

## **DCP 406A - ACCESS SCR: CHANGES TO CCCM**

### **OPTION 4 – *longer definition of Generation Connection plus additional Exception***

#### **LEGAL TEXT**

**Amend Part B of Schedule 22 (as introduced by DCP406 Alternative Solution) as follows:**

**[NB: the redline in the remainder of this text shows the changes against DCP406 Alternative Solution.]**

#### **PART B: Applications Received On or After 1 April 2023**

##### **Section 1 – Common Connection Charging Methodology**

This Section sets out the Common Connection Charging Methodology that is implemented to ensure a consistent approach in the way your Connection Charge is calculated.

This Section applies to all connection applications that are received on or after 1 April 2023.

##### **Minimum Scheme**

1.1 The Minimum Scheme is the Scheme with the lowest overall capital cost (as estimated by us), solely to provide the Required Capacity. The Minimum Scheme will be subject to:

- accepted industry standards, including the requirements of the Distribution Code;
- the status and configuration of the Relevant Section of Network (RSN);
- the standard sizes and types of equipment currently used by us on our Distribution System which shall be reasonable in all the circumstances;
- maintaining our ability to minimise regulatory penalties associated with the Interruptions Incentive Scheme and the Guaranteed Standards of Performance; and
- where the Customer is an LDNO, maintaining the Customer's ability to minimise regulatory penalties associated with the Guaranteed Standards of Performance.

and shall be consistent with our statutory and licence obligations including the requirement to develop, maintain and operate an efficient, co-ordinated and economical electricity Distribution System.

- 1.2 We will make available our design policies and standards as appropriate.
- 1.3 Subject to paragraphs 1.4 and 1.7 below, we will calculate the Connection Charge based on the estimated costs of the Minimum Scheme.
- 1.4 In certain circumstances we may decide to design an Enhanced Scheme. This will include one or more of the following:
  - additional assets not required as part of the Minimum Scheme;
  - assets of a larger capacity than required by the Minimum Scheme;
  - assets of a different specification than required by the Minimum Scheme.
- 1.5 If we decide to design an Enhanced Scheme, the Connection Charge that will apply will be the lower of the Connection Charge associated with the Minimum Scheme and the Connection Charge associated with the Enhanced Scheme.
- 1.6 The Connection Charge associated with the Enhanced Scheme will be calculated subject to the exclusion of costs of any additional assets not necessary for the provision of your connection.
- 1.7 We may recover the reasonable costs incurred, both direct and indirect, in providing a connection and may, where allowed by our Licence, apply a margin on some of those costs. The factors taken into account by us to calculate the Connection Charge will include, but are not limited to:
  - industry standards governing the Distribution System;
  - the Required Capacity;
  - available capacity of the existing Distribution System;
  - whether any necessary extension or Reinforcement of the existing Distribution System is by underground cable or overhead lines;

- whether any diversionary work is required as a result of the development and the required disconnection of any assets;
- the length of cable or line required;
- type of ground requiring excavation, the type and extent of reinstatement necessary (including New Roads and Street Works Act requirements and any other relevant legislation), and the need for road, bridge crossings etc;
- any Electrical Plant and civil costs required, allowing for any civil works undertaken by you with our agreement;
- the cost of installing communication equipment;
- the costs of installing system management equipment;
- the requirement to work outside of normal working hours;
- the costs of undertaking the design;
- the costs of securing wayleaves/easements for plant, cables or lines including any consents;
- the costs of securing suitable substation sites including any necessary Land Rights;
- any overhead line surveys required;
- the costs of public enquiries and environmental impact studies;
- charges for any other costs associated with the work on Sites of Special Scientific Interest (SSSI), railway lines etc; and
- any variations in respect of the actual costs that were reasonably incurred as specified in the Connection Offer.

### **Cost Allocation**

1.8 The costs to be charged to you as a Connection Charge may be split into three categories:

- Costs for providing the connection which are to be paid in full by you (see paragraphs 1.10 to 1.16);

- Costs for providing the connection which are to be apportioned between you and us (see paragraphs 1.2~~87~~<sup>32</sup> to 1.3~~32~~<sup>34</sup>); and
- Costs to be paid by you in respect of works that have previously been constructed or are committed and are used to provide the connection (see paragraph 1.3~~34~~<sup>34</sup>).

1.9 Some costs may be borne in full by us and will not be included in your Connection Charge (see paragraphs 1.3~~54~~<sup>54</sup> to 1.3~~98~~<sup>98</sup>).

### **Costs to be paid in full by you**

1.10 The costs of providing Extension Assets are charged in full to you.

1.11 Where you have requirements for additional security or the characteristics of your load requires us to install assets in excess of the Minimum Scheme then you will pay the costs in excess of the Minimum Scheme in full. Where you have requested a three-phase connection and/or a supply voltage that is not necessary to meet the Required Capacity, and the local Distribution System is not of the requested number of phases and/or voltage, then you will pay in full the cost of Reinforcement of the Distribution System to your specified number of phases and/or voltage.

1.12 The costs of the future operation and maintenance of any additional assets requested by you (over and above those associated with the Minimum Scheme) will be payable in full. This would normally be levied as a one-off charge representing the net present value of the future operation and maintenance costs and calculated as a percentage (specified in Section [6]) of the additional capital cost of the Scheme. See Example 3 for an illustration of where you request additional security.

1.13 Work required to reconfigure the Distribution System to meet your requirements where no additional Network or Fault Level Capacity is made available shall be charged in full to you. See Example 20.

1.14 Where the Extension Assets would normally require the extension of existing switchgear equipment and this is not possible, the cost of the full replacement of the switchgear (using the nearest standard size) will be charged to you, provided that there is no Reinforcement of the Distribution System (see paragraph 1.24).

1.15 If your development is considered to be speculative then the Reinforcement costs will be charged to you in full (see paragraphs 1.478 to 1.5049).

1.16 Reinforcement costs for the Minimum Scheme in excess of the High-Cost Project Threshold, shall be charged to you in full as a Connection Charge. The calculation of this charge will include all costs for Reinforcement carried out at the same Voltage Level and one Voltage Level above the Point of Connection to the existing Distribution System. For Generation Connections the threshold is £200/kW; for Demand Connections the threshold is £1,720/kVA. Reinforcement costs below the High-Cost Project Threshold will follow the methodology outlined under paragraphs 1.17 to 1.276. The table below illustrates the application of the High-Cost Project Threshold.

### England and Wales

	Voltage at the POC			
Voltage of Scheme Assets	LV (at or below 1000V)	HV (above 1kV but not more than 22kV)	EHV (above 22kV but not more than 72kV)	132kV
132kV Network	Excluded from assessment <sup>1</sup>	Excluded from assessment <sup>1</sup>	Included in assessment	Included in assessment
132kV/ EHV Substation	Excluded from assessment <sup>2</sup>	EHV CBs only included in assessment	Included in assessment	Not applicable
EHV Network	Excluded from assessment <sup>1</sup>	Included in assessment	Included in assessment	
132kV/ HV Substation	HV CBs only included in assessment	Included in assessment	Not applicable	
EHV/HV Substation	HV CBs only included in assessment	Included in assessment		
EHV/LV substation	Included in assessment	Not applicable	Not applicable	

<b>HV Network</b>	Included in assessment	Included in assessment		
<b>HV/ LV Substation</b>	Included in assessment	<b>Not applicable</b>		
<b>LV Network</b>	Included in assessment			

<sup>1</sup> Except where there is direct transformation from 132kV to HV or EHV to LV when the higher voltage costs are included.

<sup>2</sup> Except where there is direct transformation from 132kV to HV or EHV to LV when the higher voltage circuit breaker costs are included.

NB: The above table may not accommodate every possible set of circumstances, where this is the case, the Voltage Level (as defined in the Glossary) shall be applied.

### Scotland

	Voltage at the POC		
Voltage of Scheme Assets	LV (at or below 1000V)	HV (above 1kV but not more than 22kV)	EHV (above 22kV but not more than 72kV)
EHV Network	Excluded from assessment <sup>1</sup>	Included in assessment	Included in assessment
EHV/HV Substation	HV CBs only included in assessment	Included in assessment	Not applicable
EHV/LV substation	Included in assessment	Not applicable	
HV Network	Included in assessment	Included in assessment	
HV/ LV Substation	Included in assessment	Not applicable	
LV Network	Included in assessment		

<sup>1</sup> Except where there is direct transformation from EHV to LV when the higher voltage costs are included.

NB: The above table may not accommodate every possible set of circumstances, where this is the case, the Voltage Level (as defined in the Glossary) shall be applied.

## **Costs of Reinforcement**

- 1.17 Reinforcement is defined as assets installed that add capacity (network or fault level) to the existing shared use Distribution System.
- 1.18 For Generation Connections, where the Reinforcement is at the same Voltage Level of the voltage at the POC to the existing Distribution System, then the costs of Reinforcement shall be apportioned between you and us, unless other exceptions apply which take precedence. The methods used to apportion the costs of Reinforcement are set out in paragraphs 1.2~~87~~<sup>87</sup> – 1.3~~32~~<sup>32</sup>.
- 1.19 For Demand Connections, the costs of Reinforcement will be paid in full by us, unless other exceptions apply which take precedence.
- 1.20 Where one of the exceptions set out in paragraphs 1.21 to 1.2~~65~~<sup>65</sup> applies, Reinforcement will be treated as Extension Assets and the costs of the Reinforcement will not be apportioned or paid in full by us. The application of the exceptions is demonstrated in the Examples.
- 1.21 Exception 1: Where the Reinforcement is:
- down stream of the POC; and
  - over and above the Minimum Scheme; and
  - provided at our request; and
  - provided by connecting two points on the existing Distribution System;~~and,~~
  - ~~there is little or no prospect of the capacity created being required within the next five years,~~
- then the apportionment rules will not apply. You will pay the costs associated with the Minimum Scheme and we will pay the costs over and above the Minimum Scheme. See Example ~~45~~<sup>45</sup>.
- 1.22 Exception 2: Where the Reinforcement is in excess of the Minimum Scheme and is at your request, the Reinforcement will be treated as Extension Assets and the

apportionment rules will not apply. The costs in excess of the Minimum Scheme will be borne in full by you (see paragraphs 1.11 and 1.12 above).

1.23 Exception 3: Where the Reinforcement is provided to accommodate a Temporary Connection the Reinforcement will be treated as Extension Assets and the apportionment rules will not apply. Consequently, in such circumstances, you will pay in full the costs associated with the Temporary Connection. Temporary Connections are defined as connections that are only required for a period of up to five years, but exclude connections to provide the initial connection to a development, where the Reinforcement will subsequently be required for the permanent connection.

1.24 Exception 4: Where the replacement of switchgear results in an increase in fault level capacity and:

- that increase is solely as a result of the fault level rating of the standard switchgear equipment used by us being higher than that of the existing switchgear; and
- that increase in fault level capacity is not needed to accommodate your connection.

then, unless the switchgear adds network capacity and the Security CAF applies, the switchgear replacement will be treated as Extension Assets and the apportionment rules will not apply. Consequently, in such circumstances, you will pay the full cost of the switchgear replacement. See Example 156.

1.25 Exception 5: Where the Minimum Scheme requires Reinforcement that is provided by connecting two points on the existing Distribution System to provide connectivity to your Premises, then the lowest cost feeder shall be treated as an Extension Asset and all other feeders required to connect your Premises shall be treated as Reinforcement. See Example 17.

1.251.26 Exception 56: Where the Reinforcement:

- is provided by connecting two points on the existing Distribution System; and
- is providing connection to a development with a number of Entry/ Exit Points,

then the additional network length (measured from suitable points close to the site boundaries which would allow for a clear demarcation of Contestable and Non-Contestable Work) required to provide connectivity within the development will be



considered to be Extension Assets and the apportionment rules will not apply. Consequently, in such circumstances, you will pay the full cost of the additional network length. See Example 18.

[1.261.27](#) For avoidance of doubt, where the costs of Reinforcement are borne in full by you and any capacity created is used to accommodate new or increased connections within the ECCR Prescribed Period, the ECCR will apply (see paragraphs 1.4[43](#) – 1.4[76](#)).

### **Costs to be apportioned between you and us**

[1.271.28](#) The costs of Reinforcement will be apportioned using one of two Cost Apportionment Factors (CAFs), dependent upon which factor is driving the requirement for Reinforcement:

- The ‘Security CAF’; and
- The ‘Fault Level CAF’.

[1.281.29](#) The following definitions are used in the application of the CAFs.

<b>Existing Capacity</b>	<p>For existing Customers their Existing Capacity will be either:</p> <p>(a) the Maximum Capacity used in the calculation of their use of system charges; or</p> <p>(b) for Customers who are not charged for use of system on the basis of their Maximum Capacity the lower of:</p> <ul style="list-style-type: none"> <li>• No. of phases x nominal phase-neutral voltage (kV) x fuse rating (A); and</li> <li>• The rating of the service equipment.</li> </ul>
<b>Fault Level Contribution from Connection</b>	<p>is the assessment of the Fault Level contribution from the equipment to be connected taking account of its impact at the appropriate point on the Distribution System. Where an existing Customer requests a change to a connection</p>

	then the “Fault Level Contribution from Connection” is defined as the incremental increase in Fault Level caused by the Customer.
<b>New Fault Level Capacity</b>	is the Fault Level rating, following Reinforcement, of the equipment installed after taking account of any restrictions imposed by the local network Fault Level capacity. For the avoidance of doubt this rule will be used for all equipment types and voltages.
<b>New Network Capacity</b>	<p>is either the secure or non-secure capacity of the Relevant Section of Network (RSN) following Reinforcement. Whether secure or non-secure capacity is applicable depends upon the type of capacity that can be provided from the RSN. For example, if the capacity provided to the Customer by the RSN is secure, but the capacity requested by the Customer at the point of connection is non-secure, the secure capacity will be used. See Example 24.</p> <p>The capacity to be used will be based on our assessment of the thermal ratings, voltage change and upstream restrictions and compliance with our relevant design, planning and security of supply policies. The equipment ratings to be used are the appropriate operational rating at the time of the most onerous operational conditions taking account of seasonal ratings and demand.</p>
<b>Relevant Section of Network (RSN)</b>	<p>is that part or parts of the Distribution System which require(s) Reinforcement. Normally this will comprise:</p> <ul style="list-style-type: none"> <li>the existing assets, at the Voltage Level that is being reinforced, that would have been used to supply you (so far as they have not been replaced) had sufficient capacity been available to connect you without Reinforcement; and/or</li> </ul>

	<ul style="list-style-type: none"> <li>the new assets, at the same Voltage Level, that are to be provided by way of Reinforcement.</li> </ul> <p>Where it is unclear what assets would have supplied the Customer in the event that sufficient capacity had been available, the existing individual assets with the closest rating to the new assets will be used.</p> <p>There may be more than one RSN (e.g. at different Voltage Levels).</p>
<b>Required Capacity</b>	<p>is the Maximum Capacity agreed with the Customer. In the case of multiple connections (e.g. a housing development) it may be adjusted after consideration of the effects of diversity. Where an existing Customer requests an increase in capacity then it is the increase above their Existing Capacity.</p>

[1.291.30](#) The ‘Security CAF’ is applied, where the costs are driven by either thermal capacity or voltage (or both) as assessed against the relevant standard. This rule determines the proportion of the Reinforcement costs that should be paid by you as detailed below.

$$\text{Security CAF} = \frac{\text{Required Capacity}}{\text{New Network Capacity}} \times 100\% \quad (\text{max } 100\%)$$

[1.301.31](#) The ‘Fault Level CAF’ is applied, where the costs are driven by Fault Level restrictions. This rule determines the proportion of the Reinforcement costs that should be paid by you as detailed below.

$$\text{Fault Level CAF} = 3 \times \frac{\text{Fault Level Contribution from Connection}}{\text{New Fault Level Capacity}} \times 100\% \quad (\text{max } 100\%)$$

[1.311.32](#) For clarity, where you require an augmentation to an existing connection, both the Security and Fault Level CAFs will be based on the increase in Required Capacity and increase in Fault Level Contribution from the connection respectively. Any related increases within the previous three year period will be taken into account in determining

the increase in the Required Capacity or increase in the Fault Level Contribution from the connection to be applied within the CAF.

~~1.32~~1.33 On some Schemes there may be interaction between the two rules. In such cases, the ‘Security’ CAF will be applied to costs that are driven by the security requirement. The ‘Fault Level CAF’ will be applied to costs that are driven by Fault Level requirements. See the Examples for illustrations on the application of the CAFs.

### **Recovery of costs for previous works**

~~1.33~~1.34 Where, in order to provide your connection;

- we propose to utilise existing Distribution System assets that were previously installed to provide a connection to another customer, and
- the other customer has paid us (either in part or in full) a Connection Charge for those assets or paid an ICP for those assets which were adopted by us,

you may be required to make a payment towards them. The ECCR prescribes the circumstances where such payment is required. Charges for such works only apply where the new connection is provided within the ECCR Prescribed Period.

### **Costs to be paid in full by us**

~~1.34~~1.35 For Demand Connections we will fully fund all Reinforcement. For Generation Connections, we will fully fund Reinforcement carried out at a Voltage Level higher than the Voltage Level at the POC to the existing Distribution System. However, there are exceptions to these two approaches, as set out elsewhere in this methodology.

~~1.35~~1.36 We will fully fund Reinforcement carried out to allow the installation of all equipment at an existing Premises which remain connected via an existing low-voltage single, two or three phase service fused at 100 amperes or less per phase which is metered with whole-current metering; provided that (to the extent relevant):

- the Reinforcement is carried out to allow the installation of equipment as part of a single application for a single or multiple installations;

- any and all electricity generation equipment installed has a rated output not greater than 16 amperes per phase (or not greater than 16 amperes per phase at any single Premises if a single application for multiple installations);
- any and all equipment installed which does not constitute a modification to the existing service conforms with the technical requirements of the following standards (notwithstanding that the equipment may have an input current that is more than 16 amperes per phase):
  - BS EN 61000-3-2 Electromagnetic compatibility (EMC). Limits. Limits for harmonic current emissions (equipment input current  $\leq 16$  A per phase); and
  - BS EN 61000-3-3 Electromagnetic compatibility (EMC). Limits. Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current  $\leq 16$  A per phase and not subject to conditional connection.

~~1.36~~1.37 Where it is necessary to modify a low-voltage single phase looped service for an existing Premises, this shall be considered to have remained connected under paragraph 1.36~~5~~ above.

~~1.37~~1.38 Where another LDNO with a distribution network that is connected to our Distribution System requires an increase in capacity to its distribution network, the voltage at the POC for assessing the Voltage Level will be:

- in the case of a new extension to the network of the other LDNO, the voltage of connection at which the Extension Assets will connect to the other LDNO's network; or
- in the case of additional capacity required in respect of a customer connected to the existing assets of the LDNO, the voltage at which the customer connects to the LDNO's network; or
- in the case of additional capacity required to meet general load growth on the LDNO's network then the Reinforcement costs will be borne by us. The LDNO will be required to provide justification in such circumstances.

[4.381.39](#) The tables below illustrate the application of the voltage rules in relation to Reinforcement for Demand Connections and Generation Connections. For Generation Connections, you will be required to contribute towards the cost of any Reinforcement provided at the Voltage Level of the POC, up to and including the cost of circuit breakers provided at that voltage.

### England and Wales

<b>Demand Connections</b>				
	<b>Voltage at the POC</b>			
<b>Voltage of Scheme Assets</b>	<b>LV (at or below 1000V)</b>	<b>HV (above 1kV but not more than 22kV)</b>	<b>EHV (above 22kV but not more than 72kV)</b>	<b>132kV</b>
<b>132kV Network</b>	We fund	We fund	We fund	We fund
<b>132kV/ EHV Substation</b>	We fund	We fund	We fund	Not applicable
<b>EHV Network</b>	We fund	We fund	We fund	Not applicable
<b>132kV/ HV Substation</b>	We fund	We fund	Not applicable	Not applicable
<b>EHV/HV Substation</b>	We fund	We fund	Not applicable	Not applicable
<b>EHV/LV substation</b>	We fund	Not applicable	Not applicable	Not applicable
<b>HV Network</b>	We fund	We fund	Not applicable	Not applicable
<b>HV/ LV Substation</b>	We fund	Not applicable	Not applicable	Not applicable
<b>LV Network</b>	We fund	Not applicable	Not applicable	Not applicable

NB: The above table may not accommodate every possible circumstance, where this is the case, the Voltage Level (as defined in the Glossary) shall be applied.

<b>Generation Connections</b>				
	<b>Voltage at the POC</b>			
<b>Voltage of Scheme Assets</b>	<b>LV (at or below 1000V)</b>	<b>HV (above 1kV but not more than 22kV)</b>	<b>EHV (above 22kV but not more than 72kV)</b>	<b>132kV</b>
<b>132kV Network</b>	We fund	We fund <sup>1</sup>	We fund	Apportioned
<b>132kV/ EHV Substation</b>	We fund	We fund	EHV circuit breakers only Apportioned	Not applicable
<b>EHV Network</b>	We fund	We fund	Apportioned	Not applicable
<b>132kV/ HV Substation</b>	We fund	HV circuit breakers only Apportioned	Not applicable	Not applicable
<b>EHV/HV Substation</b>	We fund	HV circuit breakers only Apportioned	Not applicable	Not applicable
<b>EHV/LV Substation</b>	LV board only Apportioned	Not applicable	Not applicable	Not applicable
<b>HV Network</b>	We fund	Apportioned	Not applicable	Not applicable
<b>HV/ LV Substation</b>	LV board only Apportioned	Not applicable	Not applicable	Not applicable
<b>LV Network</b>	Apportioned	Not applicable	Not applicable	Not applicable

<sup>1</sup> Except where there is direct transformation from 132kV to HV when the costs are apportioned.

NB: The above table may not accommodate every possible circumstance, where this is the case, the Voltage Level (as defined in the Glossary) shall be applied.

### Scotland

<b><u>Demand Connections</u></b>
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	<b><u>Voltage at the POC</u></b>		
<b><u>Voltage of Scheme Assets</u></b>	<b><u>LV</u> <u>(at or below 1000V)</u></b>	<b><u>HV</u> <u>(above 1kV but not more than 22kV)</u></b>	<b><u>EHV</u> <u>(above 22kV but not more than 72kV)</u></b>
<b><u>EHV Network</u></b>	We fund	We fund	We fund
<b><u>EHV/HV Substation</u></b>	We fund	We fund	Not applicable
<b><u>EHV/LV substation</u></b>	We fund	Not applicable	Not applicable
<b><u>HV Network</u></b>	We fund	We fund	Not applicable
<b><u>HV/ LV Substation</u></b>	We fund	Not applicable	Not applicable
<b><u>LV Network</u></b>	We fund	Not applicable	Not applicable

NB: The above table may not accommodate every possible circumstance, where this is the case, the Voltage Level (as defined in the Glossary) shall be applied.

