If you are a contractor, please see the special warning on page 4.

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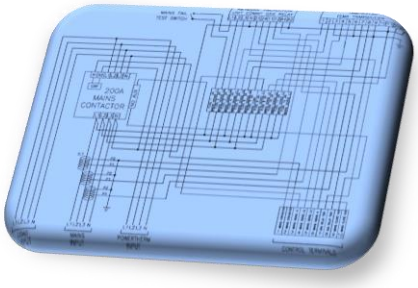
G59 Embedded Generator (CHP) Applications V4.0



An Overview

The connection of any form of generator device to run 'in parallel' or 'synchronised' with the mains electrical utility grid has certain regulations that must be complied with.

These regulations are commonly known as the 'G59' requirements, and would apply to Combined Heat & Power (CHP) units, and Generators being used for peak-lopping, or grid parallel use.

The electricity grid operators (known as DNO - District Network Operators), refer to these units as 'embedded' generators because they are embedded within the electricity grid, as opposed to being at the source of the national grid such as a power station.

This Document

The purpose of this document is to explain in simple terms the need for the G59 regulations, give guidance on the process of complying with them, and the associated responsibilities.

1. **Why is G59 Protection Needed?**

   The main reason is to prevent the embedded generator (or CHP) from sending electricity out onto the national grid in a dangerous manner:-

   For example, let's say that a cable out in the street has been broken. Along comes the electricity network operator to repair it. They go to the nearest substation and isolate the cable to make it safe to work on. However, in a nearby building is an embedded generator (CHP), which suddenly starts up and begins feeding electricity down the *other end* of the broken cable, making it live. The repair crew would have no knowledge of this and so would be placed in a potentially fatal situation.

   The G59 relay protective device, in simple terms prevents this situation by automatically disconnecting the embedded CHP from the mains.

2. **What does the G59 Device Actually Do?**

   A G59 compliant Mains Protection Relay is an electronic monitoring device which looks at the quality and stability of the mains electricity. It is programmed to certain fixed parameters dictated by the DNO - these typically include voltage, frequency, ROCOF (rate of change of frequency), phase angle and so on. Should any of these areas go outside the programmed limits, then the relay will cause a protective device such as an MCCB or other type of circuit breaker to open, thereby instantly disconnecting the generator or CHP from the grid.

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3. Some Common Myths

In years of doing projects with G59 protection we have often come across some popular myths, so we seek to dispel them here:-

"I don't need G59 Protection unless I intend to export power to the grid".
Wrong. If you have any form of generator or CHP where the output is connected to the electrical systems in your building, (it will thus be connected to the mains electrical grid), you must protect it with a G59 relay device.

"The supplier of my CHP is responsible to apply for the G59 Approval".
Wrong. Although we often provide this service to a client, (and so could your consultant or electrical contractor), this is done *on your behalf.* The legal duty of care to gain G59 approval before setting an embedded generator to work rests with the building occupier. In cases where the occupier is a tenant, then it's usually whoever the MPAN number of the electricity meter is registered to has the duty of care.

"I can apply for my G59 Approval after I've installed the CHP".
You could, but this is very unwise. You certainly must not operate the CHP in any way at all until G59 approval has been granted, protection devices fitted, tested, and signed off.

"The government says the DNO has to approve my application".
Wrong. Whilst there is a culture from government, and throughout industry, to encourage the use of embedded generation, the DNO does not guarantee to approve your application. In certain (rare) circumstances it could be rejected, so it's prudent to make the application first.

"I can commission my CHP without G59 Approval, so long as I don't leave it running".
Wrong. The CHP or generator has to run 'parallel' with the mains electricity - e.g. connected to it - to be commissioned, and this is illegal and very dangerous unless the G59 Approval has been granted.

4. Application Process

Step 1. Obtain the formal application document. Your local DNO may have their own preferred document, so you should contact them and ask for it.

If you know who your DNO is, their contact details can be found here:-
http://www.energynetworks.org/info/about/membership/members.html

If you don't know who they are, a post code search can be carried out here:-
http://www.energynetworks.org/info/faqs/who-is-my-network-operator.html

Otherwise, there is an industry standard Ofgem approved document, downloadable from:-
http://www.energynetworks.org/modx/assets/files/electricity/engineering/distributed%

Step 2. Complete the form. You will need to know whether you intend to export electricity onto the grid (for the purposes of getting paid for it), or whether you intend to just use the power within your own building or facility. You may need some help to complete this form, because it requires some technical content regarding the proposed generator. Please see section 7 - 'How Can We Help?'.

Step 3. Submit the form, and pay the fee if required. Most DNO's will charge to process the application and / or to carry out the network survey.

Step 4. Liaise with the DNO during their investigative phase. They will carry out a survey to confirm that their local network can accept your proposed generator connection. There is usually extended communication back and forth during this process.

Step 5. Agree the outcome. Normally approval will be granted and sent to the applicant. In some cases the DNO may require changes to the connection method, or upgrades to the local grid. These would need to be paid for by the applicant if required. *Warning: The above process can take months to complete, so start in good time.*

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5. **Installation Process**

Obtain and install the necessary G59 Protective Relay, breakers, and any other equipment associated with power exporting if required etc. These are usually supplied by shentongroup as part of a bespoke Site Interface Panel, but can also be built in to your mains electrical intake if required.

