
FINAL ADE Response | National Infrastructure Commission – Call for evidence | 4 February 2022

Context

The ADE welcomes the opportunity to respond to the National Infrastructure Commission's call for evidence.

The ADE is the UK's leading decentralised energy advocate, focussed on creating a more cost effective, efficient and user-led energy system. The ADE has more than 140 members active across a range of technologies, they include both the providers and the users of energy equipment and services. Our members have particular expertise in heat networks, combined heat and power, demand side energy services including demand response and storage, and energy efficiency.

Response

Question 1: *Do the nine challenges identified by the Commission cover the most pressing issues that economic infrastructure will face over the next 30 years? If not, what other challenges should the Commission consider?*

The ADE agrees that the nine challenges identified are the most pressing.

However, given the scale of new network infrastructure that will be required for heat networks, we consider that this should be an explicit part of the Commission's Challenge on new networks for net zero.

Question 2: *What changes to funding policy help address the Commission's nine challenges and what evidence is there to support this? Your response can cover any number of the Commission's challenges.*

Please see our response to Question 5.

Question 3: *How can better design, in line with the **Design Principles for National Infrastructure**, help solve any of the Commission's nine challenges for the next Assessment and what evidence is there to support this? Your response can cover any number of the Commission's challenges.*

The ADE does not have a view on this question.

Question 4: *What interactions exist between addressing the Commission's nine challenges for the next Assessment and the government's target to halt biodiversity loss by 2030 and implement biodiversity net gain? Your response can cover any number of the Commission's challenges.*

The ADE does not have a view on this question.

Question 5: *What are the main opportunities in terms of governance, policy, regulation and market mechanisms that may help solve any of the Commission's nine challenges for the Next Assessment? What are the main barriers? Your response can cover any number of the Commission's challenges.*

With respect to energy efficiency, positive steps have been taken through the introduction of higher standards for the domestic and non-domestic new build building sectors and in the upcoming introduction of Performance-Based Reporting for commercial buildings. However, energy efficiency for the existing building stock is not on track to meet the upcoming carbon budgets or to achieve net zero. This under-performance was not sufficiently addressed within the Heat and Buildings Strategy. Whilst it set out high-level commitments and forthcoming consultations, it did not introduce new substantive policy on energy efficiency. To address this, the UK Government should set out revised long term domestic retrofit targets that are consistent with reaching net zero. These targets should include a rising trajectory of minimum standards, mandated action at key trigger points and greater focus on encouraging new financing options to support, in particular, the owner-occupier market (and in line with recommendations, for example, by the Green Finance Institute). Further, and as importantly, the energy efficiency supply chain has been blighted by stop/start Government policy that is focused on mostly short-lived capital spending programmes. The latest, the Green Homes Grant Voucher Scheme, has significantly undermined the sector's confidence to invest against Government ambitions. Energy efficiency funding support and access to private financing needs to be put on a much sustainable, long-term infrastructure footing.

With respect to heat decarbonisation, the ADE considers that stronger central-local coordination and a more regional approach to infrastructure planning will be necessary. A useful framework is now developing in Government's work on heat network zoning which will likely require the UK Government to set out standardised methodologies by which regions designate the most appropriate areas for heat networks. In addition to that, there will then be new powers for Local Authorities to collect information about the local building stock, existing infrastructure, waste heat sources etc. and then to create heat network zones which will mandate connections by certain types of building (e.g., larger commercial buildings). Whilst there remain many questions still to resolve in this policy (including resources and funding for Local Authorities or other regional bodies acting as Zoning Coordinators), it represents a positive step forward and a possible model for regional approaches across heat decarbonisation infrastructure (whether heat networks, hydrogen or electrification through individual heat pumps).

With respect to shared heat infrastructure¹ specifically, the ADE considers that the Commission's framing of the challenge regarding new infrastructure for heat does not correctly describe the scale of growth to 2050. The infrastructure needed for heat networks to meet at least 20% of overall heat demand and the larger contribution of shared heat infrastructure beyond this is very considerable, largely new (rather than making use of existing assets) and is likely to require at least an equivalent or perhaps even more pipework than either hydrogen or CCUS. Further, the Government does not have a clear strategy at present as to how this scale of infrastructure deployment will be achieved. Whilst zoning is extremely welcome, existing programmes (e.g., subsidy support programmes for heat networks such as the Green Heat Network Fund) and zoning will only achieve growth to around 7% of heat demand by 2050 – far short of what is considered cost-optimal on a systems basis by the CCC.

