



BEIS-Ofgem: A Smart, Flexible Energy System

Summary

The Electricity Storage Network (UK), as the UK industry group dedicated to electricity storage, 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 most of the key immediate regulatory issues around the deployment of electricity storage have been captured.

As the cost of storage technologies continues to fall, and awareness of their capabilities becomes more widespread, they are beginning to be deployed at pace. This is a welcome development. But it also introduces a **new urgency** to removing barriers that impede the most cost-efficient and strategically beneficial approach to deployment; and highlights the need for a sense of strategic direction as to how the energy system should look in future. These are the key themes of our response.

On immediate barriers, the ESN believes the following need to be addressed as a priority:

- Universal agreement on the definition of electricity storage, subsequently enshrined in licence provisions such that there is appropriate and consistent governance of the integration of storage on the system.
- Removal of the double Consumption Levies, so that distribution connected storage facilities are not unfairly disadvantaged in relation either to storage at other connection levels or to other flexibility tools.
- 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 that allows appropriate alignment, length, and specification of contracts for service providers

On longer-term strategy, the ESN would like to see:

- The future roles of storage and Government ambition for its deployment set out with a routemap that addresses both short-term, high-value facilities and longer-term storage solutions.
- Continuation of the work on options for DSO functions, with clarity on levels of governance and on the balance of diversity vs consistency among DSO development.
- Clarity on network innovation priorities and how these are accommodated and rolled out under the RIIO price controls. – Do the network companies need further incentives to make the transformation?
- A review and consultation on the interaction between heat and electricity 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. We hope this plan will not just present a narrow set of proposals for the removal of some immediate barriers (welcome though this will be), but also propose a direction of travel for the energy system. The ESN will be happy to support BEIS and Ofgem with this work.

Introduction

The ESN was established in 2008 as the UK industry group dedicated to electricity storage. It represents a broad range of members including electricity storage manufacturers and suppliers, developers of projects, users, electricity network operators, consultants, academic institutions, and research organisations. We strongly support UK companies to deliver solutions for the GB and SEM electricity systems and beyond.

The ESN works on behalf of its members to respond to and address issues affecting the development and utilisation of electricity storage within the UK power system. We have been involved extensively in the lead-up to the Call for Evidence, notably on Smart Grids Forum and Workstream 6, working to identify the opportunities and barriers to the wider deployment of storage as a tool in a flexible energy system.

This response represents the views of the ESN as informed by our members and by our mission to promote the wider cause of electricity storage. It should not be taken as representing the specific views of individual member organisations.

The response sets out an overview, followed by short-term barriers, a number of additional practical/financial considerations, and longer-term issues. We feel this provides the best narrative for the electricity storage sector. Answers to the specific questions posed by the Call for Evidence, as relevant to the electricity storage sector, are briefly summarised in Annex C.

Overview

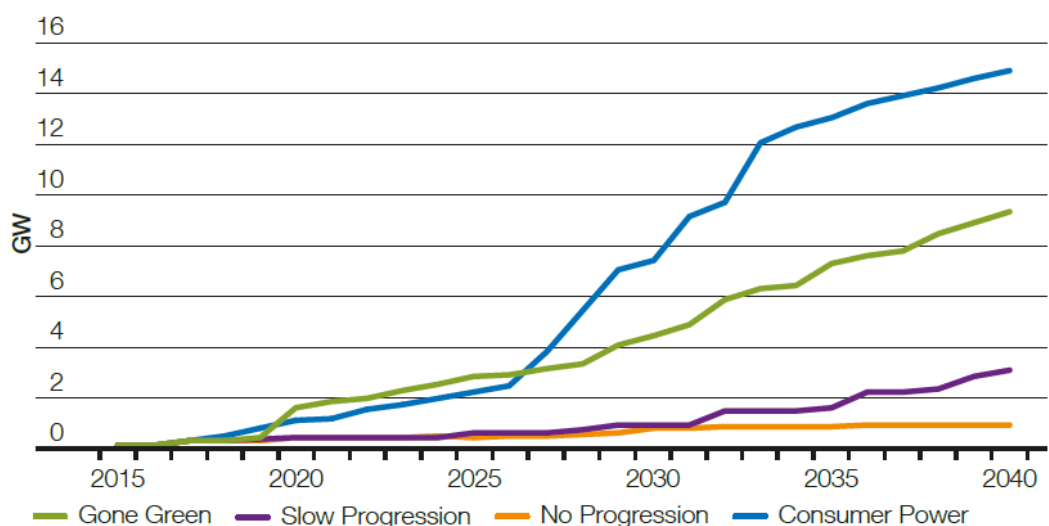
We welcome the joint work that BEIS and Ofgem have undertaken. In our experience there have been times when there seemed to be lack of clarity as to which of Government and the energy regulator needed to act to progress the storage agenda, for example around issues of definition that link into European energy legislation. The joint call for evidence ensures that such issues do not fall between the two parties. 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 excited to see the rapid development of the storage industry, most notably in the results to the Capacity Market auction (501MW batteries) and the EFR tender (201MW), and is a welcome development.

National Grid's Future Energy Scenarios (2016) projected potentially rapid growth from 2019 through steady market expansion:

Figure 1: Future Energy Scenarios for Electricity Storage Deployment



Future Energy Scenarios, National Grid, 2016

The sudden pace of recent deployment introduces a two-fold urgency to policy and regulatory work:

- First, the rapid removal of barriers as identified in the Call for Evidence. There is a risk that new storage facilities might be installed according to where barriers can be circumvented, instead of where the (fair) market demand would be greatest. This is likely to lead to large short-term gains at the expense of longer-term benefits such as societally optimal location and effective utilisation of assets.
- Second, the development of a strategy for a desired direction of travel for the electricity system, against which decisions are made. – As markets for storage and other flexibility providers bed down, these could set a *de facto* longer-term course for future development of the energy system that is not in the best interests of the consumer in terms of a security, economic efficiency, and sustainability.

