

Smart, Flexible Energy System: BEIS and Ofgem Call for Evidence

**A response to the Call for Evidence prepared by Swanbarton
Limited**

For the attention of BEIS and Ofgem

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1 Introduction

Swanbarton is a consultancy with a specialization in energy markets. We have a particular interest in the interaction of electricity storage with the power system and we have been active in the industry since 2003. We are actively involved in the development and deployment of modern and smart technologies for electricity networks. Swanbarton's expertise covers applications of energy storage at large scale, community and small scale, and has worked across the range of technologies.

Swanbarton welcomes the BEIS/Ofgem Call for Evidence and the focus on enabling various forms of flexibility in the GB electricity system. We welcome the joint work that BEIS and Ofgem have undertaken, and we are pleased to see that storage has been given a high priority as we transition towards a more flexible electricity system.

Our company is experienced in this field, with 14 years' corporate experience in energy storage, and staff experience of many years prior to that. We have been working in storage development alongside the transition of renewables from novelties into an established part of the energy sector. We are optimistic about the future direction of the power industry, but are concerned that in the rush to adopt new technologies there is a risk of unintended consequences and the potential to overlook the greater societal benefit of storage.

We have been pleased to see the cost of storage technologies continuing to fall, along with a rapid rise in recognition and deployment in recent years. However, we have also seen that the removal of barriers and hurdles to storage deployment has not kept pace, so limiting the cost-efficiency and strategic benefits of electricity storage to the energy system. We therefore would call for a more strategic approach to establish how the energy system should look in the future.

We commend BEIS/Ofgem's Call for Evidence for helpfully making the distinction between shorter-term and longer-term activity. We believe it is important to emphasise this distinction and have structured our response accordingly, before moving on to answer the specific questions. There is an urgency to shorter-term action but also a need for longer-term strategic activity.

Swanbarton is one of the founding members of the ESN and we support the ESN's views:

We support a universal definition of electricity storage, supported in licencing legislation to ensure greater consistency in the regulation of electricity storage technologies as they enter the system.

- We would like to see the removal of the double Consumption Levies, to avoid the unfair disadvantage of connected storage facilities in relation to storage at other connection levels, or to other flexibility providers.



- A strategy of continuity on network charging, to avoid stop- start step changes, such as any removal of embedded benefits before removal of unfair double network charges.
- Development of a policy and regulatory framework ensures clear value for money to the consumer, allowing for appropriate contract lengths and specifications for service providers.

On longer-term strategy, we call for:

- A reform of the electricity market to enable peer to peer trading, enable community energy markets and resolve associated cyber security issues.
- A clear routemap to establish the future roles of storage, and to clarify how a portfolio of deployment can be secured to ensure both short-term high-value facilities and long-term solutions are equally as successful. We commend examples such as the routemap produced by Energy Networks Australia and CSIRO available at <http://www.energynetworks.com.au/electricity-network-transformation-roadmap>
- Continued work outlining options for the roles of the DSO, and providing greater clarity on governance arrangements, particularly the balance of diversity against consistency among DSO development.
- A clear support for cyber security initiatives, and greater channels of communication between individual users of smart technologies, users of this personal energy use data, and regulators. We would like to see greater collaboration between Ofgem and Ofcom, and are surprised this connection has not yet been made.
- Greater signposting of innovation priorities in the network, and how these are accommodated and rolled out under the RIIO price controls.
- Further study on the interaction between heat and electricity, involving a consultation in the context of whole-system operation so that, for example, heat stores are not actively depleted just as electrification takes off.

We look forward to seeing the plan in spring 2017, and Swanbarton will be happy to support BEIS and Ofgem with this work. We hope this plan will not be restricted to simply removing existing barriers, but will propose a clear direction of travel for the energy system. We are willing to provide further information to BEIS and Ofgem either directly or through our membership of the ESN.