With respect to deep decarbonisation of the electricity sector, there is significant policy development still required to support a more flexible system. The ADE welcomes the updated Smart Systems and Flexibility Plan and the clearer vision and monitoring framework set out therein. It also welcomes the considerable work underway by Ofgem and the network companies to open up network reinforcement to competition from flexibility. However, the sector is not

¹ This includes: district heat networks, communal heat networks and shared ground loops

growing at the pace implied by either BEIS' or others' (e.g., ESO's Future Energy Scenarios or Goran Strbac's work at Imperial College) studies into the level of flexibility needed by 2050.

Across heat decarbonisation and energy efficiency in particular but also in energy more generally, substantial workforce bottlenecks are beginning to emerge². Such shortages will only become more exacerbated as these sectors scale up if more action is not taken by Government soon.

Question 6: *In which of the Commission's sectors (outside of digital) can digital services and technologies enabled by fixed and wireless communications networks deliver the biggest benefits and how much would this cost?*

In decarbonising the electricity system, significant improvements in digitalisation will be important. This includes collecting and using better data to support decisions on electricity network operation and reinforcement. It also includes ensuring that new assets such as EVs, individual heat pumps and heat pump-led heat networks are designed and operated in a way that allows their remote control and dispatch in response to the electricity markets and that their patterns of import and export are visible without incurring excessive cost. The main barriers to achieving this currently seem to be: legacy IT infrastructure (including in the ESO Control Room), a lack of data standards (although this is being progressed by BEIS) and a more cultural tendency within the Government, Ofgem and the ESO to approach this question from a mindset of how existing data processes developed for a system of a small number of fossil fuel plants can be expanded to meet the challenges of a decarbonised, flexible system of thousands, if not millions, of assets. More innovative thinking and a whole systems approach are required here.

In decarbonising the heating system, the digitalisation of the heat network sector will also be important. This will be needed to improve customer outcomes; for example, by improving information available to heat network customers and providing online means by which to monitor energy use and bills. From a heat network operation perspective, digitalisation will also be important in improving system data to identify any operational issues (e.g., very variable or too high return temperatures) and improve system efficiency. The main barriers to achieving this are likely: the lack of strong, enforceable technical standards for heat networks, the lack of a clear strategy on digitalisation for the sector and insufficient Government support to overcome specific barriers in parts of the market (e.g., not for profit schemes).

Overall, across energy, there is a clear need for stronger action on data governance and use; as identified by the Energy Data Taskforce and subsequent Government work. There is also a need for better record-keeping across energy infrastructure (including electricity, gas, heat and ultimately hydrogen networks) as identified by the Cabinet Office's National Underground Asset Register programme, to reduce the significant multi-billion pound cost currently incurred from infrastructure works disrupting existing infrastructure.

Question 7: *What barriers exist that are preventing the widescale adoption and application of new digital services and technologies to deliver better infrastructure services? And how might they be addressed? Your response can cover any number of the Commission's sectors outside digital (energy, water, flood resilience, waste, transport).*

Please see our response to Question 6.

Question 8: *What are the greatest risks to security of supply in a decarbonised power system that meets government ambition for 2035 and what solutions exist to mitigate these risks?*

Despite criticism from the CCC and urgent timescales for market reform, the Government does not have a clear strategy for the deep decarbonisation of the power sector. This is concerning given the work of the CCC and others such as the Future Energy Scenarios which shows that both

² See for example: BEIS (2020) [Heat network skills review](#)

absolute capacity as well as generation from unabated fossil fuel generation needs to start declining in the next few years.

A clear part of this strategy must be to recognise that the sources of capacity in future will be very different to those in the current system. If one considers the Future Energy Scenarios 2021 as an example, the relative contributions of each technology is different but there are also some high-level commonalities. These commonalities include -

- Regardless of how aggressive the hydrogen roll-out is and its availability for use as flexible electricity capacity, the role of storage and demand-side response is significantly more important to securing electricity system supply and operability than previously. In Consumer Transformation, it dominates generation-side sources of capacity and in System Transformation, it makes a roughly equivalent contribution.
- Many of the major forms of capacity will be playing a peaking role in the electricity system rather than providing an ongoing baseload level of generation. As a result, many of those are likely to have exceedingly low load factors – with impacts for investment and revenues, and the importance of funding capacity availability directly (rather than through, for example, an energy-only market approach).
- Under all scenarios, there are considerably more, smaller assets providing flexible capacity than previously. This is particularly striking with respect to the potential role of EVs (whether smart charging or V2G) but also holds more generally. GB markets are not designed for participation from portfolios of thousands, if not millions, of smaller assets.

