

Policy Statement on Options for Connecting Customers to the Transmission Network	
Pol_St_18	Applicable to: Ireland
Policy Owner: TSO	Category: Connection Methods
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Background & Introduction

The conventional desktop Connection Method Options (CMO) assessment performed by the Transmission System Operator (TSO) considers four different CMOs as presented below:

**Option 1: New looped-in transmission substation –**

New transmission substation connecting into an existing or planned transmission circuit. The looped-in transmission substation option consists of a 4-bay C-type substation directly adjacent to the customer HV compound.

*Note:* The customer HV compound and the new Transmission substation HV compound have a shared boundary comprising of a high security palisade fence.

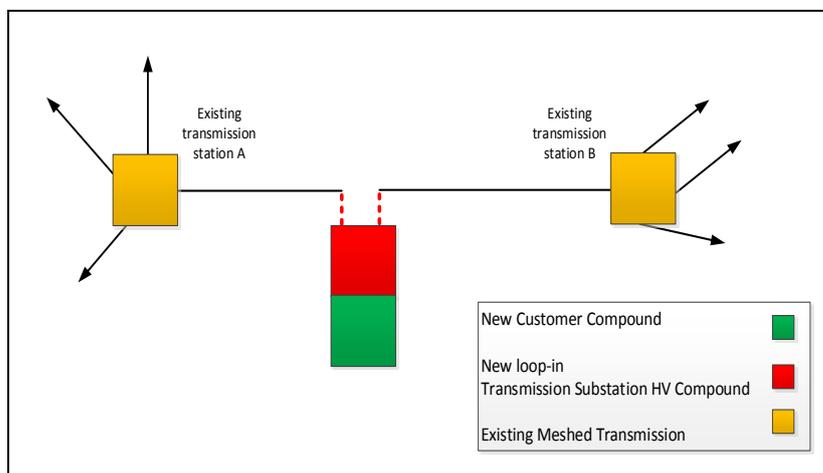


Figure 1. Diagram showing a new transmission substation looping into an existing or planned transmission circuit.

## **Option 2: New tail fed transmission substation**

New transmission substation connecting to an existing transmission substation via a radial circuit. The new tail fed transmission substation consists (at a minimum) of a single bay substation directly adjacent to the customer HV compound.

*Note:* The customer HV compound and the new Transmission substation HV compound have a shared boundary comprising of a high security palisade fence.

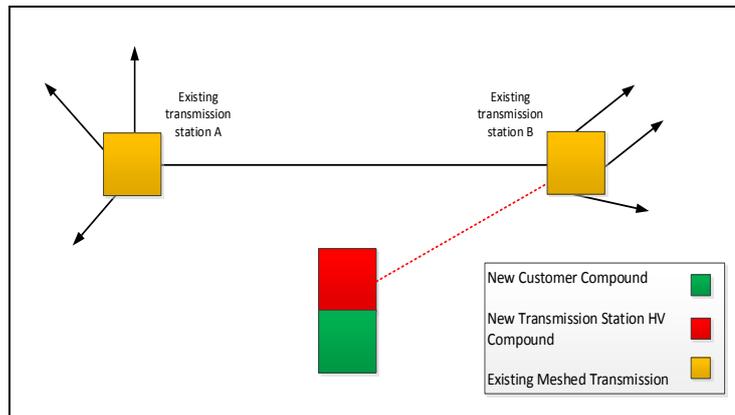


Figure 2. Diagram showing a new transmission substation tail fed from an existing transmission substation.

## **Option 3: New tail to looped-in transmission substation**

New transmission substation connecting via a radial circuit to a new looped-in transmission substation which is connecting into an existing or planned transmission circuit. Option 3 is a combination of Option 1 and Option 2 and is applicable when the CMO assessment determines that the existing transmission circuit and the existing transmission substations are located so far away from the proposed new tail fed substation that Option 3 would be more cost effective than either Option 1 or Option 2 on their own.

*Note:* The customer HV compound and the new Transmission substation HV compound have a shared boundary comprising of a high security palisade fence.