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.**

We strongly support the governance model of the Smart Grids Forum Workstream 6. A great deal of work on the major issues for electricity storage on the GB electricity system was undertaken by this group, with the final report published in December 2015. This report included an assessment of the issues, the responsible party, and the deadline for a resolution (see Annex A). We are pleased that many of the issues have been captured in the Call for Evidence, but we are also concerned that some of the actions have not been progressed over the intervening year. It is unhelpful to the development of the industry, and ultimately to the end-customer, to have such a gap, especially when the SGF process was so progressive and brought so much promise. ESN believes there is value in resurrecting Workstream 6 of the Smart Grids Forum, or a similar forum, to ensure continuity in the programme of work and in the expertise and experience around the table.

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

Short-Term Barriers

On immediate barriers, the ESN believes the Call for Evidence has captured these. The priority is now to find the most efficient way of resolving them. We believe the most pressing barriers are:

- 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 new¹ electricity storage capacity.

Table 1: Future Energy Scenarios for Electricity Storage by Level of Connection

	Transmission-connected	Distribution-connected	Sub-1 MW	Total electricity storage
Gone Green	5.9	3.8	1.7	11.4
Slow Progression	3.9	2.3	0.2	6.4
No Progression	3.0	0.5	0.1	3.6
Consumer Power	4.1	13.2	1.0	18.3

Future Energy Scenarios, National Grid, 2016

As such, it is essential to have clarity on the allowable ownership and operation arrangements for storage. We believe that network companies should be able to own and operate storage to ensure efficient and economic operation of their assets, subject to a number of safeguards, as per provisions already set out in the Winter Package from Europe,² in particular:

- There should be a clear and universally applied definition of storage, and we welcome use of the ESN wording in the Call for Evidence.

¹ I.e: excluding existing pumped hydro storage.

² We note however the lack of mention of the end consumer in the Winter Package, which we believe should be the measure.

- It should be demonstrated that the service from a prospective storage facility has been openly tendered for and that no third party provider has offered to deliver this.
- 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, to the benefit of the consumer, this function must be transparently outsourced to an independent third party.
- There should be periodic reviews as to ongoing ownership by the network company, and whether an independent provider is willing to buy and operate the facility. Note the period should be longer than the one year proposed by the Winter Package – perhaps the end of each price control.

These safeguards would need detailed development in collaboration with the storage industry, with appropriate governance, to ensure they are credible and workable. – It is essential that the industry has confidence that the markets for energy or for services cannot inadvertently be undermined by licensed network companies.³

➔ Network companies should be able to own and operate storage assets subject to a number of safeguards developed in collaboration with the industry.

We note that there are some parallels with the opening up of competition in the grid connections and separable markets. Here too, regulatory incentives and mechanisms are in place to promote competition, but the network companies build the asset where this proves ultimately to be least cost to the consumer.

If we follow the assumption that storage is to be considered as generation, then our understanding is that <50MW storage facilities would receive a class exemption from the need to hold a licence, with lower thresholds in Scotland. In this context there would be no issue with a network company managing such a storage asset. However, these thresholds themselves have been set with consideration only of export-only generators. In order to secure the safeguards set out above, and set capacity or power thresholds that are suited specifically to storage facilities (with power shifts double their nameplate capacity) rather than adapted from generator conditions, we believe it would be most helpful to have a separate licence for storage.

➔ 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 have consulted with our members on this issue over a number of years. We believe we were the first group to call for a licence for electricity storage, as we believed that the existing licence conditions set out in legislation were restricting the growth of the industry. We still hold our view that the licensing regime must be clarified. We respect the views of some of our members who do not wish there to be further delays in the deployment of storage, which might be caused by a lengthy review followed by implementation. We understand that BEIS officials have sought to understand the timetables for reform of legislation and licensing with a view to minimising the overall timescale for reform. This is very welcome. Our members wish to seek a route to reform that “gets it right, first time” and does not invoke the need for further reform at a later stage. On balance, ESN believes there is scope to agree use of the current definition even as the legislative

³ New York has been raised as an example of where such arrangements are in place.

instrument is developed and introduced, and we would ask BEIS to bring forward a plan that minimises the risks associated with parliamentary delays.

- ➔ **We ask BEIS to propose a plan for legislating for a storage licence (option d) while progressing removal of barriers in the meantime through judicious use of the agreed definition.**
- ➔ **We ask BEIS and Ofgem to issue a joint letter as soon as possible confirming the use of the ESN definition (currently consulted upon), for use in policy development, regulation, Code governance, and confirming the intention also to use this in any future legislative activity.**

The full pros and cons of a separate licence are set out in Annex B.

Double Consumption Levies

The issue of double charging of storage facilities for Consumption Levies is strategically significant and pressing, because it again disadvantages a high proportion of connections that might otherwise be taking the lead in market development, i.e: at distribution level.

The Call for Evidence suggests that 2014 final consumption levies (CCL, RO, FiTs, CfDs) made up 20% cost of electricity storage operations, set to double to 40% of costs by 2020. We are keen to discuss the associated calculations in more detail. As an example of the complicated nature of the application of this charge, consider the case of storage directly associated with a renewable generator (such as wind or PV). The intention of the CCL is not to charge it against electricity sourced from renewables, and indeed, Imperial College figures suggest that by 2030 avoidance of renewable generation curtailment will constitute the lion's share of value from distributed storage. Yet currently, while direct linkage might be exempt from the consumption levy, this would not be the case if the storage is charged indirectly, when the exact source of the incoming power is not known.

