Worked Examples for Connections Charging Methodologies

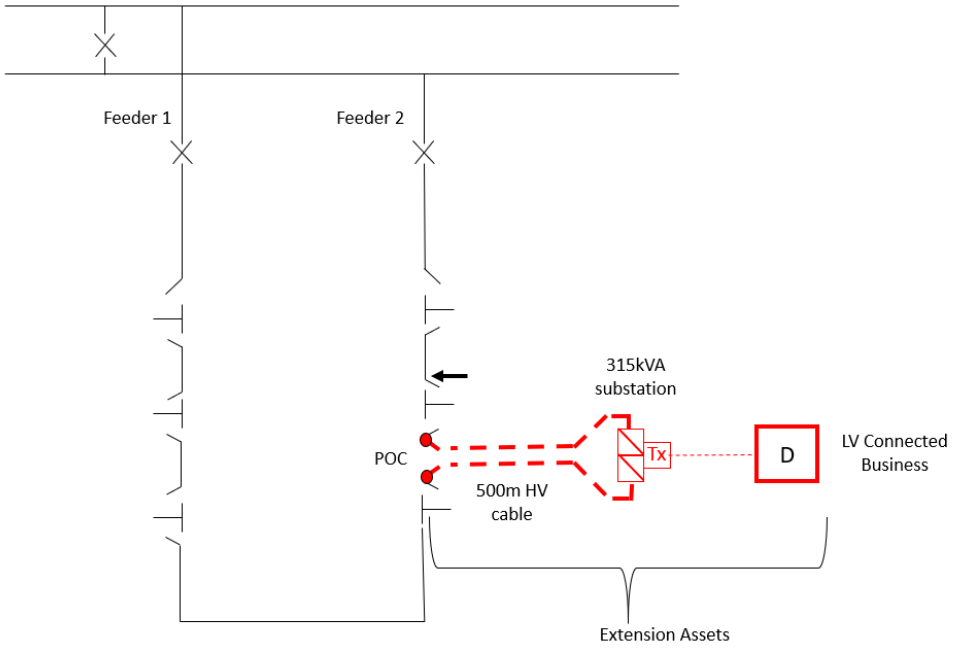
August 2024

Contents

1. WORKED EXAMPLES

1.1 Example 1 – Medium-Sized Commercial Connection

A customer has requested a new connection for a medium-sized commercial unit with a Maximum Capacity of 250kVA. The nearest LV substation only has 100kVA spare capacity which is not sufficient to connect the proposed commercial unit. To upgrade the nearest LV substation has a higher capital cost in comparison to establishing a new LV substation within the proposed site. The nearest HV underground cable has sufficient capacity to connect the proposed supermarket. The Least Cost Technically Acceptable/Minimum Scheme is to establish a new LV substation within the proposed commercial site from the nearest 11kV underground circuit.



1.1.1 Existing Connection Boundary Calculation – Example 1

The HV cable, LV substation and LV cable are categorised as Connection Assets. Therefore, these works are fully chargeable to the customer. The total cost for the HV cable, LV substation and LV cable are £120,000.

Total Existing Connection Boundary Connection Charge = £0 + £120,000= £120,000

1.1.2 Shallow Connection Boundary Calculation – Example 1

The HV cable, LV substation and LV cable are classed as Extension Assets[1] and therefore are fully chargeable to the connecting customer. The total cost for the HV cable, LV substation and LV cable are £120,000.

Total Shallow Connection Boundary Connection Charge = £0 + £120,000 = £120,000

1.1.3 Semi Shallow Connection Boundary Calculation – Example 1

The HV cable, LV substation and LV cable are classed as Extension Assets and therefore are fully chargeable to the connecting customer.

Reinforcement:

	Cost	Apportionment	Customer Contribution
Non-Contestable Work			
N/A	£0	n/a	£0
Total Reinforcement Cost	**£0**		**£0**

Extension Assets:

	Cost	Apportionment	Customer Contribution
Contestable Work			
Provision and installation of HV cable	£55,000	n/a	£55,000
315kVA LV Substation	£50,000	n/a	£50,000
Provision and installation of LV cable	£5,000	n/a	£5,000
Non-Contestable Work			
HV Jointing	£5,000	n/a	£5,000

[1] Extension Assets - are assets installed to connect a party or parties to the existing distribution network but which exclude Reinforcement assets.

