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Dear James,

REVIEW OF THE ARRANGEMENTS FOR ELECTRICITY ANCILLARY SERVICES

We are pleased to respond to your call for evidence to review the arrangements for electricity ancillary services. The consultation focuses on arrangements relating to assets *dedicated* to ancillary service provision. However, the types and capabilities of generators on the system are changing fast and this will require a re-evaluation of the provision of ancillary services. As we transition to Net Zero, there will be a rapid decline in conventional synchronous generation and an increase in asynchronous converter-based renewable generation (CBR) connected to the grid. The commercial and technical solutions procured for the future grid will need to reflect this change. Even though there may be an 80:20 mix of asynchronous CBR vs synchronous generation, the future grid will often operate as an almost 100% CBR grid.

We would like to highlight in our response to this call for evidence, that the service requirements for operation of an almost 100% CBR grid will be different to that of the power grid of the past, and any regulatory and licensing changes implemented to enable dedicated assets for provision of ancillary services may only serve a temporary purpose. Our research (with independent consultants and universities) and our own experience of owning and operating renewable generators and battery energy storage systems (connected to both transmission and distribution) has shown that:

1. The power grid will change dramatically over the next decade, and the type of ancillary services required, especially those related to grid stability (inertia, short circuit level) and voltage control, will change as the grid evolves to be operated often as a 100% CBR grid.

2. The role of dedicated assets providing ancillary services is limited and should be phased out in due course as the nature of grid system operation changes. The need for these dedicated assets, especially those related to stability services, is only relevant in the transitional phase of the power grid. Ultimately these services should be provided by grid forming generators and other advanced converter based technologies.

3. The need for a large number of assets providing dedicated ancillary services arose from the current Network Options Assessment (NOA) process and System Operability Framework (SOF), which did not fully take the capabilities of converter based generation into account. This led to specification of system requirements in pathfinders which reflected a grid of the past and not of the future.

NG ESO alongside the wider energy sector must develop short, medium, and long-term plans which will highlight the need for types of ancillary services assets over time to deliver an efficient, reliable and operable 100% CBR grid. We urge Ofgem, and the Electricity System Operator (ESO) to design the policies relating to ancillary services with this in mind. In particular, the role, need, and funding for synchronous condensers and other dedicated ancillary services assets must reflect their limited transitional role in the power system. Ofgem and the ESO should send the right signals to future CBR manufacturers to invest in technology and innovation, so that generators can provide ancillary services and reduce the need for dedicated assets to maintain stability and security of supply.

Our answers to Ofgem's questions are in Annex 1. These have been written from the perspective detailed above, ie that plans must be developed so that the current operation of the grid can change and develop over time in the most efficient way possible, to ensure that the future renewables dominated grid is operated optimally and at lowest cost to the consumer.

We appreciate that this consultation addresses a very complex subject and we hope to have further engagement following this consultation with Ofgem, NG ESO, BEIS and other stakeholders to enable a collaborative approach to address the issue of ancillary services provision as we fats transition to Net Zero.

Yours sincerely,

Richard Sweet

Richard Sweet
Head of Regulatory Policy

Annex 1

REVIEW OF THE ARRANGEMENTS FOR ELECTRICITY ANCILLARY SERVICES – SCOTTISHPOWER RESPONSE

Objective and scope of our review

1. Do you agree with the objective and scope of our review? Are there any other relevant issues we should consider?

We appreciate Ofgem's position to create the appropriate regulatory procedures and oversight for developers installing assets providing system critical ancillary services, however, we strongly believe that the premises and assumptions that sit behind the stated objectives and scope need further discussion and redefinition of its problem statement. The review appears to come from the perspective that a move away from traditional synchronous generation requires backfilling the system services that such generation provided. This approach is viable, but we do not believe that it is optimal especially as the GB power system is fast moving towards being operated as an almost 100% converter-based renewable generation (CBR) grid. The 100% CBR grid can be defined as a grid operation state where almost 100% of demand is met by asynchronous generation and imports from interconnectors. This a viable scenario and will become more prevalent as we transition to Net Zero.

The average annual inertia in GB grid has fallen by around 40% in last 10 years[1]. The regional level in short circuit level (SCL) in certain parts of Scotland and in England have fallen drastically over last 5 years and currently parts of Scottish grid is operating at SCL level as low as 5 GVAs[2]. We do not believe that there are any commercial framework and market mechanisms, that will enable us to replace the lost levels of synchronous generator type rotational stored inertia and fault-infeed contributing to SCL in an economic way. We believe that inertia in future will be obtained through inertial response or synthetic inertia solutions, which will effectively manage frequency excursions. The system strength in future grid will not be analogous to SCL in its traditional sense Thus the current approach replace these stability related services in its conventional synchronous generation manner, hundreds of synchronous condensers would need to be installed all over the grid. This is not financially viable for the developer, nor will it be in the consumer's best interest.

We consider that, in the long term, defining new operating strategies, including to deal with fault ride through, transient stability and incentivising faster CBR responses and grid forming will be the most effective approach for a CBR dominated grid.. Indeed, an almost 100% CBR grid will have different definitions of grid stability and strength due to large differences in operational characteristics of CBR to that of synchronous generation. An 100% CBR grid will have low rotational inertia, (inertial response to manage frequency excursions will still be required, and such inertial response can be efficiently obtained from grid forming converters. In addition, SCL alone will no longer be analogous to system strength and the definition of system stability will evolve to include different requirements for transient stability. For example, Grid Forming (GFM), virtual synchronous machines (VSM) CBRs can reliably operate in low SCL conditions (eg offshore HVDC grids) and can provide inertial response during frequency excursions.

