THE BARTLETT
ENERGY INSTITUTE

Energy Security and Net Zero Committee Inquiry
Keeping the Power On: Our future energy technology mix

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Contributors:

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2. **Does the Government sufficiently support development of innovative energy infrastructure?**

3. Is the Governments plan for energy security sufficiently long term?

The government's most recent strategy for energy security is set out in *Powering Up Britain*[2], published in March 2023. It is an update to the *British Energy Security Strategy*[3] which was published in the wake of the Russian invasion of Ukraine. Before commenting on whether the government has got their strategy right, including whether it is long-term enough, it is important to remind ourselves what energy security means. The International Energy Agency defines it as 'the uninterrupted availability of energy sources at an affordable price'[4].

Strategies to achieve energy security are both complex and contested[5]. They include shorter-term strategies to ensure affordability (e.g. the provision of help to households as through the Energy Bills Support Scheme), and longer term strategies to shift us away from high cost and/or unreliable energy sources (such as the broader strategy to increase investment in low carbon electricity technologies and carriers such as renewables, nuclear power and green hydrogen).

It is often tempting to assume that resources that are domestic are more secure than sources of energy from other countries. There are three key reasons why this might not be the case. First, domestic resources might be inherently limited. For example, the UK imports around half of the gas it needs because production in the

Current policies effectively rule out onshore wind deployment in England and Wales, one of the cheapest electricity generation technologies.

- Third there is not enough emphasis on measures to increase the resilience of our energy system including measures to ensure sufficient diversity of technologies, sources of energy and minerals and supply routes. The strategy contains no analysis of the current levels of diversity and resilience of the UK energy system – so it is hard for the government and other stakeholders to assess where our vulnerabilities lie, and to monitor the impact of implementation. This also includes energy storage. Whilst battery storage is being deployed very quickly, action on longer

their high costs and long build times, new large nuclear plants are unlikely to play a significant role in the medium-term, and particularly in delivering net zero power by 2035[12].

Therefore, achieving net zero power will require a rapid and sustained push to build more renewable infrastructure and transform the country from sourcing around 30% of its electricity from wind and solar today to 70% or more by the mid 2030s. Potential pathways for the transition of the UK's power system, produced by UCL using the UK TIMES whole energy system model, are shown in Figure 1, which is taken from a recent Centre for Research on Energy Demand Solutions report.[13]

Figure 1:Power generation by scenario 'Steer', 'Shift' or 'Transform', 2010–2050.

Delivering this renewable transition will critically depend both on the timely construction and connection of new generation infrastructure to the network and the contemporaneous deployment of a full suite of key technologies to increase system flexibility and enable renewable integration.

The majority of these technologies are cost effective today and have already been deployed at scale, i.e. interconnection to other countries, reinforcing the transmission system, short duration storage (e.g. batteries) as well as options to provide essential ancillary services like system inertia. Indeed, batteries are only expected to become more affordable going forward. Low carbon dispatchable generation fuelled by hydrogen is increasingly seen as a complement to variable renewables by some stakeholders[14]. Additionally, long duration energy storage using hydrogen has been identified as important for renewables integration by academia[15], the CCC[16] and Government[17], with the former study showing such storage can lower system costs by as much as 21%. Utilisation of this storage route would allow the UK to, among other things, fuel its own dispatchable low carbon generation, further enhancing energy security. Given the appropriate policy support, long-term hydrogen storage is expected to mature quickly as the most promising and affordable option relies on hydrogen storage in salt caverns, a practice which is at scale today though not for energy applications.

A crucial and often overlooked aspect of delivering a highly renewable power system is electricity demand. The transition to net zero is expected to result in demand for electricity growing substantially over the next few decades as heat pumps are deployed at scale in buildings and electric vehicles replace those driven by internal combustion engines. Much of this demand will also be coupled to the weather which, combined with