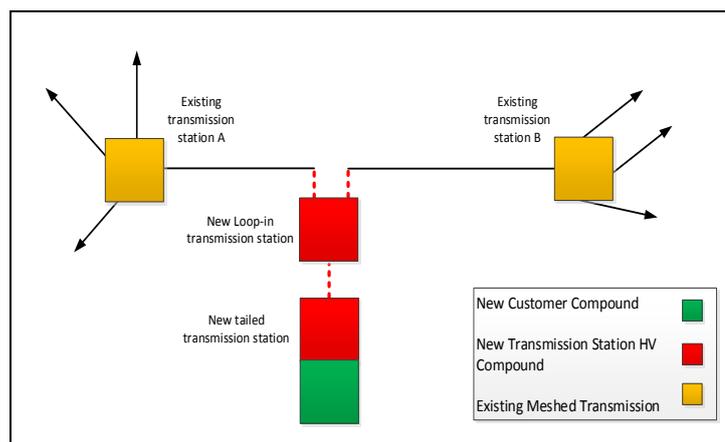


Figure 3. New transmission substation tail fed from a new transmission substation, which is looping in to an existing transmission circuit.

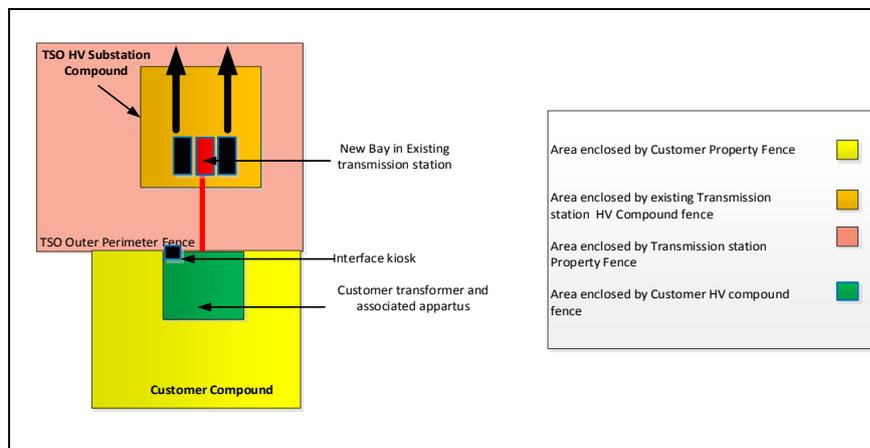
## Option 4: Connection into existing substation

This is applicable where a customer’s proposed facility is directly adjacent to an existing transmission substation.

In this option, unlike in the case of Options 1, 2 and 3 a new transmission substation is not required.

The method of connection is a direct connection into a bay in an existing transmission substation.

The extent of the HV plant required on the customer’s side is dependent on the customer’s arrangement and outlined further in the policy section below.



**Figure 4. High-level layout outlining the connection method into existing substation**

Definitions of the different terminology	Over the Fence (OTF)/Under the Fence (UTF) connection	<p>A customer connection established using an overhead line (OHL) or underground cable (UGC) connecting between a HV bay in the transmission substation and the Connection Point which is located in the customer’s compound.</p> <p>The connection shall pass over or under the customer’s HV compound fence which shall be located <u>directly adjacent</u> to:</p> <ul style="list-style-type: none"> <li>(i) The new transmission substation HV compound fence in the case of Options 1,2 &amp; 3 and</li> <li>(ii) The existing transmission substation outer perimeter boundary fence in the case of Option 4.</li> </ul> <p>The standard OTF/UTF connection requires that the Connection Point shall align with the associated customer bay in the transmission substation HV compound such that there is a relatively direct or straight route between the two.</p>
	Connection Point	The physical point where the Customer’s plant, apparatus or system is joined to the transmission system.
	Transmission Asset Owner (TAO)	The ESB, acting in its capacity as the Transmission System Owner.

## EirGrid Group Policies

Looped-in transmission substation connection	A connection to a new transmission substation which is achieved by connecting into, or looping into, an existing transmission circuit. The new looped-in transmission substation typically consists of a 4-bay C-type transmission substation.
Tail fed transmission substation connection	A connection to a new transmission substation via a radial circuit from an existing transmission substation. The new tail fed transmission substation consists (at a minimum) of a single bay transmission substation.
Tailed to looped-in transmission substation connection	A connection to a new transmission substation that is itself tailed from a new looped-in transmission substation. This option consists (at a minimum) of a new single bay transmission substation (the tailed station) and a new 4-bay C-type transmission substation (the looped-in station).
Customer HV Compound	The secure compound enclosed within a high security fence in which is located the Customer's HV and MV apparatus and all required points of isolation.
Transmission substation HV compound	The secure compound, typically enclosed by 2.6 metre tall palisade fence, within which is located the TAO's HV substation equipment.
Third party land	Land that is <u>not</u> owned by the TAO or by the customer. Third party land includes lands in public ownership such as public roads etc. It also includes land owned by ESB sub companies (e.g. ESB Generation & Trading) other than the TAO.
Transmission substation outer perimeter boundary fence	The fence (typically a non-metallic post and rail fence), hedge or ditch that demarcates the area of land owned by the TAO and within which a Transmission Substation HV Compound is located.
Existing Substation	Transmission substation that is already built (brown field) or is planned such that the substation outer perimeter boundary fence is already defined.