[1] NG ESO System Operability Framework
[2] National Trends and Insights, NG ESO

Of course, the operation of almost 100% CBR grid is not a fact now and is something that will progressively develop over time. This will require some backfilling of services from synchronous generation in the short and medium term (<10 years, until the current stability pathfinder contracts come to an end). For example, until the Transmission Owner (TO) system protection philosophy evolves to no longer be dependent on minimum SCL, in the transition period SCL will still be needed on the system to maintain protection system effectiveness. Therefore, we see the methods[3] adopted now which are focussed on backfilling inertia and SCL lost on the grid, as an intermediate step enabling the grid to transition to an almost 100% operable CBR grid. However, we strongly believe this current process will not deliver a long-term sustainable strategy and will not be in the long-term economic interest, or in the long-term interest of consumers. Ultimately, TOs, DNOs, the ESO and generators will need to adapt system protection (not to depend on minimum SCL), operation, stability and security requirements to reflect efficient and economic operation of an almost 100% CBR grid.

To highlight and evidence our views we provide links to several papers which point to the ongoing work in various parts of the world.[4,5,6]

In light of the changes highlighted above regarding the future operation of an almost 100% CBR grid, the methods adopted in NOA process and Stability Pathfinders which are focussed on backfilling inertia and SCL lost on the grid, giving rise to need of synchronous compensators is not a sustainable strategy and will not be economical or in interest of consumer in due course (over next 10 years). It is only an intermediatory step enabling the grid to transition to a 100% CBR grid.

We believe that NG ESO alongside the sector must develop short, medium, and long-term plans which will highlight the need for Ancillary Services assets over time to deliver an efficient, reliable 100% CBR grid. The most important conclusion of the work should be to determine the “break even” point where the grid will no longer require synchronous compensator type technology to meet system services requirements, but will rely on CBRs and their control algorithms to meet system stability and services requirements. An estimate of ancillary services sources with potential breakeven point is shown in Figure 1 and 2.

[3] The current networks options assessment (NOA) process and Stability Pathfinders backfill inertia and therefore give rise to a need for dedicated ancillary assets eg synchronous convertors
[4] Objectives - Project - H2020 Migrate (h2020-migrate.eu)
[5] What We Know—and Do Not Know—About Achieving a National-Scale 100% Renewable Electric Grid | News | NREL
[6] Hamilton_etal_2020_Operating_a_zero_carbon_GB_power_system_in_2025_frequency_and_fault_current.pdf (strath.ac.uk)

Figure 1: Projected electricity generation by fuel type in Britain (TWh)

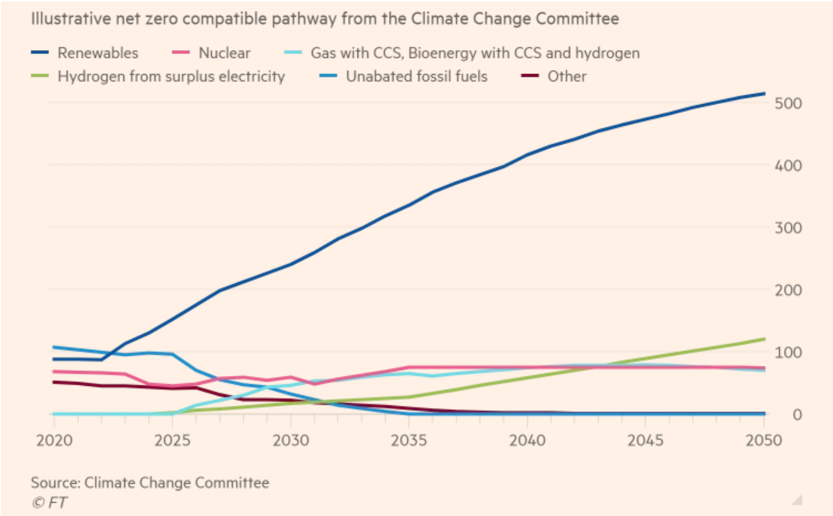
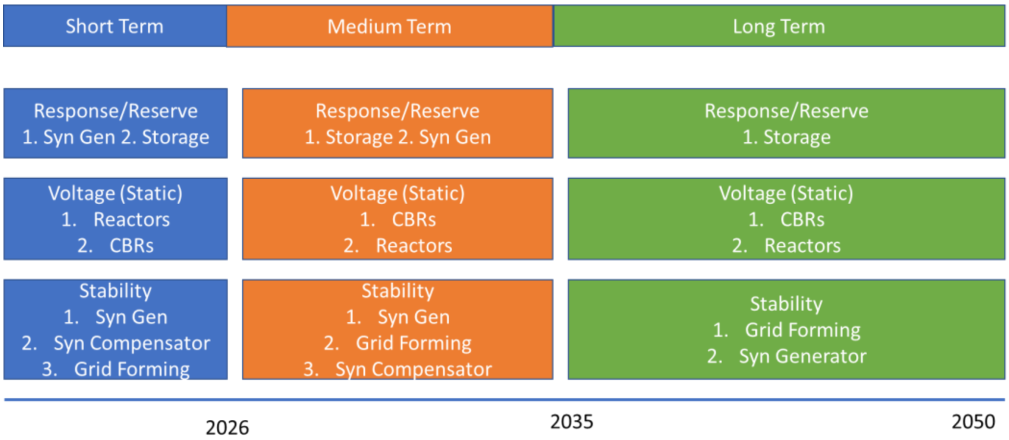


