

# Stage 03: Report to Authority

Grid Code

## GC0023 – Protection Fault Clearance Time & Back-Up Protection

What stage is this document at?

01	Workgroup Report
02	Industry Consultation
03	Report to the Authority

This proposal seeks to modify the Grid Code to clarify the role, details and Fault Clearance times required from User Back-Up Protection systems to ensure optimal discrimination.

The purpose of this document is to assist the Authority in its decision of whether to implement the proposed Grid Code Modification.

**Published on: 01 December 2015**



**National Grid recommends:**

GC0023 should be implemented as it better facilitates Applicable Grid Code objectives (i) and (iii)



**High Impact:**

Directly connected Generators or directly connected Distribution Network Operators / Non-Embedded Customers and directly connected DC Converter Stations



**Medium Impact:**

None identified



**Low Impact:**

None identified

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### Any Questions?

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## About this document

This document is the report to the Authority for GC0023 which contains the responses to the Industry Consultation and the National Grid recommendation. The purpose of this document is to assist the Authority in their decision on whether to implement the GC0023 proposed changes.

The revisions to the Grid Code proposed by National Grid and sent to the Authority require approval by that body and will, if approved, come into force on such date (or dates) of which Authorised Electricity Operators will be notified by National Grid, in accordance with the Authority's approval.

Proposer:

**National Grid**

## Document Control

Version	Date	Author	Change Reference
1.0	24 November 2015	Franklin Rodrick National Grid	Final Report to Authority
1.1	25 January 2016	Franklin Rodrick National Grid	Minor clerical corrections to the final report and legal text in line with Ofgem decision letter.

## 1 Executive Summary

- 1.1 This document describes the GC0023 Modification Proposal which seeks to update and clarify the requirements for User Back-Up Protection systems to ensure optimal discrimination.
- 1.2 GC0023 proposes to correct current terminology (faster / slower) in CC.6.2.2.2.2 and CC.6.2.3.1.1 of the Grid Code which relates to Generator, Distribution Network Operator (DNO), Non-Embedded Customer & DC Converter Station fault clearance time as well as the SI units (**ms** - milliseconds) used to define fault clearance time.
- 1.3 In addition GC0023 also proposes to introduce additional wording in CC.6.2.2.2.2 (b) to add further clarity to the minimum fault clearance time required by Generator Back-Up Protection systems.
- 1.4 GC0023 also introduces changes to the existing definitions of Back-Up Protection and Main Protection and the addition of new definitions for Independent Main Protection and Independent Back-Up Protection.
- 1.5 An issue pro forma for GC0023 was originally completed by National Grid and submitted to the Grid Code Review Panel for their consideration in November 2008. The Panel determined that the proposal should be progressed to a Workshop to further clarify the requirements.
- 1.6 Following the Workshop held on 20 March 2009, National Grid conducted a survey to assess the sites that posed a potential risk to the Transmission System and have taken the necessary actions to eliminate the risk. National Grid has adopted a best practice approach for Protection requirements through the compliance process since 2009.
- 1.7 GC0023 proposes to embed the best practice approach for Protection settings currently used during the compliance process into the Grid Code, given that this best practice has now been successfully used for a number of years. Bringing the Grid Code into line with these best practices has lacked urgency but also needed a demonstration of successful implementation and completion of remedial works for existing connections, both of which have now been successfully achieved.

### National Grid Recommendation

- 1.8 National Grid supports the implementation of GC0023 as it better facilitates the Applicable Grid Code objectives.

Timeline of Events
Sep 2007 - Issue first raised at GCRP
Nov 2007 - Issue paper presented at GCRP
Nov 2008 - Presented at GCRP
Mar 2009 - One-off Workshop
Post Mar 2009 - NG conducted survey on existing generators
Jul 2012 - Issue paper re-raised at GCRP
Oct 2013 - Legal text presented to GCRP
Mar 2015 - Issue re-raised at GCRP
Mar - Jun 2015 - Legal text drafted
Jul 2015 - Consultation drafted
Jul 2015 - Consultation / legal text circulated to GCRP
Aug 2015 - Industry Consultation published

