

# Energy Saving Trust's response to the Scottish Science Advisory Council's questionnaire about the scientific evidence for hydrogen's role into the delivery of the Energy Strategy and Just Transition Plan

Submitted on 23rd June 2022

How would you like your response to be considered:

- a. Kept confidential to the SSAC and used solely for informing this study
- b. Quotes from your response could be used (in the Roundtable and/or report) but not attributed
- c. Quotes from your response could be used (in the Roundtable and/or report) and attributed to your organisation**
- d. Quotes from your response could be used (in the Roundtable and/or report) and attributed to you
- e. Your response could be shared in whole or part with the Whole Systems and Technical Policy Unit in the Scottish Government
  - i) Do you think the messaging around the potential for Hydrogen has been clear? If not, what more should be done?**

Our primary interest in “*messaging around the potential for Hydrogen*” relates specifically to messaging to householders, to communities and to businesses about:

- the zero carbon heating solutions which will be most appropriate for the home(s)/building(s) they own
- low/zero carbon options for personal vehicle transport

In terms of the sectors which look likely to benefit most from hydrogen deployment this will primarily include heavy transportation and hard-to-decarbonise industrial processes. The use of hydrogen for heating homes is seen as a marginal one under

virtually all realistic decarbonisation scenarios<sup>1</sup> provided by the Climate Change Committee<sup>2</sup>, Energy Systems Catapult<sup>3</sup>, National Grid<sup>4</sup> and others, and the regions which will be most likely to see hydrogen used in this way are those situated proximate to hydrogen production facilities with relatively small populations where residential heating could be provided by hydrogen if electrification is difficult. The CCC for example estimate that across the UK approximately 11% of homes will be heated by hydrogen in 2050.

National Grid Future Energy Scenarios estimate that hydrogen for home heating will not be available until 2035. However, significant numbers of homes in Scotland will need to be decarbonised before then. The Scottish Government's Heat in Buildings Strategy notes that reducing emissions from the housing stock will require the rapid deployment of low and zero emissions heating systems such that by 2030 over 1 million homes are using these systems instead of fossil fuelled boilers. Hydrogen will not therefore be a viable solution for meeting the Scottish Government's 2030 heat decarbonisation ambitions for homes. The key routes available in this timeframe will be electrification and heat networks.

While the messaging in publicly available documents such as the Scottish Government's draft Hydrogen Action Plan, which details the actions that the Scottish Government will take over the next 5 years, appears to be clear this has not yet been translated into messages to householders, communities and businesses. For people to make informed choices they will need to know what the most appropriate zero-carbon heating solution will be for the home(s)/building(s) they own, whether they be in the domestic or non-domestic sector. So, we would argue that in terms of messages to householders, communities and business about the potential for hydrogen as a viable solution for heating their buildings, the issue isn't whether messages are clear or not it's that they (i.e., messages to the public about having their home heating fuelled by hydrogen) do not yet exist to any real extent. We believe that messaging is an important gap that needs to be filled – people need to know that hydrogen will not be the solution for the majority of households, that it will not be available as an option for heating homes until c. 2035, and that low/zero carbon alternatives to natural gas already exist, and are proven, in the form of heat pumps and biomass boilers. In the case of heat pumps they are significantly more

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<sup>1</sup> [www.carbonbrief.org/in-depth-qa-does-the-world-need-hydrogen-to-solve-climate-change](http://www.carbonbrief.org/in-depth-qa-does-the-world-need-hydrogen-to-solve-climate-change)

<sup>2</sup> Climate Change Committee advice to both the UK Government

<sup>3</sup> [es.catapult.org.uk/reports/innovating-to-net-zero/](http://es.catapult.org.uk/reports/innovating-to-net-zero/)

<sup>4</sup> National Grid ESOs 2020 Future Energy Scenarios

efficient than boilers because they harness the use of heat energy in our surroundings rather than relying solely on the heat that can be derived from burning a fuel.

Local Heat and Energy Efficiency Strategies (LHEES) will have a key role to play here as they will be required to include “*proposals in relation not the way in which buildings in the local authority’s area are heated can be altered, in order to - ...reduce the emission of greenhouse gases produced by or otherwise associated with the heating of such buildings*”<sup>5</sup>. As such, the information that they contain should allow tailored messages to be produced at a local level about appropriate heating options (including, where appropriate, heating fuelled by hydrogen).