Figure 2: System Services sources short term, medium term and long term



We recommend NG ESO, Ofgem, BEIS, TOs, DNOs, generators, developers, academia, and research bodies should work collaboratively together to define the future almost 100% CBR grid through NOA and system operability framework (SOF) process. This should also consider:

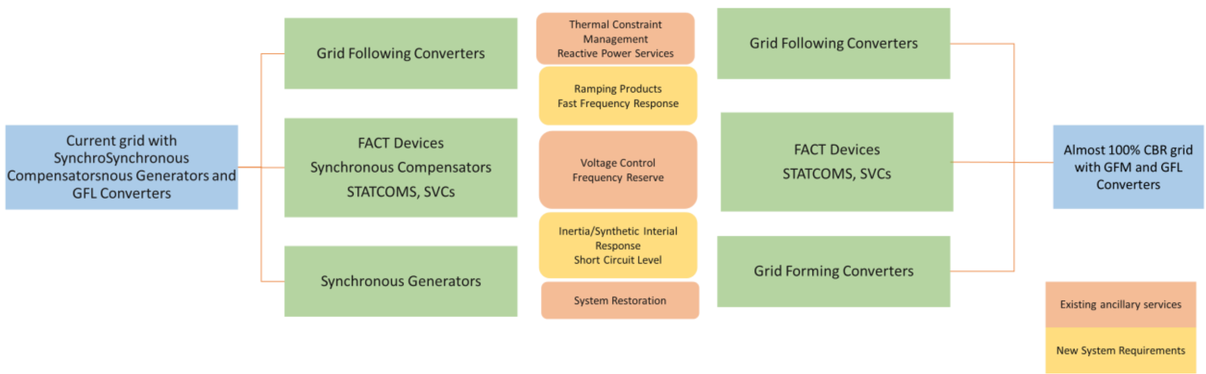
1. The regional differences in need for ancillary services based on regional future energy scenarios (FES) and better distinguishing regional requirements as compared system wide requirements for ancillary services
2. The types of services that can be enabled from CBRs such as BESS, grid forming control and enhanced grid following control.
3. Providing a roadmap of transition to 100% CBR grid which intermediatory and transitional needs which may include assets dedicated to providing ancillary services.

This innovation landscape, supply chain and OEM research and development should examine innovations needed in ancillary services – considering secure and stable operation of the grid in an almost 100% CBR grid. Ancillary services need to be adapted to increase system flexibility by remunerating **new types of technologies for ancillary services** needed in a high-variability scenario which include fast ramping products, faster and more dynamic voltage control, and enhanced fault ride through (FRT) control. Moreover, in addition to being open to conventional generation or generation type units such as synchronous condensers, the ancillary service market should be open to new participants, such as grid forming CBRs and BESS, and distributed energy resources (DERs). An excellent example of such approach is demonstrated through Distributed ReStart project and its inclusion Electricity System Restoration Standard (ESRS). As part of the project it was demonstrated with a different approach and taking the capability and characteristics of DERs into account system restoration can be enabled from DERs. As a transitional step towards 100% CBR grid, this demonstrates a proper approach towards enabling change and doing things different, rather than backfilling lost synchronous generation and related ancillary services.

Another example is the trial of Grid Forming (GFM) technology through SP Renewables' Dersalloch trial, where GFM enabled Wind Turbine Generators (WTGs) were used to re-energise part of the transmission system. This effort was a major contributing factor to Grid Code modification GC 0137 which provided requirements for GFM converters and thus enabled NG ESO to procure five GFM BESS through the Stability Pathfinder Phase 2 tender for Scotland, enabling GFM CBRs to provide system black start and restoration services. Such examples highlight that innovation is required to transition to Net Zero and an almost 100% CBR grid.

Figure 3 shows the change in type of ancillary services required and how innovation can enable these services from CBRs and storage systems. We emphasise that it is highly likely that the need for dedicated assets to provide ancillary services is transitional over next 10 years and will ultimately be phased out, as they are only backfilling the needs of a grid of the past and will no longer be required in the same form in future. Innovation should enable the new types of ancillary services for the future almost 100% CBR grid, and regulation and policy should support this approach in the interest of accelerating transition to Net Zero in an efficient way that benefits the consumers.

Figure 3: Ancillary Service Types new and existing and CBR sources



2. **Table 1 summarises the key dedicated ancillary service technologies and the ancillary services that they provide. Do you consider other technologies as capable of providing dedicated ancillary services? If so, please indicate what services they can provide.**

We consider that this review comes from the perspective that a move away from traditional synchronous generation requires backfilling the system services that it provided. This approach is neither viable nor optimal. From a grid enhancement perspective, investment directed to enable grid connections on new sites purely for enabling ancillary services from dedicated assets may not be the most efficient solution in the future operation of an almost

100% CBR grid. Whilst these assets will serve a temporary purpose on the grid, installation of many such assets will lead to sites with stranded assets within a decade.

We believe that the definition of dedicated ancillary service technologies needs more clarity. Are these assets, whose main purpose is not to provide MWs to meet demand requirements, considered to be dedicated ancillary services regardless of location? For example, if they are co-located with an existing generator, are they considered dedicated or do they need to be installed standalone purely to fulfil the purpose of providing ancillary services?

