Call for evidence: National Infrastructure Commission

Submission from the Chartered Institution of Building Services Engineers

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About the Chartered Institution of Building Services Engineers (CIBSE)

CIBSE is the primary professional body and learned society for those who design, install, operate and maintain the energy using systems, both mechanical and electrical, which are used in buildings. Our members therefore have a pervasive involvement in the use of energy in all types of buildings the UK. Our focus is on adopting a co-ordinated approach at all stages of the life cycle of buildings, including conception, briefing, design, procurement, construction, operation, maintenance and ultimate disposal.

CIBSE is one of the leading global professional organisations for building performance related knowledge. The Institution and its members are the primary source of professional guidance for the building services sector on the design and installation of energy efficient building services systems to deliver healthy, comfortable and effective building performance.

This response is concerned with the third national challenge highlighted in the National Infrastructure Commission's call for evidence, *improving how electricity demand and supply are balanced.*

1. **What changes may need to be made to the electricity market to ensure that supply and demand are balanced, whilst minimising cost to consumers, over the long-term?**

1.1 It must first be noted that reducing demand is a more time and cost effective approach than investing in new generation and distribution capacity. Improving energy security and reducing consumer bills are positive outcomes of a greater focus on energy efficiency, and would benefit from a coherent overall approach. Reducing energy demand in existing buildings (domestic and non-domestic) is an effective way to reduce consumption and costs and therefore to reduce demand on the national electricity infrastructure. This will then free up funds to be invested in other pressing types of national infrastructure, such as those highlighted in this call for evidence.

1.2 We have the experience and knowledge to improve the performance of building stock, but need Government to provide an appropriate policy and legislative infrastructure to support and implement this on a national scale.

2. What are the barriers to the deployment of energy storage capacity?

2.1 There are a number of publicly funded research projects which look into this issue. For example, Understanding the Balancing Challenge produced by Imperial College London analyses the merits of, and the interaction between, alternative balancing technologies (interconnection, flexible generation, storage and demand side response) in minimising the costs of balancing the system in short and long-term. It also considers the key barriers to achieving the efficient deployment of and investment in alternative balancing technologies.

2.2 Combined Heat and Power (CHP) and District Heating (DH) with large thermal storage could play a major role in balancing supply and demand. Large thermal storage can be used to smooth/prolong heat demands so that CHP can generate more in peak times. The lack of regulation in this area has created a barrier that prevents investment in heat energy storage. Adding heat storage into infrastructure can act as a balancing mechanism to assist the grid both at a local and a power station level. Storing heat is practical, feasible and reasonably cheap. The Institute of Mechanical Engineers highlights the issues around heat energy infrastructure in the report Heat Energy: The Nation's Forgotten Crisis.

2.3 There is a vibrant district heating sector with a number of towns and cities either doing feasibility studies or installing plant. These localised (often city wide) heat networks provide the opportunity for connecting local CHP and renewable technologies such as water source heat pumps. These systems almost always include large heat storage capacity that can help buffer the energy supply system and the generation capacity can act as a spinning reserve for the electricity grid. Examples include Southampton, Birmingham, Leicester, Sheffield, Kings Cross, the Olympic Park and Citigen in London and many more. The scheme at Pimlico includes 3MW electrical output combined heat and power (CHP) and three 8MW gas fired boilers and has the largest thermal store in the UK with a capacity of 2,500 m3 of water.

2.4 Another barrier is the lack of a systems thinking approach when it comes to energy infrastructure. For example, using rejected heat from power stations. Also, taking into consideration the rise of heat pump technology and the effect on our electricity infrastructure. Cooling is another forgotten part of the UK's energy infrastructure, electricity consumption for cooling is

increasing and renewable forms such as water source heat pumps should be considered.

2.5 CIBSE has produced, with others, Codes of Practice on both Heat Networks and Water Source Heat Pumps to help raise standards across the supply chain and overcome the barriers of poor coordination and quality management in these areas.

2.6 There is a pressing need for greater systems thinking in the planning and design of energy and electricity related infrastructure to deliver energy in the most cost effective and secure manner in a given set of circumstances.

2.7 The most appropriate scale depends on the specific circumstances of the case – this is one aspect of the lack of systems thinking which we face. In some circumstances domestic scale may be cost effective, especially in isolated areas. In other circumstances, such as the Elephant and Castle regeneration programme, a district level solution is likely to be appropriate. It is least likely that storage at network level will be as efficient as more localised solutions.

3. What level of electricity interconnection is likely to be in the best interests of consumers?

3.1 Interconnection is a tacit admission of inadequate local supply. Investment in local energy demand reduction measures would reduce the requirements for interconnection to supplement local supply, would reduce aggregate demand and promote security of supply and would be a more robust overall solution for the UK.

4. What can the UK learn from international best practice in terms of dealing with changes in energy technology when planning to balance supply and demand?

4.1 Thermal storage has been used with District Heating Networks for more than two decades, for example, in Denmark, large-scale thermal store systems have been deployed to take advantage of liberalised electricity market and now almost all DH systems with CHP plant include heat

storage[1].

4.2 In a number of European countries, heat networks are planned in a strategic way to integrate them into wider infrastructure. The City of Copenhagen's district heating system is one of the world's largest, oldest and most successful, supplying 97% of the City with clean, reliable and affordable heating. Set up by five Mayors in 1984, the system simply captures waste heat from electricity production - normally released into the sea – and channels it back through pipes into peoples' homes. The system cuts household bills by 1,400 EUR annually, and has saved Copenhagen district the equivalent of 203,000 tonnes of oil every year - that's 665,000 tonnes of carbon dioxide[2].

[1] The potential for thermal storage to reduce the overall carbon emissions from district heating systems, Tyndall Centre for Climate Research

[2] For further details see, C40 Cities