## 2 Why Change?

- 2.1 GC0023 identified two Grid Code deficiencies. The first issue is related to CC.6.2.2.2 and CC.6.2.3.1.1. The current terminology (faster / slower) used in the Grid Code referring to the fault clearance time is incorrect. The correct terminology is shorter / longer which is the standard industry wide term used in relation to fault clearance time on Protection equipment.
- 2.2 In addition, the SI unit **mS** currently used for fault clearance time in CC.6.2.2.2 and CC.6.2.3.1.1 is incorrect as it stands for milli-Siemens, a unit of electrical susceptance, and hence should be changed to **ms (milli-seconds)**.
- 2.3 The second issue relates to CC.6.2.2.2 (b) which is designed to ensure that Generators directly connected to the transmission network provide Back-Up Protection for the detection of uncleared faults. This requirement is to ensure that Generator's Backup Protection is coordinated with NGET's Back-Up Protection. National Grid's role in managing the Grid Code compliance process for new generators connecting to the system and ongoing compliance for existing generators highlighted potentially inadequate discrimination between National Grid's and the Generator's Backup Protection systems. It was also unclear why the Back-up Protection requirements were different in England and Wales (800ms) from those in Scotland (300ms).
- 2.4 The consequence of inadequate discrimination is that in the event of a failure of the Main Protection System an uncleared fault on the transmission network could result in fault clearance by National Grid's feeder remote end Back-up Protection (typically at 500ms). This would typically result in the loss of both the local substation and the connected transmission feeder circuits from the respective remote ends.
- 2.5 CC.6.2.2.2 (b) currently does not adequately clarify:
- That the Back-Up Protection has to be separate from the Main Protection;
  - That the function should be supported by a separate Current Transformer (CT) (i.e. does not share the same CT as the Main Protection); or
  - Under what circumstances the function may be provided as part of the Main Protection (e.g. when two Main Protection systems are provided)
- 2.6 CC.6.2.3.1.1 (a) required more clarification on the requirements for the Distribution Network Operators and Non-Embedded Users connecting to the National Electricity Transmission System. National Grid wants to protect the low voltage busbar from any faults on either the User's equipment or National Grid equipment.

### 3 Solution

- 3.1 So far as the deficiency associated with CC.6.2.2.2 and CC.6.2.3.1.1 is concerned this is a simple text change to reflect current practice.
- 3.2 For CC.6.2.2.2 (b) the solution is slightly more complex. In 2009, National Grid conducted a survey on connections before 1 January 2009 to assess whether any sites were at risk and whether any remedial work was required. Where remedial work was identified as being necessary, this has been completed and National Grid is satisfied that the connections before 1 January 2009 are compliant. Since January 2009, National Grid has, as part of the compliance process, ensured that these issues were covered for any new connections. On this basis this proposal only looks to implement the changes for connections after the “**Date of Approval**” of this modification and no retrospective work will be required.
- 3.3 For CC.6.2.3.1.1 (b) the solution is to clarify the requirements. The fault clearance times stated in CC.6.2.3.1.1 (b) now refer to the point of connection of the User’s equipment to the National Electricity Transmission System. The point of connection is deemed to be the low voltage busbar irrespective of whether National Grid or the User owns the busbar. For reasons mentioned in 3.2 this proposal only looks to implement the changes for connections after the “**Date of Approval**” of this modification and no retrospective work will be required.
- 3.4 GC0023 seeks to implement the proposed legal text changes identified in Annex 1.
- 3.5 It is proposed to amend CC.6.2.2.2, CC.6.2.3.1 and the Glossary and Definitions of the Grid Code to address the above issues.

## 4 Impact & Assessment

### Impact on the Grid Code

- 4.1 GC0023 requires amendments to the following parts of the Grid Code:
- Connection Conditions CC.6.2.2.2 / CC.6.2.3.1 and some minor amendments to the Glossary and Definitions
- 4.2 The text required to give effect to the proposal is contained in Annex 1 of this document.

### Impact on National Electricity Transmission System (NETS)

- 4.3 The proposed changes will not have an adverse impact on the Transmission System.

### Impact on Grid Code Users

- 4.4 The proposed changes will clarify the requirements placed on Users connecting to the system in respect of the protection requirements.

### Impact on Greenhouse Gas emissions

- 4.5 The proposed changes will not have a material impact on Greenhouse Gas Emissions.

### Assessment against Grid Code Objectives

- 4.6 National Grid considers that GC0023 will better facilitate the Grid Code objectives as follows:

- (i) to permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity;

*The proposed changes permit the operation of an efficient transmission system by removing any confusion within the Grid Code requirements in facilitating the operation of protection systems so as to cause the minimum loss of equipment following a fault on the Transmission System.*

- (ii) to facilitate competition in the generation and supply of electricity (and without limiting the foregoing, to facilitate the National Electricity Transmission System being made available to persons authorised to supply or generate electricity on terms which neither prevent nor restrict competition in the supply or generation of electricity);

*The proposed changes have a neutral impact on this objective*

- (iii) subject to sub-paragraphs (i) and (ii), to promote the security and efficiency of the electricity generation, transmission and distribution systems in the National Electricity Transmission System operator area taken as a whole; and

*With the clauses in the Grid Code clarified, it will remove any possible confusion regarding the operation of protection systems and promote a more secure transmission system.*

- (iv) to efficiently discharge the obligations imposed upon the licensee by this license and to comply with the Electricity Regulation and any relevant legally binding decisions of the European Commission and/or the Agency.

