Electricity System Team
Department for Business, Energy and Industrial Strategy
3 Whitehall Place
London SW1A 2AW

18 January 2017

Dear Sir/Madam

Response to the call for evidence on a smart, flexible energy system

Scottish Renewables is the representative body for the renewable energy industry in Scotland, working to deliver a low-carbon, secure energy system, integrating renewable electricity, heat and transport at the lowest possible cost.

We share the view of the Government that a smarter and more flexible energy system could offer significant benefits for consumers and the economy and will ensure that the UK has a secure, affordable and clean energy system, now and in the future.

It is our view that government, working alongside the regulator and industry, will have a critical role in securing the benefits of this transition, focussing particularly on the following areas:

- **Consistency**: The transition to a smarter energy system will have far-reaching impacts. It is therefore essential that government policy is consistent, transparent and clear. For example, interconnection has been signalled as a priority for enabling greater flexibility within the energy system, but is not considered within the scope of this paper. At the same time there is some concern with wider energy policy which restricts the cheapest forms of renewable generation competing in the market.
- **Vision:** It is important that government's ambitions are not restricted to energy policy alone. The transition to a smart energy system will create opportunities for industrial strategy, economic growth and international export.
- **Delivery:** We would strongly encourage BEIS and Ofgem to coordinate a well-defined delivery plan to take forward any actions arising from this call for evidence. For example, it is important that other areas of regulatory reform (such as National Grid's charging review) are aligned with the actions arising from this call for evidence.
- **Scope:** While we welcome this call for evidence and appreciate the need to focus on issues within the on electricity market, it is clear that a similar approach should also be taken to consider the need for, and impact of, changes in the wider energy system including heat and transport.

Overall the energy sector is becoming more diverse, and the number of participants who can add value is multiplying. With this in mind there is a significant risk that the regulation of this new market becomes very complex. It is our view that a 'smart, flexible energy system;'

6th Floor, Tara House, 46 Bath Street,
Glasgow, G2 1HG
0141 353 4980 @ScotRenew
www.scottishrenewables.com

should also be accessible, transparent and predictable.

Finally, it is important to note that Britain's future relationship with Europe could have a significant bearing on the regulatory framework which will govern the transition to a smart flexible system. A number of European regulations are currently being adopted and integrated into the legislation that underpins the way that the GB electricity market operates. This is designed to ease the transition towards a single energy market and we would welcome clarity on how these rules will be treated as Britain seeks to exit the EU.

Our response to a number of the key questions from the call for evidence are set out below and we would be happy to provide any further information where required.

Yours sincerely

Michael Rieley
Senior Policy Manager – Markets and Systems

Removing policy and regulatory barriers - enabling storage:

1. **Have we identified and correctly assessed the main policy and regulatory barriers to the development of storage? Are there any additional barriers faced by industry? Please provide evidence to support your views.**

As a priority, we would encourage government to focus on setting a clear definition for storage, providing sufficient visibility of required services and ensuring that flaws in the system, such as the double charging of final consumption levies, are addressed.

At the same time, it is important to note that, in addition to different types of storage technology offering different benefits to the system, the range of technologies also have different needs for securing investment. This will require government to strike a balance between creating a level playing field while ensuring that price signals will allow the most efficient solutions to come forward.

For example, pumped storage hydro can provide much needed system services such as inertial response and black start capability. Yet without reform, it is highly unlikely that investment in new pumped storage projects will be secured.

Such projects face large upfront capital costs and long lead times, but this is coupled with comparatively long operational lives and low operational costs. At present, the energy market does not provide sufficient revenue certainty for such significant financial commitments to be made. Project developers are faced with the potential that future revenues will not be sufficient to cover capital and fixed costs.

DNV GL recently set out in a report 'The Benefits of Pumped Storage Hydro to the UK'[1] a number of factors leading to this uncertainty for pumped storage developers, including uncertainty as to the future of government policy and its impact on available revenues, a lack of an available market for a number of the services provided by pumped storage, and the lack of predictability of revenue forecasting from ancillary service markets, given the short-term nature of such contracts.

Given the challenges above, the report concluded that large-scale storage projects of this nature ought to be treated similarly to infrastructure projects, such as interconnectors, which face many similar challenges to investment. In line with the report's findings, we would strongly recommend that consideration be given to mechanisms such as a 'Cap and Floor', to enable revenue certainty, allowing these technologies to move forward, and for the important benefits they can provide to be realised.

Finally, a number of challenges across policy and regulation will require significant work and coordination between government, regulators, system operators and industry. For example as more storage is deployed on the network, and existing assets stack new revenue streams, the behaviour of storage on the system will change. This will create new challenges and

[1] https://www.scottishrenewables.com/publications/benefits-pumped-storage-hydro-uk/

opportunities and will require a greater focus on system planning to account for this complexity. At the same time, the ongoing lack of clarity regarding TNUoS charging and the review of charging for embedded generators has the effect of dampening investor certainty in the broader market and may also have an impact on storage developers' business plans.

2. **Have we identified and correctly assessed the issues regarding network connections for storage? Have we identified the correct areas where more progress is required? Please provide evidence to support your views.**

We agree that quick and efficient connections for storage applicants are important, and support Ofgem's work in that regard - including the work of the Energy Network Association's DG-DNO steering group - and we would encourage Ofgem to monitor whether Distribution Network Operators apply these voluntary measures.

It is our view that further progress could be achieved in the following areas:

Providing network information: There is an increasing focus on the benefits that could arise through the publication of demand heat maps. This would provide a useful tool to highlight areas of the network that would benefit from the connection of storage (or other flexibility solutions). Access to network information of this type is pivotal for unlocking investment in all forms of flexibility. To go one step further, consideration should be given to coordinating this information with a competitive tender process that would allow DNOs to consider lower-cost flexibility solutions as a means of deferring network reinforcement where it is identified as necessary.

Improving the connection process: Storage assets have more complex network requirements. However by facilitating flexible connections and adopting innovations such as Active Network Management, operators will be better able to accommodate these assets.

