Gas Networks Ireland

On Network Hydrogen Blend Feasibility Study

Project Background

As a greener alternative to natural gas alone, renewable based or green hydrogen can play an important role in achieving net zero carbon objectives for the gas network. In this context and to help realise hydrogen decarbonisation pathways, it is firstly essential to understand the level of readiness of the gas network, and its assets, to accept hydrogen blends. GNI appointed Arup to appraise the technical feasibility of introducing a 20% blend of hydrogen into a section of the gas distribution network, as part of a potential pilot study.

Any prospect of the development of hydrogen pilots would be subject to a number of considerations including the national hydrogen strategy, the sectoral demand for hydrogen and government policy in relation to hydrogen use in pipeline networks, and the completion of all necessary safety prerequisites.

Site Selection

As part of the site selection process for the hydrogen trial project, an assessment of 32 candidate networks was undertaken in order to establish their suitability under a set of predetermined criteria including ability to isolate the hydrogen supply, suitability to install the new hydrogen equipment, network condition and ability to scale up the pilot study. Further to the site assessment and evaluation, one site was identified as the preferred location for the following reasons:

- Minimal to no safety impact on the greater gas network as it provides a safe isolated network with no risk of hydrogen ingress and no security of supply or gas quality issues upstream.
- Capacity to scale up the pilot study with linkage to an entry point.
- The network proposed is considered to be relatively new and in good condition with infrastructure installed circa 2000 onwards.

Feasibility Assessment

Following the selection of the preferred pilot location, the technical feasibility of introducing a 20% blend of hydrogen into the network has been assessed. As part of this assessment, a review of the existing infrastructure was initially undertaken including a desktop study, consultation with GNI in relation to study inputs and asset data. Asset data gaps were identified, and recommendations proposed to fill any remaining data gaps, e.g. site investigation, confirmatory customer surveys, etc. In parallel, a literature review of a number of key relevant projects was undertaken to ensure technical findings and learnings have been leveraged from similar studies and pilots being undertaken outside of Ireland, including HyDeploy, H21, Hy4Heat and H100 Fife. A suitability assessment was then carried out to examine the technical feasibility of introducing a 20% blend of hydrogen into the network and its assets. As part of this process, information from a GNI Material Specification Review and hydrogen acceptability of assets was overlaid.

Literature Review key findings

Asset condition

On this basis, a Level of Confidence (LoC) Risk Indicator was then attributed to each asset within the selected network with respect to its technical feasibility to accept the hydrogen blend. All assets within the selected network demonstrated a moderate to high degree of confidence in their ability to accommodate hydrogen, with no major obstacles or critical material concerns identified. The following recommendations have been made in order to reinforce and increase the robustness of the LoC risk indicator:

- Data Enrichment: liaison with other TSOs which have completed similar projects to reinforce the current knowledge.
- Demonstration Testing: lab testing to verify/fill literature gaps.
- Site Investigation: Upstream of meter to verify/fill asset data gaps.
- Customer Confirmatory Surveys: Downstream of meter - to gather data about the customer side of the installations.

New Infrastructure Assessment

An assessment of the new infrastructure requirements has been undertaken to identify the key equipment for delivering hydrogen to the AGI and then distributing this hydrogen and blending it into the existing gas transmission system. Due to the low volumes required, hydrogen is assumed to be delivered to the site from trucks where it will be stored prior to being distributed to the blending skid. This hydrogen distribution is assumed to require the following systems:

- Offloading facilities.
- Hydrogen storage.
- Pressure let-down.
- Blending skid and injection.

Key Study Findings

Key study findings can be summarised as follows:

- The chosen site has been identified as the most suitable for the study with isolatable supply, good network condition and the potential to scale up for future pilot studies.
- The existing asset review has been very encouraging with respect to acceptability of the proposed 20% hydrogen blend.
- No significant areas of concern have been noted in the review of the GNI material specifications.
- Generally, there is a low risk of hydrogen embrittlement in low pressure systems (below 70 bar).
- New hydrogen equipment can be accommodated spatially within the AGI site.
- Difficulties with hydrogen blending have been noted on previous pilot studies in terms of issues with blending units at low flow rates; thus low flow rates at the AGI site to be considered in this context.

It is noted that residual study risks have been identified and captured in a Project Risk Register appended to this report. Key stakeholder groups have been identified along with future channels

of communication for further consideration should a scenario arise that a hydrogen blend pilot was to be undertaken.

Next Steps

A development roadmap has been laid out to build on the findings from this initial feasibility phase of the pilot study.

Future progression of this study to a next phase will be a function of emerging government policy in relation to hydrogen blend pilots. At this point in time, government policy, as set out in the National Hydrogen Strategy, has specified that hydrogen blends may be considered during a transition phase.

The National Hydrogen Strategy states the following:

> *"While blending may offer an initial demand sink in the short term, it can only be supported if it can prove to be a transitional step to the development of pure hydrogen transportation and end uses. Blending may also have challenges in terms of user acceptance and associated costs with maintaining gas quality. Overall, at preset, blending is not seen as a high priority end-use for renewable hydrogen. Blending could play an enabling role however as a "supply of last resort", where there is excess production or as a transport and storage buffer in the absence of dedicated hydrogen infrastructure. Blending into the gas network in these instances may offer a solution to improve the overall efficiency of the value chain and reduce overall production costs".*

On this basis, the pilot study, whilst illustrating the credentials of a part of the network for a 20% hydrogen pilot, will not progress any further at this point pending further national developments on hydrogen and also developments in relation to Great Britian, given Ireland currently imports over 80% of its natural gas from Scotland.