*The proposed changes have a neutral impact on this objective*

#### **Impact on core industry documents**

4.7 The proposed modification only requires changes to the Grid Code.

#### **Impact on other industry documents**

4.8 The proposed modification does not impact on any other industry documents

#### **Implementation**

4.9 National Grid proposes that GC0023 should be implemented 10 business days after an Authority decision.

## 5 Consultation Responses

5.1 An Industry Consultation was held which opened on 25 August 2015 and closed on 22 September 2015. 5 responses were received during the consultation period.

5.2 The table below provides an overview of the responses received. Copies of the responses are also included in Annex 2 of this report.

Ref	Company	Supportive	Comments
CR-01	RWE Group of GB companies, including RWE Generation UK plc, RWE Innogy UK Limited and RWE Supply & Trading GmbH	Yes	<ul style="list-style-type: none"> <li>RWE believe that the changes proposed by GC0023 better facilitate the appropriate Grid Code objectives</li> <li>A couple of minor changes to the legal text were suggested by RWE to aid clarity. These are included in the final legal text in Annex 1</li> </ul>
CR-02	Northern Powergrid	Yes	<ul style="list-style-type: none"> <li>Northern Powergrid supported the changes however they required more clarification.</li> <li>Northern Powergrid wanted to further clarify ownership boundaries at the low voltage busbar in the clause CC.6.2.3.1.1</li> <li>Following discussion, Northern Powergrid agreed that the proposed legal text in the consultation was sufficient and no further amendments were required.</li> </ul>
CR-03	Scottish Power Generation	Yes	<ul style="list-style-type: none"> <li>Scottish Power support the changes however requested clarifying text regarding existing plant in Scotland.</li> <li>The final legal text included in Annex 1 covers the point raised through the consultation.</li> </ul>
CR-04	Western Power Distribution	Yes	<ul style="list-style-type: none"> <li>Western Power Distribution support the changes suggested by GC0023</li> </ul>
CR-05	SSEPD	No	<ul style="list-style-type: none"> <li>SSEPD would not support implementation timescales of 10 days</li> <li>SSEPD would not support the proposal to change the backup protection time to 300ms.</li> </ul>



## National Grid Comments on Responses

- 5.3 National Grid would like to thank all respondents for their comments regarding GC0023.
- 5.4 The responses received were broadly supportive to change the Grid Code text to highlight the Back-up Protection time to 300ms which would remove any confusion within the Grid Code requirements in facilitating the operation of protection systems so as to cause the minimum loss to the Transmission System.
- 5.5 Of the supportive response, minor changes were made to the legal text as suggested by RWE to aid clarity and by Scottish Power to clarify how these arrangements would apply in Scotland. Both parties were satisfied with these changes.
- 5.6 SSE Power Distribution (SSEPD) were not supportive of the changes and did not agree with the implementation timescales. Their interpretation was that the changes will have to be made to affected equipment within 10 days of approval. It was clarified to SSEPD that the implementation timescales referred to changing the Grid Code but that this would then apply to new connections after that date and that no retrospective works were envisaged.
- 5.7 SSEPD also didn't agree with the suggested proposal of changing the Back-up Protection time to 300ms as it would have cost and implementation issues at 11kV and 33kV to 132kV in Scotland. It was clarified to SSEPD that the changes are only applicable to Transmission System connected equipment (above 132kV) and that equipment connected to the Distribution System is not impacted. It was also reiterated that the changes do not apply retrospectively. SSEPD agreed that they had misinterpreted the requirements.
- 5.8 Scottish Power Generation suggested making reference to existing equipment in Scotland. CC.6.2.2.2 (b) stated that the existing plant in Scotland needs to have a Back-Up Protection fault clearance time of 300ms which was deleted in the suggested legal text in the consultation. Following the consultation response, the reference has been added to the proposed legal text in Annex1.
- 5.9 Northern Powergrid suggested slight amendments to the proposed legal text in CC.6.2.3.1.1 to further clarify the clause. The respondent was informed that the proposed legal text aims to clarify National Grid's intention of protecting the low voltage busbar by providing fault clearance time of 120ms on National Grid's and Users' Protection equipment. It was agreed between National Grid and the respondent that the suggested

amendments do not add any value and the proposed legal text was sufficient.

5.10 The suggested amendments to the legal text improve the clarity and have been incorporated into the final version.

CC.6.2.2 Requirements at Connection Points or, in the case of OTSDUW at Interface Points that relate to Generators or OTSDUW Plant and Apparatus or DC Converter Station owners

CC.6.2.2.1 Not Used.

CC.6.2.2.2 Generating Unit, OTSDUW Plant and Apparatus and Power Station Protection Arrangements

CC.6.2.2.2.1 Minimum Requirements

**Protection** of Generating Units (other than Power Park Units), DC Converters, **OTSDUW Plant and Apparatus** or Power Park Modules and their connections to the **National Electricity Transmission System** ~~must~~ shall meet the ~~minimum~~ requirements given below. These are necessary to reduce ~~to a practical minimum~~ the impact on the **National Electricity Transmission System** of faults on **OTSDUW Plant and Apparatus** circuits or circuits owned by Generators or DC Converter Station owners.