Enabling co-location: Co-locating energy storage technologies with renewable generation sites has the potential to offer number of benefits to our energy system, including maximising the use of existing assets and smoothing load profiles from intermittent generation. However, a lack of clarity on the process for co-locating is presenting a risk to investors, and currently deterring investment in co-location projects.

However, there is currently no agreed process for co-locating a storage asset with a renewables site, particularly where sites are in receipt of revenue support through the Renewables Obligation, Contract for Difference or Feed-in Tariff.

While there has been some focus on RO projects, there is still uncertainty as to whether sites seeking to co-locate with storage will need to re-accredit under the RO which would create significant uncertainty and undermine investor confidence

Allocation of resources: DNOs are processing overwhelming volumes of applications, and a large cost associated with applications that are not accepted is distributed across those that do end up contracting. Ultimately, this cost is picked up by bill payers rather than the responsible parties. With this in mind, we support the introduction of proportionate

assessment and design fees and encourage Government to set out its decision on the recent consultation on this matter[2]-.

Investing in the network: While flexibility providers may be able to defer the need for network reinforcements, in some cases the reinforcement will still be required. Therefore, consideration should be given as to how best to encourage investment in our network alongside developing system flexibility. For example, there is little incentive for DNOs to make anticipatory reinforcement investments, even though in some instances this would be more efficient than piecemeal reinforcements.

In summary, the impact storage will have on the network needs careful consideration in both the system planning and the connections process.

3. **Have we identified and correctly assessed the issues regarding storage and network charging? Do you agree that flexible connection agreements could help to address issues regarding storage and network charging? Please provide evidence to support your views, in particular on the impact of network charging on the competitiveness of storage compared to other providers of flexibility**.

Network charging is a complex area with potential for knock-on effects and it is important that any changes to the charging regime should prioritise creating a level playing field for all providers of flexibility. With this in mind we would raise the following concerns:

- The Call for Evidence overlooks the potential of existing assets (all forms of generation, and interconnectors) and the value they could add to efficient and flexible system operation.
- Guidance is required on charging methodologies for energy storage. In particular there is some concern that, although the double counting effect of Final Consumption Levies is identified within the call for evidence, there is little detail on the Government's planned next steps. We look forward to seeing more detail on further work in this area.
- In particular, storage needs a clear definition within the Security and Quality of Supply Standard (SQSS) and Engineering Recommendation P2/6. While much of the debate surrounding this has focussed on whether to class storage as intermittent or non-intermittent, a more appropriate approach would be to develop a classification based on the actual and specific functioning of storage on the network.

We do caution that addressing the points above is difficult without a clear understanding of how changes will impact other areas of network charging. It is therefore important to note that National Grid has indicated that it intends to conduct a review of commercial arrangements for electricity network charging.

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2 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/510314/A_D_Fees_consultation_230316.pdf

Given the web of complexities and dependencies within network charging, we recommend that the consideration of network charging for energy storage is tackled holistically within such a review.

Overall, we support the views expressed in paragraph 11, that network charges should represent a cost-reflective and fair recovery of network costs, and that storage (whereby it both imports and exports) should not seek to obtain different treatment.

4. **Do you agree with our assessment that network operators could use storage to support their networks? Are there sufficient existing safeguards to enable the development of a competitive market for storage? Are there any circumstances in which network companies should own storage? Please provide evidence to support your views.**

Overall it is our view that the priority should be to focus on running competitive tenders for third parties to own and operate storage where the network owner has indicated it is required.

Energy storage assets can have clear benefits to the network, such as freeing up capacity and the lower cost and shorter timescales of installing a battery unit rather than traditional network investment. However there is significant concern among our members with allowing network companies to own or operate storage assets due to the very high risk of market distortion (as has been signalled by the European Commission in the draft Clean Energy Package).

Where there is insufficient incentive for developers to connect storage resources where they are needed, but those resources would have a beneficial impact upon the network as a whole, the reasons for why the incentive is insufficient must be addressed by Ofgem, and action taken to remedy this'

In general, therefore, we would encourage the provision of clear information as to where on the network flexibility solutions may be required. This should be reinforced with clear price signals to encourage energy storage to provide the required services at the appropriate points on the network. Network operators' focus should be on creating markets for third party operators to compete in.

6. **Do you agree with any of the proposed definitions of storage? If applicable, how would you amend any of these definitions? Please provide evidence to support your views.**

There is concern among industry that the variety of definitions appearing for energy storage could at best create confusion and at worst create disparity in how storage assets are treated. We welcome that government and Ofgem are minded to define energy storage.

We also note that a definition would help address a number of barriers facing energy storage:

- Classification for network charging
- The application of queue management to energy storage

- Planning
- Final Consumption Levies double charging
- End of life decommissioning requirements

Providing price signals for flexibility – 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 is important to note that a range of technologies including existing generation plant, new battery technologies, pumped storage and demand side response are all able to offer flexibility services. Accessing and realising the benefit of these services will require a balance of longer term reform to bring regulation and commercial arrangements in line with a modern clean energy system and short term 'fixes' to enable the system to move forward.

Overall the objective should be to create a level playing field that allows all technologies to compete and ensures that the most efficient solutions are ultimately delivered for the whole system.

The Institute of Engineering and Technology (IET) recently estimated that by 2030 the number of generators providing services to the network will have increased from around 15 to over 600,000.[3] However the current market for ancillary services was designed for a different time, where a smaller number of generators would provide service as an addition to the core commercial activity of generation.

'Flexibility' service providers operate under a different set of commercial drivers. For, example storage providers will look at the service market as core revenue.

With this in mind, it is our view that there are three key revenue-based barriers to making flexibility, financeable:

- **Low bankability:** Revenue streams are not easily bankable from a private sector perspective.
- **Revenue interface risk:** Revenue streams do not always match up from a timing, contractual and technical perspective.
- **Lost potential:** Flexibility operators cannot monetise the full range of services that their plant can deliver.