Policy

New customer connections to the transmission network

This policy applies to all new transmission connections including those that use Option 4 which entails connecting into existing transmission substations (brown field sites) and those that use Options 1, 2 or 3 which entail connecting into new transmission substations (green field sites).

However its primary focus is to identify when it is appropriate to use Option 4.

The following applies to all options –

A customer owned HV disconnector with earth switch shall be installed in the customer’s HV compound as illustrated below in Figure 5.

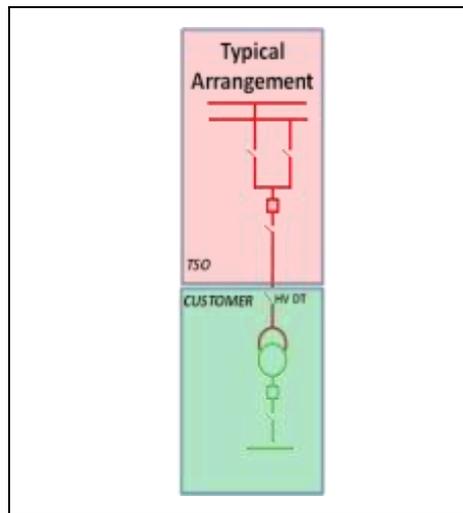


Figure 5. High-level SLD for a customer connection showing a typical arrangement

In addition if the customer proposes to –

Description	Single Line Diagram
<p>Install a transformer with two or more secondary windings then:</p> <ul style="list-style-type: none"> <li>The customer shall install a customer owned HV circuit breaker and customer owned HV disconnector between the connection point and the customer owned transformer as illustrated.</li> </ul>	<p>Figure 6. High-level SLD showing the connection method for multiple secondary winding transformer</p>

Connect two or more transformers to a single connection point then:

- The customer shall install a customer owned HV circuit breaker and customer owned HV disconnectors between the connection point and the customer owned busbar as illustrated.
- In addition the customer shall install a customer owned HV circuit breaker with HV disconnector for each customer transformer.

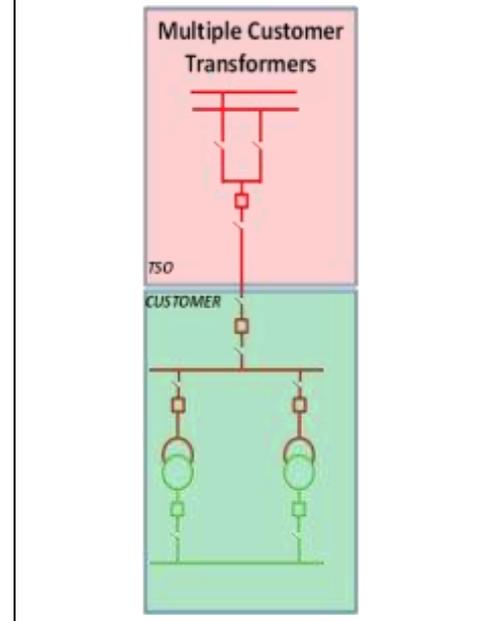


Figure 7. High-level SLD showing the connection method for multiple customer transformers

Connect two or more HV circuits or items of HV equipment to a single connection point then:

- The customer shall install a customer owned HV circuit breaker and customer owned HV disconnectors between the connection point and the customer owned busbar as illustrated.
- In addition the customer shall install a customer own HV circuit breaker with HV disconnector for each connected circuit/item of HV plant.