<b>Generation Connections</b>			
	<b><u>Voltage at the POC</u></b>		
<b><u>Voltage of Scheme Assets</u></b>	<b><u>LV</u> <u>(at or below 1000V)</u></b>	<b><u>HV</u> <u>(above 1kV but not more than 22kV)</u></b>	<b><u>EHV</u> <u>(above 22kV but not more than 72kV)</u></b>
<b><u>EHV Network</u></b>	We fund	We fund	Apportioned
<b><u>EHV/HV Substation</u></b>	We fund	HV circuit breakers only Apportioned	Not applicable
<b><u>EHV/LV Substation</u></b>	LV board only Apportioned	Not applicable	Not applicable
<b><u>HV Network</u></b>	We fund	Apportioned	Not applicable
<b><u>HV/ LV Substation</u></b>	LV board only Apportioned	Not applicable	Not applicable
<b><u>LV Network</u></b>	Apportioned	Not applicable	Not applicable

NB: The above table may not accommodate every possible circumstance, where this is the case, the Voltage Level (as defined in the Glossary) shall be applied.



### **Additional Cost Allocation for Flexible Connections**

[1.391.40](#) To facilitate a Flexible Connection, we may need to install and maintain specific system management equipment, at your Premises and/or further upstream in other parts of the Distribution System. Some of the costs associated with installing, operating and maintaining the system management equipment will be directly attributed to your connection and be included as part of your Connection Charge (see illustrative table in paragraph 1.410). The proportion of the costs which you must fund depends on whether your connection forms part of a Dedicated Scheme or a Wide Area Scheme, as described below:

Type 1 – Dedicated Scheme: A scheme managing constraint(s) where there are no customers downstream of the constraint(s) who could connect new or additional demand or generation without being controlled by the Dedicated Scheme:

- Type ‘1A’ considers a scenario involving only one customer; and
- Type ‘1B’ considers a scenario involving multiple customers.

Type 2 – Wide Area Scheme: A scheme managing constraint(s) where there are customers downstream of the constraint(s) who could connect new or additional demand or generation without being controlled by the Wide Area Scheme.

[1.401.41](#) The table below illustrates the scheme types and methodology for cost recovery associated with each type of Flexible Connection. The methodology covers Type 1A, Type 1B and Type 2 (as each is described in paragraph 1.4039).

<b>Typical connection components<sup>1</sup></b>	<b>Type 1A - Single</b>	<b>Type 1B - Multiple</b>	<b>Type 2 - Wide Area</b>
<b>Extension Assets for customer</b>	You fund	You fund	You fund
<b>End user control unit for the customer</b>	You fund	You fund	You fund

<b>Local system management unit</b>	You fund	Shared equally between participants	We fund
<b>Scheme management unit</b>	You fund	Shared equally between participants	We fund
<b>Central management unit</b>	N/A	N/A	We fund
<b>Scheme specific ongoing costs e.g. communications</b>	We fund	We fund	We fund

<sup>1</sup>We will describe the main connection components within the relevant connection offer, which will also include the funding arrangements for each such connection component (if different to that stated in this illustrative table).

### **Recovered Equipment and Deferment of Asset Replacement**

1.41.42 Normally, you will not receive any credit for the value of any equipment recovered by us as a result of providing the connection. However, where a Temporary Connection is to be Disconnected, we will determine the value of recovered equipment that we can subsequently reuse (net of depreciation and removal and refurbishment costs). Where there is a net value in the recovered equipment that can be reused, we will pay you the amount of such net value subject to a de minimis level as specified in Section [6].

1.42.43 You will not receive any credit for the value of any deferment of asset renewal expenditure by us.

### **Rebates**

1.43.44 For Distribution System assets where you have paid in full, then you may be entitled to a reimbursement payment under the ECCR should another Customer connect to those assets. These circumstances are detailed in the ECCR.

~~1.44~~1.45 For Distribution System assets where you have paid in proportion to your Required Capacity, then you are not entitled to a future rebate of charges should another Customer connect to those assets.

~~1.45~~1.46 Your entitlement to receive payments under the ECCR only applies to connections made within the ECCR Prescribed Period from the first provision of the connection.

~~1.46~~1.47 These provisions do not apply where your connection was made before 6 April 2017 and we have adopted the assets from an ICP. However, for connections made on or after 6 April 2017, these provisions do apply to assets we have adopted from an ICP (as further described in the ECCR).

### **Speculative Developments**

~~1.47~~1.48 Developments which have one or more of the following characteristics may be considered as speculative:

- their detailed electrical load requirements are not known;
- the development is phased over a period of time and the timing of the phases is unclear;
- the capacity requested caters for future expansion rather than the immediate requirements of (an) end user(s);
- the capacity requested caters for future speculative phases of a development rather than the initial phase(s) of the development; or
- the infrastructure only is being provided, with no connections for end users requested.

~~1.48~~1.49 Where we are asked to provide a connection to a speculative development then the cost of the work including any Reinforcement is charged in full and the CAFs do not apply. Additional charges to reflect ongoing operation, repair and maintenance costs may also be levied.

~~1.49~~1.50 We may, at our sole discretion, allow capacity to be reserved on the infrastructure provided to service the speculative development on the commercial terms agreed between you and us in respect of the development.

### **Connection Alterations**

~~1.50~~1.51 Where you request an alteration to your connection arrangements, including a change in the supply voltage, the costs are charged in full to you. For the avoidance of doubt increases in the Required Capacity are dealt with in accordance with the previous Sections.

### **National Electricity Transmission System Operator (NETSO) Charges**

~~1.51~~1.52 We have an obligation under the CUSC to discuss certain requests for connection or changes in connection with the NETSO. Such requests are typically for large electrical demand or generation projects. Under certain circumstances, as determined by the NETSO, they may apply charges to assess the potential impact on the GB Transmission System of a request or the combined effect of a number of requests and these will be included in the Connection Charge, or through a separate mechanism agreed between you and us.

~~1.52~~1.53 Subsequent to such assessment, the NETSO may also require works to be undertaken on the GB Transmission System as a condition of the connection being permitted. In the event of NETSO applying charges for these works, we will reflect these charges in our charges to you.

~~1.53~~1.54 Should GB Transmission System works be required, NETSO may apply a cancellation charge in the event that your project is cancelled or the capacity of your project reduces. The NETSO also calculates a secured amount in respect of this cancellation charge (being a percentage of the cancellation charge, which reduces at certain trigger points). We may ask you for security in respect of this cancellation charge, but we will not ask you for more than the secured amount calculated by the NETSO.

## **Land Rights**

~~1.54~~1.55 Where Land Rights are required from a third party, the cost of acquiring those rights will be included in either the Connection Charge to you or through a separate mechanism agreed between you and us.

~~1.55~~1.56 If the Land Rights that we require cannot be obtained by negotiation, we may, following discussion with you, exercise our powers of compulsory purchase (Section 10 and Schedule 3 of the Act) or apply to the Secretary of State or the Scottish Government in Scotland for a ‘necessary wayleave’ (paragraphs 6-8 of Schedule 4 of the Act). If we do so, the costs that we incur, including those of the Lands Tribunal/ Lands Tribunal for Scotland (which determine issues of compensation) will be charged to you. The Lands Tribunal may award compensation to the landowner and/or anyone who holds an interest in the land and this will be included in the Connection Charge or through a separate mechanism agreed between you and us.

## **Unmetered Supplies**

~~1.56~~1.57 For some street lighting and other installations, we may allow items of equipment to be connected to our Distribution System without a meter. This is subject to the equipment having a low and predictable pattern of consumption and meeting the requirements of The Electricity (Unmetered Supply) Regulations 2001.

~~1.57~~1.58 Where we agree that a meter is not required the provision of such a connection is dependent on the owner entering into an unmetered Connection Agreement and providing and maintaining an auditable inventory, in a format agreed with us, so that an accurate estimate of the consumption can be produced.

~~1.58~~1.59 Where certain criteria are met the provision of services for unmetered connections may be made via a time-based connection service charge, e.g. Rent-a-Jointer Services. This is subject to us entering into a contract with you for the provision of such services.

~~1.59~~1.60 You may elect to appoint an accredited ICP to carry out the Contestable Work for unmetered connections. The ICP will be allowed to carry out live jointing on low voltage, underground cables. Where you use an ICP, arrangements must first be established as follows:

- You will enter into an agreement with the ICP to carry out and complete the Contestable Work; and
- We will enter into an agreement and/or an Adoption Agreement with you and/or your appointed ICP as appropriate.

### **Capacity Ramping for LDNOs**

~~1.60~~1.61 For an LDNO the Required Capacity (expressed in kVA) is the Maximum Capacity to be provided at the boundary between the LDNO's distribution network and our Distribution System. This value will be agreed with us and stated in the Bilateral Connection Agreement for the relevant embedded network.

~~1.61~~1.62 When a connection is provided to an LDNO the take-up of capacity may grow over a period of time as the site develops and individual customers are connected. In such circumstances the Bilateral Connection Agreement shall include a phased Required Capacity based on the Development Phase.

~~1.62~~1.63 During the Development Phase a review may be undertaken annually on the anniversary of the Energisation of the embedded network. Any unused capacity identified in such review may be released for use by other customers and the Maximum Capacity reduced to an agreed level within the Bilateral Connection Agreement.

~~1.63~~1.64 The Required Capacity agreed with us as being required at the end of the Development Phase shall be used to determine the Required Capacity for determination of the Cost Apportionment Factors where applicable.

~~1.64~~1.65 Should additional capacity subsequently be required, the LDNO may incur additional Connection Charges for any Reinforcement based on the increase in capacity.

### **Disconnection and De-Energisation**

~~1.65~~1.66 If we either Disconnect or De-energise your Entry/ Exit Point:

- at the request of your Supplier; or
- due to a failure of your Supplier to comply with the terms of the DCUSA,

then the cost of such disconnection or De-energisation will be borne by your Supplier.

~~1.66~~1.67 If we either Disconnect or De-energise your Entry/ Exit Point:

- at your request; or
- due to a failure by you to comply with the terms of your Connection Agreement,

then the cost of such disconnection or De-energisation will be borne by you.

~~1.67~~1.68 On termination of your Connection Agreement, we retain the right to remove our Electrical Plant and Electric Lines and charge you if we do so. Apparatus which is not cost effective for us to recover (e.g. Electric Lines laid underground) will normally be made safe and left at the Premises, but if you require us to remove them, the cost of removal will be payable by you. All such apparatus will remain our property unless otherwise agreed in writing.

### **Adoption Payments**

~~1.68~~1.69 Where we adopt assets installed by an ICP we will not make any adoption payment in respect of those assets.

### **Competition in Connections**

~~1.69~~1.70 Where you choose to have any Contestable Work undertaken by an ICP, we levy CIC Charges associated with the design approval, inspection and adoption of the Contestable Works as set out in Section [6] and Section [7].

### **Worked Examples Illustrating the Application of the Connection Charging Methodology**

The following Examples are to illustrate the application of the Connection Charging Methodology and are not intended to provide an accurate estimate of the charges for which a person would become liable in respect of the provision of a connection. The Examples do not necessarily represent the Minimum Scheme for a specific connection application or how we would classify a connection between what is a Demand Connection or Generation Connection. Where an example only applies to either Demand or Generation Connections, then this is identified in the Example title, otherwise the examples apply to both.

The figures quoted in the Examples are illustrative. Section [7] of this statement provides our charges and indicative costs to undertake various activities.

The Examples illustrate where we undertake both the Contestable and Non-Contestable Work. These costs will include the determination of the POC and assessment and design costs, though these are not explicitly identified in the Examples.

Where Contestable Work is undertaken by an ICP, we will apply CIC Charges for services associated with the Contestable Works which would cover activities including design approval, inspection and monitoring. The CIC Charges are not shown in the Examples. For the avoidance of doubt, in each Example, where an ICP undertakes the Contestable Work, our Connection Charge will include the cost of the Non-Contestable Work and the CIC Charges but exclude the cost of Contestable Work.

The Examples are generic and standard for all LDNOs, but they do not represent the network analysis and subsequent design solutions that would be completed for an actual connection scheme. The actual designs are subject to our design policies.

For illustrative purposes only, the rated capacities of the Examples use 'kVA, MVA' and 'kW, MW' interchangeably.

### **Index of Examples**

Example	Description	Purpose
1	A new connection at LV	To show Extension Assets are charged in full to the Customer.
2	A new connection at HV	To show LV and HV Extension Assets are charged in full to the Customer.
3	A new connection on a domestic housing development with interconnection requested by Customer	To illustrate Exception 2 where the interconnection is treated as Extension Assets and are charged in full to the Customer.
<del>4</del>	<del>A new connection with interconnection requested by us</del>	<del>To illustrate that where no Exceptions apply, the Reinforcement costs are paid for by us, as is the interconnection</del>
<del>45</del>	<del>A new connection with interconnection requested by us but with little prospect of the capacity created being used.</del>	<del>To illustrate Exception 1 where LV and HV Extension Assets are charged in full to the Customer, but the interconnection is paid in full by us requested by us but there is little prospect of the capacity created being used.</del>
<del>56</del>	<del>A new connection where the Minimum Scheme is a new substation teed onto the existing HV network.</del>	<del>Simple example of a commercial connection, Extension Assets only, so charged in full to the Customer.</del>
<del>67</del>	<del>A new connection where the Minimum Scheme is a new substation looped into existing HV network.</del>	<del>Simple example of looped connection, Extension Assets only, so charged in full to the Customer.</del>
<del>78</del>	<del>A new connection where the Minimum Scheme is as for Example <del>56</del> but the Customer requests an enhanced connection arrangement where the substation is looped into existing HV network.</del>	<del>Shows that for a Customer requested Enhanced Scheme that the Customer pays costs above the Minimum Scheme plus O&amp;M.</del>



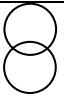

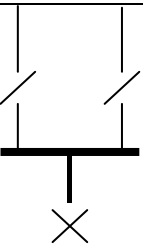






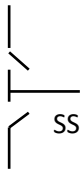


Example	Description	Purpose
<a href="#">89</a>	A new connection where the Minimum Scheme is as for Example <a href="#">56</a> but we request an Enhanced Scheme where the substation is looped into the existing HV network.	Shows that for a DNO requested Enhanced Scheme that the DNO pays for all costs above Minimum Scheme.
<a href="#">109</a>	An additional load application requiring a new connection from the HV network and Reinforcement.	To demonstrate the treatment of Reinforcement cost for a Demand Connection that drives Reinforcement.
<a href="#">101</a>	A new connection that results in a Point of Connection further away than the nearest network.	To show that the Minimum Scheme may result in a Point of Connection that is further away than the nearest network and may result in increased Extension Asset costs that are charged in full to the Customer.
<a href="#">112</a>	A new Generation Connection with capacity triggered Reinforcement.	To demonstrate the treatment of Reinforcement cost for a Generation Connection which drives Reinforcement using the Security CAF.
<a href="#">123</a>	A new Generation Connection with Fault Level Triggered Reinforcement.	To demonstrate how the Fault Level CAF calculation is applied.
<a href="#">134</a>	A new Generation Connection that requires Reinforcement involving both Security and Fault Level CAFs.	To demonstrate Reinforcement charging principles for a Generation Connection where both Security CAF and Fault Level CAF are applicable.
<a href="#">145</a>	A new Generation Connection with Reinforcement at a voltage above that of the Point of Connection.	To illustrate that a Generation Connection does not contribute to Reinforcement costs at a voltage level above the connection voltage.
<a href="#">156</a>	New Generation Connection where switchgear extension is not possible and switchgear replacement is needed	Illustrate Exception 4, if switchgear extension not possible, then treated as Extension Assets and costs are charged in full to the Customer.
<a href="#">167</a>	A new Storage Connection that triggers Reinforcement	To show that Storage, when not co-located with other demand, is treated as a Generation Connection for the purposes of charging and any Reinforcement at the same Voltage of the POC will be charged, irrespective of whether the Reinforcement is due to the import or the export.
<a href="#">17</a>	<a href="#">A new connection that is connected by Reinforced assets</a>	<a href="#">To demonstrate the application of Exception 5 where the Customer needs to pay for the assets that connect them to the existing network.</a>
18	A new connection of a development	To demonstrate the application of Exception <a href="#">65</a> where the Customer pays for assets within the site boundary.
19	A new connection with remote network Reinforcement	To show treatment where capacity is created on a different part of the network and a load transfer is

Example	Description	Purpose
		required to allow the connection. Example again demonstrates which elements are Reinforcement and which are Extension Assets.
20	A new connection with load transfer	Variation to Example 19 where a load transfer is required to free up capacity, but no new capacity is created and demonstrates why elements become Extension Assets.
21	A new Generation Connection with an Enhanced Scheme at the DNO's request.	To show how the Security CAF calculation is applied where the DNO requests an Enhanced Scheme.
22	A new Generation Connection on a meshed HV distribution system requiring Reinforcement.	To show that a contribution is required where Reinforcement is carried out at the same voltage as the Point of Connection for a Generation Connection.
23	A non-secure Generation Connection with non-secure Reinforcement.	To show that a contribution is required where Reinforcement is carried out at the same voltage as the Point of Connection for a Generation Connection in relation to a non-secure system.
24	A new non-secure Generation Connection with secure Reinforcement.	To show the application of the apportionment rule where secure Reinforcement is provided but the connection for a Generation Connection is non-secure.
25	A new Generation Connection with voltage rise triggered Reinforcement.	To show that a Generation Connection pays for Reinforcement at the voltage level of connection based on the CAF.
26	A new Generation Connection with voltage rise triggered Reinforcement.	To show that if voltage rise Reinforcement is tailored so that just the amount of network is upgraded to meet the Customer requirements, the CAF is 100% for a Generation Connection.
27	A new Generation Connection with Fault Level Triggered Reinforcement and transmission works.	To show how the Fault Level CAF calculation is applied and how the cost of transmission works are treated for a Generation Connection.
28	A new Generation Connection with Fault Level triggered Reinforcement and transmission works.	To show the treatment of Reinforcement costs at more than one voltage level above the POC and the cost of transmission works for a Generation Connection.
29	A new Demand Connection that has Reinforcement above the High-Cost Project Threshold.	To show how the Demand High-Cost Project Threshold is applied.
30	A new Generation Connection that has Reinforcement above the High-Cost Project Threshold.	To show how a Generation Connection that triggers the Generation High-Cost Project Threshold is charged when the Reinforcement required is at the same voltage of connection.
31	The Customer requirements for supply characteristics are	To illustrate that the Customer specifically requesting a three-phase connection, where the existing

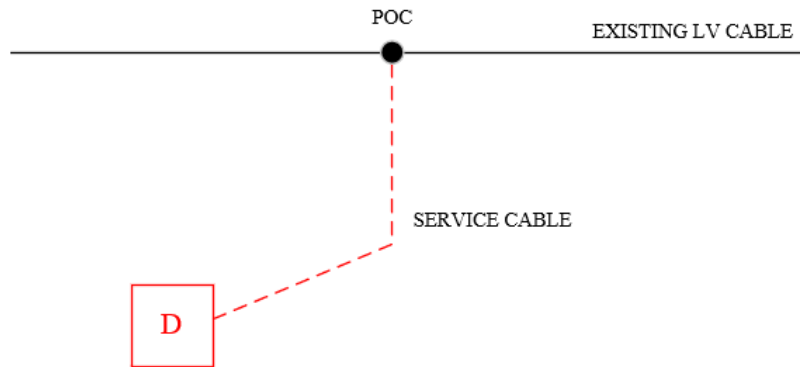
Example	Description	Purpose
	greater than the Minimum Scheme.	network is not of a sufficient number of phases, pays for any Reinforcement.

### Key to Illustrations

	Circuit Breaker (any voltage)
	Switch
	Transformer
	Joint on cable
	High voltage ring main unit
	Existing cable
	Proposed cable
	Normal Open Point (NOP)
	Generation Connection
	Demand Connection
	Point of Connection (POC)
	Sub Station

**Example 1: A new connection at LV****Purpose:** To show Extension Assets are charged in full to the Customer.

A Customer requests a LV single phase connection to a new house. The Premises can be connected to an existing LV main cable in the street.



The Connection Charge for this Scheme is calculated as follows:

**Extension Assets:**

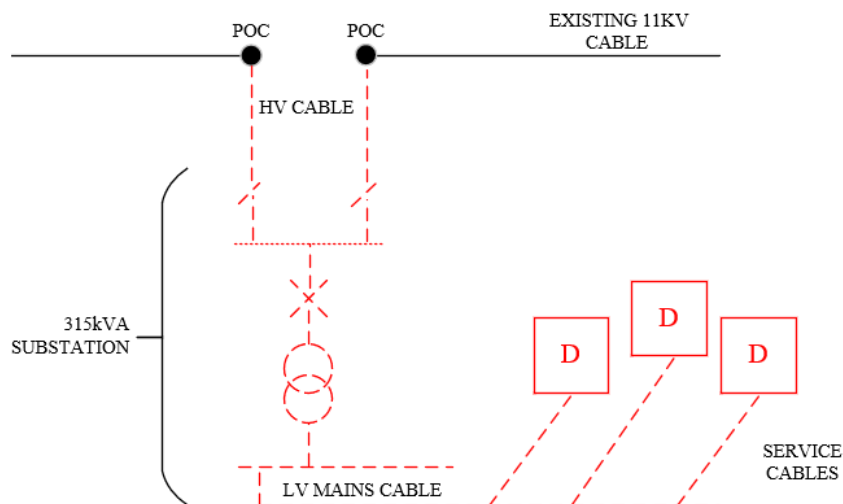
	Cost	Apportionment	Customer Contribution
15m service cable, excavation in footpath for joint hole to Customer laid duct, backfill and termination	£1,600	n/a	£1,600
Single service breach joint	£300	n/a	£300
<b>Total Extension Asset Cost</b>	<b>£1,900</b>		<b>£1,900</b>

**Total cost of the work = £1,900**

**Total Connection Charge to Customer = £1,900**

**Example 2: A new connection at HV****Purpose: To show LV and HV Extension Assets are charged in full to the Customer.**

A housing developer requests connection for 200 domestic Premises. The Required Capacity to supply the 200 homes is 250kVA. A new distribution substation will be established to provide the Required Capacity of the site. The Minimum Scheme requires the substation to be looped into the existing 11kV network.



