Grid Code Modification Proposal Form	At what stage is this document in the process?
# GC0142: ## Mod Title: Adding Non-Standard Voltages to the Grid Code	01 Proposal Form 02 Workgroup Consultation 03 Workgroup Report 04 Code Administrator Consultation 05 Draft Grid Code Modification Report 06 Final Grid Code Modification Report

Purpose of Modification: Following the rejection of modification GSR0021[1] to the System Quality and Standards of Supply (SQSS) by Ofgem, this modification is being raised to seek modifications to the Grid Code. A separate modification will be raised to modify the SQSS. The modifications are looking to incorporate equipment at nominal voltages other than those that are currently used within the Codes.

	**The Proposer recommends that this modification should be:** • Proceed to Consultation This modification was raised 03 April 2020 and will be presented by the Proposer to the Panel on 22 April 2020**.** The Panel will consider the Proposer's recommendation and determine the appropriate route.
	**High Impact**: None.
	**Medium Impact:** Any users subject to requirements of the Grid Code installing equipment at novel voltages, who will gain clarity.
	**Low Impact** Users subject to requirements of the Grid Code of equipment at standard voltages who will see no change.

Guidance on the use of this Template: *Please complete all sections unless specifically marked for the Code* ***Administrator.*** *Green italic text is provided as guidance and should be removed before submission. Contact us:* ***The Code Administrator is available to help and support the drafting of any modifications, including guidance on completion of this template and the wider modification process. If you require any advice on how to fill in this form please contact the Panel Secretary e-mail:*** grid.code@nationalgrid.com

[1] https://www.nationalgrideso.com/codes/security-and-quality-supply-standards/modifications/gsr021-operational-and-planning-criteria

Contents

Timetable

The Code Administrator will update the timetable.

The Code Administrator recommends the following timetable: *(To be updated following first Workgroup Meeting)*

Initial consideration by Workgroup	dd month year
Workgroup Consultation issued to the Industry	dd month year
Modification concluded by Workgroup	dd month year
Workgroup Report presented to Panel	dd month year
Code Administration Consultation Report issued to the Industry	dd month year
Draft Final Modification Report presented to Panel	dd month year
Modification Panel decision	dd month year
Final Modification Report issued the Authority	dd month year
Decision implemented in Grid Code	dd month year

Any questions?

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Proposer Details

Details of Proposer: (Organisation Name)	National Grid ESO
Capacity in which the Grid Code Modification Proposal is being proposed: (e.g. CUSC Party)	The Company
Details of Proposer's Representative:	
Name:	Louise Trodden
Organisation:	National Grid ESO
Telephone Number:	07866 165538
Email Address:	Louise.trodden@nationalgrideso.com
Details of Representative's Alternate:	
Name:	Robert Wilson
Organisation:	National Grid ESO
Telephone Number:	07799 656402
Email Address:	Robert.wilson2@nationalgrideso.com
Attachments (Yes): **Ofgem decision letter GSR021\;** https://www.nationalgrideso.com/document/15301/download	

Impact on Core Industry Documentation.

Please mark the relevant boxes with an "x" and provide any supporting information

BSC	
CUSC	
STC	
Other	X

This modification proposal endeavours to apply consistency to the SQSS alongside Grid Code changes by incorporating changes to both codes concurrently. There is a

separate modification for the SQSS (GSR026) which follows the same principles as this modification. This is due to be raised at the April SQSS panel.

1 Summary

Defect

A previous modification, (GSR0021) to include 220kV assets into the SQSS was rejected by Ofgem in July 2016. This was for the following reasons:

- There were concerns regarding the original proposal having only considered the addition of 220kV as a nominal voltage and did not cover future technological advancements or subsequent new voltage rates.
- The original proposal was also not detailed enough to differentiate how both on and offshore voltages were reported in chapter 6 and chapter 10 of the SQSS.

These assets are currently situated at the Kintyre-Hunerston subsea AC link with two subsea cables between Crossaig on the Kintyre peninsula and Hunterston. The connection to the Onshore transmission system is via two 400/20kV supergrid transformers at Hunterston and via two 200/123kV transformers at Crossaig. Whilst there is currently no user equipment directly affected by the new voltage, 220kV assets are not currently specified within the Grid Code.

This defect remains however, this modification now seeks to expand the Grid Code to clarify the requirements that will be placed on equipment at non standard voltages. For reference, currently 400kV, 275kV and 132kV are voltages typically referred to within the Grid Code. This means that any other nominal voltages specification and requirements are not defined in the code.

What

The proposer suggests that by removing specific nominal voltages from the relevant clauses of the Grid Code, this will align better with the treatment given in the European Network Codes and cover any technical or subsequent introduction of new voltages in the future. (It is worth noting that other standard EU voltages are 110kV, 220kV and 380kV) Also ensuring these changes are aligned with the SQSS.

Why

The proposed changes to the Grid Code should ensure that current and future voltages within the transmission network have clear specification and performance requirements. By including specifications for voltages in such a way that will enable consistency for both the Grid Code and the SQSS.

How

The legal text to embody this modification relies on the use of voltage ranges for equipment to ensure that all future possibilities are captured and so better aligning the

Grid Code and SQSS with an approach followed in EU codes using a table of voltages and the specifications to suit.

2 Governance

As the proposed changes are not material, the proposer contends that this modification should follow the standard governance process. This modification is running alongside GSR026 to amend the SQSS. There is no self-governance process for the SQSS, and given this modification is being raised in response to a previously rejected modification, we will also send this to Ofgem for review.

Requested Next Steps

This modification should:

- be assessed by a Workgroup, if the panel deems necessary to discuss the change proposed, or
- proceed straight to Code Administrator Consultation

As the legal text for this proposal is complete and straightforward, in the Proposer's view a workgroup may not be necessary.