Another point of clarification relates to Battery Energy Storage Systems (BESS). Short duration storage systems (half hourly, hourly batteries, BESS) can be installed purely for providing stability and response services without participating in the balancing mechanism and capacity markets. These should also be considered under the same definition of dedicated ancillary services assets and it should be clearly defined in their connection agreement that their sole objective is to provide non-capacity related ancillary services.

In Table 1 below we have listed assets currently co-located with existing generators and/or installed standalone that can be considered under the wider definition of dedicated assets for the provision of ancillary services.

Table 1: Ancillary service technologies matrix

	Synchronous condenser (inc modified generator equipment)	**Shunt reactor**	**BESS (with Grid Forming Converter)**	**STATCOMs**
System stability (inertia/synthetic inertia)	C	N	C	N
System stability (SCL)	C	N	C**	C**
Black Start (Grid Forming)	N	N	C (in combination with a generator)	N
Restoration Top-Up Service	C	C	C	C
Voltage management (slow dynamic response)	C	C	C	C
Voltage management (faster dynamic response)	N	C	C	C
Frequency Regulation	N	N	C	N
Power Oscillation Damping	C	N	C	C
Active Harmonic Filtering	N	N	C	C

*C – capable of service provision; N – not capable of service provision
** Contribution subject to design of the converter and limited by its size

As Table 1 indicates, short duration grid forming (GFM) BESS inverters can provide a full range of services and are reasonably cheap. We consider that they are more versatile when compared to other technologies. This means they can continue providing newer types of ancillary services as well as being easily transferable to other markets. Versatility is important when considering the changing needs of the grid as it progresses towards being almost 100% CBR. Size is often a limitation of BESS inverters however, when optimally designed, BESS can be utilised for multiple system service applications.

Synchronous condensers are excellent in providing larger quantities of the same service; however, capital and maintenance costs of synchronous condensers are considerably higher than those of other technologies including GFM BESS inverters. Synchronous condensers are not versatile and hence, as the grid becomes 100% CBR, the need for volume and type of services required from synchronous condensers will decline, potentially stranded these assets. BESS and STATCOMs, on the other hand, can continue providing newer types of ancillary services (such as faster voltage response and harmonic filtering) as shown in Table 1. These units, being cheaper in comparison, might have already fulfilled their purpose and can be easily decommissioned or replaced. The same will not be true for synchronous condensers as their requirements for connection and maintenance are more analogous to conventional synchronous generation which will become outdated over time.

Level playing field issues

3. What are the barriers to commercial dedicated provision of ancillary services?
   a) Are there specific barriers for dedicated stability service providers? If so, what are they?
   b) Are there specific barriers for dedicated voltage service providers? If so, what are they?
   c) Are there specific barriers for other types of assets dedicated to providing ancillary services? If so, what are they?

As outlined in our responses to Questions 1 and 2, the need for dedicated assets for provision of ancillary services is only temporary as the system transitions to a 100% CBR grid.

The ESO and the sector must perform proper studies to identify role of CBRs, BESS and other storage systems in future operation of grid. As a result, the ESO could then develop a better NOA assessment procedure, which takes into account BESS, converter control capabilities and grid forming converters and amend the SOF which still is mainly focussed on backfilling services from synchronous generation rather than identifying requirements for new types of ancillary services that can be produced from CBRs. In the short- and medium-term transition, however, Ofgem and the ESO may identify the need for dedicated assets for providing ancillary services, until such scenarios with grid services from CBRs have been clearly studied, planned and subsequently realised.

We have responded to the sub-questions from this perspective. The barriers to commercial dedicated provision of ancillary services lie in the lack of clear definition of these assets, their nature of connection and purpose on the grid in long run.

a) Are there specific barriers for dedicated stability service providers? If so, what are they?

We believe that the installation of many dedicated stability service providers should be and will be a temporary measure, and these dedicated assets will no longer be needed to provide the same service in future. We believe this creates a commercial barrier for many developers to bring such assets to FID. For a majority of developers the financial model does not pay off to invest in synchronous condensers that have high CAPEX and OPEX requirements as well as needing to build the knowledge and skillset within the company to operate and maintain an asset which will only be needed for 10 years but has a projected lifetime of 40 years. As a result, we believe that there is no clear investment case for commercial developers to invest in synchronous condensers as dedicated stability service providers. Ultimately, there is a general acceptance and knowledge in the industry acknowledging future changes in the power system, that stability services will be procured from grid forming CBRs such as GFM wind turbine generators, BESS, solar, HVDC converters etc.

b) Are there specific barriers for dedicated voltage service providers? If so, what are they?

The commercial barriers to dedicated voltage service providers is that there are different types of voltage services and many technologies that can provide various forms of voltage services both static and dynamic which could be owned by TOs/DNOs, interconnectors, OFTOs, generation owners and independent developers. Thus, it is complex to create a level playing field where an existing asset owned willing to add a new asset to provide the same service. In the financial analysis, the new asset will most probably be more expensive and uneconomical as compared to an existing asset or an asset funded through regulatory funding providing the same service. This was very clear in NG ESO's Voltage Pennine Pathfinder where Dogger Bank C with its predesigned converter and NGET with its shunt reactors won the tender. Similarly, mechanisms enabled through CLASS project enabling Volt/Var control through transformer tap-changers may prove more economical in system perspective rather than the same services being procured from individual developers. As developers are often not aware of the asset base capabilities of TOs, DNOs and that of other developers, it is tougher to bring a dedicated voltage service asset to FID with so much risk around its route to market and tough competition within the market.

c) Are there specific barriers for other types of assets dedicated to providing ancillary services? If so, what are they?

