

## FAQs on Engineering Recommendations G98 and G99

Engineering Recommendations G98 and G99 come into effect on 27<sup>th</sup> April 2019. There are significant new requirements for generation of all sizes, including domestic scale photovoltaic generation, which connects to the distribution system. New G98 and G99 application forms have also been introduced. This document contains background and Frequently Asked Questions (FAQs) on G98 and G99.

1. How do G83 and G59 relate to G98 and G99?.....	3
2. Why have G98 and G99 been introduced? .....	3
3. What are Types A, B, C and D? .....	3
4. Is there a new G99 application form?.....	3
5. What's a Power Generating Module Document (PGMD) and do I have to complete one? .....	4
6. What are EONs, IONs, LONs and FONs?.....	4
7. Where can I find more information? .....	4
8. Where can I find the new G98 and G99 forms?.....	5
9. If I have accepted a generation Connection Offer that I applied for using the G59 Common Application Form do I now have to fill in the new Standard Application Form as well? .....	5
10. Can I use the simplified application form (Form A1-1) for a Generating Unit that is < 50 kW, if the aggregate capacity on the site will be > 50 kW?.....	5
11. My generation equipment supplier website does not provide G98 / G99 data sheets – what should I do? .....	5
12. Do G98 and G99 apply to existing generation (i.e. generation that is connected under G83 or G59)?.....	5
13. What should I do if I have already purchased G59 equipment?.....	6
14. What do I need to do if I want to install a G99 installation downstream of an existing G59 Connection Point?.....	6
15. Do G98 and G99 apply to mobile generation?.....	6
16. Is regenerative equipment covered by G99? .....	6
17. Is storage covered by G99? .....	6
18. Are there any other exceptions in G98 and G99?.....	6
19. Who issues the Operational Notifications (EON, ION, FON, LON)? .....	7
20. Does UK Power Networks have a timescale for publishing interface requirements (standard)?	7
21. Can UK Power Networks list the tests they will want to witness at commissioning? .....	7
22. What impact will G99 have on witness testing charges? .....	7
23. Is witness testing required for all Type A PGMs? .....	7
24. What is an Equipment Certificate? .....	8
25. Some of the commissioning tests (e.g. reactive power capability) require the Power Generating Module to be operational for a period of time. How will this work with intermittent generation, such as solar PV and wind? .....	8
26. Related to the question above – where you have multiple Generating Units which are the same model, will demonstrating the reactive capability on one model be sufficient for all Generating Units? .....	8
27. If my generation is embedded in a site, do I need to demonstrate the Reactive Power capability at the Connection Point?.....	8
28. Will I be able to use a Type Tested relay with a Combined Heat and Power (CHP) plant? This was previously only possible for inverter modules.....	8
29. Will there be a Type Test Database for G99 equipment?.....	9
30. What do I need to do if I do not have a direct contract with UK Power Networks, e.g. I am connected to an Independent Distribution Network Operator (IDNO) or private network? .....	9

31. If my installation comprises multiple Synchronous Power Generating Modules (PGMs), is an interface required for each PGM? .....	9
32. For Type C and D Power Generating Modules (PGM), what format models should I provide? ..	9
33. I am not sure whether my site will need to connect at 33 kV or 132 kV. Should I make an application for a Type C or a Type D connection? .....	9
34. G99 Annex C.7 talks about the possibility of the DNO permitting relaxations – what is UK Power Network’s approach to these? .....	10
35. How do the old G83 / G59 forms relate to the new G98 / G99 forms? .....	10

## **G98 and G99 Background Information – What's new?**

### **1. How do G83 and G59 relate to G98 and G99?**

These are all Engineering Recommendations (EREC), which contain technical and operational standards for connecting generation (including storage) to electricity distribution networks in Great Britain. G83 covers smaller generation (up to and including 16 A per phase) and G59 covers all other generation. G98 is going to replace G83, and G99 is going to replace G59, for new connections from 27<sup>th</sup> April 2019. Before 27<sup>th</sup> April 2019, generation can be connected under G83, G59, G98 or G99, which can all be found on the [Distribution Code website](#) (Annex 1 and Annex 2 Documents), and the ENA webpages for [G98](#) and [G99](#).

