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Contact / Extension:
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Dear Steve,

## Ofgem Call for evidence: Visibility of distributed generation connected to the GB distribution networks

SP Energy Networks owns and operates the electricity distribution networks in central and south Scotland (SP Distribution), and Merseyside and North Wales (SP Manweb). We serve 3.5million distribution customers. We also own and maintain the electricity transmission network in central and south Scotland (SP Transmission). We are the only DNO group to operate across all three GB political administrations.

The events of August 9th 2019 as outlined in your Call for Evidence are clearly something that as an industry we need to address and either mitigate or prevent from occurring again. This will become an increasingly challenging prospect as we transition towards a Net Zero future with greater uncertainty and variability in how our customers use the electricity network. The compounding challenge is that are also seeking to manage the risk of future system operability events at the lowest overall cost to our customers.

In responding to this Call for Evidence we have found it important to consider the time frames in which information and visibility can be provided to support overall system operability. Where information is largely static or based on historic metering trends it can be used in planning timescales to inform future system forecasts and likely requirements. Where information is half hourly or more frequent it can be used in operational timescales to manage system operability or network loading. Where information is in the <1 sec range this will largely be used for protection systems and will operate based on settings and system conditions.

It cannot be ignored that increased visibility and control will come at a cost, for our larger customers, dedicated telecommunication links can cost upwards of £500k to install. As part of the Distribution Code the obligation falls on DNOs to provide the lowest cost connection offer and in terms of telecommunications infrastructure that will often be the minimum requirements as outlined in the appropriate Engineering Recommendations (G98/G99). Although changes could be made for new connecting customers this will have a minimal impact on the overall volume of connected generation. If we are to ask connected customers to retrospectively upgrade their telecommunication links the cost will have to be borne by either those customers or by all UK customers. Alternative telecommunication channels such as APIs could be an alternative provided suitable infrastructure is in place and the level of reliability and or cyber security is adequate for the purpose the data is being used for.

As part of the ESO's summer operability programme we proposed potential solutions to the ESO that would allow generation connected through our Active Network Management (ANM) system to be controlled in the event of an ESO requirement, with suitable compensation provided to generators. This was not ultimately progressed but if developed further this could provide the ESO with a very fast (<3mins) and reliable mechanism to manage future system operability events or requirements. This is one example of truly whole system thinking and another opportunity to demonstrate that ANM is not inimical to market based solutions and can in fact be an enabler for services to operate in the time scales that may be required to manage a large scale frequency deviation.

There have been a number of suggestions from Ofgem to increase the visibility of the DCP350 requirements below 1MW, whilst there are logical reasons to extend the amount of information we make public we need to understand the cost vs benefits of doing so. Generation below 1MW accounts for almost 80% of our connected generation customers but accounts for less than 3% of our connected generation. Extending DCP350 to cover generation below this threshold would have a minimal impact on the ability to manage system operability issues. That is not to say that there is not value in this data but a more automated, public register for information on generation below 1MW may be more practical than DNO published reports.

Additional information on connecting customers would help to assist both DNOs and the ESO to manage their networks but for smaller customers e.g. Electric vehicles or domestic photovoltaics (PV) DNOs do not have a complete data set. Where possible Ofgem and Government must work with network operators to make this information complete and accessible.

We have also supported the ESO in its Accelerated Loss of Mains programme, which will both mitigate the impact of future events caused by Frequency reductions and has also improved the information that we have on our connected generation customers. To date we have brought more that 330MW of generation cross 450 sites up to the current Loss of Mains standards.

In addition to the comments and points raised within this response I would also like to call out the Energy Networks Association (ENA) response and the excellent work that is taking place across the Open Networks project to address a number of the issues raised within the Call for Evidence.

If you have any questions about any part of our response please do not hesitate to contact me.