We believe that double charging of consumption levies is an anomaly that no one had intended. It illustrates how electricity storage can be "forgotten" if not given explicit treatment as a separate asset class, and how legislation must now be carefully revisited to provide a remedy.

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

We are concerned at suggestions that the remedy might take a significant amount of time in view of the need to change legislation. The industry might legitimately have assumed that this barrier would be removed in good time, and indeed, National Grid's Future Energy Scenarios of summer 2016 bases its storage deployment scenarios on the assumption that such barriers would be removed within a 12 month period.

The conceptual solution seems clear: to apply levies to imports net of exports (i.e: the energy actually used up or lost by the storage facility). The net would be summed over an appropriate period of time. We urge BEIS and HMRC to find an efficient way through the regulation.

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

Network Charging for Storage

The imposition of double network charges for electricity that passes through a storage facility is unfair. We understand that a facility may pay up to ten times as much as a generator to use the same network.

We understand the argument for incentivising a storage facility to operate in a manner that alleviates congestion on the network, and indeed many times that will be its primary purpose. However, the double network charging arrangement does not do this; it disincentivises a storage facility from operating at all, thereby losing the proportion of £8bn smart grid savings that it could offer to the networks, and ultimately to the end consumer.

➔ **Double network 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. We are however concerned at the various streams of charging work that seem at the moment not to be clearly linked and may pull in different directions. Table 2 illustrates the reviews of which we are aware:

Table 2: Timetable of Charging Reviews

	Q4 2016	Q1 2017	Q2 2017	Q3 2017	Q4 2017	Q1 2018	Q2 2018	Q3 2018
Embedded Benefits: withdrawal on export		Ofgem minded to	Ofgem decision			earliest implement	
Storage contribution to network costs		Ofgem targeted consultation					
Storage specific barriers: double charging, intermittency, flexibility	BEIS / Ofgem consultation	BEIS/Ofgem forward plan				
Wider reform of charging, involving T & D	Ofgem initial thinking						

We would welcome a summary of how all these reviews link together in relation to the development of markets for flexibility tools and in particular for storage. As part of this summary, we would welcome reassurances of continuity in direction such that, for example, embedded benefits are not withdrawn from storage exports (thereby making storage facilities up to £75/kW p.a. more expensive), and certainly that this is not done before a more equitable charging regime for imports/exports from storage has been put in place. Stop-start regimes are obviously unhelpful for the development of nascent, tentative markets.

➔ **There is a need for continuity in network charging reviews and reassurance regarding potential stop-start signals.**

We note that arguments around charging tend to revolve around optimising for the current state of the system rather than optimising for future development of the system. Hence again our call for continuity and a sense of direction.

Service Provision

There are a number of well-aided barriers to the participation by storage facilities in tenders and auctions, notably for ancillary services and for the Capacity Market but also for the emergence of local services. The key issues have been:

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

The EFR tender issued by National Grid demonstrates the huge contribution storage facilities can make as such barriers are addressed. While the tender was not perfect, we commend National Grid for being proactive, and for pursuing further developments in collaboration with stakeholders as part of their Power Responsive initiative. The key is not to favour any particular technology, but to tender in a way that ensures maximum value for money for the consumer of today and of the future.

We would like to see the policy and regulatory frameworks that govern procurement to be developed accordingly. Notably, the SO incentive should allow for appropriate arrangements. These might be longer-term contracts if the SO is confident they will be of use; or they might be contracts that mitigate risk for all parties, perhaps in the form of a cap-and-floor return on investment. Likewise, the Capacity Market should cater for flexible, short-duration contracts where it is appropriate to do so. The measure should be whether the consumer ultimately benefits in terms of system security, economy, and sustainability.

➔ 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.

We welcome current arrangements under the Capacity Market (noting our comment below on eligibility for EFR contracts) but are concerned at repeated proposals by non-storage parties to raise new barriers to storage, for example by extending the required performance from half an hour to two hours. Such proposals can be seen to present an ongoing but unnecessary regulatory risk in an environment already fraught with regulatory uncertainty.

One acute concern regarding the CM is that EFR (providers of which are all storage) is not currently classed as a “Relevant Balancing Service.” In other words, EFR providers cannot benefit from the CM in the same way as FFR bidders (which are mainly generators). While we respect the views of NGET in defining their contract so as to ensure that EFR is delivered when required, this leads to an anomaly in the contract terms for balancing services. It is not clear whether this was intended. ESN members are split as to whether the arrangements for current EFR winners can be altered without legal challenge by others. However, moving forwards, this issue could be sensibly and rapidly resolved through a CM modification such as CP162 to cover future rounds of EFR provision.

- ➔ **Future rounds of EFR should be classed as a Relevant Balancing Service under CM, in complete consistency with the approach to removal of barriers and enabling of “revenue stacking.”**

In the foregoing we have set out what we see as the most pressing regulatory barriers needing to be addressed in order to secure a level playing field in current markets, markets that to date have been dominated by large conventional plant.

Additional Considerations

ESN has in collaboration with our members identified a number of further areas in need of policy attention from BEIS and other Government departments.

Planning

Treating storage as generation can complicate planning: if it is treated as generation, then >50 MW projects would be come under national planning which is more complex and has longer timescales than the Town and Country Planning Act. Adding storage to an existing generator may move a whole site from one category to another. For example, should a 30 MW wind generator with a 25 MW storage plant be treated under national rules, not local rules?

Treating storage as generation places the measure of planning assessment on the power rating: eg 50 MW. Is this to be taken as the maximum power passed (input or export), whereas the other critical parameter is energy content? For a long duration energy storage project, the energy content (say battery materials) is a more significant factor in determining the planning application than the size of the power conversion system.