The Connection Charge for this Scheme is calculated as follows:

Extension Assets:	Cost	Apportionment	Customer Contribution
Provision and installation 100m 11kV cable	£30,000	n/a	£30,000
315kVA substation	£60,000	n/a	£60,000
LV mains, service cables and terminations	£200,000	n/a	£200,000
Two 11KV cable joints	£6,000	n/a	£6,000
<b>Total Extension Asset Cost</b>	<b>£296,000</b>		<b>£296,000</b>

**Total cost of the work = £296,000**

**Total Connection Charge to Customer = £296,000**

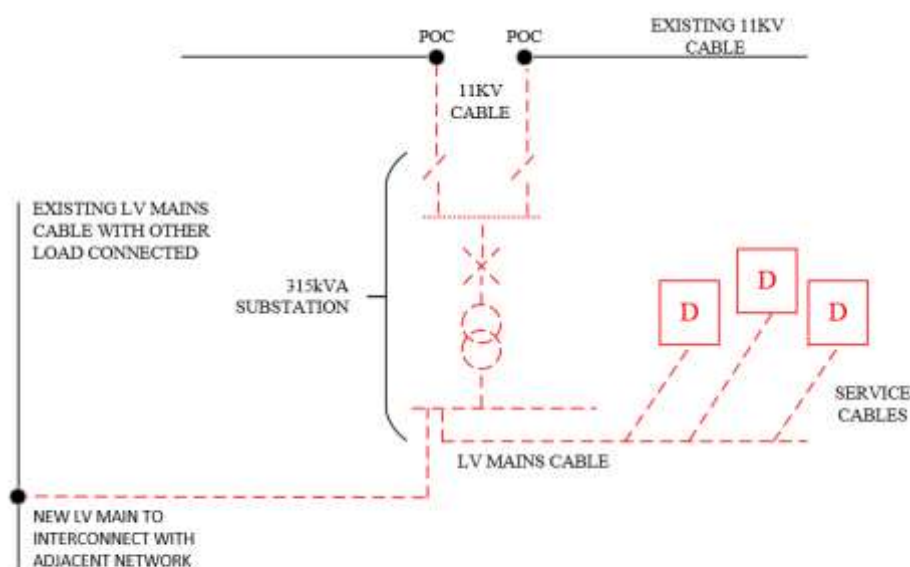
**Example 3: A new connection on a domestic housing development with interconnection requested by Customer**

**Purpose:** To illustrate Exception 2 where the interconnection is treated as Extension Assets and are charged in full to the Customer.

As in Example 2, a housing developer requests connections for 200 domestic Premises. The Required Capacity to supply the 200 homes is 250kVA. A new distribution substation will be established to provide the Required Capacity of the site. The Minimum Scheme requires the substation to be looped into the existing 11KV network. However, in this example there is an option to provide an additional LV cable to interconnect the distribution substation with the existing LV network. This option is over and above the Minimum Scheme.

Interconnecting into the existing LV network will increase the capacity of the existing Distribution System. Therefore, the assets that connect the 11KV and LV network would normally be considered to be Reinforcement. These assets (as shown on the diagram below) include the 11KV cable, the 315kVA substation and the interconnecting LV main. They exclude the LV mains and service cables from the 315kVA substation to the Customer's development. However, whether these assets are to be considered Reinforcement or Extension Assets depends upon who requested the LV interconnection.

In this case Exception 2 applies as the LV interconnector is over and above the minimum scheme and requested by the Customer, therefore all assets (including the interconnecting LV cable) will be treated as Extension Assets and their costs will be borne in full by the Customer. As the interconnecting LV main and associated LV joint are over and above the Minimum Scheme, a charge for their future operation and maintenance will be made.



The Connection Charge for this Scheme is calculated as follows:

<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Provision and installation 100m 11KV cable (from existing 11KV network to substation)	£30,000	n/a	£30,000
315kVA substation	£60,000	n/a	£60,000
LV mains, service cables and terminations (from substation to the Customer's development)	£200,000	n/a	£200,000
Two 11KV cable joints	£6,000	n/a	£6,000
Interconnecting cable (from substation to existing LV network)	£12,000	In excess of Minimum Scheme	£12,000
LV cable joint	£300	In excess of Minimum Scheme	£300
Difference between Minimum Scheme and actual Scheme is £12,300. Operations & maintenance @ 20%* of £12,300		20%* of £12,300	£2,460
<b>Total Extension Asset Cost</b>	<b>£308,300</b>		<b>£310,760</b>

\*Note, the 20% Operation and Maintenance percentage has been used for illustrative purposes only.

**Total cost of the work = £308,300**

**Total Connection Charge to Customer = £308,300 + £2,460 = £310,760**

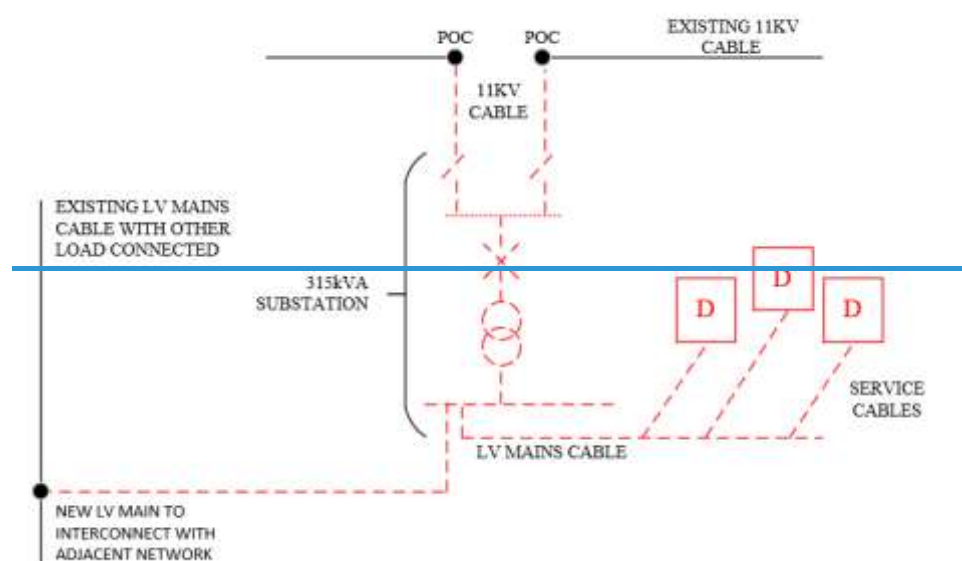
**Example 4: A new connection with interconnection requested by us**

**Purpose:** To illustrate that where no Exceptions apply, the Reinforcement costs are paid for by us, as is the interconnection.

As in Example 2, a housing developer requests connections for 200 domestic Premises. The Required Capacity to supply the 200 homes is 250kVA. A new distribution substation will be established to provide the Required Capacity of the site. The Minimum Scheme requires the substation to be looped into the existing 11KV network. However, in this Example there is an option to provide an additional LV cable to interconnect the distribution substation with the existing LV network. This option is over and above the Minimum Scheme.

Interconnecting into the existing LV network will increase the capacity of the existing Distribution System. Therefore, the assets that connect the 11KV and LV network would normally be considered to be Reinforcement. These assets (as shown on the diagram below) include the 11KV cable, the 315kVA substation and the interconnecting LV main. They exclude the LV mains and service cables from the 315kVA substation to the Customer's development. However, whether these assets are to be considered Reinforcement or Extension Assets depends upon who requested the LV interconnection and whether any capacity created is likely to be used.

In this case, the assets connecting the existing HV and LV network add capacity to the existing network and none of the exceptions described in paragraphs 1.17-1.21 apply. Therefore, they will be treated as Reinforcement. The costs of the Reinforcement assets that form part of the Minimum Scheme (the HV cable and associated HV joints; the 315kVA substation) will be borne in full by us. The interconnecting LV cable and associated LV joint are considered to be Reinforcement but, as they are over and above the Minimum Scheme and requested by us, the costs will be borne in full by us.





The Connection Charge for this Scheme is calculated as follows:

Reinforcement	Cost	Apportionment	Customer Contribution
Provision and installation 100m 11KV cable (from existing 11KV network to substation)	£30,000	0%	£0
315kVA substation	£60,000	0%	£0
Two 11KV cable joints	£6,000	0%	£0
Interconnecting cable (from substation to existing LV network)	£12,000	In excess of Minimum Scheme	£0
LV cable joint	£300	In excess of Minimum Scheme	£0
<b>Total Reinforcement Cost</b>	<b>£108,300</b>		<b>£0</b>

Extension Assets:	Cost	Apportionment	Customer Contribution
LV mains, service cables and terminations (from substation to the Customer's development)	£200,000		£200,000
<b>Total Extension Asset Cost</b>	<b>£200,000</b>		<b>£200,000</b>

**Total cost of the work** ————— = **£308,300**

**Total Connection Charge to Customer** ————— = **£200,000**

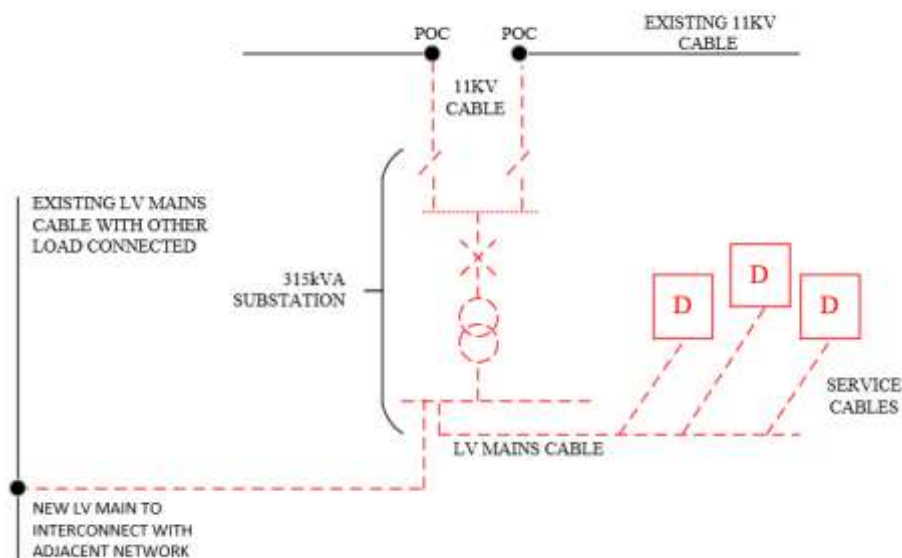
**Example 54:** A new connection with interconnection requested by us ~~but with little prospect of the capacity created being used.~~

**Purpose:** To illustrate Exception 1 where LV and HV Extension Assets are charged in full to the Customer, but the interconnection is ~~paid in full by us requested by us but there is little prospect of the capacity created being used.~~

As in Example 2, a housing developer requests connections for 200 domestic Premises. The Required Capacity to supply the 200 homes is 250kVA. A new distribution substation will be established to provide the Required Capacity of the site. The Minimum Scheme requires the substation to be looped into the existing 11KV network. However, in this Example there is an option to provide an additional LV cable to interconnect the distribution substation with the existing LV network. This option is over and above the Minimum Scheme.

Interconnecting into the existing LV network will increase the capacity of the existing Distribution System. Therefore, the assets that connect the 11KV and LV network would normally be considered to be Reinforcement. These assets (as shown on the diagram below) include the 11KV cable, the 315kVA substation and the interconnecting LV main. They exclude the LV mains and service cables from the 315kVA substation to the Customer's development. However, whether these assets are to be considered Reinforcement or Extension Assets depends upon who requested the LV interconnection ~~and whether any capacity created is likely to be used.~~

In this case all the requirements of Exception 1 (paragraph 1.21) are met so the assets that connect the existing 11KV and LV Distribution System will be treated as Extension Assets. The Customer will pay the costs associated with the Minimum Scheme in full. The interconnecting LV cable and associated LV joint, as they are over and above the Minimum Scheme and were requested by us, therefore the costs will be borne in full by us.



The Connection Charge for this Scheme is calculated as follows:

<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Provision and installation 100m 11KV cable (from existing 11KV network to substation)	£30,000	n/a	£30,000
315kVA substation	£60,000	n/a	£60,000
LV mains, service cables and terminations (from substation to the Customer's development)	£200,000	n/a	£200,000
Two 11KV cable joints	£6,000	n/a	£6,000
Interconnecting cable (from substation to existing LV network)	£12,000	In excess of Minimum Scheme	£0
LV cable joint	£300	In excess of Minimum Scheme	£0
<b>Total Extension Asset Cost</b>	<b>£308,300</b>		<b>£296,000</b>

**Total cost of the work = £308,300**

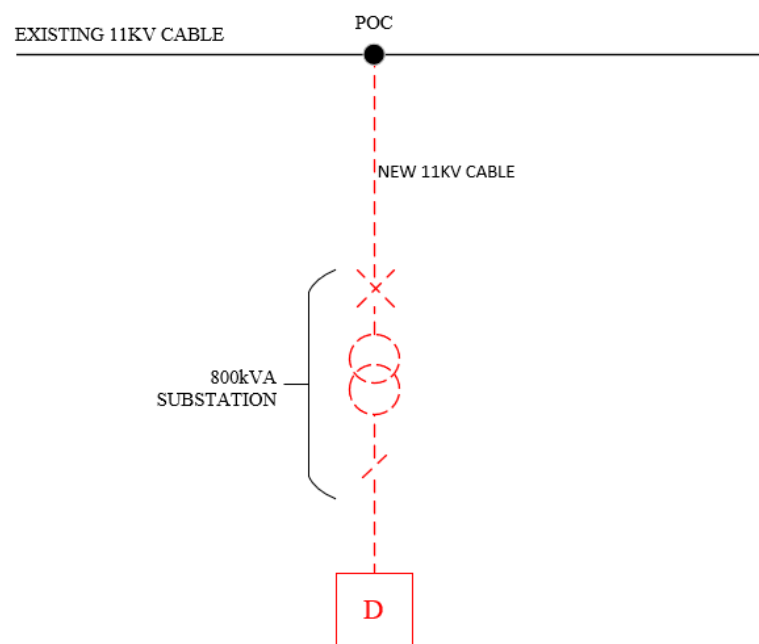
**Total Connection Charge to Customer = £296,000**

**Example 56:** A new connection where the Minimum Scheme is a new substation teed onto the existing HV network.

**Purpose:** Simple example of a commercial connection, Extension Assets only, so charged in full to the Customer.

A Customer requests a new LV three phase 600kVA connection to commercial Premises. Four scenarios for connection are considered in Examples 56 to 89. The Minimum Scheme will be dependent on the specific circumstances as set out in paragraphs 1.1 to 1.7.

In this example the Minimum Scheme is a new 800kVA substation teed onto the existing 11KV network. The figure below shows the proposed network.



The Connection Charge for this Scheme is calculated as follows:

Extension Assets:	Cost	Apportionment	Customer Contribution
Provision and installation of 150m of 11KV cable	£45,000	n/a	£45,000
800kVA substation	£75,000	n/a	£75,000
Provision and installation LV cabling	£6,000	n/a	£6,000
LV Metering Panel	£4,000	n/a	£4,000
11KV joint to network	£3,000	n/a	£3,000
<b>Total Extension Asset Cost</b>	<b>£133,000</b>		<b>£133,000</b>

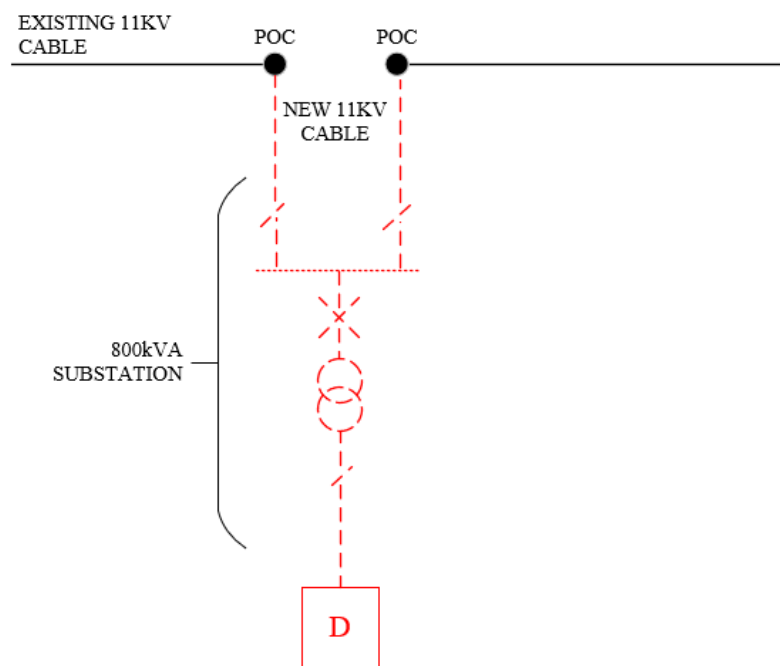
**Total cost of the work** = **£133,000**

**Total Connection Charge to Customer** = **£133,000**

**Example 67:** A new connection where the Minimum Scheme is a new substation looped into existing HV network.

**Purpose:** Simple example of looped connection, Extension Assets only, so charged in full to the Customer.

In this variation to Example 65, the Customer is connected with a looped connection, as illustrated in the following diagram. The Minimum Scheme is a new 800kVA substation looped into existing 11KV network.



The Connection Charge for this Scheme is calculated as follows:

Extension Assets:	Cost	Apportionment	Customer Contribution
Provision and installation of 300m (2x150m) of 11KV cable looped to network,	£90,000	n/a	£90,000
800kVA substation	£75,000	n/a	£75,000
Ring Main Unit	£25,000	n/a	£25,000
Provision and installation LV cabling	£6,000	n/a	£6,000
LV Metering Panel	£4,000	n/a	£4,000
11KV joints to network	£6,000	n/a	£6,000

<b>Total Extension Asset Cost</b>	<b>£206,000</b>		<b>£206,000</b>
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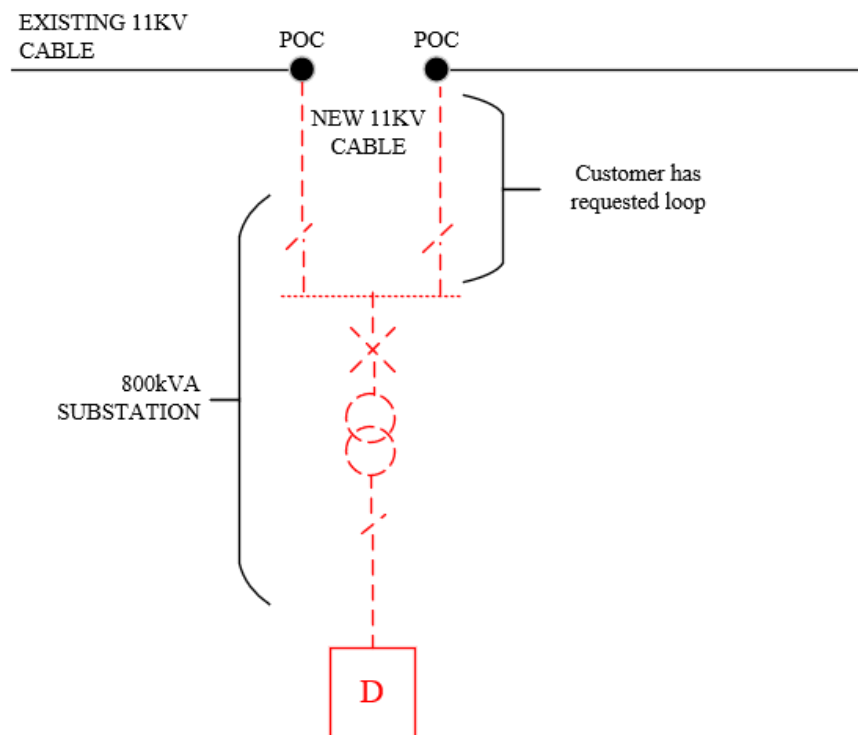
**Total cost of the work = £206,000**

**Total Connection Charge to Customer = £206,000**

**Example 78:** A new connection where the Minimum Scheme is as for Example 65 but the Customer requests an enhanced connection arrangement where the substation is looped into existing HV network.

**Purpose:** Shows that for a Customer requested Enhanced Scheme that the Customer pays costs above the Minimum Scheme plus O&M.

In this variation to Example 65, the Customer requests an enhanced connection arrangement where the substation is looped into existing 11KV network, as illustrated in the following diagram. The Minimum Scheme is as for Example 65.



The Connection Charge for this Scheme is calculated as follows:

Extension Assets:	Cost	Apportionment	Customer Contribution
Provision and installation of 300m (2x150m) of 11KV cable looped to network	£90,000	n/a	£90,000
800kVA substation	£75,000	n/a	£75,000
Ring Main Unit	£25,000	n/a	£25,000
Provision and installation LV cabling	£6,000	n/a	£6,000
LV Metering Panel	£4,000	n/a	£4,000
11KV joints to network	£6,000	n/a	£6,000



<b>Total Extension Asset Cost</b>	<b>£206,000</b>		<b>£206,000</b>
Difference between Minimum and the actual Scheme is £73,000 (£206,000-£133,000). Operation & Maintenance @20%* of £73,000.		20%* of £73,000	£14,600
<b>Total Extension Asset Cost incl O&amp;M</b>			<b>£220,600</b>

\*Note, the 20% Operation and Maintenance percentage has been used for illustrative purposes only

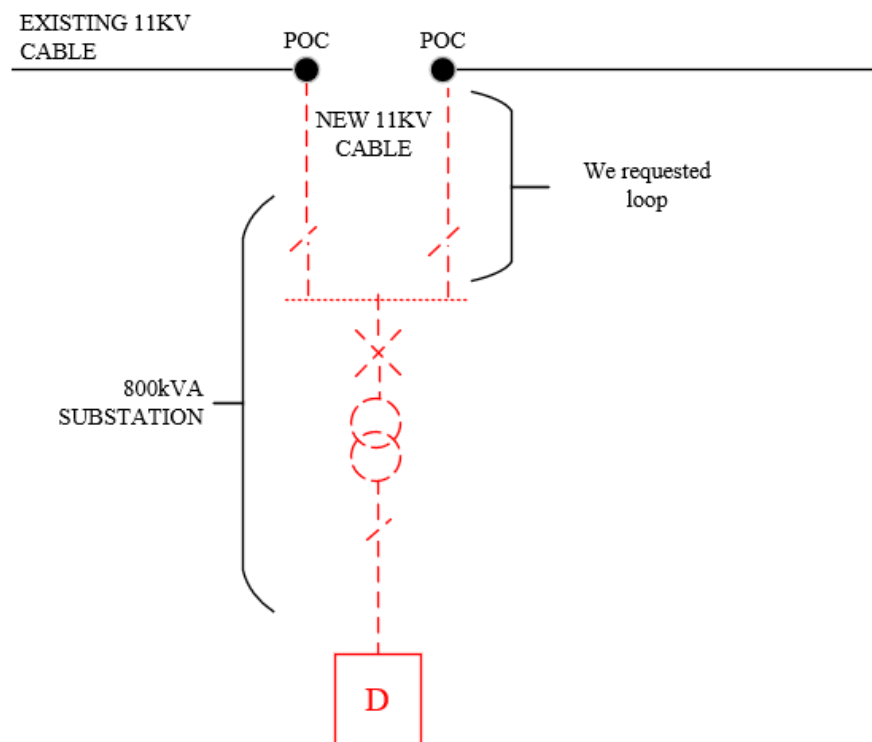
**Total cost of the work = £206,000**

**Total Connection Charge to Customer = £206,000 + £14,600 = £220,600**

**Example 89:** A new connection where the Minimum Scheme is as for Example 56 but we request an Enhanced Scheme where the substation is looped into the existing HV network.

