UMSUG121/05 – PRINCIPLES FOR CONSIDERING CHARGE CODE APPLICATIONS FOR CABINETS AND APPARATUS WITH VARIABLE LOAD

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Summary	This paper presents issues with creating Charge Codes for certain equipment types with variable loads, caused by components such as heaters and fans. ELEXON has proposed potential solutions to these issues and invites the UMSUG to agree an approach.

1. Background

1.1 ELEXON and the UMSUG have recently considered Charge Code applications where there has been an initial lack of clarity/consensus on the best approach, due to the various loads that certain equipment types are capable of. This is often due to components which are capable of heating or cooling.

1.2 The latest version (v17.0) of the Unmetered Supplies (UMS) Operational Information Document (OID) lacks clarity on how these types of equipment should be tested. Currently, only section 3.2 provides the following guidance:

'If the equipment incorporates heating (e.g. frost heaters) or cooling equipment (e.g. fans) then the estimated operating hours under the different regimes should be reported;'

'If the equipment load varies with ambient temperature then test data shall be provided at a room temperature (approx. 20ºC). The testing temperature shall be declared and a statement or data shall be provided on the maximum variation in load at both likely extremes (high and low) with the application;'

1.3 The lack of clarity and guidelines has made certain applications difficult to assess, resulting in manufacturers, ELEXON and UMSUG members struggling to reach an agreement on how to construct or even permit a Charge Code.

Heaters and cooling fans

1.4 Heaters and cooling fans in certain equipment have proven problematic, not only due to the difference in load between the different operating modes, but also due to various temperature thresholds and unpredictable operating times of these components.

1.5 Currently, the only reference to heaters in the OID is for 5°C heaters for CCTV equipment (section 3.6), which suggests a 13% weighting of the heater's circuit watts into the overall Circuit Watts calculation.

1.6 Unlike heaters, there is no reference to cooling fans in the OID other than that quoted in section 1.2 above.

Cable network cabinets

1.7 Recent cable network cabinet applications have highlighted that there is a large difference in the way this type of equipment type can operate, which makes defining testing requirements difficult. However, although this particular equipment type can be both complex and varied in mode of operation, only a few applications have been made in recent years. At present a 'case by case' approach is being taken, but using precedents set by previous applications.

2. Recent examples of Charge Code applications

Arqiva

2.1 Arqiva submitted a Charge Code application for its communications equipment in July 2017. Its progression has proven to be complex and time consuming for ELEXON and UMSUG members.

2.2 The equipment contains a heater component, which has the potential to raise the load from 25 watts to 125 watts (a 400% increase). UMSUG members agreed that the highly variable load created by the heater made approving a Charge Code application difficult. UMSUG members queried if the heater could be exchanged for a smaller heater, but the applicant said this would not be possible as it was a requirement for the product to remain above 15°C to avoid 'dew point'.

2.3 The manufacturer explained that the heater comes on when the temperature falls below 15°C. There is currently no defined way of calculating an average operating time for a heater that operates at 15°C. ELEXON asked the applicant to provide evidence of operating times, to which the applicant provided average temperatures throughout the year, sourced from the website Project Britain.

2.4 These average temperature values were used to calculate a yearly average operating time for the heater (58%), which was factored in to create a proposed Charge Code. We will be seeking the SVG's approval of this Charge Code on 31 October 2017 as part of Market Domain Data (MDD) version 262.

Independent Next Generation Ltd

2.5 Independent Next Generation Ltd submitted a Charge Code application for its cable network cabinet in May 2017, which was approved and published as part of MDD version 258 in July 2017.

2.6 The difficulty with this application was the fact that there were fans in the cabinet which were always on, unless the temperature fell below 5°C when they would then turn off. The fan speed also increased if the temperature reached 25°C, at which point it increased proportionately with the temperature.

2.7 After some deliberation, an UMSUG member was able to retrieve data from the Met Office which provided the average number of hours per year that certain temperatures were reached. In relation to the temperatures that the cooling fan would switch off and back on, the total percentage of times it would have impacted the load was minimal. The test data provided, which stated an ambient testing temperature of 21°C, was suggested to be an accurate representation of the typical load. This, taken into account with the fact that the fans would have minimal impact annually, was used as the basis to agree a Charge Code for the equipment.

Openreach

2.8 Openreach requested a Charge Code for its cable network cabinet, which was approved and published as part of MDD version 258.