3 Why Change?

Following the rejection of GSR0021, and the request to reassess the consistency of approach to defining voltage limits, this proposal seeks to change the way both nominal, and operational and planning voltages are categorised within both Grid Code and SQSS. By aligning with the SQSS in the process, this shows consistency across the codes, and using similar formats to that of EU code should support the authorities request to avoid changes to the codes, should further nominal voltages be introduced to the system.

4 Code Specific Matters

Technical Skillsets

Understanding the previously rejected SQSS modification for GSR0021 and understanding of the structure of the relevant sections Grid Code would be helpful but not essential – the principles of this change are straightforward.

Reference Documents

Decision Letter from Ofgem – GSR021. This decision letter from Ofgem outlines the reason for this proposal.

5 Solution

The modification will update the Grid Code with the changes outlined in Section 9- ‘’Legal Text’’ to ensure that nominal voltages other than those used as standard in GB (132kV, 275kV, 400kV) can be accommodated for equipment connecting to the system.

6 Impacts & Other Considerations

Current and future parties that are subject to requirements of the Grid Code when connecting to the transmission system and installing equipment of non standard GB voltages.

These changes aim to make it clearer for those connecting to the transmission system what performance and specification should be followed at each nominal voltage. Additionally, this modification allows for consistency with the changes being proposed to the SQSS.

Does this modification impact a Significant Code Review (SCR) or other significant industry change projects, if so, how?

None expected

Consumer Impacts

None expected

7 Relevant Objectives

Impact of the modification on the Applicable Grid Code Objectives:

Relevant Objective	Identified impact
(a) To permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity	Positive
(b) Facilitating effective 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);	Positive
(c) 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;	Positive

(d) 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; and	Positive
(e) To promote efficiency in the implementation and administration of the Grid Code arrangements	Neutral

To support the alignment of the EU codes and facilitate the future of the system.

8 Implementation

Implementation of this modification will only require minor amendments to the legal text of the Grid Code and with alignment to a similar change being taken forwards in the SQSS.

Given that the SQSS modification was initially rejected in 2016 with the request to further review, we should move forward with the proposal, however, given there are no customer connections at this voltage as quoted in Ofgem's decision letter, this was not a high priority.

Implementation should occur as standard on completion of the modification and approval by Ofgem. The application should apply to all new and existing equipment but no changes in costs for specifications or system changes are envisaged. SEE have confirmed that the equipment currently installed (Kintyre-Hunterston) can comply with the operational limits specified.

9 Legal Text

Please see below legal text for this modification. A question has been raised to ask if we change the Connection Conditions (CC) sections as these only apply to the current connections. Whilst the proposer agrees with the theory, we would like to change these alongside the European Connection Conditions (ECC) sections to keep the consistency through the codes. There is no specification change, the requirements will be presented in the same way for both the CC and EEC with a range of voltages.

Section Title	Current Text	Proposed Text
Station Transformer Pg 53	A transformer supplying electrical power to the Auxiliaries of (a) a Power Station, which is not directly connected to the Generating Unit terminals (typical voltage ratios being 132/11kV or 275/11kV), or (b) a DC Converter Station	No Change- as text states 'typical'
Single Point of Connection PC.A.8.1	For a Single Point of Connection to a User's System (and OTSUA), as an equivalent 400kV or 275kV source and also in Scotland and Offshore as an equivalent 132kV source, the data (as at the HV side of the Point of Connection (and in the case of OTSUA, each Interface Point and Connection Point)	For a Single Point of Connection to a User's System (and OTSUA), as a voltage source ~~an~~ equivalent to the nominal System voltage ~~400kV or 275kV source and also in Scotland and Offshore as an equivalent 132kV source~~, the data (as at the HV side of the Point of Connection (and in the case of