GFM BESS inverters which could be dedicated to providing ancillary services is treated commercially as a generator thus subjecting the BESS to same connection charges and capacity requirements as a generator. NG ESO does not consider storage and BESS as an economical solution to provide constraint management services, however in our view this is down to inadequate modelling of BESS on the system and inability of BESS to be co-located with generation in the CfD regime where it can also participate in other ancillary service markets.

The competitive allocation process of the CfD regime encourages low cost solutions for renewable energy including CAPEX costs. The viability of connecting more renewables to GB power system in line with UK Government Targets will depend on having a stable and operable network that can support operation of an almost 100% CBR grid. In order to facilitate the design of this grid and meet the need for ancillary services in various parts of the network, we recommend the CfD framework driven by BEIS is more closely aligned with NG ESO's regional stability and services requirements. The CfD regime should prioritise value to the system by allowing developers to bid in with projects at higher CAPEX costs, but with ancillary services provisions for the grid which can be commercialised through market mechanisms. This approach will reduce reliance on dedicated assets for ancillary services and streamline the approach to procurement of ancillary services based on regional requirements and ultimately drive down costs for GB customers.

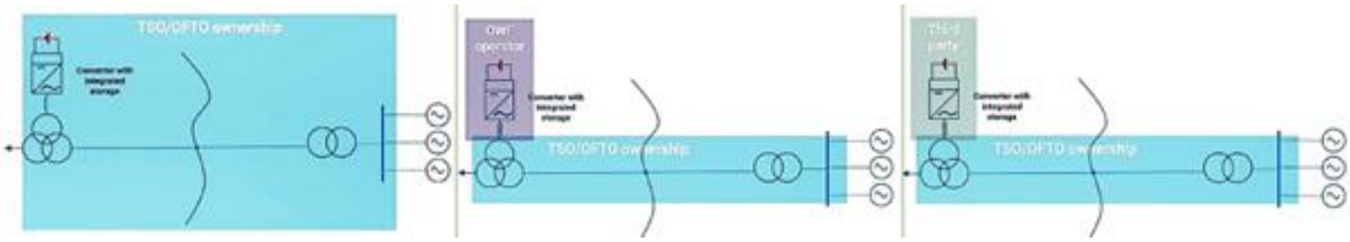
<u>Offshore and OFTO Licences</u>

For ancillary services, both OFTO owned assets and offshore windfarms can contribute to various types of service, however the different ownership model and licence conditions makes the business case complex. Generation owners can design ancillary services that would be provided from onshore converters and/or onshore located BESS which can support the onshore grid. Under the current model, the offshore developer then divests the onshore asset to an OFTO. Therefore, the ability for offshore generation and the OFTO model to provide ancillary services from assets connected to or under OFTO ownership needs to be considered as shown in Figure 4.

There is a need for understanding of licensing conditions especially if there is an onshore BESS or other dedicated ancillary services assets connected at the onshore point of connection. The clarity under onshore asset ownership and licensing will provide offshore developers more certainty and assurance, to create an investment model to install ancillary services assets onshore, such as BESS, or even consider enhanced functions for the OFTO system during design stage, such as HVDC converter stations with Grid Forming capabilities, to meet onshore ancillary services requirements for stability, voltage and black start and/or develop competitive business cases for the OFTO divestment process.

This is particularly significant under the current UK Government plans to install 50 GW of offshore generation on the network. It will be a lost opportunity, if issues such as licensing and ownership, and the CfD low cost framework hinder provision of ancillary services from 50 GW of offshore wind.

Figure 4: Offshore Generator/OFTO ownership model



4. Should assets dedicated to providing ancillary services receive regulatory funding, be commercially provided, or should there be a combination of the two?

We support a whole system approach to ancillary services where assets dedicated to providing ancillary services which do not store energy and thus cannot be transferred to capacity or balancing markets are enabled through both regulatory funding and commercial provisions, if such combination leads to the lowest costs for consumers. The requirements we see as essential, especially in light of the changing nature of the grid and the different operating strategies that should be used in the short/medium vs long-term, are:

- Understanding of the detail behind the requirements including the short, medium, and long-term requirements. The current processes including how the requirements for various pathfinders get determined, what studies are performed, and at which point of time these requirements are identified is opaque for all outside NG ESO. The use of a regulatory funding/commercial provision combined model requires a detailed plan of the challenges of operating the grid in the short, medium, and long term to understand in more detail the requirements and the long-term need for different technologies. The system requirements would therefore be known well in advance of tenders so potential investors would be able to make informed investment decisions regarding dedicated ancillary services assets. Without this, it may be too late for developers planning dedicated ancillary services products to make a financial decision, given they need to compete against regulatory-funded assets that are already suitably planned and placed, as the TO/DNO has prior knowledge of the network requirements. The time from Expression of Interest (EoI) and tender announcement to CoD is usually 15-24 months.

- Clear information on what is considered to be a dedicated ancillary service. It is important for there to clarity in the definition well in advance, for example, whether the existing connected CBR generation and BESS capabilities are considered in such tenders.