Much of the storage interest in the UK to date has focused on high power applications such as frequency response. But high energy applications with longer storage durations are of particular value to the system. As it stands the GB electricity system already benefits from 24GWh of pumped storage capacity, split across four sites, largely in Scotland. Around

[3] http://www.theiet.org/sectors/energy/resources/modelling-reports/index.cfm

another 50GWh of capacity has planning permission – enough to cover close to the UK's total peak electricity demand for an hour[4].

Revenue stacks need to attract cost effective debt and equity finance, to ensure that the lowest cost source of flexibility is able to access the market. This means designing revenue streams with investors and consumers in mind, reflecting the reality that the financial characteristics of new flexibility projects are different from those of the past.

It is our view that the following changes are necessary to achieve this;

- **Improving bankability:** Given the range of services that flexibility providers will be seeking to access there is a need to ensure that these market opportunities will be enduring and that price signals will work in a way that allows developers to secure investment. This can be achieved by setting out the system requirements both in the short and long term and by regulating to ensure the services should be procured on a rational, transparent basis.
- **Addressing revenue interface risk:** Ensuring that technically compatible revenue stream can work together is central to building the storage business case. Aligning tender timelines will help reduce the risk premium that investors assign to secondary revenue streams.
- **Unlocking potential:** Distribution network owners have been taking active steps to trial 'storage-friendly' commercial innovations– ensuring that these innovations become business as usual through the transition to Distribution System Operator (DSO) will be a crucial step. Ultimately this should enable greater coordination between transmission and distribution allowing local markets for balancing services while avoiding conflicting and counter-productive system balancing actions.

12. If you are a potential or existing provider of flexibility could you provide evidence on the extent to which you are currently able to access and combine different revenue streams? Where do you see the most attractive opportunities for combining revenues and what do you see as the main barriers preventing you from doing so?

Revenue streams for 'flexibility service' providers will typically be stacked or combined in a way that maximises impact and recovers the income necessary to secure investment, at acceptable risk. The optimal combination will vary over time and also according to a number of factors including risk appetite, technology and connection point.

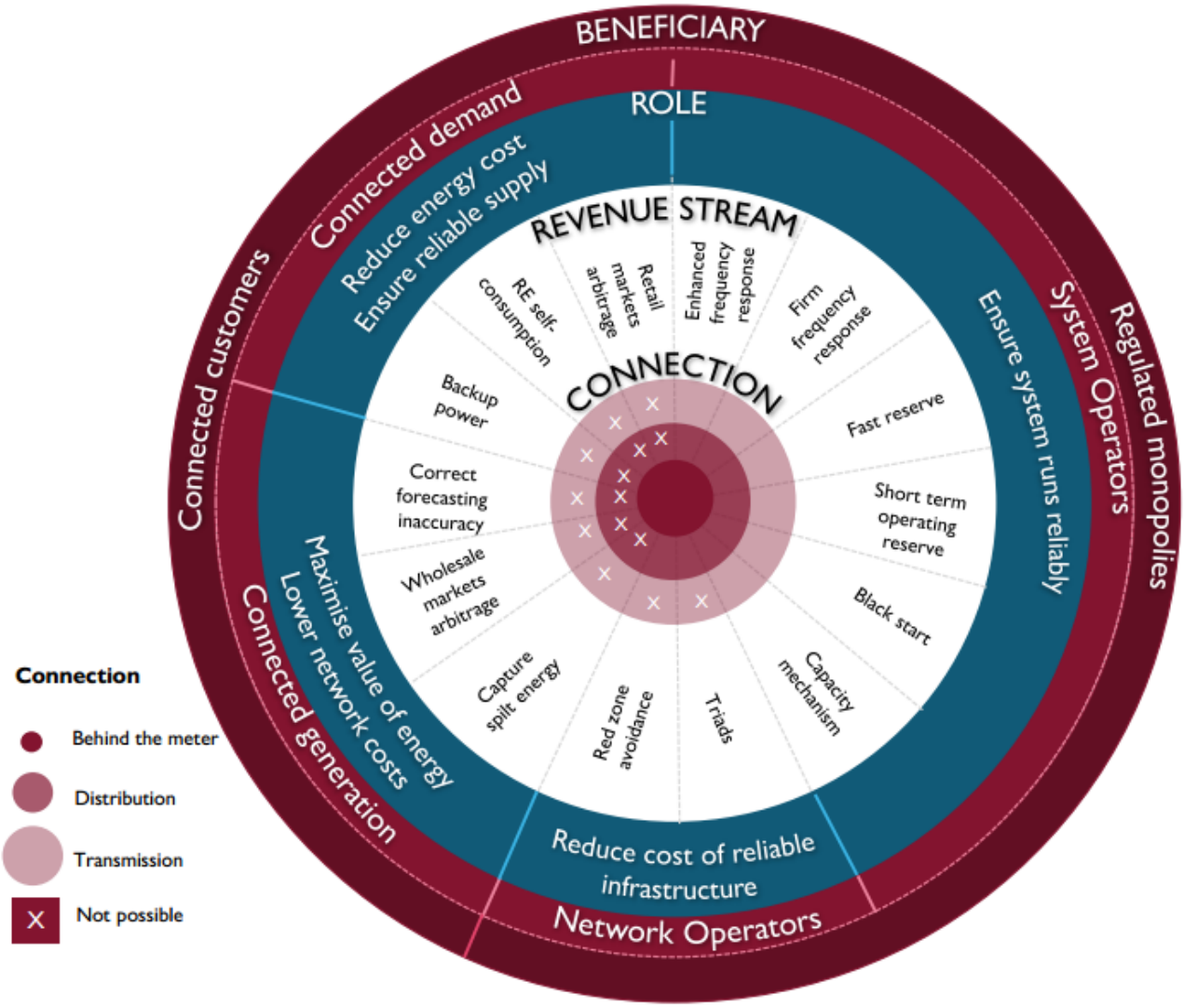
The National Infrastructure Commission clearly sets out how a smart power revolution spanning storage, interconnection and demand response is worth up to £8bn to UK consumers.

