Keeping the Power On: Our future energy technology mix - Committees - UK Parliament

IET Response

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Key messages (executive summary)

Whilst the net-zero is goal is of huge international importance, it is vital that the UK's plans are efficient and effective in the long term, rather than directed towards potentially misleading short-term targets or attractive gains.

The security of the UK's past energy system could largely be taken for granted due to the abundant availability of natural gas. However, the future UK energy mix needs an urgent, and robust assessment of the technologies, both existing and in development, to meet the most demanding conditions driven by the requirements of a net zero world. There is a need for a mix of substantial non-intermittent sustainable generation capacity to operate in conjunction with the intermittent production from renewable sources.

The IET Energy Panel and Future Power Systems Architecture (FPSA) make the following recommendations:

- A Centralised Strategic Whole System Plan must be developed by an independent, appropriately resourced, and authoritative body to provide early direction and leadership.
- The Centralised Strategic Whole System Plan must:
  - Establish pathways and options for the transition of the future UK energy system.
  - Guide system transition and incorporate all significant energy sources, vectors, storage, interconnection, and applications.
  - Analyse the role of renewables and the associated requirement for low-carbon, non-intermittent power, linking to the production, storage and potential applications of hydrogen, and CCS requirements.
  - Deliver the major 2050 objectives, maintaining accepted levels of security during transition, with more detailed shorter-term stages informed by the ultimate 2050 goals.
  - Be mindful of the development of adjacent energy systems and potential exploitation opportunities of UK resources for other markets.

The next page details answers to the Inquiry questions.

1. **Is the energy sector open enough to new generation technology?**

   The energy sector has shown great willingness to identify and connect what were seen as new generation technologies, particularly wind and solar power, albeit bounded by technical considerations, planning consent challenges and resource availability. Whilst it may be inevitable that incentives are likely to be guided by economic assessments based on prevailing policies, there does not appear to be a systemic reluctance to apply effective new generation technologies.

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

   This question requires a rather broader answer as it implies that innovation itself would drive the development of an effective energy system. Government through UKRI has invested in innovation support for a wide range of new technologies. The rapid growth of wind and solar power has been due to innovation funding and deployment support (through tools like Contracts for Differences) and there must continue to be adequate support for a range of technologies to scale. However, the wider scale adoption and growth of innovative technologies also requires essential strategic context.

   It is then vital that a Centralised Strategic Whole System Plan is developed to establish agreed pathways and options for the transition of the energy system. The process should focus on those solutions with the potential for greatest impact and be clear on the technical and physical constraints implied by options under consideration. This provides a foundation for efficient infrastructure investment including a national spatial plan, policy and regulatory development, societal engagement, and resource and local area planning. It also identifies potential areas for innovation, where importantly it steers activity towards useful prospects and away from development topics that hitherto may have been seen as interesting but are unlikely to be particularly impactful components of the future system.

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

   The national importance of energy security has not until very recently been fully appreciated, as characterised by the demise of the UK's nuclear power capacity and development capability, and the loss of key strategic gas storage resources leading to a disproportionate reliance on LNG imports, in parallel with progressive objectives to dramatically grow renewable energy inputs from what are inevitably intermittent sources.

   So, whilst the security of the past energy system could to some extent be taken for granted largely due to the abundant availability of natural gas, the future energy mix urgently needs a robust assessment of the technologies, both existing and in development, to meet the most demanding conditions ultimately driven by the requirements of future society in a net zero world.

   It is essential to promptly develop a coherent Centralised Strategic Whole System Plan, which will guide system transition and incorporate all significant energy sources, vectors, storage, interconnection, and applications. A key component of this analysis will be the role of renewables and the associated requirement for low-carbon, non-intermittent power, linking to the production, storage and potential applications of hydrogen, and CCS requirements. The plan should be directed to deliver the major 2050 objectives, maintaining accepted levels of security during transition, with more detailed shorter-term stages informed by the ultimate 2050 goals.

The plan must also be mindful of the development of adjacent energy systems and potential exploitation opportunities of UK resources for other markets.

4. **What current technologies could usefully be deployed at scale to deliver better energy security in the UK?**

The answer to this question will be significantly enlightened by insights identified by the suitably optimised strategic plan development and the associated pre-requisites including security requirements. However, technologies that could usefully be deployed at scale in pursuit of a secure net-zero system include: –

Nuclear fission - It seems unlikely that successful and secure energy system transition at UK's latitude will be delivered without the deployment of substantial nuclear power input. In addition to large scale plant, the development of small modular units, and alternative fissile materials should be actively encouraged, not just for the potential speed and simplicity of construction, but also possibilities for association with industrial demands and transport highways.