CC.6.2.2.2.2 Fault Clearance Times

(a) The ~~required~~ fault clearance ~~time times~~ for faults on the Generator's or DC Converter Station owner's equipment directly connected to the **National Electricity Transmission System** or **OTSDUW Plant and Apparatus** and for faults on the **National Electricity Transmission System** directly connected to the Generator or DC Converter Station owner's equipment or **OTSDUW Plant and Apparatus**, from fault inception to the circuit breaker arc extinction, shall be set out in ~~accordance with~~ the **Bilateral Agreement**. The ~~fault clearance time times~~ specified in ~~accordance with~~ the **Bilateral Agreement** shall not be ~~shorter faster than the durations~~ specified below:

- (i) ~~80mS~~ 80ms at 400kV
- (ii) ~~400mS~~ 100ms at 275kV
- (iii) ~~420mS~~ 120ms at 132kV and below

but this shall not prevent ~~a the~~ **User** or **NGET** or ~~a the~~ **Generator** (including in respect of **OTSDUW Plant and Apparatus**) ~~having faster~~ from selecting a shorter fault clearance ~~times time~~ on their own **Plant and Apparatus** provided **Discrimination** is achieved.

~~Slower~~ A longer fault clearance ~~times time~~ may be specified in ~~accordance with~~ the **Bilateral Agreement** for faults on the **National Electricity Transmission System**. ~~Slower~~ A longer fault clearance ~~times time~~ for faults on the **Generator** or **DC Converter Station** owner's equipment or **OTSDUW Plant and**

**Apparatus** may be agreed **with NGET** in accordance with the terms of the **Bilateral Agreement** but only if **System** requirements, in **NGET's** view, permit. The probability that the fault clearance ~~time times~~—stated in ~~accordance with~~ the **Bilateral Agreement** will be exceeded by any given fault, must be less than 2%.

- (b) ~~For~~In the event that the ~~above required~~ fault clearance ~~times~~ ~~are~~ ~~time~~ is not met as a result of failure to operate on the **Main Protection System(s)** provided, the **Generators** or **DC Converter Station** owners or **Generators** in the case of **OTSDUW Plant and Apparatus** shall, ~~except as specified below~~ provide **Independent Back-Up Protection**. **NGET** will also provide **Back-Up Protection** and ~~these NGET and the User's~~ **Back-Up Protections** will be co-ordinated so as to provide **Discrimination**.

On a **Generating Unit** (other than a **Power Park UnitsUnit**), **DC Converter** or **Power Park Module** or **OTSDUW Plant and Apparatus** in respect of which the **Completion Date** is after [Date of Approval] and connected to the **National Electricity Transmission System** at 400kV or 275kV and where ~~only one~~ ~~two Independent-Main Protection is~~ **Protections** are provided to clear faults on the **HV Connections** within the required fault clearance time, the **Back-Up Protection** provided by the **Generators** (including in respect of **OTSDUW Plant and Apparatus**) and **DC Converter Station** ~~owners-owner~~ shall operate to give a fault clearance time of no ~~slower-longer~~ than ~~300 ms~~ **300ms** at the minimum infeed for normal operation for faults on the **HV Connections**. ~~Where two Independent Main Protections~~ are installed the **Back-Up Protection** may be integrated into one (or both) of the **Independent Main Protection** relays.

On a **Generating Unit** (other than a **Power Park Unit**), **DC Converter** or **Power Park Module** or **OTSDUW Plant and Apparatus** in respect of which the **Completion Date** is after [Date of Approval] and connected to the **National Electricity Transmission System** at 132 kV and where only one **Main Protection** is provided to clear faults on the **HV Connections** within the required fault clearance time, the **Independent Back-Up Protection** provided by the **Generator** (including in respect of **OTSDUW Plant and Apparatus**) and the **DC Converter Station** owner shall operate to give a fault clearance time of no longer than 300ms at the minimum infeed for normal operation for faults on the **HV Connections**.

On a **Generating Unit** (other than a **Power Park Unit**), **DC Converter** or **Power Park Module** or **OTSDUW Plant and Apparatus** connected to the **National Electricity**

**Transmission System and on Generating Units** (other than a **Power Park UnitsUnit**), **DC Converters or Power Park Modules or OTSDUW Plant and Apparatus** connected to the **National Electricity Transmission System** at 400 kV ~~and or~~ 275 kV ~~where two Main Protections are provided and on~~ ~~Generating Units (other than Power Park Units), DC Converters or Power Park Modules or OTSDUW Plant and Apparatus~~ connected to the **National Electricity Transmission System** at or 132 kV ~~and below~~, in respect of which the **Completion Date** is before the [Date of Approval], the **Back-Up Protection or Independent Back-Up Protection** shall operate to give a fault clearance time of no ~~slower than 800 ms in England and Wales or Offshore and 300 ms in Scotland~~ longer than 800ms in England and Wales or 300ms in **Scotland** at the minimum infeed for normal operation for faults on the **HV Connections**.