<table>
<tr><td></td><td>reflecting data given to NGET by Users) will be given to a User as follows: The data items listed under the following parts of PC.A.8.3: (a) (i), (ii), (iii), (iv), (v) and (vi) and the data items shall be provided in accordance with the detailed provisions of PC.A.8.3 (b) - (e)</td><td>OTSUA, each Interface Point and Connection Point) reflecting data given to The Company by Users) will be given to a User as follows: The data items listed under the following parts of PC.A.8.3: (a) (i), (ii), (iii), (iv), (v) and (vi) and the data items shall be provided in accordance with the detailed provisions of PC.A.8.3 (b) - (e)</td></tr>
<tr><td>Data Items PC.A.8.3</td><td>(d) Since the equivalent will be produced for the 400kV or 275kV and also in Scotland and Offshore132kV parts of the National Electricity Transmission System NGET will provide the appropriate supergrid transformer data</td><td>(d) ~~Since the equivalent will be produced for the 400kV or 275kV and also in Scotland and Offshore132kV parts of the National Electricity Transmission System~~ The Company will provide the appropriate supergrid transformer data for the National Electricity Transmission System associated with equivalent voltage source data.</td></tr>
<tr><td>Grid Voltage Variations CC.6.1.4</td><td>Subject as provided below, the voltage on the 400kV part of the National Electricity Transmission System at each Connection Site with a User (and in the case of OTSDUW Plant and Apparatus, a Transmission Interface Point) will normally remain within +/_5% of the nominal value unless abnormal conditions prevail. The minimum voltage is -10% and the maximum voltage is +10% unless abnormal conditions prevail, but voltages between +5% and +10% will not last longer than 15 minutes unless abnormal conditions prevail.</td><td>Subject as provided below, the voltage on any greater than 300kV ~~the 400kV~~ part of the National Electricity Transmission System at each Connection Site with a User (and in the case of OTSDUW Plant and Apparatus, a Transmission Interface Point) will normally remain within +/_5% of the nominal value unless abnormal conditions prevail. The minimum voltage is -10% and the maximum voltage is +10% unless abnormal conditions prevail, but voltages between +5% and +10% will not last longer than 15 minutes unless abnormal conditions prevail.</td></tr>
<tr><td>Grid Voltage Variations CC.6.1.4</td><td>Voltages on the 275kV and 132kV parts of the National Electricity Transmission System at each Connection Site with a User (and in the case of OTSDUW Plant and Apparatus, a Transmission Interface Point) will normally remain within the limits +/_10% of the nominal value unless abnormal conditions prevail. At nominal System voltages below 132kV the voltage of the National Electricity Transmission System at each Connection Site with a User (and in the case of OTSDUW Plant and Apparatus, a Transmission Interface Point) will normally remain within the limits +/_6% of the nominal value unless abnormal conditions prevail. Under fault conditions, voltage may collapse transiently to zero at the point of fault until the fault is cleared.</td><td>Voltages on any less than 300kV but greater than or equal to 132kV ~~on the 275kV and 132kV~~ parts of the National Electricity Transmission System at each Connection Site with a User (and in the case of OTSDUW Plant and Apparatus, a Transmission Interface Point) will normally remain within the limits +/_10% of the nominal value unless abnormal conditions prevail. At nominal System voltages below 132kV the voltage of the National Electricity Transmission System at each Connection Site with a User (and in the case of OTSDUW Plant and Apparatus, a Transmission Interface Point) will normally remain within the limits +/_6% of the nominal value unless abnormal conditions prevail. Under fault conditions, voltage may collapse transiently to zero at the point of fault until the fault is cleared.</td></tr>
<tr><td>Grid Voltage Variations CC.6.1.4</td><td>
<table>
<tr><th>National Electricity Transmission System Nominal Voltage</th><th>Normal Operating Range</th></tr>
<tr><td>400kV</td><td>400kV +/_ 5%</td></tr>
<tr><td>275kV</td><td>275kV +/_ 10%</td></tr>
<tr><td>132kV</td><td>132kV +/_ 10%</td></tr>
</table>
NGET and a User may agree greater or lesser variations in voltage to those set out above in relation to a particular Connection Site, and insofar as a greater or lesser variation is</td><td>
<table>
<tr><th>National Electricity Transmission System Nominal Voltage</th><th>Normal Operating Range</th><th>Pu</th></tr>
<tr><td>300kV- 400kV</td><td>+/_ 5%</td><td>0.95pu-1.05pu</td></tr>
<tr><td>200kV-300kV</td><td>+/_ 10%</td><td>0.90pu-1.10pu</td></tr>
<tr><td>200kV and below</td><td>+/_ 10%</td><td>0.90pu-1.10pu</td></tr>
</table>
NGET and a User may agree greater or lesser variations in voltage to those set out above in relation to a particular Connection Site, and insofar as a greater or</td></tr>
</table>

<table>
<tr><td></td><td>agreed, the relevant figure set out above shall, in relation to that User at the particular Connection Site, be replaced by the figure agreed.</td><td>lesser variation is agreed, the relevant figure set out above shall, in relation to that User at the particular Connection Site, be replaced by the figure agreed.</td></tr>
<tr><td>Grid Voltage Fluctuations CC.6.1.7</td><td>Table CC.6.7.1 (b) Planning Levels for Flicker
<table><tr><th>Supply system Nominal voltage</th><th colspan="2">Planning level</th></tr><tr><td></td><td>Flicker Severity Short Term (Pst)</td><td>Flicker Severity Long Term (Plt)</td></tr><tr><td>3.3 kV, 6.6 kV, 11 kV, 20 kV, 33 kV</td><td>0.9</td><td>0.7</td></tr><tr><td>66 kV, 110 kV, 132 kV, 150 kV, 200 kV, 220 kV, 275 kV, 400 kV</td><td>0.8</td><td>0.6</td></tr><tr><td colspan="3">NOTE 1: The magnitude of P_{st} is linear with respect to the magnitude of the voltage changes giving rise to it.
NOTE 2: Extreme caution is advised in allowing any excursions of P_{st} and P_{lt} above the planning level.</td></tr></table></td><td><table><tr><td>Supply system Nominal voltage</td><td colspan="2">Planning level</td></tr><tr><td></td><td>Flicker Severity Short Term (Pst)</td><td>Flicker Severity Long Term (Plt)</td></tr><tr><td>3.3 kV, 6.6 kV, 11 kV, 20 kV, 33 kV</td><td>0.9</td><td>0.7</td></tr><tr><td>66 kV and greater ~~, 110 kV, 132 kV, 150 kV, 200 kV, 220 kV, 275 kV, 400 kV~~</td><td>0.8</td><td>0.6</td></tr><tr><td colspan="3">NOTE 1: The magnitude of Pst is linear with respect to the magnitude of the voltage changes giving rise to it.
NOTE 2: Extreme caution is advised in allowing any excursions of Pst and Plt above the planning level.</td></tr></table>Table CC.6.7.1 (b) Planning Levels for Flicker</td></tr>
<tr><td>Fault Clearance Times CC.6.2.2.2.2</td><td>(a) The required fault clearance time 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 the Bilateral Agreement. The fault clearance time specified in the Bilateral Agreement shall not be shorter than the durations specified below:
(i) 80ms at 400kV
(ii) 100ms at 275kV
(iii) 120ms at 132kV and below

(b) 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 20 January 2016 and connected to the National Electricity Transmission System at 400kV or 275kV and where two Independent Main 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 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. Where two Independent Main Protections are installed the Back-Up Protection may be integrated into one (or both) of the Independent Main Protection relays.</td><td>(a) The required fault clearance time 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 the Bilateral Agreement. The fault clearance time specified in the Bilateral Agreement shall not be shorter than the durations specified below:
(i) 80ms at voltages over 300~~400~~kV
(ii) 100ms at voltages over 132kV and up to 300~~275~~kV
(iii) 120ms at 132kV and below

