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# BEIS/Ofgem

## A smart, flexible energy system: A call for evidence

### WWF-UK RESPONSE

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#### SUMMARY

WWF is a leading global conservation organisation, employing over 5,000 staff in more than 100 countries and with more than five million supporters across the world. Working to prevent dangerous climate change is a priority for us as around one in six species will be at risk of extinction due to the warming of our planet<sup>1</sup>.

WWF has an established track record working on energy and climate change in the UK and is recognised as a leading NGO on carbon budgets and the Climate Change Act. Our current focus is on ensuring that the government brings forward robust policies to both achieve the Fifth Carbon Budget, and to stay on the cost-effective path to the 2050 goal to cut emissions by 80% on 1990 levels. A vital part of decarbonising the UK economy is reducing emissions from the power sector to below 100g Co<sub>2</sub>/kWh, in line with the advice from the Committee on Climate Change<sup>2</sup>. Both the National Infrastructure Commission (NIC) and research conducted by Imperial/Nera found that increasing the flexibility of our power system will be key to integrating high levels of renewable electricity capacity in a cost effective manner<sup>3</sup>.

WWF-UK therefore sees flexible technologies as being pivotal to the successful decarbonisation of the power sector. Over a number of years, we have consistently advocated for the greater provision of Demand Side Response (DSR), storage and interconnection and have recognised the contribution that these technologies can make to an affordable, secure and clean power system<sup>4</sup>. The WWF-UK convened business taskforce on renewables also found that focusing on growing our energy systems expertise could result in significant economic benefits for the UK.

However, the regulatory framework currently favours increasing capacity from traditional forms of generation, rather than incentivising action on the demand side and storage. WWF-

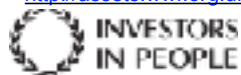
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<sup>1</sup> <http://science.sciencemag.org/content/348/6234/571>

<sup>2</sup> <https://www.theccc.org.uk/wp-content/uploads/2015/10/Power-sector-scenarios-for-the-fifth-carbon-budget.pdf>

<sup>3</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/505218/IC\\_Energy\\_Report\\_web.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/505218/IC_Energy_Report_web.pdf)

<sup>4</sup> [http://assets.wwf.org.uk/downloads/wwf\\_capacity\\_market\\_briefing\\_march\\_2015.pdf](http://assets.wwf.org.uk/downloads/wwf_capacity_market_briefing_march_2015.pdf)



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UK supported the recommendations of the NIC which identified some “no regrets” solutions to increasing the flexibility of our power sector. WWF-UK therefore welcomes this call for evidence and is pleased to see the smart power agenda being progressed jointly by the government and the regulator. However in order to present a truly holistic approach to increasing the flexibility of the system, WWF-UK urges BEIS and Ofgem to work together with the system operator and the distribution network operators.

## CROSS CUTTING ISSUES

- 1. A changing energy system** The way we generate and use energy is changing. It is moving away from the old, centralised model, towards a more modern and responsive system. With 25% of electricity generated from renewables and dramatically reducing costs, the UK now stands poised to secure an affordable, low carbon power system<sup>5</sup>. The last few years have seen innovative new technologies, such as dynamic demand management and battery storage, enter the market. The advent of smart appliances combined with smart meters, half hourly settlements and time of use tariffs will enable ever more accuracy in the balancing of supply and demand. This means that continuing with a strategy of building more traditional generating capacity to back up variable renewables is no longer valid.
- 2. Increasing flexibility complements renewable deployment** As the proportion of renewable generation increases, it is crucial that the electricity system becomes more flexible<sup>6</sup>. Research by Imperial College and NERA found that increasing flexibility maintains system security and leads to “very significant cost savings”<sup>7</sup>. Flexible technologies such as Demand Side Response (DSR), storage and interconnection will not only play an important role in balancing variable renewable generation, but also have the potential to save consumers around £8 billion a year.
- 3. Increasing flexibility is an economic opportunity** The further deployment of renewables will present opportunities for major economic benefits, both at a national and a local level. As pioneering areas such as the Humber have shown, low carbon growth can offer significant regional economic benefits, as well as opportunities for job creation and community regeneration. The UK has the capability, experience and circumstances that equip us to lead this transformation – delivering value for current and future generations of UK consumers whilst building new export markets for our technology, skills and services abroad. By capitalising on the UK’s record of success in renewables and our longstanding reputation for innovation across the energy sector, the UK could become a world leader in the development and integration of low-carbon energy systems. These systems are relevant to much of the global electricity infrastructure, from similar island-bound jurisdictions to those developing economies that are increasingly seeking to bypass investment in traditional transmission grids.
- 4. Removing barriers** The WWF-convened business taskforce on renewables argues that the UK needs a new programme of reform, in infrastructure, operation, regulation and governance, to deliver a low carbon energy system that provides the services that consumers need at the lowest cost. Rapid technological advancement in smart technologies is not being matched by a fit for purpose regulatory framework. This reform is a vital element of meeting our international goals for climate change, which are mandated by the Paris Climate Change agreement and by our own domestic Climate Change Act. Since privatisation a complex regulatory framework has built up which

