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RESPOND

DCUSA Change Proposal

15 March 2018

DCUSA change proposal for amending application approach to Fault Level Cost Apportionment Factor in Common Connection Charging Methodology

Introduction

The instantaneous surge of current that flows when a fault occurs on an electrical network is called the fault current and is significantly greater than the normal load current. The fault level is the potential maximum fault current that will flow when a fault occurs and it increases as new generators/motors are connected to the network.

Traditionally fault level was calculated based upon a steady network state and the network was reinforced by replacing assets that exceeded their rating. The Respond project utilises an intelligent Fault Level Assessment Tool (FLAT) to constantly monitor fault level which, in the event of a network fault occurring, is then reduced so that the fault can be safely cleared. Consequently, it is possible to release fault level capacity quicker and cheaper than by utilising traditional methods.

The fault level reduction techniques and devices being trialled in the Respond project have not been previously applied by the industry. Until there is clarity on how the Fault Level Cost Apportionment Factor (CAF) rule is applied to these new engineering solutions there is an opportunity for misinterpretation by the network operators, potentially negatively affecting customers' contributions. In order to ensure that there is a common approach on the application of the fault level CAF rules, there is a Successful Delivery Reward Criteria (SDRC) in the project plan to submit a DCUSA change proposal for amending the application approach to Fault Level Cost Apportionment Factor in Common Connection Charging Methodology. However, while the techniques and devices have been trialled they cannot be implemented until the safety cases relating to their use are completed.

Furthermore the project team have not been able to successfully engage with a customer to provide a Fault Current Limiting Service and have concluded that there is little appetite for this provision in the marketplace. Consequently, it was decided that rather than submit a change proposal to DCUSA which would take up the valuable time and resource of a national working group on something that may never be required it would be better to provide a draft submission paper that could be used as a basis for change if it was required at some future date.

Overview of the Respond project fault current limiting solutions

- Adaptive Protection is retro fitted to existing networks to re-sequence the operation of circuit breakers to clear a fault when the fault level is above the rating of the controlling circuit breaker. Essentially, when a fault occurs on the HV network the fault level is reduced by instantaneously tripping a bus section or primary transformer HV circuit breaker so that the controlling circuit breaker can then safely clear the fault.

- A new or existing customer can provide a Fault Current Limiting Service (FCL Service) by installing Adaptive Protection which can also be used to trip a customer's circuit breaker thereby disconnecting a motor/generator which in turn will reduce fault level so that the controlling circuit breaker can clear the fault. It is envisaged that the provision of an FCL Service by a customer will require a commercial agreement to be in place.

- The I_S-limiter is a device that uses electronics to monitor the rate of rise of fault current to calculate peak fault current. It will detect currents above a pre-defined setting and limit them in less than one millisecond. I_S-limiters are installed in series with the

primary transformer or across the HV bus section in a primary substation. They can also be installed in series with a customer's generator/motor

Common Connection Charging Methodology

This is documented in Schedule 22 of the DCUSA and replicated in each DNO's Statement of Methodology and Connection Charges and is based upon the principle that the connectee pays for the whole cost of sole use connection assets and a proportion of any associated reinforcement costs up to one voltage above the connection voltage.

The reinforcement apportionment is calculated as follows:

$$\text{Fault Level Cost Apportionment Factor} = 3 \times \frac{\text{Fault level contribution from Connection}}{\text{New fault level capacity}} \times 100\%$$

The '*fault level contribution from the connection'* is the assessment of the contribution to fault level from the equipment being connected taking into account its impact at the appropriate point on the network. For changes in connection it is defined as the incremental increase in fault level caused by the customers demand.

The '*new fault level capacity'* 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.

This text was originally developed on the premise that fault level issues would be mitigated by the replacement of the substation switchgear. For example 150MVA fault rated switchgear would be replaced by 250MVA (or even 350MVA) switchgear.

Until there is clarity on how the fault level CAF rule is applied to these new engineering solutions there is an opportunity for misinterpretation by the network operators, potentially negatively affecting customers' contributions.