(b) 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 20 January 2016 and connected to the National Electricity Transmission System at ~~400kV or 275kV~~ Supergrid Voltage and where two Independent Main 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 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. Where two Independent Main Protections are installed the Back-Up Protection may be integrated into one (or both) of the Independent Main Protection relays.</td></tr>
<tr><td>CC.6.2.2.2.2</td><td>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 Unit), DC Converters or Power Park Modules or OTSDUW Plant and Apparatus connected to the National Electricity Transmission System</td><td>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 Unit), DC Converters or Power Park Modules or OTSDUW Plant and Apparatus connected to the National Electricity Transmission</td></tr>
</table>

	at 400 kV or 275 kV or 132 kV, in respect of which the Completion Date is before the 20 January 2016, the Back-Up Protection or Independent Back-Up Protection shall operate to give a fault clearance time of no longer than 800ms in England and Wales or 300ms in Scotland at the minimum infeed for normal operation for faults on the HV Connections	System at a nominal System voltage of greater than 132kV 400 kV or 275 kV or 132 kV, in respect of which the Completion Date is before the 20 January 2016, the Back-Up Protection or Independent Back-Up Protection shall operate to give a fault clearance time of no longer than 800ms in England and Wales or 300ms in Scotland at the minimum infeed for normal operation for faults on the HV Connections
CC.6.2.2.2.2	A Generating Unit (other than a Power Park Unit), DC Converter or Power Park Module or OTSDUW Plant and Apparatus) 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 or Independent Back-Up Protection and the Back-Up Protection provided on the National Electricity Transmission System and other Users' Systems.	A Generating Unit (other than a Power Park Unit), DC Converter or Power Park Module or OTSDUW Plant and Apparatus) 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 Supergrid Voltage ~~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 or Independent Back-Up Protection and the Back-Up Protection provided on the National Electricity Transmission System and other Users' Systems.
CC.6.2.2.2.2	(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 200ms.	(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 a voltage greater than 132kV, and in Scotland and Offshore at a voltage greater than or equal to 132kV, ~~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 200ms.
Fault	(a) The required fault clearance time for	(a) The required fault clearance time for

Clearance Times CC.6.2.3.1.1	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 each Bilateral Agreement. The fault clearance time specified in the Bilateral Agreement shall not be shorter than the durations specified below: (i) 80ms at 400kV (ii) 100ms at 275kV (iii) 120ms at 132kV and below but this shall not prevent the User or NGET from selecting a shorter fault clearance time on its own Plant and Apparatus provided Discrimination is achieved.	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 each Bilateral Agreement. The fault clearance time specified in the Bilateral Agreement shall not be shorter than the durations specified below: (i) 80ms at voltages over 300kV ~~400kV~~ (ii) 100ms at voltages over 132kV and upto 300kV ~~275kV~~ (iii) 120ms at 132kV and below but this shall not prevent the User or NGET from selecting a shorter fault clearance time on its own Plant and Apparatus provided Discrimination is achieved.
CC.6.2.3.1.1	(b) (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 longer than 300ms for faults on the Network Operator's or Non-Embedded Customer's Apparatus.	(b) (iv) For connections with the National Electricity Transmission System at Supergrid Voltage ~~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 longer than 300ms for faults on the Network Operator's or Non-Embedded Customer's Apparatus.
CC.6.2.3.1.1	(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 NonEmbedded Customer's Back-Up Protection, as the case may be, 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.	(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 Supergrid Voltage ~~400kV or 275kV.~~ This will permit Discrimination between Network Operator's Back-Up Protection or NonEmbedded Customer's Back-Up Protection, as the case may be, 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.
CC.6.2.3.1.1	(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 NonEmbedded 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 NonEmbedded Customer, or NGET, as the case may be, on this circuit breaker.	(c) (i) Where the Network Operator or Non-Embedded Customer is connected to the National Electricity Transmission System at a voltage greater than or equal to 132kV, and in Scotland also at 132kV, ~~at 400kV or 275kV, and in Scotland also at 132kV~~ and a circuit breaker is provided by the Network Operator or NonEmbedded 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 NonEmbedded Customer, or NGET, as the case may be, on this circuit breaker.
3 GENERAL	(c) Subject to the provisions of CC.6.3.2(d)	(c) Subject to the provisions of CC.6.3.2(d)

