

Generation connections - case studies








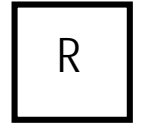
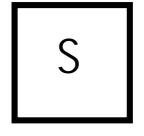
The following examples are to help you:

- plan your application to connect your generation project; and
- estimate the likely costs and timescales for that connection.

These examples show the most common generation connection scenarios with tables giving indicative costs.

More general connection examples and costs are already laid out in our connections methodology and charges statements (<http://www.ssepd.co.uk/Connections/Useful Documents/>). This document is a subset of this and should be read in conjunction with it.

Key to illustrations

	Circuit breaker (any voltage)
	Switch
	Transformer
	Joint on cable or line
	Existing cable/overhead line
	Proposed cable/overhead line
	Generator
	Regulator
	STATCOM

Indicative costs for components commonly included in generation connections

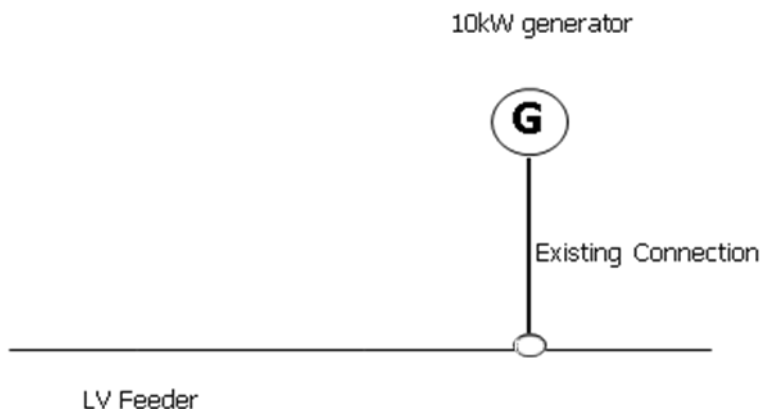
			SHEPD Distribution Service Area		
Activity	Description	Unit	Min	Max	
33 kV OVERHEAD LINE	33kV H pole	1	£2,100	£4,500	
	33kV PMR incl miniRTU	1	£25,000	£35,000	
	33kV EHV/LV 1-phase 16kVA TFR	1	£6,000	£8,000	
	33kV ABSD	1	£2,500	£4,500	
	33kV REGULATOR	1	£40,000	£80,000	
11 kV OVERHEAD LINE	11kV ABSD	1	£2,000	£3,500	
	11kV PMR incl miniRTU	1	£17,000	£25,000	
	11kV Terminal H pole inc stays	1	£1,500	£2,500	
	11 kV Re-string 16mm to 25 mm per km	km	£30,000	Rebuild Costs	
	11kV Single Phase to 3 Phase upgrade (per km)	km	£15,000	Rebuild Costs	
	11kV REGULATOR	1	£30,000	£45,000	
SUBSTATION WORK	Up to 1.5MVA 33kV/LV TFR	1	£40,000	£75,000	
	33 kV indoor metering CB, protection and disconnecter	1	£90,000	£150,000	
	11kV Metering RMU + Act + NVD	1	£30,000	£45,000	
	New 33 kV Outdoor CB inc Control Panel and Wiring	1	£75,000	£120,000	
	33 kV 50k4 pad mounted transformer + GRP cladding	1	£25,000	£45,000	
	4MVA STATCOM	1	£450,000	POA	
SCADA, COMMS and PQM	Real-Time Comms Link	1	£20,000	£30,000	
	RTU	1	£17,000	£25,000	
	Power Quality Monitoring	1	£9,000	£15,000	
	Protection Modifications	1	£5,000	£40,000	

Example 1: Small new generation at a home, farm or shop

A customer requests to connect 10kW of generation at their property. This may be new photovoltaic cells on their roof or a small wind turbine.

1a The existing low voltage (LV) network can accommodate the new connection

We will check if the existing low voltage (LV) network can accommodate the new generation connection. Our checks ensure the generator can operate correctly and will disconnect safely when required.



If the existing network has enough capacity, we may only need to charge for our time to check the network and also to witness the generator being commissioned.