Current policy work and reform within Government do not currently address this profound shift adequately enough.

The ADE does not have a view on the other aspects of this question.

Question 9: *What evidence do you have on the barriers to converting the existing gas grid to hydrogen, installing heat pumps in different types of properties, or rolling out low carbon heat networks? What are the potential solutions to these barriers?*

With respect to heat networks, the main barriers and some potential solutions are as follows.

Barrier	Potential solutions
Demand risk: In particular for large schemes but across the sector more generally, uncertainty over the extent and timing of connections creates risks to investment and cash flow	<ul style="list-style-type: none"> • Obligation to connect within heat network zones (as being progressed by UK Government) • Government guarantees or under-writing of investment risk for heat networks (for example, through a Regulated Asset Base model)
Lack of regulation on consumer protections or technical standards	<ul style="list-style-type: none"> • Consumer protections are being progressed through the UK Government’s Heat Network Market Framework • Technical standards will be introduced through the Heat Network Market Framework but this is less well-developed and may require further policy (e.g., quality assurance and enforcement)

<p>Decarbonisation strategy: At present (just as with individual dwelling solutions), zero carbon heat networks (from Energy from Waste, heat pumps etc.) cost more to build and run than those using gas. Heat network developers and operators struggle to create competitive offerings and pass these costs onto domestic or non-domestic customers where users can still use low-cost gas heating</p>	<ul style="list-style-type: none"> • The 2022 uplift and the Future Homes Standard will mean that gas boilers cannot be installed in new build domestic and non-domestic buildings after 2025. This will make it easier for heat networks connecting to new builds to charge higher tariffs (set at a level comparable to individual heat pumps) and still be competitive • The fossil-fuel phase-out in the off-gas grid will similarly create the same conditions in these regions and is positive <p>However, this leaves the on-gas grid sector where there are currently only weak commitments to phase out gas boilers. In combination with the introduction of mandated connections within heat network zones and decarbonisation regulation on those heat networks, this is potentially creating the situation where –</p> <ul style="list-style-type: none"> • On-gas grid commercial buildings in heat network zones will face costs to decarbonise earlier than those outside of heat network zones • On-gas grid domestic homes will have very little incentive to connect to heat networks given the higher costs required and the lack of policy requiring them to decarbonise
<p>Extension of statutory undertaker rights to heat networks to allow larger schemes to cost-effectively cross linear barriers (e.g., roads, railways)</p>	<p>Likely to be progressed through the UK Government’s Heat Network Market Framework</p>
<p>Business rates relief</p>	<p>Heat networks pay substantially more in business rates per km of pipework than any other energy infrastructure. This has now been partially addressed through temporary reliefs from both the UK Government and the Scottish Government but there is still no long-term approach.</p>

Question 10: *What evidence do you have of the barriers and potential solutions to deploying energy efficiency in the English building stock?*

As set out above, the Heat and Buildings Strategy has failed to provide a more comprehensive policy framework for the entire building stock, and a comprehensive view on the emissions reductions that can be achieved by current and future energy efficiency policies is still lacking. In particular, the Government currently lacks any meaningful policy to improve owner occupier homes.

Across the tenure, this has created a very mixed set of policies which does not support the sector to grow in scale. Below, we set out the barriers and some potential solutions.

Building tenure type	Current Govt approach	Potential solutions
New build (domestic and non-domestic)	High building standards from 2025	The Future Homes Standard is very welcome. However, there remains a performance gap between standards and delivery which requires more attention.