The uncertainty of revenue streams and competition against regulatory funded assets often results in developers not taking dedicated ancillary services projects forward and thus automatically leading to such services being primarily provided from regulatory funded assets.

However, we do appreciate that the economics of such assets is complex, and it may be that in some cases it is in the interest of consumers for such services to be procured from regulatory funded assets. We encourage NG ESO and Ofgem to engage with developers early on and regularly to highlight detailed regional and system wide ancillary services needs, thus allowing for a combined model to function and create a level playing field for all dedicated ancillary services asset owners.

5. On an enduring basis, should electricity consumed solely to provide an ancillary service be exposed to the costs, charges and levies that consumption of electricity in general (such as final demand) is exposed to? Please provide details to support your position, such as the magnitude of the impact to your business, and the impacts on competition and energy consumers more widely.

We strongly recommend that electricity consumed solely to provide an ancillary service is **not** exposed to the costs, charges and levies similar to final demand for consumed electricity, as the sole purpose of such assets is to provide ancillary services and the electricity imported by such assets is much less than by pure demand, when compared to the services and export of reactive power, active energy and fault infeed provided to the grid.

For example, a BESS does not use the energy imported (except for the small amount lost through round trip efficiency) but exports all energy back to the grid. Similarly, a synchronous condenser uses the import energy to convert it to kinetic energy during spinning and exports it back as active or reactive power. The losses of a synchronous condenser can be higher and it may always need a constant import of active power to maintain its rotational speed, however the consumed energy is not used for any other purpose than maintaining the rotational speed of the machine. Constant consumption of, say, 1 to 10 MW of energy may amount to a significant electricity demand from the grid (as compared to BESS round trip efficiency of 96-97%) and this is a significantly more constant load. However, we think that there is an argument that the consumption of energy is purely for providing it back to the grid when required.

Other dedicated assets for ancillary services, such as reactors or capacitor banks, convert the energy to some form or store electricity again solely for the purpose of exporting it back to the grid in form of reactive power.

If these assets were to be subject to final demand prices, the business model would definitely not stack up in periods of low demand for ancillary services, where the assets still need to be on standby in case a fault or unstable condition occurs; in those periods of time when the asset is on standby, the use of system charges may exceed the availability fees with the result that the asset is making a net payment to the grid.

In any case, the energy consumed is almost always injected back into the grid with >90% efficiency. Overall, we recommend that dedicated ancillary services assets receive the same treatment as BESS and are freed of final consumption levies except for those required to maintain the house load, ie auxiliary supplies, heating/cooling requirements of these assets.

6. Are any other changes to the licensing and charging regime needed which could better enable competition that drives down prices for the dedicated provision of ancillary services and why?

We consider that dedicated ancillary service assets should be:

1. subject to relevant Grid Code, and Connection Use of System Code (CUSC) requirements where applicable;
2. subject to some form of licensing so there is regulatory oversight;
3. exempted from TNUoS and BSUoS charges.

We explain each these points below.

Grid Code and CUSC requirements

We recommend that dedicated ancillary service assets are subject to relevant Grid Code, Distribution Code and CUSC requirements similar to generation assets, largely from a technical and network performance requirement perspective. It is important for system security and reliability that these assets connect and perform similarly to other generators providing the same or similar services. This will ensure better regulation of the asset and its impact on overall network performance.

Licensing

We consider that dedicated ancillary service owners should be subject to some sort of licence obligation. The options as we see it are:

1. Generation licence
2. TO/DNO-type licence
3. New bespoke licence
4. Offshore and OFTO licences

We discuss each in turn below.

1. Generation licence

The needs of a licence for an ancillary service provider do not align fully with the definition of a generator and hence a generator licence may add additional unnecessary obligations for developers. There is also the complication that generators which also own collocated assets which could be dedicated ancillary services assets will continue operating such assets under the same generation licence.

Our view is that Ofgem should continue regulating and granting generation licences to assets for dedicated ancillary services provision, recognising that many of these dedicated assets for voltage services and stability services will be owned by a generation licensee. The same applies to dedicated GFM BESS, as BESS is already classified as a generator under licensing requirements. Our expectation is that with innovation, more generators and BESS will have virtual synchronous machine and GFM capabilities, and the system dependence on dedicated ancillary service providers will greatly reduce, as the system transitions to Net Zero and an almost 100% CBR grid.

2. TO/DNO licence

A licence similar to TO and DNO licences may also be an option and allow the assets to be subject to similar performance requirements and regulatory reporting framework. This would likely mean that assets would not be allowed to participate in capacity and balancing markets.

3. New bespoke licence

As discussed in response to Question 1, we consider the need for dedicated assets is likely to be transitional therefore it may not justify the definition of a new type of licence. If Ofgem does intend to create a separate ancillary services licence, it would need to be similar to the generation or TO/DNO licence and subject to similar performance requirements and regulatory reporting framework, and would need to prevent such assets from participating in capacity and balancing markets.. Existing generators and TOs/DNOs would need to obtain this new licence in addition to their generation or network licence, thus bringing all ancillary services providers within the same regulatory framework.

4. Offshore and OFTO licence

As highlighted in our response to Question 3(c), there are challenges related to ownership and licensing of ancillary services assets in current offshore generator and OFTO models of operation. It needs to be clarified, how an offshore generator and OFTO operate assets to provide ancillary services to the grid. It also needs to be agreed that if the developer builds additional ancillary services capability on its offshore platform or at the onshore substation, it will be able to capitalise investment through participation in commercial ancillary services market mechanisms.

