George Adams PPCIBSE Spie
Prof Roberto Amendolia f'rmly Italian Emb'y
Dr Bill Bordass Usable Buildings Trust
Francesca Berriman CIAT Chief Exec
Edith Blennerhassett Arup
Richard Boyd Arup Assocs.
Jane Briginshaw Design England
Lynne Ceeney Lytton Consulting
Keith Clarke ABC & Constructionarium
Katie Clemence Max Fordham
Caroline Cole Colander
Mike Cook, Buro Happold
Paddy Conaghan Hoare Lea
Dr Frank Duffy PPRIBA Co-Founder DEGW
Prof Max Fordham PPCIBSE
Prof Andy Ford PPCIBSE LSBU
Dr Tim Forman U of Cambridge
Simon Foxell The Architects Practice
Dr Julie Futcher co-founder Urban Generation
Bill Gething Sustainability + Architecture
Dr Julie Godefroy Julie Godefroy Sustainability
Prof Peter Guthrie University of Cambridge
Dave Hampton The Carbon Coach
Hattie Hartman The Architects Journal
Prof Colin Haylock PPRTPI Haylock P&D
Stephen Hill C_20 futureplanners
Mike Hitchens Pell Frischmann
Sue James TDAG
Dr Dorte Rich Jørgensen sustainability expert
Chris Jofeh Arup
Prof Paul Jowitt, PPICE Heriot-Watt U
Sara Kassam CIBSE
David Lindsey Max Fordham LLP
Richard Lorch Editor 'Buildings and Cities'
Ciaran Malik AA + U of Arts
Dr Kerry Mashford interfacing
Anne Minors Sound Space Vision
Hal Moggridge Colvin and Moggridge
Dr Mike Murray DMPIP
Robin Nicholson Cullinan Studio
Prof Tadj Oreszczyn, UCL Energy Institute
Adam Poole Buro Happold
Dr Sunand Prasad PPRIBA P + P LLP
Prof Flora Samuel University of Reading
Andrew Scoones ngenuity Ltd
Prof Richard Simmons Bartlett, UCL
Oliver Smith 5th Studio
Simon Sturgis Targeting Zero llp
Lynne Sullivan LSA Studio
Judith Sykes Expedition
Helen Taylor Scott Brownrigg
Ian Taylor FCB Studios
Eddie Tuttle CIOB
Chris Twinn TwinnSustainabilityInnovation
Michelle Wang Hoare Lea
Dr Elanor Warwick Clarion Housing Group
Jenny Watt, Builidng Centre
Jane Wernick engineers HRW
Prof Mark Whitby PPICE whitby wood
Ollie Wildman Ramboll
Albert Williamson Taylor AKT II
www.edgedebate.com

Submission to the Environmental Audit Committee on: **Technological Innovations and Climate Change: Hydrogen** - June 2020

the Edge is a voluntary built and natural environment think tank and network. It is multi-disciplinary in a landscape remarkable for its abundance of single-discipline institutions. We stand for being:

- **Interdisciplinary**: bringing built environmental professionals together, inclusively along with others who share their concerns.
- **Open and creative**: working across all disciplines with competitors and collaborators.
- **Strategic in approach**: encouraging accessible and shared knowledge and seeking to connect place, practice, policy and research.
- **Visionary**: in identifying the issues and in promoting effective and urgent responses to both local and global challenges.
- **Professional**: developing a broad-based ethic of responsibility to social and environmental demands based on an equitable global framework.
- **Business-like:** furthering the skills and capacity of the UK construction industry to promote prosperity and deliver a better built environment.

We have a particular interest in hydrogen (H_2) as a potential future energy carrier for buildings because it fundamentally changes the current market direction of travel for what is naturally a very fragmented sector.

Summary points

The proposals:

- lack joined-up, systems-level thinking.
- have the appearance of being driven by vested interests
- ignore who pays for the duplicate zero carbon energy supply networks required
- overlook the end consumer who will ultimately pay for the conversion and the subsequent higher kWh charges
- ignore the crucial debate on the balance between demand reduction, versus electrical and/or gas supply.