Yours sincerely,

**Graham Campbell**
**Head of Distribution System Operation and Whole Systems**
**SP Energy Networks**

**1. DCUSA modification DCP350 will provide data on a number of characteristics for DG greater than 1MW. Are there additional characteristics for DG, such as real-time MW/MVAr output, load factors and protection settings, which would aid in the prevention of, live management, and recovery from loss of supply events?**

A distinction has to be made between improved static information and the widening of DCP350 or other transparent methods of data sharing to include dynamic data sets. Static data sets can be approached as a data improvement exercise, identifying and including unknown data points. As soon as we include the sharing of dynamic data sets this needs to be captured within automated platforms supplied via network monitoring or direct customer information.

Several areas of ENA's Open Networks (ON) project are assessing further data exchange and further data publication to improve whole electricity network planning and operation including the prevention of, live management, and recovery from loss of supply events.

Regarding dynamic data sets this is being explored under the ON project, Workstream 1B Product 3 – Real Time Data Exchange product, more information on the scope and progress of that product can be found via the ENA ON website.

The recent Accelerated Loss of Mains programme has demonstrated that have an up to date record of protection settings for connected customers, would be beneficial and allow ready identification of those customers that are not compliant with current industry guidance. There are challenges in populating this data however, contacting customers is not always straightforward when ownership can change over time and a robust mechanism to capture protection settings changes would be required.

**2. What value will these additional characteristics provide to improving the planning, security and real time operation of the GB transmission and distribution systems?**

Increased understanding of the connected generation, generation historic load flow and real time load flow all support improved management and forecasting of how both the transmission and distribution systems operate. An improved understating allows for better planning and actions ahead of real time to manage system frequency or network constraints. However to mitigate unforeseen events such as those experienced on the 9th August 2019 there is also a need for actions to take place in real time. This could be a traditional dispatch via the Balancing Market or it could be a more autonomous dispatch via some of the solutions being explores in the Regional Development Programmes (RDP).

As part of our Dumfries & Galloway ANM project and to address some of the summer operability challenges we have discussed options with the ESO to activate and dispatch DG via the ANM system. This could provide a key tool to manage transmission load flows in real time. In deploying ANM it is necessary to install network monitoring and/or collect loading information from connected customers to inform the load flow analysis that governs the ANM system. It should also be noted that in our view ANM can prioritise and instruct based on commercial information and should not be considered as being at cross purposes to a market based approach. ANM allows these actions to be take autonomously within the timescales that may be required to mitigate major system events.

**3. What value will the above characteristics provide to improving DSO function delivery by the DNOs or other stakeholders? DSO functions may include network management, flexibility procurement, and service conflict avoidance.**

Improved understating of networks in real time is at the heart of any DSO model. It is only by doing so that we will be able to efficiently manage the uncertainty of a Net Zero ready network, a network that will be heavily supported by flexibility rather than a surplus of capacity. The above characteristics do not improve DSO function delivery they are part of the critical path towards any DSO model.

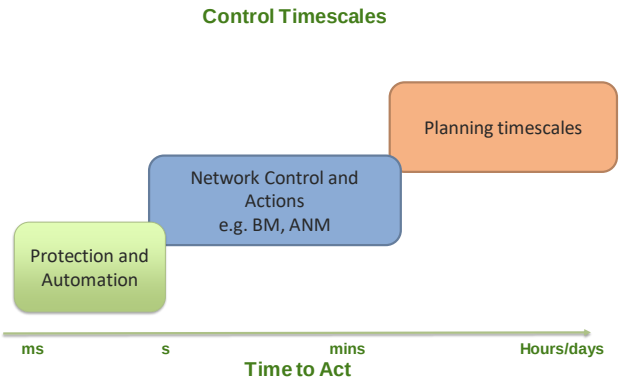
Only through the sharing of data and network load flows will it be possible to coordinate Transmission and Distribution service requirements both minimising potential conflicts and system operating costs. If we are to truly drive whole system solutions then we need to start with the sharing of data, understanding the actions taken by the ESO will also allow us to better gauge the capabilities of service providers and any overlaps with service provision or availability of services.