Planning requirements vary across the country, and conditions are different for urban, rural and areas such as the National Parks and SSSI. There are further variations and with the options relating to general development orders for parties who have licences under the 1989 Electricity Act. The granting of an electricity storage licence would go some way to redressing the access to simplified planning which incumbent generators may have if they are to use a general development order to cover their planning application. There would be little, if any, cost to this change.

- ➔ **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 understand that procurement rules, for example under the EFR tender, did not fully specify Fire and Health & Safety requirements. This is a concern for the industry on the basis that only one accident can lead to a negative impact on reputation and perceptions of liability, not to mention the genuine danger were the worst to happen. There is a need for technical standards, and codes of practice, as relevant to each technology to be applied for all procurement processes. This includes siting, for example proximity to fuel tanks. In our

discussions with the Government's Health and Safety Laboratories we understand that there is concern about the low level of general awareness of these issues.

➔ **Relevant technical and safety standards should be applied to the procurement processes of all regulated companies.**

Battery Disposal

The Waste Batteries and Accumulators Regulations (2009), implementing a European Directive, set out obligations on battery suppliers to take back batteries at the end of life. The regulations were clearly not written for grid-scale, industrial batteries, and as they stand leave:

- A lack of auditability
- Uncertainty as to the liabilities
- A lack of proportionality in obligations

We believe what is needed is a new set of Regulations applicable specifically to industrial batteries, where these matters can be resolved. A particular concern is the definition of the battery, and whether it includes the whole battery storage facility or just the cells. This is of concern as non-traditional battery types, such as flow cells may be subject to unequal treatment alongside other battery types. We are also concerned about the disposal liabilities of the last battery supplier standing as they are then bound to accept back batteries of similar types, even from their competitors. This presents a significant barrier to entry.

➔ **A new class of "grid scale" battery is needed in the legislation to set out appropriate arrangements and liabilities for disposal.**

Building Regulations

Where new buildings are constructed in line with Building Regulations Part L or, in the case of a progressive city such as London, zero-carbon emissions policies, the inclusion of electricity storage will become an increasingly viable solution. Building regulations should include sufficient free working space to ensure that fitting or retro fitting of appropriately sized electrical energy storage can be safely included in the property. We note that the drive to install combi boilers and the consequential removal of hot water cylinders from domestic properties has now led to regret as the immersion heater and water storage is not available as a domestic demand turn up resource.

➔ **Electricity and energy storage should be considered in future rounds of Building Regulations and building performance standards.**

Small Installation Visibility

Behind-the-meter battery installations have the potential to make a massive positive difference to consumers, commercial premises, and to the electricity system. But they also run the risk of being invisible to the System Operator, raising the need for additional reserve and balancing services to manage the associated uncertainty.

ESN supports a mechanism for ensuring full visibility by the network operators of grid connected storage installations, while not raising unnecessary hurdles to their deployment or requests for more data than can realistically be put to use. This may be enabled simply by capturing storage installation as part of G83/G59 registration, since AC coupled batteries include an inverter and are therefore automatically covered by network registration. But it could be extended so that DC (behind the inverter) coupled batteries also need to register, as they impact on the performance of associated generation technologies including those covered by MCS.

➔ Information on installation of storage units should be captured in the most non-burdensome manner and to the extent that this is useful to system and network operation.

Even if export limiters are placed on devices to avoid undue burden on the local network, their behaviour may be more difficult to predict than technologies such as solar PV (which at least we know generate when the sun is out). Further collaborative work is needed to explore how this is best managed by the system, and such work may usefully interface with a parallel stream of work on Electric Vehicles.

We understand that some 2-4GW of UK load is connected to batteries residing in Uninterruptible Power Supply (UPS) equipment.⁴ However, this storage is not currently an issue to the SO because it is only accessed in blackout or brownout conditions and not fed back to the grid.

Existing RO Plant Retrofit

How is financial support treated for a renewables plant that is retrofitted with a storage device? We believe it is anomalous that storage operating in alliance with renewable generation is not easily able to be credited with the value of support for low carbon generation. We understand that the “work around” to use a third party as the host for the storage is gaining in viability, but clarity from Ofgem E-Serve on acceptable configurations for a generation / storage hybrid plant would do much to encourage the take up of storage, encourage self-consumption and develop the security of the whole electricity system. Configurations set out by Ofgem may carry a rider of being only indicative and not exhaustive, but are very useful for project developers as templates, and as examples of Ofgem’s application of decision making criteria.

➔ Guidance is urgently needed from Ofgem on the application of storage to RO-accredited sites.

Business Rates

The assessment for storage for business rates lacks clarity in how it is to be treated, and storage can be subject to high rating costs if it is grouped with “generation.” If it is treated under the plant and machinery regulations (which recognises a definition of storage) and it is valued on a percentage of the contract and materials cost this is a potentially significant Opex item. We believe the rate should be sensibly low, or even not rated, to reflect the low operational impact of storage systems on the local environment. There also needs to be a rationalisation between the application of business rates to batteries installed inside a building, to those considered ground mounted or considered temporarily located, as in shipping containers.

⁴ Correspondence with Yuasa.

The rateable value of a battery storage plant may be assessed as 5% of the installed cost. Using an installed battery cost of £400 / kW a 20 MW 20 MWh battery would have a rateable value of approximately £400,000 and rates would be approximately £160,000 / year. If however the energy capacity was raised to 40 MWh, the rates bill would double. This places storage in a worse position than generation, and again highlights the practical difference between power (MW) and energy (MWh) and the unhelpful consequences of classing storage as generation. Furthermore, the report of the Wood committee draws a distinction between storage used for services on the hereditament and for services only used externally. Similarly, if a DNO were to own and operate a storage unit, the applicable business rates would be lower than those that a third party would have to pay. Since a storage unit might be “shared” by a DNO and a third party there is need for clarity on how business rates would be estimated in this case.