2 Overview

We are pleased this call for evidence comes jointly from BEIS and Ofgem. We hope this will mean that issues will not fall between the two parties, and as such be neglected. In this vein, we also strongly support the work of the new, bespoke storage team within BEIS, and the chapter in the Call for Evidence dedicated to storage, allowing attention to be given to the sector at this important time.

➔ **We welcome joint work by BEIS and Ofgem and specific teams dedicated to storage.**

We are pleased to have been actively involved with BEIS and its predecessors, DECC and DTI since 2003 and welcome this new development in Government. As consultants, we have been active in the development of proposals for electrical energy storage over the past 14 years, and we supported companies directly and indirectly in their preparations for the recent tender rounds for EFR and the



Capacity Market. Prior to that we were active developers in several battery projects, which did not come to fruition, usually because of financial limitations.

We worked with a client to design a 32 MW, 200 MWh battery system, connected to the transmission network, with the intention to supply ancillary services to the National Grid. The project was put into abeyance because of the lack of confidence in future ancillary service prices. As a result of this initiative, we established an excellent relationship with National Grid. From here we proposed a smaller project to provide STOR services to National Grid. Again, this project was not successful because of the then high costs of battery storage and the lack of financial viability.

We welcome the rapid development of the storage industry as proof of the decline of these financial barriers, most notably in the results to the Capacity Market auction (501MW batteries) and the EFR tender (201MW).

➔ **There is an urgency to take shorter-term actions but also a need for longer-term strategic activity.**

We support the calls of the Electricity Storage Network (ESN) and their support for the governance model of the Smart Grids Forum Workstream 6. We recognise the great deal of work undertaken within the SGF to explore the major issues for electricity storage in the GB electricity system. Whilst we are pleased these issues have been captured in this Call for Evidence, we are concerned that a number of actions agreed under the SGF have not been delivered or progressed over the intervening year. Swanbarton, alongside ESN believe there is value in resurrecting Workstream 6 of the Smart Grids Forum, or a similar forum, as an effective governance mechanism to ensure continuity in the programme of work and in the expertise around the table.

➔ **The Smart Grids Forum Workstream 6 was an effective vehicle for progressing the agenda that should be continued in some form.**

3 Short Term Barriers

We believe the Call for Evidence has captured well the immediate barriers. We turn now to find the most efficient way of resolving them, including:

- Uncertainty in network ownership and operation arrangements
- Double charging of Consumption Levies on distribution connected facilities
- Double network charging, compounded by huge uncertainty in future charging arrangements
- Contract lengths and specifications that do not adequately reflect the value offered by electricity storage

Ownership and Operation Arrangements

We believe that a major driving force for the deployment of storage facilities in the short-mid term will be the need for more efficient management of the distribution networks. According to FES 2016, this may amount to 45-85% of new electricity storage capacity.

As such, it is essential to have clarity on the allowable ownership and operation arrangements for storage. We are concerned that a blanket ban on Network company ownership and operation will not be any one's best interest and that pressure from vocal players in the market may lead to an



unhelpful outcome. The problem should be addressed both in terms of power rating and energy storage content as well as location. We are also wary of being over-restrictive and not considering all the different types of storage. For example SVC equipment has electricity storage capability, albeit of only short duration, and at present this seems to sit naturally within the operating arena of a network operator.

At the largest scales, the arguments for storage to be owned and operated independently are based on an IPP type of business model. For example, we saw in the 1990's, the ownership of the pumped hydro fleet move away from network companies into private industry. This was not necessarily financially sound and changes in ownership due to the financial state of the energy industry tells its own story. We should remember that large scale facilities such as pumped hydro are system assets and the deregulated market may not be able to finance their construction and operation. We commend the analysis by Imperial College which illustrates the system value of storage to be much higher than the value to individual participants.