GENERATING UNIT (AND OTSDUW) REQUIREMENTS CC.6.3.2	below, all Onshore Non-Synchronous Generating Units, Onshore DC Converters (excluding current source technology) and Onshore Power Park Modules (excluding those connected to the Total System by a current source Onshore DC Converter) and OTSDUW Plant and Apparatus at the Interface Point with a Completion Date on or after 1 January 2006 must be capable of supplying Rated MW output or Interface Point Capacity in the case of OTSDUW Plant and Apparatus at any point between the limits 0.95 Power Factor lagging and 0.95 Power Factor leading at the Onshore Grid Entry Point in England and Wales or Interface Point in the case of OTSDUW Plant and Apparatus or at the HV side of the 33/132kV or 33/275kV or 33/400kV transformer for Generators directly connected to the Onshore Transmission System in Scotland (or User System Entry Point if Embedded). With all Plant in service, the Reactive Power limits defined at Rated MW or Interface Point Capacity in the case of OTSDUW Plant and Apparatus at Lagging Power Factor will apply at all Active Power output levels above 20% of the Rated MW or Interface Point Capacity in the case of OTSDUW Plant and Apparatus output as defined in Figure 1. With all Plant in service, the Reactive Power limits defined at Rated MW at Leading Power Factor will apply at all Active Power output levels above 50% of the Rated MW output or Interface Point Capacity in the case of OTSDUW Plant and Apparatus as defined in Figure 1. With all Plant in service, the Reactive Power limits will reduce linearly below 50% Active Power output as shown in Figure 1 unless the requirement to maintain the Reactive Power limits defined at Rated MW or Interface Point Capacity in the case of OTSDUW Plant and Apparatus at Leading Power Factor down to 20% Active Power output is specified in the Bilateral Agreement. These Reactive Power limits will be reduced pro rata to the amount of Plant in service	below, all Onshore Non-Synchronous Generating Units, Onshore DC Converters (excluding current source technology) and Onshore Power Park Modules (excluding those connected to the Total System by a current source Onshore DC Converter) and OTSDUW Plant and Apparatus at the Interface Point with a Completion Date on or after 1 January 2006 must be capable of supplying Rated MW output or Interface Point Capacity in the case of OTSDUW Plant and Apparatus at any point between the limits 0.95 Power Factor lagging and 0.95 Power Factor leading at the Onshore Grid Entry Point in England and Wales or Interface Point in the case of OTSDUW Plant and Apparatus or at the HV side of the (typically) 33/132kV or 33/275kV or 33/400kV transformer for Generators directly connected to the Onshore Transmission System in Scotland (or User System Entry Point if Embedded). With all Plant in service, the Reactive Power limits defined at Rated MW or Interface Point Capacity in the case of OTSDUW Plant and Apparatus at Lagging Power Factor will apply at all Active Power output levels above 20% of the Rated MW or Interface Point Capacity in the case of OTSDUW Plant and Apparatus output as defined in Figure 1. With all Plant in service, the Reactive Power limits defined at Rated MW at Leading Power Factor will apply at all Active Power output levels above 50% of the Rated MW output or Interface Point Capacity in the case of OTSDUW Plant and Apparatus as defined in Figure 1. With all Plant in service, the Reactive Power limits will reduce linearly below 50% Active Power output as shown in Figure 1 unless the requirement to maintain the Reactive Power limits defined at Rated MW or Interface Point Capacity in the case of OTSDUW Plant and Apparatus at Leading Power Factor down to 20% Active Power output is specified in the Bilateral Agreement. These Reactive Power limits will be reduced pro rata to the amount of Plant in service
	(i) from 0.95 lead to 0.95 lag as illustrated in Figure 1 at the User System Entry Point for Embedded Generators or at the HV side of the 33/132kV or 33/275kV or 33/400kV transformer for Generators directly connected to the Onshore Transmission System. With all Plant in service, the Reactive Power limits defined at Rated MW will apply at all Active Power output levels above 20% of the Rated MW output as defined in Figure 1. These Reactive Power limits will be reduced pro rata to the amount of Plant in service, or (ii) from 0.95 lead to 0.90 lag at the Onshore Non-Synchronous Generating Unit (including Power Park Unit) terminals. For the avoidance of doubt Generators complying with this option (ii) are not required to comply with CC.6.3.2(b).	(i) from 0.95 lead to 0.95 lag as illustrated in Figure 1 at the User System Entry Point for Embedded Generators or at the HV side of the (typically) 33/132kV or 33/275kV or 33/400kV transformer for Generators directly connected to the Onshore Transmission System. With all Plant in service, the Reactive Power limits defined at Rated MW will apply at all Active Power output levels above 20% of the Rated MW output as defined in Figure 1. These Reactive Power limits will be reduced pro rata to the amount of Plant in service, or (ii) from 0.95 lead to 0.90 lag at the Onshore Non-Synchronous Generating Unit (including Power Park Unit) terminals. For the avoidance of doubt Generators complying with this option (ii) are not required to

