S&C ELECTRIC COMPANY
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Steve McMahon
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30 August 2017

Dear Steve,

S&C Electric Company response to Ofgem's Open Letter on a potential RIIO-ED1 mid-period review – timetable and next steps: a call for evidence

S&C Electric Company welcomes the opportunity to provide a response to the call for evidence on a potential RIIO-ED1 Mid Period Review.

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. S&C Electric Company has been actively engaged in deploying Battery Energy Storage Systems since 2006 providing a full range of services and using a range of battery technologies. It currently has 76 MW/189 MWh in operation, including the UK Power Network's 6 MW/ 10 MWh battery that provides local peak load support and frequency services to National Grid, the GB System Operator.

As Ofgem has highlighted in its July open letter on the RIIO-2 framework, the energy system has changed dramatically over the last decade, with demand having fallen and the share of electricity produced from renewable sources having increased dramatically as the costs for new technology including storage, solar and wind have rapidly fallen. Over 50% of the renewable energy capacity is now connected to the distribution networks. Considering these changes and other factors, we recommend enhancing the existing RIIO-ED1 reliability incentives for the second half of the RIIO-ED1 period to include an additional financially incentivized output measure based on measured improvements in short interruption performance.

The remainder of our response focuses on the case for the introduction of this measure and associated incentives. We discussed some of these issues in a meeting with Grant McEachran and his team at Ofgem in Glasgow on 15th June 2017.

We would like to take part in workshops that take place as part of the MPR process. If you would like to discuss the contents of this letter in more detail, please contact me on 07887 298393.

Yours sincerely,

C. Watts.

Chris Watts
Regulatory Affairs Director, EMEA

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Case for the introduction of a financially incentivized output measure on short interruptions

Introduction

We understand that the scope of any mid-period review for RIIO-ED1 needs to be limited to material changes of outputs justified by either by clear changes in government policy, or the needs of consumers and other network users.

We consider that there is a need for an additional financially incentivized output measure relating to short interruptions, which is justified by the changing nature of the energy system and the needs of both distribution generation connectees and both larger and smaller consumers in an increasingly digitalized economy.

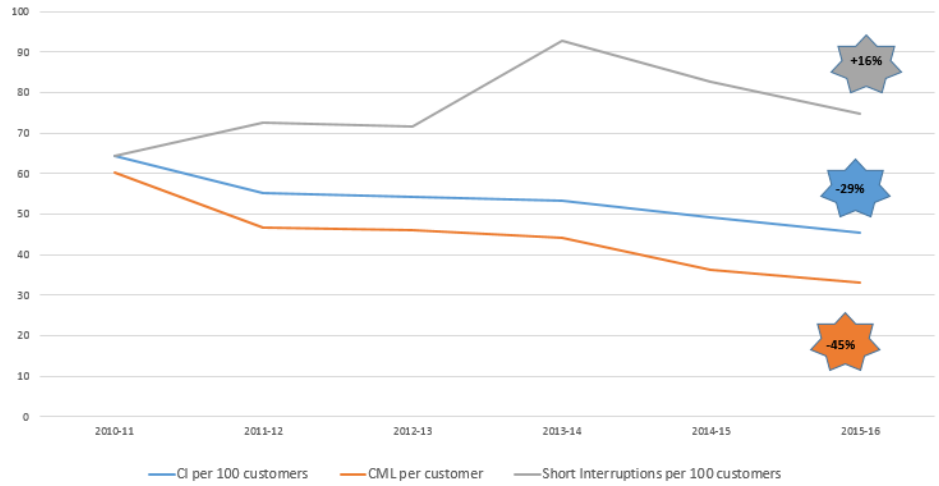
Interruption Incentives and Short Interruptions

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-sectionalisers 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.

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There has been a vast improvement in sustained outage performance - 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 this is that there are no outputs or financial incentives associated with short interruption. 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. There are also large regional variations in the data including much higher levels of short interruptions than average in the north of Scotland, South Wales and southwest England.

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-sectionalisers. 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 all customers on the main feeders are now affected. Such technologies worked well in the conventional energy system, but aren't well suited to the modern grid.

Growth in DG

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.