[4] http://sse.com/newsandviews/allarticles/2016/10/future-of-pumped-storage-hydro-analysed-in-new-report/

To realise these savings, we need to ensure that the lowest cost technologies are able to provide the system with the services that it needs. Scottish Renewables commissioned consultants Everoze to set out the main revenue streams available to electricity storage providers, taking into account where they connect on the network and the ability of relevant parties to monetise the benefits.

The findings of that report[5] , published in 2016, are illustrated in Figure 1, and the 14 revenue streams are summarised in Annex 1 of this response.

Figure 1: Revenue streams for electricity storage (Everoze, 2016)



[5] https://www.scottishrenewables.com/publications/electricity-storage-cracking-code/

13. **If you are a potential or existing provider of flexibility are there benefits of your technology which are not currently remunerated or are undervalued? What is preventing you from capturing the full value of these benefits?**

Ancillary Services

Renewable electricity generators already provide a number of system services including frequency response, reactive power and intertrip through contracts with National Grid the system operator (SO). Largely these services are provided by generators that are connected to the transmission network and therefore have an existing contractual relationship with the SO.

At the distribution level services provided directly to the distribution network operator are not yet well defined - beyond existing innovation projects - and there is some uncertainty around the DNO's ability to pass on cost savings to the service provider.

With that in mind a number of distributed generation projects have been able to work with the SO and develop a contractual route to provide necessary services to the SO despite their connection with the (DNO)

As the system changes and DNO's seek to take on the role of DSO this could have the potential to create conflicting signals. It is important therefore to ensure that embedded service providers contracting with National Grid do not drive costs for the DNO and where generators or other service providers are able to lower costs for the DNO that there is an appropriate mechanism to realise or recover this value.

Balancing Services

Through the balancing mechanism wind generators are able to connect to the electricity network in advance of reinforcement accepting curtailment at times where there is insufficient capacity on the network.

This mechanism provides a useful price signal for generators to alter behaviour in response to the network capabilities while providing the network owner a signal to invest in new infrastructure where the level of curtailment is sufficient to justify investing in new connections.

Largely these services are provided by generators connected to the transmission network. However, at the distribution level a number of innovation projects have adopted a similar approach – allowing variable generation to connect in advance of network reinforcement - curtailing output at times of insufficient demand or capacity.

There is some concern however that at the moment there is no price signal within these arrangements that would support the case for network investment – and we would encourage this to be further considered under the roles and responsibilities of network owners – particularly through the shift to having DSO models.

Network deferral

Storage and other flexibility providers can help network operators find ways to minimise the cost of providing reliable grid infrastructure, including either deferring or avoiding investment.

This is particularly relevant at the distribution system level. TRIADs and red zone management do not fully capture the network investment deferral benefits that storage can offer.

In addition DNO's have limited experience in procuring such services directly from third parties.

Overall, the full breadth of potential roles that storage and other service provider can offer is not fully mapped into revenue streams. This means that the size of the market is smaller than it should be.

We have set out some additional areas for consideration below, and it is important to note that enabling these solutions can be achieved through changes to markets and regulation rather than a need to remove technical constraints. In fact many have been tested through Low Carbon Network Fund innovation projects

- Islanding networks: to enable maintenance/repair work to be conducted upstream while keeping customers powered up. There is also currently a lack of regulation to limit the duration of outages
- Phase rebalancing: a location-dependent (due to the dispersion effect of a larger number of customers) requirement to enable the load to become more balanced across phases.
- Harmonics mitigation: addressing the expectation for increased challenges with harmonics on the grid, which can be mitigated by additional functionality in the converter interface of storage and other converter-connected plant, such as wind and solar PV installations, and some loads.
- Voltage regulation: at point of connection
- Providing reactive power: to improve power factor and reduce losses
- Localised grid balancing: working under an active network management scheme to maintain the power flow through the transformer to a defined constraint.

14. **Can you provide evidence to support changes to market and regulatory arrangements that would allow the efficient use of flexibility and what might be the Government's, Ofgem's, and System Operator's role in making these changes?**

Reforming the market to ensure a level playing field for all technologies should be the priority. The end goal should be to ensure that National Grid has a suite of flexibility products

that allows all market participants to compete on an equal basis. This includes improving the information provided to industry and looking at how National Grid can simplify its products where appropriate.

Given the scale of potential change required to deliver a 'smart, flexible energy system' there is a clear role for coordination between the Government, Ofgem and System Operator, ensuring the proposed changes are consistent, ownership of actions are well understood and that the timescale for implementation is achievable. For example, it may be helpful for Ofgem, BEIS and DNO's to develop a roadmap for the transition to DSO.

Providing price signals for flexibility – smart distribution tariffs, incremental change

19. Are distribution charges currently acting as a barrier to the development of a more flexible system? Please provide details, including experiences/case studies where relevant.

Overall distribution tariffs do provide some signal as to where to locate on the system. However tariff structure are not clear and there is no long term forecast for Generator Distribution Use of System (GDUoS) charges meaning that it does not provide a particularly strong signal. In addition there is some concern that the current tariff structure may not be consistent with the transition to a smarter more flexible system as it is unable to capture the variation in types of network user and does not accurately reflect the value of flexibility on the network.

For example, the treatment of intermittent/ non-intermittent generation sites with regard to 'super-red tariffs' distorts the market with an overly simplistic price signal. In addition, import capacity charges are disproportionately high compared to other operational costs which could distort the market between flexibility providers.

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?

We would encourage the following incremental actions:

- Better data publication from DNOs to give greater transparency of charging calculations and provision of charging forecasts.
- Review of the discrimination between intermittent / non-intermittent charges and review of treatment of hybrid sites in this regard.
- Review of the application and cost reflectivity of super-red tariffs at extra high voltage (EHV)

Providing price signals for flexibility – smart distribution tariffs, fundamental change

As more consumers move toward half-hourly settlement periods, the value of the TNUoS demand charge (through the TRIAD system) will increasingly be seen as a valuable signal to encourage demand to turn down at peak times and embedded generation to turn up – offsetting the need to transmission imports.