As storage is still relatively new, it is unlikely that income from storage has been included in HMRC budgetary forecasts and so excluding storage from business rating would not be at a financial disincentive to the Government. Failure to address this issue will simply add the cost of rating to projects, slowing down the deployment of storage at large scale and creating further confusion in the industry.

➔ **Electricity storage devices, in whatever form, and whatever configuration should be considered for exclusion from business rates.**

VAT

For BTM (behind the meter) battery installations in domestic properties there is an inconsistency in VAT charging. This can be presented as 5% for a new solar and battery co-installation, where HMRC views this as a PV related asset. However, it can attract 20% VAT, if a battery is installed independently – for example as a retrofit to an existing solar system. Given the value to the system, to consumers, and to the decarbonisation agenda of solar installations, VAT treatment should be harmonised so that batteries are treated like solar for any installation.

VAT harmonisation would not only remove the market distortion, it would also have the effect of sending the market a positive message about storage in the form of tax relief.

➔ **Electricity storage should qualify for lower rates of VAT regardless of whether it is installed in a home at the same time as a generating asset or afterwards.**

Long-Term Strategy

In addition to the immediate and pressing short-term barriers to market participation, ESN agrees with the Call for Evidence that there are a number of longer-term and wider strategic issues to address. These comprise:

- The future role of storage
- The framework for development of the DSO
- Network innovation framework and priorities
- The interface between heat and electricity

The Future Role of Storage

National Grid describe three principal applications of storage in Future Energy Scenarios (Figure 4.3.2) as: balancing and ancillary services, asset services, and wholesale and arbitrage. In the recent past, most commercial attention has been placed on the need for short term storage (< 1 hour), primarily for the provision of high value balancing and ancillary services. Nevertheless, there are significantly more applications that require the use of long duration energy storage (> 1 hour). This is also referred to in the work by Imperial College, which shows the significant impact of long duration storage (between 1 hour and 6 hours) on the value of the whole system.

Figure 2: Principal Applications of Storage

	GB consumer benefit and system challenges...	...create storage opportunity and applications	Connection	Length	Customer
Balancing and ancillary services	1. Maintain grid frequency	1. Enhanced frequency response		Short	System Operator
	2. Minimise reserve costs	2. Firm frequency response		Short	
	3. Minimise foot room costs	3. Reserves: STOR		Long	
	4. Ensure black start capability	4. Reserves: fast reserve		Short	
		5. Demand turn-up		Long	
		6. Black start		Long	
Asset services Storage needs to be in correct location to deliver service	5. Minimise TO/DNO reinforcement costs	7. Transmission deferral		Long	Transmission and/or distribution
	6. Reduce congestion management	8. Distribution deferral		Varies	System Operator
	7. Keep voltages in limits	9. Constraint management			
	8. Provide backup power	10. Triad and Distribution Use of System cost reduction		Long	Industrial and commercial consumers
		11. Voltage (asset-based) 12. Voltage (commercial)		Any	Transmission and distribution asset-based, System Operator (commercial)
		13. Backup power		Any	Industrial and commercial consumers
Wholesale and arbitrage	9. Lower wholesale costs	14. Arbitrage (wholesale only)		Long	Wholesale agents
	10. Optimise self-consumption	15. Self-consumption (residential)		Long	Residential consumers
	11. Optimise imbalances	16. Self-consumption (industrial and commercial)		Long	Industrial and commercial consumers
	12. Reduce capacity costs	17. Imbalance; cash-out		Long	Wholesale agents
		18. Capacity Market		Long	Wholesale agents

Key

	Generation		Distribution		Typically >1 hour
	Transmission		End-users		Typically <1 hour

Future Energy Scenarios, National Grid, 2016

While we very much welcome the recent National Grid EFR tender, we are concerned that the current focus on high value services, and the implementation of short duration storage (typically with low cost, short duration lithium ion batteries), should not be to the detriment of measures to encourage other services such as network management, peak power deferment, the provision of long duration headroom and footroom, and long-term curtailment avoidance. For many years, the industry has argued for the need to have value stacking of services.

➔ **The rules of procurement by regulated network companies should be aligned to maximise the potential for stacking of services where this is in the overall consumer interest.**

BEIS and Ofgem should ensure that there are adequate signals to market participants that longer duration storage has a market value. Indeed, the Capacity Market was implemented to overcome the lack of adequate capacity, a situation that had arisen because of the short-term nature of power market investment. The need for longer duration storage is presented very capably in the analysis of the GB system by Imperial College. While protecting the ability of shorter-term storage to participate, the option of banding in future Capacity Market auctions should be kept under review to ensure that longer duration energy storage is valued.

Assuming that curtailment avoidance will be a main source of value in future, the right mechanisms to monetise this should be explored, and this may itself develop the right conditions for the development of some storage projects.

Development of the DSO

The ESN supports the development of DSOs, defined in the first instance as active distribution network companies that procure services as necessary to ensure economic and efficient management of their networks. Though there are further definitions and roles, we believe this forms the basis of the concept. As such, the DSO should materialise as DNOs identify opportunities to manage their networks more effectively through the use of external service providers. Conversely, if there is insufficient incentive for management efficiency, or if external service providers are lacking, the DSO will be slow to appear.

➔ **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.**

In this context, we would support consideration of an additional regulatory uplift mechanism where DNOs can employ DSO-style measures at comparable cost to conventional solutions.

We welcome the options in the Call for Evidence on further DSO functions in the context of whole-system operation (Figure 2 on DSO models). It is hard to predict how the models would play out but, depending on how they are developed, it is worth considering whether they would tend towards use of more centralised or more decentralised forms of power and service provision. For example, which of the models would militate in favour of large-scale pumped hydro plant as opposed to smaller battery installations?