~~Generators' (including in respect of A Generating Unit (other than a Power Park Unit), DC Converter or Power Park Module or OTSDUW Plant and Apparatus) and DC Converter Station owners'~~ with **Back-Up Protection or Independent Back-Up Protection** will also be required to withstand, without tripping, the loading incurred during the clearance of a fault on the **National Electricity Transmission System** by breaker fail **Protection** at 400kV or 275kV or of a fault cleared by **Back-Up Protection** where the **Generator** (including in the case of **OTSDUW Plant and Apparatus**) or **DC Converter** is connected at 132kV and below. This will permit **Discrimination** between **Generator in respect of OTSDUW Plant and Apparatus or DC Converter Station owners' Back-Up Protection and or Independent Back-Up Protection** and the **Back-Up Protection** provided on the **National Electricity Transmission System** and other **Users' Systems**.

- (c) When the **Generating Unit** (other than **Power Park Units**), or the **DC Converter or Power Park Module or OTSDUW Plant and Apparatus** is connected to the **National Electricity Transmission System** at 400kV or 275kV, and in **Scotland** and **Offshore** also at 132kV, and a circuit breaker is provided by the **Generator** (including in respect of **OTSDUW Plant and Apparatus**) or the **DC Converter Station** owner, or **NGET**, as the case may be, to interrupt fault current interchange with the **National Electricity Transmission System**, or **Generator's System**, or **DC Converter Station** owner's **System**, as the case may be, circuit breaker fail **Protection** shall be provided by the **Generator** (including in respect of **OTSDUW Plant and**

**Apparatus**) or **DC Converter Station** owner, or **NGET**, as the case may be, on this circuit breaker. In the event, following operation of a **Protection** system, of a failure to interrupt fault current by these circuit-breakers within the **Fault Current Interruption Time**, the circuit breaker fail **Protection** is required to initiate tripping of all the necessary electrically adjacent circuit-breakers so as to interrupt the fault current within the next ~~200 ms~~ **200ms**.

- (d) The target performance for the **System Fault Dependability Index** shall be not less than 99%. This is a measure of the ability of **Protection** to initiate successful tripping of circuit breakers which are associated with the faulty item of **Apparatus**.

CC.6.2.2.3 Equipment to be provided

CC.6.2.2.3.1 Protection of Interconnecting Connections

The requirements for the provision of **Protection** equipment for interconnecting connections will be specified in the **Bilateral Agreement**. In this **CC** the term "interconnecting connections" means the primary conductors from the current transformer accommodation on the circuit side of the circuit breaker to the **Connection Point** or the primary conductors from the current transformer accommodation on the circuit side of the **OTSDUW Plant and Apparatus** of the circuit breaker to the **Transmission Interface Point**.

CC.6.2.2.3.2 Circuit-breaker fail Protection

The **Generator** or **DC Converter Station** owner will install circuit breaker fail **Protection** equipment in accordance with the requirements of the **Bilateral Agreement**. The **Generator** or **DC Converter Station** owner will also provide a back-trip signal in the event of loss of air from its pressurised head circuit breakers, during the **Generating Unit** (other than a **CCGT Unit** or **Power Park Unit**) or **CCGT Module** or **DC Converter** or **Power Park Module** run-up sequence, where these circuit breakers are installed.

CC.6.2.2.3.3 Loss of Excitation

The **Generator** must provide **Protection** to detect loss of excitation on a **Generating Unit** and initiate a **Generating Unit** trip.

CC.6.2.2.3.4 Pole-Slipping Protection

Where, in **NGET's** reasonable opinion, **System** requirements dictate, **NGET** will specify in the **Bilateral Agreement** a requirement for **Generators** to fit pole-slipping **Protection** on their **Generating Units**.

CC.6.2.2.3.5 Signals for Tariff Metering

**Generators** and **DC Converter Station** owners will install current and voltage transformers supplying all tariff meters at a voltage to be specified in, and in accordance with, the **Bilateral Agreement**.

#### CC.6.2.2.4 Work on Protection Equipment

No busbar **Protection**, mesh corner **Protection**, circuit-breaker fail **Protection** relays, AC or DC wiring (other than power supplies or DC tripping associated with the **Generating Unit**, **DC Converter** or **Power Park Module** itself) may be worked upon or altered by the **Generator** or **DC Converter Station** owner personnel in the absence of a representative of **NGET** or in Scotland or **Offshore**, a representative of **NGET**, or written authority from **NGET** to perform such work or alterations in the absence of a representative of **NGET**.