### **2. Why have G98 and G99 been introduced?**

As part of a piece of European legislation (the Third Energy Package), a Network Code called Requirements for Generators was written. This contains technical and operational requirements for generation connecting to networks. It is a legally binding document. G98 and G99 were written to incorporate the new requirements into the existing requirements in Great Britain.

Because G98 and G99 are Annex documents to the Distribution Code and are therefore law in Great Britain, they will apply regardless of any Brexit outcomes.

### **3. What are Types A, B, C and D?**

The Requirements for Generators (RfG) introduced new classifications for generation, called "Types". The generation Type increases with capacity (or connection voltage). There are more requirements for larger generation. There are also different compliance requirements, forms and notifications for different Types.

The Types are:

- Type A: From 0.8 kW to < 1 MW and connected at < 110 kV
- Type B: From 1 MW to < 10 MW and connected at < 110 kV
- Type C: From 10 MW to < 50 MW and connected at < 110 kV
- Type D:  $\geq$  50 MW or connected at  $\geq$  110 kV

In practice in Great Britain, Type D Power Generating Modules are connected at or above 132 kV.

### **4. Is there a new G99 application form?**

There is a new [Standard Application Form](#) for G99 applications. Although this looks quite different from the G59 Common Application Form, a lot of the fields are the same. Some new fields have been added to reflect new technical requirements in G99, and some fields relating to storage have been added. The form has been restructured into five parts – guidance is given on the form of when to complete each part.

Parts 1 to 3 of the Standard Application Form are the minimum information required when you submit your application to UK Power Networks.

## 5. What's a Power Generating Module Document (PGMD) and do I have to complete one?

A Power Generating Module Document (PGMD) is required for all Type B, C and D Power Generating Modules. It is used by the generation customer to show the Distribution Network Operator (DNO) that their Power Generating Module meets the requirements of G99. It is likely to be completed and updated in stages throughout the connection process. You must submit the PGMD to UK Power Networks at least 28 days before synchronising, although ideally a first draft of the PGMD will be submitted shortly after accepting the Connection Offer. You must submit a final version of the PGMD with correct data in (if information was previously estimated or not provided) in order to obtain a Final Operational Notification (FON) from UK Power Networks.

A blank PGMD is available in G99, and as a stand-alone form on the [ENA website](#) (form B2-1 for Type B and C2-1 for Types C and D).

## 6. What are EONs, IONs, LONs and FONs?

The RfG has introduced a number of Notifications for Type B, C and D Power Generating Modules. They are:

- EON (Energisation Operational Notification): For Type D only, you need to obtain this before energizing your internal network.
- ION (Interim Operational Notification): For Type D only, you need to obtain this before synchronizing your Power Generating Module for the first time.
- LON (Limited Operational Notification): For Type D only, you may need one of these if you have a non-compliance issue that is not resolved within a certain amount of time.
- FON (Final Operational Notification): For Types B, C and D, this is issued by UK Power Networks when they are satisfied you have demonstrated compliance with G99. You will not be permitted to operate your Power Generating Module until you have received your FON.

In most cases these are issued by UK Power Networks, unless you are installing a Large Power Station, in which case National Grid will issue some of these notifications.

## 7. Where can I find more information?

The UK Power Networks website has links to the new forms required for G98 and G99, as well as links to the Distributed Generation Connection Guides (see below). This is on the [Distributed Energy Resources \(DER\) page](#). All forms are available on the [Energy Networks Association website](#).

The Distributed Generation Connection Guides contain guidance on connecting under G98 and G99. The G99 Guides contain a one-page summary of key terms used in G98 and G99. The Guides are available [here](#).

## **G98 and G99 Frequently Asked Questions**

### **8. Where can I find the new G98 and G99 forms?**

All G98 forms are available on the [ENA website](#). Similarly, G99 forms are also available on the [ENA website](#).