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<sup>5</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/579527/Renewables.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/579527/Renewables.pdf)

<sup>6</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/507256/Future-proof\\_energy\\_infrastructure\\_imp\\_Cam\\_Feb\\_2016.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/507256/Future-proof_energy_infrastructure_imp_Cam_Feb_2016.pdf)

<sup>7</sup> [https://www.theccc.org.uk/wp-content/uploads/2015/10/CCC\\_Externalities\\_report\\_Imperial\\_Final\\_21Oct20151.pdf](https://www.theccc.org.uk/wp-content/uploads/2015/10/CCC_Externalities_report_Imperial_Final_21Oct20151.pdf)

distorts the market in favour of incumbent and long established technologies. The government should prioritise the removal of barriers to flexible technologies in order to increase competition and maximise cost reductions. Globally, energy and technology markets are innovating rapidly and the UK's regulatory framework needs to be suitably responsive to ensure the UK is well placed to capture opportunities.

## RESPONSES TO QUESTIONS

### Questions 1 - 6 : Enabling storage

Technological developments in storage are happening at an extraordinary pace. With the right support, these advances will enable a global transition to clean energy that would have been hard to envisage even a few years ago. WWF-UK believes that storage will enable a lower carbon, lower cost energy systems where consumers can take greater control of their electricity usage.

At the transmission scale, storage can aid the System Operator in mitigating the variances in supply and demand<sup>8</sup>. Storage will also reduce the overall amount of new generating capacity that is needed and will enable more effective system operation. This enhanced security of supply will allow investment in low carbon generation to be optimised as well as reducing overall energy costs to consumers. At a domestic level, storage will allow consumers to take greater control of their electricity production and usage (becoming so-called “prosumers”), furthering the decentralisation of the electricity grid. As this call for evidence identifies, penetration of domestic scale storage links closely to deployment of electric vehicles and take up of electric heat. Coupled with the smart meter roll-out, the integration of domestic storage and generation presents a considerable opportunity to develop the wider network.

It is important to consider that there are a number of different electricity storage technologies which are at differing levels of commercial development. For example, pumped hydro is a mature technology that has been used successfully for many years, whereas transmission scale battery storage and flywheels are emerging technologies. Recent years have seen investors and developers race to find technological breakthroughs in battery storage that will enable electricity to be stored and discharged quickly, efficiently and cost-effectively<sup>9</sup>. The cost of battery storage is anticipated to fall rapidly between now and 2020<sup>10</sup> but ultimately cost reductions will be dependent on the type of technology adopted and its uptake, which in turn is dependent on the business model which is used to access the market.

We welcome the focus on removing barriers for storage in this call for evidence and are supportive of the approach outlined. Unleashing the revolutionary potential of storage will require a new regulatory framework for the energy market. Research by Imperial College found that storage can help the UK realise significant cost savings but only “if market arrangements for the electricity system” are updated<sup>11</sup>. Battery storage is an immature technology and as such business models that utilise this technology are, as yet, unproven. Currently, there is a lack of a shared vision amongst stakeholders as to how the various forms of storage, and the range of services it can enable, could best be deployed. Storage investors currently have to identify the potential revenue streams associated with the services that storage can provide. This usually means that developers must grapple with

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<sup>8</sup> <https://www.carbontrust.com/media/672486/energy-storage.pdf>

<sup>9</sup> <http://www.bloomberg.com/news/articles/2015-04-14/gates-pritzkers-take-on-musk-in-5-billion-race-for-new-battery>

<sup>10</sup> <http://www.bloomberg.com/news/articles/2016-01-04/energy-storage-costs-expected-to-slide-41-by-2020-gtm-says>

<sup>11</sup> <https://www.carbontrust.com/media/672486/energy-storage.pdf>

several regulatory frameworks in order to develop a business case. The regulatory framework compounds this issue by failing to take account of the system wide benefits storage could deliver, and of the different commercial models that need to be promoted to maximise their development at various stages.

Whilst the government needs to guard against picking winners in this fast moving area of technological progress, it should support a range of business models and approaches by setting out a storage roadmap and by prioritising projects of strategic importance. This roadmap should include the prioritisation of strategic projects, demonstrators and activities across the UK, possibly facilitated by some form of competitive funding to support investment in novel infrastructure. For more on incentivising innovation, please see the questions on that topic below.

### **Questions 11 - 14: System value pricing**

One of the most fundamental changes in the power market is that the wholesale price can no longer be relied upon as an effective price signal; it is not sufficient to incentivise investment in any form of plant. All market actors therefore need to stack revenues from the other parts of the electricity market - whether that is via a Contract for Difference (CfD), the Capacity Market or in the balancing market - in order to build a business case. Different technologies can access these markets to a greater or lesser extent depending on their inherent characteristics but current government policies do not value flexibility specifically. This has led to a situation where auctions support old, inflexible capacity which then undercuts investment in the more flexible technologies needed by our system. For instance, in the recent Capacity Market action, old coal plants received £128 million of payments, thus prolonging the life of old coal<sup>12</sup>.