6. **Testing & Certification Process**

Before the generator can be used, the G59 must pass a series of functional and safety tests. These need to be carried out by a trained engineer, using a suite of calibrated test equipment. The test engineer and his equipment are normally provided by shentongroup. The test usually has to be witnessed by a representative from the DNO. There is a charge for this, although their fees may be wrapped up in the application fee or network survey fee.

7. **How Can We Help?**

Unless you are very familiar with the processes, working through the G59 matters from application through to final sign-off can be a daunting and time consuming task.

Shentongroup can help in the following ways. You can chose any 1 of these, or you can assign the entire process to us and have us take complete responsibility for it on your behalf.

A. Provision of Managed Application Service

Here we will help you locate the relevant DNO, we will complete the application forms for you (a certain amount of information is needed from you), and we will submit them to the DNO on your behalf.

We will then liaise with them throughout the process, including chasing them up to keep the application running on time. We will deal with any technical queries they raise, and generally manage the whole process for you.

Notes:

- We charge a fee for this, which *excludes* the fees that may be charged by the DNO. These vary from one area to another and need individually quoting at the time. Sometimes the DNO will provide the application FOC, but charge for the network survey. Other times they will quote an all-inclusive price. It varies.

- We do not guarantee to obtain approval. This is a fully managed service, but ultimately the decision whether to grant approval for a scheme or not, is beyond our control.

- Finally it must be remembered that as a result of the network survey, the DNO may require the end client to fund network changes or upgrades as a prerequisite for granting approval. The shentongroup fee obviously *excludes* such costs.

B. Design & Supply the G59 Equipment

It is normal practice for shentongroup to provide the actual G59 devices, breakers, and any other equipment associated with exporting power to the grid etc.

This is generically known as a 'Site Interface Panel', and will usually have been included in our CHP / Generator quotation with a provisional sum set against it. It is common for the equipment to be in a separate electrical enclosure, but it can also be incorporated into the CHP panel sometimes.

The requirements of this area are specific to each individual installation, and usually require liaison with the electrical contractor on the project.

C. Provide G59 Witness Testing Service

Again, it is normal practice for shentongroup to provide a trained engineer, with a suite of calibrated test equipment. *Note:* Our fee for this service will *exclude* any costs levied by the DNO to supply their engineer to witness the test.

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8. SPECIAL WARNING TO CONTRACTORS

If you are a contractor with CHP or Generator in your scope of work, please be advised that - failure to obtain the legal G59 Permission in good time can seriously threaten Practical Completion of your project. The CHP or Generator CANNOT BE COMMISSIONED WITHOUT THE G59 APPROVAL.

We have seen this so many times so we now issue this general warning to raise awareness of the risk.

The root cause of the problem is failure by contractors to allow sufficient time for the process, and tardiness in supplying the necessary information.

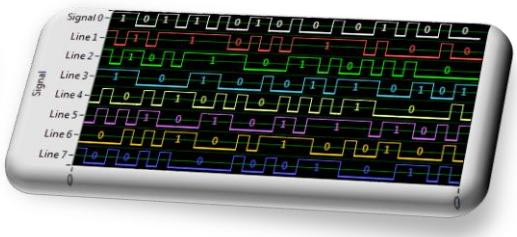
The Solution?

a. Start the G59 Application process as soon as you have been awarded the job - or sooner if you can.
b. Be aware that it could take 4 - 5 months to obtain the permission from the DNO.
c. Be prepared to supply all the necessary information promptly. You will need to work with your client, and the electrical designer of the scheme to provide this information. As a minimum you will be expected to provide:-
   i. The Meter Point Administration Number (MPAN) of the site.
   ii. Site plan showing location, proximity to roads, position of CHP, proposed connection point and mains incoming meter position.
   iii. Letter of consent from the client / landowner (generally whoever the MPAN is registered to), in order to give us authority to communicate with the DNO on their behalf.
   iv. Single line electrical schematic drawing showing any protection systems associated with the automatic disconnecting devices for additional sources of electrical energy including loss-of-mains protection and trip-circuit supervision. Note if the site has solar PV the facilities for this will need to be shown as well as the CHP / Generator. (The G59 relay Comap MainsPro will be mounted within the CHP control panel, so should be drawn in).
   v. Information from the calculations done by the electrical designer, such as:-
      - Maximum Site demand from grid (*'Power station standby import requirements'*)
      - Site demand from grid when CHP is running at minimum output (*'Power station top-up import requirements'*).
      - Export requirement (*'Total power station output at registered capacity'*).
   vi. Site contact name and phone number.

Final Caution. It should be remembered that you can have G59 Permission refused, which would mean the CHP could not be used. This has grave contractual consequences, especially if the CHP plant was part of the design in order to secure BREEAM or comply with building Regs. Fortunately such refusals are rare. More commonly, the DNO can grant the approval but subject to network upgrade costs which can run into £1,000s and usually have to be borne by the contractor.

9. Conclusion

In our experience G59 is not always well understood, but please be re-assured; with a proper managed approach to the process, and relevant information supplied in a timely manner, the obtaining of G59 Approval need not be a drama.



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