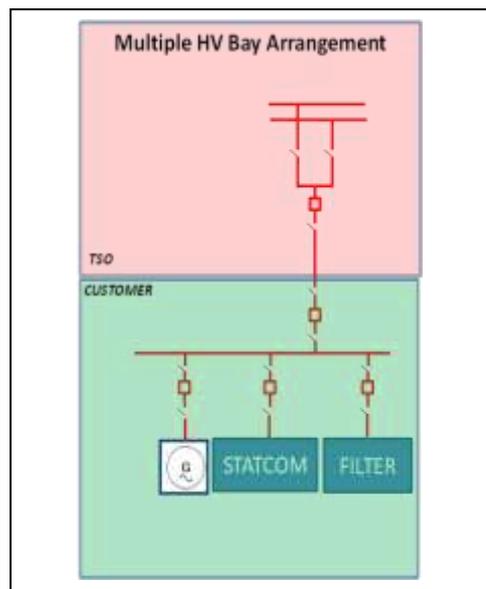


Figure 8. High-level SLD showing the connection method for multiple HV customer circuits

Option 4 is only permitted when the customer’s HV compound fence is located directly adjacent to the existing transmission station outer perimeter boundary fence (so a shared boundary as shown in Figure 4). Note that the customer’s connection point shall align with the customer bay in the transmission substation such that the connection passes relatively straight over or under the compound fence as outlined in the definition of ‘Over the Fence (OTF)/Under the Fence (UTF) connection’ above.

Where a new connection does not adhere to all of the principles and criteria that apply to Option 4 as described below then at a minimum a new single bay tail fed transmission substation (Option 2) shall be required. All applications seeking an Option 4 type connection (a connection into an existing transmission substation) shall be assessed on a case-by-case basis in consultation with the TAO.

The following shall apply for connections using Option 4. Most of the criteria described below apply equally to Options 1, 2 and 3. Where a statement is applicable to Option 4 only it is shown in **bold font**.

**Location of customer HV compound and HV Circuit route design**

- **The main principle at the outset is that the customer HV compound shall be directly adjacent to the existing transmission substation outer perimeter boundary fence, i.e., a shared boundary such that the connection does not pass through, over or under third party land.**
- The customer’s connection point shall align with the customer bay in the Transmission substation such that the connection passes relatively straight over or under the compound fence without causing:
  - o Any obstruction to the future expansion of the transmission substation or future development of transmission circuits,
  - o Sterilisation of transmission bays or undeveloped transmission and or distribution assets,
  - o Limitations or deratings of existing or planned transmission or distribution circuits.
- **When the existing transmission station in question is located within a customer owned campus/facility such as that of a large data centre or power station then the following shall apply -**
  - o **If the applicant for the connection is the owner of the campus / facility then an Option 4 type connection should be possible however it will require some bespoke arrangements and guarantees.**
  - o **If the applicant for the connection is not the owner of the campus / facility then an Option 4 type connection will not be possible because the connection would then by definition have to pass through third party land.**

**Interface kiosk location and LV cable route**

- **The Customer HV compound fence and the transmission substation outer perimeter boundary fence shall abut such that they form a common or shared boundary.**
- The TAO/Customer Interface Kiosk shall be located on the shared boundary. It shall be built into the fence such that the customer will be able to access its contents from their side of the fence while the TAO will be able to access it from the TAO side. This will negate the requirement for any agreements between the TAO and the customer for access to the other parties’ property.
- **Provision of suitable security and safety (incl. earthing) features both sides of the interface kiosk shall be designed on a case-by case basis.**
- The location of the customer’s control building should be sufficiently close to the customer bay in the transmission substation such that the length of the LV control and protection cables does not exceed 250 m. This is in order to reduce risk to or limitations for the safe and proper operation of the protection scheme. The customer shall provide studies showing that the control and protection cables are suitable for the protection scheme (CT Burden, LV Cabling Voltage drop and LV trench security).

**Earthing requirements**

- The transmission substation HV compound and customer HV compound shall form an equipotential zone, i.e., both compounds’ earth grids shall interconnect and any necessary mitigation measures identified in the customer’s or the TAO’s earthing studies shall be implemented. Note: The transmission substation’s earth grid shall not be reliant on the customer earth grid to be effective, as there is no guarantee that the customer’s installation will not be removed in the future.
  - o It is the customer’s responsibility to conduct earthing studies to comply with the EirGrid Earthing and Lightning Protection Functional Specification (XDS-GFS-12-001) and to