2.9 The main complication of this application was that it had a variable load based on how many 'line cards' were installed. Each cabinet could hold up to four line cards, with each new line card installed depending on how many customers were connected. There was also a variable load based for each line card, based on how many modems (customers) were connected to it, with an average range of 20 watts difference between its 0% and 100% load (per line card).

2.10 The final agreed approach taken for this application was to have multiple Charge Codes for the cabinet, based on how many line cards were connected. In live operation, a new line card is installed when the current line card reaches 75% customer load. Once that line card reaches 100% load, the next line card will be used. Each Charge Code was therefore made at 75% load, plus the amount of line cards at 100% load before that. The declared Charge Code by the customer would change as more line cards are installed.

2.11 The cable network cabinet also contained cooling fans. Although in the entirety of the Apparatus, the cooling fans only made a small difference whether it was on or off (7 watts difference), this does show the difficulties that can arise for equipment with various components that affect the load.

Virgin Media

2.12 Virgin Media requested a Charge Code for its cable network cabinet, which was approved and published as part of MDD version 260 in September 2017.

2.13 Unlike the Openreach cabinet, the load of the Virgin Media cabinet was more consistent and predictable due to the use of fibre cable, which allows multiple customers to be connected without impacting the load.

2.14 The cabinet also had cooling fans, although the applicant was able to confirm it would have minimal impact on the overall load. Due to the dissipated heat from the other electrical components, the internal temperature is never likely to drop below the point where the fans would switch off.

3. Potential solutions

3.1 Based on the problematic areas highlighted regarding equipment with variable loads, we propose the following potential solutions:

Variance load limit

3.2 One of the requirements for an UMS Charge Code to be granted to a piece of equipment, as outlined in BSC Procedure 520 'Unmetered Supplies registered in SMRS', is that 'the electrical load is of a predictable nature'. This has always been an ambiguous phrase, as the requirement is taken from the relevant Statutory Instrument (SI)[1] in which the word 'predictable' is not defined. The SI guidance published by the National Measurement Office (now Regulatory Delivery at the Department for Business, Energy & Industrial Strategy) provides further information on predictability, which we have included in Appendix 1. However, this guidance is itself open to different interpretations. The UMSUG's attempts to further define 'predictability' have in the past been unsuccessful (see, for example, UMSUG paper 114/02 and the minutes of UMSUG114). Any further UMSUG definition would need to be compatible with the existing SI guidance.

3.3 It is often down to the discretion of UMSUG members on a case by case basis, to decide if a Charge Code application satisfies the predictability requirement. However, as highlighted in applications such as Arqiva's, the variance in load between the heater off and the heater on is 100 watts (a 400% increase). Equipment

[1] The Electricity (Unmetered Supply) Regulations 2001 (Statutory Instrument 2001/3263). The SI sits under Schedule 7 of the Electricity Act 1989 and takes precedence over the UMS provisions in the BSC, BSCP520 and OID.

with such a large variance, which is entirely dependent on unpredictable weather patterns, makes it difficult to satisfy the 'predictability' requirement for a UMS.

3.4 A variance load limit could therefore be introduced to the OID, which could be based on either a percentage difference between the minimum and maximum loads (such as the +/- 3.5% outlined in Appendix 1), or a total wattage difference (whichever would have the greater impact on Settlement). This has the possibility to make future Charge Code applications not only less cumbersome, but clearer on the notion of predictability. Equipment that has such a varied load could be deemed too unpredictable for a UMS and should therefore be metered.

3.5 However, a strict limit could be considered too 'hard and fast' as an approach and it may prove difficult to decide upon a specific percentage or wattage variance limit, based on how varied different equipment types can be.

'Proof of predictability' requirements for manufacturers

3.6 The applications discussed in this paper have taken up a lot of UMSUG members' time. It would be beneficial for Charge Code applications to already have proof that the load is predictable to a certain extent. One way this could be achieved is through the use of metered data from samples of the equipment already in live operation. A calculation could be used, in a similar approach to the one already used for test data samples, to derive the average Circuit Watts. If the metered data of the samples provided is too varied, this would only assist in proving that the equipment's loads are too varied to satisfy the requirements for a Charge Code.

3.7 The downside of this approach is it will prove problematic for manufacturers that don't already have metered versions of the same equipment.

Temperature profiling

3.8 Heaters and cooling fans are often dependent on the temperature. While the weather in Great Britain is far from consistent, a profile could be created based on historical data (e.g. last three years) from a reliable source (such as the Met Office) and a percentage weighting could be applied to future applications, based on the temperature(s) that trigger the heating or cooling components.