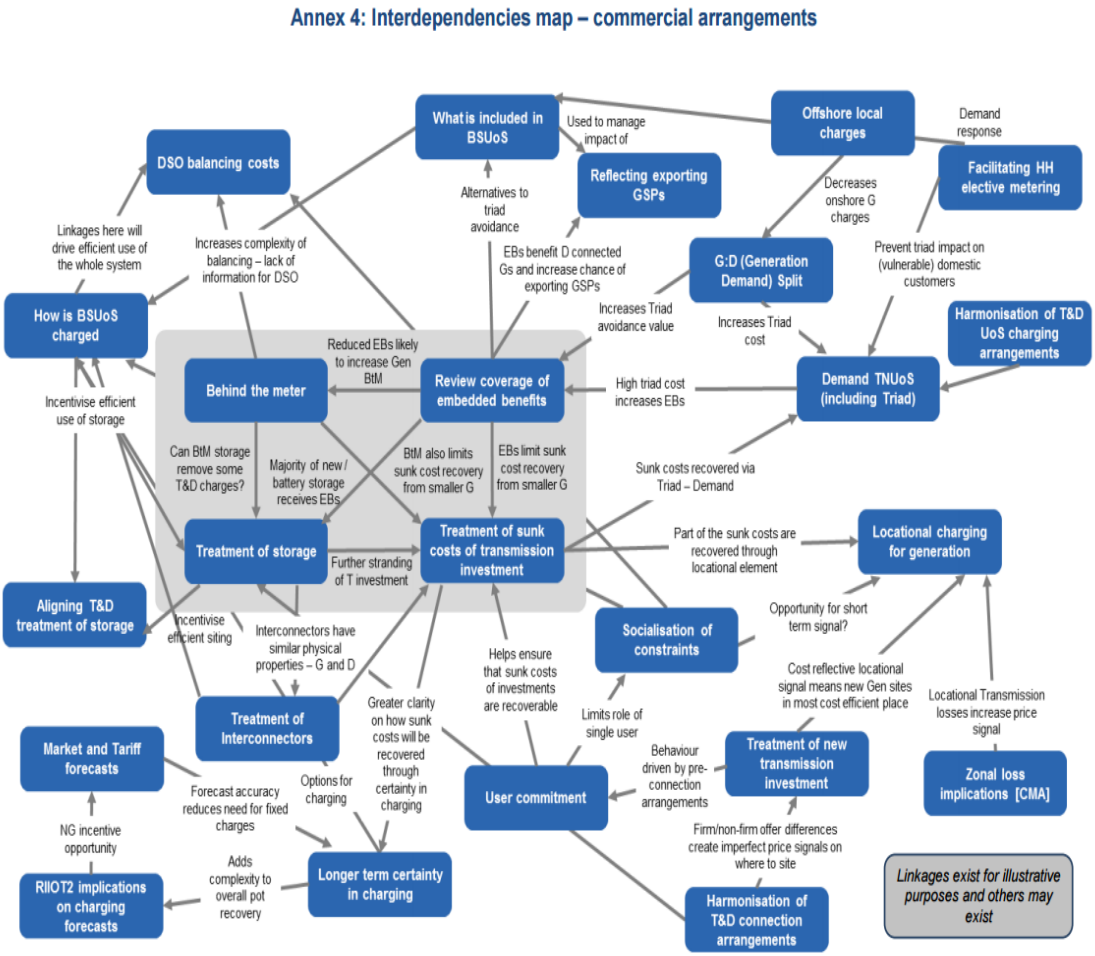
With this in mind there is some concern that rising TRIAD values are overcompensating generators on the distribution network – particularly where distribution networks are exporting.

While we acknowledge that increasing value of these payments indicates a need to consider their cost reflectivity, it is essential that any short term solutions do not undermine investor confidence.

Overall, changes to one element of charging arrangements considered in isolation will have knock-on effects across the electricity market. In order to avoid incremental change with the potential for unintended consequences there is widespread support in the renewables sector for a holistic approach to reform.

It is our view that any such reform should be led by Ofgem and requires close coordination with National Grid and BEIS. The number of commercial relationships that must be considered when tackling the issue of embedded benefit alone has been set out by National Grid, as illustrated in Figure 2

Figure 2: Interdependencies map – commercial arrangements (National Grid[6])



Clearly unpicking the knock-on effects from changes to one element of transmission charging takes time, and it is important that any review has a clear scope and delivery timetable. Equally, it is important that all effects are considered and that the right balance is achieved in securing cost reflective price signals while providing transparency and predictability where possible.

It is our view that the following issues should be considered within the scope of a holistic review:

- **The value of embedded renewable generation**: Further work is required to fully understand and assess the value that intermittent embedded generation can provide the system. Given the range of 'cost reflective' values that have been proposed by interested parties, it is our view that Ofgem is best placed to deliver the necessary independent assessment.

[6] http://www2.nationalgrid.com/WorkArea/DownloadAsset.aspx?id=8589937129

- **The principle of net charging:** The current 'net supplier model' recognises that, in the majority of cases, embedded generators do not use the transmission system and generally bring benefit to it by reducing flows demanded on the main system. It is our view that this core principle should be retained on a cost reflective basis where generation continues to counter demand.
- **Exporting Grid Supply Points:** We are in support of development and implementation of cost reflective and consistent charging arrangements for exporting GSPs that drive investment and costs. However, further work is required to ensure generators are exposed to an appropriate price signal, to better understand how DNOs would pass on any charges and to consider wider issues such as the implications for achieving environmental and decarbonisation aspirations and targets.
- **The definition of transmission and distribution:** the continued definition of the 132kV network in Scotland as transmission means that it is difficult to consider changes to charges for, and treatment of benefits arising from, embedded generators across GB without reconsidering this definition.

22. Do you anticipate that underlying network cost drivers are likely to substantively change as the use of the distribution network changes? If so, in what way and how should DUoS charges change as a result?

