Document No. **EMB-DLF-GLR-02**

Title: **DISTRIBUTION LOSS FACTOR CALCULATION FOR AMCOR GAWLER GLASS FACTORY**

Document Status

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Distribution Loss Factor Calculation

1 Introduction

Energy Response (ER) is engaged by exempt network operator, Amcor Packaging (Australia) Pty Ltd (APENO) as an intermediary for Amcor's Gawler Glass Factory's embedded generators which are registered as non-scheduled market generators in the National Electricity Market (NEM).

APENO has expanded the glass factory's production capacity by adding a third stage to the existing two stages. The third stage is scheduled for commissioning in February 2010. The three stages are very similar in design and capacity.

This document shows the calculations used by ER to confirm that with all 3 stages in operation, there is minimal change to the site's Distribution Loss Factor (DLF) as compared to the DLF approved for 09/10 financial year.

The underlying DLF calculation methodology used herewith is the same as that used in ER's earlier Distribution Loss Factor Calculation Methodology (Rev 00C) dated 17/2/2009; only the site layout and site parameters have changed hence necessitating a recalculation of the DLF.

This document will form an addendum to ER's earlier document as mentioned above.

1.1 AMCOR GAWLER EXEMPT NETWORK SERVICE

Figure 1 below shows the location of various connection points within the expanded exempt network.