Proposed changes to Charging Methodology for existing Fault Level CAF

As the application of the Respond techniques does not increase the fault level capacity of the network but simply reduces the fault level while the fault is cleared then it is proposed to use the existing definition of 'New Fault Level' as the denominator in the Fault Level CAF calculation.

The reinforcement costs are those arising from the design, installation and commissioning of either an Adaptive Protection scheme / I_S-limiter in a primary substation or an Adaptive Protection scheme controlling a customer's demand to reduce the fault level of the network while a fault is cleared.

Proposed Charging Methodology for the provision of FCL Services

The reinforcement costs associated with paying a customer to provide a fault current limiting service in the event of a fault needs further consideration depending upon whether it is provided by the new or existing customer causing the increase in fault level or by an existing customer providing a service.

In the case of a new or existing customer providing an FCL Service due the increase in fault level caused by the connection of **their** new equipment then it is considered inappropriate to make any payment as the customer benefits from not having to contribute to a traditional reinforcement scheme.

In the case of an existing customer providing an FCL Service to facilitate the connection of additional demand by a new customer it is proposed to introduce the concept of a Fault Current Limiting Service CAF to determine the proportion of the reinforcement costs that should be paid by the new customer.

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

The FCL Service Capacity is the additional capacity made available by the purchase and implementation of a Fault Current Limiting Service.

The costs arising with the provision of an FCL Service arise from the contractual payments to be made to a third party and the following options have been considered:

- The DNO negotiates an annual contract with the customer providing the fault level reduction service and collects the payments each year. The payment due to the DNO from the new connectee would be calculated by applying the fault level apportionment factor and include a cost to cover administration.

- The DNO negotiates a longer term (five year) contract with the existing customer providing the fault level reduction service and uses the total amount payable to the customer as the FCL Service cost in the calculation used to apportion the costs payable by the new connections customer. The contribution from the new connectee would be calculated by applying the fault level apportionment factor and including a cost to cover administration.

There are a number of things to consider with Option 1. Firstly it requires the DNO to set up a system to collect annual payments from the newly connected customer and pass them through to the customer providing the FCL Service. While this arrangement should be covered in a connection contract there is a is financial risk to the DNO if payment is not received as the FCL Service will still be required until the demand causing the increase in fault level is disconnected and in the interim the DNO will still have to purchase the service from the existing customer. Secondly, there is a also a risk that if the contract with the service provider (existing customer) is terminated or not renewed for subsequent years, then the DNO would have to immediately implement an alternative reinforcement solution. While it may be possible to address this situation by including a clause in the connection agreement requiring an additional contribution from the customer to fund an alternative (more expensive) reinforcement solution in the event of the FCL Service being discontinued. However, it is considered that this approach would require both the level of financial risk and timescales to be accurately articulated to the new connections customer so that they can consider their potential liabilities before entering into the connections contract

Option 2 has the advantage to the customer in that all of the costs associated with the new connection would be dealt with at the outset and the DNO would carry the risks identified in option 1 associated with contract termination.

The following section is a copy of DCUSA Schedule 22 – Common Connection Charging Methodology with the change proposals shown in red.

Proposed changes to Schedule 22 – Common Connection Charging Methodology

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.

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, then, 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, 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 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.
- the costs of implementing a Fault Current Limiting Service (FCL Service) including any payments to third parties.

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 1.15);
- Costs for providing the connection which are to be apportioned between you and us (see paragraphs 1.16 to 1.33 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. 34).

1.9 Some costs may be borne in full by us and will not be included in your Connection Charge (see paragraphs 1.35 to 1.37).

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 8D.

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 1.20).

1.15 For generation connections only, Reinforcement costs in excess of the high-cost project threshold of £200/kW shall be charged to you in full as a Connection Charge. Where both this paragraph 1.15 and paragraph 1.35 below apply to a generation connection, the provisions of paragraph 1.35 shall take precedence.