Changes to the overall market design will influence the utilisation of the networks for all participants. For example, providers of capacity (at times of system stress) are likely to utilise the network infrequently compared to parties operating primarily in the energy market or parties that provide flexibility which could include services to the local DNO to avoid/defer network investment.

It is likely that the types of network user will continue to diversify and evolve, which will alter the demand for networks. Network requirements based on conservative

Assumptions regarding 'peak' demand and/or generation output are therefore unlikely to continue to be representative of the ways that networks are utilised.

With this in mind it is important that design and connection arrangements (and therefore network charging) reflect the diversity across network users and ensure that parties pay for the required investment and O&M of the networks in a cost reflective way.

24. In the context of the DSO transition and the models set out in Chapter 5 we would be interested to understand your views of the interaction between potential distribution charges and this thinking

We envisage DSO licence area(s) to emerge through the development and tender of the DSO function. These may or may not follow existing DNO structures (see also question 45).

We envisage DSOs being able to procure services to air the operation of their network areas. The impacts of local balancing must not conflict with the operation of the transmission network. DSO models have the potential to look across the Transmission/Distribution boundary, allowing DSOs to respond to transmission system needs

Providing price signals for flexibility- 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?

Consistency, transparency and predictability of policy are essential, particularly given the long term investment timeframes required for the infrastructure to deliver a smart flexible energy system.

While the UK energy market is effectively liberalised, the UK Government can still find itself in the position of 'picking winners' by making the policy environment more or less favourable for certain technologies, for example there is a barrier with co-locating storage with renewable sites (particularly intermittent generation) due to existing regulation (we are aware that there is ongoing work in Ofgem on this issue).

At times, such action may be required in order to control costs or encourage innovation. However, the Government's powers in this regard should be entirely evidence based and exercised with caution as investors will seek reassurance that the policies that underpin investments will endure and are not exposed to unnecessary or excessive policy or political risk[7].

This issue was reflected by the Competition and Markets Authority (CMA) in its energy market investigation[8]. Focussing specifically on the method for allocating CfD's, the CMA recommended that the then Department of Energy and Climate Change should:

- Carry out and disclose the outcome of a clear and thorough impact assessment supporting a proposal to use its powers to allocate CfD's outside a competitive process; and
- Regularly monitor the division of technologies between different pots, which form the basis of CfD auctions, and provide a clear justification when deciding on the allocation of budgets between the pots for each auction.

The CMA's proposed remedy underlines the importance of providing a robust evidence to underpin any changes to the policy environment in order to reassure investors that the Government is not unnecessarily distorting the market.

[7] http://www.e3g.org/docs/E3G_Electricity_Market_Reform-_Unfinished_Business_Simon_Skillings_120515.pdf
[8] https://assets.digital.cabinet-office.gov.uk/media/559aacbee5274a1559000017/EMI_Notice_of_PFs.pdf

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?

The Committee on Climate Change has identified that the capacity of renewable energy will need to at least double if we are to remain on track to meet our carbon targets[9].

With this in mind the Levy Control Framework (LCF) should serve as a cornerstone of today's electricity market by providing investors and consumers with a reliable signal as to the scale of investment required to meet the UK's Fifth Carbon Budget while reconciling the challenges of security of supply and affordability.

Effective communication and long term visibility of the LCF is therefore critical and, while we welcomed the announcement of £730m to be made available to less established technologies (pot 2) within the next LCF period, there is some concern that the two cheapest forms of generation – onshore wind and solar PV - are not currently permitted to access the market.

It is important to note that "at present no form of generation is investable based on the wholesale price alone[10]". While the Renewables Obligation, Feed-in Tariff, Contracts for Difference and Capacity Market may differ in the terms and level of support that they offer they each exist to provide a reliable signal to investors who would otherwise be unable to commit the significant investment required to replace and upgrade the UK's electricity infrastructure.

It is our view that there is a clear case for further reform of the LCF in order to ensure that the framework is stable, transparent and robust, and that it achieves best value to the consumer.

The roles of different parties in network and system operation:

43. Do you agree with the emerging system requirements we have identified (set out in Figure 1)? Are any missing?

We recognise that, in order to successfully transition to a secure, flexible and low-carbon energy system at the lowest possible cost, the roles and responsibilities of system actors must change and greater dependencies between them will likely develop.

We agree with the emerging system requirements identified in the Call for Evidence and particularly welcome the recognition of the need to create a 'level playing-field for new and existing flexible technologies, providers and solutions and access to a wide range of revenue streams'.

[9] https://www.theccc.org.uk/publication/the-fifth-carbon-budget-the-next-step-towards-a-low-carbon-economy/
[10] https://policyexchange.org.uk/what-exactly-is-subsidy-free-onshore-wind/

We would add that the emerging system ought to maintain a focus on low-carbon sources of generation and flexibility, in line with the recommendations set out in the Fifth Carbon Budget from the Committee on Climate Change.

Some elements are missing from this depiction of the emerging system requirements and drivers. Increasing interconnection and becoming further integrated into a European energy market are additional key drivers for system change that are missing. BEIS must also reflect on the changes coming in via Project TERRE.

We should rapidly move beyond Active Network Management (ANM) and other trials to creating DSO models and more open, holistic ancillary service markets to satisfy the combined needs of the DSO and TSO.

The current RIIO-ED1 framework does not accommodate the role of the DNO to move to that of a DSO. We question wither BEIS and Ofgem should reopen the current price controls and/or implement separate regulatory allowances for DSO activities.

44. Do you have any data which illustrates: a) the current scale and cost of the system impacts described in table 7, and how these might change in the future? b) the potential efficiency savings which could be achieved, now and in the future, through a more co-ordinated approach to managing these impacts

The current opaque model and system planning activity has created a model that can inhibit development of renewables and other forms of DG and whereby the DNOs can seek to charge developers potentially unnecessary and sometimes prohibitive reinforcements and protection costs. This issue is as a result of some of the 'more established' (legacy) network planning models continuing to assume that all connected DG could under 'worst case scenarios' be producing power at all times, including wind and solar PV.

