

## **Written Evidence Submitted by Enertek International Ltd (HNZ0014)**

Enertek International Ltd is an independent engineering research and development company specialising in domestic and commercial heating and cooking appliance design, testing and development.

The company is technology agnostic and provide R&D services to manufacturers in all sectors – gas, oil and electrical appliances (including heat pumps, boilers, fires and catering equipment). The company does not sell any products and has no vested interest in promoting any one technology.

Enertek International Ltd. has a UKAS accredited quality system to ISO EN 17025 and a fully operational appliance testing laboratory with dedicated test bays for natural gas, hydrogen, oil, and electrical appliances.

Enertek International agree with the UK Government's policy to achieve Net Zero by 2050 and want to help the government to reach this. The company's contribution (primarily working for appliance manufacturers) is to ensure that new appliances have greatly reduced emissions in line with the Net Zero target.

### **Overview of the gas/oil/electrical appliance industry.**

The domestic and commercial appliance industry is primarily concerned with heating and cooking. In this field, there are three main parameters:

- Capital cost (of appliances and installation)
- Operational cost (primarily fuel costs)
- Benefits (features).

In terms of heating, the 'benefit' is the level of comfort. Most occupants (both at home and at work) appreciate a comfortable temperature environment but have no preference where the heat comes from (appliance or fuel). The priority of the bill payer is usually to provide this level of comfort at the lowest possible cost - which does influence their choice of fuel and appliance.

The only exception to the above is where aesthetic considerations are involved, notably a 'fire' being the centre point of a room. Sometimes the 'decorative effect' is more important than the heat output or fuel used to achieve it.

With regard to cooking, the 'benefits' are the convenience of use and the quality of the cooked food. The user often has a preference both for the appliance (depending upon what is to be cooked) and the fuel. For example, gas hobs are more visibly controllable than electric ones (flames can be instantaneously turned up or down,) and the humidity in an oven is affected by the fuel used, with gas combustion giving a higher level of humidity than electricity.

Capital and operational costs for both heating and cooking are dependent upon the equipment purchased, the cost of installation, and energy prices. Appliances are usually designed to last for at least 15 years.

### **The role of hydrogen.**

Natural gas combustion produces CO<sub>2</sub> and is not compatible with Net Zero. This also applies to LPG and oil. Biomethane, bioLPG and bio-oil are carbon neutral alternatives, but we understand that they cannot be produced in sufficient volume at an acceptable cost to be a mainstream alternative.

Hydrogen is a clear and obvious alternative with no carbon emissions when combusted. We understand that with suitable investment it can be produced at scale and at an acceptable cost (but this is outside our field of competence).

The qualities of hydrogen enable it to replace methane in the distribution network with minimal disruption due to having a similar Wobbe number to natural gas. Although a greater volume of hydrogen must be combusted to achieve a similar heat output, the lower density and viscosity produces a greater volume flow at similar pressures thereby compensating for the lower calorific value.

### **Hydrogen Heating and Cooking Appliances**

Enertek International are heavily involved in the BEIS Hy4Heat project (work packages 4 and 5 – developing domestic and commercial appliances respectively). Enertek are heading consortiums with nine leading appliance manufacturers, and are developing sixteen different hydrogen products, including three types of domestic hydrogen cookers, three different types of gas fire, four different types of air heaters and a radiant tube heater. Some are certified already, and all will be certified for installation and use by the end of the project, mid 2021.

It is public knowledge that Bosch and Baxi have already certified hydrogen boilers under the same Hy4Heat programme, and therefore it has been proven that current gas appliances can be modified to operate with hydrogen without major changes to the design, construction and cost.

The above has been achieved within two years, consequently this demonstrates that the timescale for appliance development is not significant given the overall timescales and objectives for Net Zero. It is therefore feasible to have 'hydrogen ready' appliances available for market by 2025 as currently proposed.

### **Enertek International's Evidence for Consideration by the S&T committee.**

- The Hy4heat programme has demonstrated that it is possible to create hydrogen fuelled boilers, fires, air heaters and catering appliances to comply with all relevant safety standards and achieve certification. These will be available for commercial launch later this year (2021).
- To date, Enertek International have been able to convert every type of gas appliance submitted for adaptation from natural gas to hydrogen. This proves that the gas appliance industry is capable of providing suitable appliances to facilitate a change from methane to hydrogen.
- The design (appearance), dimensions and construction of hydrogen appliances is similar to that of natural gas appliances, therefore the direct manufacturing cost of hydrogen appliances is expected to be similar to that of natural gas appliances on a volume per volume basis.
- The ability to convert from methane to hydrogen would enable householders or users to continue to have a choice of fuel for cooking and heating. This would reduce the increase in demand for electricity compared with if gas is no longer an option.
- The timescale for developing hydrogen appliances, and hydrogen 'ready' appliances is compatible with the proposed 2025 introduction of 'hydrogen ready' appliances.

**Further work required.**

Not all types of gas appliance have been included in the Hy4Heat project, and there are other appliance types which Enertek have not been commissioned to work on (internal combustion engines for example) so there are other products to be considered before Enertek's declaration regarding appliance adaptation can be stated industry-wide.

Reliability tests on hydrogen appliances are ongoing. Certification is not a guarantee of long-term reliability but initial indications (from known work carried out to date by Enertek International and others) is that hydrogen products will have a similar life expectancy to natural gas products.

**Short term options.**

Hydrogen blending (adding up to 20% hydrogen to the current natural gas supply) is a good way of building up hydrogen production whilst having a positive reduction in CO<sub>2</sub> emissions, but due to the different properties of the gas, the reduction in CO<sub>2</sub> is nearer to 6% than 20% so is of limited value.

Natural gas appliances can tolerate up to 23% hydrogen without significant changes in performance, but above this level the appliance certification becomes invalid, and performance problems become evident on many appliances when hydrogen exceeds 30% by volume.

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