### **9. If I have accepted a generation Connection Offer that I applied for using the G59 Common Application Form do I now have to fill in the new Standard Application Form as well?**

Yes, if you intend to connect on or after 27<sup>th</sup> April 2019 you will now need to fill in the new Standard Application Form and send this to the UK Power Networks Project Manager that you are dealing with. The Standard Application Form is available on the [UK Power Networks website](#) and the [Energy Networks Association website](#).

### **10. Can I use the simplified application form (Form A1-1) for a Generating Unit that is < 50 kW, if the aggregate capacity on the site will be > 50 kW?**

The simplified application form, Form A1-1 in G99, is for Power Generating Modules with an aggregate capacity < 50 kW 3-phase or 17 kW single-phase. So for example, if your site has an existing 30 kW PV installation, and you would like to add a 30 kW storage device, the aggregate capacity of the Power Park Module will be 60 kW. As this is over the 50 kW threshold, you would have to complete the G99 Standard Application form for the additional 30 kW storage device.

### **11. My generation equipment supplier website does not provide G98 / G99 data sheets – what should I do?**

We would advise that you contact the generation manufacturer directly to enquire about the availability of equipment that complies with G98 and G99.

### **12. Do G98 and G99 apply to existing generation (i.e. generation that is connected under G83 or G59)?**

G98 and G99 only apply to new generation connecting from 27<sup>th</sup> April 2019 (although you can connect compliant generation before that date if you wish). However, if you make a change to an existing installation, you will need to notify UK Power Networks. If it is determined that the change is significant – which would be based on the Requirements for Generators and agreed at an industry level – you and UK Power Networks will need to agree an approach. This which could involve submitting a new Standard Application Form under G99.

For more details on existing and new generation, and making changes to your installation, refer to the [Distributed Generation Connection Guides](#).

### **13. What should I do if I have already purchased G59 equipment?**

If you are connecting generation after 27<sup>th</sup> April 2019, you may still be able to connect under EREC G59, provided that you concluded a signed final and binding contract by 17<sup>th</sup> May 2018 for the main plant items, and you have an existing contract with UK Power Networks (e.g. accepted Connection Offer). If this is the case, you should contact your UKPN Connections Project Manager.

### **14. What do I need to do if I want to install a G99 installation downstream of an existing G59 Connection Point?**

You cannot have a G99 compliant Power Generating Module (PGM) connected behind G59 interface protection, as the G59 relay will not allow the technical capabilities of G99 generation to be used in full. In this case you would either need to amend the protection at the Connection Point to meet G99 requirements, move the existing G59 interface protection to the G59 generation location, or seek a new Connection Point for the G99 Power Generating Modules.

### **15. Do G98 and G99 apply to mobile generation?**

As with G83 and G59, G98 and G99 apply to fixed generation that operates in parallel with the public distribution network. Mobile generation is covered by EREC G84 "Recommendations for the connection of mobile Generating Sets to public distribution networks".

### **16. Is regenerative equipment covered by G99?**

The application of G99 to regenerative equipment (e.g. lifts, escalators) is being considered by the ENA EU Network Codes Steering Group and is likely to be clarified in a future amendment of G99. The current view is that regenerative equipment such as lifts and escalators do not need to comply with G99. At the time of writing (February 2019) the latest version of G99 is out for consultation, which includes clarifying that in general G99 does not apply to regenerative equipment. Interested readers should keep up to date with G99 amendments.

### **17. Is storage covered by G99?**

Most of G98 and G99 applies to storage connections. However, the Requirements for Generators (RfG) excludes storage, other than pumped-storage. This means there are a few specific technical requirements in G98 and G99, which have come from the RfG, that do not apply to storage. In G98 the exceptions are listed in Appendix 1. In G99 the exceptions are listed in Annex A.4.2. Storage, and other exceptions, must still be commissioned under G98 / G99 from 27<sup>th</sup> April 2019, unless you meet the grace period exception described in FAQ #13.