A more coordinated, open approach to managing local and regional network dynamics should be able to produce more efficient outcomes, delivered by the market and avoid unnecessary reinforcement work (or costs being born by marginal plant and/or consumers).

45. With regard to the need for immediate action: a) Do you agree with the proposed roles of DSOs and the need for increased coordination between DSOs, the SO and TOs in delivering efficient network planning and local/system-wide use of resources? b) How could industry best carry these activities forward? Do you agree the further progress we describe is both necessary and possible over the coming year? c) Are there any legal or regulatory barriers (e.g. including appropriate incentives), to the immediate actions we identify as necessary? If so, please state and prioritise them.

It is our view that the transition of DNO to DSO provides a valuable opportunity to help reach our low-carbon ambitions, minimise costs to the consumer, and to create the right market conditions to develop new technologies such as electricity storage, demand side response and active network management. However, we would note some concern regarding the

expectation that the current DNOs will automatically transition into becoming DSOs, and note the potential for a broader DSO role (contracting counterparty) which could be developed. A number of trials have clearly demonstrated the benefits of network innovation. Active network management (ANM) schemes have enabled generation to connect to the network and demonstrated cost savings of up to 90 per cent[11].

DNOs have been limited in their ability to adopt these successes at a large scale, by further rolling out existing trials and we would welcome a DSO model taking these innovations forward.

In order to achieve this, is it clear that a DSO model must:

- Create a level playing-field for service providers with clear contractual routes for all parties
- Ensure that market mechanisms are transparent, competitive and aligned at both transmission and distribution level

In order to fully understand how the benefits of these models can be realised, including driving efficiencies in network operation and planning, it is our position that work is required to set out further detail on the scope and operation of the proposed services market.

Any commercial arrangements must be transparent, cost reflective and create a level playing-field for all technologies to compete to provide the most efficient solutions.

The benefits brought by services, and by system flexibility in general, are felt by multiple players in our energy system. However not all these benefits are currently priced in the market. It is imperative therefore that service markets are developed in a way that balances the priorities of different system actors while encouraging the system we require.

A flexible, low-carbon, system will require a variety of service providers including renewable technologies, demand side response and energy storage – all of which rely on a firm understanding of contractual arrangements necessary to secure investment.

It is equally crucial that market mechanisms are effectively harmonised across the transmission/distribution interface. Particularly as some service providers may already have existing contracts with the System Operator (SO) National Grid or may be looking to additionally participate in those markets. To maximise efficiencies market mechanisms should be developed which are not prohibitive to service providers acting in multiple markets. Equally, it is essential that both markets work together to avoid driving inconsistent behaviour.

Should participation in a DSO service market preclude providing services to others, this must be appropriately reflected in price signals in order to appropriately incentivise service providers.

[11] http://innovation.ukpowernetworks.co.uk/innovation/en/Projects/tier-2-projects/Flexible-Plug-and-Play-(FPP)/

A number of key enabling technologies will be required to support the transition to a DSO, including: enhanced monitoring, improved modelling and prediction tools, control and automation of assets, communication and distribution management systems and cyber security and data protection. We would encourage more discussion on how to further develop these enabling technologies to benefit all system actors and users.

Finally, it is important that changes are tackled holistically across all system actors and that they support the development of transparent and integrated markets to catalyse system modifications. Emphasis should be placed on removing regulatory barriers to enable industry to develop appropriate solutions.

Determining System Need

Determining system need will become more complex and more of a necessity, as our system develops and more flexibility providers come forward,. Signals will need to be developed, particularly at a distribution level, to prompt network reinforcement or for certain flexibility actions to be taken while ensuring market stability and that the value flexibility providers bring to the system is retained.

While some current processes, including the *Network Options Assessment, System Operability Framework* and *Future Energy Scenarios*, can aid with system planning, these processes can risk subjective judgements being made by the System Operator. More sophisticated network planning tools will have to be developed that take into account the more complex requirements of flexibility providers.

b) How could industry best carry these activities forward? Do you agree the further progress we describe is both necessary and possible over the coming year?

It is our view that the transition should be tackled holistically across all system actors and should support the development of transparent and integrated markets to catalyse system changes. Emphasis should be placed on removing regulatory barriers to enable industry to develop appropriate solutions in addition to taking a modular approach to these activities by rolling out or deepening existing schemes, and learning from them

c) Are there any legal or regulatory barriers (e.g. including appropriate incentives), to the immediate actions we identify as necessary? If so please state and prioritise them.

We would strongly encourage Ofgem to consider whether there are any barriers in existing licensing arrangements, including RIIO Frameworks and existing ICE commitments which would prevent network operators from taking these initiatives forward.

It is worth noting the impact of certain EU network codes, including the Requirements for Generators. This will come into force in 2019 and includes elements of controllability for generation above 800W.

46. **With regard to further future changes to arrangements: a) Do you consider that further changes to roles and arrangements are likely to be necessary? Please provide reasons. If so, when do you consider they would be needed? Why? b) What are your views on the different models, including: i. whether the models presented illustrate the right range of potential arrangements to act as a basis for further thinking and analysis? Are there any other models/trials we should be aware of? ii. Which other changes or arrangements might be needed to support the adoption of different models? iii. Do you have any initial thoughts on the potential benefits, costs and risks of the models?**

We agree that roles and market arrangements will likely have to adapt as the energy system develops, and we support pragmatism in developing arrangements that are flexible and resilient across a broad range of scenarios.

As previously discussed, the creation of an overall vision for the energy system would offer strategic direction and help minimise the likelihood of developing roles and markets that do not reflect system requirements.

It is important that government is mindful of the balance between changes that are economically reasonable and deliverable in realistic timescales whilst recognising fundamentals which need to be addressed to future-proof system operations. The earlier regulatory and proposed policy clarity is available, the better.

We believe the prospect for greater coordination and planning of network requirements and charging in the future is a further illustration of the need for Ofgem to undertake a full, Significant Code Review to identify and understand the wider context of proposed changes to network charging.

b) What are your views on the different models, including:

i. whether the models presented illustrate the right range of potential arrangements to act as a basis for further thinking and analysis? Are there any other models/trials we should be aware of?