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

In general, we would observe that there could be greater clarity on the levels of governance in the development of the DSO itself, and on the balance between diversity and consistency in DSO development. For example:

- Could one DSO opt to be more pro-active in system management while another leaves more to the SO?
- Would Scottish DSO functionality at 33kV look the same as English / Welsh DSO functionality at 132kV?
- Could one DSO choose to use different business assumptions for service procurement to another?
- Could one DSO introduce a wholly different network and services charging methodology to another?

There are inevitably valid reasons for diversity – including geography, existing network requirements, and business approach to risk – and the level of allowable diversity should be made explicit. Service providers will of course want as much consistency as possible for ease of participation, but not at the expense of progress.

→ There could usefully be greater clarity on the balance of diversity and consistency among emerging DSOs, and the governance to monitor this.

We believe being more explicit on this issue 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 more likely align with network charging reform that acknowledges the contribution these providers make

Innovation

ESN has very much welcomed the innovation undertaken by DNOs under the LCNF initiative, notably UKPN's SNS project, and we also welcome initiatives under the Network Innovation Competition (NIC). The DNOs have achieved notable results and publicised these well.

We welcome the review of LCNF. We believe a wider strategy to prioritise innovations has been missing, however. This might address questions 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)?

It is not always clear to a non-DNO party why activity is a funded "innovation project" rather than an "innovative approach" to day-to-day business. For example, we very much welcome the joint DNO/TSO work on TDI (Transmission/Distribution Innovation) under the auspices of ENA, and we welcome the funded innovation project TDI 2.0, but we are not sure how the two link, and whether the TDI work will spawn other similar projects, and if so, where these will be located and to what timescales.

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

ESN also welcomes the £50M from BEIS for innovation support. As with network innovations, we believe a wider strategy, and forward direction for the wider energy system (see below), would facilitate more efficient and targeted expenditure for innovation projects to “plug the gaps.” As an example, there has been Government support for technologies at Technology Readiness Level TRL5/6, but there seems to be no support for the next phase, TRL6/7 and project commercialisation. We call for further clarity on the strategic allocation of innovation funding to help bring beneficial storage to market.

The commercialisation of storage is very dependent on the energy supply conditions of each country’s specific environment. The technical development of components is being driven globally but the commercial feasibility has to be demonstrated locally. The LCNF experience has been very informative and participation in Innovate UK projects has given some battery businesses a significant platform of experience that has not been obtained in other European countries. The support for single project deployment has clearly accelerated activity in the UK compared with other parts of the world. Such innovation support is arguably more useful than wider subsidy or tariff support, which can be detrimental to long term business planning when support levels fluctuate unpredictably.

Interaction between Heat and Electricity

We note that while this is a Call for Evidence that encompasses “Smart Energy”, there is little mention of heat. We understand the need to bound the problem, and we are pleased at the headway that is being made on removing the barriers to electricity storage, which should unlock a critical source of flexibility on our energy system.

In the longer term, there is a need for a more comprehensive strategy that addresses the links between heat (storage) and electricity (storage).

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

Storing thermal energy (most likely heat, rather than cold, but the latter is also practical) could for example provide a demand “turn-up” flexibility service. – While hot water tanks are rapidly being removed from domestic properties, there are still millions of gas and electric heating systems that do incorporate a hot water tank. There is also an increasing number of solar thermal installations. Just considering the number of hot water tanks alone suggests that flexibility provision amounting to many GWh could be made available with minimal technical development. Were such turn-up services provided by hot water tanks, a longer-term study might usefully look at what services – for example reactive power, capacity, frequency response – would remain unmet, for delivery by other sources of flexibility such as electricity storage. Such a study could also assess whether these services synergise (by accommodating more variable generation on the system) or compete.

The Call for Evidence also flags the potential to fund inter-seasonal storage innovation projects. As set out previously, it would first be useful to understand if inter-seasonal storage is needed in a country with plenty of wind generation in winter and sunshine in summer, or 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.

Next Steps

We look forward to the publication of the BEIS/Ofgem Plan in Spring 2017. We understand that all the answers will not 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 direction of travel, the regulations and incentives governing markets should more easily align. The ESN looks forward to supporting BEIS and Ofgem with this work.

Annex A: Smart Grids Forum Workstream 6 Actions Review

A great deal of work on the major issues for electricity storage in the GB electricity systems was undertaken by Workstream 6 of the DECC/BEIS and Ofgem Smart Grid Forum. Workstream 6 published its final report in December 2015 and this included an assessment of the issues, the responsible party and the deadline for a resolution. The report recommended a number of reviews, with this Call for Evidence as part of that process, but several key issues remain not fully resolved.

Taken from Table 3 – Summary of Issues and Actions⁵

Ref	Who	Activity	Due	Status
12A	Ofgem	Reinforcement Cost Recovery	Q1 2016	Awaited
12E(ii)	HMRC	HMRC to issue guidance on charging of levies	Q3 2016	Awaited
12H	ENA/DNO	Flexible connection terms	Q3 2016	Awaited
3D(ii)	DCRP	Provision of reactive power to DNOs	Q2 2016	Awaited
3D(iii)	DCUSA	Provision of reactive power to DNOs	Q2 2016	Awaited
12G	ENA/DNO	DUoS charging	Q2 2016	Partial, but superseded by CMP 264 & 265
NOTE: Adoption of CMP 264 & 265 while treating storage as generation, will negatively impact on storage. Wider review planned by Ofgem on Q1 2017 for storage and will further delay resolution				
15C	Ofgem, DECC, ENA/DNO	DNO-DSO transition	Q3 2016	Nov 2016 Call for Evidence
11B	Ofgem, BEIS	Storage with Renewable Generation	Q2 2016	Jan 2017 workshop
12I(i)	BEIS	Capacity Market versus Ancillary Services	2020	Little apparent progress
NOTE: Already causing issues (EFR with CM)				
12E(i)	BEIS	Regulatory treatment of storage	Q2 2016	Nov 2016 Call for Evidence
NOTE: Continued delays in clarity impacts on investment and deployment				
12I(i)	Ofgem	New SO services	Q2 2017	Superseded by circumstance
3A(ii)	TSO	New technology services	Q4 2016	Superseded by EFR Service
NOTE: Multiple service contracts not yet available, but being considered				
12C(i)	TSO	New smaller players	Q2 2016	Done
NOTE: Power Responsive, Runway & Bridging Programmes				