At the mid-scale, both the EFR and the Capacity market tenders illustrated the desire of private investment to propose projects based on a single income stream, of between 1 and 15 years duration. This is natural business territory for an independent operator. However the risk is that these storage projects will not be sited in the best geographical position to support the network without a favourable contract from the DNO. Our modelling shows that in most cases this will be economically disadvantaged.

We are subject to a number of safeguards, as shown by the provisions already set out in the Winter Package from Europe, and would like to stress their continued importance, in particular:

- A clear and universally applied definition of storage, and we welcome use of the ESN wording in the Call for Evidence.
- Assurance that the storage facility will not be developed by a third party provider.
- The facility will be used by the network company only for the efficient and economic operation of network assets, and not in wider trading in the energy or services markets.
- If the facility is to be used for wider purposes, this function must be outsourced to an independent third party.
- There should be regular reviews as to ongoing ownership by the network company or whether an independent provider is willing to buy and operate the facility.

These safeguards require more detailed development in collaboration with the storage industry, with appropriate governance, to ensure they are credible and workable. This would crucially ensure industry confidence in energy markets, and that services are not undermined by licensed network companies.

- ➔ **Network companies should be able to own and operate storage assets subject to a number of safeguards developed in collaboration with the industry.**
- ➔ **There is a need for a separate licence for electricity storage in order for bespoke safeguards to be developed and applied, and for this to be done through appropriate industry governance.**



We support the ESN's lead in this area, as the first group to call for a dedicated licence for electricity storage to renew the existing legislation, which adds confusion and risks limiting the growth of the storage industry. We welcome BEIS's current efforts to set out a timetable to reform this legislation, and reduce the overall timescale for such reforms. We also endorse the ESN's assessment that there is scope in agreeing to the current definition as more effective legislation is introduced, and we would urge BEIS to implement a plan that minimises the risk of parliamentary delay in the passage of this legislation.

➔ **We ask BEIS to propose a plan for developing legislation for a storage licence while progressing removal of barriers in the meantime through judicious use of the agreed definition.**

Double Consumption Levies

Energy storage was initially considered not economically viable, but these high costs have fallen significantly. However, we remain greatly concerned by those hidden details, including double consumption levies and business rates.

The issue of double charging of storage facilities for Consumption Levies particularly pressing, and is likely to have an adverse impact on energy storage strategy as we have seen it can disadvantage a high proportion of connections that would otherwise be leaders in developing the market for energy storage. Although the problem of double charging was unintentional, it illustrates the fact that electricity storage can be forgotten and even undermined in relation to the regulation of the energy sector at large.

➔ **A separate storage licence would help avoid such legislative anomalies in future.**

➔ **Removal of double Consumption Levies is a pressing issue and should be raised with HMRC as a priority.**

Network Charging for Storage

We find the process of double charging network charges for electricity that passes through a storage facility is unfair and can in many cases discourage a facility from operating at all. We recognise the need for some system to incentivise storage facilities to operate in the most efficient way by avoiding network congestion, but the current system equally risks losing the proportion of £8bn smart grid savings offered to networks and end-consumers.

➔ **Double charging of storage is a disincentive to a flexibility tool that could otherwise be used to reduce consumer bills.**

We support a wider review of charging to address this issue, but stress the need for consistency in message of this review.

Service Provision

The barriers to participation of storage facilities in tenders and auctions are well-known, these involve:

- Short contract lengths
- Long-duration discharge
- Exclusivity or penalty clauses



We were pleased by the success of the National Grid's EFR Tender in 2016, and the considerable success of storage facilities further illustrates the benefit to the sector if these barriers are removed. We also support the National Grid's proactivity in this area, and for pursuing further developments in collaboration with stakeholders as part of their Power Responsive initiative.

As such we call for the associated policy and regulatory frameworks that govern tenders and procurement to change accordingly. We do not believe that the market needs the certainty of long term contracts for all storage projects. We believe that energy storage has a role in the market that is both short-term and long-term in nature. Developers must be prepared to trade actively in the electricity market and accept the market risks and uncertainties that this entails, in order to receive the obvious financial rewards energy storage offers.