**Purpose:** Shows that for a DNO requested Enhanced Scheme that the DNO pays for all costs above Minimum Scheme.

In this variation to Example 56, the Customer is connected with a looped connection, as illustrated in the following diagram. The Minimum Scheme is as for Example 56 but we request an Enhanced Scheme where the substation is looped into the existing 11KV network.



The Connection Charge for this Scheme is calculated as follows:

Extension Assets:	Cost	Apportionment	Customer Contribution
Provision and installation of 300m (2x150m) of 11KV cable	£90,000	Minimum Scheme	£45,000
800kVA transformer	£75,000	n/a	£75,000
Ring Main Unit	£25,000	Minimum Scheme	0
Provision and installation LV cabling	£6,000	n/a	£6,000
LV Metering Panel	£4,000	n/a	£4,000

11KV joints to network	£6,000	Minimum Scheme	£3,000
Total Extension Asset Cost	<b>£206,000</b>		<b>£133,000</b>

**Total cost of the work = £206,000**

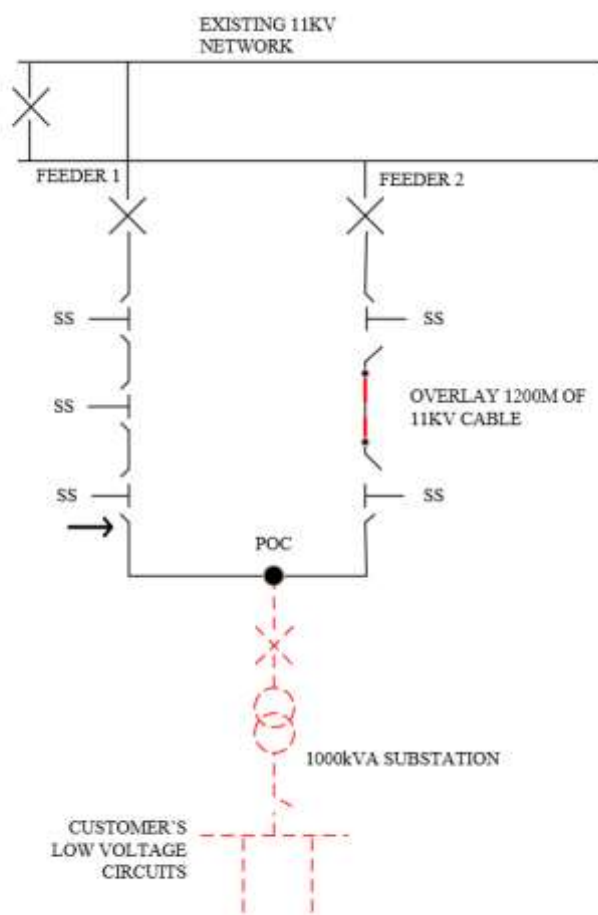
**Total Connection Charge to Customer = £133,000**

**Example 910: An additional load application requiring a new connection from the HV network and Reinforcement.**

**Purpose:** To demonstrate the treatment of Reinforcement cost for a Demand Connection that drives Reinforcement.

A Customer requests to increase the Maximum Capacity of their existing LV connection from 200kVA to 850kVA; an increase of 650kVA (the Required Capacity). The Connection is a Demand Connection.

As the Customer's existing LV connection is unable to deliver the Required Capacity a new connection will be required from the local 11KV network. This will be a non-secure connection to a secure network. The Minimum Scheme is to overlay part of the nearest 11KV circuit (Feeder 2) which only has spare capacity of 200kVA. The Reinforcement to make the capacity available requires 1200m of existing 11KV cable to be overlaid with a larger capacity cable.



**Reinforcement:**

The Relevant Section of Network is the two feeder ring comprising Feeder 1 and Feeder 2.

As this connection is a Demand Connection the Customer will not be charged for Reinforcement. The Connection Charge for this Scheme is calculated as follows:

<b>Reinforcement</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Overlay 1200m of 11KV cable	£360,000	0%	£0
11KV Jointing	£6,000	0%	£0
<b>Total Reinforcement Cost</b>	<b>£366,000</b>		<b>£0</b>

<b>Extension Assets</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Provision and installation 11KV cable	£60,000	n/a	£60,000
1000kVA substation	£80,000	n/a	£80,000
Termination of Customer's LV cables	£4,000	n/a	£4,000
LV Metering panel	£4,000	n/a	£4,000
11KV Jointing	£3,000	n/a	£3,000
<b>Total Extension Asset Cost</b>	<b>£151,000</b>		<b>£151,000</b>

**Total Cost of the Work** = £366,000 + £151,000 = **£517,000**

**Total Connection Charge to Customer** = **£151,000**

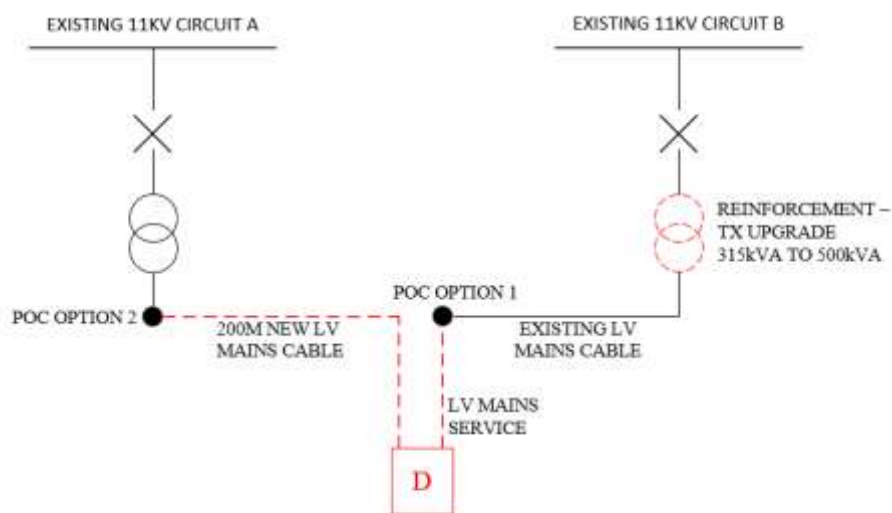
**Example 101: A new connection that results in a Point of Connection further away than the nearest network.**

**Purpose:** To show that the Minimum Scheme may result in a Point of Connection that is further away than the nearest network and may result in increased Extension Asset costs that are charged in full to the Customer.

A Customer applies for a new connection with a Maximum Capacity of 100kVA.

Assessment of the local network identifies that there is an existing LV cable to the front of the development, which is fed from a 315kVA transformer. The LV cable has sufficient spare capacity for the connection; however the transformer is at full capacity and would therefore require Reinforcement work to upgrade it from a 315kVA to 500kVA transformer.

Two design options are considered. For the first option, the cost of this work is estimated to be £70,000, and the cost of the LV Extension Assets is estimated to be £5,000.



The Connection Charge for this Option 1 would be calculated as follows:

Reinforcement Assets:	Cost	Apportionment	Customer Contribution
Upgrade 315kVA transformer to 500kVA	£70,000	0%	£0
<b>Total Reinforcement Asset Cost</b>	<b>£70,000</b>		<b>£0</b>

<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
LV Extension Assets	£5,000	n/a	£5,000
<b>Total Extension Asset Cost</b>	<b>£5,000</b>		<b>£5,000</b>

**Total cost of the work** = £70,000 + £5,000 = **£75,000**

**Total Connection Charge to Customer** = £5,000 = **£5,000**

For the second option, there is a large cross-sectional LV cable 200m from the development which is fed from a 1000kVA transformer, and both the LV cable and transformer have sufficient spare capacity to provide a connection to the development without Reinforcement work. This design requires Extension Assets involving 200m of LV Cable estimated to cost £40,000 and a mains type service; the cost of the LV Extension Assets is £5,000 consistent with the first option.

The Connection Charge for Option 2 would be calculated as follows:

<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
200m of LV mains cable	£40,000	n/a	£40,000
LV Extension Assets	£5,000	n/a	£5,000
<b>Total Extension Asset Cost</b>	<b>£45,000</b>		<b>£45,000</b>

**Total cost of the work** = **£45,000**

**Total Connection Charge to Customer** = **£45,000**

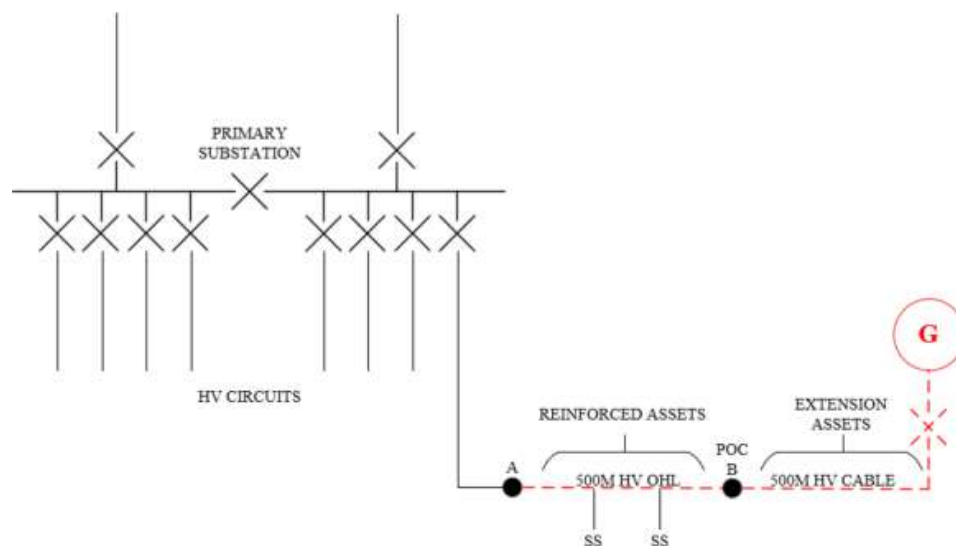
Option 2 has the lower overall capital cost of £45,000 (compared to £75,000 for Option 1) and therefore represents the Minimum Scheme. Whilst Option 2 results in a higher charge to the Customer, it is the overall capital cost that is used to determine the Minimum Scheme. The connection offer to the Customer would therefore be based on Option 2.

**Example 11.2: A new Generation Connection with capacity triggered Reinforcement.**

**Purpose:** To demonstrate the treatment of Reinforcement cost for a Generation Connection which drives Reinforcement using the Security CAF.

A Customer requests a Generation Connection with a Required Capacity for export purposes of 3MW. The Minimum Scheme requires the Reinforcement of 500m of 11KV overhead line between points A and B to provide 7.6MVA of capacity.

The POC is to the existing 11KV network at point B and it is proposed to install 500m of 11KV underground cable from the POC to the Customer's installation and this cable is treated as Extension Assets.

**Reinforcement:**

The Relevant Section of Network is the 11KV OHL between points A and B and the Security CAF applies. The numerator in the CAF calculation is based upon the Required Capacity of the Customer, i.e. 3MVA and the denominator is based on the New Network Capacity following Reinforcement, i.e. 7.6MVA.

The Connection Charge for this Scheme is calculated as follows:

Reinforcement:	Cost	Apportionment	Customer Contribution
Re-conductor 500m of 11KV overhead line at a higher capacity (7.6MVA)	£60,000	$3/7.6 \times 100\%$ = 39.5%	£23,700



<b>Total Reinforcement Cost</b>	<b>£60,000</b>		<b>£23,700</b>
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<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Installation of 500m 11KV cable	£45,000	n/a	£45,000
11KV circuit breaker at Customer's substation	£25,000	n/a	£25,000
<b>Total Extension Asset Cost</b>	<b>£70,000</b>		<b>£70,000</b>

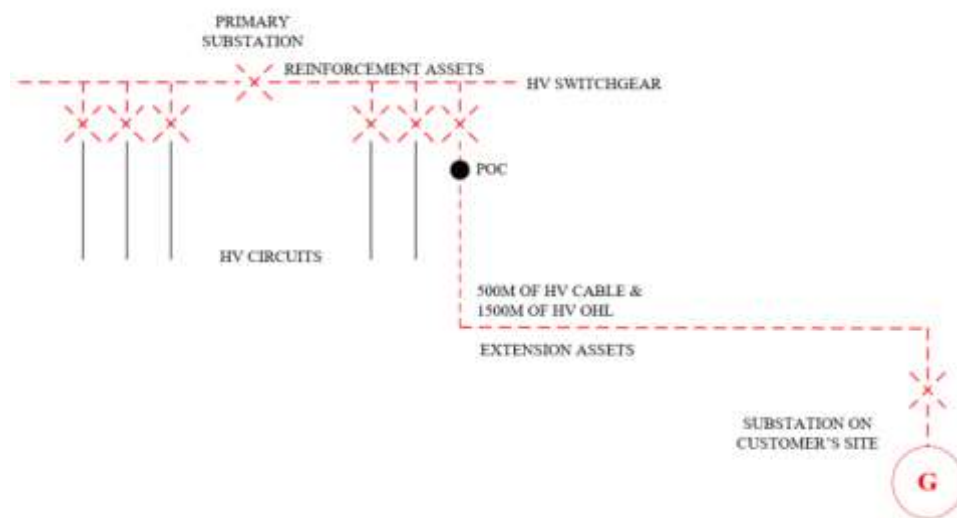
**Total cost of the work** = £60,000 + £70,000 = **£130,000**

**Total Connection Charge to Customer** = £23,700 + £70,000 = **£93,700**

**Example 123: A new Generation Connection with Fault Level-Triggered Reinforcement.****Purpose:** To demonstrate how the Fault Level CAF calculation is applied.

A Customer wishes to connect a new generator with a Required Capacity for export purposes of 6MW. The connection of the generator requires the installation of 500m of 11kV cable and 1500m of overhead line between a new circuit breaker, added to the 11kV extensible switchgear panel at an existing primary substation and a new substation at the Customer's Premises. These assets are treated as Extension Assets.

The connection of the generator necessitates Reinforcement works to replace the 11kV switchgear at the existing primary substation with switchgear of a higher fault level rating.

**Reinforcement:**

Fault Level CAF calculation: The numerator in the CAF calculation is based upon the Fault Level contribution from the Customer's new generator connection, in this Example 24MVA. The denominator is based upon the New Fault Level Capacity; in this Example the Fault Level capacity of the new 11kV switchboard, 315MVA.

The Connection Charge for this Scheme is calculated as follows:

Reinforcement:	Cost	Apportionment	Customer Contribution
Replacement 11KV switchboard (excluding Customer's sole use circuit breaker)	£800,000	3x (24/315) x 100% = 22.9%	£182,857
<b>Total Reinforcement Cost</b>	<b>£800,000</b>		<b>£182,857</b>

<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Installation of a 500m 11KV cable	£150,000	n/a	£150,000
Installation of a 1500m 11KV overhead line	£120,000	n/a	£120,000
11KV circuit breaker at Customer substation	£25,000	n/a	£25,000
<b>Total Extension Asset Cost</b>	<b>£325,000</b>		<b>£325,000</b>

**Total cost of the work** = £800,000 + £325,000 = **£1,125,000**

**Total Connection Charge to Customer** = £182,857 + £325,000 = **£507,857**

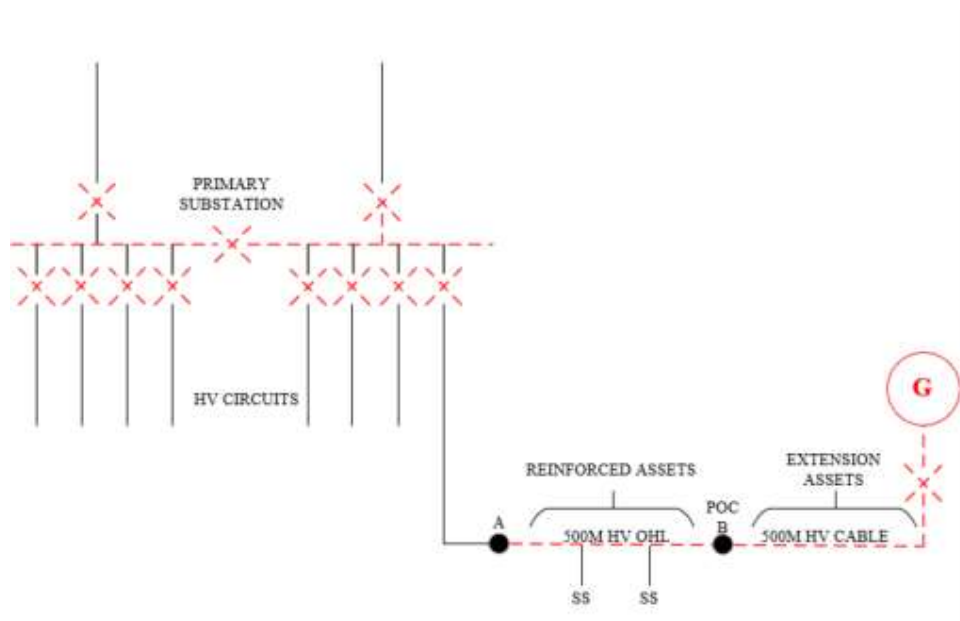
**Example 134A new Generation Connection that requires Reinforcement involving both Security and Fault Level CAFs.**

**Purpose:** To demonstrate Reinforcement charging principles for a Generation Connection where both Security CAF and Fault Level CAF are applicable.

A Customer requests a connection to a generator with a Required Capacity for export purposes of 6MW. The Fault Level contribution at the primary substation from the generation connection is 10MW.

The POC is to the existing 11KV network at point B and it is proposed to install 500m of 11KV underground cable from the POC to the Customer's installation. This is treated as Extension Assets.

The connection requires the Reinforcement of 500m of 11KV overhead line between points A and B for a thermal capacity requirement and the Security CAF applies. The connection also requires the replacement of the existing 11 panel 11KV switchboard at the primary substation in order to increase its fault level rating from 150MVA to 350MVA and the Fault Level CAF applies. However, the new fault level will be limited by the fault level rating of the local network of 250MVA.



**Reinforcement:**

The Relevant Section of Network is the 11KV network from the primary substation to Point B.

Security CAF calculation: the numerator in the CAF calculation is based upon the Required Capacity of the Customer, i.e. 6MW. The denominator is based on the New Network Capacity following Reinforcement, which is 7.6MVA, i.e. after Reinforcement, in this particular case, the section of cable with the lowest rating.

The Relevant Section of Network is the 11kV switchboard at the primary substation.

Fault Level CAF calculation: The numerator in the CAF calculation is based upon the Fault Level contribution from the Customer's new generator connection, in this Example 10MVA. The

denominator is based upon the New Fault Level Capacity, which is the lower of the Fault Level capacity of the new 11KV switchboard, 350MVA or of the local system, 250MVA in this Example.

The Connection Charge for this Scheme is calculated as follows:

Reinforcement	Cost	Apportionment	Customer Contribution
Re-conductor of 500m of 11KV overhead line	£20,000	6/7.6 x 100% = 78.9%  Security CAF	£15,789
Replacement 11KV switchboard	£800,000	3x (10/250) x 100% = 12.0%  Fault Level CAF	£96,000
<b>Total Reinforcement Cost</b>	<b>£820,000</b>		<b>£111,789</b>

Extension Assets	Cost	Apportionment	Customer Contribution
Installation of 500m 11KV cable	£150,000	n/a	£150,000
11KV circuit breaker at Customer's substation	£12,000	n/a	£12,000
11KV pole top termination	£2,500	n/a	£2,500
<b>Total Extension Asset Cost</b>	<b>£164,500</b>		<b>£164,500</b>

**Total cost of the work:** = £820,000 + £164,500 = **£984,500**

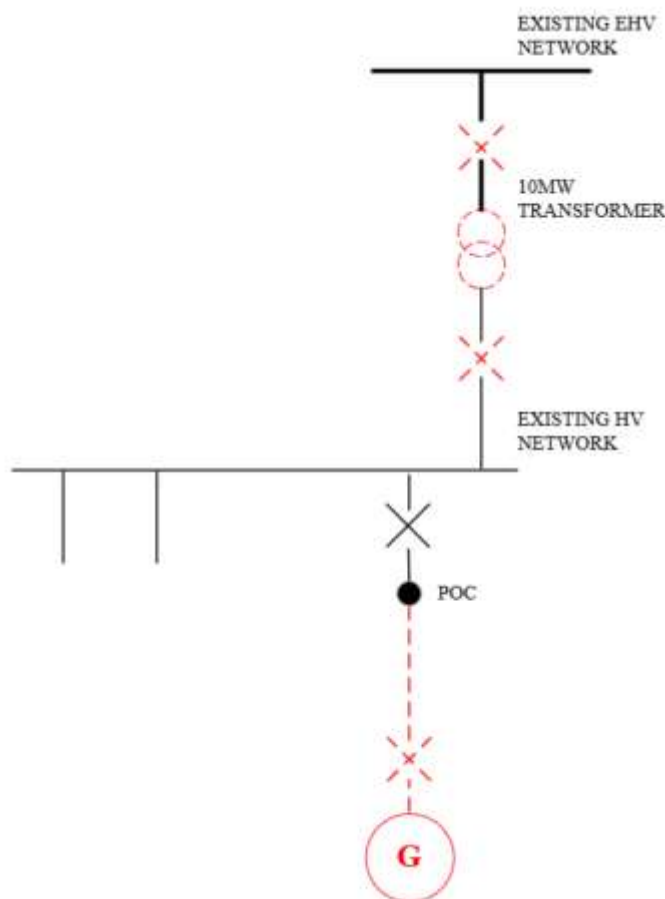
**Total Connection Charge to Customer** = £111,789 + £164,500 = **£276,289**

**Example 145 A new Generation Connection with Reinforcement at a voltage above that of the Point of Connection.**

**Purpose:** To illustrate that a Generation Connection does not contribute to Reinforcement costs at a voltage level above the connection voltage.