Likely connection charge to customer = £750

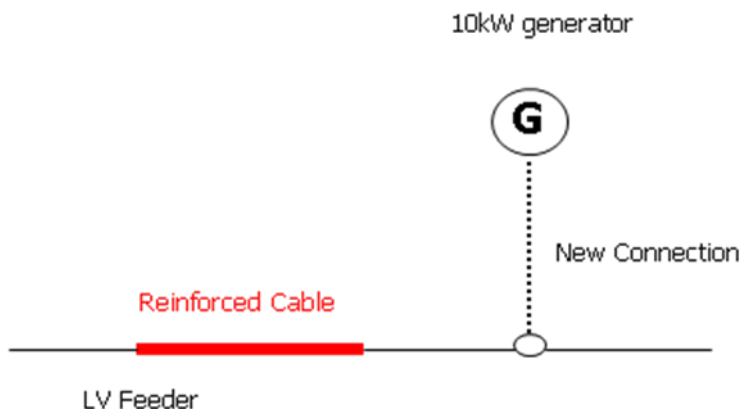
Likely timescale: If we don't need to make any changes to the electricity network, once you have accepted our quote your installer can go ahead with the installation. You just need to notify us at least 15 working days in advance of the date your installer intends to connect and commission your generator so we can arrange to witness the commissioning before connecting the generator to the network.

1b Replace existing connection and reinforce the existing network

Sometimes we need to reinforce the existing network before new generation equipment can be connected.

This may be because

- the cable is not large enough to transport the energy (thermal rating) or
- more commonly that the generator causes the voltage to rise too high (voltage rise).



In certain situations we may fund some of the cost of reinforcing the existing network so you only pay part of the total cost. Your contribution will vary according to the size of the generator and total connection costs.

Indicative costs

	Cost	Apportionment	Customer Contribution
Contestable Costs*			
Provide new LV service connection	£600	n/a	£600
Non-Contestable Costs*			
Final Connection onto our Network	£100	n/a	£100
Assessment, Design and Witness	£750	n/a	£750



Testing			
Replace 50m of LV cable	£5,000	£2,000	£3,000

***Contestable** – those tasks that others may carry out. **Non-Contestable** – those tasks that only we may carry out.

Likely connection charge to customer = £4,450

Likely timescale: Our expected time to deliver a project like this would be two to six months. The time varies depending on how long it takes to get planning approval or wayleave consents, if needed.

Example 2: Larger commercial generator connected to our high voltage (HV) network

A customer wants to connect 3MW of generation on their land. This may be for a new wind or photovoltaic farm, a hydro electric power station of a farm based anaerobic digester.

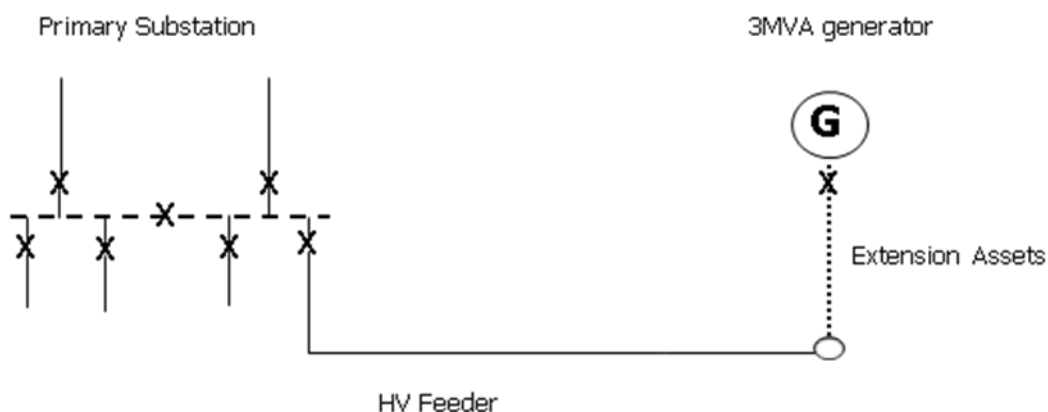
We will need to check the network can accommodate a generator of this size. The network will need to large enough:

- to transport the energy (thermal rating);
- to stop the generator itself causing the voltage of the network to rise too much (voltage rise)
- to ensure the current flow in the event of a fault is not too great as the generator will add to it. (fault level); and
- to ensure when the generator starts and stops generating, it does not cause voltage quality issues (voltage step change, starting current).

