Charge Code Application for G.Fast Pods utilising Nokia cabinets

Introduction

Last year Openreach obtained Charge Codes for G.Fast pods using a new technology that delivers Ultra-Fast Broadband, with download speeds of up to 300mbps via copper cables. The technology in use was manufactured for Openreach by Huawei. In addition to the existing Huawei pods, equipment is also now being manufactured by Nokia and a series of charge codes is required to reflect this additional equipment.

As with the Huawei pods, these Nokia pods are powered by a 48-volt DC supply connected to (but separate from) the existing Super-Fast unmetered cabinets using an extra low voltage (48V) cable running parallel to the fibre.

The testing and average circuit watts calculations in this application has followed the principles that were established with approval of last year's application.

The difference in operation of the existing of the Huawei pod and the Nokia pod is that the Huawei pod contains up to 4 line cards, each with 24 ports, potentially providing internet connections for 96 customers. Initial installation of the Huawei side pods has one line card powered, with additional line cards being powered as additional customers are connected. The charge codes for the Huawei pods are based upon the number of line cards powered.

The Nokia pods that are being installed will have 3 line cards installed and powered on initial installation. Each of the line cards has 16 ports, providing potential connections for up to 48 customers. As there will always be 3 cards connected, this application for charge codes is based upon the number of end customers connected to the pod.

Finally the Nokia pod contains cooling fans rather than the heat exchanger used in the Huawei pod.

Testing of the Pods

As required by the Charge Code application process, five samples of the Nokia pod complete with their components were provided to the Lighting Industry Association laboratory for testing. In addition, 16 modems were provided in order that the increase in energy consumption resulting from the number of end customers connected to the pod could be replicated in laboratory conditions.

The energy consuming components within a Nokia G.Fast pod all operate at 48V and are as follows;

- Card Chassis – provides the connection between the incoming fibre cable and the line cards and also provides the power supply to all other components in the pod.
- Line Cards – these connect the fibre to the final customer copper cables. As noted above 3 line cards are being installed, and there will be a variation in power depending on the number of end customers connected via the copper cables.
- Cooling Fans.- used to cool the electronic components as heat within the pod rises. There are two cooling components, one on the chassis that is constantly running and roof fans that only operate when the internal temperature exceeds 50^0C.

The test results are provided in the LIA report enclosed with this application.

Analysis of the Test Results

Extensive testing was carried out to establish consumption patterns including testing of the pods with only one and two line cards installed, however because the pod will always be installed with three line cards connected from day one, those test results have not been used in this application.

An Excel workbook is provided with this application that shows the analysis of the test results, and the charge codes applied for. The tab named "Test Results" contains all of the tables in the formal test report.

In the tab named "Analysis" the average watts & VA values from each of the tests at 48V used in the calculation of the Charge Code circuit watts are shown. Using Elexon's usual practice a tab called "For Standard CC" is included, this tab uses the average watts figure to create the four charge codes values that are the subject of this application.

There are two variables in the energy consumption, they are the additional load generated as each additional customer is connected and the cooling in the roof of the pod.

To arrive at an average watts figure, and the consequential increase in watts as modems are added, the following logic has been applied. Subtracting the data load test results from the base load test results and then dividing by the number of modems connected, shows that as each additional customer is connected the energy load increases by an average of circa 1 watt. Note that tests were carried out with 5, 9, 13 & 16 modems connected to get results at 25%, 50%, 75% & 100% energy loads.

The cooling on the card chassis operates constantly and the power used is included in the test results for the pod. However the cooling fans in the roof do not operate until the internal temperature reaches 50^0C. Although the test lab had an ambient temperature of 27.4^0C, the lab technician had to apply a heat gun to the thermostat to force the cooling to switch on. The cooling will therefore only be operational infrequently and at extreme temperature. With the previous application a figure of 13% was applied to the fan load and it seems reasonable to apply the same figure again, giving an average of just over 1 watt.

Charge Code Applications

Using Elexon's usual practice a tab called "For Standard CC" is included, this tab uses the average watts figures to create the four charge code values that are the subject of this application.

As explained previously the Nokia pods will always be installed with 3 line cards installed, so the base load of the pod is used in the sum of watts for the four charge codes applied for. The second element of the sum is the number of customers connected. It is felt that four charge codes will be sufficient to cover the range of potential wattages as with the Huawei pods. There is an element of swings and roundabouts, and it is recognised that it is probable that there will be a slight overstatement of the energy consumed, noting that the increase in energy load per customer is a small percentage of the total load of the pod.

Although these components have been tested at 48V an uplift to include transformer losses would *not* be appropriate as the 48V supply is taken from an existing fibre cabinet that has a charge code which already factors in the power supply and their associated losses.

Inventory

As with the existing Huawei G.Fast pods these new Nokia pods will be added as a new line to the inventory of existing fibre cabinets that Openreach maintains. The detail that is required to allocate the relevant charge code for the pod (out of the four proposed codes) is recorded within the asset data base, i.e. number of customers connected.

Existing Huawei Side Pods

In order to differentiate between the two different G.Fast pods, this application includes a request to amend the existing Charge Code descriptions, the revised descriptions are shown in the Excel workbook.