		comply with CC.6.3.2(b).
3 GENERAL GENERATING UNIT (AND OTSDUW) REQUIREMENTS CC.6.3.4	(a) For any Onshore Generating Unit, Onshore DC Converter and Onshore Power Park Module or OTSDUW the Reactive Power output under steady state conditions should be fully available within the voltage range +/-5% at 400kV, 275kV and 132kV and lower voltages, except for an Onshore Power Park Module or Onshore NonSynchronous Generating Unit if Embedded at 33kV and below (or directly connected to the Onshore Transmission System at 33kV and below) where the requirement shown in Figure 4 applies.	(a) For any Onshore Generating Unit, Onshore DC Converter and Onshore Power Park Module or OTSDUW the Reactive Power output under steady state conditions should be fully available within ~~the~~ a voltage range of +/-5% ~~at 400kV, 275kV and 132kV and lower voltages~~ of each nominal voltage, except for an Onshore Power Park Module or Onshore NonSynchronous Generating Unit if Embedded at 33kV and below (or directly connected to the Onshore Transmission System at 33kV and below) where the requirement shown in Figure 4 applies.
3 GENERAL GENERATING UNIT (AND OTSDUW) REQUIREMENTS CC.6.3.4	(b) At a Large Power Station, in the case of an Offshore Generating Unit, Offshore DC Converter and Offshore Power Park Module where an alternative reactive capability has been agreed with the Generator, as specified in CC.6.3.2(e) (iii), the voltage / Reactive Power requirement shall be specified in the Bilateral Agreement. The Reactive Power output under steady state conditions shall be fully available within the voltage range +/-5% at 400kV, 275kV and 132kV and lower voltages.	(b) At a Large Power Station, in the case of an Offshore Generating Unit, Offshore DC Converter and Offshore Power Park Module where an alternative reactive capability has been agreed with the Generator, as specified in CC.6.3.2(e) (iii), the voltage / Reactive Power requirement shall be specified in the Bilateral Agreement. The Reactive Power output under steady state conditions shall be fully available within the voltage range +/-5% at each nominal voltage. ~~400kV, 275kV and 132kV and lower voltages.~~
Other Requirements CC.6.3.15.3	(4) Voltage as measured at the Onshore Connection Point or Onshore User System Entry Point or Offshore Grid Entry Point or Interface Point in the case of OTSDUW Plant and Apparatus is above 120% (115% for 275kV) for more than 1 second.	
Steady State Voltage Control CC.A.7.2.2.1 T	The Onshore Non-Synchronous Generating Unit, Onshore DC Converter, Onshore Power Park Module or OTSDUW Plant and Apparatus shall provide continuous steady state control of the voltage at the Onshore Grid Entry Point (or Onshore User System Entry Point if Embedded) (or the Interface Point in the case of OTSDUW Plant and Apparatus) with a Setpoint Voltage and Slope characteristic as illustrated in Figure CC.A.7.2.2a. It should be noted that where the Reactive Power capability requirement of a directly connected Onshore Non-Synchronous Generating Unit, Onshore DC Converter, Onshore Power Park Module in Scotland, or OTSDUW Plant and Apparatus in Scotland as specified in CC.6.3.2 (c), is not at the Onshore Grid Entry Point or Interface Point, the values of Qmin and Qmax shown in this figure will be as modified by the 33/132kV or 33/275kV or 33/400kV transformer.	The Onshore Non-Synchronous Generating Unit, Onshore DC Converter, Onshore Power Park Module or OTSDUW Plant and Apparatus shall provide continuous steady state control of the voltage at the Onshore Grid Entry Point (or Onshore User System Entry Point if Embedded) (or the Interface Point in the case of OTSDUW Plant and Apparatus) with a Setpoint Voltage and Slope characteristic as illustrated in Figure CC.A.7.2.2a. It should be noted that where the Reactive Power capability requirement of a directly connected Onshore Non-Synchronous Generating Unit, Onshore DC Converter, Onshore Power Park Module in Scotland, or OTSDUW Plant and Apparatus in Scotland as specified in CC.6.3.2 (c), is not at the Onshore Grid Entry Point or Interface Point, the values of Qmin and Qmax shown in this figure will be as modified by the (typically) 33/132kV or 33/275kV or 33/400kV transformer.
Steady State Voltage Control CC.A.7.2.2.4	Figure CC.A.7.2.2b shows the required envelope of operation for Onshore NonSynchronous Generating Units, Onshore DC Converters, OTSDUW Plant and Apparatus and Onshore Power Park Modules except for those Embedded at 33kV and	Figure CC.A.7.2.2b shows the required envelope of operation for Onshore NonSynchronous Generating Units, Onshore DC Converters, OTSDUW Plant and Apparatus and Onshore Power Park Modules except for those Embedded at

	below or directly connected to the National Electricity Transmission System at 33kV and below. Figure CC.A.7.2.2c shows the required envelope of operation for Onshore NonSynchronous Generating Units, Onshore DC Converters and Onshore Power Park Modules Embedded at 33kV and below or directly connected to the National Electricity Transmission System at 33kV and below. Where the Reactive Power capability requirement of a directly connected Onshore Non-Synchronous Generating Unit, Onshore DC Converter, OTSDUW Plant and Apparatus or Onshore Power Park Module in Scotland, as specified in CC.6.3.2 (c), is not at the Onshore Grid Entry Point or Interface Point in the case of OTSDUW Plant and Apparatus, the values of Qmin and Qmax shown in this figure will be as modified by the 33/132kV or 33/275kV or 33/400kV transformer. The enclosed area within points ABCDEFGH is the required capability range within which the Slope and Setpoint Voltage can be changed.	33kV and below or directly connected to the National Electricity Transmission System at 33kV and below. Figure CC.A.7.2.2c shows the required envelope of operation for Onshore NonSynchronous Generating Units, Onshore DC Converters and Onshore Power Park Modules Embedded at 33kV and below or directly connected to the National Electricity Transmission System at 33kV and below. Where the Reactive Power capability requirement of a directly connected Onshore Non-Synchronous Generating Unit, Onshore DC Converter, OTSDUW Plant and Apparatus or Onshore Power Park Module in Scotland, as specified in CC.6.3.2 (c), is not at the Onshore Grid Entry Point or Interface Point in the case of OTSDUW Plant and Apparatus, the values of Qmin and Qmax shown in this figure will be as modified by the (typically) 33/132kV or 33/275kV or 33/400kV transformer. The enclosed area within points ABCDEFGH is the required capability range within which the Slope and Setpoint Voltage can be changed.
Reactive Capability (in a table) CC.6.3.2 (and in the case of CC.6.3.2(e)(iii), the Bilateral Agreement), CC.6.3.4, Ancillary Services Agreement. Pg 305	Measurements of the Reactive Power output under steady state conditions should be consistent with Grid Code requirements i.e. fully available within the voltage range ±5% at 400kV, 275kV and 132kV and lower voltages.	Measurements of the Reactive Power output under steady state conditions should be consistent with Grid Code requirements i.e. fully available within a ~~the~~ voltage range of ±5% at ~~400kV, 275kV and 132kV and lower voltages.~~ each nominal voltage.
The Electrical Standards are as follows: ANNEX TO THE GENERAL CONDITIONS	Current Transformers for Protection and General Use on the 132kV, 275kV and 400kV Systems	TO provide comment
The Electrical Standards are as follows: (d) Scottish Electrical Standards for SHETL's Transmission System.	6. NGTS 3.2.3: Metal-Oxide surge arresters for use on 132, 275 and 400kV systems. Issue 2 May 1994. 7. NGTS 3.2.4: Current Transformers for protection and General use on the 132, 275 and 400kV systems. Issue 1 September 1992. 8. NGTS 3.2.5: Voltage Transformers for use on the 132, 275 and 400 kV systems. Issue 2 March 1994. 9. NGTS 3.2.6: Current and Voltage Measurement Transformers for Settlement Metering of 33, 66, 132, 275 and 400kV systems. Issue 1 September 1992.	TO provide comment
Grid Voltage Variations for Users excluding	Subject as provided below, the voltage on the 400kV part of the National Electricity Transmission System at each Connection Site with a User (and in the case of OTSDUW	Subject as provided below, at nominal System voltages of greater than 300kV the voltage ~~on the 400kV parts~~ of the National Electricity Transmission System at each