To forecast the level of flexibility that is required we need to understand our network, our own RIIO ED2 Flexibility tender required our design team to model the entire network under a range of both uptake scenarios and configurations on a half hourly basis. Any refinement to those models via improved network information will provide a higher confidence in both the flexibility we require and where we expect that reinforcement will ultimately be required. Without a complete model provided by enhanced network monitoring there is a risk that customers foot the bill for more flexibility services then strictly required.

In addition, a more complete register of connected assets and how they operate will provide an improved picture of what is available with regard to flexibility providers.

**4. At what temporal resolution (instantaneous, seconds, minutes etc.) would real time data on DG be valuable to improve the resilience of the GB electricity system in the prevention of, live management, and recovery from loss of supply events?**

When designing our own Active Network Management solutions we have taken some time to consider the temporal resolutions of control mechanisms and discussed at length with the ESO how these can best support system operability. Fundamentally the temporal resolution required to improve resilience is a function of how quickly you need action and how quickly connected generation can respond. The diagram below tries to illustrate how these timeframes correspond to the action being taken.



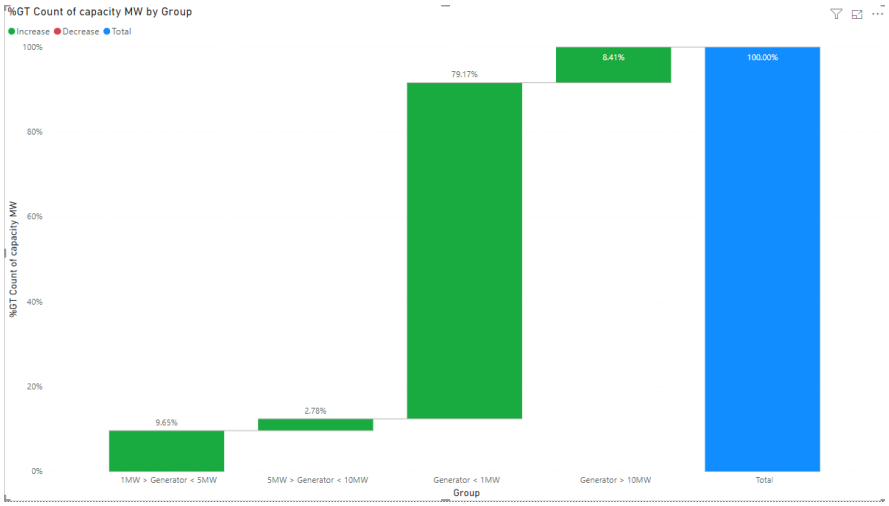

If a system overload or frequency excursion is unacceptable for a number of seconds (typically up to 3s) then in reality only protection systems or automation will be capable of responding quickly enough. There will be no real time decision making required or possible to operate in this timeframe, relying on pre-determined settings. This is not just a matter of how fast network equipment can operate, no meaningful control actions can be carried out by generators (with possible exceptions for battery storage). Initiatives like the Accelerated Loss of Mains programme are best placed to ensure that protection settings are aligned with current industry codes and policies to mitigate risk.

If a system overload or frequency excursion is unacceptable for a number of minutes (less than 30mins) then network control actions can be taken either through direct instruction by the system operator or through automated control systems (e.g. ANM). Seconds to minutes are required because there is a need to identify system conditions, calculate/determine a solution, instruct the solution, illicit a response and finally confirmation of an action having taken place. This can still be incredibly useful in managing system overloads.