The customer-focused smart grid: Next steps for regulatory policy and commercial issues in GB, Ofgem, 2015

ESN believes there is value in resurrecting Workstream 6 of the Smart Grids Forum, or a similar forum, to ensure continuity in the programme of work and in the expertise and experience around the table.

⁵ Note: References to “DECC” in original report have been replaced with “BEIS.”

Annex B: Separate Licence for Electricity Storage

This table sets out the pros and cons of developing a completely separate licence for electricity storage. While there is some debate among members, on balance the ESN comes down in favour of a separate licence, for the following reasons:

- It ensures electricity storage is treated explicitly and consistently across the board, for current and future legislative and regulatory developments.
- It enables licence conditions to be drawn up that are suited specifically to electricity storage.
- It allows full industry governance owned by the electricity storage sector.
- It reassures key potential users such as network operators that the rules for use of the asset are explicit.
- The downside is the potential delay in wider reforms, but we believe this can be addressed by using the same definition in short-term reforms as will be used in legislation for the licence.

Pros	Cons
General	
<p>Simplicity of concept</p> <p>Accuracy; “storage is not generation”</p> <p>Future-proofing for as yet not known technologies and users</p> <p>Codes should be drawn up with affected parties involved in the governance process rather than a process dominated by export-only generators</p> <p>Time-saving, not redebating at every forum and consistency in definition</p> <p>Generation licence is onerous for a smaller storage provider, forcing out non-generator players</p> <p>Has been done elsewhere where similar issues have arisen, i.e: Interconnectors</p>	<p>Red tape and bureaucracy of a new licence (“extra regulation”)</p> <p>Opportunity cost for policy makers to work on other things</p> <p>Time needed to develop a new licence and incorporating into the range of Code and charging regimes</p> <p>Uncertainty in environment until licence has been fully developed</p> <p>Consistency in definition can be achieved without actually creating a new licence</p> <p>Large facilities that export electricity should be covered by many of the conditions of a generation licence, albeit to different thresholds</p>

<p>Trying to change status quo, not just debate “intellectual accuracy”</p> <p>Storage is a key new asset class for a decarbonised electricity sector and warrants explicit treatment in regulations</p> <p>Storage is mentioned in Capacity Market regulations and EU Directives, while inconsistent definitions of “generation” in 1989 Act and subsequent amendments create uncertainty for storage technologies</p>	
Specific	
<p>Separate licence could allow DNO to own and operate larger (>50-100MW assets) if this was desired; or to reduce the threshold (in view of import/export swings) as appropriate.</p> <p>Third party will have advantageous negotiating position for services to network if monopolising an essential service.</p> <p>Storage >50MW under a generation licence comes under national planning which is complex and has longer timescales than local planning, with 50MW being a somewhat arbitrary threshold for an import/export device – energy content seems more relevant than power.</p> <p>Storage treated as generation places it in an unfavourable category with respect to business rates.</p>	<p>Networks should not own assets that can play a material role in energy market</p> <p>Networks can already own and operate licence exempt (<50-100MW) storage</p> <p>Possible to offer licence exemption where network has tendered for a storage service and no market player has come forward</p> <p>Third party solutions are reliable; no commercial player will risk their reputation by denying a service</p>

Annex C: Call for Evidence Questions

Brief answers are provided below to the specific questions posed, where relevant to the brief of the Electricity Storage Network.

Enabling Storage

1. Have we identified and correctly assessed the main policy and regulatory barriers?

Most of the fiscal and regulatory barriers have been well identified, but in addition there are:

- uncertainty over battery disposal
- lack of clarity on interaction with support schemes, for example RO

2. Have we identified and correctly assessed the issues regarding network connections for storage?

Yes. We note the uncertainty around treatment of support schemes such as RO when storage is connected. We note also the lack of clarity on whether it is for the DNO to stipulate where storage may be needed, or for merchant storage providers to develop facilities according where it suits them.

3. Have we identified and correctly assessed the issues regarding storage and network charging.

Mostly. We would like to see more streamlining of various charging reviews and reassurance that the direction of travel for storage will be maintained, i.e: no hiatus between reviews.

Do you agree that flexible connection agreements could help to address issues regarding storage and network charging?

Flexible connection agreements in the form of export limiters can be used to address concerns about unnecessary reinforcement. However, they only address one element of a range of issues around network charging. They do nothing for double network charges for example.

4. Do you agree with our assessment that network operators could use storage to support their networks?

Yes.

Are there sufficient existing safeguards to enable the development of a competitive market for storage?

No. The safeguards must be further consulted on and developed in collaboration with the industry, drawing in particular, but not exclusively, on the framework provided by the 2016 Winter Package.

Are there any circumstances in which network companies should own storage?

Yes. Whenever this is the lowest cost option for the end-consumer.

5. Do you agree with our assessment of the regulatory approaches available to provide greater clarity for storage?

Yes. What is missing however is the prospect of a dual approach. For example, we suggest the best solution is use of an industry agreed definition even as the legislation for a separate licence is developed.

How should the capacity of a storage installation be assessed for planning purposes?