### **18. Are there any other exceptions in G98 and G99?**

Yes, as well as storage (above) there are also exceptions in G98 and G99 for:

- Micro-generators with a Registered Capacity of < 800 W (G98 only)
- Generation classified as "Emerging Technology" (G98 and G99)

- Power Generating Modules that operate in parallel with the Distribution Network under an infrequent short-term parallel operation mode (G99 only)

As with storage, most of G98 and G99 still apply to the above – but there are a few specific exceptions, which are listed in the annexes. These exceptions must still be commissioned under G98 / G99 from 27<sup>th</sup> April 2019, unless you meet the grace period exception described in FAQ #13.

## **19. Who issues the Operational Notifications (EON, ION, FON, LON)?**

For most Power Generating Modules, the notifications will be issued by UK Power Networks. If your generation is classified as “Large”, the EON will be issued by UK Power Networks, but all other notifications will be issued by National Grid. Refer also to FAQ #6.

## **20. Does UK Power Networks have a timescale for publishing interface requirements (standard)?**

G99 introduces a number of requirements for a communication interfaces between the Power Generating Module and UK Power Networks. The exact requirements vary by RfG Type and include the capability to cease or reduce Active Power output in response to a signal received from UK Power Networks, and requirements for operational monitoring. UK Power Networks is developing a technical standard to define the interface requirements.

## **21. Can UK Power Networks list the tests they will want to witness at commissioning?**

The short answer is no. The tests that UK Power Networks will witness depend on the Type of Power Generating Module, as well as which elements of compliance you have demonstrated by other means (via the Power Generating Module Document, see FAQ #5) – e.g. Manufacturers’ Information, Simulation Studies, Type Test reports and Equipment Certificates (see FAQ #24). UK Power Networks will not advise the Generator which tests are required; it is for the Generator to notify UK Power Networks, at least 28 days prior to commissioning, what their test programme is. UK Power Networks is likely to witness testing for installations that are > 100 kW.

## **22. What impact will G99 have on witness testing charges?**

Witness testing charges will vary, depending on how much compliance you demonstrate before commissioning (e.g. with Manufacturers’ Information, Simulation Studies and Type Test reports). UK Power Networks has a daily charge rate for witness testing.

## **23. Is witness testing required for all Type A PGMs?**

In general UK Power Networks will not witness the testing of Fully Type Tested Power Park Modules (PPMs) between 16 A/phase and 100 kW. You will still need to complete Form A3. For generation that is partially Type Tested or not Type Tested at all, UK Power Networks will witness the tests to meet the requirements of Form A2-4.

## 24. What is an Equipment Certificate?

An equipment certificate regime is being established by the ENA during 2019. Equipment Certificate(s) are defined in EU 2016/631 and they can cover all or part of the relevant compliance points. Where they are used they demonstrate compliance without need for further evidence for those aspects within the scope of the Equipment Certificate. Until the Equipment Certificate regime is in place Self Certified Manufacturers' Information will be acceptable on the assumption it has sufficient detail (e.g. technical construction files) behind it.

## 25. Some of the commissioning tests (e.g. reactive power capability) require the Power Generating Module to be operational for a period of time. How will this work with intermittent generation, such as solar PV and wind?

For Type B, C and D Power Park Modules (PPMs), G99 contains a requirement to demonstrate certain technical capabilities, including reactive power capabilities. The tests (detailed in Annex B.6.3 for Type B PPMs and Annex C.9.3 for Type C and D PPMs) involve operating the PPM at different portions of Registered Capacity and at different Power Factors, for periods of 5 – 60 minutes. The tests require that:

- At least 95% of Generating Units in the PPM are in service, and
- Sufficient MW resource is forecasted to generate at least 85% of Registered Capacity of the PPM

i.e. the test dates may be dependent on forecast weather conditions.

## 26. Related to the question above – where you have multiple Generating Units which are the same model, will demonstrating the reactive capability on one model be sufficient for all Generating Units?

Yes, UK Power Networks anticipates that demonstrating compliance with one Generating Unit should cover others for this requirement, where they are the same model. This should be agreed between the Generator and UK Power Networks prior to testing.

## 27. If my generation is embedded in a site, do I need to demonstrate the Reactive Power capability at the Connection Point?