Response

The debate on H_2 supply should be part of a wider equation that, in particular, includes greater demand reduction ('nega-Watts') as well as renewable electricity. At present the debate on H_2 appears to be driven by gas supply-side parties, in the legitimate pursuit of profit, and not the consumers who will pay for it or the building constructors and operators who will be required to implement its introduction.

The debate needs to be balanced between the requirements of all parties. The gas supply industry has been very vocal, pouring money into reversing their already declining market and with the corporate objective of selling more gas. The needs of the consumer, who would generally prefer to use less gas, are not similarly funded. The emphasis, including support funding, should be on reducing the need for energy, thereby reducing the costs to consumers, the supply infrastructure

More should be invested in insulating homes to reduce demand, with the co-benefits of improved health, reduced fuel poverty, and reduced NHS costs [1].

The arguments made for the future supply of H_2 hide worrying mismatches between the Committee on Climate Change's (CCC) net-zero carbon (NZC) scenario and what is being offered. For example, whereas the CCC suggests H_2 may have a role in coping with peaks in energy demand – suggesting perhaps 25% of building heat supply, the gas supply industry presents costs that assume the delivery of closer to 100% of current demand. This means the cost to consumers paying for the investment, per delivered kWh, is underestimated by the order of 75% [2]. There is also no transparency concerning the uplift to costs to consumers for what is a manufactured gas, compared with the presently largely unprocessed natural gas.

To those of us who work in the building industry, the suggested building conversion costs[3] appear to be substantially underestimated. For example: we know that retrofit tends to uncover many other related remedial cost issues, which presumably the building owner will then need to pick up. Also, the energy supply industry has not been very successful at implementing large-scale in-building upgrade rollouts. Witness the mishandled attempts to install smart meters in all domestic premises.

The gas supply industry suggests that the public is generally neutral about a gas switch [3]. However, there is a public general lack of awareness on many issues that would impact:

- Who picks up the costs? Will they fall disproportionally on those least able to pay?
- There will be significant home disruption during pipe replacement, most of which is now hidden away and difficult to get at.
- In future will the off-gassing from open flame cooking and impacts on asthma and other health issues be regarded as acceptable[4].
- Given recent tragic events, we are also beginning to see occupants with fire risk concerns preferring not to have combustible gas in their homes.
- Combustion is a dirty corrosion process that means domestic boilers typically last only 11 years [5]. Who will fund this relatively short replacement cycle?
- The previous, and much cited, conversion of town gas to natural gas was not the smooth process many claim [6].

On the other hand, heat pumps use a fundamentally far more efficient and cleaner process, meaning they can last as long as 20 years between replacements (witness the longevity of domestic fridges). In addition, now that the original aspirations for domestic integrated hybrid heat pumps are receding with the Germany manufacturers concluding there is unlikely to be a major market for them[7, 8], there is a danger that residents will be expected to pay for both a gas boiler and a heat pump, and also lose the valuable space they are installed in.

Rather than claiming that H_2 can supply all domestic heating requirements; involving the conversion of some 23 million[9] separately owned and managed properties; its inherent benefits should be the main focus. H_2 can usefully:

- store energy seasonally and help address winter peak demands. This can then serve converted gas-fired power stations that feed into the electrical grid. Consumers will only have to pay the modest investment[10] in enhanced upgrading of one grid, not for upgrading two.
- harness excess renewable energy generation with electrolysis to create 100% 'Green' H_2. This would avoid the heavy investment[11] lock-in to 'Blue' H_2 from methane + CCS (inherently not a 100% NZC process plus with upstream methane GHG emissions[8]).
- focus on far fewer high intensity users with a smaller network instead of a network for 23 million smaller end users. Such high intensity users could include industry, long haul aviation and heavy lift haulage. Key here is the extra energy supply costs are diluted within wider service costs before being paid for by consumers.

The above does not suggest that all-electric heating in buildings is without its challenges. However, from the evidence available from the building sector, the hydrogen route to a mass market seems unnecessarily fraught and impractical.

the Edge, June 2020

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