#### CC.6.2.2.5 Relay Settings

**Protection** and relay settings will be co-ordinated (both on connection and subsequently) across the **Connection Point** in accordance with the **Bilateral Agreement** and in relation to **OTSDUW Plant and Apparatus**, across the **Interface Point** in accordance with the **Bilateral Agreement** to ensure effective disconnection of faulty **Apparatus**.

#### CC.6.2.3 Requirements at Connection Points relating to Network Operators and Non-Embedded Customers

##### CC.6.2.3.1 Protection Arrangements for Network Operators and Non-Embedded Customers

CC.6.2.3.1.1 **Protection of Network Operator and Non-Embedded Customers User Systems** directly ~~supplied from~~ connected to the **National Electricity Transmission System**, ~~must~~ shall meet the ~~minimum~~ requirements ~~referred to~~ given below:

##### Fault Clearance Times

(a) The ~~required~~ fault clearance ~~times~~ time for faults on **Network Operator** and **Non-Embedded Customer** equipment directly connected to the **National Electricity Transmission System**, and for faults on the **National Electricity Transmission System** directly connected to the **Network Operator's** or **Non-Embedded Customer's** equipment, from fault inception to the circuit breaker arc extinction, shall be set out in ~~accordance with~~ each **Bilateral Agreement**. The ~~times~~ fault clearance time specified in ~~accordance with~~ the **Bilateral Agreement** shall not be ~~faster~~ shorter than the durations specified below:

- (i) ~~80mS~~ 80ms at 400kV
- (ii) ~~400mS~~ 100ms at 275kV
- (iii) ~~420mS~~ 120ms at 132kV and below

but this shall not prevent ~~a~~ the **User** or **NGET** ~~having a faster~~ from selecting a shorter fault clearance time on its own **Plant** and **Apparatus** provided **Discrimination** is achieved.

For the purpose of establishing the **Protection** requirements in accordance with CC.6.2.3.1.1 only, the point of connection of the **Network Operator** or **Non-Embedded Customer** equipment to the **National Electricity Transmission System** shall be deemed to be the low voltage busbars at a **Grid Supply Point**, irrespective of the ownership of the equipment at the **Grid Supply Point**.

~~Slower-A longer~~ fault clearance ~~times-time~~ may be specified in ~~accordance with~~ the **Bilateral Agreement** for faults on the **National Electricity Transmission System**. ~~Slower-A longer~~ fault clearance ~~times-time~~ for faults on the **Network Operator** and **Non-Embedded Customers** equipment may be agreed with **NGET** in accordance with the terms of the **Bilateral Agreement** but only if **System** requirements in **NGET's** view permit. The probability that the fault clearance ~~times-time~~ stated in ~~accordance with~~ the **Bilateral Agreement** will be exceeded by any given fault must be less than 2%.

- (b) (i) For the event of failure of the **Protection** systems provided to meet the above fault clearance time requirements, **Back-Up Protection** shall be provided by the **Network Operator** or **Non-Embedded Customer** as the case may be.
- (ii) **NGET** will also provide **Back-Up Protection**, which will result in a fault clearance time ~~slower-longer~~ than that specified for the **Network Operator** or **Non-Embedded Customer Back-Up Protection** so as to provide **Discrimination**.
- (iii) For connections with the **National Electricity Transmission System** at 132kV and below, it is normally required that the **Back-Up Protection** on the **National Electricity Transmission System** shall discriminate with the **Network Operator** or **Non-Embedded Customer's Back-Up Protection**.
- (iv) For connections with the **National Electricity Transmission System** at 400kV or 275kV, the **Back-Up Protection** will be provided by the **Network Operator** or **Non-Embedded Customer**, as the case may be, with a fault clearance time not ~~slower-longer~~ than ~~300ms-300ms~~ for faults on the **Network Operator's** or **Non-Embedded Customer's Apparatus**.
- (v) Such **Protection** will also be required to withstand, without tripping, the loading incurred during the clearance of a fault on the **National Electricity Transmission System** by breaker fail **Protection** at 400kV or 275kV. This will permit **Discrimination** between **Network Operator's Back-Up Protection** or **Non-Embedded Customer's Back-Up Protection**, as the case



may be, ~~Back-Up Protection~~ and **Back-Up Protection** provided on the **National Electricity Transmission System** and other **User Systems**. The requirement for and level of **Discrimination** required will be specified in the **Bilateral Agreement**.