- implement any mitigation measures on the customer property as a result of the connection.
- **The TAO shall also conduct an assessment of the likely earthing related impact and potential mitigation measures required in the existing transmission substation as a result of the new connection. Examples of this could include extension of the earthgrid and the installation of crushed rock between the compound fence and the outer perimeter property fence. Further requirements relating to substation earthing is available in the EirGrid Earthing and Lightning Protection Functional Specification (XDS-GFS-12-001).**
- The transmission station and the adjacent customer HV compound will have a shared or common earth grid. The earth grid in the TAO's transmission station shall not be connected to any remote earths. It follows therefore that the customer's HV compound cannot be connected to a remote earth. This means that the earthing for any downstream parts of the customer's network that are electrically connected to the customer's HV compound but are considered to be remote will need to be isolated from the transmission HV compound earth grid. The requirement for this will be determined by the Customer as part of the earthing study which is subject to approval by the TSO and TAO.
  - The customer's earthing system shall be designed and tested to demonstrate safe step and touch potential levels under all conditions and all necessary mitigations are considered and carried out as necessary.
  - The testing of the customer's earth grid in practice typically requires the use of a part of the existing transmission network and in that circumstance can only be carried out by and in conjunction with the TAO.
  - Further requirements are available in the EirGrid Earthing and Lightning Protection Functional Specification (XDS-GFS-12-001).

### **Customer HV compound**

All of the customer's equipment associated with the transmission system connection, such as control and protection equipment, power transformer and associated HV and MV switchgear and LV interface shall be located within the customer HV compound. No part of the MV/LV interface arrangements (associated with the transmission substation) are to extend beyond the customer HV transformer compound.

- Further guidance on customer interface isolation and interlocking requirements can be found in the EirGrid 110/220/400 kV Control, Protection and Metering Functional Specification (XDS-GFS-06-001). Note where relevant the MV switchgear shall meet ESB requirements for isolation of plant/telemessing.
- The customer's HV compound shall be considered to be a substation in its own right and allocated a unique name different from that of the adjacent transmission substation, further details of which will form part of the project specific SLDs.
- The connection point shall be located in the customer's HV compound. This means that no equipment that is owned by the customer shall be located in the transmission station however out of necessity some equipment that is owned by the TAO will be located in the customer's HV compound. The extent of the TAO owned equipment in the customer's HV compound shall be kept to a minimum and the connection point shall be located accordingly.
- The connection point shall be formed by a bolted connector on the terminal of an item of AIS equipment such as a cable sealing end, post insulator, surge arrester or disconnector. Connection points are not permitted inside cable boxes or on HV AIS bushings located on customer owned transformers or on metal enclosed switchgear.
- In the case of under the fence connections the underground cable and the associated cable sealing end in the customer HV compound shall be owned by the TAO. The connection point shall be the bolted connector on the terminal stud of the cable sealing end. Surge arrestors shall be installed

	<p>close to the cable sealing end in the customer HV compound. These shall also be owned by the TAO as their prime purpose is to protect the TAO's asset.</p> <ul style="list-style-type: none"> <li>- A lightning protection study is required to ensure that new substation equipment is sufficiently shielded.</li> </ul> <p><b><u>ESB Telecoms and EirGrid Telecoms Assets</u></b></p> <ul style="list-style-type: none"> <li>- ESB telecoms infrastructure and EirGrid telecoms infrastructure (RTUs and Meters) shall be installed in the control room in the transmission substation. If sub-metering is required for the customer's connection the meters will be located in the control room in the transmission substation.</li> </ul>					
Application (Who this policy applies to and from when)	<p>This policy applies to applications from Generators, Demand Customers and Autoproducers for connection to the transmission system with the exception (for now) of applications in respect of offshore windfarm developments.</p> <p>It does not apply to applications for the connection of HVDC interconnectors.</p> <p><b>Pre – Connection Offer Stage:</b></p> <p>This policy is applicable from its date of approval to all new applications for connection to the transmission system.</p> <p><b>Connection Offers in process:</b></p> <p>Customers who on the date of approval of this policy had already received a connection offer but had yet to execute the connection agreement should engage with EirGrid to determine if the offer can be amended to bring the connection into line in full or in part with the policy.</p> <p><b>Post – Connection Agreement Execution Stage:</b></p> <p>The policy is not applied retrospectively.</p>					
Derogation	<p>Derogation requests from this policy will be by exception and will follow the derogation policy.</p> <p>Any application seeking a connection into an existing transmission substation shall be assessed in line with this policy and any exception shall be assessed on a case-by-case basis and in consultation with the TAO.</p>					
Revision History	<b>Version</b>	<b>Date</b>	<b>Summary of Changes/ Reasons</b>	<b>Authors</b>	<b>Approved By</b>	
	v1.0	November 2021	New Policy	Conor Farrell, Ray Doyle, Aidan Geoghegan	Transmission Investment Committee	