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Energy Saving Trust response to National Infrastructure Commission call for evidence

Energy Saving Trust is the leading, impartial sustainable energy organisation. We work on behalf of governments and businesses across the UK providing services in the area of data, assurance, consumer engagement, advice and grant administration.

For the Department of Energy and Climate Change (DECC) the Energy Saving Trust delivers the Energy Saving Advice Service in England and Wales. We also undertake other research and awareness-raising work for DECC on a project-by-project basis – particularly field trials and studies to understand the impact of home energy technologies. EST has also worked with National Grid and other businesses to help them understand the impact of sustainable energy technologies – particularly in homes – on the wider energy system.

In Scotland Energy Saving Trust is the principal delivery partner of the Scottish Government for home energy efficiency. We run comprehensive local and national advice and support programmes. The Trust is also the lead partner for Local Energy Scotland on the “CARES” community renewable energy programme. This programme includes a challenge fund supporting innovative grid integration for community renewable energy projects including energy storage and demand side management initiatives.

The Energy Saving Trust Foundation supports the development of a strong and vibrant community energy sector in the UK through research and support projects including convening cross-sector roundtables on the role of community energy alongside energy storage and smart technology.

Since 2011 Energy Saving Trust, on behalf of OLEV, has advised over 200 organisations on where they could utilise plug-in vehicles in their fleets, and carried out a number of electric vehicle charging infrastructure mapping projects for Transport for London. This has given us a broad view of the practical issues involved in the large-scale roll out of plug-in vehicles. Our involvement in the Innovate UK-funded *Ebbs and Flows of Energy* project means we are also at the vanguard of the emerging vehicle to grid market and seeking to understand how this will change the electricity market

Electricity interconnection and storage

Key response points:

- Energy efficiency is one of the most cost effective ways to reduce electricity demand and reduce energy bills and as such should be an infrastructure priority
- Load balancing at a local level could be significant to improve the flexibility of the energy system
- Energy storage, along with renewables, could play an important role in balancing supply and demand, with storage important to alleviate grid capacity issues
- There are currently various barriers to the adoption of energy storage, many of which can be reduced by effective policymaking
- Households represent a substantial energy storage market building on uptake in the business sector
- Community energy groups are often willing to try innovative and untested business models and technologies, and could therefore be useful partners to deploy energy storage and smaller scale balancing technologies

There are a number of EST projects and studies to which we would like to refer you and about which we would be happy to provide more information:

- Energy Demand Archetype Model (EDAM). This energy model - designed for engineers - creates best estimates of what demand changes will look like in the future as new technologies are installed in the home.
- Scottish Government Challenge Fund for Community renewables and storage
- Recent round table events with government, academia and industry on the potential for community energy and storage

Question 1:

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?

- What role can changes to the market framework play to incentivise this outcome:
 - Is there a need for an independent system operator (SO)? How could the incentives faced by the SO be set to minimise long-run balancing costs?
 - Is there a need to further reform the “balancing market” and which market participants are responsible for imbalances?
- To what extent can demand-side management measures and embedded generation be used to increase the flexibility of the electricity system?

Energy Saving Trust response:

One of the most significant steps to help reduce electricity demand is through improved energy efficiency in homes. It represents a huge cost-effective potential to reduce energy use and carbon emissions from homes, at the same time lowering energy bills for ordinary households. Energy efficiency achieves a number of important government objectives and there seems to be little disagreement that retrofitting the UK housing stock is crucial to achieve our decarbonisation targets, ensure better energy security and keep energy bills down. Nonetheless government action to date has not been sufficient with a lack of stability, clarity and with no clear roadmap in place on how to improve the energy efficiency of our homes. The Committee on Climate Change – for instance – stated in its 2015 progress report¹ that:

“[...] the policy landscape is complex and in places inconsistent. Our assessment of existing policies is that some of these are at risk of failing to deliver, either due to design and delivery problems, or because they are currently unfunded. Even if these policies delivered in full, there would be a policy gap to achievement of the fourth carbon budget (2023-27) and the cost-effective path to the 2050 target.”

