# Hydrogen Village Trial Detailed Design Studies Consultation

## Question 1: Do you agree with our minded-to decision on the projects to fund?

Kiwa Ltd thoroughly supports BEIS/Ofgem’s decision to move forward to hydrogen field trials. This is exactly what the nascent industry requires, however in summary we believe that roll out should be larger and more focussed on the whole supply chain, especially the use of green hydrogen that can probably be delivered more quickly and with more certainty than some of grey/blue options currently listed. Recent oil and gas price increases and volatility will (and are) dramatically affecting the cost of blue hydrogen.

Our suggestions are probably best described in the context of the supply chain.

* Provision of hydrogen. Current offerings concentrate upon blue/grey hydrogen which although historically lower cost than green hydrogen, at current natural gas prices is considerably more expensive. Whilst the document is non location specific it is clear that in the Chester area (which is detailed for Cadent) there is (purely by way of example) the Frodsham wind farm (50MW) which could support an 18MWe electrolyser that could in turn supply~8000homes. Hydrogen for inter-seasonal use could then be stored in one of the local salt caverns maybe on a huff & puff basis.
* This increase in scale suddenly takes the UK into a different league of global leadership. The project could be staged with the first 2000homes, a second batch of 2000homes and then 4000homes. Each phase would learn from the previous. Appliances would be required in reasonable numbers, and most importantly hydrogen would be demonstrating its key use - that of demand shifting.
* This UK based project would achieve a carbon reduction that has currently evaded other localities ie from gas at ~0.21kg/kWh to <~0.02kg/kWh by-passing the issues of the cost of imported or even N Sea natural gas.
* The issue of appliance numbers is very important; the UK has currently shown a lead in hydrogen appliances. We will not keep this lead unless large numbers are now ordered.
* The cost of this expansion is currently difficult to evaluate as
  + GDNOs are required to offer heat pumps, and these very quickly dominate the capital expenditure, especially where local distribution cables need upgrading or replacing.
  + The project has to fund the margin between current energy costs and the new low carbon energy for several years.
  + But GDNOs could be challenged to achieve an expenditure of <£20,000 per house (or other agreed figure) The total should be less than £150m. This is <1% of the cost of a new 3GW nuclear power station, and of course the cost of such power station is not source to sofa.

Similar arguments can be made in the Fife/Buckhaven area.

* Provision of hydrogen. The recently upgraded Mossmorran 132kV substation (probably about 200MVA and again purely by way of example) could provide an excellent power supply for a large adjacent electrolyser than could pick up power from one of the main HV feeders from the Highlands. This might require an innovative PPA but supported by BEIS and Ofgem this should be possible.
* Although not proven there is an anticline close by that would be worth exploring for local inter-seasonal storage. This hydrogen could be used to feed the whole area around Buckhaven including its industry. Alternative anticlines exist in and the Scottish lowland belt. These would require either new or repurposing of pipeline, but it would demonstrate the viability of large scale green hydrogen
* Any pipeline would also be extremely close to the Mossmorran ethylene plant from which grey/blue hydrogen may well be sourced in the medium term.

Supporting both these projects demonstrates at scale a desire to widen our energy supplies away from fossil fuel. The scale is important as hydrogen does have huge economies of scale and not to use them right from the start is a major weakness of the current approach.

The NGN project would be a good remaining project, especially with the involvement of BP.

Just to fund one project does not begin to build the economies of scale or demonstrate the real potential of this approach. The appliance industry has invested heavily in the hydrogen sector as they are closest to the consumer and fully understand that the latter greatly appreciates the small physical size, the rapid responsiveness and limitless DHW from a combi boiler.

Enlarging these projects inherently makes hydrogen available for local commerce, industry and transport. Hydrogen can be available from the local distribution grid to the local garage or transport depot. It is worth noting that 30mtonnes/y of hydrogen could effectively decarbonise all the UK and at <2/kg (in the UK) would be less than £60bn a year ie much less than our current fossil fuel energy bill. Clearly the percentage of hydrogen made here and imported will offer the usual energy trilemma, but in today’s uncertain world this cannot be an excuse to not to progress with decarbonisation.

With the fall in the price of large solar farms and wind turbines, it is likely the world will not be short of low-cost energy at the farm terminals. The issue is most/much of this will probably at the wrong time and the wrong place; hydrogen with its inherent storage capabilities is the only vector to solve this. The capacity of the world’s largest long distance power cables is <~5GW. Nord Stream 2 is ~68GW.

Question 2. Do you have any views on the proposed project deliverables for Cadent and NGN, and whether further deliverables are required?

Cadent and NGN should be required to identify a plan to expand their current proposal to larger towns using a source to sofa blend of blue and green hydrogen to reflect the current and future energy trilemma.

This should logically build upon their hydrogen town and should explain how this could be rolled out stepwise, a neighbourhood at time and include production, transmission and storage. This should not immediately extrapolate to a regional scale but should indicate in a deliverable and financially feasible fashion how step wise progression can be provided. This could use a mixture of imported and UK derived hydrogen.

Beyond this, all of the GDNOs should be asked to formulate practical and budget costed hydrogen roll out plans at two scales; one at 2.5Mt/y and one at 10Mt/y by 2035 to give a sound basis for what could be achieved.

Question 3. Do you have any views on the proposed directions for the projects contained in Appendix 2 to 4?

These projects should build upon the advantages of their geographical location eg both the NE and NW projects should concentrate upon the integration of storage and production from several sources. The sums of moneys appear reasonable for the scope offered. These should be increased to meet the extended scope suggested above.

Other matters

Attached is another paper indicating how the hand of government has always been necessary to achieve major changes in energy supply infrastructure. The investment can be made by the private sector (ideally at RAB rates) but the planning must be centrally co-ordinated. Examples of this are :

* Rural electrification in the 1950’s
* Changing the Town Gas supply from coal carbonisation to naphtha cracking for ~13m homes and 44m appliances
* Conversion to Natural gas 1967-77
* Closure of the coal mines 1980’s
* A new generation of gas fired powered stations (by Ofgem permitting back to back gas purchase /PPA agreements) 1990’s
* Solar power, wind and biogas by Ofgem organising minimum prices into a huge and liquid market (since 2010)

Conversely, areas where the state has withdrawn eg district heat and nuclear power have not prospered.

The repurposing of either the gas network to hydrogen or power network to low carbon electricity is too complex to be left to short term markets and world politics; historical evidence indicates it will not meet our decarbonisation deadlines. With barely 25 years to achieve this, and an unstable fossil fuel market, the tiny investments to decarbonise exemplar towns should be pursued, this is especially as most of the investment will result in skilled UK jobs. The Ukraine war surely offers the opportunity of a major rethink and investigation of all feasible decarbonisation options, especially those with a proven short delivery time; discussions should start between BEIS and GDNOs on the feasibility and costs of regional roll out of LCHS compliant hydrogen.

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10th April ‘22.