Costs to be apportioned between you and us

1.16 Reinforcement is defined as assets installed or demand services procured that add capacity (network or fault level) to the existing shared use Distribution System. The costs of Reinforcement shall be apportioned between you and us. The methods used to apportion the costs of Reinforcement are set out in paragraphs 1.27 – 1.33 There are six exceptions to this rule. Where an exception applies Reinforcement will treated as Extension Assets and costs will not be apportioned. These exceptions are described below and the application of exceptions 1, 2, 4, and 5 is demonstrated in the Examples.

1.17 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 2B.

1.18 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).

1.19 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. The costs associated with the Temporary Connection will be borne in full by you. 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.

1.20 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. You will pay the full cost of the switchgear replacement. See Example 7B.

1.21 Exception 5: 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. You will pay the full cost of the additional network length. See Example 8B.

1.22 Exception 6 Where you provide part or all of the additional network capacity via a Fault Current Limiting Service.

1.23 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 1.40-1.43).

1.24 The costs of any Fault Current Limiting Service utilised to allow your connection to be made will be apportioned between you and us. Your portion of the costs would normally be levied as a one-off charge representing the apportioned costs of the net present value of the costs of establishing the FCL Service including any payments to third parties.

1.25 Where a Fault Current Limiting Service is included in any agreement with you to allow your connection to be made and the agreement is breached, expires or if you terminate it, then you will be required to pay all or a proportion of any subsequent reinforcement costs required for your connection to remain connected.

1.26 Where a Fault Current Limiting Service Agreement is put in place with a third party to allow your connection to be made; and the agreement expires or is terminated by either party then we will be responsible for finding other alternative FCL Service arrangements or undertaking any required reinforcement work to allow your connection to remain connected with no further cost to you.

1.27 The costs of Reinforcement will be apportioned using one of three Cost Apportionment Factors (CAFs), dependent upon which factor is driving the requirement for Reinforcement:

- The ‘Security CAF’; and
- The ‘Fault Level CAF’.
- The ‘Fault Level Current Limiting Service CAF’

1.28 The following definitions are used in the application of the CAFs.

Existing Capacity	**For existing Customers their Existing Capacity will be either:-** **a) the Maximum Capacity used in the calculation of their use of system charges; or** **b) for Customers who are not charged for use of system on the basis of their Maximum Capacity the lower of:** • **No. of phases x nominal phase-neutral voltage (kV) x fuse rating (A); and** • **The rating of the service equipment.**
Fault Level Contribution from Connection	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 then the ‘‘Fault Level Contribution from Connection’’ is defined as the incremental increase in Fault Level caused by the Customer.
New Fault Level Capacity	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.
Fault Current Limiting Service (FCL Service)	is the purchase of a fault current limiting service from an existing customer.
(FCL Service) Capacity	is the additional capacity made available by the purchase and implementation of a Fault Current Limiting Service.
New Network Capacity	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 12. 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.
Relevant Section of Network (RSN)	is that part or parts of the Distribution System which require(s) Reinforcement. Normally this will comprise: • 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 • the new assets, at the same voltage level, that are to be provided by way of Reinforcement. 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, See example 13. There may be more than one RSN (e.g. at different voltage levels.
Required Capacity	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.

1.29 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.

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

1.30 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.

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

1.31 The Fault Current Limiting CAF is applied where the costs are derived by the provision of a Fault Current Limiting Service. This rule determines the proportion of the Reinforcement costs that should be paid by you as detailed below.

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

1.32 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.

1.33 On some Schemes there may be interaction between the three 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 and the Fault Current Limiting Service CAF will be applied to costs arising from the implementation and provision of the Fault Current Limiting Service. See the Examples for illustrations on the application of the CAFs.

Recovery of costs for previous works

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

you may be required to make a payment towards them. The ECCR prescribes the circumstances where such payment is required. Charges for such works may only apply where the new connection is provided within five years of the original Distribution System assets being provided.