A Customer requests a Generation Connection with a Required Capacity for export purposes of 3.0MW. A new single circuit cable will be required to connect the Customer to the existing 11KV network. There is sufficient spare capacity on the existing 11KV network main but the existing 7.5MVA transformer at the local 11KV/33KV substation is fully loaded.

The Minimum Scheme is to provide a new 250m 11KV cable from the POC which is treated as Extension Assets. The connection also requires the replacement of the 7.5MW transformer at the local substation with a 10MVA transformer and is treated as Reinforcement. The 11KV and 33KV switchgear either side of the transformer also requires replacement due to exceedance of its thermal capacity.



**Reinforcement:**

Security CAF calculation: The numerator in the CAF calculation is based upon the Required Capacity of the Customer, which is 3MW. The denominator is based on the New Network Capacity following Reinforcement, which is 10MVA.

Reinforcement is required at both the 11KV and 33KV levels, however the CAF is only required at the same voltage of connection, which in this case is 11KV.

The Connection Charge for this Scheme is calculated as follows:

<b>Reinforcement:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
11KV Jointing	£3,000	3/10 x 100% = 30%  Security CAF	£900
11KV circuit breaker	£30,000	3/10 x 100% = 30%  Security CAF	£9,000
33KV circuit breaker	£80,000	0%	£0
Transformer replacement	£1,500,000	0%	£0
<b>Total Reinforcement Cost</b>	<b>£1,613,000</b>		<b>£9,900</b>

<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Install 200m of 11KV cable	£60,000	n/a	£60,000
11KV circuit breaker at Customer's substation	£25,000	n/a	£25,000
11KV Jointing	£3,000	n/a	£3,000
<b>Total Extension Asset Cost</b>	<b>£88,000</b>		<b>£88,000</b>

**Total cost of the work** = £1,613,000 + £88,000 = **£1,701,000**

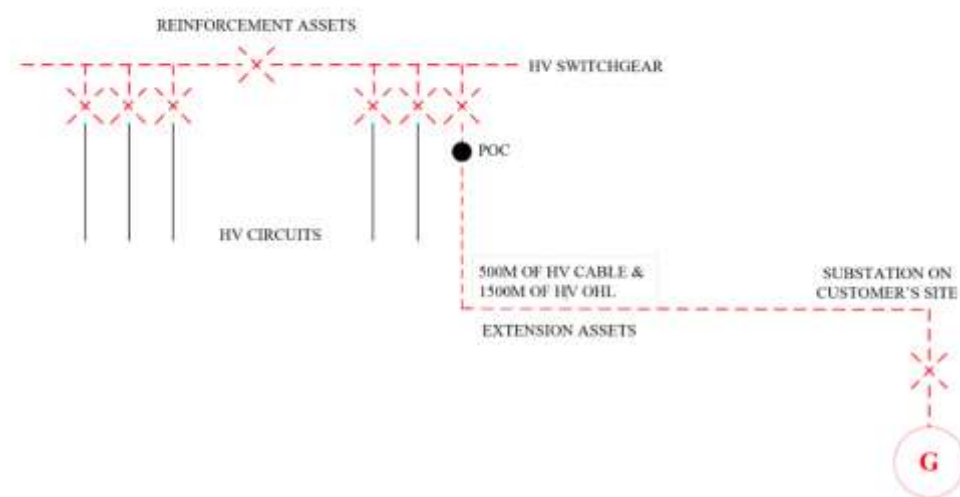
**Total Connection Charge to Customer** = £9,900 + £88,000 = **£97,900**

**Example 156: A new Generation Connection where switchgear extension is not possible and switchgear replacement is needed.**

**Purpose:** Illustrate Exception 4, if switchgear extension not possible, then treated as Extension Assets and costs are charged in full to the Customer.

This example demonstrates the application of Exception 4 (paragraph 1.24).

A Customer requests to connect a new generator with a Required Capacity for export purposes of 3MW. The connection of the generator requires the installation of the works as provided in Example 13 above. In this scenario, however, there is no Fault Level issue but, as the connection cannot be facilitated by an extension of the existing switchgear equipment in our primary substation, a full replacement of the existing switchgear installation is required. As no capacity is added to the existing shared use distribution network, the Customer will be required to fund the full cost of the switchgear installation replacement.



The existing switchgear had fault level rating of 250MVA. The company no longer uses switchgear with a fault level rating of 250MVA, so uses the closest equivalent switchgear used by it as standard, which has a slightly higher rating. Whilst the replacement switchgear increases the fault level capacity and could be considered Reinforcement, in this case this is due solely to the fault level rating of the standard equipment used by the company being higher than the fault level rating of the existing switchgear. The increase in fault level capacity is not required to connect the Customer. Therefore, Exception 4 (Paragraph 1.24) applies and the switchgear is considered Extension Assets and its costs will be charged in full to the Customer.

The Connection Charge for this Scheme is calculated as follows:

Extension Assets:	Cost	Apportionment	Customer Contribution
Installation of a 500m 11KV cable	£150,000	n/a	£150,000



Installation of a 1500m 11KV overhead line	£120,000	n/a	£120,000
11KV circuit breaker at Customer substation	£25,000	n/a	£25,000
Replacement 11kV switchboard	£450,000	n/a	£450,000
New Extension Asset circuit breaker	£25,000	n/a	£25,000
<b>Total Extension Asset Cost</b>	<b>£770,000</b>		<b>£770,000</b>

**Total cost of the work = £770,000**

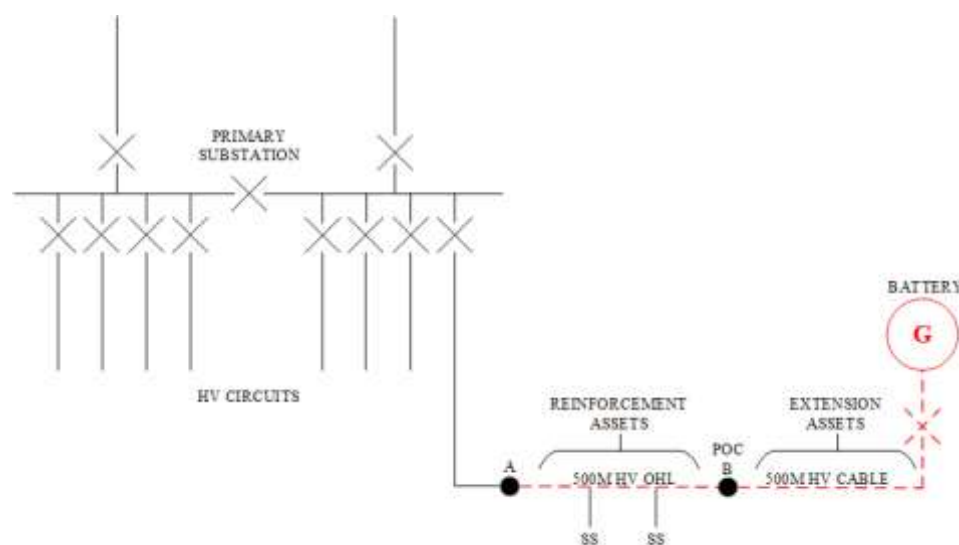
**Total Connection Charge to Customer = £770,000**

**Example 167: A new Storage Connection that triggers Reinforcement.**

**Purpose:** To show that Storage, when not co-located with other demand, is treated as a Generation Connection for the purposes of charging and any Reinforcement at the same Voltage of the POC will be charged, irrespective of whether the Reinforcement is due to the import or the export.

A Customer requests to connect a Battery with a Required Capacity of 3MW export and 3MVA import. The Minimum Scheme requires the Reinforcement of 500m of 11KV overhead line between points A and B to provide 7.6MVA of capacity.

The POC is to the existing 11KV network at point B and it is proposed to install 500m of 11KV underground cable from the POC to the Customer's installation and this cable is treated as Extension Assets.

**Reinforcement:**

The Relevant Section of Network is the 11KV OHL between points A and B and the Security CAF applies. The numerator in the CAF calculation is based upon the Required Capacity of the Customer. In this instance, the reinforcement is driven by the Required Capacity for import, i.e. 3MVA and the denominator is based on the New Network Capacity following Reinforcement, i.e. 7.6MVA.

The Connection Charge for this Scheme is calculated as follows:

<b>Reinforcement:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Re-conductor 500m of 11KV overhead line at a higher capacity (7.6MVA)	£60,000	$3/7.6 \times 100\%$ = 39.5%	£23,700
<b>Total Reinforcement Cost</b>	<b>£60,000</b>		<b>£23,700</b>

<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Installation of 500m 11KV cable	£45,000	n/a	£45,000
11KV circuit breaker at Customer's substation	£25,000	n/a	£25,000
<b>Total Extension Asset Cost</b>	<b>£70,000</b>		<b>£70,000</b>

**Total cost of the work** = £60,000 + £70,000 = **£130,000**

**Total Connection Charge to Customer** = £23,700 + £70,000 = **£93,700**

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**Example 17: A new housing development connection that is connected by Reinforced assets**

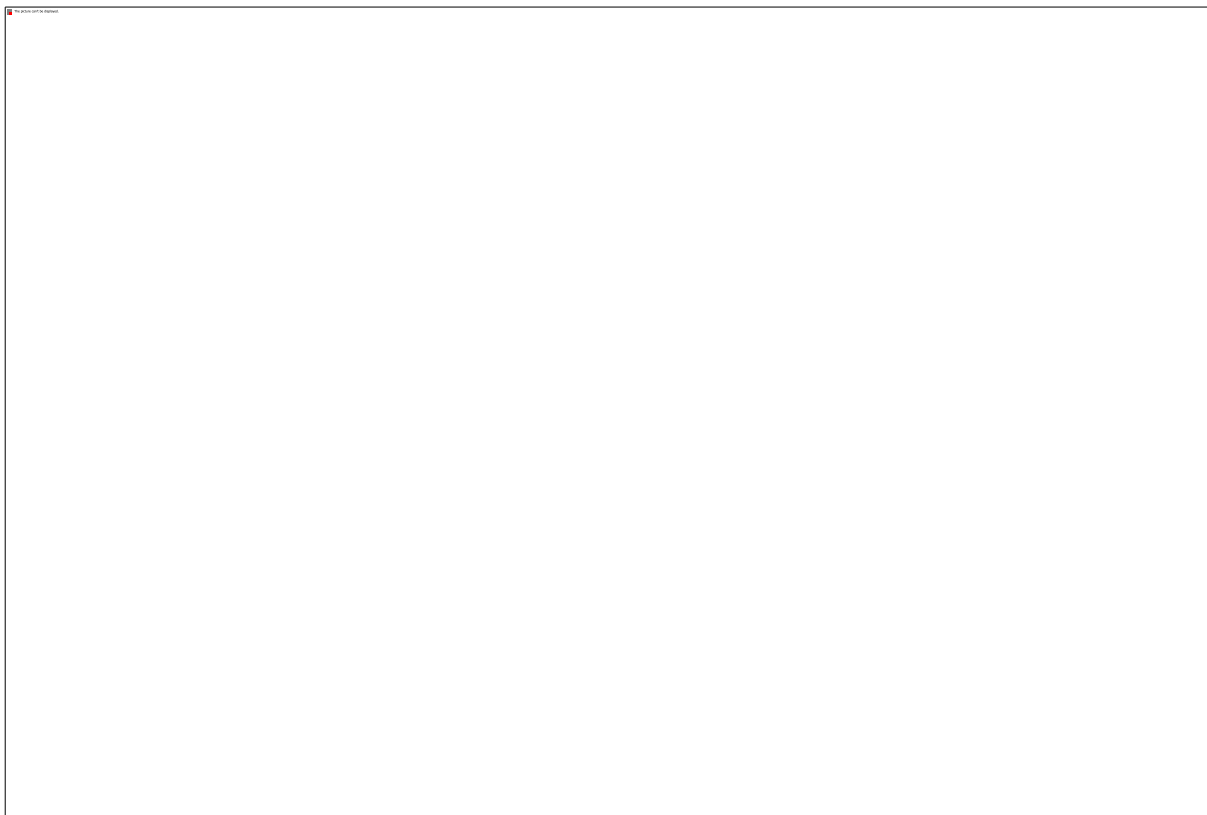
**Purpose:** To demonstrate the application of Exception 5 where the Customer needs to pay for the assets that connect them to the existing network

A new housing development has a Required Capacity of 1MVA to serve 450 plots. The local 11kV feeder has a network capacity of 7.7MVA based upon the limitation of the existing 400 Amp circuit breakers at Primary Substation A. The existing load on the circuit is 7.6MVA. The new load will be connected to the existing 11kV feeder from Primary Substation A with 100m of 11kV cable from POC A to the point D at the boundary of the site and provide interconnection with 700m of 11kV cable from POC B at Primary Substation B to the boundary of the site at point C. In this example:

- 200m of 11kV cable on site (between points C and D) is required to provide connectivity within the development and is considered to be Extension Assets.
- 100m of 11kV cable from POC A to the point D.
- 700m of 11kV cable from POC B to the point C

The Minimum Scheme requires the site to be connected onto the existing network. In this case the lowest cost feeder is the 11kV cable from A to D and is treated as an Extension Asset. The alternative connection to POC B at Primary Substation B is required to meet the minimum network security requirements and is treated as Reinforcement.

The figure below shows the proposed network.



**Reinforcement:**

The 700m of 11kV cable from POC B at Primary Substation B to point C is treated as reinforcement however as this is a demand connection the reinforcement work is funded by us.

The Connection Charge for this Scheme is calculated as follows:

<b><u>Reinforcement:</u></b>	<b><u>Cost</u></b>	<b><u>Apportionment</u></b>	<b><u>Customer Contribution</u></b>
<u>1 new HV Circuit Breaker from POC B</u>	<u>£30,000</u>	<u>0%</u>	<u>£0</u>
<u>2 by HV closing joints</u>	<u>£6,000</u>	<u>0%</u>	<u>£0</u>
<u>700m of HV cable from POC B to point C</u>	<u>£210,000</u>	<u>0%</u>	<u>£0</u>
<b><u>Total Reinforcement Cost</u></b>	<b><u>£246,000</u></b>		<b><u>£0</u></b>

<b><u>Extension Assets:</u></b>	<b><u>Cost</u></b>	<b><u>Apportionment</u></b>	<b><u>Customer Contribution</u></b>
<u>100m of HV cable from POC A to point D</u>	<u>£30,000</u>	<u>n/a</u>	<u>£30,000</u>
<u>One 1000KVA Substation</u>	<u>£225,000</u>	<u>n/a</u>	<u>£225,000</u>
<u>On site LV mains and services</u>	<u>£24,900</u>	<u>n/a</u>	<u>£24,900</u>
<u>2 by HV cable box terminations</u>	<u>£24,000</u>	<u>n/a</u>	<u>£24,000</u>
<b><u>Total Extension Asset Cost</u></b>	<b><u>£303,900</u></b>		<b><u>£303,900</u></b>

**Total cost of the work** = £246,000 + £303,900 = **£549,900**

**Total Connection Charge to Customer** = £303,900 = **£303,900**

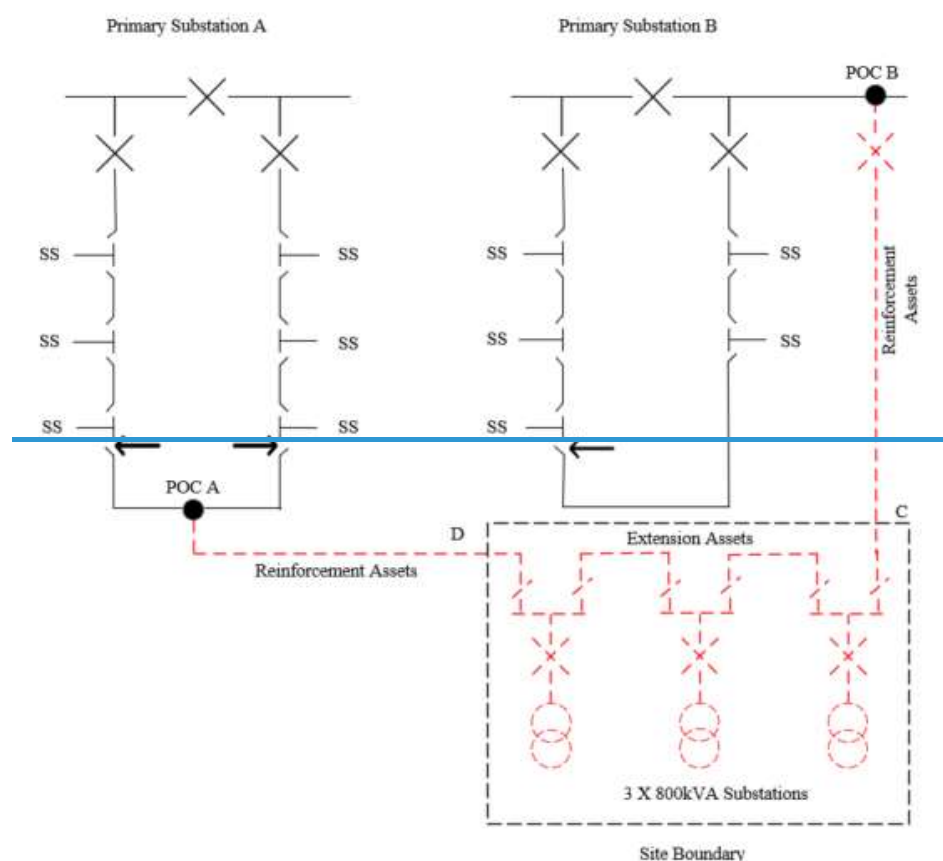
**Example 18: A new connection of a development**

**Purpose:** To demonstrate the application of Exception 5 where the Customer pays for assets within the site boundary.

This example demonstrates the application of Exception 65 (paragraph 1.265) where the Customer pays for assets within the site boundary.

A new housing development (a Demand Connection) has a Required Capacity of 2MVA to serve 900 plots. The local 11KV feeder has a network capacity of 7.7MVA based upon the limitation of the existing 400 Amp circuit breakers at Primary Substation A. The existing load on the circuit is 7.6MVA. It is therefore not possible to connect the new load to this circuit without Reinforcement works. The Minimum Scheme is to connect the new load to the new 11KV feeder from Primary Substation B and provide interconnection to an existing secure 11KV feeder from Primary Substation A. In this Example 600m of 11KV cable on site (between Points C and D) is required to provide connectivity within the development and is considered to be Extension Assets.

The figure below shows the proposed network.

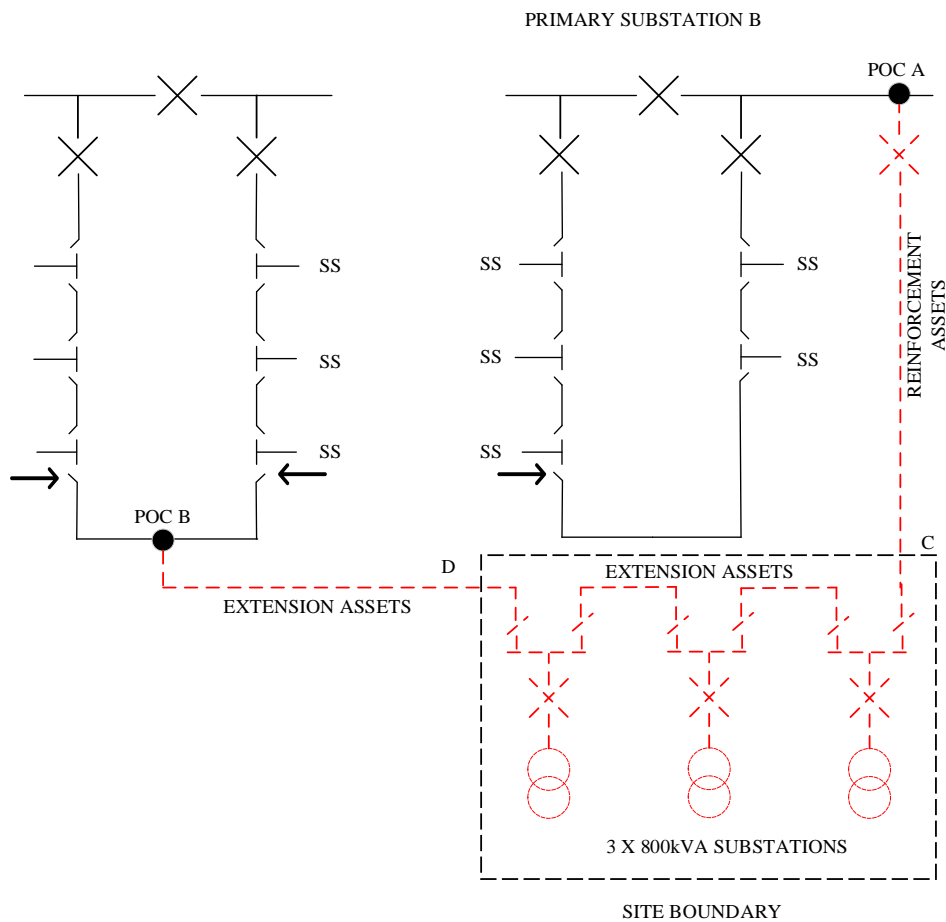
**Reinforcement:**

The assets connecting POC A and POC B add capacity to the existing network will be treated as Reinforcement. These comprise—

- the assets between the Customer's site and POC A (POC A to point D);
- the assets between the Customer's site and POC B (POC B to point C); and
- the 600m of 11KV cable on site.

The three 800kVA substations are not considered to provide connection between POC A and POC B. The 600m of 11KV cable on site is additional network length to provide connectivity between multiple exit points on the Customer's site. Therefore, Exception 65 applies and the 600m of 11KV cable on site will be treated as Extension Assets and its costs will be charged in full to the Customer.

The figure below shows the proposed network.



### Reinforcement:

The assets connecting POC B and point C add capacity to the existing network will be treated as Reinforcement and funded by us.

The Connection Charge for this Scheme is calculated as follows:

Reinforcement:	Cost	Apportionment	Customer Contribution
----------------	------	---------------	-----------------------

1 new 11KV Circuit Breaker tailed out from Primary Substation B (POC A)	£30,000	0%	£0
2 by 11KV closing joints	£6,000	0%	£0
700m of 11KV cable from Primary Substation B to site	£210,000	0%	£0
<del>600m of 11KV cable from POC B to site</del>	<del>£180,000</del>	<del>0%</del>	<del>£0</del>
<b>Total Reinforcement Cost</b>	<b>£4246,000</b>		<b>£0</b>

<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
600m of 11KV cable on site	£180,000	n/a	£180,000
3 by 800KVA unit Substation	£225,000	n/a	£225,000
On site LV mains and services	£24,900	n/a	£24,900
2 by 11KV cable box terminations	£24,000	n/a	£24,000
<u>600m of 11KV cable from POC A to site</u>	<u>£180,000</u>	<u>n/a</u>	<u>£180,000</u>
<b>Total Extension Asset Cost</b>	<b>£633453,900</b>		<b>£633453,900</b>

**Total cost of the work** = £24426,000 + £63453,900 = **£879,900**

**Total Connection Charge to Customer** = £0 + £63453,900 = **£63453,900**



**Example 19: A new connection with remote network Reinforcement**

**Purpose:** To show treatment where capacity is created on a different part of the network and a load transfer is required to allow the connection. Example again demonstrates which elements are Reinforcement and which are Extension Assets.