The three models proposed in Fig-2: all appear plausible and have their own merits, specifically: the ‘DSO/SO Procurement Mechanism’ appears at first sight to be the most simple to implement (and its application potential within the Project Terre process) but the ‘Market Signals and Arrangements’ appears to reflect the efficient balancing model that prevails in the Netherlands (which is not dissimilar to GB in terms of climate, consumers and generation dynamics).

Further detail on the models is required for full analysis. **ii. Which other changes or arrangements might be needed to support the adoption of different models?**

iii. Do you have any initial thoughts on the potential benefits, costs and risks of the models?

Harmonisation between transmission and distribution systems will be key to delivering the right models and market structures to enable the development of a flexible energy system.

Models need to be transparent, inclusive and create a level playing-field for service providers.

The Call for Evidence rightly notes that there could be interdependencies between the models and market structures developed and other aspects of the energy system, including network charging and wider commercial arrangements. We support the recognition that any changes would need to be considered holistically.

Some DNOs are already proactively considering models and market structures in anticipation of a future requirement for transitioning to DSO models, and the impacts of these models across the energy system and we would encourage a coordinated approach with the DNOs when giving further consideration to models.

Innovation:

47. **Can you give specific examples of types of support that would be most effective in bringing forward innovation in these areas?**
48. **Do you think these are the right areas for innovation funding support? Please state reasons or, if possible, provide evidence to support your answer.**

It is our position that driving innovation in the below areas can enable the development of a flexible, secure, cost-effective and low carbon energy system.

Flexible Networks: The Committee on Climate Change states that achieving our carbon budgets with a 'more flexible power system' has the potential to save consumers £3bn-3.5bn per year[12]. Securing this flexibility will require a range of new technologies such as Active Network Management (ANM) systems, demand side response, storage and will encompass efforts to better operate networks, including transitioning to a DSO.

Energy Storage: Significant volumes of energy storage have been awarded contracts in both the Enhanced Frequency Response services and the Capacity Market tenders. However, storage technologies have a number of other benefits which are not currently aren't priced in the market (including enabling increased renewables capacity and potentially deferring network upgrades). Innovation, both directed at storage technologies themselves and in the mechanisms to encourage storage technologies to market will be required to realise these benefits.

Energy Systems Integration: A whole systems approach will be required to facilitate a transition to a smart and flexible energy system. Holistically considering electricity, heat and transport will allow us to drive efficiencies in our system and tackle the energy trilemma. Developing new technologies, market structures and business models will be essential.

[12] https://documents.theccc.org.uk/wp-content/uploads/2015/10/Power-sector-scenarios-for-the-fifth-carbon-budget.pdf

Low-Carbon Heat: Heat accounts for 46 per cent of UK energy demand[13], supports 32,600 jobs[14] and had a turnover of £4.9bn in 2013 alone[15]. However, only 4.9 per cent of total heat demand was renewable in 2014[16]. Decarbonising the sector will mean fully developing new technologies, supporting their large-scale deployment and integrating them into our wider energy system.

Innovative Renewable Generation: If we are to meet our climate budgets, and deliver a secure, low-cost and low-carbon energy system, increased renewable generation capacity will be required.

[13] http://www.policyconnect.org.uk/cc/sites/site_cc/files/policy_for_heat_-_transforming_the_system_online.pdf

[14] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/416240/bis-15-206-size-and-performance-of-uk-low-carbon-economy.pdf

[15] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/416240/bis-15-206-size-and-performance-of-uk-low-carbon-economy.pdf

[16] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/437953/Renewable_energy_in_2014.pdf

ANNEX 1 – Revenue Streams for Energy Storage[17]

REVENUE STREAM	DESCRIPTION	VEHICLE
1. Enhanced Frequency Response (EFR)	System frequency is a continuously changing variable that is determined and controlled by the second-by-second (real time) balance between system demand and total generation. EFR is a new, fast frequency response product which helps manage frequency, requiring a full response in less than a second.	Tender
2. Firm Frequency Response (FFR)	A monthly electronically tendered service through which National Grid procures energy that can respond within 30 seconds.	Tender
3. Fast Reserve	A monthly tendered market designed to procure large blocks of reserve energy of 50MW to respond within 2 minutes.	Tender
4. Short Term Operating Reserve (STOR)	An important source of reserve energy for National Grid. Procured via 3 tenders throughout each year, a response time of up to 20 minutes is required.	Tender
5. Black Start	The procedure to recover from a total or partial shutdown of the transmission system which has caused an extensive loss of supplies.	Tender
6. Capacity Mechanism	The capacity mechanism is a catch-all term for the auctions for the Capacity Market that National Grid runs to guarantee capacity for any given year. The Capacity Market is one of the main building blocks in the UK Government's Electricity Market Reform (EMR) programme	Tender
7. Triad Avoidance	Reducing consumption at periods where peak winter national demand is forecast, in order to proportionally reduce TNUoS (Transmission Network Use of System) charge.	Via supplier
8. Red Zone Management	Shifting consumption to avoid periods of highest distribution network cost (DUoS; Distribution Use of System), often referred to as "red-zones"	Via supplier
9. Capture spilt energy	Storing energy (particularly from wind/solar plant) that would otherwise be lost due to grid constraint or instances where the rated capacity of the generating plant exceeds that of the grid connection.	Markets / CfD
10. Wholesale markets arbitrage	Price arbitrage: buying energy cheap on the wholesale energy markets, and then selling when prices are higher.	Markets
11. Correct for forecasting inaccuracy	Store/release energy when generation is out of line with forecasts.	Imbalance cost
12. Backup power	Provide backup power in the event of grid failure	N/A
13. Renewable energy self-consumption	Maximise use of onsite renewable energy (minimize grid exports)	Energy bills
14. Retail markets arbitrage	Similar to energy arbitrage, but based on customer's retail tariff, not prevailing wholesale price	Energy bills

[17] https://www.scottishrenewables.com/publications/electricity-storage-cracking-code/