Existing document sections numbered 1.30 to 1.60 will remain unaltered except for renumbering as 1.35 to 1.65

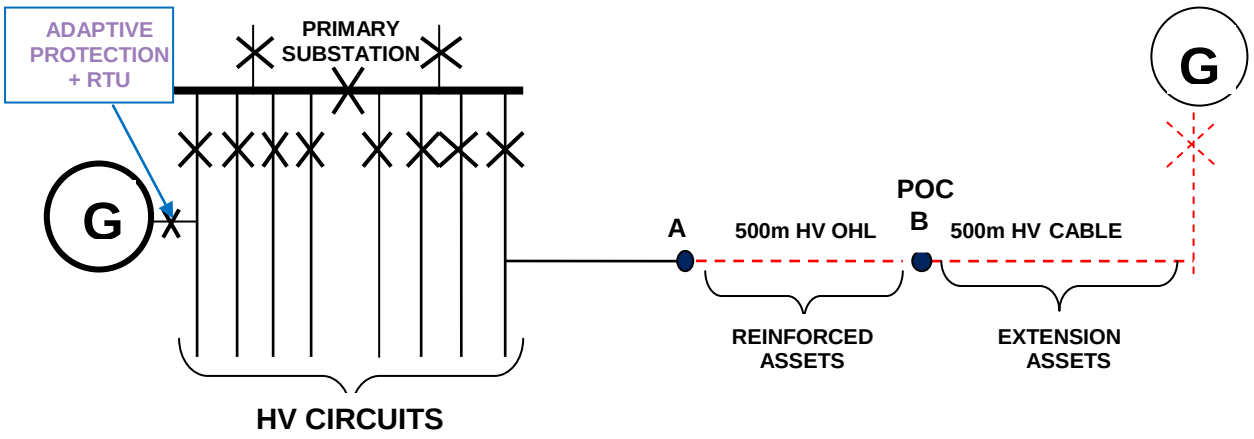
The following examples are reworked versions of the existing Examples 5 and 7A.

Example 5a: Connection of a new embedded generator that requires Reinforcement involving Security and Fault Current Limiting Service CAFs.

A Customer requests a connection to a generator with a Required Capacity for export purposes of 3MVA. The Fault Level contribution at the primary substation from the generation connection is 10MVA.

The POC is to the existing HV network at point B and it is proposed to install 500m of HV underground cable from the POC to the Customer's installation. This is a non-secure connection that requires reinforcement of a non-secure network.

The connection requires the Reinforcement of 500m of HV overhead line between points A and B for a thermal capacity requirement and the Fault level Contribution will mean that the controlling circuit breaker on the HV switchboard at the primary substation will now exceed its fault level rating of 150MVA so a Fault Current Limiting Service of 30MVA has been purchased for a period of 5years from an existing customer at an annual cost of £12000 following the installation of an Adaptive Protection scheme at a cost of £15000.



Reinforcement

The RSN is the HV 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. 3MVA. 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 RSN 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 existing HV switchboard, 150MVA, or of the local system, 250MVA.

Fault Current Limiting Service 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 additional New Fault Current Limiting Service Capacity of 30MVA that has been procured from an existing customer

The Connection Charge for this Scheme is calculated as follows:

Reinforcement

	Cost	Apportionment	Customer Contribution
Non Contestable Work			
Re-conductor of 500m of HV overhead line	£49,000	3/7.6 x 100% = 39.5% **Security CAF**	£19,342
Installation of Adaptive Protection, remote terminal unit and communications	£15,000	3 x (10/150)x 100% = 20% **Fault Level CAF**	£3,000
Purchase and implementation of FCL Services	£60,000	3x10/30x100% = 100.00% **FCL Service CAF**	£60,000
Total Reinforcement Cost	**£139,000**		**£82,342**