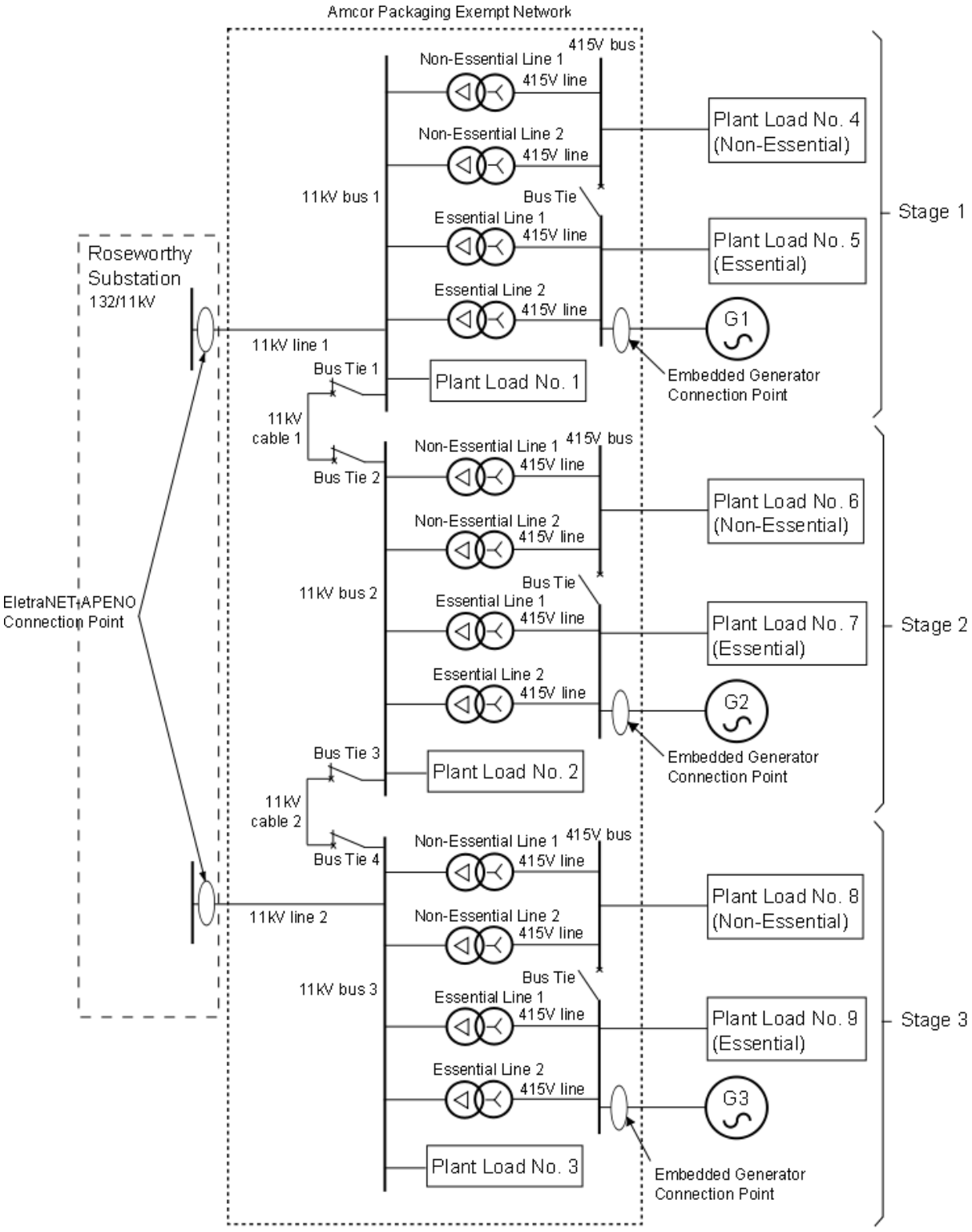

Figure 1 - Simplified representation of the APENO exempt network

1.2 GENERATOR OPERATING STATES

Being a new stage, Amcor Gawler Glass Factory does not yet have a record of the consumption profile for Stage 3. However, it is quite safe to assume the consumption profile to be similar to Stages 1 & 2 since they are similar in design and capacity. Therefore, the average consumption of Stages 1 & 2 would be used as a projected consumption profile for Stage 3. Once Stage 3 is in operation and actual data is available; the DLF calculation shall be revised.

2 Amcor Gawler Generator DLF Calculation

2.1 IDENTIFICATION OF DISTRIBUTION LOSSES

Based on the new layout for APENO's exempt network as shown in Figure 1, the distribution losses were derived as follows:-

2.1.1 11kV Incomer Network (Stage 1, Stage 2 & Stage 3)

The main contributions to losses on the 11kV incomer network have been identified as follows:-

- Copper Losses across the 11kV cables from the Roseworthy substation to the 11kV switchboard
- Copper Losses across the 11kV cables connecting the bus ties between Stages 1, 2 & 3 11kV Main Switchboards
- Copper Losses across the 11kV Main Switchboard Incomer and Bus Tie Circuit Breakers

It has been assumed that negligible losses are developed across the 11kV main switchboard busbars; therefore those losses are ignored.

2.1.2 Essential Line No. 1 & No. 2 (Stage 1, Stage 2 & Stage 3) - 11kV Feeder, 11kV/415V Transformers, 415V Busduct & 415V Incomer

The main contributions to losses on the Essential Lines No. 1 & No. 2 have been identified as follows:-

- Copper Losses across the 11kV Main Switchboard Feeder Circuit Breakers
- Copper Losses across the 11kV cables from the 11kV switchboards to the 11kV/415V transformers

- Copper Losses across the transformer winding
- Iron Losses in the transformer core
- Copper Losses across the 415V Busduct from the transformer to the 415V Essential Switchboard
- Copper Losses across the 415V Essential Switchboard Incomer Circuit Breakers

It has been assumed that negligible losses are developed across the 415V essential switchboard busbars; therefore those losses are not considered.

Attachment 2 lists the technical details obtained from Amcor Packaging (Australia) Pty Ltd.

3 Modelling of Distribution Losses

Based on the sources of losses identified in (2.1), we can calculate the parameters for the equivalent network model of the APENO exempt network as detailed in Attachment 1 and Attachment 2.

The load flow on the 11kV Incomer Network loop can then be calculated using the Superposition Theorem to find the current values across the elements of the network.

Subsequently, the equivalent network as referred to 11kV can be obtained as shown in Figure 2 for load flow with generators stopped; and Figure 3 for load flow with generators running.

(NOTE: Cable, busduct & transformer inductances are not included in the equivalent network because we are only interested in the active power losses of the APENO exempt network.)

[Confidential Network Information Withheld]

4 Calculation of Distribution Loss Factors

We can arrive at the distribution losses without and with generators running as follows:-

[Confidential Network Information Withheld]

4.1 MLF & DLF CALCULATION

We can obtain the MLF for the embedded generator connection points as follows:-

MLF = **1.0057**

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Converting the MLF to DLF:-

DLF = √(1.0057)

= **1.0028**

References

1	Distribution Loss Factor Calculation Methodology for Amcor Gawler Glass Factory (Revision 00C) dated 17/2/09	EMB-DLF-GLR-01

Version Management

Version	Date	Reason For Change	Author	Approved
A	15/01/2010	First draft	TiHaur Tan	
B	20/01/2010	For Release	TiHaur Tan	Paul Troughton

ATTACHMENT 1: Summary of Amcor Gawler Plant Consumption Details for the period 17/12/2008 till 17/12/2008

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ATTACHMENT 2: Amcor Gawler Plant Technical Details

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