<u>Exemption from TNUoS and BSUoS charges</u>

We recommend that assets dedicated to providing ancillary services including constraint management, stability and voltage management services are not subjected to TNUoS and BSUoS charges. Ancillary services may often be required in regions such as Scotland with high levels of connected CBRs and lower demand for stability purposes. However, the TNUoS charges in Scotland are much higher than in England. These assets will not participate in balancing and capacity markets but purely function to provide ancillary services, thus enabling other generators to connect and enabling the TO, DNO, and NGESO to meet their licence obligations under NETS ESQCR, STC etc. Hence these assets should not be subject to TNUoS charges. It is arguably counterproductive even for BESS to be treated as a generator and subject to grid connection charges as BESS is not a generator; a dedicated ancillary services BESS enables more services on the grid and can also be used to mitigate constraints.

Removing TNUoS will ultimately drive down connection costs for dedicated ancillary services assets and reduce the price of service provision thus reducing overall ancillary services costs.

7. Are there any other existing disadvantages between different providers of ancillary services that need to be addressed and why?

We have highlighted many of the disadvantages in response to previous questions, but in summary:

- lack of system requirements, or the process of determination of service tender requirements for developers;

- lack of understanding or detailed modelling and studies of an almost 100% CBR grid - which will highlight need for different kinds of ancillary services and CBR control mechanisms than those enabled today through NOA and SOF pathfinder process.

The lack of system modelling and dynamic studies also poses a serious risk to system security where ancillary services procured today may not be able to ensure network resilience in short or long term.

We urge NG ESO and Ofgem to commence detailed system studies taking CBR generation control characteristics into account to correctly identify future ancillary service requirements and provide early signals to manufacturers and original equipment manufacturers (OEMs) to create innovative products such as superior grid following converters or advanced grid forming converters to meet the future requirements of the system. Relying unduly on technologies such synchronous condensers because they are similar to synchronous generators and provide an transitional solution, and not providing market and system requirement signals to OEMs and developers, will set GB ancillary services market on a wrong path where the future needs for fast control and performance will probably not be met by synchronous condensers.

Licensing arrangements

8. Should the dedicated provision of ancillary services be a licensed activity?

a) What are the benefits and risks for consumers and other stakeholders of assets dedicated to providing ancillary services being provided solely through Transmission Owner (TO) ownership?

We believe this option will not meet future requirements for ancillary services and will unnecessarily burden GB consumers with additional energy costs. CBR with the correct design and adequate converter capability can provide all types of system stability and voltage management services. All we need to do to ensure it gets built is identify a system need early via the NOA process, and ensure there is a guaranteed route to market to offset the additional investment to include this additional capability. If we do not provide the need identification and route to market, then, as more and more CBR based generation get connected to the grid without the additional capability, we will need to rely on installing additional dedicated ancillary services equipment by TOs and this will add to costs to consumers. This investment can easily be avoided by improving NOA processes and involving developers and generators early on in the process, providing them with clear system requirements.

There is a transitional period where there may be merit in TO ownership of such assets as they meet system security and resilience requirements, especially where there is uncertainty that the requirements for such services will be fully met through commercial market mechanisms. We urge NG ESO, working with industry and Ofgem, to develop a clear transition roadmap to show the transitional need for dedicated assets for ancillary services provision. Our expectation is that these should decline through improved planning, detailed system modelling and changes to ancillary services market provisions more befitting an almost 100% CBR grid.

b) What are the benefits and risks for consumers and other stakeholders of assets dedicated to providing ancillary services being provided only through commercial ownership?

The benefits of commercial ownership have been listed in our response to part (a). of this question. Commercial ownership promotes fair competition and technology innovation, thus ultimately driving costs down to consumers. Commercial ownership and a clear route to market allows developers to plan for ancillary services in their business case model, as an add-on service which allows for better utilisation of existing connection assets. Such competition is made more difficult with the TO ownership model, as the costs for TOs to own and operate such assets will be recovered through regulatory funding. TOs have included dedicated assets in their RIIO T2 business plan, as part of uncertainty mechanism, in case such services are not delivered through commercial market mechanisms. The general expectation of the industry is that ancillary service provision will be enabled through commercial ownership and competition to drive down costs for services. However, in order for commercial mechanisms to deliver efficient solutions, a joined-up approach is required between different frameworks such as NOA, SOF, CfD and pathfinders, to identify system requirements of 100% CBR grid early and provide market signals to developers. Such a joined up approach will create more market value, drive for services to be provided from generators and storage and will decrease reliance on dedicated ancillary service units.

c) Would different licensing treatment for assets dedicated to providing ancillary services present any challenges? For example, with TO-owned assets licensed under their electricity transmission licence and commercially owned assets under a different (or no) licence.

We support a licensing arrangement for all transmission and distribution connected assets to ensure regulatory oversight and network performance requirements. However, we do not envisage any challenges in such assets being owned under either TO or generation licences. Our preference is for such assets to be enabled through commercial ownership driven by competition; thus a generation licence is in our view most appropriate for such assets. We do not however support a scenario where such assets are not subject to any licence conditions as dedicated assets which are supposed to provide system critical services would not then be subject to any verifiable regulation**.**

d) What would be the impact of each of these options on competition?