<table>
<tr>
<td>DC Connected Power Park Modules and Remote End HVDC Converters ECC.6.1.4.1</td>
<td>Plant and Apparatus, a Transmission Interface Point, excluding DC Connected Power
Park Modules and Remote End HVDC Converters) will normally remain within ±5% of the
nominal value unless abnormal conditions prevail. The minimum voltage is -10% and the maximum voltage is +10% unless abnormal conditions prevail, but voltages between +5% and
+10% will not last longer than 15 minutes unless abnormal conditions prevail. Voltages on the
275kV and 132kV parts of the National Electricity Transmission System at each Connection Point (and in the case of OTSDUW Plant and Apparatus, a Transmission Interface Point) will normally remain within the limits ±10% of the nominal value unless abnormal conditions prevail. At nominal System voltages below 110kV the voltage of the
National Electricity Transmission System at each Connection Site with a User (and in the case of OTSDUW Plant and Apparatus, a Transmission Interface Point), excluding Connection Sites for DC Connected Power Park Modules and Remote End HVDC Converters) will normally remain within the limits ±6% of the nominal value unless abnormal
conditions prevail. Under fault conditions, the voltage may collapse transiently to zero at the
point of fault until the fault is cleared. The normal operating ranges of the National Electricity System are summarised below:</td>
<td>Connection Site with a User (and in the case of OTSDUW Plant and Apparatus, a Transmission Interface Point, excluding DC Connected Power Park Modules and Remote End HVDC Converters) will normally remain within ±5% of the nominal value unless abnormal conditions prevail. The minimum voltage is -10% and the maximum voltage is +10% unless abnormal conditions prevail, but voltages between +5% and +10% will not last longer than 15 minutes unless abnormal conditions prevail. For nominal System voltages of 110kV or greater up to 300kV voltages on the ~~275kV and 132kV~~ parts of the National Electricity Transmission System at each Connection Point (and in the case of OTSDUW Plant and Apparatus, a Transmission Interface Point) will normally remain within the limits ±10% of the nominal value unless abnormal conditions prevail. At nominal System voltages below 110kV the voltage of the National Electricity Transmission System at each Connection Site with a User (and in the case of OTSDUW Plant and Apparatus, a Transmission Interface Point), excluding Connection Sites for DC Connected Power Park Modules and Remote End HVDC Converters) will normally remain within the limits ±6% of the nominal value unless abnormal conditions prevail. Under fault conditions, the voltage may collapse transiently to zero at the point of fault until the fault is cleared. The normal operating ranges of the National Electricity Transmission System are summarised below</td>
</tr>
<tr>
<td></td>
<td>
<table>
<tr><th>National Electricity Transmission System Nominal Voltage</th><th>Normal Operating Range</th><th>Time period for Operation</th></tr>
<tr><td>400kV</td><td>400kV -10% to +5%
400kV +5% to +10%</td><td>Unlimited
15 minutes</td></tr>
<tr><td>275kV</td><td>275kV ±10%</td><td>Unlimited</td></tr>
<tr><td>132kV</td><td>132kV ±10%</td><td>Unlimited</td></tr>
<tr><td>110kV</td><td>110kV ±10%</td><td>Unlimited</td></tr>
<tr><td>Below 110kV</td><td>Below 110kV ±6%</td><td>Unlimited</td></tr>
</table>
The Company and a User may agree greater variations or longer minimum time periods of
operation in voltage to those set out above in relation to a particular Connection Site, and
insofar as a greater variation is agreed, the relevant figure set out above shall, in relation to
that User at the particular Connection Site, be replaced by the figure agreed.</td>
<td>
<table>
<tr><td rowspan="2">National Electricity Transmission System Nominal Voltage</td><td colspan="2">Normal Operating Range</td><td rowspan="2">Time period for Operation</td></tr>
<tr><td>Voltage</td><td>pu</td></tr>
<tr><td>~~400kV~~ greater than 300kV</td><td>~~400kV~~ -10% to +5%
~~400kV~~ +5% to +10%</td><td>0.9pu – 1.05pu
1.05pu – 1.10pu</td><td>Unlimited
15 minutes</td></tr>
<tr><td>~~275kV~~ 110kV up to 300kV</td><td>~~275kV~~ ±10%</td><td>0.90pu – 1.10pu</td><td>Unlimited</td></tr>
<tr><td>~~132kV~~</td><td>~~132kV ±10%~~</td><td></td><td>~~Unlimited~~</td></tr>
<tr><td>~~110kV~~</td><td>~~110kV ±10%~~</td><td></td><td>~~Unlimited~~</td></tr>
<tr><td>Below 110kV</td><td>Below 110kV ±6%</td><td>0.94pu – 1.06pu</td><td>Unlimited</td></tr>
</table>
The Company and a User may agree greater variations or longer minimum time periods of
operation in voltage to those set out above in relation to a particular Connection Site, and
insofar as a greater variation is agreed, the relevant figure set out above shall, in relation to
that User at the particular Connection Site, be replaced by the figure agreed.</td>
</tr>
<tr>
<td>Fault Clearance Times ECC.6.2.2.2.2</td>
<td>(a) The required fault clearance time for faults on the Generator's (including DC Connected
Power Park Modules) or HVDC System 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 EU Generator (including DC Connected Power</td>
<td>(a) The required fault clearance time for faults on the Generator's (including DC Connected Power Park Modules) or HVDC System 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 EU Generator (including DC Connected Power Park Modules) or HVDC System Owner's equipment or</td>
</tr>
</table>