As such we are calling for energy efficiency to be set as an infrastructure priority – for reasons that are set out in the recent paper published by Frontier Economics²: *‘Energy*

¹ ‘Reducing emissions and preparing for climate change: 2015 Progress Report to Parliament- The Committee on Climate Change. June 2015.
<https://www.theccc.org.uk/publication/reducing-emissions-and-preparing-for-climate-change-2015-progress-report-to-parliament/>

² ‘Energy efficiency: An infrastructure priority’- Frontier Economics. September 2015.
<http://www.energysavingtrust.org.uk/sites/default/files/reports/Energy%20efficiency%20as%20infrastructure%20September%20Final.pdf>

Efficiency: an infrastructure priority'. And we would like to see NIC priorities and planning for the energy system to reflect this.

Load balancing at a localised level will play an important role in improving the flexibility and resilience of the energy market. In turn, energy storage and batteries (in EVs for instance), along with microgeneration, represent a clear opportunity in localised load balancing. In certain parts of the country where there are grid capacity issues storage could allow the installation of more solar PV without having to upgrade infrastructure and help load balance.

Energy Saving Trust data suggests there are over 6 million houses in the UK with south facing roofs. This does not include blocks of flats with flat roofs or non-domestic buildings. Even allowing for the fact that some of these may not be suitable for solar PV this still represents a significant opportunity. Considering this tremendous potential, having to restrict the growth of the industry because of excessive pressure on the grid is a missed opportunity.

We understand that there are various market-based solutions that are being looked at and one example of this that Energy Saving Trust is involved with is the 'Ebbs and Flows Energy System (EFES)' project: it is looking at creating a local energy system that can help address the electrical needs of the UK through utilisation of plug-in vehicle to grid technology to reduce demand on the National Grid (NG) at peak demand times. The project aims to demonstrate the development, impact and business potential of a Virtual Power Plant (VPP) integrating; building energy management, renewable electricity generation, electric vehicles and battery storage systems.

In addition, in Scotland the Scottish Government Challenge Fund, which runs alongside the CARES (community renewable energy systems) The fund supports *"projects looking to develop innovative energy distribution and storage solutions that have an overall aim of creating more local value and benefit."* Applications have included integration of energy storage and demand side management alongside community renewable energy. A similar fund would be useful for the rest of the UK. Although Ofgem has the Low Carbon Networks Fund this is not generally accessible to stakeholders other than Distribution Network Operators. Bringing in a wider range of stakeholders alongside DNOs could greatly increase the potential for innovation.

Finally, local authorities and community energy groups could have a significant role in supporting and facilitating the development of smart-grid approaches through their ability to draw together broad partnerships around local energy projects (e.g. area-based energy efficiency and local renewable energy projects). Energy Saving Trust Foundation has

identified significant support for smart grid approaches, demand side management and energy storage within these sectors through a series of roundtable events and workshops we have facilitated with government, academia and industry. These focused on locality-based approaches to smart-grids alongside community-ownership models and had attendance from a wide range of organisations including:

- The community energy sector, alongside local authorities, could be a strong ally for this work on the basis of shared goals around energy efficiency, security of supply and carbon emissions reduction.

We would be happy to offer more information about these events and their outcomes if the commission wanted it. If so please get in contact.

Question 2:

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

- Are there specific market failures/barriers that prevent investment in energy storage that are not faced by other 'balancing' technologies? How might these be overcome?
- What is the most appropriate scale for future energy storage technologies in the UK? (i.e. transmission network scale, the distributed network or the domestic scale.)

Energy Saving Trust response:

In a recent roundtable event on community scale energy storage (and domestic to an extent) bringing together stakeholders from different backgrounds (academia, industry, community energy groups) a number of different challenges were identified:

- Capital cost of energy storage systems needs to be reduced
- Energy storage could have multiple income streams (including selling balancing services and increasing revenue from local generation) but in practice these can be difficult to realise as the market is not yet mature. Piloting new approaches could help to address this.
- A stable policy framework is needed for community energy and energy storage
- Social enterprise models for energy supply could help to unlock the potential of community-scale energy storage
- Deployment of more pilot projects is needed to demonstrate the viability of energy storage and test different business models

This list is not exhaustive and it should be noted that understanding the barriers to energy storage is complex.