Total Extension Asset Cost	**£115,000**		**£115,000**

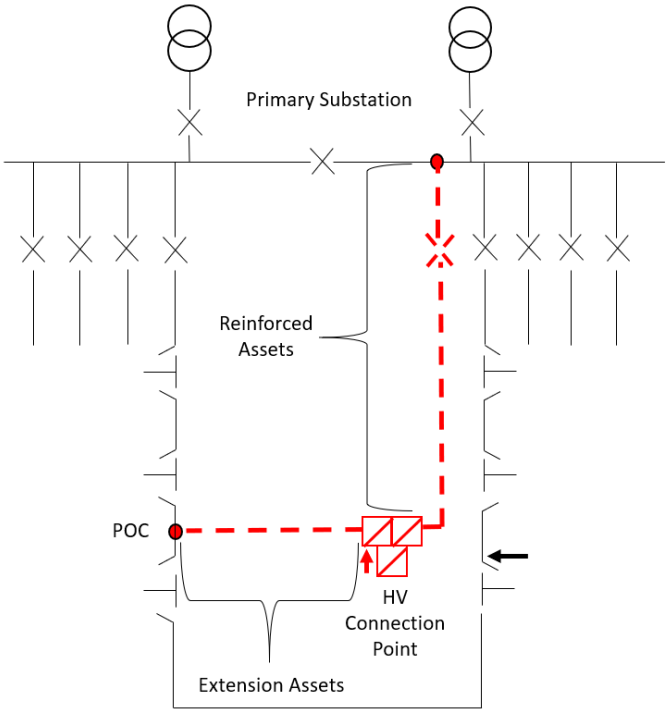
Total Semi Shallow Connection Boundary Connection Charge = £0 + £115,000 = £115,000

1.1.4 Connection Charge Summary – Example 1

	Total Cost of Works	Reinforcement Cost for Customer	Extension Assets for Customer	Total Cost for Customer
Existing Connection Boundary	£115,000	N/A	£115,000	£115,000
Shallow Connection Boundary	£115,000	N/A	£115,000	£115,000
Semi Shallow Connection Boundary for Demand	£115,000	N/A	£115,000	£115,000
Semi Shallow Connection Boundary for LV Connections	£115,000	N/A	£115,000	£115,000

1.2 Example 2 – Large Factory connecting at HV

A large factory has requested a new HV connection with a Maximum Capacity of 3500kVA. The nearest 11kV underground circuit only has 700kVA spare capacity which is not sufficient to connect the proposed factory. The Least Cost Technically Acceptable/Minimum Scheme is to establish a new circuit breaker at the 11kV primary substation and lay a single HV cable to the new factory and provide a single cable interconnection with the existing nearest 11kV underground circuit.



1.2.1 Existing Connection Boundary Calculation – Example 2

The new circuit breaker, HV cable and HV connection point are categorised as Connection Assets. Therefore, these works are fully chargeable to the customer. The total cost for the new circuit breaker, HV cable and HV connection point is £460,000.

Total Existing Connection Boundary Connection Charge = £275,000 + £185,000 = £460,000

1.2.2 Shallow Connection Boundary Calculation – Example 2

Under a Shallow Connection Boundary, only Extension Assets are fully chargeable. Reinforcement works required are non-chargeable to the connecting customer. One HV cable is connecting to the existing 11kV underground circuit and is classed as an Extension Asset along with the new HV connection point. The new circuit breaker and HV cable that connects the new circuit breaker to the HV connection point add capacity to the existing network and therefore are treated as Reinforcement works. The costs for the new circuit breaker and HV cable that connects the new circuit breaker to the HV connection point are not included within the connection charge to the connecting customer. The total cost for the single HV cable from the existing network to the HV connection point and the new HV connection point is £185,000.