Extension Assets

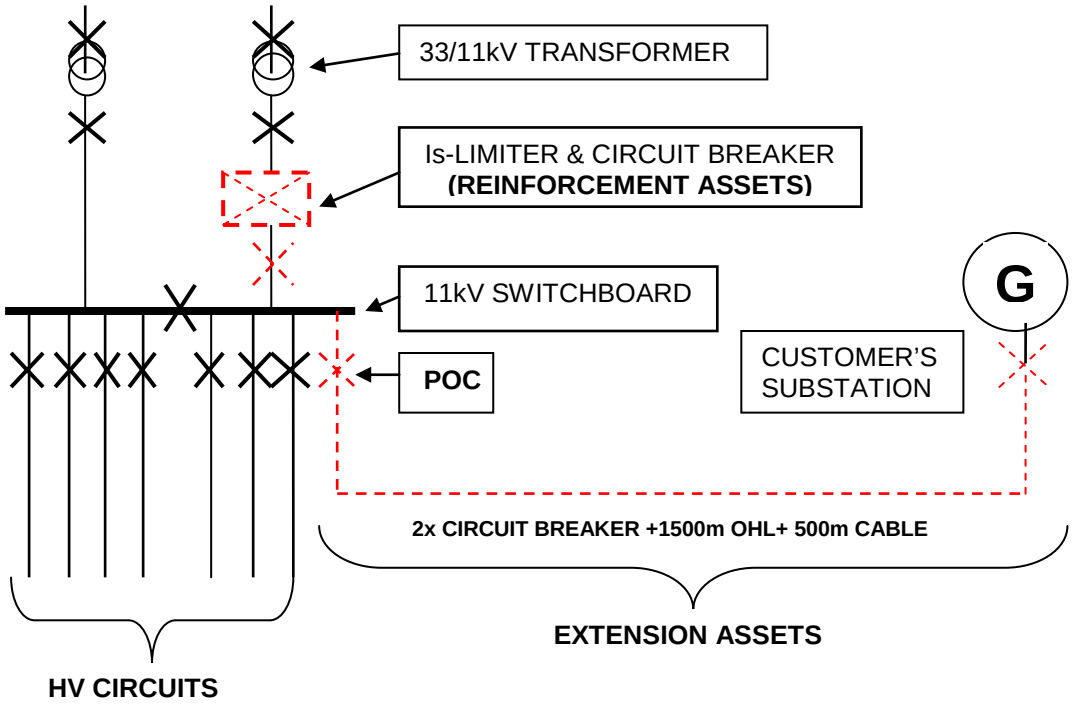
	Cost	Apportionment	Customer Contribution
Contestable Work			
Installation of 500m HV cable	£47,000	N/A	£47,000

	Cost	Apportionment	Customer Contribution
HV circuit breaker at Customer's substation	£10,000	N/A	£10,000
Non-Contestable Work			
HV pole top termination	£1,400	N/A	£1,400
Total Extension Asset Cost	**£58,400**		**£58,400**
CIC Charges			**£1,100**

Total Connection Charge = £82,342 + £58,400 = £140,742

Example 7b: New 3MVA Generation Connection, Fault Level Triggered Reinforcement.

A Customer wishes to connect a new generator with a Required Capacity for export purposes of 3MVA. 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 switchboard at an existing primary substation and a new substation at the Customer's premises. The 24MVA Fault Level contribution from the generator would increase the fault level at the existing primary substation to a level in excess of the 11kV switchgear rating of 150MVA. To reduce the fault level it is proposed to install an Is-limiter in series with one of the primary transformers.



Reinforcement

The RSN is the 11kV switchboard at the primary substation.

Fault Current Limiting Service 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 Current Limiting Service Capacity, which is the lower of the Fault Level capacity of the existing HV switchboard, 150MVA or of the local system, 250MVA.

The Connection Charge for this Scheme is calculated as follows:

Reinforcement

	Cost	Apportionment	Customer Contribution
Non Contestable Work			
Install Is-limiter and associated circuit breaker	£310,000	3 x (24/150) x 100% = 48% **Fault Level CAF**	£148,800
Total Reinforcement Cost	**£310,000**		**£148,800**

Extension Assets

	Cost	Apportionment	Customer Contribution
Non-Contestable Work			
HV circuit breaker at primary substation	£25,000	N/A	£25,000
Contestable Work			
Installation of a 500m HV cable	£40,000	N/A	£40,000
Installation of a 1500m overhead line	£35,000		£35,000
HV circuit breaker at Customer's substation	£25,000	N/A	£25,000
Total Extension Asset Cost	**£125,000**		**£125,000**
CIC Charges			**£1,100**

Total Connection Charge = £148,800 + £125,000 = £273,800