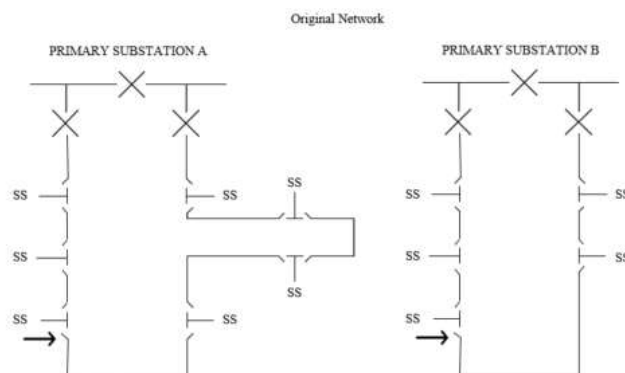
This example shows the arrangements that will apply where it is necessary to reinforce a different part of the Distribution System so that existing load may be transferred in order to release capacity for the new connection.

A Customer requests a Generation Connection with a Required Capacity of 2MW. The local 11KV feeder has a network capacity of 7.7MW based upon the limitation of the existing 400 Amp circuit breakers at Primary Substation A. The existing load on the circuit is 7.7MW. It is therefore not possible to connect the new generation to this circuit without Reinforcement works.

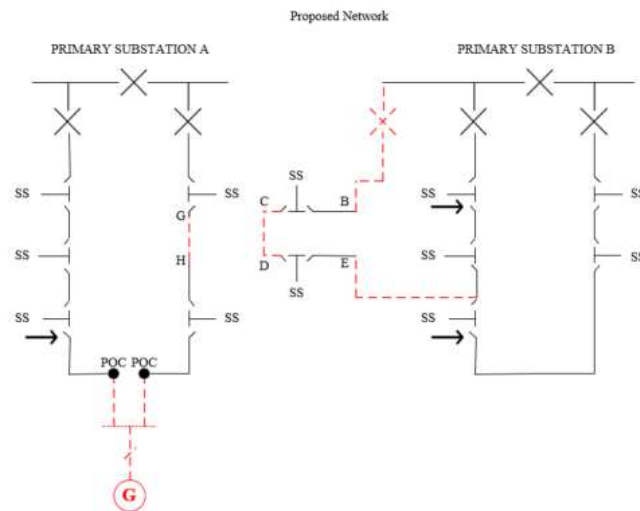
It is proposed to reinforce an adjacent network from primary substation B so that two existing substations may be transferred on to it from primary substation A, in order to release capacity to accommodate the new connection. Primary Substation B has sufficient spare capacity to accommodate the two existing substations. A new circuit breaker is to be installed at Primary Substation B and a new 11KV feeder (also rated at 7.7MW) is to be installed between points A – B and between points E – F for connection to the local 11KV circuit at point F. The existing circuit will be cut at point BE so that the new joints can be made. This will convert the Primary Substation B network from a two-feeder to a three-feeder network. The total new cable length between points A – B and points E - F is 500m. The network will be reconfigured by the installation of two short straps C – D and G - H in order to maintain connectivity.

This Reinforcement will allow a POC to be taken from the local 11KV circuit to supply the new generation. The newly installed cable to connect the generation from the POC is 1200m long. The above work represents the Minimum Scheme to provide connections to the new site.

The figure below shows the original network.



The figure below shows the proposed network.



### Reinforcement:

The Relevant Section of Network is the three-feeder network from Primary Substation B which supplies the loads on the existing two feeders from Primary Substation B as well as the loads at points C and D transferred from the network from the Primary Substation A. The RSN does not supply the new generation in this case. The numerator in the CAF calculation is based upon the Required Capacity of the new generation, i.e. 2MW. In this case, the New Network Capacity (under N-1 conditions) following the Reinforcement works is equal to  $(3 - 1) \times 7.7\text{MW} = 15.4\text{MW}$ .

Fault Level CAF calculation: This Scheme does not have any significant Fault Level contribution to the existing shared use distribution network and Fault Level CAF is therefore not applicable here.

The Connection Charge for this Scheme is calculated as follows:

Reinforcement:	Cost	Apportionment	Customer Contribution
500m of 11KV cable: A-B, C-D, E-F	£150,000	$2/15.4 \times 100\% = 13\%$	£19,480
11KV Circuit Breaker at Primary Substation B	£30,000	As above	£3,896
11KV jointing at Points A,B,C,D,E,F	£18,000	As above	£2,337
<b>Total Reinforcement Cost</b>	<b>£198,000</b>		<b>£25,713</b>

Extension Assets:	Cost	Apportionment	Customer Contribution
1200m of 11KV cable inc. strap at G – H	£360,000	n/a	£360,000

3 by 800kVA distribution substations	£225,000	n/a	£225,000
On site LV mains and services	£24,900	n/a	£24,900
4 by 11KV closing joints at POC and at points G,H	£12,000	n/a	£12,000
<b>Total Extension Asset Cost</b>	<b>£621,900</b>		<b>£621,900</b>

**Total cost of the work** = £198,000 + £621,900 = **£819,900**

**Total Connection Charge to Customer** = £25,713 + £621,900 = **£647,613**

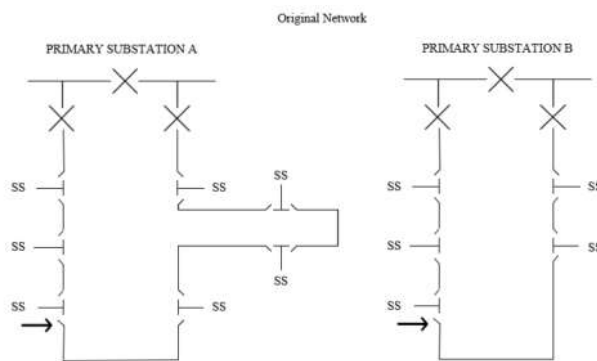
**Example 20: A new connection with load transfer**

**Purpose:** Variation to Example 19 where a load transfer is required to free up capacity but no new capacity is created and demonstrates why elements become Extension Assets.

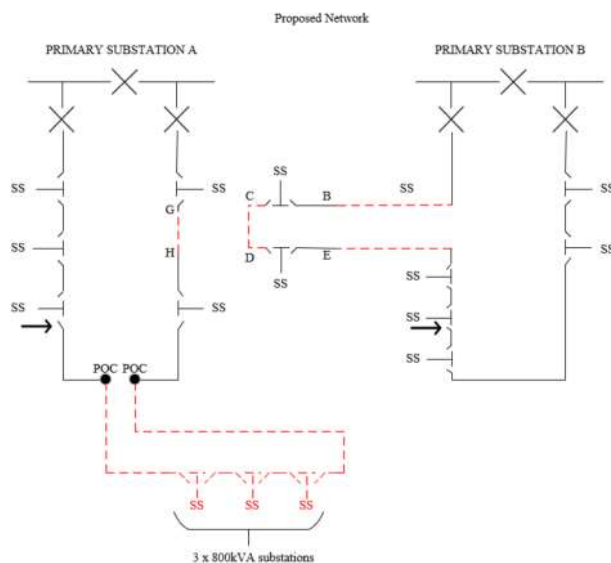
This variation of Example 19 shows the arrangements that will apply where it is necessary to reconfigure the Distribution System so that existing demand may be transferred in order to release capacity for the new connection.

A new housing development has a Required Capacity of 2MVA to serve 900 plots. The local 11KV feeder has a network capacity of 7.7MVA based upon the limitation of the existing 400 Amp circuit breakers at Primary Substation A. The existing load on the circuit is 7.6MVA. It is therefore not possible to connect the new load to this circuit as presently configured.

The figure below shows the original network.



The figure below shows the proposed network.



**Reinforcement:**

It is proposed to reconfigure the Distribution System such that two existing substations may be transferred on to an adjacent network, in order to release capacity so that the new connections can be made. Primary Substation B has sufficient spare capacity to accommodate the two existing substations. New cables are to be installed between points A – B and between points E – F. The existing circuit will be cut at point B & E so that the new joints can be made. The total new cable length between points A – B and points E – F is 100m. The network will be reconfigured by the installation of two short straps C – D and G - H in order to maintain connectivity. As this work involves the transfer of capacity there is no Reinforcement work required.

This transfer of existing demand will allow a POC to be taken from the local 11KV circuit to connect the new development. The newly installed cable to connect the development from the POC is 1200m long. Three 800kVA distribution substations are to be established onsite. The above work represents the Minimum Scheme to provide connections to the new site.

The Connection Charge for this Scheme is calculated as follows:

<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
1300m of 11KV cable including A-B, C-D, E-F, G-H and from POC to the development	£390,000	n/a	£390,000
3 by 800kVA distribution substations	£225,000	n/a	£225,000
On site LV mains and services	£24,900	n/a	£24,900
10 by 11KV closing joints at POC and at points A,B,C,D,E,F,G,H	£30,000	n/a	£30,000
<b>Total Extension Asset Cost</b>	<b>£669,900</b>		<b>£669,900</b>

**Total cost of the work = £669,900**

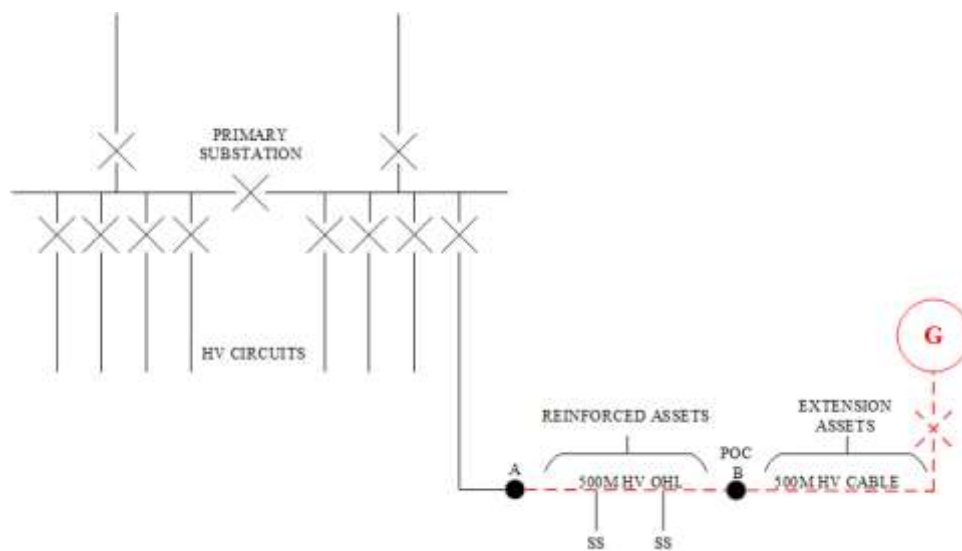
**Total Connection Charge to Customer = £669,900**

**Example 21: A new Generation Connection with an Enhanced Scheme at the DNO's request.**

**Purpose:** To show how the Security CAF calculation is applied where the DNO requests an Enhanced Scheme.

Please refer to Example 112, which is the Minimum Scheme for this project. In this example, a Customer requests a Generation Connection with a Required Capacity for export purposes of 3MW. The Minimum Scheme requires the Reinforcement of 500m of 11KV overhead line between points A and B to provide 7.6MVA of capacity. However, the DNO has decided to install an Enhanced Scheme by increasing the capacity of the 11KV overhead line to 13MVA.

The POC is to the existing 11KV network at point B and it is proposed to install 500m of 11KV underground cable from the POC to the Customer's installation.

**Reinforcement:**

The Relevant Section of Network is the 11KV OHL between points A and B

Security CAF calculation: The numerator in the CAF calculation is based upon the Required Capacity of the new generation, i.e. 3MW. In this example the DNO has decided to install an Enhanced Scheme and the Connection Charge that will apply will be the lower of the Connection Charge associated with the Minimum Scheme (see Example 112) and the Enhanced Scheme. The numerator in the CAF calculation is based upon the Required Capacity of the Customer, i.e. 3MW and the denominator is based on the Enhanced Scheme New Network Capacity following Reinforcement, i.e. 13MVA.

Fault Level CAF calculation: This Scheme does not have any significant Fault Level contribution to the existing shared use distribution network so the Fault Level CAF is therefore not applicable here.

The Connection Charge for this Scheme is calculated as follows:

<b>Reinforcement:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Re-conductor 500m of 11KV overhead line at a higher capacity (13MVA)	£70,000	3/13 x 100% = 23.1%	£16,170
<b>Total Reinforcement Cost</b>	<b>£70,000</b>		<b>£16,170</b>

<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Installation of 500m 11KV cable	£45,000	n/a	£45,000
11KV circuit breaker at Customer's substation	£25,000	n/a	£25,000
<b>Total Extension Asset Cost</b>	<b>£70,000</b>		<b>£70,000</b>

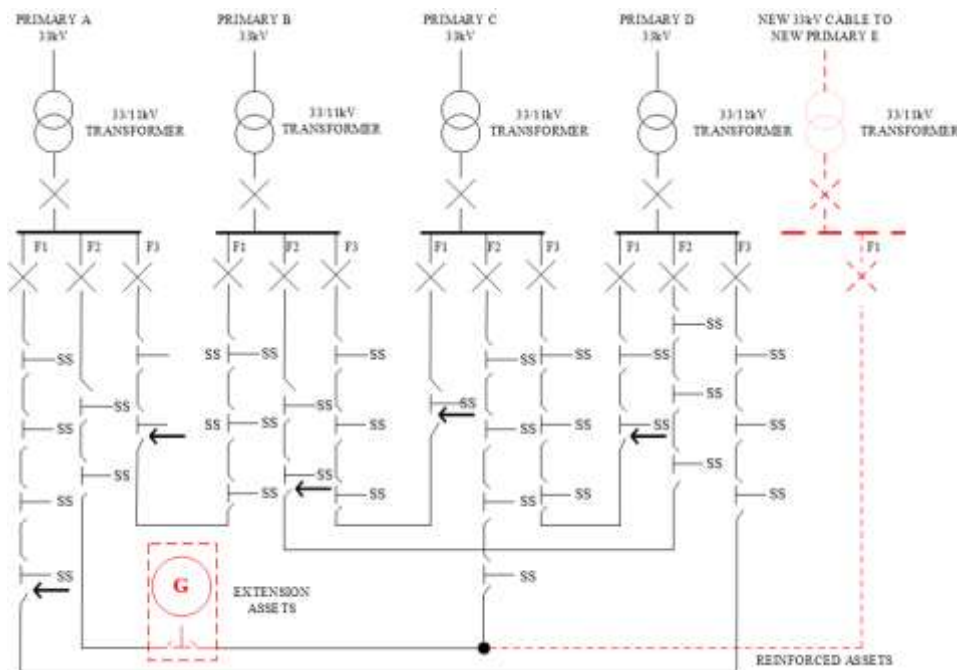
**Total cost of the work** = £70,000 + £70,000 = **£140,000**

**Total Connection Charge to Customer** = £16,170 + £70,000 = **£86,170**

**Example 22: A new Generation Connection on a meshed HV distribution system requiring Reinforcement.**

**Purpose:** To show that a contribution is required where Reinforcement is carried out at the same voltage as the Point of Connection for a Generation Connection.

A Customer requests a new Generation Connection requiring a 4MVA 11KV metered connection. The local 11KV network is of a meshed design whereby the 11KV network is supplied from single 33/11KV primary transformers via 33KV radial feeds as shown below.



The existing network consists of four 10MVA primary transformer substations and associated 11KV switchgear. A new connection of 4MVA has been requested in the vicinity of F2 from Primary A.

The existing relevant primary transformer group is loaded to its secure capacity so the primary transformer group will require Reinforcement to enable the new connection to progress.

To provide the Required Capacity, the 11KV network will be reinforced by the installation of a new primary substation connected to the nearest 33KV circuit. The new primary substation (Primary E) will contain a 10MVA transformer, associated 11KV switchgear and a new 11KV (7.7 MVA) cable installed to interconnect into the existing 11KV network (from F2 at Primary A to F2 at Primary C).

**Reinforcement:**

Security CAF calculation: In this example there are two different Security CAFs applied. This is because the Relevant Section of Network is different when considering the New Network Capacity in respect of different elements of the Reinforcement works.



The Relevant Section of Network for the Reinforcement comprising the 11KV Cable Works:

For the 11KV cable assets the Relevant Section of Network is considered to be the secure three feeder 11KV network from Primary A (Feeder 2), Primary C (Feeder 2) and Primary E (Feeder 1). In this case the New Network Capacity (under secure N -1 conditions) following the Reinforcement works is equal to

$$(3 - 1) \times 7.7\text{MVA} = 15.4\text{MVA}$$

This is due to the fact that following the Reinforcement work both of the existing circuits; Primary A, Feeder 2 and Primary C, Feeder 2 can be loaded to their full capacity and will have the newly installed clean feeder from Primary E to act as a back feed to meet the requirements of P2.

The Security CAF for these assets will therefore be  $4/15.4 \times 100\% = 26.0\%$

The Relevant Section of Network for the Reinforcement comprising the Primary substation assets:

In this instance the Relevant Section of Network comprises Primary A, C and E within the group that can be used to supply the Customer in normal and abnormal conditions. The New Network Capacity of this Relevant Section of Network (under secure N -1 conditions) following the Reinforcement works is equal to 17.7MVA. (10MVA from either Primary A or Primary C and 7.7MVA from Primary E which is limited by the single 11KV cable connected to it.

The Security CAF for these assets will therefore be  $4/17.7 \times 100\% = 22.6\%$  towards the 11KV assets to be installed.

Due to the voltage rule, contributions will not be required towards the 33KV assets.

Fault Level CAF calculation: This Scheme does not have any significant Fault Level contribution to the existing shared use distribution network and Fault Level CAF is therefore not applicable here.

The Connection Charge for this Scheme is calculated as follows:

**Reinforcement:**

<b>Reinforcement:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
500m 11KV cable from new primary substation E	£150,000	$4/15.4 \times 100\% = 26.0\%$	£39,000
1 by 11KV closing joints	£3,000	As above	£780
11KV switchgear at new Primary E	£30,000	$4/17.7 \times 100\% = 22.6\%$	£6,780
Primary transformer	£6,500,000	0%	£0
2.5km of 33KV cable installation	£1,000,000	0%	£0

33KV Circuit Breaker	£80,000	0%	£0
33KV Termination	£30,000	0%	£0
<b>Total Reinforcement Cost</b>	<b>£7,793,000</b>		<b>£46,560</b>

<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
11KV ring main unit	£25,000	n/a	£25,000
11KV metering unit	£12,000	n/a	£12,000
500m of 11KV cable	£150,000	n/a	£150,000
2 by 11KV closing joints	£6,000	n/a	£6,000
<b>Total Extension Asset Cost</b>	<b>£193,000</b>		<b>£193,000</b>

**Total cost of the work** = £7,793,000 + £193,000 = **£7,986,000**

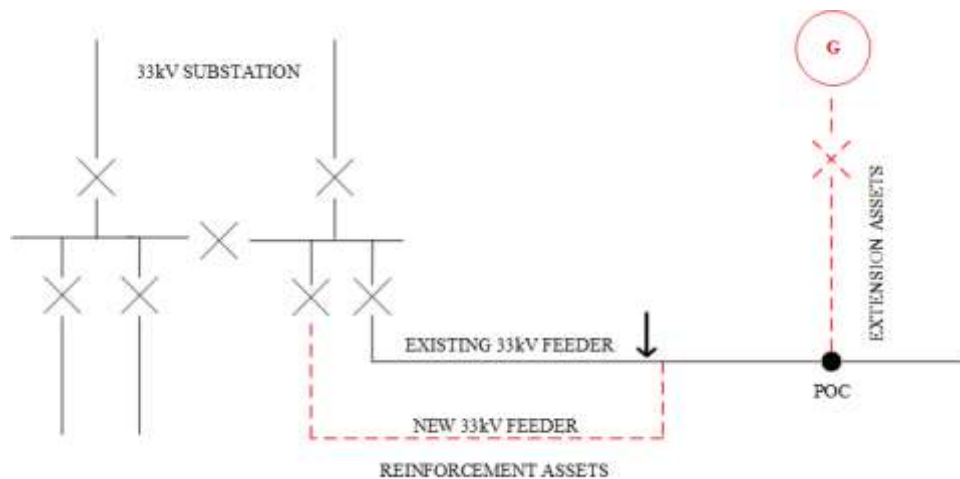
**Total Connection Charge to Customer** = £46,560 + £193,000 = **£239,560**

**Example 23: A non-secure Generation Connection with non-secure Reinforcement.**

**Purpose:** To show that a contribution is required where Reinforcement is carried out at the same voltage as the Point of Connection for a Generation Connection in relation to a non-secure system.

A Customer wishes to connect a new generator (a Generation Connection) with a Required Capacity for export purposes of 5 MVA. The connection of the generator requires the installation of 1,000m of 33KV cable and a 33KV metering circuit breaker, these being Extension Assets. An existing spare circuit breaker at the substation is utilised which, in this case, is not chargeable to the Customer.

As there is insufficient capacity in the existing 24.0 MVA thermal capacity rated 33KV feeder for the new generation due to the presence of existing generation, the connection also requires the installation of a new 33KV feeder, which also has a thermal capacity of 24.0 MVA, as Reinforcement. This is the Minimum Scheme as it is cheaper to do this, to the extent as shown in the diagram below, rather than upgrade the existing 33KV feeder to the same point along it.

**Reinforcement:**

The numerator in the CAF calculation is the Required Capacity of the new generator, which is 5.0 MVA.

The RSN in this case is the existing 33KV feeder and the new 33KV feeder. The New Network Capacity is calculated using the non-secure capacity and is therefore the sum of the thermal capacities of the two feeders, which is 48.0 MVA. This is the denominator in the CAF calculation.