Key planning considerations will include size of the facility. As such, planning assessment by energy (MWh) rather than power (MW) seems appropriate. Even on power, there is no reason why the 50MW threshold for generation should apply to storage. There is a need for further discussion.

6. Do you agree with any of the proposed definitions of storage?

We agree with the definition proposed by ESN in consultation with our industry membership. We believe it is important for the definition to refer to *electricity* storage. – From the perspective of governance of the electricity system, energy storage that does not entail both electricity imports and exports would seem to be either demand or generation.

We support further consideration of how facilities that are not electricity storage should be treated, under a separate policy initiative that reviews heat storage for example. This should not hold up the removal of barriers for electricity storage.

Aggregators

7-10. No strong evidence

System Value Pricing

11. What types of enablers do you think could make accessing flexibility, and seeing a benefit from offering it, easier in future?

It would be helpful to model and trial various flexibility solutions in relation to half-hourly settlement.

There is a need to monitor service provision and report on this on a regular basis, with a formal process for raising issues around non-level playing field so these are addressed before tender processes are drawn up.

12-13 No expertise

14. Can you provide evidence to support any changes to market and regulatory arrangements that you consider necessary to allow the efficient use of flexibility?

The exclusion of EFR, providers of which are all storage facilities, as a “Relevant Balancing Service” for CM participants means that a key mechanism for “stacking” of revenue streams, and for generating value out of assets, is lost. This should be remedied.

In a similar vein, the plethora of service procurement arrangements should be reviewed and developed in closer collaboration among the regulated network companies, such that services providers can stack offerings where it is in the best interest of the consumer to do so.

Smart Tariffs

15. To what extent do you believe Government and Ofgem should play a role in promoting smart tariffs or enabling new business models in this area?

There is a need to present a more positive and reassuring narrative than we currently have around DSR and storage. – These solutions have been utilised in the UK for decades, for example pumped hydro, Triads, hot water tanks, storage heaters; then car batteries, laptops, phones, etc. These things are “normal” rather than a new idea that somehow compromises the operation of a civilised, industrialised society.

16.-18 No strong evidence

Smart Distribution Tariffs: Incremental Change

19. Are distribution charges currently acting as a barrier to the development of a more flexible system?

Yes. Storage is charged demand charges for electricity imports, then charged generation charges for electricity exports. This is essentially charging double for a tool that is potentially helping the system.

In addition, the variety of separate charging reviews are creating further uncertainty and potential for disjointed and contradictory price signals.

20. What are the incremental changes that could be made to distribution charges to overcome any barriers you have identified, and to better enable flexibility.

Separate definition and eventually licence for storage would enable it to be treated more explicitly and fairly under charging reviews.

It would be helpful to see the relationship and timing between various reviews clearly set out, with reassurances that there will be no hiatuses or discontinuity between decisions.

21. How problematic and urgent are any disparities between the treatment of different types of distribution connected users?

We understand that storage can at times pay as much as ten times more network charges than a generator. This is clearly discriminatory, even if there is a case for an element of charges for both imports and exports. We believe that storage projects are being developed on the basis that the such unfair barriers will be removed. Indeed, National Grid’s Future Energy Scenarios 2016 suggests that scenarios for deployment are dependent on the removal of barriers over the twelve month period since summer 2016.

Smart Distribution Tariffs

22-24. No strong evidence

Other Government Policies

25. Can you provide evidence to show how existing Government policies can help or hinder the transition to a smart energy future?

The issues identified in the call for evidence, notably the double charging of Consumption Levies and the uncertainty around liabilities for battery disposal, clear increase the cost and risk premium of projects.

26. What changes to CM application / verification processes could reduce barriers to flexibility in the near term, and what longer-term evolutions within / alongside the CM might be needed to enable newer forms of flexibility?

We would support any reassurance that the delivery window in the CM will not be reduced, as we believe this is not necessary but the threat can be seen as a business risk to shorter-term duration storage solutions.

We believe CM participants should be eligible to provide SO services such as EFR, and vice-versa, as is the case with FFR. This should be clarified at least for future rounds of EFR tenders.

27. Do you have any evidence to support measures that would best incentivise renewable generation but fully account for the costs and benefits of distributed generation on a smart system?

We would simply say that cost and benefits will depend on the baseline and where you want to get to. – The cost and benefits of large, inflexible plant should be accounted for in any review of the cost and benefits of distributed facilities, whether generation or storage.

Smart Appliances

28-32. No strong evidence

Ultra-Low Emission Vehicles

33-35. No strong evidence

Consumer Engagement with Demand Side Response

36-39. No strong evidence

Consumer Protection and Cyber Security

40-42. No strong evidence

Roles and Responsibilities

43-46. No strong evidence

We welcome the forward thinking and analysis provided in the Call for Evidence. Our key concern is that the governance framework for DSO development should be clear. – At what level will decisions be made? What is the balance between consistency and diversity? Are Scottish DSOs expected to develop similarly to English/Welsh DNOs? Etc. It is unlikely these

Innovation

47. Can you give specific examples of types of support that would be most effective in bringing forward innovation in these areas?

We welcome project innovation support as was provided under the LCNF, notably for UKPN's SNS

project. We welcome support for commercialisation at Technology Readiness Level TRL 6/7.

48. Do you think these are the right areas for innovation funding support?

We believe there is a need for an innovation strategy that highlights the problems that need to be addressed in the context of a routemap to a more flexible system.

Large-scale, inter-seasonal storage technologies are expensive. An assessment is needed of the value of inter-seasonal storage according to various scenarios, before determining exactly what kind of innovation support is needed in this area. For example, what is the relative need for multi-hour/multi-day storage compared with inter-seasonal storage?

Electricity Storage Network
Dairy Farm, Pinkney
Malmesbury
Wiltshire
SN16 0NX

Tel: 01666 841262

January 2017