It is our view that the future role for hydrogen in personal vehicle transport and smaller commercial transport will be minimal with the vast majority of these vehicles being replaced by electrified vehicles or public transport. For this reason, we think that the messaging around hydrogen’s potential in the transport sector should focus on heavier commercial vehicles, such as large freight lorries. It is our view that vehicles should only be powered by hydrogen when necessary. Large vans used by tradespeople do not need to be powered by hydrogen – electrification will work perfectly well for these vehicles.

**ii) Are you aware of societal concerns around incorporation of hydrogen in the energy mix and are they being addressed?**

This is not an area in which we have any particular expertise and as such we have no response to this question.

**iii) What are the main energy demand challenges to be faced in Scotland up to 2030?**

- Ramping up electrification of heat and transport and ensuring renewables on the grid can be used effectively to minimise curtailment, for example by increasing the deployment of storage.
- Reducing energy demand in buildings in line with Scotland’s climate change targets.
- Reducing energy demand (but not comfort) in line with Scotland’s fuel poverty targets.
- Improving energy security.

**iv) Where can the solutions for these challenges come from?**

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<sup>5</sup> See: [The Local Heat and Energy Efficiency Strategies \(Scotland\) Order 2022 \(legislation.gov.uk\)](https://legislation.gov.uk)

We firmly believe that energy efficiency has to be at the heart of approaches to tackle energy demand challenges. As the IEA point out in their recent report “*The Value of Urgent Action on Energy Efficiency*”<sup>6</sup> energy efficiency can quickly and significantly reduce energy bill, fuel imports and greenhouse gas emissions while at the same time supporting job creation and economic growth.

Electrification of heat and transport helps reduce reliance on fossil fuel imports, and commodities where the price is set by global markets

**v) Do you expect hydrogen to play a part in resolving energy demand challenges? If so, in what ways?**

As noted above the use of hydrogen for heating homes is seen as a marginal one under virtually all realistic decarbonisation scenarios<sup>7</sup> provided by the Climate Change Committee<sup>8</sup>, Energy Systems Catapult<sup>9</sup>, National Grid<sup>10</sup> and others and the regions which will be most likely to see hydrogen used in this way are those situated proximate to hydrogen production facilities with relatively small populations where residential heating could be provided by hydrogen if electrification is difficult. So, for the sectors that we work in we expect we expect hydrogen to only play a marginal role in resolving energy demand challenges, either directly in homes or indirectly as a fuel source for heat networks. Green hydrogen from renewable sources, or pink hydrogen from waste sources will be important low carbon fuels but will be scarce and therefore it will be important to focus this where it is most needed.

**vi) What role can Hydrogen play in the whole energy system beyond demand challenges?**

Hydrogen could play a role in inter-seasonal or long-term energy storage, but this is not an area in which we have great depth of expertise and as such we have no further detail to add.

**vii) What opportunities can arise from utilising hydrogen to help accelerate decarbonisation?**

This is not an area in which we have any particular expertise and as such we have no response to this question.

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<sup>6</sup> See: [7th Annual Global Conference on Energy Efficiency \(windows.net\)](https://www.windows.net)

<sup>7</sup> [www.carbonbrief.org/in-depth-qa-does-the-world-need-hydrogen-to-solve-climate-change](https://www.carbonbrief.org/in-depth-qa-does-the-world-need-hydrogen-to-solve-climate-change)

<sup>8</sup> Climate Change Committee in their most recent advice to both the UK and Welsh Governments

<sup>9</sup> [es.catapult.org.uk/reports/innovating-to-net-zero/](https://es.catapult.org.uk/reports/innovating-to-net-zero/)

<sup>10</sup> National Grid ESOs 2020 Future Energy Scenarios

- viii) Do you have comments on any foreseen impacts which incorporating **hydrogen** in the energy mix might have on Scotland's eight Just Transition Outcomes ([Just Transition - A Fairer, Greener Scotland: Scottish Government response - gov.scot \(www.gov.scot\)](#)).