High Capacity, Long Term Energy Storage - In general, the extent of efficient long term energy storage capacity needed increases with greater deployment levels of intermittent renewables. Storage is then required to ensure strategic reserves providing for inter-seasonal imbalances and support during unplanned situations, to ensure sufficiency during the inevitable extended periods of low renewables outputs, and to accommodate excess wind generation output at times of high output / low demand.

Hydrogen - Hydrogen looks clear to emerge as a valuable and flexible system vector, particularly for some industrial and transport applications, and its contribution to the balancing of renewable generation intermittency using hydrogen turbines. The extent to which hydrogen might feature more extensively, specifically for diverting energy demands from the future power system or operating in tandem with a balanced and secure power system with substantial low carbon, firm capacity should be a key consideration of the previously mentioned strategic planning process.

Wave / Tidal / Tidal Stream - The UK is a leader in the development of wave and tidal applications, though they have yet to find economic application at scale. Nevertheless, their potential for delivering predictable outputs could find new economic value compared to other intermittent renewable source when considered as part of a whole system economic appraisal.

Deep Geothermal Heat - Whilst exploitation is presently limited, some sources of geothermal heat such as mine water can be comparatively readily accessed and used in conjunction with heat pump systems, often with the support of local populations. There is the possibility of more extensive and widespread deep geothermal heat extraction across the UK, and it is therefore suggested that continued research into this potentially substantial and attractive resource should be encouraged.

Naturally, the potential efficacy offered by each technology should be considered within the context of the potential benefits to whole energy system net zero delivery.

5. **Are there technologies that have not been able to develop their potential and should be abandoned?**

There are numerous technologies currently being explored and/or evaluated under innovation funded programmes such as Ofgem's Strategic Innovation Fund, and it will be important to ensure those with the greatest promise are prioritised for further funding over those which show less promise. This will be an ongoing process.

6. **What energy generation mix will get us to net zero the quickest in the most affordable way?**

The objectives outlined in the question are not necessarily mutually supportive, so there are inevitably trade-offs between the cost and speed of transformation of the energy mix.

There are many views on the potential mix of generation sources, and some are well informed and impartial, but none are definitive. What is clear is the need to for a mix of substantial non-intermittent sustainable generation capacity to operate in conjunction with the intermittent production from renewable sources. For example, the development of solar energy which is inherently most productive in summer needs to be considered in conjunction with long-term storage or changes in demand for its capacity not to be duplicated by that needed to meet winter heating demands.

Whilst the net-zero is goal is of huge international importance, it is vital that the UK's plans are efficient and effective in the long term, rather than directed towards presently perceived attractive but potentially misleading short-term targets or apparent gains. It is now vital that these considerations are addressed through a central net zero whole energy system development strategy is created by an independent, appropriately resourced, and authoritative body. Whilst the extent of analysis to be undertaken is substantial, the scale should be commensurate with the principal requirement to provide early direction and leadership. Effective pathways are created by the progression of footsteps following a plan.

Naturally, the speed of decarbonisation is important, and the timeframe for achieving 2050 goals is short given the extensive nature of the transition. There is also a heightened need for enhanced energy security, and both these drivers need prompt attention. It is though important to ensure that delivery efforts are directed towards the long term, maximising security gains but not deflected by the appeal of shorter-term opportunities that do not directly align with efficient delivery of a cost effective and secure system for future generations.

7. **Are the energy solutions universal across the UK or are there regional and local?**

Energy solutions will almost certainly need to take account of regional and local approaches, so reflecting both local constraints and decarbonisation opportunities. However, any such regional and locally based solutions also need to be contextualised within a more global implementation perspective. Internationally focused end use applications, such as aviation and maritime sector-based solutions are also more likely to require the development of universal solutions that reach beyond national boundaries.

It seems clear that requirements and opportunities differ across regions, with some for example including identified energy intensive industrial clusters having access to hydrogen hubs, and some likely to have proximity to CCUS transport facilities.

At a more local level, heat networks making use of waste heat, large scale heat pumps and other energy sources could offer benefits over the adoptions of individual heat pumps. Innovative examples include the use of heat recovery from mines and the London Underground network.

A systematic and properly resourced planning process that takes account of these factors along with others such as climatic variation, housing stock profiles and social preferences is important, and provides an important link to the national strategic plans as well as greatly supporting stakeholder engagement. As an example of such a place-based planning mechanism, the Welsh Government is deploying the Energy Systems Catapult's 'Local Area Energy Planning' tools and process across all regions. It is therefore important to continue to explore the Regional System Planning concept, possibly building on progress that some authorities (e.g., West Midlands, Manchester) have made in developing regional energy planning capability.