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Ofgem

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Dear Akshay,

S&C Electric Company response to Ofgem's RIIO-2 Framework Consultation

S&C Electric Company welcomes the opportunity to provide a response to your consultation on the RIIO-2 Framework.

S&C Electric Company has been supporting the operation of electricity utilities in the UK for over 60 years, while S&C Electric Company in the USA has been supporting the delivery of secure electricity systems for over 100 years. S&C Electric Company not only supports "wires and poles" activities but has delivered over 8 GW wind and over 1 GW of solar globally.

As Ofgem has highlighted in RIIO-2 framework consultation, the energy system is currently going through a period of rapid transition to a lower carbon, more flexible and distributed system. Demand has fallen, over 50% of renewable capacity and 25% of total generation is now connected to the distribution networks and the costs for new technology including storage, solar and wind are quickly falling. These changes will continue with further rebalancing of both supply and demand as greater volumes of DG are connected and there is a shift towards electric vehicles and electrification of heat. In its Future Energy Scenarios, National Grid estimates that up to 60% of total generation capacity could be connected to the distribution networks by 2050.¹ In this context, we welcome the broad range of issues that Ofgem is consulting on as part of the development of the RIIO-2 framework.

Our response focuses on chapter 4 of the consultation relating to changes in the way networks are used and we want to highlight the growing importance of distribution network reliability in supporting the energy transition and ensuring there are not barriers to realising the value of network flexibility and the transition of DNOs towards an active DSO role. We consider there needs to be greater emphasis on the impact that both short and longer duration interruptions have on DG and other DERs and that there would be significant benefits of introducing new financial incentives in this area as part of RIIO-ED2.

If you would like to discuss the contents of this letter in more detail, please contact me on 07887 298393.

Yours sincerely,

Chris Watts
Regulatory Affairs Director

¹ "Future Energy Scenarios in 5", National Grid, July 2017, <http://fes.nationalgrid.com/media/1245/fes-in-5-for-web.pdf>



Importance of distribution network reliability for the development of DG, broader Distributed Energy Resources and a Flexible System

Introduction

The reliability incentives for electricity distribution should be reviewed and enhanced to take account of the changing energy system. Ofgem and BEIS' Smart System and Flexibility Plan highlights benefits of a smart energy system to be £17-40bn to 2050. However, it should not be forgotten that most of flexibility resources will be connected to distribution feeders and therefore will depend on distribution system reliability to provide services when they are needed.

We consider that there should be financially incentivized outputs to take account of the impact of both short and longer duration interruptions on DG and other DERs.

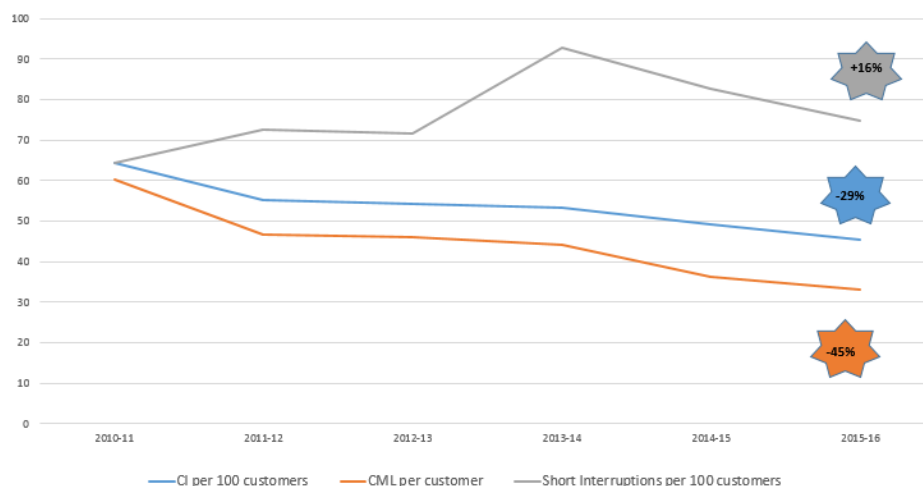
Interruption Incentives and Short Interruptions

The Interruptions Incentive Scheme was first introduced by Ofgem in April 2002 against a background of large centralized generation feeding through the transmission and distribution networks to inflexible demand at the base of the system. The incentive scheme gives equal weighting to all users of the networks and it focuses on sustained interruptions which last for 3 minutes or longer.

The form of these reliability incentives has remained broadly the same since then although there have been refinements in the rules defining the measurement of interruptions, the treatment of planned interruptions, and exceptional events. The targets, incentive rates and caps and collars on the incentives have been reset with each successive price control.

The incentives have worked very successfully in terms of driving major improvements in both CI and CMLs across all the DNOs. These improvements have been achieved through a range of approaches such as more effective deployment of field crews, improved condition-based asset replacement and refurbishment, automated switching, reclosing and using auto-sectionalizers to manage transient faults on tee or spur lines.

The chart below highlights the GB trends in CI and CML and Short Interruptions since 2010-11.



*The graph is based on Ofgem data excluding SSEN as data was not available for them the full period for short interruptions



There has been a vast improvement in sustained outage performance from 2010-11 to 2015-16 - a 29% reduction in CI and a 45% reduction CML over this period. However, there's something that has been missed here, which is not well reported. There has been a corresponding increase in short interruptions. The reason for both the increase in short interruptions and a lack of detailed reporting information is that there are no outputs or financial incentives associated with short interruptions.