Fair competition can only be ensured through commercial ownership and developer funding. However, we do appreciate that system security and resilience is also critical for the transition to Net Zero. Hence, in the transitional period (and at least in the next decade), some of these dedicated ancillary services assets will need to be owned by TOs/DNOs in order not to burden GB consumers with large costs where the commercial case is not clear due to assets only being used in the transition. Such provisions should be transitional and, ultimately, ancillary service assets should ideally only be facilitated through commercial ownership to promote fair competition.

9. Do you think that the dedicated provision of ancillary services should fit within an existing licence category as an enduring solution? If not, how should this activity be best categorised within the licensing framework?

We believe that, on balance, dedicated provision of ancillary services best fits into the existing licensing category of the generation licence, as an optional service to be provided by generators. However, some of these assets especially those related to voltage management services could be owned by TO/DNO licensees, and using a generation licence may restrict developments.

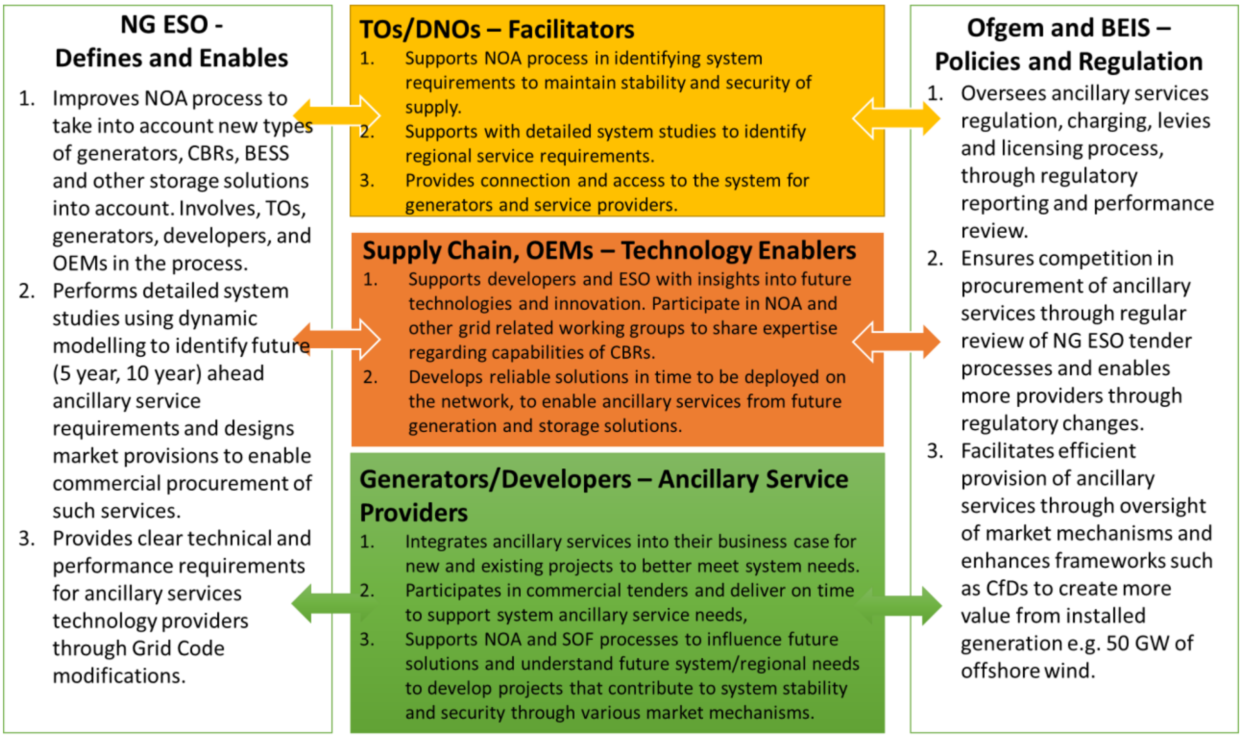
Roles and responsibilities:

10. Do you think there is enough clarity around existing roles and responsibilities in the provision of ancillary services?

We believe there is currently enough clarity around roles and responsibilities in the provision of ancillary services. However, as the system is evolving fast, and types of ancillary services required change such roles and responsibilities will need to be more clearly defined. This is crucial to drive competition, ensure system security and resilience, and drive system costs down to benefit GB consumers.

We believe there is need for more collaboration across the industry, in defining system requirements. The industry should be better represented in NOA and SOF processes. Similarly, the future CfD framework should have elements of system operability reflected, to facilitate service provisions as per regional needs and enable developers to create more value from the connecting generation. One of the key issues to be addressed in all processes is treatment of storage solutions, especially BESS; as the potential of BESS to address system constraints and other stability requirements is currently underutilised. The future utilisation of storage technologies (short and long duration) to provide ancillary services and manage constraints on the network, strongly depends on its inclusion in NOA process and provision of hybrid installations through CfD framework. The development of such integrated and holistic network models will require industry collaboration among ESO, TOs, DNOs, OEMs, generation developers, Ofgem and BEIS as shown in Figure 5 below.

Figure 5: Roles and responsibilities ancillary services



11. Are changes to arrangements needed to clarify responsibilities? If so, what changes are needed?

We recommend there should be clearer clarification of assets providing ancillary services ownership and how competition is ensured through commercial ownership, so as to minimise services costs to consumers. We have illustrated in Figure 5 above how we envisage the roles and responsibilities for ancillary services could evolve in future, to ensure that the new kinds of services (and technologies required to provide these services) are made available in time and supported through a commercial market mechanism with fair competition.

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