

Grid connections



This factsheet explains some of the challenges that may be faced by businesses who wish to connect local electricity generation systems such as solar PV to an existing grid connection within their buildings.

The electrical power supply implications of adding electric vehicle (EV) charging points are also considered.

Electricity generating systems such as solar PV or battery energy storage systems are usually tied into a building's existing electrical systems in the same way as other power-consuming loads are connected. The connection is made on the consumer's side of the electricity meter and the installation is said to be behind the meter and in parallel with the grid.

RENEWABLE GRID CONNECTIONS

If you intend to install electricity generating equipment such as solar PV at your business premises you may need to get permission from the Distribution Network Operator (DNO). In the North East region of the UK, the DNO is Northern Powergrid.

Battery energy storage systems are also treated as generation systems by the DNO and, as with other types of generating equipment, permission is usually needed to install them.

Renewable energy connections can be difficult for the DNO to accommodate due to the following reasons:

- Fault level** The rating of the switchgear may be exceeded meaning it may not operate correctly in a fault situation.
- Reverse power flow** Substation equipment is not always fully rated for reverse power flow so these may need to be upgraded before the distribution network can cope with renewable energy generation.
- Voltage rise** The addition of generation may increase voltage to levels which are above statutory limits and this can result in power blackouts.
- Thermal rating** The thermal rating (current carrying capacity) of equipment may be exceeded by the introduction of generation.
- Flicker** A voltage fluctuation may occur due to the sudden start or stop of generation causing a voltage fluctuation (flicker) which exceeds statutory limits.
- Power quality** Poor quality inverters can cause disturbances on the network which can affect other customers. It can cause issues such as equipment failure, high neutral currents and poor running of three phase machinery.

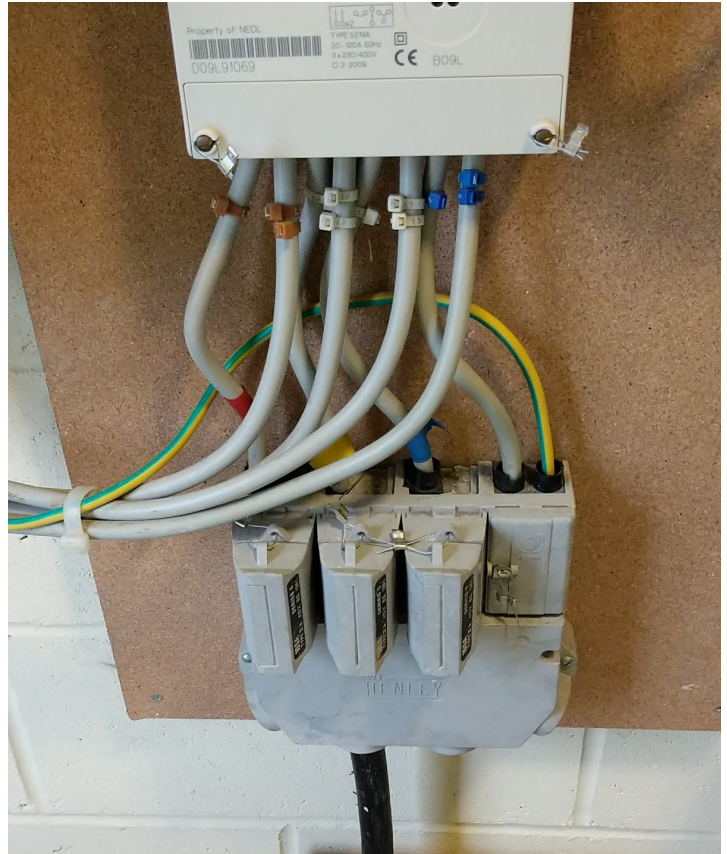


Depending on the electrical capacity of your generation system, there are two different requirements for involving the DNO:

SMALL MICROGENERATION SYSTEMS

For systems which supply less than 16amps per phase into the distribution network, you do not usually need to get permission from the DNO before the installation takes place. The installer just has to notify them of the installation within 30 days of the system being energised.

Very small commercial premises are often equipped with a single-phase electrical supply whereas larger premises normally have a 3-phase supply. On a single-phase supply, the 16amp limit is equivalent to a microgeneration system with a power rating of about 3.68kW. For a solar PV system that would typically be about 12 solar panels. On a building which has a 3-phase supply you could have around 36 solar panels (approx. 11kW) under this notification route.



LARGER GENERATION SYSTEMS

For systems which can supply more than 16amps per phase into the distribution network, it is necessary to seek permission from the DNO before the installation goes ahead. The application process can be quite technical and is usually done by the installer or their technical consultant. The DNO will not normally refuse to offer a connection, but there are situations where the proposed generation system could mean that some parts of their local network will need to be upgraded. The DNO will provide a budgetary estimate of the costs involved but these works can be expensive and time consuming. It is therefore advisable to seek expert advice when considering any large renewable energy generation scheme for your premises as some buildings are in areas where the distribution network cannot accommodate any additional load.



CASE STUDY

A business wishes to install a large 500kW solar PV system on the roof of one of their factory buildings. The factory has its own local substation but the DNO has confirmed that it will need to be upgraded. The costs and timescales for this example are as follows:

- New transformer, air circuit breaker and bus coupler required in the existing substation
- G99 relay and power quality meter required at the point of connection
- Cost of solar PV system: £450,000
- Cost of grid connection upgrade: £50,000

Timescales:

- Approximately 3 months to receive quotation from the DNO
- Approximately 6 months lead-time for local substation upgrade works

ELECTRIC VEHICLE CHARGERS

Many businesses wish to install electric vehicle charging points either for their own vehicle fleet or for their employees to use.

The first generation of electric vehicles charged at quite a low rate and some of them only needed to be connected via a 13A plug. The charging rate would be limited to a few kilowatts and it would take many hours to charge a vehicle battery. Nowadays, vehicle battery capacities and charging rates are much higher and even the most basic EV would be charged at around 7.4kW. To put this into context, that's almost as much power as an electric shower consumes so it can have a significant impact on the electrical power demands of a building. Many EVs have even higher rate charging capabilities and these can use charging points which supply 50kW or more.



If you are considering installing EV charge points outside your commercial premises it is quite likely that the electrical supply to the building will need to be upgraded. This could involve getting the DNO to install a larger service cable and higher rated service fuses as well as having new electrical equipment within the building such as distribution boards and sub-metering.

Where the electrical infrastructure is already adequate, it may still be necessary to apply to the DNO for a higher electrical import capacity and this can have significant cost implications for businesses who buy their electricity with a pass-through contract.

CASE STUDY

A business which operates a distribution warehouse wishes to change their vehicle fleet from diesel engine vans to electric vans. A request is made to the DNO to increase the import capacity of the site from 400kVA to 700kVA so that they can accommodate 6 new 50kW rapid charge points.

- New transformer, air circuit breaker and bus coupler required in the existing substation
- Cost of grid connection upgrade: £43,000

Timescales:

- Approximately 3 months to receive quotation from the DNO
- Approximately 6 months lead-time for local substation upgrade works



ABOUT US

Decerna provides a wide range of consultancy and development services, to ensure that the right decisions are made, to support our customers in the whole journey, from initial concept through to implementation of low carbon systems and infrastructure. Please get in touch to find out how we can help your organisation to de-carbonise.

www.decerna.co.uk

info@decerna.co.uk

+44 (0)1670 613 270

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