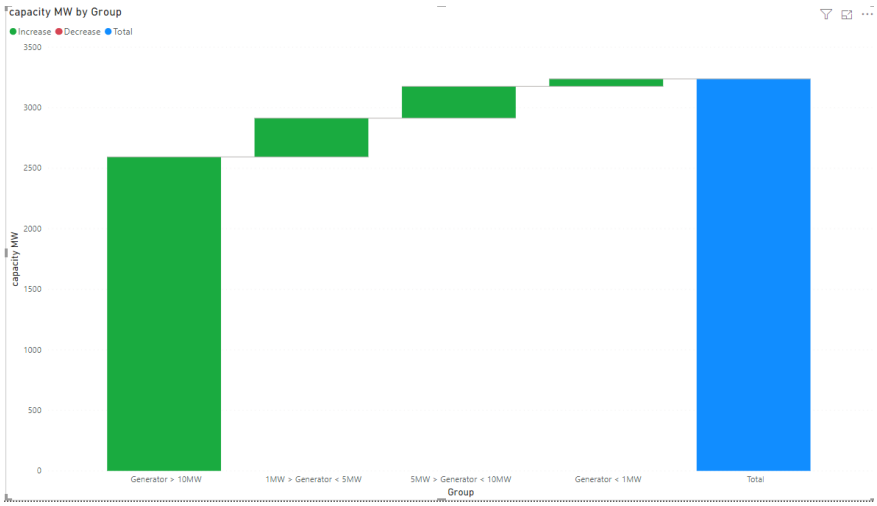
If a system overload can or frequency excursion can is unacceptable over a course of minutes to hours then half hourly metering information may provide increased visibility for system operators and allow improved forecasting. Improved historic half hourly information could also support forecasting activities which in turn allows the ESO to more accurately and effectively carry out its system balancing activities.

**5. What investment would be required for monitoring, collecting, storing and disseminating real time operational data associated with DG? Which party should be responsible for these investments? How does this vary, based on the size of visible DG at 1MW or 50kW?**

As outlined within our covering letter it has been suggested that we extend the requirements of DCP350 to 50kW. Before considering the expansion of requirements to <1MW we must really understand the benefits. The tables below show a rage of generation sizes as a proportion of connected MW and as a proportion of our connected customers.




Percentage of customers by MW category




Percentage of connected MW by MW category

It is clear that the actual increase in MW that we would be able to provide operational data for would be marginal whilst requiring a large volume of generators to provide real time operational data. It is our recommendation that efforts would be better spent focusing on those customers that already have telecommunications infrastructure and improving the transparency and availability of that data.

The monitoring, collection and storage of real time operation data would exceed the requirements of DCP350, likely requiring a dedicated telecommunication link. The connection guidance documents G98 and G99 (previously G83 and G59) specify the requirements for telecommunication links based on the size and type of generator connecting. Given that DNOs are obligated to provide the minimum cost connection offer customers have rarely opted for more than the minimum telecommunication links required. In many cases dedicated telecommunication links can form a large percentage of the overall connection costs as they require significant infrastructure. Retrospectively installing dedicated telecommunications links could range from tens of thousands to hundreds of thousands of pounds per site, typically this will be in the tens of thousands but it is site specific and often bespoke. The question is open as to which party should burden these costs, but it would ultimately fall to either the connected customer or be socialised to all customers via Use of System charges. These sizable costs further

emphasise the absolute requirement to understand the costs and benefits of extending the scale in which we capture real time operational data.

Requirements could be mandated for new connecting generation but this will similarly have a small impact on the overall MW of generation in comparison to the volume of existing connected generation.

**6. What are the credible technical, regulatory (industry codes, licences and governance) and legal barriers and costs associated with increasing the data collected, stored and shared regarding DG operations, and in obligating parties to do so?**

DG connections already need to meet relevant connection requirements (e.g. frequency performance, voltage performance).

Several requirements are already in place for larger generators (Type C & Type D, >10MW) to provide system monitoring (Grid Code ECC.6.6 on Monitoring). This includes fault recording and dynamic system monitoring. Extending these requirements to cover smaller generators (Type A & Type B, <10MW) would require an extensive programme of work given the numbers of generators already connected to the GB networks.

For the Embedded Capacity Register (ECR), the inclusion and publication of data for DG < 1MW would require further DCUSA changes to extend existing obligations on DNOs and IDNOs. The inclusion of resources below 1MW will also be impacted by data privacy regulations as many of these resources will be owned and operated by individuals rather than limited companies.

Additional information on connecting customers would help to assist both DNOs and the ESO to manage their networks, but for smaller customers e.g. Electric vehicles or domestic photovoltaics (PV) DNOs do not have a complete data set. Where possible Ofgem and Government must work with network operators to make this information complete and accessible.