2a The existing network can accommodate the new connection

It may be possible for the local high voltage (HV) network to accommodate the generator without any reinforcement.





If so, we would only charge for designing and installing the new equipment needed so the generator can operate.

Indicative costs:

	Cost	Apportionment	Customer Contribution
Contestable Costs*			
Provision and installation of 150m of HV cable	£20,000	n/a	£20,000
Generator HV Metering Breaker (complete with suitable protection)	£30,000	n/a	£30,000
Actuators and Remote Control (RTU)	£16,000	n/a	£16,000
Non-Contestable Costs*			
Final Connection onto our Network	£500	n/a	£500
Assessment, Design and Witness Testing	£5,000	n/a	£5,000

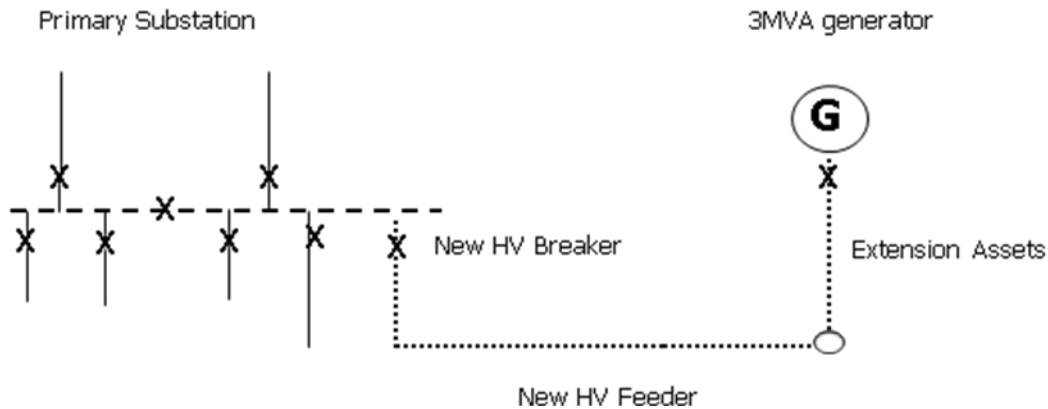
***Contestable** – those tasks that others may carry out. **Non-Contestable** – those tasks that only we may carry out.



Likely total connection charge to customer = £71,500

Likely timescale: Our expected time to deliver a project like this would be six to eighteen months, dependent on any planning approval or wayleaves required from other landowners or authorities.

2b New dedicated HV switch (circuit breaker) and line (feeder) needed



Indicative costs:

	Cost	Appor- tion- ment	Customer Contribution
Contestable Costs*			
Generator HV Metering Breaker (complete with suitable protection)	£30,000	n/a	£30,000
Actuators and Remote Control (RTU)	£16,000	n/a	£16,000
Provision and installation of 1500m of HV cable	£150,000	n/a	£150,000
Non-Contestable Costs*			
Final Connection onto our Network	£500	n/a	£500
Assessment, Design and Witness Testing	£5,000	n/a	£5,000
HV Circuit Breaker at Primary S/S (complete with suitable protection mods)	£65,000	n/a	£65,000