3.9 A similar approach was taken with the Arqiva application, whereby historical data was used from Project Britain to derive an average percentage time that the heating component was in use throughout the year. The heating component triggers at 15°C, therefore based on the monthly average temperature, it was estimated that the heater would be on for 50-60% of the year.

	England	Scotland	Wales	Average
Jan	3	2	3	3
Feb	4	3	4	4
Mar	7	6	7	7
Apr	9	8	9	9
May	12	11	12	12
June	15	14	15	15
July	17	16	17	17
aug	16	15	16	16
Sept	14	13	14	14
Oct	11	10	11	11
Nov	8	7	8	8
Dec	5	4	5	5

3.10 Using a similar dataset, profiling could be created for average temperatures throughout the year. Currently, the only reference to temperatures for a heater is specifically for CCTV equipment, which suggests a 13% operational time for a heater set at 5°C. A temperature profile could allow for various equipment types that use different temperature thresholds for their heating and cooling components to calculate an average operating time annually.

3.11 While this idea would provide a quick and simple solution for equipment that incorporates heating and cooling components, it would still only be a rough estimate, and still have the potential to vary greatly, based on the physical location of the equipment (e.g. in a well-shaded area versus in the middle of an open field) as well as the geographical location in Great Britain of the equipment, where temperatures can vary. This can be even more complicated if the heaters and cooling systems work at various speeds.

4. Next steps

4.1 We invite the UMSUG to consider the proposed solutions and agree an approach. A follow-up paper can be provided in time for the next UMSUG meeting if more detailed analysis and methods for implementing such requirements are agreed. Draft redlining to the OID to account for these changes can also be provided at the same time.

5. Recommendations

5.1 We invite you to:

a) **NOTE** the issues identified in this paper;

b) **NOTE** ELEXON's proposed solutions; and

c) **AGREE** an approach to equipment with variable loads.

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APPENDIX 1 – EXTRACT FROM GUIDANCE ON UNMETERED SUPPLY REGULATIONS

From Version 2.0, March 2014:

4.6 Predictable nature

3(1)(a)

For an unmetered supply to be provided the electrical load must be predictable. In assessing the electrical load, consideration should be given to any ancillary loads (such as heaters or fans) which may be temperature dependent and therefore generally much less predictable than the "useful" load.

It is not appropriate for a supply of electricity to be unmetered where the consumption pattern is unpredictable as this would clearly result in difficulties in the calculation of the customer's bill, and its accuracy.

The NMO considers that in the context of these Regulations, predictable shall be assumed to mean a load that can be consistently understood throughout its usage period, such that billing can be correctly estimated or accurately calculated based on pre-defined operational profiles or based on event records. The NMO considers that to maintain settlement accuracy, there should be a maximum permitted variation of +/- 3.5% which means the calculated usage should be equivalent in accuracy to that of a metered supply.

In determining if a load meets this criterion NMO encourage a pragmatic approach to equipment which will, for the majority of time, require a constant load but may have small variations in load from time to time that are insignificant in terms of overall kWh consumption taken on an annual basis.

The definition of "predictable" included in this guidance is intended to assist stakeholders to determine if other items of street furniture are suitable for connection to unmetered supplies. When the load is less predictable, then it may be necessary for the supply to be metered. However NMO also encourages parties to adopt a pragmatic approach for small, loads (e.g. vehicle activated signs where a speed warning sign "flashes") where the cost of metering would significantly outweigh the value of the electricity consumed. In this situation it may be possible for the parties to agree a number of "burn hours" based on the estimated number of "flashes" over a time period to provide a reasonably accurate estimate (if necessary, erring on the high side) of consumption. This is particularly the case for customers who have a good record of maintaining an accurate inventory.

For the avoidance of doubt, the supply of electricity to all premises suitable for occupation does not meet this definition of predictable and should therefore always be metered. Similarly, supplies to electric vehicle charging points should be metered in all cases because of the size of the load and the inability to predict the usage of such points.

NMO believe that temporary connections for festive lighting should generally be given an unmetered supply, as the usage is fairly constant and for a limited time. Temporary connections for other purposes (e.g. market traders, fairs, exhibitions, etc) may not be as predictable and it may be necessary to consider other supply options such as the installation of a dedicated, metered feeder pillar.