- (c) (i) Where the **Network Operator** or **Non-Embedded Customer** is connected to the **National Electricity Transmission System** at 400kV or 275kV, and in Scotland also at 132kV, and a circuit breaker is provided by the **Network Operator** or **Non-Embedded Customer**, or **NGET**, as the case may be, to interrupt the interchange of fault current with the **National Electricity Transmission System** or the **System** of the **Network Operator** or **Non-Embedded Customer**, as the case may be, circuit breaker fail **Protection** will be provided by the **Network Operator** or **Non-Embedded Customer**, or **NGET**, as the case may be, on this circuit breaker.
  - (ii) In the event, following operation of a **Protection** system, of a failure to interrupt fault current by these circuit-breakers within the **Fault Current Interruption Time**, the circuit breaker fail **Protection** is required to initiate tripping of all the necessary electrically adjacent circuit-breakers so as to interrupt the fault current within the next ~~200ms~~ **200ms**.
- (d) The target performance for the **System Fault Dependability Index** shall be not less than 99%. This is a measure of the ability of **Protection** to initiate successful tripping of circuit breakers which are associated with the faulty items of **Apparatus**.

## Proposed Changes to Glossary and Definitions

**Independent Back-Up Protection** A **Back-Up Protection** system which utilises a discrete relay, different current transformers and an alternate operating principle to the **Main Protection** systems(s) such that it can operate autonomously in the event of a failure of the **Main Protection**.

**Independent Main Protection** A **Main Protection** system which utilises a physically discrete relay and different current transformers to any other **Main Protection**.

## Main Protection

~~A Protection equipment or~~ system ~~expected to have~~ which has priority above other **Protection** in initiating either a fault clearance or an action to terminate an abnormal condition in a power system.

## Back-Up Protection

~~A Protection equipment or~~ system which ~~is intended to operate when a~~ will operate when a system fault is not cleared by other **Protection**. ~~in due time because of failure or inability of the Main Protection to operate or in case of failure to operate of a circuit breaker other than the associated circuit breaker.~~

### CR-01 RWE

#### GC0023 Protection Fault Clearance Time & Back-Up Protection

Industry parties are invited to respond to this consultation expressing their views and supplying the rationale for those views, particularly in respect of any specific questions detailed below.

Please send your responses by **22 September 2015** to [Grid.Code@nationalgrid.com](mailto:Grid.Code@nationalgrid.com). Please note that any responses received after the deadline or sent to a different email address may not receive due consideration.

These responses will be included in the Report to the Authority which is drafted by National Grid and submitted to the Authority for a decision.

<b>Respondent:</b>	John Norbury Network Connections Manager RWE Supply & Trading GmbH Windmill Hill Business Park Whitehill Way Swindon SN5 6PB T +44 (0)1793 89 2667 M +44 (0)7795 354 382 john.norbury@rwe.com
<b>Company Name:</b>	RWE Group of GB companies, including RWE Generation UK plc, RWE Innogy UK Limited and RWE Supply & Trading GmbH
<b>1. Do you support the proposed implementation approach of 10 business days following an Authority decision?</b>	Yes
<b>2. Do you believe that GC0023 better facilitates the appropriate Grid Code objectives?</b>	We believe that GC0023 better facilitates the appropriate Grid Code objectives for the reasons given under Chapter 4.6 of the consultation <i>For reference the applicable Grid Code objectives are:</i> <i>(i) to permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity;</i> <i>(ii) to facilitate competition in the generation and supply of electricity (and without limiting the foregoing, to facilitate the national electricity transmission system being made available to persons authorised to supply or generate electricity on terms which neither prevent nor restrict competition in the supply or generation of electricity);</i> <i>(iii) subject to sub-paragraphs (i) and (ii), to</i>

	<p><i>promote the security and efficiency of the electricity generation, transmission and distribution systems in the national electricity transmission system operator area taken as a whole; and</i></p> <p><i>(iv) to efficiently discharge the obligations imposed upon the licensee by this license and to comply with the Electricity Regulation and any relevant legally binding decisions of the European Commission and/or the Agency.</i></p>
<p><b>3. Do you support the proposed changes to CC.6.2.2.2 and CC.6.2.3.1</b></p>	<p>Yes</p>
<p><b>4. Do you have any additional comments?</b></p>	<p>RWE has provided a number of comments during the development of this proposal and, other than the following typographical comments, has no additional comments.</p> <p>CC.6.2.2.2(a):  After (iii) - substitute “<i>a Generator</i>” with “<i>the Generator</i>”  Insert “<i>a</i>” before “shorter” (2 lines later) – comment also applies to CC.6.2.3.1.1</p>

**GC0023 Protection Fault Clearance Time & Back-Up Protection**

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<b>Respondent:</b>	Alan Creighton
<b>Company Name:</b>	Northern Powergrid
<b>1. Do you support the proposed implementation approach of 10 business days following an Authority decision?</b>	Yes
<b>2. Do you believe that GC0023 better facilitates the appropriate Grid Code objectives?</b>	<p><i>For reference the applicable Grid Code objectives are:</i></p> <p><i>(i) to permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity;</i></p> <p>Yes, the proposed changes provide clarification and reduce potential confusion.</p> <p><i>(ii) to facilitate competition in the generation and supply of electricity (and without limiting the foregoing, to facilitate the national electricity transmission system being made available to persons authorised to supply or generate electricity on terms which neither prevent nor restrict competition in the supply or generation of electricity);</i></p> <p>The proposed changes have a neutral impact on this objective.</p> <p><i>(iii) subject to sub-paragraphs (i) and (ii), to promote the security and efficiency of the electricity generation, transmission and distribution systems</i></p>