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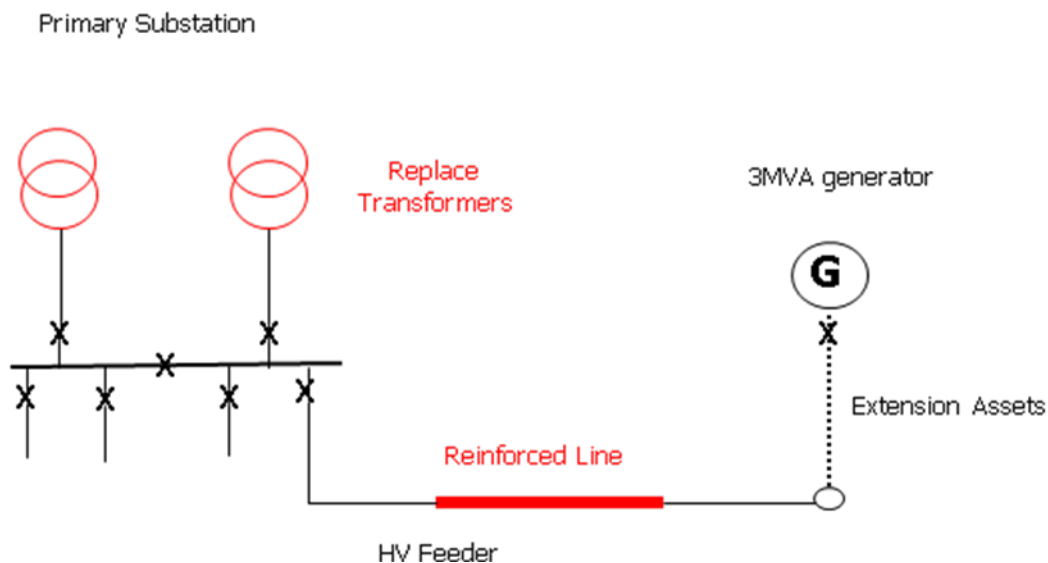
Likely connection charge to customer = £271,500

Likely timescale: Our expected time to deliver a project like this would be 12 to 24 months, dependent on any planning approval or wayleaves required from other landowners or authorities.

2c Existing network and primary substation reinforcement

We may need to reinforce our existing network and sometimes the primary substation as well.

In many situations we will fund some of the network reinforcement costs so you only pay part of the total cost. Your contribution will vary according to the size of the generator and the total connection costs.



Indicative costs:

	Cost	Apportionment	Customer Contribution
Contestable Costs*			



Generator HV Metering Breaker (complete with suitable protection)	£30,000	n/a	£30,000
Actuators and Remote Control (RTU)	£16,000	n/a	£16,000
Provision and installation of 150m of HV cable	£20,000	n/a	£20,000
Non-Contestable Costs*			
Final Connection onto our Network	£500	n/a	£500
Assessment, Design and Witness Testing	£5,000	n/a	£5,000
Rebuild 2km of HV Line	£150,000	£75,000	£75,000
Primary Substation Transformer	£2.5M	£525,000	£1,975,000

***Contestable** – those tasks that others may carry out. **Non-Contestable** – those tasks that only we may carry out.

Likely connection charge to customer = £2.1M

Likely timescale: Our expected time to deliver a project like this would be 18 to 36 months, dependent on any planning approval or wayleaves required from other landowners or authorities.

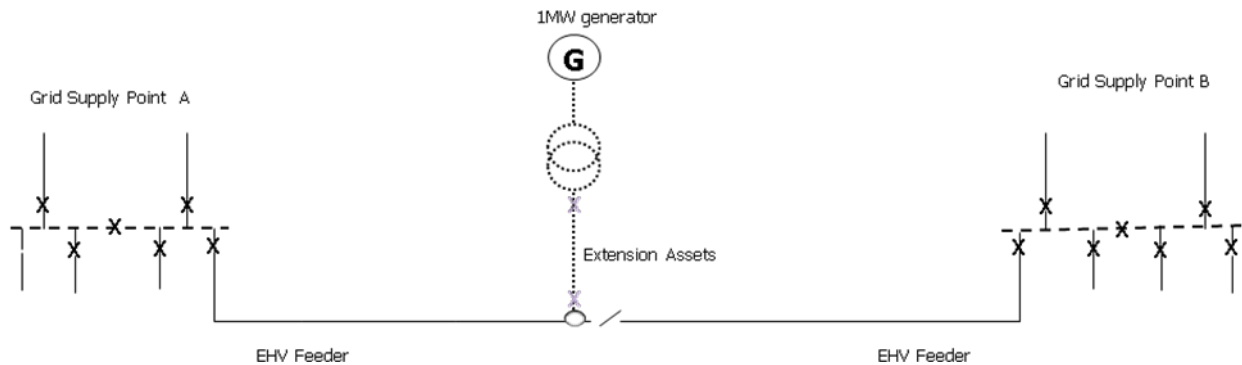
Occasionally generation connections will need up-stream reinforcement such as an extra high voltage (EHV) or grid reinforcement. In these cases we will include the costs and the timescales in our quotation.