Energy storage will become much more economically viable once the true environmental impact of alternatives is taken into account. Although storage forms part of the capacity market auctions, in comparison to diesel and coal generation it plays a relatively minor role at the moment. One of the difficulties quoted for energy storage is that there needs to be greater deployment of the technology, not only to help bring costs down but also to demonstrate the viability and explore the different potential business models that could be built around storage. The Capacity Market mechanism could be used to promote and develop energy storage to a much greater extent and help overcoming this hurdle. If, for instance, a greater emphasis on the environmental impact was taken into account in the

Capacity Market then energy storage would emerge as a more attractive option than diesel storage. Given the potential future role of energy storage in reducing carbon emissions and providing secure supply through addressing the intermittency of renewable energy generation and balancing supply and demand, this would appear to be a much better investment than diesel generation.

Energy storage technologies are applicable for deployment at various different scales and we believe that businesses, communities and households all have an important role to play. Households often receive the bulk of the attention when energy storage is looked at, however as businesses work on a larger scale and have greater capacity it may be easier to focus on them first. Industry deployment could be a useful precursor to domestic rollout, particularly as they are already experimenting with demand side reduction supply contracts which provide additional financial incentives for embracing flexibility.

We also believe that community energy groups could play a leading role when it comes to this as they are frequently driven by social and sustainability concerns. In addition, community energy groups have shown themselves to be willing to try innovative and relatively untested technologies and business models.

Generally there seem to be few mechanisms in place to incentivise uptake of domestic storage; without half-hourly settlements and as the feed-in tariff does not offer financial incentives to store electricity, households currently have little financial reason to install storage.

The domestic sector represents a tremendous market. The single most significant change to get domestic energy storage on its feet would be half hourly settlements. The value of energy storage at a household level would increase substantially at this point as households and community groups would be able to charge their batteries during the daytime (off peak) and use or export the stored electricity during the evening (peak demand times). At present there is little financial value in storing electricity because the export tariff is the same regardless of the time of day, as is the cost of the electricity. Although we understand that Ofgem will introduce a time of use tariff in 2017 we are as yet unclear whether this will be the trigger for the domestic markets and to what extent this will incentivise the uptake of energy storage.

Of potential interest to the Commission is the modelling tool that Energy Saving Trust helped develop for National Grid - Energy Demand Archetype Model (EDAM). This energy model - designed for engineers - creates best estimates of what demand changes will look like in the

future as new technologies are installed in the home. EDAM works with user-set assumptions regarding the uptake of various energy saving measures and low carbon or renewable energy technologies, although this does not currently include energy storage there is no reason why it could not be included if necessary. EDAM covers the domestic sector and the most recent version EDAM II includes both the domestic and non-domestic sector.

Finally, as pointed out by the Institute for Chartered Engineers³ *“The key point is not to look at individual technologies or responses in isolation but rather consider the electricity system as a whole.”* Although energy storage has a lot of potential to help balance supply and demand it is more important to look at ways that demand management and other systems can improve the flexibility of the system as a whole – including, for example, home energy efficiency. Looking at the system in a holistic manner is important in this regard and we would encourage looking at models that can be scaled up, interact and incorporate a variety of technologies into them. There is no “winning” technology that policy should be focussed on, instead developing a smart system for consumption, generation and network management that can adjust to include different technologies as they become available is needed.

³ In their written response to the inquiry into Low Carbon Network Infrastructure by the Energy and Climate Change Committee. 17 November 2015.
<http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/energy-and-climate-change-committee/low-carbon-network-infrastructure/written/23817.html>

Question 3:

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

- Is there a case for building interconnection out to a greater capacity or more rapidly than the current 'cap and floor' regime would allow beyond 2020? If so, why do you think the current arrangements are not sufficient to incentivise this investment?
- Are there specific market failures/barriers that prevent investment in electricity interconnection that are not faced by other 'balancing' technologies? How might these be overcome?

Energy Saving Trust Response:

As the Energy Saving Trust's focus is on domestic and community level engagement, interconnection is not one of the areas that we work on. Our response to this question is therefore simply that the value for money of interconnection needs to be carefully looked at, investing heavily into expensive interconnection should be weighed against other, potentially less expensive, alternatives. Another point is that it is arguably better to keep the economic benefits of low carbon electricity generation in the UK economy by supporting development of our own industry in their area, given that this will be one of the most important global industries of the twenty first century in the wake of the Paris agreement.

Question 4:

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?

No response.