The Connection Charge for this Scheme is calculated as follows:

**Reinforcement:**

Reinforcement:	Cost	Apportionment	Customer Contribution
Installation of new 33KV feeder	£ 500,000	$5.0 / 48.0 \times 100\% = 10.4\%$	£ 52,000

<b>Total Reinforcement Cost</b>	£500,000		<b>£ 52,000</b>

<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Installation of 1,000m 33KV cable	£ 400,000	n/a	£ 400,000
Installation of 33KV metering circuit breaker	£ 80,000	n/a	£ 80,000
11KV Jointing x2	£6,000	n/a	£6,000
<b>Total Extension Asset Cost</b>	<b>£486,000</b>		<b>£486,000</b>

**Total cost of the work** = £500,000 + £486,000 = **£986,000**

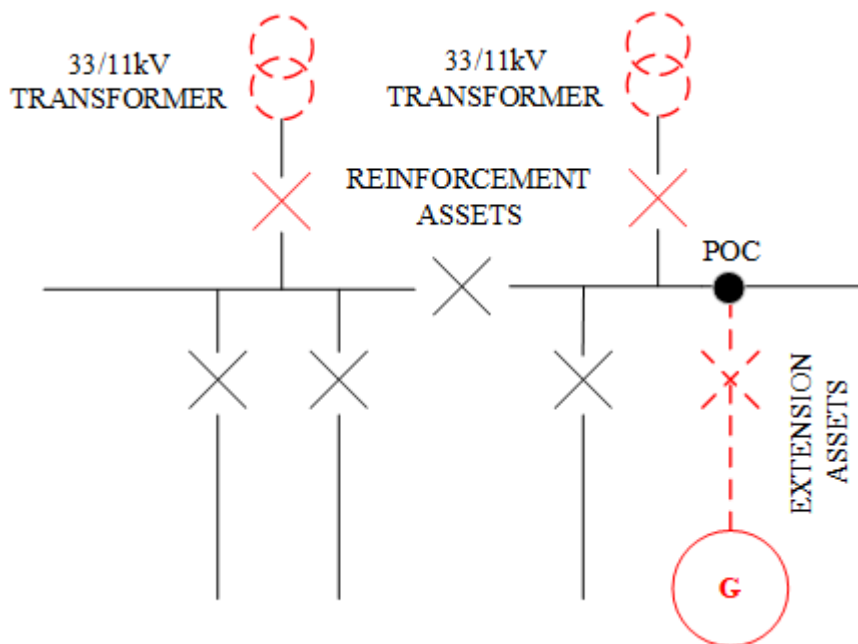
**Total Connection Charge to Customer** = £52,000 + £486,000 = **£538,000**

**Example 24: A new non-secure Generation Connection with secure Reinforcement.**

**Purpose:** To show the application of the apportionment rule where secure Reinforcement is provided but the connection for a Generation Connection is non-secure.

A Customer applies for a new generator (a Generation Connection) requiring an 8 MW metered connection. In this case, the Customer has exercised their option to request non-secure Extension Assets in the provision of the connection.

The existing network comprises a substation which has 2 x 15 MVA 33/11kV transformers. The Minimum Scheme to provide the connection is to install 750m of 11kV cable from the substation to the industrial premises, as Extension Assets. As there is insufficient capacity available from the existing 2 x 15 MVA transformers to provide the new connection, it will be necessary to upgrade the transformers to 2 x 24 MVA units along with their associated 11kV circuit breakers. The Reinforcement is required to ensure the 11kV network load can be maintained during planned or unplanned outages of one of the transformers. Although the Customer wishes to accept a non-secure connection, the substation must provide secure capacity to its Group Demand (which includes the Customer) to comply with the requirements of Engineering Recommendation P2. As the Extension Assets will be provided solely for the Customer, these can be provided on the basis of a single circuit to provide a non-secure connection, at the Customer's request.

**Reinforcement:**

As the transformer Reinforcement is a voltage above, the generator will not contribute towards this part of the works.

The numerator in the CAF calculation is the Required Capacity, which is 8.0 MVA.

The New Network Capacity is the secure capacity of the transformers, which is 24 MVA. This is the denominator in the CAF calculation.

The Connection Charge for this Scheme is calculated as follows:

<b>Reinforcement:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Installation of 2 x 24MVA 33/11kV transformers	£6,500,000	0%	£0
2 x 11kV circuit breakers	£60,000	8 / 24 x 100% = 33.3%	£20,000
<b>Total Reinforcement Cost</b>	<b>£6,560,000</b>		<b>£20,000</b>

<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
750m 11kV cable	£225,000	n/a	£225,000
11kV metering circuit breaker	£30,000	n/a	£30,000
11kV joints x2	£6,000	n/a	£6,000
<b>Total Extension Asset Cost</b>	<b>£261,000</b>		<b>£261,000</b>

**Total cost of the work** = £6,560,000 + £261,000 = **£6,821,000**

**Total Connection Charge to Customer** = £20,000 + £261,000 = **£281,000**

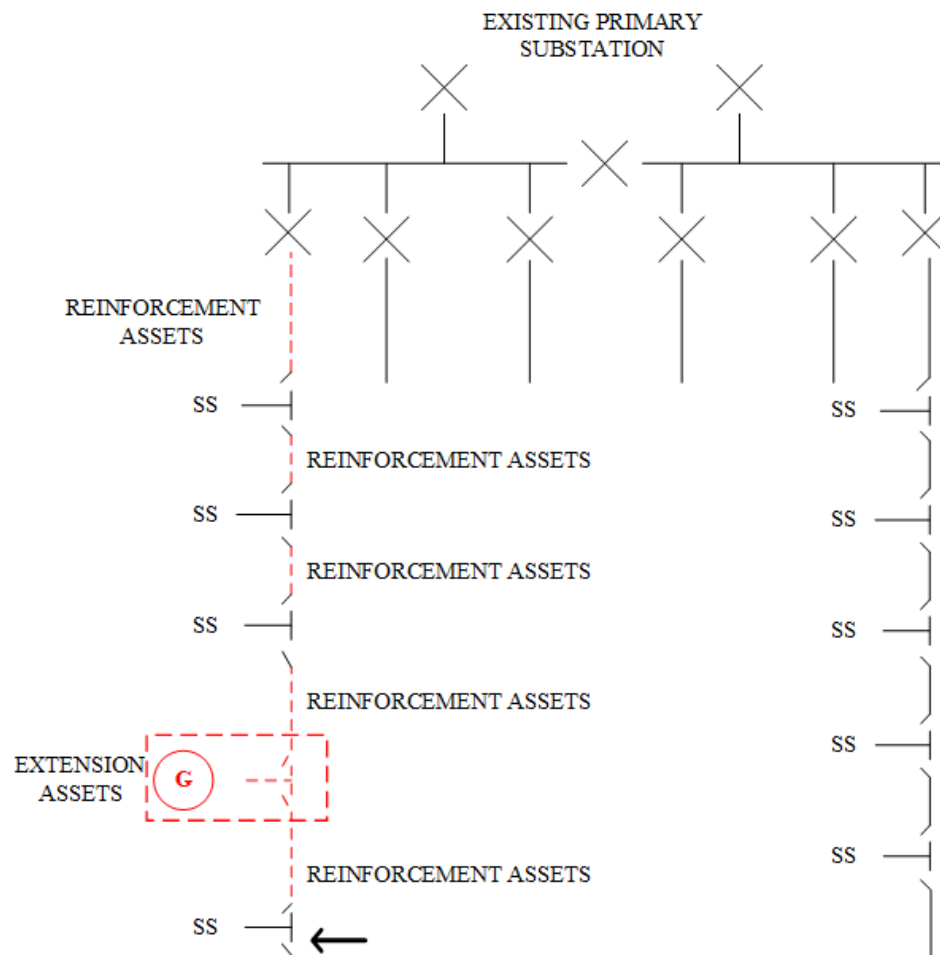
**Example 25: A new Generation Connection with voltage rise triggered Reinforcement.**

**Purpose:** To show that a Generation Connection pays for Reinforcement at the voltage level of connection based on the CAF.

A Customer wishes to connect a new generator (a Generation Connection) with a Required Capacity for export purposes of 2MVA.

The local 11kV feeder has a large amount of generation already connected and will need to be reinforced in order to keep voltage rise within acceptable limits.

The Minimum Scheme requires Reinforcement of the existing 185mm<sup>2</sup> 11kV underground cable with 300mm<sup>2</sup> underground cable and installation of a new substation for connection of the 2MW export capacity. The total length of the reinforced cable is 2km. The thermal rating of the 300mm<sup>2</sup> underground cable is 8MVA. The 11kV underground cable on the other side of the normal open point is already 300mm<sup>2</sup> and does not require to be reinforced.

**Reinforcement:**

The Relevant Section of Network for the Reinforcement is the 11kV feeder.

Security CAF calculation: the numerator in the CAF calculation is the Required Capacity of the Customer, i.e. 2MW. The denominator is the New Network Capacity following Reinforcement, this being the maximum generation that could be connected whilst keeping the voltage rise within acceptable limits, i.e. 8MVA in this case.

Fault Level CAF calculation: this scheme does not have any significant Fault Level contribution to the existing shared use distribution network and Fault Level CAF is therefore not applicable here.

The Connection Charge for this Scheme is calculated as follows:

<b>Reinforcement:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
2km 300mm 11kV Cable	£600,000	$2 / 8 \times 100\% = 25\%$	£150,000
<b>Total Reinforcement Cost</b>	<b>£600,000</b>		<b>£150,000</b>

<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
2MVA 11kV Substation	£160,000	n/a	£160,000
2 by 11kV Closing Joints	£6,000	n/a	£6,000
<b>Total Extension Asset Cost</b>	<b>£166,000</b>		<b>£166,000</b>

**Total cost of the work** = £600,000 + £166,000 = **£766,000**

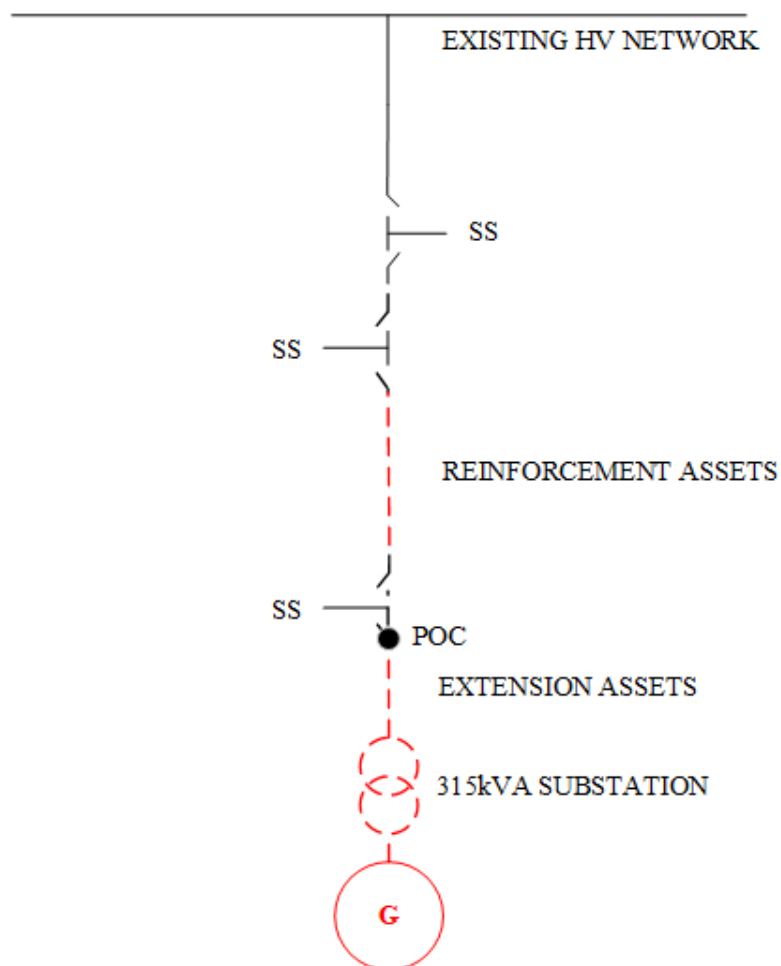
**Total Connection Charge to Customer** = £150,000 + £166,000 = **£316,000**



**Example 26 A new Generation Connection with voltage rise triggered Reinforcement.**

**Purpose:** To show that if voltage rise Reinforcement is tailored so that just the amount of network is upgraded to meet the Customer requirements, the CAF is 100% for a Generation Connection.

A Customer wishes to connect a new generator (a Generation Connection) with a Required Capacity for export of 250kW. The Minimum Scheme for connection of the generator requires the local 11kV overhead line to be reinforced with 100mm<sup>2</sup> conductor over part of its length in order to keep voltage rise within acceptable limits. The thermal capacity of the 100mm<sup>2</sup> overhead line is 5MVA. The thermal capacity of the original 50mm<sup>2</sup> overhead line is 3MVA. A new 315kVA ground mounted substation requires to be installed at the premises. The overhead line is 1km in length but only 500m is required to be reinforced in order to keep voltage rise within acceptable limits.

**Reinforcement:**

The Relevant Section of Network for the Reinforcement is the 11kV overhead line

Security CAF calculation: the numerator in the CAF calculation is the Required Capacity of the Customer, i.e. 250kW. The denominator is the New Network Capacity following Reinforcement, this being the maximum generation that could be connected whilst keeping the voltage rise within acceptable limits. As the length of overhead line to be reinforced has been determined to accommodate the 250kW requirement only, then this is also 250kW in this case.

Fault Level CAF calculation: this scheme does not have any significant Fault Level contribution to the existing shared use distribution network and Fault Level CAF is therefore not applicable here.

The Connection Charge for this Scheme is calculated as follows:

<b>Reinforcement:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Replacement 11kV overhead line conductor	£40,000	250 / 250 x 100% = 100%	£40,000
<b>Total Reinforcement Cost</b>	<b>£40,000</b>		<b>£40,000</b>

<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Provision and installation of 315kV substation	£60,000	n/a	£60,000
11kV joint to network	£3,000	n/a	£3,000
<b>Total Extension Asset Cost</b>	<b>£63,000</b>		<b>£63,000</b>

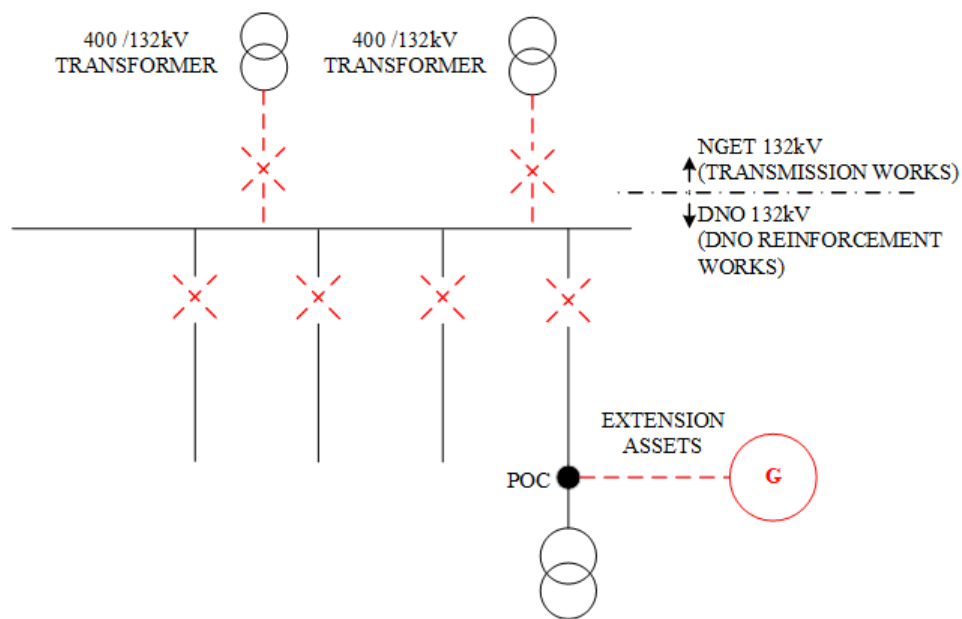
**Total cost of the work** = £40,000 + £63,000 = **£103,000**

**Total Connection Charge to Customer** = £40,000 + £63,000 = **£103,000**

**Example 27: A new Generation Connection with Fault Level Triggered Reinforcement and transmission works.**

**Purpose:** To show how the Fault Level CAF calculation is applied and how the cost of transmission works are treated for a Generation Connection.

A Customer requests a 65MW connection for a new 132kV generator (a Generation Connection) and the 85MVA Fault Level contribution from the generator necessitates Reinforcement works to replace the 132kV switchgear at the existing grid supply point with switchgear of a higher fault level rating. The Fault Level contribution also requires upgrades to the transmission system to replace the 132kV transformer tails and associated switchgear. New 132kV Extension Assets from the existing 132kV system will be required to connect the generator.



### Reinforcement

In this example the Reinforcement is at the voltage level of the POC and the Fault Level CAF is applied to the DNO works only.

Fault Level CAF calculation: The numerator in the CAF calculation is based upon the Fault Level contribution from the Customer's new generator connection, i.e. 85MVA. The denominator is based upon the New Fault Level Capacity, in this Example the Fault Level capacity of the new 132kV switchgear, i.e. 9140MVA.

### Transmission

The cost of the transmission works are fully funded by the Customer.

The Connection Charge for this Scheme is calculated as follows:

<b>Transmission Works:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Replace the 132kV transformer tails and associated switchgear	£5,000,000	N/A	£5,000,000
<b>Total Transmission Cost</b>	<b>£5,000,000</b>		<b>£5,000,000</b>

<b>Reinforcement:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Reinforcement: replace the existing 132kV switchgear	£12,000,000	$3 \times (85/9140) \times 100\% = 2.8\%$	£336,000
<b>Total Reinforcement Cost</b>	<b>£12,000,000</b>		<b>£336,000</b>

<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Installation of 200m 132kV underground cable	£400,000	N/A	£400,000
<b>Total Extension Asset Cost</b>	<b>£400,000</b>		<b>£400,000</b>

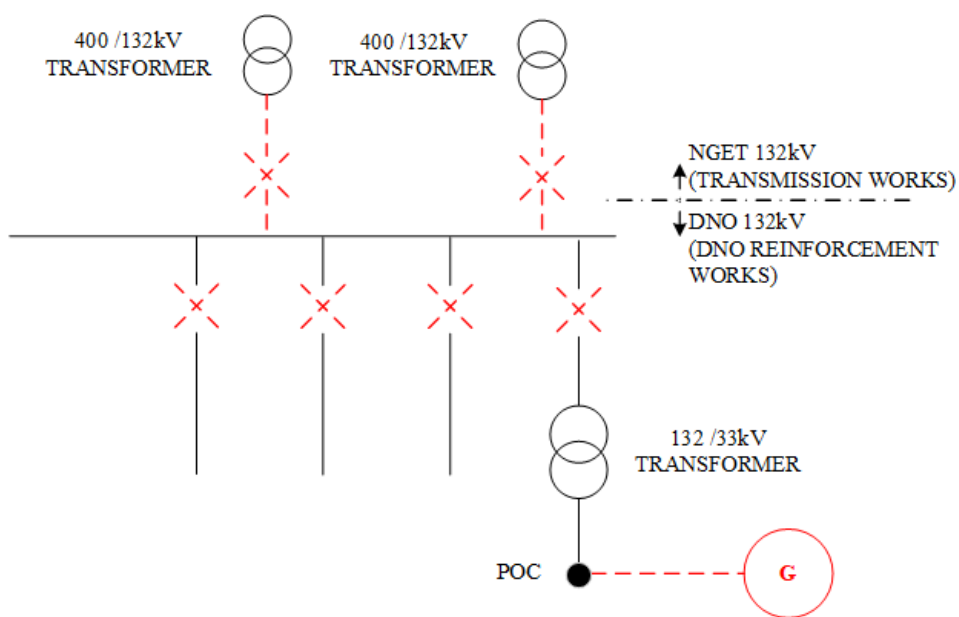
**Total cost of the work** = £5,000,000 + £12,000,000 + £400,000 = **£17,400,000**

**Total Connection Charge to Customer** = £5,000,000 + £336,000 + £400,000 = **£5,736,000**

**Example 28: A new Generation Connection with Fault Level Triggered Reinforcement and transmission works.**

**Purpose:** To show the treatment of Reinforcement costs at more than one voltage level above the POC and the cost of transmission works for a Generation Connection.

A Customer requests an 8MW connection for a new 33kV generator (a Generation Connection) and the 24MVA Fault Level contribution from the generator necessitates Reinforcement works to replace the 132kV switchgear at the existing grid supply point with switchgear of a higher fault level rating. The Fault Level contribution also requires upgrades to the transmission system to replace the 132kV transformer tails and associated switchgear. New 33kV Extension Assets from the existing 33kV system will be required to connect the generator.


**Reinforcement**

In this example the Reinforcement is at the voltage level above the POC and fully funded by the DNO.

**Transmission**

The Connection Charge for this Scheme is calculated as follows:

Transmission Works:	Cost	Apportionment	Customer Contribution
Replace the 132kV transformer tails and associated switchgear	£5,000,000	N/A	£5,000,000
<b>Total Transmission Cost</b>	<b>£5,000,000</b>		<b>£5,000,000</b>

<b>Reinforcement:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Replacement 132kV switchboard (excluding Customer's sole use circuit breaker)	£12,000,000	N/A	£0
<b>Total Reinforcement Cost</b>	<b>£12,000,000</b>		<b>£0</b>

<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Installation of a 500m 33kV cable	£40,000	N/A	£40,000
33kV circuit breaker at Customer substation	£25,000	N/A	£25,000
<b>Total Extension Asset Cost</b>	<b>£75,000</b>		<b>£75,000</b>

**Total cost of the work** = £5,000,000 + £12,000,000 + £75,000 = **£17,075,000**

**Total Connection Charge to Customer** = £5,000,000 + £75,000 = **£5,075,000**

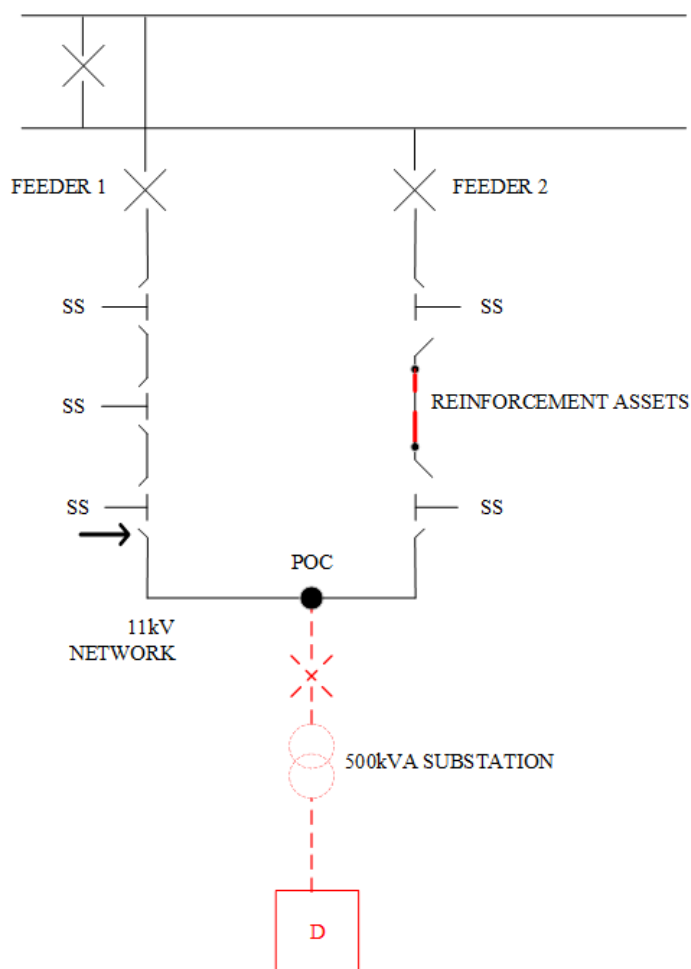
**Example 29: A new Demand Connection that has Reinforcement above the High-Cost Project Threshold.**

**Purpose:** To show how the Demand High-Cost Project Threshold is applied.

A Customer wishes to connect a new supply to a commercial premise for 70kVA (the Required Capacity). This will be a non-secure Demand Connection to a secure network.

