PEPITE, TECHNOFI, RISOE,Quinary, IA, ARTELYS, INES PORTO. Further details are available at the project website:

<http://www.itesla-project.eu/>

External funding of approximately £11m from European union 7th Framework programme and approximately £5.1m from other partners.

Potential for New Learning

This project will bring forward a major innovation: carry out operational dynamic simulations in the frame of a full probabilistic approach, thus going further that the current “N-1” approach and optimizing the transit capacities of the grid at different spatial (national, regional, Pan-European) and time (two-days ahead, day-ahead, intra-day, real-time) scales.

Scale of Project

This project is European wide, encompassing leading European research organisations and a number of European TSOs in order to achieve optimal progress and application.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

This project is being delivered in various locations across Europe.

Revenue Allowed for the RIIO Settlement

Zero

Indicative Total NIA Project Expenditure

£119,000

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)

This research is contributing towards the effective management of the Transmission system on a European scale. If we can exploit the abilities of other European TSOs then this could help in contributing towards the security of supply of the electricity grid, or assist in black start events. All of which are worth millions of pounds to the UK economy.

Please provide a calculation of the expected benefits the Solution

Research Project - Not required.

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

This method will apply to the whole of the GB transmission system.

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

This work will be done as part of the project.

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

n/a

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

The project addresses the following aspects of the innovation strategy:

System Operability : Smarter System Operation

- 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.

Following a review of the ENA portal and main innovation partners (including Universities and EPRI) National Grid can confirm that this work has not been done before.

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