As per G99 15.1.1 the Reactive Power capability can be demonstrated at the Generating Unit terminals rather than the Connection Point, where it is not practical or reasonable to demonstrate at the Connection Point, e.g. if the site has embedded demand. This approach should be agreed between the Generator and UK Power Networks prior to commissioning.

## 28. Will I be able to use a Type Tested relay with a Combined Heat and Power (CHP) plant? This was previously only possible for inverter modules.

Yes, G99 allows for the use of Type Tested relays, which would remove the need for witnessing of onsite injection testing. However, onsite witnessing of other tests and checks is still required (see Form A3 Installation Document).



## 29. Will there be a Type Test Database for G99 equipment?

The Energy Networks Association (ENA) hosts a [Type Test Verification Report Register](#) or Type Test database. This allows manufacturers of generating units that have been Type Tested to meet the requirements of G83 or G59 to upload relevant documentation and obtain a Type Test Reference Number (Product ID), which can be quoted on application forms. The ENA has developed this facility for G98 and G99; Phase 1 of the facility is available at: [www.ena-eng.org/gen-ttr](http://www.ena-eng.org/gen-ttr). The ENA is collecting feedback on the usability etc of the database.

## 30. What do I need to do if I do not have a direct contract with UK Power Networks, e.g. I am connected to an Independent Distribution Network Operator (IDNO) or private network?

If you do not have a direct contract with UK Power Networks, you will need to liaise with the party with whom you do have a contract for connection. They may be obliged to pass on certain information to UK Power Networks, as part of their contract with UK Power Networks. Where the party you have a contract with is an Independent Distribution Network Operator (IDNO), G98 and G99 will still apply, but you will need to demonstrate compliance to the IDNO, rather than UK Power Networks.

## 31. If my installation comprises multiple Synchronous Power Generating Modules (PGMs), is an interface required for each PGM?

Some of the technical requirements (e.g. control of active power output) are required for each Power Generating Module (PGM). But this does not necessarily mean you need multiple interfaces with UK Power Networks – it may be that you manage a single incoming signal from UK Power Networks across your Power Generating Facility.

## 32. For Type C and D Power Generating Modules (PGM), what format models should I provide?

G99 requires Generators of Type C and D Power Generating Modules (PGM) to submit appropriate simulation models of their Power Generating Modules (G99 Issue 1 Amendment 3 6.3.9.3). You will need to provide your model in a format that is compatible for use with DigSilent PowerFactory, and suitable for the current version of the software in use by UK Power Networks. To find out the details of the current version of software, contact your Connections Project Manager. As well as providing the model, you should also provide guidance on how to run the model, for the purpose for which it is being provided.

## 33. I am not sure whether my site will need to connect at 33 kV or 132 kV. Should I make an application for a Type C or a Type D connection?

At the application stage, the Standard Application Form (SAF) does not require a Type determination. There is the option to add a preferred connection point voltage; however, UK Power Networks will determine the optimum connection point for the capacity requested. Therefore it is not necessary to determine the Type before making a budget or formal application.

### 34. G99 Annex C.7 talks about the possibility of the DNO permitting relaxations – what is UK Power Network’s approach to these?

G99 Annex C.7 covers simulation studies for Type C and Type D Power Generating Modules. In a number of cases it talks about DNOs permitting relaxations from certain requirements, e.g.:

*“The DNO may permit relaxation from the requirement in paragraph C.7.2 to paragraph C.7.8 where Manufacturers’ Information for the Power Generating Module has been provided which details the characteristics from appropriate simulations on a representative installation with the same equipment and settings and the performance of the Power Generating Module can, in the DNO’s opinion, reasonably represent that of the installed Power Generating Module.”*

These and other relaxations allow the Generator to provide Manufacturers’ Information to demonstrate compliance, and removes the requirement for the Generator to arrange for suitable simulation studies to be undertaken for certain requirements. The relaxation is with regard to the fact that some of the studies being supplied for C7 are not necessarily site specific but representative of the Power Generating Module (i.e. same equipment, aggregated capacity and settings). It is still a requirement that studies are submitted and the models that were used to undertake these studies are supplied. This will depend on whether your Manufacturer has such models / simulations to demonstrate these requirements. In this case, UK Power Networks will consider accepting these in lieu of you, as the Generator, undertaking the studies.