Traditionally, flexibility in the power sector has been provided by large thermal generators connected to the transmission network. Many of these plants are now nearing the end of their working lives and are being replaced by more decentralised, renewable capacity. This means that the power sector now has to procure flexibility as a commodity in its own right. The variable nature of renewables combined with changing consumer demands for heat and transport means that there is a growing need for flexibility, especially at the local system level. Large, centralised power plants are less able to provide the flexibility required to balance supply and demand at local level.

WWF-UK would argue therefore argue that the system needs to begin to value flexibility as a good in its own right. Whilst removing barriers should be a priority action, policies need to adapt to price in the value of flexibility as a commodity. This would enable investment in the technologies and capabilities that are most needed by the system. Currently the procurement of flexibility in the balancing market is focussed on what existing plants can offer, rather than what the system actually needs to procure (for instance, the ancillary service contracts awarded to Fiddler's Ferry coal power station<sup>13</sup>). Likewise, the Capacity Market needs to evolve to differentiate between different resources, valuing the most flexible resources more<sup>14</sup>, to ensure that the needs of the system are met most efficiently. Fundamentally value streams and market structures need to reflect the technology of the day, not the other way round. A review of current arrangements for the electricity balancing services procured by National Grid should be undertaken to ensure they are as open as possible to new entrants and technologies.

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<sup>12</sup> <https://www.emrdeliverybody.com/Capacity%20Markets%20Document%20Library/Final%20Results%20Report%20-%20T-4%202016.pdf>

<sup>13</sup> <http://www.timera-energy.com/uk-coal-plants-security-of-supply/>

<sup>14</sup> [http://www.green-alliance.org.uk/resources/Smart\\_investment.pdf](http://www.green-alliance.org.uk/resources/Smart_investment.pdf)

Increased transparency in the procurement of flexibility services is of paramount importance, both to ensure value for consumers and fair access for different technologies. Open and competitive auctions should be utilised and specifications and contracted obligation periods should be streamlined to prevent established technologies gaining an unfair advantage over newer and more innovative technologies.

### **Questions 25 - 27: Other government policies**

WWF-UK welcomes the focus placed by the government and the regulator on evaluating the participation of DSR in the Capacity Market. However, we would caution that other forms of generation bidding into the auction could be in danger of undermining investment in more flexible forms of generation, as well as undermining stated government policy.

WWF-UK would argue that allowing coal fired power stations to bid into the Capacity Market undermines investment in flexible technologies. As stated above, in the recent capacity market auction, existing coal fired power secured £128 million of capacity contracts. Furthermore, there is a risk to the government's stated coal phase out policy if coal fired power stations continue to receive contracts for capacity.

To allow fair competition in the Capacity Market, and to streamline government policies, WWF-UK recommends that coal fired power stations should no longer be eligible for participation in the T-4 Capacity Market auction. Taking this action would be of benefit both in terms of ensuring that coal phase out is achieved in a smooth and efficient manner, and in encouraging investment in DSR.

### **Questions 28 - 32 - Smart appliances**

Yes. WWF-UK agrees with the intended focus and we are supportive of the four principles that are outlined. We are encouraged by the inclusion of the 'energy consumption' principle. It is essential that in moving to a more flexible energy system we do not unnecessarily increase electricity demand.

### **Questions 43 - 46 - Roles and responsibilities**

WWF-UK believes that government, Ofgem, the system operator and distribution network operators all have important roles to play in facilitating the transition to a smarter system. We urge these different parties to work together to facilitate the transition to a more flexible and decarbonised system as holistically as possible. WWF-UK would also like to note that demand reduction, alongside demand shifting and smarter appliances, should form a large part of the UK's approach towards making the system more cost effective and secure. Changing consumers' behaviour will be an integral part of this journey and so we urge parties to move towards half hourly settlement and time of use tariffs as quickly and efficiently as possible if we are to realise a decarbonised power sector that also works for consumers.

WWF-UK agrees that there is a need for immediate action by the DSOs, SO and TOs to increase coordination in short and long-term network planning to ensure the most efficient use of all available resources is achieved and that this should include:

- developing a formalised framework to ensure the network planning process takes into account whole system requirements and the needs of the wider range of stakeholders.
- the DSOs feeding into the System Operability Framework. Maximising the grid network efficiencies available to us, will reduce the total amount of new generating capacity that needs to be deployed as part of the renewable transition.

## Questions 47 - 48 - Innovation

WWF-UK welcomes the focus on innovation in this nascent sector. It is key that the regulatory framework fosters innovation across different technologies and should also focus on incentivising innovation in flexibility technologies. The UK will need to try many new technologies at scale in order to discover an efficient energy mix and to build supply chains that can compete globally. The WWF-UK convened business taskforce on renewables recommends that the UK should build on its reputation for world leading R&D, and establish a “sandbox” for new entrants into the electricity market. This would enable developers to try out new technologies without huge upfront capital investment and would allow them to identify potential regulatory barriers early.

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