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| Network Innovation Competition 2020 Supplementary Answer form | | |

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| Project Name | H100 Fife | | |
| Question number | #8 | Pro forma section | 2 |
| Question date | 10/09/20 | Answer date | 14/09/20 |
| Question summary | Please can you share details of the work undertaken to consider the costs of the alternative methods for supplying hydrogen to the project? This should include cost comparisons to tankered non-renewable hydrogen. | | |

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## Answer (please retain document formatting and do not exceed 2 pages unless otherwise agreed with Ofgem)

The cost assessment of tankered hydrogen compared to electrolysis and local SMR was undertaken in partnership with Kiwa. A summary is detailed below:

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| Production Method | Cost (£/kWh) |
| Off-site SMR (Without CCS) | 0.48 |
| On-site SMR (Without CCS) | 0.30 |
| Electrolysis (with preferential rate) | 0.25 |

Therefore the least cost solution, as well as the lowest carbon and customer solution is to access the preferential electricity rate from the OREC turbine.

There are a number of factors that affect the logistics of balancing supply and demand, and these extend beyond cost alone. First amongst the issues that were considered was the capacity of hydrogen delivery vehicles. Hydrogen is much less dense than other gases, and thus there is a limited capacity that can be delivered. To supply the annual gas energy required by 300 typical UK homes, 3.7 million kWh of hydrogen per year would be needed.

To deliver this quantity of hydrogen by road would require in excess of 300 tanker deliveries through the year, with multiple deliveries per day in the winter. This delivery by road causes disruption imposed upon local residents in terms of noise and additional local pollution.

The project would require continuous delivery of hydrogen using dedicated vehicles purchased as part of the project. These vehicles would be on the road every day, with commensurate tailpipe emissions and risk of accidents.

Identification of a suitable manufacturer of hydrogen able to supply it reliably, at a variable production rate throughout the year, is not trivial and creates cross chain risks to security of supply. In a report produced in partnership with KIWA for H100 NIA, it was assumed that the closest feasible producer was located at Grangemouth. Alternatively, a supplier with sufficient capacity may be further, in Aberdeen, Teesside or beyond. Any supplier that could be used would need to be equipped with the facilities to safely load high pressure hydrogen into vehicles.

The amount of gas required for this project would be intermediate between small scale bottled gas production and large-scale continuous production typical of industrial uses of hydrogen.

A significant part of the project cost is independent of the supply and manufacturing costs. Storage of hydrogen in bullets to provide a buffer of a number of days of demand does not depend on the production method. Bullets contain over twice as much gas per quantity of capital cost compared to tube trailers, therefore storage on site using trailers would be less attractive than using fixed bullets.

To allow hydrogen to be brought onto site by road delivery would require significant civil and piping engineering works. The ground would need to be made suitable to accommodate multiple HGVs with sufficient manoeuvring room. The site footprint would present difficulties. A tanker offloading station would also introduce frequent manual operations with the potential for high pressure gas releases – a hazard that is not present with the lower pressure system integrating local production by electrolyser.

Hydrogen is available commercially in MCPs at an approximate cost equivalent of £15,000 per home. The limited amount of gas contained within each MCP would require continuous connection and emptying at an unachievable rate.