Reported short interruptions have increased by 16%. However, the real increase in short interruptions may be significantly larger as there are questions over the robustness of the short interruptions data, as common recording and reporting practices haven't developed in the same way as for CI and CML.

The strategies being used to manage CI and CML are giving rise to another problem in the form of short interruptions. Approximately 70 to 80% of faults affecting overhead lines are transient in nature. A key part of the way in which CI and CML have been tackled for transient faults is to replace fuses on tee or spur lines with auto-sectionalizers. This meets the objectives of improving reliability in terms of longer duration interruptions because you no longer have transient faults blowing fuses which requires the line crews to go to the field searching for a problem that is no longer there. However, when you take fuses out and use sectionalizers together with up-line breakers or reclosers, short interruptions increase significantly, because the auto-sectionalisers do not contain the fault to the tee or spur it occurs on. All customers on the main feeder are now affected, meaning 100s or 1,000s of customers experience a disruption instead of just 10s of customers on the affected spur. Such technologies worked well in the conventional energy system but aren't well suited to the modern grid with large proportions of generation and DER connected to distribution feeders.

Growth in DG and DERs

The current design of the Interruption Incentive Scheme didn't anticipate some of the dramatic changes that are underway in the energy sector and which will continue to evolve quickly.

Over the past decade the share of electricity generation from renewable sources has increased dramatically as the costs of new technology (including storage, solar and wind power) have fallen at rapid rates. Over 50% of total renewable electricity generation capacity (and 25% of total capacity) is now connected to the local distribution networks. Most of this is likely to be connected to the overhead network, which will typically experience higher fault rates than the underground network.

Worldwide, short interruptions, are becoming less tolerable. Even a short-interruption of 5 seconds will knock generation offline. Different types of generation have different recovery times. Some recover quickly, within a few minutes, and others may be subject to manual intervention of complex startup sequences, meaning they are offline for a longer period, even though the service is restored to the feeder and the load is fully present. Taken in scale (such as during a large storm with many scattered outages) this is bad news for the DNO/DSO as a growing portion of the generation is not available when it is most needed. This can aggregate from a small local problem to a larger distribution network problem as generation availability is shifting on and off.

In summary such short interruptions mean:

- The renewable resource is unable to export.
- Demand previously met by distributed generation now must be met through additional reserve from conventional generators.
- Distribution-network loading under the planning standard, must be managed in a way that does not take DG into account.



Generation connections and other DER will have a direct financial loss associated with such outages, meaning that the tolerance for such short interruptions will become less and less over time.

At the same time the requirements of end consumers have changed with a move to an increasingly digitalized economy. There is an increasing proliferation of electronics and power electronic devices that are sensitive to short interruptions and power quality issues. Factories make increasing use of human machine interfaces, smart sensors and alarms which would all be affected.

Financial incentives based on measured performance improvements

Ofgem has collected information on short interruptions per customer since 2001 but has not so far introduced financial incentives in this area. In its Strategy Decision for the RIIO-ED1 price control Ofgem noted "We also have concerns that the short interruption data is not sufficiently robust to support a financial incentive. We intend to revisit the reporting of this data during RIIO-ED1."

We recognise that measuring and baselining short interruptions could take several years and be subject to poor quality of data available. So, we suggest a different approach that is more immediate. Since short interruptions can trip off distributed generation, there is a good case for RIIO-2 to include new incentives on DG interruptions (DGI) and minutes lost (DGML), as a separate customer class, covering both short interruptions and longer duration outages. Instead of trying to measure and incentivise difficult-to-measure short interruptions directly, the incentives could be aimed at a very useful, important, and quantifiable measure that is intended to protect DG from any type of outage.

This can be a good thing for both the DNOs/DSOs and DG owners. The DSO benefits as it helps to ensure that they can make full use of DG and other DERs. The DG owners or owners of DERs then do not suffer financial losses because of network unavailability. The intended consequence, or side-effect, of this, is that domestic customers will also see the benefits of less short interruptions

There are now smart devices such as single phase reclosers that can tell you accurately what has been happening to short and sustained interruption performance based on recorded event or trip logs. Instead of waiting around for years to collect data to try to establish a baseline, a financial incentive can be based on directly recorded improvements in performance.

Financial incentives on short interruptions have already been implemented in several countries internationally and it would be worthwhile Ofgem building on these examples. For example, the Service Target Performance Incentive Scheme (STPIS) for 2016-20 for Powercor in Victoria, Australia includes financial incentives for the Momentary Annual Interruption Frequency Index (MAIFI) which specifies target levels of performance and short interruption incentive rates for urban, short rural and long rural networks. The CENS reliability in Norway applies to both short interruptions and sustained interruptions.

Ultimately strong financial incentives are needed to address this area of performance. I would also like to draw your attention to a recent Engerati webinar Chris McCarthy and myself recorded relating to managing transient faults and cutting costly short interruptions.

<https://www.engerati.com/transmission-and-distribution/webinars/transmission-distribution/managing-transient-faults-how-cut>