Engineering Deliverable Requirements for Electrical Power Asset Design

Module L: AC/DC Traction Power Supply Interfaces

1 Typical AC/DC Traction Power Supply Interface Requirements

Only the appropriate items described in clauses **2** to **4** should be specified in the PRS along with the requirements identified in Module A. Additional requirements may be specified for complex or unusual schemes.

2 AC/DC Traction Power Supply Interfaces Form A

The required items may be incorporated into the associated GRIP 3 option selection report instead of providing standalone deliverables. The level of detail for each item should only be sufficient to satisfy the approval in principle of single option selection.

a) Isolation System.

The principles of operation of the system to provide segregation between the two types of electrification system which share the same return rails.

Isolation may be provided by the use of HV isolating transformers or by created buffer sections which can be exclusively energised by both systems.

Buffer sections must take account of the maximum length of any train traversing the AC/DC interface and if signalling arrangements could cause simultaneous bridging of block joints thus compromising the isolating section.

By pass arrangements may be required to facilitate train operations in the event of failure of equipment e.g. isolation transformers, DC contactors, section insulators, etc.

b) Major Feeding Diagram.

Required to show the arrangements of the isolating mechanism and how it interfaces with the AC and DC electrified systems.

A major feeding diagram produced at GRIP 3 in order to obtain approval in principle of single option selection may require updating at a later GRIP stage to reflect any scheme alterations.

A major feeding diagram commentary will be required to identify any new or modified feeding arrangements shown on the diagram and the rationale for those arrangements.

c) Sectioning Principles.

Include details of switching and the arrangements to confirm segregation between the AC and DC electrification systems. Clearly demonstrate that the proposed feeding arrangements do not give rise to excessive voltages across section insulators.

d) Single Line Diagram.

A single line diagram showing all principal elements associated with an AC/DC interface. It may include controlled switchgear, current and voltage transformers, manually operated isolators. The single line diagram should

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include the interface with the overhead line equipment, traction return bonding and any special interfaces with DC equipment.

e) Interfaces with Third Party Networks.

Details of interfaces with other networks such as London Underground (TFL) should be identified. Effects on signalling systems will need to be considered.

f) Site Layout Drawings.

Special care will be required in the routing of HV, earthing and bonding cables to avoid compromising the method to achieve segregation between the AC and DC systems.

g) Equipment Layout Drawings.

Outline equipment layout drawings are required where significant changes to existing enclosures/buildings are required.

h) TNO/DNO Interface Requirements.

i) Isolating Transformers.

Where isolating transformers are utilised the design should consider inrush currents, noise levels, voltage regulation, DC saturation of the core and repetitive short circuits.

j) Earthing and Bonding Strategy.

The standard arrangements for AC networks will need to be tailored to satisfy the requirements for segregation between the AC and DC systems. The normal earth-free status of DC systems can not be guaranteed and special attention to stray current mitigation measures will also be needed.

k) Stray Current.

Proposals are required to identify and mitigate risks caused by stray traction current.

l) Primary Equipment.

Identification of the type, ratings and configuration of key items of plant and equipment

m) Ancillary Services.

Type and configuration of substation buildings, building services requirements (e.g. heating, lighting and ventilation) and ancillary equipment requirements (e.g. batteries and chargers and low voltage distribution equipment).

3 AC/DC Traction Power Supply Interfaces Form B

a) Site Location Drawing.

To be produced for sites with new or modified infrastructure.

b) Site Layout Drawing.

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