The Minimum Scheme is to overlay part of the nearest 11KV circuit (Feeder 2) which only has spare capacity of 50kVA. The Reinforcement to make the capacity available requires 1200m of existing 11KV cable to be overlaid with a larger capacity cable.

Following the Reinforcement the New Network Capacity will be 8000kVA. (i.e. after Reinforcement, in this particular case, the section of cable with the lowest rating in the ring represented by Feeder 1 and Feeder 2 is rated at 8000kVA).



**Reinforcement:**

The Relevant Section of Network is the two-feeder ring comprising Feeder 1 and Feeder 2.

As this is a Demand Connection, no CAF contribution is required.

The High-Cost Project Threshold (HCPT) applied is the Required Capacity x HCPT of £1,720 per kVA.

In this instance;

$70 \times £1,720 = £120,400$ . The Customer will pay the costs in excess of £120,400 for works up to one voltage above the Point of Connection, therefore £363,000 (i.e, total Reinforcement cost - £120,400 = £242,600).

The Connection Charge for this Scheme is calculated as follows:

<b>Reinforcement:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Overlay 1200m of 11KV cable	£360,000	Total cost exceeding HCPT  £363,000- £120,400	£242,600
11KV Jointing	£3,000		
<b>Total Reinforcement Cost</b>	<b>£363,000</b>		<b>£242,600</b>

<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
500m 11KV cable	£150,000	n/a	£150,000
500kVA substation	£70,000	n/a	£70,000
Termination of Customer's LV cable	£2,000	n/a	£2,000
LV Metering panel	£4,000	n/a	£4,000
11KV Jointing x2	£6,000	n/a	£6,000
<b>Total Extension Asset Cost</b>	<b>£232,000</b>		<b>£232,000</b>

**Total cost of the work** = £363,000 + £232,000 = **£595,000**

**Total Connection Charge to Customer** = £242,600 + £232,000 = **£474,600**



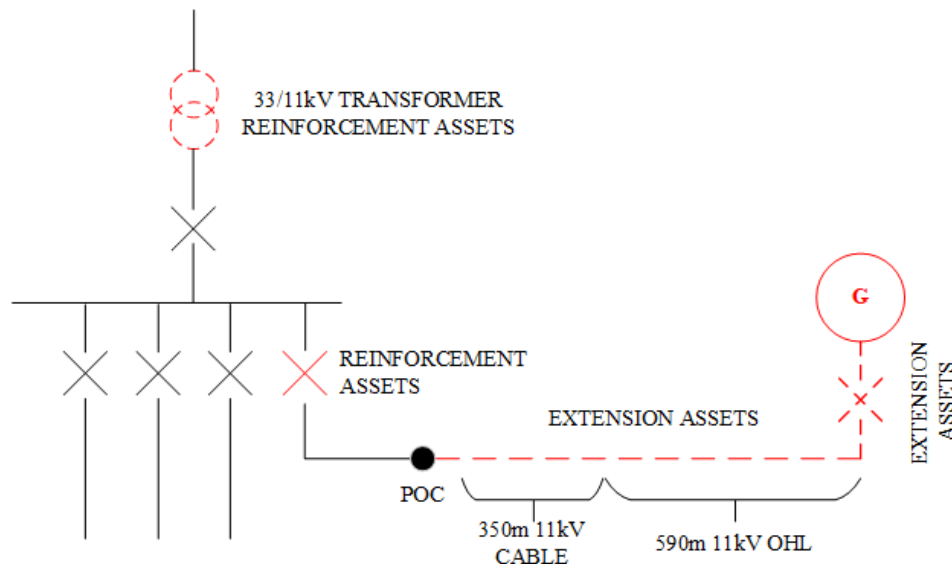
**Example 30: A new Generation Connection that has Reinforcement above the High-Cost Project Threshold.**

**Purpose:** To show how a Generation Connection that triggers the Generation High-Cost Project Threshold is charged when the Reinforcement required is at the same voltage of connection.

A Customer wishes to connect a 225kVA wind farm (a Generation Connection).

In order to connect the wind farm the Minimum Scheme involves the installation of 590m of 11kV overhead line, 350m of 11kV cable and associated jointing and install switchgear into the substation. In addition, Reinforcement is required to replace the 33/11kV transformer to facilitate reverse power flow and the 11kV circuit breaker in the primary substation. The New Network Capacity following Reinforcement is 19,700 kVA. The total cost of the Reinforcement is £505,400.

The High-Cost Project Threshold (HCPT) applies to this connection. The HCPT is £200/kW and costs in excess of this threshold will be charged in full to the Customer.



**Reinforcement:**

Security CAF calculation: the numerator in the CAF calculation is the Required Capacity of the Customer, i.e. 225kVA. The denominator is the New Network Capacity following Reinforcement, this being the maximum generation that could be connected whilst keeping the voltage rise within acceptable limits. This is 19,700kVA.

The High-Cost Project Threshold for Generation Connections is £200/kW.

The Reinforcement required to provide the connection is:

- 33/11kV transformer; and
- 11kV circuit breaker.

The 33/11kV transformer Reinforcement is one Voltage Level above the POC and not subject to the Security CAF. The work is covered by the High-Cost Project Threshold of £200/kW.

HCPT:  $£200 \times 225 = £45,000$

$£505,400 - £45,000 = £460,400$  Customer Contribution

The 11kV circuit breaker Reinforcement is at the Voltage Level of the POC and is subject to the Security CAF. The work is under the High-Cost Project Threshold of £45,000 ( $£200 \times 225$ ) and not covered.

Security CAF:  $(225/19,700) \times 100 = 1.14\%$

$£30,000 \times 1.14\% = £342$  Customer Contribution

The Connection Charge for this Scheme is calculated as follows:

<b>Reinforcement Over High-Cost Project Threshold:</b>	<b>Cost</b>	<b>Apportionment/ HCPT</b>	<b>Customer Contribution</b>
33/11kV Transformer Replacement	£475,400	£505,400- £45,000= £460,400	£460,400
11kV circuit breaker	£30,000		
<b>Total Reinforcement Cost</b>	£505,400		<b>£460,400</b>

<b>Reinforcement Under High-Cost Project Threshold:</b>	<b>Cost</b>	<b>Apportionment/ HCPT</b>	<b>Customer Contribution</b>
11kV circuit breaker	£30,000	$225/19,700 = 1.14\%$	£342
<b>Total Reinforcement Cost</b>	£30,000		<b>£342</b>

<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
Electrical substation works	£34,500	n/a	£34,500

Install 590m of 11kV Overhead Line	£53,500	n/a	£53,500
Install 350m of 11kV XLPE cable	£14,000	n/a	£14,000
<b>Total Extension Asset Cost</b>	<b>£102,000</b>		<b>£102,000</b>

**Total cost of the work** = £505,400 + £102,000 = **£607,400**

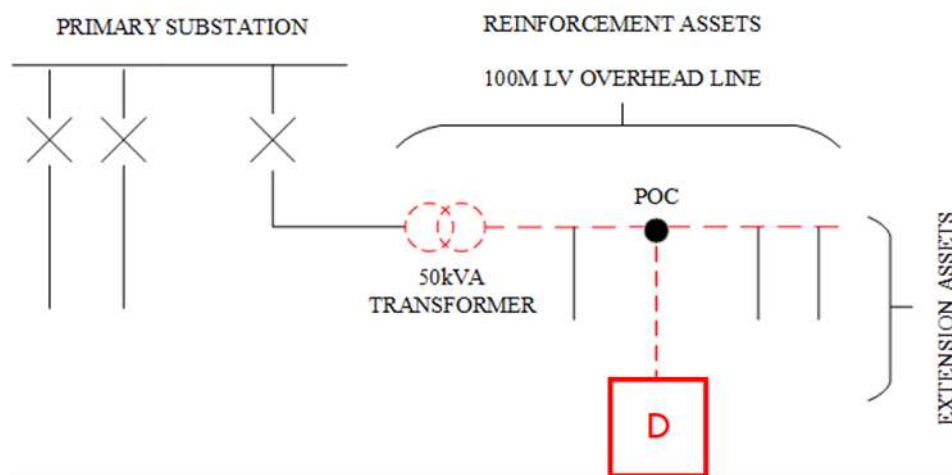
**Total Connection Charge to Customer** = £460,400 + £342 + £102,000 = **£562,742**

**Example 31 The Customer requirements for supply characteristics are greater than the Minimum Scheme.**

**Purpose:** To illustrate that when a Customer specifically requests a three-phase connection, where the existing network is not of a sufficient number of phases, the Customer pays for any Reinforcement.

A Customer with an existing single phase domestic connection with rated at 100 Amps (23 kVA) requests a three-phase connection to allow them to connect a three-phase load (e.g. a three-phase domestic welder). The property is located halfway along on a single phase 100m LV overhead line, which connects to a single phase 50kVA pole-top transformer feeding four properties. The pole-top transformer connects to the local Primary substation via a three-phase underground cable.

The existing network has sufficient capacity to accommodate the Required Capacity but the existing 50kVA pole-top transformer and 100m LV overhead line do not have a sufficient number of phases.


**Reinforcement:**

The Minimum Scheme is to replace the existing 100m LV overhead line in its entirety with a three-phase overhead line. The existing single phase 50kVA pole-top transformer will need to be replaced with a three-phase equivalent. The existing three-phase cable feed and the Primary substation are of sufficient capacity.

As the Reinforcement is only to accommodate the required number of phases, no cost apportionment will be applied.

The Connection Charge for this Scheme is calculated as follows:

Reinforcement:	Cost	Apportionment	Customer Contribution
Replace existing single-phase LV Overhead Line with new 100m three-phase LV Overhead Line	£12,600	100%	£12,600
New three-phase 50kVA pole-top transformer	£20,000	100%	£20,000

LV Jointing	£300	100%	£300
<b>Total Reinforcement Cost</b>	<b>£32,900</b>		<b>£32,900</b>
Operation & Maintenance @32%* of £32,900	<b>£10,528</b>		<b>£10,528</b>

\*Note, the 32% Operation and Maintenance figure is illustrative.

<b>Extension Assets:</b>	<b>Cost</b>	<b>Apportionment</b>	<b>Customer Contribution</b>
New 30m three-phase 100A service	£1,600	n/a	£1,600
Single service breach joint	£300	n/a	£300
<b>Total Extension Asset Cost</b>	<b>£1,900</b>		<b>£1,900</b>

**Total cost of the work** = £43,428 + £1,900 = **£45,328**

**Total Connection Charge to Customer** = £43,428 + £1,900 = **£45,328**

## Section 2 – Glossary of Terms

<b>Act</b>	the Electricity Act 1989 (as amended).
<b>Adoption Agreement</b>	<p>is an agreement for us to adopt the Contestable Work, subject to the satisfaction of certain conditions. This agreement, amongst other things, addresses a number of fundamental principles:</p> <ul style="list-style-type: none"> <li>• The transfer of title from the asset owner (normally the Customer or the ICP) to us;</li> <li>• The quality and safety of the adopted asset;</li> <li>• Any required sureties;</li> <li>• The transfer of Land Rights;</li> <li>• The procedure for us to Energise the assets installed by the ICP during the works;</li> <li>• The payment of any residual Connection Charges or fees;</li> <li>• Planning permissions and compliance with street works legislation; and</li> <li>• Defect correction processes, where applicable.</li> </ul> <p>The parties to the Adoption Agreement may vary depending on the circumstances and may be between:-</p> <ul style="list-style-type: none"> <li>• us and you</li> <li>• us and your appointed ICP</li> <li>• us, you and your appointed ICP.</li> </ul>
<b>Bilateral Connection Agreement</b>	an agreement between us and another LDNO setting out the terms and conditions under which an embedded network shall be entitled to be and remain connected to the Distribution System.
<b>Business Day</b>	any day other than a Saturday, a Sunday, Christmas Day, Good Friday or a day which is a bank holiday within the meaning of

	the Banking and Financial Dealings Act 1971 and will be from 9:00am to 5:00pm (GMT or BST as applicable).
<b>CIC Charges</b>	are the charges detailed in parts D, E, G, H, I, and J of Section [7] of this document.
<b>Connection Agreement</b>	<p>the owner/ occupier of the Premises to which the connection is to be provided will be required to enter into a Connection Agreement with us. The Connection Agreement will set out the terms upon which they will be, and remain, connected to our Distribution System. The Connection Agreement will normally be provided on our behalf by the owner/occupier's chosen Supplier for the Premises as part of their application for a supply of electricity.</p> <p>However, in some cases for larger connections, or where non-standard conditions exist, we will provide a site-specific Connection Agreement, which replaces any Connection Agreement put in place via the Supplier, as part of the connection process. This particular Connection Agreement will only take effect upon completion of the connection and will set out, in more detail, our rights and obligations to one another. Additionally, it may contain the technical detail of the installation being connected to the Distribution System and will require the owner/occupier of the Premises to comply with the provisions of the Distribution Code.</p>
<b>Connection Charge</b>	the payment to be made by the applicant to us for the provision of the connection.
<b>CUSC</b>	the Connection and Use of System Code which constitutes the contractual framework for connection to, and use of, the GB Transmission System.
<b>Customer</b>	the person requesting the connection.

<b>DCUSA</b>	the Distribution Connection and Use of System Agreement designated as such by the Authority under condition 22 of the Licence.
<b>Dedicated Scheme</b>	is defined in paragraph 1. <del>4039</del> .
<b>De-energise</b>	to deliberately prevent the flow of electricity to or from an Exit/ Entry Point for any purpose other than a system outage on the our Distribution System (and cognate expressions shall be construed accordingly).
<b>Demand Connection</b>	a connection which is not a Generation Connection.
<b>Development Phase</b>	the five year period, unless otherwise agreed with us, commencing on the date of Energisation of an embedded network during which period the development is to be constructed.
<b>Disconnect</b>	means to permanently De-energise an Exit/ Entry Point by the removal of all or part of our equipment (and cognate expressions shall be construed accordingly).
<b>Distributed Generation Connections Guide</b>	the guide produced by us as required by our Licence which provides guidance on the connection process for distributed generation.
<b>Distribution Code</b>	<p>covers, amongst other matters, all material technical aspects relating to:</p> <ul style="list-style-type: none"> <li>• connection to, and the operation and use of, the Distribution System; and</li> <li>• the operation of electrical lines and electrical plant or apparatus connected to the Distribution System.</li> </ul> <p>A copy of the Distribution Code can be downloaded from the Distribution Code website at <a href="http://www.dcode.org.uk">www.dcode.org.uk</a>.</p>



<b>Distribution System</b>	the system (as defined in the Licence) consisting (wholly or mainly) of electric lines owned or operated by us and used for the distribution of electricity.
<b>ECCR</b>	the Electricity (Connection Charges) Regulations 2017 (SI 2017/106) as amended from time to time.
<b>ECCR Prescribed Period</b>	the relevant period from the date on which a connection is made as prescribed by the ECCR, being ten years, for connections made on or after 6 April 2017.
<b>EHV</b>	more than 22kV but not more than 72kV.
<b>Electric Lines</b>	<p>means any line which is used for carrying electricity to or from an Exit/ Entry Point and includes, unless the context otherwise requires:</p> <ul style="list-style-type: none"> <li>(a) any support for such line, that is to say, any structure, pole or other thing in, on, by or from which any such line is or may be supported, carried or suspended;</li> <li>(b) any apparatus connected to such line for the purpose of carrying electricity; and</li> <li>(c) any wire, cable, tube, pipe or other similar thing (including its casing or coating) which surrounds or supports, or is surrounded or supported by, or is installed in close proximity to, or is supported, carried or suspended in association with, any such line.</li> </ul>
<b>Electric Plant</b>	means any plant, equipment, apparatus or appliance used for or for purposes connected with the distribution of electricity (including any metering equipment) other than an Electric Line.
<b>Electricity Storage</b>	is the conversion of electrical energy into a form of energy which can be stored, the storing of that energy, and the

	subsequent reconversion of that energy back into electrical energy.
<b>Electricity Generation</b>	is the process of generating electricity.
<b>Energise</b>	to deliberately allow the flow of electricity to or from an Exit/ Entry Point where such a flow of electricity has never previously existed (and cognate expressions shall be construed accordingly).
<b>Enhanced Scheme</b>	is defined in paragraph 1.4.
<b>Entry/ Exit Point</b>	a point at which electricity, whether metered or unmetered, enter or exit our Distribution System.
<b>Existing Capacity</b>	is defined in paragraph 1.2 <sup>98</sup> .
<b>Extension Assets</b>	are assets installed to connect a party or parties to the existing distribution network but which exclude Reinforcement assets.
<b>Fault Level</b>	the maximum prospective current or power that will flow into a short circuit at a point on the network, usually expressed in MVA or kA.
<b>Fault Level Contribution from Connection</b>	is defined in paragraph 1.2 <sup>98</sup> .
<b>Flexible Connections</b>	are connection arrangements whereby a Customer's export or import of electricity is managed (often through real-time control) based upon contracted and agreed principles of available capacity. Flexible Connections typically allow quicker and cheaper connection to the Distribution System but are made on the basis that there is no limit on the extent to which a user's access can be interrupted.
<b>GB Transmission System</b>	the system consisting (wholly or mainly) of high voltage electric wires owned or operated by transmission licensees within Great Britain.

<b>Generation Connection</b>	<p>means a connection to a Premises where the primary purpose of the Premises is wholly or mainly Electricity Generation and/or Electricity Storage. In determining such primary purpose we will consider:</p> <ul style="list-style-type: none"> <li>i. if the Maximum Capacity of the connection of the Premises to the Distribution System for export is greater than the Maximum Capacity for import;</li> <li>ii. if the Premises has a Generation Licence;</li> <li>iii. if the Premises has a Generation Licence Exemption; and/or</li> <li>iv. any other information we consider relevant.</li> </ul>
<b>Generation Licence</b>	means the owner or occupier of the Premises holds a licence to carry out the activity specified in section 4(1)(a) of the Act.
<b>Generation Licence Exemption</b>	means the owner or occupier of the Premises has an exemption from holding a Generation Licence, including under the Electricity (Class Exemptions from the Requirement for a Licence) Order 2001.
<b>Guaranteed Standards of Performance</b>	the standards of service set out in the Electricity (Standards of Performance) Regulations 2015 (as amended from time to time).
<b>High-Cost Project Threshold</b>	is defined in paragraph 1.16.
<b>HV</b>	more than 1kV but not more than 22kV
<b>Independent Connections Provider (ICP)</b>	a person with sufficient accreditation to carry out all or part of the Contestable Work.
<b>Interruptions Incentive Scheme</b>	the scheme which provides incentives on us to deliver a good level of performance in respect of customer interruptions and customer minutes lost.
<b>Land Rights</b>	all such rights in, under or over Land as are necessary for the construction, installation, operation, repair, maintenance,

	renewal or use of the Contestable Work or Non-Contestable Work.
<b>Licensed Distribution Network Operator (LDNO)</b>	the holder of a Licence to distribute electricity.
<b>LV</b>	not more than 1kV.
<b>Maximum Capacity</b>	means in relation to any connection the maximum amount of electricity, as agreed with us and expressed in kW or kVA, that can be imported from or exported onto our Distribution System.
<b>Meter Point Administration Number (MPAN)</b>	is a 21 digit reference to uniquely identify Exit/ Entry Point, such as individual domestic residences.
<b>Minimum Scheme</b>	is defined in paragraphs 1.1 to 1.7.
<b>New Fault Level Capacity</b>	is defined in paragraph 1.2 <sup>98</sup> .
<b>New Network Capacity</b>	is defined in paragraph 1.2 <sup>98</sup> .
<b>NETSO</b>	means the national electricity transmission system operator for Great Britain from time to time.
<b>Point of Connection (POC)</b>	is the point (or points) of physical connection to our existing Distribution System.
<b>Premises</b>	means any land, building or structure.
<b>Reinforcement</b>	is defined in paragraphs 1.17 to 1.2 <sup>76</sup> .
<b>Relevant Section of Network</b>	is defined in paragraph 1.2 <sup>98</sup> .
<b>Rent-a-Jointer Services</b>	the service relating to hiring of resource from us to facilitate the provision of unmetered connections.
<b>Required Capacity</b>	is defined in paragraph 1.2 <sup>98</sup> .

<b>Scheme</b>	our network design to provide the connection.
<b>Speculative Developments</b>	is defined in paragraph 1.4 <sup>87</sup> .
<b>Supplier</b>	a person who holds a Supply Licence.
<b>Supply Licence</b>	a licence granted under section 6(1)(d) of the Act.
<b>Supply Number</b>	a unique identifier of those Entry/ Exit Points on the Distribution System which are used for the purposes of either taking a supply of electricity or for the connection of a distributed generator, and which forms the basis of the metering point record on the Company's registration system.
<b>Temporary Connections</b>	is defined in paragraph 1.23.
<b>Validity Period</b>	the period for which a connection Offer or POC Offer is open for acceptance.
<b>Voltage of Connection</b>	is the voltage at the POC between the existing distribution network and the assets used to provide the connection. For clarity, this is not necessarily the voltage of supply to the Customer.
<b>Voltage Level</b>	is the voltage at the transforming point between two points on the Distribution System that is directly associated with the Customer's connection. The higher voltage is one Voltage Level above the Voltage Level of the POC.
<b>Wide Area Scheme</b>	is defined in paragraph 1.4 <sup>10</sup> .
<b>Working Day</b>	any day other than a Saturday, a Sunday, Christmas Day, Good Friday or a day which is a bank holiday within the meaning of the Banking and Financial Dealings Act 1971.