Please comment where appropriate below:

**Just Transition Outcomes:**

Outcome	Comments on impact of incorporating hydrogen
<p><b>Citizens, communities and place:</b> support affected regions by empowering and invigorating communities and strengthening local economies;</p>	<p>There will be regions in Scotland which are better suited to utilising hydrogen than others (e.g. they are sparsely populated but have significant renewable generation potential). Being aware of these possibilities and supporting the development of local approaches will enable an efficient transition to net zero. In general, wider outreach to the general public should be encouraged. Transitioning to net zero will be disruptive and will only be possible with the 'buy-in' of the public, they should feel engaged in the process in their local area.</p>
<p><b>Jobs, skills and education:</b> equip people with the skills, education and retraining required to support retention and creation of access to green, fair and high-value work;</p>	
<p><b>Fair distribution of costs and benefits:</b> address existing economic and social inequality by sharing the benefits of climate action widely, while ensuring that the costs are distributed on the basis of ability to pay;</p>	<p>Available evidence (see for example: <a href="https://www.imperial.ac.uk/news/233420/heat-pump-roll-out-must-urgent-home/">https://www.imperial.ac.uk/news/233420/heat-pump-roll-out-must-urgent-home/</a> and <a href="https://www.raonline.org/blog/pipe-dream-alleviating-energy-poverty-hydrogen/">https://www.raonline.org/blog/pipe-dream-alleviating-energy-poverty-hydrogen/</a>) suggests that energy efficiency, heat pumps (including hybrid systems) and heat networks</p>

	<p>will be the least-cost pathway to decarbonising heat (with direct electric heating in space-constrained properties and some use of biomass in hard-to-insulate, off-grid properties).</p>
<p><b>Business and Economy:</b> support a strong, dynamic and productive economy which creates wealth and high quality employment across Scotland, upholds the UN Guiding Principles on Human Rights, and continues to make Scotland a great place to do business;</p>	
<p><b>Adaptation and resilience:</b> identify key risks from climate change and set out actions to build resilience to these risks, ensuring our economy is flexible, adaptable and responsive to the changing climate;</p>	
<p><b>Environmental protection and restoration:</b> commit to act within our planetary boundaries while protecting and restoring our natural environment;</p>	<p>We are supportive of Scotland pursuing specific hydrogen opportunities as part of a broader decarbonisation strategy because we recognise the necessity of using hydrogen in particular circumstances and can see that Scotland is well-placed to become an early mover in hydrogen generated using the abundant renewable resource that we have in Scotland, helping to avoid energy imports. Hydrogen generated using fossil fuels should be avoided, even if this is intended to be coupled with carbon capture use and storage technologies as these technologies remain at an early stage of development and are</p>

	<p>unlikely to ever be able to remove all emissions<sup>11</sup> and store them safely. To help make a success of our move towards net zero we need to be avoiding the combustion of fossil fuels wherever possible.</p>
<p><b>Decarbonisation and efficiencies:</b> contribute to resource efficient and sustainable economic approaches that actively encourage decarbonisation, support low-carbon investment and infrastructure, and avoid carbon 'lock-in'</p>	<p>We think that a key risk in the adoption of hydrogen is infrastructural lock-in where we invest heavily in technologies that rapidly become obsolete and create stranded assets or throw up barriers to full decarbonisation. For this reason it is our view that the Scottish Government should be cautious in pursuing or supporting hydrogen production that uses fossil fuels as either the feedstock or energy source. Imports of hydrogen produced through these processes should also be viewed with caution.</p>
<p><b>Further equality and human rights implementation and preventing new inequalities from arising:</b> address fuel poverty and child poverty in a manner consistent with Scotland's statutory targets on each, while furthering wider equality and human rights across all protected characteristics.</p>	<p>As noted above, available evidence (see for example: <a href="https://www.imperial.ac.uk/news/233420/heat-pump-roll-out-must-urgent-home/">https://www.imperial.ac.uk/news/233420/heat-pump-roll-out-must-urgent-home/</a> and <a href="https://www.raponline.org/blog/pipe-dream-alleviating-energy-poverty-hydrogen/">https://www.raponline.org/blog/pipe-dream-alleviating-energy-poverty-hydrogen/</a>) suggests that energy efficiency, heat pumps (including hybrid systems) and heat networks will be the least-cost pathway to decarbonising heat (with direct electric heating in space-constrained properties and some use of biomass in hard-to-insulate, off-grid properties).</p>

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<sup>11</sup> The Energy Systems Catapult [net-zero report](#) states that while “speculative innovation measures” that result in carbon capture of up to 99% would make blue hydrogen “highly appealing”, anything less effective should not be considered: “Without speculative innovation measures, methane reforming at a 95% capture rate is too high carbon to meet net-zero.” Even at 100% CCUS effectiveness emissions from blue hydrogen would still occur through upstream leakage as illustrated in [a report](#) which accounts for these leakages, by the [Pembina Institute thinktank](#)

