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## NIA Project Annual Progress Report Document

### Date of Submission

Jul 2023

### Project Reference Number

NIA2\_NGESO036

## Project Progress

### Project Title

Hydrogen Production for Thermal Electricity Constraints Management

### Project Reference Number

NIA2\_NGESO036

### Project Start Date

March 2023

### Project Duration

1 year and 6 months

### Nominated Project Contact(s)

Louis Priday

## Scope

This project will develop models and tools to build a detailed understanding of the potential for hydrogen electrolysis to reduce thermal constraints on the electricity transmission network. The results of work packages on location, commercial models, and the economic and regulatory feasibility will feed into a proof-of-concept design for an electrolysis facility.

The project will also investigate the feasibility (both technical and commercial) of the hydrogen produced to alleviate thermal constraints subsequently being injected into the gas grid.

## Objectives

This project aims to:

- Identify where HPFs need to be located to provide balancing mechanism services to National Grid ESO and to achieve “optimal” commercial and system operability benefits.
- Investigate the high-level feasibility of operating hydrogen plants as a method of balancing thermal grid constraints and other system services.
- Define the regulatory requirements to deliver the right investment signals to hydrogen plants whilst minimising constraint management costs for the ESO.
- Develop modular HPF design concepts to assist in determining the high-level characteristics and constraints of archetype plant designs.
- Explore the feasibility of hydrogen produced from the HPFs being blended into the gas grid.

## Success Criteria

The project will be successful if the following questions are answered:

- Can green hydrogen production facilities meet the operational and technical requirements to provide thermal constraint management services for transmission system operation?
- How should commercial terms be structured for green hydrogen production facilities to provide constraint management services?

- How can the right market signals (investment) be provided to green hydrogen developers given locational, operational and downstream H2 gas usage considerations?
- Are there any regulatory challenges around commercial terms?

## Performance Compared to the Original Project Aims, Objectives and Success Criteria

*National Grid Electricity System Operator (“NGESO”) has endeavoured to prepare the published report (“Report”) in respect of Hydrogen Production for Thermal Electricity Constraints Management, NIA2\_NGESO036 (“Project”) in a manner which is, as far as possible, objective, using information collected and compiled by NG and its Project partners (“Publishers”). Any intellectual property rights developed in the course of the Project and used in the Report shall be owned by the Publishers (as agreed between NG and the Project partners).*

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All work packages are making progress towards producing interim deliverables in June 2023. The outputs of each work package at the interim deliverable stage in June are intended to be:

### **WP1, Site Location and Selection:**

- Creation of the interactive map tool and import of some initial data

### **WP2, Commercial Model:**

- Creation of the commercial model
- Development of three commercial pathways from which the modelling will be based upon:
  - Electricity balancing
  - Hydrogen to grid
  - Hydrogen to refueling station (other offtakes to be considered in WP5)

### **WP3, Economic and Regulatory Model:**

- Initial modelling of historic constraints and predicted constraint data
- Workshop and discussions with ESO on constraints modelling
- Development of a constraints model
- Initial progress on analysing existing regulatory environment

### **WP4, Modular Plant Design:**

- Creation of a technology evaluation note - looking at a small/medium/large archetypal design scheme
- Initial modular design model

### **WP5, Hydrogen Injection into the Grid:**

- Kick off with National Gas Transmission (NGT) for WP5
- Building a cost sheet for blending facilities
- Initial report detailing the pros and cons for blending at this scale

All work packages have started and are being worked on in parallel with feedback between work packages ongoing throughout the project.

Since project kick-off the following activities were also undertaken:

- Project Kick off meeting
- Steering group created with representation from all project partners (ESO, Arup, NGT)

- Regular fortnightly reporting mechanism implemented.
- Engagement with Statera regarding a similar project (Kintore Hydrogen), exploring the opportunity for knowledge sharing from both projects.

## Required Modifications to the Planned Approach During the Course of the Project

There have been no modifications to the planned approach to date.

## Lessons Learnt for Future Projects

There are no lessons learned to date as all work packages have started and are being worked on in parallel. As the project progresses through the work packages and deliverables, all lessons learnt will be captured and shared via the relevant reports.

Note: The following sections are only required for those projects which have been completed since 1st April 2013, or since the previous Project Progress information was reported.

## The Outcomes of the Project

The project is in the early stages of delivery. Work Packages 1-5 have been started in parallel, no deliverables have been produced to date.

## Data Access

Details on how network or consumption data arising in the course of NIA funded projects can be requested by interested parties, and the terms on which such data will be made available by National Grid can be found in our publicly available “Data sharing policy related to NIC/NIA projects” and [www.nationalgrideso.com/innovation](http://www.nationalgrideso.com/innovation).

National Grid Electricity System Operator already publishes much of the data arising from our NIC/NIA/SIF projects on the Smarter Networks Portal ([www.smarternetworks.org](http://www.smarternetworks.org)) and National Grid ESO Data Portal ([data.nationalgrideso.com](http://data.nationalgrideso.com)). You may wish to check these websites before making an application under this policy, in case the data which you are seeking has already been published.

## Foreground IPR

The following IPR will be generated in the course of the project:

- A UK wide mapping of variables for HPFs siting on energy constrained areas with cumulative ranking assessed to 1 km hexagon grid cells.
- A tool to interrogate the mapped variables by hexagon grid cell and apply bespoke weighting for each variable.
- A short list of potential HPF site locations ranked in order of preference, according to pre agreed site criteria.
- Excel-based commercial model that summarises the key inputs and outputs for each of the scenarios outlined (including dashboard).
- Excel based model that will define what will output the facility and system benefits.
- Modular HPF design outlined for up to three HPF archetypes.
- Detailed scope for demonstration of thermal constraint management by a hydrogen electrolyser plant/s, suitable for use in an innovation funding bid.
- An overall report to include dedicated sections on the outcomes of each of the six work packages.