

Standard 110 kV Customer Connection (CC) - Designer's Log

Doc No	Standard 110 kV CC - Designer's Log (Rev3 - Issue).xlsx
Doc Rev	3

ID	Item Topic	Reference	Description
1	Purpose/ Overview	General	<p>The purpose of this document is to identify the key decisions and assumptions for a standard 110 kV single circuit substation design to be used as consenting and conceptual design input for all new Customer Connections to Transpower's 110 kV network.</p> <p>Previous work completed as below: Stage 1 - Consenting and conceptual design for the standard 220 kV single circuit substation</p> <p>Further development is planned as below: Stage 3 - Consenting and conceptual design for the standard 220 kV double circuit substation</p>
2	Demarcation	General	<p>The demarcation between Transpower and the Customer is to be agreed with Transpower on a connection-specific basis.</p> <p>Alternative demarcation points are described below.</p> <p>Grid injection points: 1) 33 kV cable termination on the LV side of the power transformer (as shown on the layouts). Transpower will own the cable termination stand. 2) Conductor support post between the 110 kV ES and the HV bushing of the 110/33 kV power transformer. Transpower will own the conductor support post.</p> <p>Grid exit points: 3) 33 kV cable termination within Customer-owned incomer switchgear panel. Transpower will own the 33 kV incomer cable. 4) 33 kV cable termination within Transpower-owned 33 kV bus. Customer will own 33 kV feeder cables connected to Transpower-owned 33 kV switchgear panel.</p>
3	110 kV Line Entry	General	The 110 kV standard line entry will be developed by Transpower and included in a separate design document.
4	110 kV Gantry Type	General	<p>The 110 kV gantry type is a steel H frame sourced from an overseas supplier - note following:</p> <p>- The provided heights represent an expected worst case height - Project-specific design is required and will be completed in the detailed design stage</p>
5	110 kV H Bus Arrangement	General	<p>The 110 kV H bus arrangement is based on the recently published Standard 110 kV DCB Substation design with drawing reference TP107012/1.</p> <p>The following items are fixed:</p> <ul style="list-style-type: none">- 110 kV line bay switchgear arrangement, except surge arresters (refer below)- 110 kV bus arrangement comprising 2 bus sections, connected via a back-to-back DCB bus section arrangement- 110 kV transformer switchgear arrangement, except quantity of connections (refer below)- 110 kV bay spacing- 110 kV gantry position relative to the 110 kV bus <p>The following items are variable:</p> <ul style="list-style-type: none">- Installation of surge arresters on the line bays (refer item 7)- Quantity of transformer bays. The Customer can choose to install 1 or 2 connections to Transpower <p>Refer also to item 6 for a description of future allowances.</p>
6	110 kV H Bus Arrangement - Future	General	<p>The layout considers the following future equipment:</p> <p>a) 110 kV reactive power support connected to new bay G. The spatial allowance for this has not been considered. b) Bay H for a replacement 110/33 kV power transformer. This is to maintain N-1 security of support during installation of the replacement 110/33 kV transformer.</p> <p>In both cases, the switchyard restricted access area will need to be extended to at least the 15 m future transformer replacement radius distance - refer to TP_INDEX/1 and TP_GENERAL/1 for further details.</p>
7	110 kV Surge Arresters	General	The layout includes 110 kV line surge arresters - these may be omitted if overhead line earth wires extend a minimum of 1 km out from the substation.
8	110 kV Switchgear Arrangement	General	The layout includes space for the 110 kV switchgear arrangement to comprise of a 110 kV bus disconnector, 110 kV circuit breaker, 110 kV CT and 110 kV line disconnector including earth switch(es).
9	Oil Containment	General	<p>The oil containment system as shown is based on one of Transpower's standard solutions and is located in Transpower's preferred position for the case where Transpower own the 110/33 kV power transformers. The final solution will be confirmed by Transpower.</p> <p>Where the customer owns the 110/33 kV power transformers, the location and type of system is to be determined by the Customer.</p>
10	Fire Clearances	General	<p>The fire clearances are based on TP DS 61.06, Issue 6.</p> <p>The following basis has been applied to the layouts based on Table 1 of TP DS 61.06, Issue 6:</p> <p>a) The switchyard security fence is to be placed at the non-combustible building material limit (15 m). The reasons for this approach are:</p> <ul style="list-style-type: none">- To control the type of items that are placed within the non-combustible building material extent- To minimise the risk of fire spread- To maintain the integrity of the switchyard security fence in the event of a transformer fire. <p>b) The extent of the <i>Setback Zone</i> (refer item 15) is the greater of:</p> <ul style="list-style-type: none">- The combustible building material limit for initial and future transformers (30 m)- Allowance for a Transpower access corridor between the 110 KV ES and the barrier fence (refer item 10) <p>The layout sketches also include the <i>Property Boundary</i> limit as per TP DS 61.06 Issue 6, Table 1.</p>
11	Transpower and Customer Barrier Fence	General	<p>Where the Customer owns the 110/33 kV power transformers and installs this adjacent to the Transpower switchyard, a barrier fence will be installed at the demarcation point between Transpower and the Customer.</p> <p>In this case, Transpower's equipment arrangement is modified to include a 7m space between the 110 kV ES and the barrier fence - this is to allow for a 5m vehicle access corridor, bus support posts and maintenance of the 110 kV ES (2m).</p> <p>The purpose of the barrier fence is to prevent inadvertent access to the other party's switchyard where personnel may not have the right competency. The barrier will be the same specification as Transpower's standard security fence but without the possum wire installed.</p>
12	110 kV Connected NER	General	<p>The 110 kV neutral connected NER is required for some sites only.</p> <p>The Customer is to seek clarification from Transpower.</p>
13	Vehicle Access	General	<p>Vehicle access is based on the requirements of TP DS 62.01 Issue 4.1.</p> <p>Where overall site access from the road does not align with the Transpower site access as shown, a 6 m roadway is to be provided to Transpower's access point.</p>
14	Electrical Clearances	General	Electrical clearances are based on the requirements of TP DS 62.01 Issue 4.1.
15	Digital Substation	General	Transpower's switchyard arrangement is based on a process bus solution (digital substation).
16	Setback Zone	General	<p>The basis of the setback zone is:</p> <ol style="list-style-type: none">1) To provide space for future transformer replacement in a new bay with N-1 security maintained during installation.2) To provide space for Transpower to install future 110 kV reactive power support.3) To restrict development to greater than the combustible building material limit of 30 m.4) To provide space for an access corridor between Transpower's 110 kV ES and the barrier fence (for cases where the Customer owns the 110/33 kV power transformer). <p>The <i>Setback Zone</i>, as shown on TP_GENERAL/1 is considered a standard development footprint to meet Transpower's requirements.</p>
17	Lightning Protection	General	The lightning protection design is based on a representative calculation of the required rolling sphere radius to achieve protection using the method given in TP DG 01.01. A rolling sphere radius of 24m has been applied. Project-specific calculation is required and will be completed in the detailed design stage.

Standard 110 kV Customer Connection (CC) - Designer's Log - Revision Log					
Revision	Date	Prepared by	Checked by	Approved by	Description
1	12/03/2024	AU	JB	AB	Initial draft for Transpower comments
2	1/05/2024	AB	JB	AB	Added lightning protection basis (item 17)
3	26/09/2024	MT (TP)	AB	AB	Revised oil containment statement (item 9)