➔ **Tender and auction regimes should be governed by what is in the long-term interest of the consumer, which may entail ability to enter into longer-term contracts or risk mitigation measures.**

Planning

Swanbarton has been active in the planning process for battery storage projects since 2003. We have had considerable success in planning approval in permitted development rights, generation development rights, and the Town and Country Planning Act. However, the issue of planning is greatly affected by the implementation of COSSH and COMAH regulations. We believe these should be more uniformly applied across technologies.

We do not support the assumption that storage is treated as generation by default, as we have had reassurance from DTI (the precursor to DECC and BEIS) that a battery storage project is not generation. If there is a presumption that storage is now generation, this will lead to projects, in the short term at least, to be considered as generation projects with some difficult problems of classification especially in the areas of hybrid projects, such as where storage is added to an existing renewable generator, or to an existing conventional generator where the terms of an pollution permit may need to be changed. Regulation of storage based solely on MW rating is not appropriate as it does not include the energy content, which is much more significant as a planning issue. We are also aware that not all storage technologies should be considered as equals with regard to planning.

We are also concerned about the lack of a uniform approach between licence holders who may use General Development Orders on their properties and non licence holders who are subject to different rules.

We have written some informal notes which we have sent to the officers of BEIS with supporting background material relevant to this section.

➔ **Electricity storage should be governed by planning rules appropriate to it rather than to generation of equivalent power (capacity).**

Fire and Health & Safety Regulations

We are concerned that procurement of storage services by the TSO do not assess compliance with fire, Health and Safety regulations and pending national and international standards – this risks allowing just one accident that could lead to a negative impact on the reputation and perceptions of the sector, not to mention the genuine danger to those involved. We are pleased to note, that many in the industry wish to develop a greater awareness of these issues.



We are concerned that in the rush to pursue battery storage, broad statements of safety are made by developers without full knowledge of the facts. Planning applications should be made with specific knowledge of the type of battery system which is to be used, as there are numerous different battery types, and variations within the types depending on manufacturer and configuration. The work of Oxford University in this area is relevant. Furthermore the differences between battery storage and other types of storage need to be enumerated.

There needs to be higher standards of inspection applied at the planning stage to ensure adequate examination and a uniform degree of rigour applied to all projects

Battery Disposal

We would like to see further detail about the considerations for the end of life of battery storage projects. This is not well understood and should be of the highest priority for Government.

We note the contribution of the Waste Batteries and Accumulators Regulations (2009), implementing a European Directive, which sets out obligations on battery suppliers to take back batteries at the end of life. The responsibility of the last supplier standing to take back not only their batteries, but those of their competitors is an astonishingly risky liability and will stifle innovation. This regulatory approach covers some, but not all, issues arising from energy storage facilities. As such, we call for a new set of Regulations applied specifically to industrial batteries.

Building Regulations

We consider there are also considerable anomalies in the planning process, which considers power output (MW) without accounting for energy content (MWh).

We are also concerned about the default position for battery storage projects, which has seemingly been based on the use of shipping containers. This is not necessarily the most suitable aesthetic solution, and there are many practical issues missed if this approach is used. Swanbarton is happy to offer further advice on this issue.

Small Installation Visibility

We support the ESN's mechanism for ensuring full visibility by the network operators of grid connected storage installations, while not raising unnecessary hurdles to their deployment. There is considerable potential for behind-the-meter battery installations to make a positive financial difference to consumers, businesses, and the entire electricity system. These however are invisible to the system operator, and as such the uncertainty created requires the use of additional reserve and balancing services.

Further collaborative work is needed to explore these uncertainties operating at the small-scale, to find the best solution to manage the system.