We would advise that you discuss this with your UK Power Networks Connections Project Manager.

### 35. How do the old G83 / G59 forms relate to the new G98 / G99 forms?

Some of the forms in G98 / G99 are based on forms from G83 / G59. Others are new, as they are based on new requirements from the EU Network Code Requirements for Generators. The relationship between the old and new forms is shown in the table below.

Note that in G99, separate Annexes and Forms are provided for the different RfG Types A – D. This is to make G99 easier to use for Generators. This does mean that some of the G59 forms are mapped to more than one G99 form.

#### EREC G83 and G98:

EREC G98/1-2	EREC G83/2-1	Comment
Form A - Application for Connection of Multiple Micro-Generator Installations	Appendix 2 Application for Connection	
Form B - Installation Document for Connection under ER G98	Appendix 3 SSEG Installation Commissioning Confirmation	
Form C - Type Test Verification Report	Appendix 4 Type Verification Test Report	Amended for new technical requirements and revised protection settings in G98
Form D - Micro-Generator Decommissioning Confirmation	Appendix 5 SSEG Decommissioning Confirmation	

**EREC G59 and G99:**

<b>EREC G99/1-3</b>	<b>EREC G59/3-4</b>	<b>Comment</b>
Form A1-1 : Application for connection of Power Generating Module(s) with Total Aggregate Capacity <50 kW 3-phase or 17 kW single phase	A13.5 Application for connection of Type Tested Generating Units with totals aggregate Power Station capacity < 50kW three phase or 17kW single phase	
Form A1-2 : Application for connection of Integrated Micro Generation and Storage installations		New to G99, to capture Integrated Micro Generation and Storage procedure (formally known as Energy Storage Fast Track)
A.2 Type A Compliance Verification Report (Form A2-1, Form A2-2, Form A2-3)	A13.1 Generating Unit Type Test Sheet - Type Tested Generating Unit (>16A per phase but < 50kW three phase or 17kW single phase)	Amended for new technical requirements and revised protection settings in G99; extended to cover fully and partially Type Tested; not limited to < 50 kW in G99. Three different forms, depending on type and capacity of Power Generating Module.
Form A2-4: Site Compliance and Commissioning test requirements for Type A Power Generating Modules	A13.3 Generating Plant Installation and Commissioning Tests - Commissioning test requirements for non-Type Tested Generating Units in addition to those required in A13.2	
Form A3-1: Installation Document for Type A Power Generating Modules / Form A3-2: Installation Document for Integrated Micro Generation and Storage	A13.2 Generating Plant Installation and Commissioning Confirmation	Form A3-2 new for Integrated Micro Generation and Storage procedure.
Form B2-1 Power Generating Module Document for Type B Power Generating Modules		New to G99, required by Requirements for Generators.
Form B2-2: Site Compliance and Commissioning test requirements for Type B Power Generating Modules	A13.3 Generating Plant Installation and Commissioning Tests - Commissioning test requirements for non-Type Tested Generating Units in addition to those required in A13.2	
Form B3 - Installation and Commissioning Confirmation Form for Type B PGMs	A13.2 Generating Plant Installation and Commissioning Confirmation	
Form C2-1 Power Generating Module Document for Type C and Type D Power Generating Modules		New to G99, required by Requirements for Generators.
Form C2-2: Site Compliance and Commissioning test requirements for Type C and Type D Power	A13.3 Generating Plant Installation and Commissioning Tests - Commissioning test	

Generating Modules	requirements for non-Type Tested Generating Units in addition to those required in A13.2	
Form C3 Installation and Commissioning Confirmation Form for Type C and Type D PGMs	A13.2 Generating Plant Installation and Commissioning Confirmation	
D.0 Power Generating Module Decommissioning Confirmation	A13.4 Generating Plant Decommissioning Confirmation	