Example 3: Generator connecting to our extra high voltage (EHV) network

We may need to connect new generation such a new wind or photovoltaic farm or hydro electric power station to our EHV network. This would apply if the HV network is fully utilised already or the planned generation needs a larger connection of, for example, 10MW.



If the generation connecting to the EHV network is for less than 1.35MW, we will offer to provide your connection at LV, providing the EHV to LV transformer in your costs. We will also provide an LV auxiliary supply where requested.



Indicative costs:

	Cost	Apportionment	Customer Contribution
Contestable Costs*			
Assessment, Design and Witness Testing	£5,000	n/a	£5,000
1.5MVA EHV/LV Transformer	£45,000	n/a	£45,000
Actuators and Remote Control (RTU)	£16,000	n/a	£16,000
Provision and installation of 150m of HV cable	£20,000	n/a	£20,000
EHV Outdoor CB inc Control Panel and Wiring	£95,000	n/a	£95,000
EHV 50k4 pad mounted transformer	£30,000	n/a	£30,000
EHV PMR including H-Pole	£25,000	n/a	£25,000
Non-Contestable Costs*			
Final Connection onto our Network	£500	n/a	£500
Assessment, Design and Witness Testing	£5,000	n/a	£5,000



***Contestable** – those tasks that others may carry out. **Non-Contestable** – those tasks that only we may carry out.

Likely connection charge to customer = £241,500

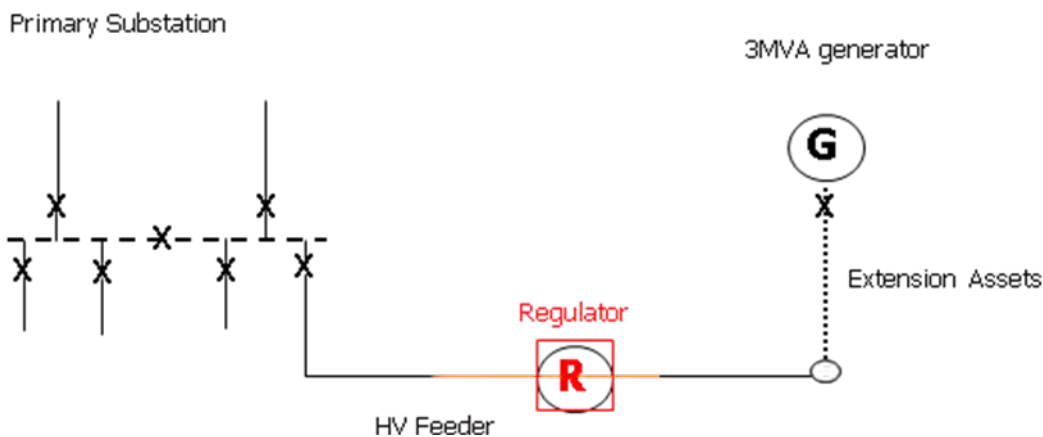
Likely timescale: Our expected time to deliver a project like this would be 6 to 18 months, dependent on any planning approval or wayleaves required from other landowners or authorities.

Occasionally generation connections will need up-stream reinforcement such as grid reinforcement. If this applies, we will include the costs and the timescales in our quotation.

Example 4: New generator connection using alternative technology

Wherever possible we use alternative connection arrangements in our solutions. These could include the Regulator or STATCOM illustrated below. These allow additional generation to connect while avoiding the cost and timescale involved in rebuilding the network. Your quotation will take advantage of these and other novel solutions to allow generation to connect at minimum cost.

Example regulator arrangement:



Example STATCOM arrangement:



STATCOM



Active Network Management

We operate or have in development a number of Active Network Management (ANM) schemes for clusters of generators.

In its simplest form this involves the monitor of 'pinch points' on a network so that, during peak times where they are at their limit with no extra capacity for a generator to export its electricity, the ANM will constrain that generator (switch the generator off). Although there are additional costs for this monitoring and control, it means the generator can operate for part of the time while avoiding the time and cost of reinforcement to allow it to operate all of the time.

Although not suitable in every situation when the costs or timescale to connect a generator through a more permanent arrangement become prohibitive we are happy to discuss the options open to a generator to connect on the basis of an ANM arrangement.