Business Rates

We feel the entire system of business rates is inappropriate. As we understand it, the current system means that building a facility which includes some electricity storage may have a severe application of business rates, depending on the configuration of the electricity storage. It is inappropriate that rates vary depending on underlying technologies: accumulators (batteries, flywheels, compressed air), but that some technologies, for example that a flow battery is assessed on the volume of the tank, whereas



this is not the case for solid state batteries. There should not be a different treatment for rating purposes for storage sited inside buildings compared to those considered to be temporarily sited outside,

The only positive aspect of the current scheme is its recognition of different technologies, and the clarity of definitions. We note however that unless this clarity is engaged with new licences and asset classes, and complies with other legislation, this effectiveness is highly limited.

Our financial modelling shows that the impact of business rates on a battery business can be a key deciding factor in the viability of the project. The interpretation of the Plant and Machinery Regulations becomes critical, and a battery project must be carefully configured to reduce the rating liability. However such restrictive configurations will reduce significantly the flexibility that can be offered by an energy storage system to the flexibility market. We can provide further information on this matter if required.

4 Long-Term Strategy

The future role of storage

We endorse the ESN's concerns that the current focus on certain storage facilities will result in an issue of quantity not quality, which is likely to have long-term repercussions. We stress the fact that electricity storage should be developed carefully and not in haste, to ensure the a high quality provision of service.

We would like to see a comprehensive roadmap for the role of energy storage as part of BEIS and Ofgem's strategy.

Development of the DSO

Swanbarton also supports the ESN's endorsement of the development of DSOs, defined chiefly as active distribution network companies that procure services as necessary to ensure economic and efficient management of their networks. We believe the DSO should materialise in this way as DNOs identify opportunities for more effective management of this networks, which in particular would involve the use of external service providers.

➔ **Emergence of the DSO is dependent on a) sufficiently strong incentives for effective network management and b) sufficiently strong, barrier-free markets of service providers such as storage.**

We are pleased that the Call for Evidence covered a whole-system operation. However we would call for greater clarity of vision on how DSO models play out. Energy storage technologies are diverse in form and benefits, and some tend towards more centralised forms of power and service provision, such as large-scale pumped hydro, whereas others fit a more decentralised model, such as small-scale battery installations.

➔ **We support further development of the DSO models and exploration of their implications for the look of the wider energy system.**

We would like to see greater clarity in governance arrangements in the development of the DSO itself, and the balancing of diversity and consistency:



Diversity is key, particularly if we are to meet the ambitions of a smart and flexible energy system. Issues such as geography, existing network requirements, and business approach to risk are important to note, but we would like to see a more explicit level of allowable diversity to enable storage providers, of a range of types and configuration to participate.

➔ **There should be greater clarity on the balance of diversity and consistency among emerging DSOs, and the governance to monitor this.**

This will allow DNOs to proceed with the transformation with more confidence. Indeed, with a clearer direction of travel, the wider regulations and incentives governing markets should more easily align. For example, removal of the commercial barriers to decentralised service providers will align with network charging reform that acknowledges the contribution these providers make

Innovation

Swanbarton very much appreciates the innovation undertaken by DNOs under the LCNF initiative, notably UKPN's SNS project on which we had the privilege to be a project partner. We also welcome initiatives under the Network Innovation Competition (NIC). The DNOs have achieved notable results and publicised these well. We would support a review of LCNF covering issues such as:

- What is the critical path in innovations to explore and deliver full DSO functionality?
- How much innovation funding is needed for DSO transformation, compared with existing drivers for efficiency under the RIIO price controls?
- What is the wider applicability of an innovation project (e.g: how does an English/Welsh project inform Scottish DSO development)?

➔ **There is a need for an innovation strategy indicating a critical path to full DSO delivery.**

We also welcome the £50 million from BEIS for innovation support. As with network innovations, we believe a wider strategy, and forward direction for the wider energy system to enhance the efficiency of innovation projects through targeted spending.