Total Shallow Connection Boundary Connection Charge = £0 + £185,000 = £185,000

1.2.3 Semi Shallow Connection Boundary Calculation – Example 2

Security CAF calculation: the numerator in the CAF calculation is based upon the Required Capacity of the Customer, i.e. 3500kVA. The denominator is based on the New Network Capacity following Reinforcement, i.e. 5600kVA.

$$Security\ CAF = \frac{3500}{5600} \times 100 = 62.5\%$$

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.

Reinforcement:

	Cost	Apportionment	Customer Contribution
Non-Contestable Work			
HV circuit breaker	£100,000	62.5%	£62,500
Provision and installation of HV cable	£175,000	62.5%	£109,375
Total Reinforcement Cost	**£275,000**		**£171,875**

Extension Assets:

	Cost	Apportionment	Customer Contribution
Contestable Work			
Provision and installation of HV cable	£145,000	n/a	£145,000
HV Connection Point	£35,000	n/a	£35,000
Non-Contestable Work			
HV Cable Joint	£5,000	n/a	£5,000
Total Extension Asset Cost	**£185,000**		**£185,000**

Total Semi Shallow Connection Boundary Connection Charge = £171,875 + £185,000 = £356,875

1.2.4 Connection Charge Summary – Example 2

	Total Cost of Works	Reinforcement Cost for Customer	Extension Assets for Customer	Total Cost for Customer
Existing Connection Boundary	£460,000	£275,000	£185,000	£460,000
Shallow Connection Boundary	£460,000	£0	£185,000	£185,000
Semi Shallow Connection Boundary for Demand	£460,000	£171,875	£185,000	£356,875
Semi Shallow Connection Boundary for LV Connections	£460,000	£275,000	£185,000	£460,000

1.3 Example 3 – Domestic Rural Connection

A new build domestic rural site has requested a new LV connection with a Maximum Import Capacity of 18kVA.

To be able to get the new site connected a transformer upgrade (reinforcement) is required on top of the new LV cabling required as extension assets. The project requires upgrading the transformer from 25kVA to 50kVA single phase to accommodate the capacity for the new connection.

This connection includes the following: upgrading the Tx to the next size up (50kVA), operational earths, replacing the LV wiring, replacing the LV fuse unit and transformer earth testing.

Total Connection Cost : £11,917.15.

The cost of the Tx upgrade is £7,407.67.

Therefore, total Reinforcement Cost: £7,407.67

Total Extension Asset Cost: £4,509.48

1.3.1 Existing Connection Boundary Calculation – Example 3

Under the existing connection boundary, all of these works are fully chargeable to the customer.

Total Existing Connection Boundary Connection Charge =£11,917.15

1.3.2 Shallow Connection Boundary Calculation – Example 3

The transformer upgrade is classed as reinforcement assets and therefore is fully socialised under a shallow connection boundary. The customer pays the remaining extension asset costs.

Total Shallow Connection Boundary Connection Charge = £11,917.15 - £7,407.67 = £4,509.48

1.3.3 Semi Shallow Connection Boundary Calculation – Example 3

The transformer upgrade is classed as reinforcement assets and therefore is partially socialised under a semi shallow connection boundary. This is apportioned by dividing the capacity required from the connection (18) by the total capacity created (50). The customer pays the remaining extension asset costs.

Total Semi Shallow Connection Boundary Connection Charge 18 / 50 x £7,407.67 = £2,666.76

£2,666.76 + £4,509.48 = £7,176.24

Note since this site is both demand and at LV, the connection cost would be the same under options 3 and 4 as option 2 outlined above.

1.3.4 Connection Charge Summary – Example 3

	Total Cost of Works	Reinforcement Cost for Customer	Extension Assets for Customer	Total Cost for Customer
Existing Connection Boundary	£11,917.15	£7,407.67	£4,509.48	£11,917.15
Shallow Connection Boundary	£11,917.15	£0	£4,509.48	£4,509.48
Semi Shallow Connection Boundary for Demand	£11,917.15	£2,666.76	£4,509.48	£7,176.24
Semi Shallow Connection Boundary for LV Connections	£11,917.15	£2,666.76	£4,509.48	£7,176.24