

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

Jan 2016

Project Reference Number

NIA_NGET0178

Project Registration

Project Title

Environmental Containment solutions for Midel 7131

Project Reference Number

NIA_NGET0178

Project Licensee(s)

National Grid Electricity Transmission

Project Start

February 2016

Project Duration

1 year and 6 months

Nominated Project Contact(s)

Doug Galloway

Project Budget

£310,000.00

Summary

National Grid will work with a research supplier to deliver a report at the end of each of the three phases outlined below:

1. Test how effective National Grid's existing drainage solutions (installed to prevent the release of mineral oil) are at controlling a release of Midel 7131.
 - Test the efficacy of existing civil infrastructure to control the presence of potential Midel 7131 pollutants to less than 5ppm in water discharged from a National Grid substation site?
 - Assess the performance of Bund Water Control Units (BWCU) and Class I oil separators when dealing with Midel 7131 instead of mineral oil..
2. Test the biodegradability of MIDEL 7131 in a typical substation environment.
 - Investigate the impact that different volumes of Midel 7131 released on substation chippings has on biodegradation rates.
 - Research and report on the availability of suitable accelerants that can be used to increase the rate of Midel 7131 biodegradation?
3. Investigate the availability of alternative innovative secondary containment solutions and recommend bunding solutions for Midel 7131 filled transformers.

Nominated Contact Email Address(es)

box.NG.ETInnovation@nationalgrid.com

Problem Being Solved

National Grid is in the process of deploying its first Midel 7131 filled 400kV transformers to a new build urban site. Whilst Midel 7131 has benefits in reduced costs of civil works, such as eliminating the need for fire walls, the industry does not currently understand how Midel 7131 behaves when released in a typical substation; the options available for accelerated degradation; whether existing secondary containment solutions are appropriate for applications where Midel 7131 is used and what alternative containment

solutions might be available.

Method(s)

The use of Midel 7131 presents a challenge to the industry in how to ensure that when the transformers leak the Midel 7131 does not contaminate the environment. This is because Midel 7131 has different physical and chemical properties to the traditional mineral oil and so requires innovative ways to manage and contain any leaks. National Grid now needs to understand the impact on civil infrastructure of , replacing a mineral oil filled transformer with a Midel 7131 filled transformers, and what measures it might need to put in place to address fundamental differences in Midel 7131 and mineral oil on new transformer installations.

National Grid has a track record of protecting the environment by ensuring that no oil leaks escape into the environment. National Grid has processes and specifications in place that dictate how civil infrastructure is built to manage mineral oil leaks from transformers on substations. However given that the physical and chemical properties of Midel 7131 differ from mineral oil (most notably, its specific gravity and biodegradability) National Grid needs to:

- Be assured that the existing infrastructure remains fit for purpose or understand if there is a need to develop its civil infrastructure to keep pace with recent developments in insulating liquid applications in particular the introduction of Midel 7131.

Understand how Midel 7131 behaves and biodegrades in a substation environment and how these properties can be used in the event of an accidental spill to ensure maximum environmental protection.

- Know that the Midel 7131 containment solution developed by this study is not only fit for purpose but that it is adopting best practices in civil engineering solutions that will provide value for stakeholders.

This study will investigate the behaviour of Midel 7131 in a substation environment and will recommend suitable containment solutions when the “oil” escapes from transformers..

Scope

National Grid will work with a research supplier to deliver a report at the end of each of the three phases outlined below:

1. Test how effective National Grid's existing drainage solutions (installed to prevent the release of mineral oil) are at controlling a release of Midel 7131.
 - Test the efficacy of existing civil infrastructure to control the presence of potential Midel 7131 pollutants to less than 5ppm in water discharged from a National Grid substation site?
 - Assess the performance of Bund Water Control Units (BWCU) and Class I oil separators when dealing with Midel 7131 instead of mineral oil..
2. Test the biodegradability of MIDELE 7131 in a typical substation environment.
 - Investigate the impact that different volumes of Midel 7131 released on substation chippings has on biodegradation rates.
 - Research and report on the availability of suitable accelerants that can be used to increase the rate of Midel 7131 biodegradation?
3. Investigate the availability of alternative innovative secondary containment solutions and recommend bunding solutions for Midel 7131 filled transformers.

Objective(s)

The objective of this project is to research and document appropriate environmental containment solutions for Midel 7131 filled transformers on National Grid electricity substations. This will include a study of how bund pumps and separators will ensure that Midel 7131 can be prevented from polluting the environment. The project also aims to enhance industry understanding of the biodegradation of Midel 7131 in a substation environment.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The three reports delivered against each of the three phases outlined in the Scope section will provide National Grid with the knowledge required to inform the development of relevant policy documents and technical specifications.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The project seeks to understand how Midel 7131 can be contained within the substation so that when there is a spill it does not pollute the environment. The work will involve desk study reviews, laboratory and site (Bund Water control unit and oil separator) test and biodegradation rates in a substation environment. In this way National Grid will understand how to best use existing and new civil infrastructure to protect the environmental from accidental escape of Midel 7131.

Technology Readiness at Start

TRL5 Pilot Scale

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

The project is being undertaken in a laboratory and on a National Grid Electricity Substation site in the Midlands, and will be applicable for the whole of the National Grid and UK Transmission system.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£310,000

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)

The successful results of this study provide a potential estimated savings of £250k per transformer.

Over the next 6 years, if the estimated 20 transformers are replaced or newly installed with Midel 7131 transformers, a potential saving of up to £5million could be realised during that time period.

Please provide a calculation of the expected benefits the Solution

The Baseline is the current costs of a traditional oil separator for a single new transformer installation in an urban environment. Benefit is based on costs for a single site.

Base Costs ~£250,000 - Method Costs ~ £0 = anticipated cost benefit estimated at ~£250,000

Further savings which is not reflected in the above Baseline due to site specificity - depending on site specific layout there may be additional savings associated with a smaller land footprint on a new site of ~£20k.

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

This work will be applied to the whole of the National Grid Electricity Transmission system, and will be widely applicable to all network licensees in GB.

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

Should the project be successful National Grid will be able to use Midel 7131 on new and existing transformer installations. This has the potential benefit of reducing the amount of civil works for a transformer installation over the next 6 years by up to £10m assuming 20 transformers are replaced/installed with Midel 7131.

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

Midel 7131 has not been used in the UK for high voltage transformers, however this is changing as the use of Midel 7131 is gaining more widespread use. The learning that will arise from this work will influence the development of appropriate Midel 7131 secondary containment solutions which will ensure that there is no environmental pollution from Midel 7131 leaks, which all relevant Network Licensees can implement on their assets.

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

National Grid's Innovation strategy challenges the company to use innovative products and reduce whole life infrastructure costs as much as possible. As part of National Grid's corporate responsibility no part of our assets are to pollute the environment and only sustainable solutions will be used in asset management. This project fits within the Electricity Innovation Strategy under Efficient build and Corporate Responsibility by developing environmentally friendly and sustainable ways to manage Midel 7131 on substation assets.

- 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