Owner occupier tenure	No clear targets or funding support	Will likely require a comprehensive package of private financing and stronger Minimum Energy Efficiency Standards regulation
Private rented sector tenure	Minimum Energy Efficiency Standards target EPC C by the end of the 2020s	The target is likely the right ambition but there has been almost no focus or resourcing given to enforcement, significantly limiting the effectiveness of this policy from DLUHC to the Local Authorities.
Social housing tenure	<ul style="list-style-type: none"> Decent Homes Standard Social Housing Decarbonisation Fund (SHDF) 	<ul style="list-style-type: none"> Review of the Decent Homes Standard needs to be ambitious in setting higher targets for energy efficiency and heat decarbonisation Further funding needs to be provided through the SHDF or its successor
Non-domestic private sector	<ul style="list-style-type: none"> Minimum Energy Efficiency Standards Performance-Based Ratings 	The ambition is right and the introduction of Performance-based Ratings very welcome. The main barrier going forward is likely to be good quality data to support these policies.
Public sector	<ul style="list-style-type: none"> Voluntary decarbonisation targets Public Sector Decarbonisation Fund (PSDF) 	The PSDF provides significant funding to support the public sector estate. However, there is a need for clearer targets and regulation to support this investment.

Across the board, there is a need for clearer energy advice to homeowners. The ADE supports a greater focus on impartial energy advice – particularly in England which has no such dedicated service currently. Further, to ensure that all households and communities understand the transition and what is being asked of them, there is a need for a broader and proactive awareness-raising campaign.

Question 11: *What barriers exist to the long term growth of the hydrogen sector beyond 2030 and how can they be overcome? Are any parts of the value chain (production, storage, transportation) more challenging than others and if so why?*

With respect to end uses for hydrogen, we would note the following barriers –

- As set out in the Government’s Industrial Decarbonisation and Hydrogen Strategies, the first uses of hydrogen are likely to be energy-intensive industries in the clusters. Many of those currently use CHP and are likely to maintain their use of CHP when they switch fuels. At present and as a result of incremental policy changes, Government incentives for good quality CHP are almost entirely tied to exemptions from carbon pricing. As a result, as these industries decarbonise, incentives to support efficient CHP over the use of straight boilers and grid import will fall away. This needs to be addressed to support early uses of hydrogen
- The cost of hydrogen will be a major barrier to its uptake. The ADE strongly supports the Government’s proposed Business Model for hydrogen to close the gap between this and gas as the status quo alternative.
- Dispersed industrial areas are unlikely to have the level of hydrogen infrastructure of the clusters. Whilst some areas may decarbonise through electrification, this may not be possible for all (especially those needing high grade steam for industrial processes). In these cases, a more decentralised approach to hydrogen production and infrastructure will be needed. This will likely require more Government and industry work; including on innovation in smaller modular CCUS and smaller hydrogen electrolyzers as well as approaches to smaller, decarbonised private networks.

More generally, into the 2030s and beyond, the gas grid is likely to shrink whilst network infrastructure for electricity, heat networks and hydrogen are growing strongly. At present, the costs of existing and new network infrastructure are recovered almost exclusively from the population base of that vector; i.e., gas consumers paying towards gas infrastructure, electricity consumers for the electricity networks etc. This approach may become unsustainable in the long-term as the population base covering the costs of the gas network (and potentially hydrogen infrastructure if levied on gas bills) shrinks and the regional differences between infrastructure costs become more important (for example, where buildings only have one feasible way of decarbonising their heating).

The ADE does not have a view on the other aspects of this question.

Question 12: *What are the main barriers to delivering the carbon capture and storage networks required to support the transition to a net zero economy? What are the solutions to overcoming these barriers?*

The ADE does not have a view on this question.

Question 13: *In what ways will current asset management practice need to improve to support better infrastructure resilience? Your response can cover any number of the Commission's sectors.*

The ADE does not have a view on this question.

Question 14: *What are the barriers to and solutions for expanding recycling capacity, both now and in the future to deliver environmental and net zero targets?*

The ADE does not have a view on this question.

Question 15: *What is the likely environmental impact of waste streams from construction across economic infrastructure sectors, over the next 30 years, and what are the appropriate measures for addressing it?*

The ADE does not have a view on this question.

Question 16: *What evidence is there of the effectiveness in reducing congestion of different approaches to demand management used in cities around the world, including, but not limited to, congestion charging, and what are the different approaches used to build public consensus for such measures?*

The ADE does not have a view on this question.

Question 17: *What are the barriers to a decision making framework on interurban transport that reflects a balanced approach across different transport modes?*

The ADE does not have a view on this question.

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