As highlighted in Ofgem's June open letter on the RIIO-2 framework, 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 34% of total capacity) is now connected to the local distribution networks. Most this is likely to be connected to the overhead network, which will typically experience higher fault rates than the underground network. In its 2017 Future Energy Scenarios, National Grid has forecast that distributed generation could increase to up to 60% of total generation capacity by 2050.[1]

Short interruptions have a major impact when large amounts of DG are connected to distribution feeders as they will knock the DG offline. Generation connections have a direct financial loss associated with such outages. Further, when all the DG is knocked offline on a feeder, typically they are off for 5 minutes or more before they can restart. For this approximately 5-minute window, the DNO needs to fully support power to that feeder, which previously had a lower apparent load because the DG was offsetting some demand. This means the DNO still needs to provide capacity for peak demand with no DG support, even though that capacity is only called on for minutes at a time, which is in clearly inefficient.

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

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The tolerance for such short interruptions as increasing volumes of DG penetrate the distribution feeders 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 by such interruptions.

Evidence on the impact of short interruptions on consumers

Short interruptions, are causing frustration and increasing costs for today's users of sensitive digital technology. Domestic customers are growing irritated, for example, at having to reset clocks and security systems more frequently. Retail businesses are equally upset at the disruption, costs, and lost sales that occur when customers leave rather than waiting for electronic cash registers to reboot. Manufacturing plants incur major costs due to lost production and idle workers while product assembly-line controls are reset. They may even have to scrap material and clean up messes caused when factory processes stop suddenly when the electricity "blinks."

In the United States, in what is regarded as the most comprehensive analysis there on power interruptions in 2004, the Lawrence Berkeley National Laboratory estimated the cost of interruptions at approximately $80 billion in 2004[2] and a recent update to this in 2016[3] showed the costs have risen to $110 billion. Over half of these costs relate to short interruptions, with most of this falling on I&C customers.

At a meeting one of our colleagues recently attended in the US, a hospital facility manager stood up noting they had 40 short interruptions in a single day. Those short interruptions were short enough not to trip on the standby generators but had an impact on other important hospital equipment.[4]

The issue of short interruptions has arisen in DNO stakeholder workshops. In its response to the Strategy Consultation for RIIO-ED1 UKPN[5] set out, "We are still getting strong feedback from some customer groups about the impact of short interruptions, with questions raised about the three-minute threshold. These customers may even be sensitive to transient interruptions or disturbances."

2 "Understanding the Cost of Power Interruptions to U.S. Electricity Consumers", K.H. LaCommare and J.H. Eto, Ernest Orlando Lawrence Berkeley National Laboratory, September 2004, https://emp.lbl.gov/sites/all/files/lbnl-55718.pdf

3 "The National Cost of Power Interruptions to Electricity Customers – An Early Peek at LBNL's 2016 Updated Estimate", Presentation to the IEEE, Distribution Reliability Working Group, July 19 2016, http://grouper.ieee.org/groups/td/dist/sd/doc/2016-09-02%20LBNL%202016%20Updated%20Estimate-Nat%20Cost%20of%20Pwr%20Interruptions%20to%20Elec%20Custs-Joe%20Eto.pdf

4 "A Growing Utility Dilemma: Momentary Power Outages", S&C Gridtalk article, May 9, 2017 https://www.sandc.com/en/gridtalk/2017/may/9/a-growing-utility-dilemma-momentary-power-outages/

5 UKPN response to the RIIO-ED1 strategy consultation, November 2012, https://www.ofgem.gov.uk/ofgem-publications/47138/ukpned1stratresponse.pdf

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Customers at a WPD stakeholder workshop raised the following issues.[6] A business customer representative said "resetting heating and security systems can be a real issue because "even a short power cut can cause lots of knock-on issues for us and sometimes this is not recognized". An environmental representative was frustrated that the DNO did not count or record power cuts which are under 3 minutes long. They felt that they were irritating as they happen a lot. "Devices in homes are reset in times of a power cut even if it is a second long." A business customer representative was of the view any loss of power "is a big cost for business."

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."

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. This would incentivize DNOs to deploy smart technologies in the right places to best improve reliability and customer service, immediately benefitting DG and end consumers as well as the overall security and reliability of the system. Such an incentive would encourage DNOs to optimize their networks considering both shorter and sustained interruptions.

There needn't be conflict between a short interruption incentive and incentives on CI and CML as the latest technologies can address both to the benefit of end consumers and DG.

Financial incentives on short interruptions have already been implemented in several countries internationally and it would be worthwhile Ofgem following 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 on short interruptions to improve performance.

[6] WPD Stakeholder report for workshop in Exeter on 12th November 2012, Green Communiqué, https://www.westernpower.co.uk/docs/About-us/Stakeholder-information/Our-future-business-plan/Supporting-Stakeholder-information/April-2013-stakeholder-workshop-report-Exeter.aspx