	<p><i>in the national electricity transmission system operator area taken as a whole; and</i></p> <p>Yes, the proposed changes provide clarification and reduce potential confusion.</p> <p><i>(iv) to efficiently discharge the obligations imposed upon the licensee by this license and to comply with the Electricity Regulation and any relevant legally binding decisions of the European Commission and/or the Agency.</i></p> <p>The proposed changes have a neutral impact on this objective.</p>
<p><b>3. Do you support the proposed changes to CC.6.2.2.2 and CC.6.2.3.1</b></p>	<p>Yes, although the additional clarification to CC.6.2.3.1 below would help improve clarity</p> <p>For the purpose of establishing the <b>Protection</b> requirements in accordance with CC.6.2.3.1.1 only, the point of connection of the <b>Network Operator</b> or <b>Non-Embedded Customer</b> equipment to the <b>National Electricity Transmission System</b> shall be deemed to be <b>between the supergrid transformers and the</b> low voltage busbars at a <b>Grid Supply Point</b>, irrespective of the ownership of the equipment at the <b>Grid Supply Point</b>.</p>
<p><b>4. Do you have any additional comments?</b></p>	<p>No</p>

**GC0023 Protection Fault Clearance Time & Back-Up Protection**

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<b>Respondent:</b>	Alastair Frew
<b>Company Name:</b>	Scottish Power Generation
<b>1. Do you support the proposed implementation approach of 10 business days following an Authority decision?</b>	Yes
<b>2. Do you believe that GC0023 better facilitates the appropriate Grid Code objectives?</b>	Yes
<b>3. Do you support the proposed changes to CC.6.2.2.2 and CC.6.2.3.1</b>	<p>In principle yes, however in CC.6.2.2.2 (b) third paragraph it is not clear what happens to existing plant in Scotland.</p> <p>The original text read “800ms in England and Wales or Offshore and 300 ms in Scotland”</p> <p>The new text has “in England and Wales ... longer than 800ms”, but has no reference to Scotland.</p> <p>It might also be helpful to the reader if section CC6.2.2.2 (b) was split into 2 subsections (b) i) &amp; (b) ii).</p> <p>With the sections being named something like :-</p> <p>(b) i) new plant with a completion date after... with this sub-section including the first 2 paragraphs</p> <p>(b) ii) existing plant connected on or before ... with this sub-section including the last 2 paragraphs.</p>
<b>4. Do you have any additional comments?</b>	No

## CR-04 WPD

### GC0023 Protection Fault Clearance Time & Back-Up Protection

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<b>Respondent:</b>	<i>Please insert your name and contact details (phone number or email address)</i>
<b>Company Name:</b>	<i>Western Power Distribution</i>
<b>1. Do you support the proposed implementation approach of 10 business days following an Authority decision?</b>	Yes
<b>2. Do you believe that GC0023 better facilitates the appropriate Grid Code objectives?</b>	Yes
<b>3. Do you support the proposed changes to CC.6.2.2.2 and CC.6.2.3.1</b>	Yes
<b>4. Do you have any additional comments?</b>	No

## CR-5 SSEPD



## GC0023 Protection Fault Clearance Time & Back-Up Protection

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These responses will be included in the Report to the Authority which is drafted by National Grid and submitted to the Authority for a decision.

<b>Respondent:</b>	<i>Mark Mitchinson Protection Policy Engineer Mark.mitchinson@sse.com</i>
<b>Company Name:</b>	<i>Scottish and Southern Energy Power Distribution</i>
<b>1. Do you support the proposed implementation approach of 10 business days following an Authority decision?</b>	<i>No, the new requirement for 300ms clearance time (CC6.2.2.2.2 (b)) may have implications for new connections to 132kV mainly in SSEPD Scottish areas. These can not be implemented within 10 days.</i>
<b>2. Do you believe that GC0023 better facilitates the appropriate Grid Code objectives?</b>	<i>No Comment. The question is too wide ranging to be answered as a belief.</i>
<b>3. Do you support the proposed changes to CC.6.2.2.2 and CC.6.2.3.1</b>	<i>No – there are cost and implementation issues associated with the proposed 300ms clearance time (CC6.2.2.2.2 (b)) for new connection points at 11kV and 33kV to 132kV mainly in SSEPD Scottish areas due to the line lengths.</i>
<b>4. Do you have any additional comments?</b>	<i>No</i>