Interaction between Heat and Electricity

We note that this Call for Evidence that encompasses "Smart Energy", contains few references to heat. For ours to be a truly flexible system, a more comprehensive strategy is required to make the links between heat and electricity storage functions, which we believe is a critical source of flexibility in the system.

➔ **There is a need for a thorough assessment of the interface between electricity, particularly electricity storage, and heat.**

Storing thermal energy for example, could provide a demand "turn-up" flexibility service. We call on BEIS and Ofgem to look more strategically on the storage facilities already in place for heat, namely domestic hot water tanks and solar thermal, which could be turned-up to provide flexibility in the system with little cost or technical interference. The Call for Evidence also flags the potential to fund inter-seasonal storage innovation projects. It would be useful to understand if inter-seasonal storage is needed in the UK, where we have much wind generation in winter and solar power in summer, and whether the required storage periods are more of the order of hours and days. Assessments of the



role of pumped hydro plant may feature in this analysis. We would appreciate a more in-depth assessment of the possibilities in this field.

Community Energy Storage

Swanbarton has an interest in energy storage and local energy markets. It has completed a feasibility study on local energy markets with the support of the Technology Strategy Board (now Innvoate UK) and has worked on a project to investigate the feasibility of residential and community electrical energy storage within the context of a local market for electricity.

Swanbarton's modelling of local electricity markets indicates considerable benefits to participants, reducing costs for consumers, and increasing revenues for producers. In the past, we have encouraged the Government (formerly in consultation with DECC) to make the need to find and agree an equitable way of charging for the use of the distribution and transmission system a matter of priority. It does not seem right that if community energy is successful, and thus the need to make use of the transmission and distribution networks reduces, that charges to individual consumers and producers should continue to be levied at the same rate.

Peer to Peer Trading Including Storage

Swanbarton is a leader in the development of peer to peer trading of energy and the incorporation of storage technologies. We envisage a free trading system for a local electricity market between households and businesses. We seek a liberated trading structure to improve the affordability of energy to consumers first and foremost, as well as enhancing the durability of our distribution networks and incentivising renewable energy generation. Swanbarton has built small and low cost trading agent devices which could be installed in homes to measure electricity demand or surplus, and to negotiate electricity purchase or sale with similar agents in nearby homes, in real time. We've demonstrated these in a laboratory environment, and we've done large scale simulations of how they would behave when trading in a neighbourhood-scale community. We would like to seek the UK become world leaders in this, and hope BEIS and Ofgem will recognise the potential of community energy markets in their long-term strategy.

Cyber Security

We welcome the consultation's concerns about security issues in the context of developing a smarter energy system. We are pleased they have raised it as a significant issue at this early stage, and look forward to working with BEIS and Ofgem in this complex area.

Swanbarton has led the cyber security component of several community energy trading schemes and technologies, and we see significant opportunities to improve these activities particularly those which use and collaborate with other big data technologies. However, there is considerable risk that big data technology can be used to extract detailed personal lifestyle information using energy data, that risks being used in countless illegal applications, and at a risk to public privacy and individual security. Swanbarton has found a widespread lack of information security skills among the operators of community energy schemes, and it is likely this problem is endemic across the entire system of smart energy applications which use big data. We believe we are well placed to develop a consultancy service to address this, but would welcome Government support to investigate and help disseminate knowledge and skills for cyber security.

5 Next Steps

We look forward to the publication of the BEIS/Ofgem Plan in Spring 2017. We understand that not all the answers will be found between now and then. However, we hope the plan will continue the helpful distinction between short term actions and longer-term strategies.

For the short term, we look forward to rapid action in removal of the most immediate barriers to market participation. For the longer term, we hope the plan will propose a direction of travel for the energy system, identifying the gaps that need to be filled in order to move forward. With a clearly stated direction of travel, the regulations and incentives governing markets should more easily align. Swanbarton looks forward to supporting BEIS and Ofgem with this work.

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