	Park Modules) or HVDC System Owner's equipment or OTSDUW Plant and Apparatus, from fault inception to the circuit breaker arc extinction, shall be set out in the Bilateral Agreement. The fault clearance time specified in the Bilateral Agreement shall not be shorter than the durations specified below: (i) 80ms at 400kV, (ii) 100ms at 275kV, (iii) 120ms at 132kV and below but this shall not prevent the User or The Company or the Relevant Transmission Licensee or the EU Generator (including in respect of OTSDUW Plant and Apparatus and DC Connected Power Park Modules) from selecting a shorter fault clearance time on their own Plant and Apparatus provided Discrimination is achieved. A longer fault clearance time may be specified in the Bilateral Agreement for faults on the National Electricity Transmission System. A longer fault clearance time for faults on the EU Generator or HVDC System Owner's equipment or OTSDUW Plant and Apparatus may be agreed with The Company in accordance with the terms of the Bilateral Agreement but only if System requirements, in The Company's view, permit. The probability that the fault clearance time stated in the Bilateral Agreement will be exceeded by any given fault, must be less than 2%	OTSDUW Plant and Apparatus, from fault inception to the circuit breaker arc extinction, shall be set out in the Bilateral Agreement. The fault clearance time specified in the Bilateral Agreement shall not be shorter than the durations specified below: (i) 80ms ~~at 400kV~~ for connections with a nominal System voltage of greater than 300kV (ii) 100ms ~~at 275kV~~ for connections with a nominal System voltage of greater than 132kV up to 300kV (iii) 120ms ~~at~~ for connections with a nominal System voltage of 132kV and below but this shall not prevent the User or The Company or the Relevant Transmission Licensee or the EU Generator (including in respect of OTSDUW Plant and Apparatus and DC Connected Power Park Modules) from selecting a shorter fault clearance time on their own Plant and Apparatus provided Discrimination is achieved. A longer fault clearance time may be specified in the Bilateral Agreement for faults on the National Electricity Transmission System. A longer fault clearance time for faults on the EU Generator or HVDC System Owner's equipment or OTSDUW Plant and Apparatus may be agreed with The Company in accordance with the terms of the Bilateral Agreement but only if System requirements, in The Company's view, permit. The probability that the fault clearance time stated in the Bilateral Agreement will be exceeded by any given fault, must be less than 2%
	(b) In the event that the required fault clearance time is not met as a result of failure to operate on the Main Protection System(s) provided, the Generators or HVDC System Owners or Generators in the case of OTSDUW Plant and Apparatus shall, except as specified below provide Independent Back-Up Protection. The Relevant Transmission Licensee will also provide Back-Up Protection and the Relevant Transmission Licensee's and the User's Back-Up Protections will be co-ordinated so as to provide Discrimination. On a Power Generating Module (other than a Power Park Unit), HVDC Equipment or OTSDUW Plant and Apparatus and connected to the National Electricity Transmission System at 400kV or 275kV and where two Independent Main Protections are provided to clear faults on the HV Connections within the required fault clearance time, the Back-Up Protection provided by EU Generators (including in respect of OTSDUW Plant and Apparatus and DC Connected Power Park Modules) and HVDC System Owners shall operate to give a fault clearance time of no longer than 300ms at the minimum infeed for	(b) In the event that the required fault clearance time is not met as a result of failure to operate on the Main Protection System(s) provided, the Generators or HVDC System Owners or Generators in the case of OTSDUW Plant and Apparatus shall, except as specified below provide Independent Back-Up Protection. The Relevant Transmission Licensee will also provide Back-Up Protection and the Relevant Transmission Licensee's and the User's Back-Up Protections will be co-ordinated so as to provide Discrimination. On a Power Generating Module (other than a Power Park Unit), HVDC Equipment or OTSDUW Plant and Apparatus and connected to the National Electricity Transmission System at a nominal System voltage of greater than 132kV ~~400kV or 275kV~~ and where two Independent Main Protections are provided to clear faults on the HV Connections within the required fault clearance time, the Back-Up Protection provided by EU Generators (including in respect of OTSDUW Plant and Apparatus and DC Connected Power Park Modules) and HVDC System Owners shall

	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 Power Generating Module (other than a Power Park Unit), HVDC Equipment or OTSDUW Plant and Apparatus 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 DC Connected Power Park Modules) and the HVDC System 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.	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. 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 Power Generating Module (other than a Power Park Unit), HVDC Equipment or OTSDUW Plant and Apparatus 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 DC Connected Power Park Modules) and the HVDC System 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
	A Power Generating Module (other than a Power Park Unit), HVDC Equipment or OTSDUW Plant and Apparatus) 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 EU Generator (including in the case of OTSDUW Plant and Apparatus or DC Connected Power Park Module) or HVDC System is connected at 132kV and below. This will permit Discrimination between the Generator in respect of OTSDUW Plant and Apparatus or DC Connected Power Park Modules or HVDC System Owners' Back-Up Protection or Independent Back-Up Protection and the Back-Up Protection provided on the National Electricity Transmission System and other Users' Systems	A Power Generating Module (other than a Power Park Unit), HVDC Equipment or OTSDUW Plant and Apparatus) 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 Supergrid Voltage ~~400kV or 275kV~~ or of a fault cleared by Back-Up Protection where the EU Generator (including in the case of OTSDUW Plant and Apparatus or DC Connected Power Park Module) or HVDC System is connected at 132kV and below. This will permit Discrimination between the Generator in respect of OTSDUW Plant and Apparatus or DC Connected Power Park Modules or HVDC System Owners' Back-Up Protection or Independent Back-Up Protection and the Back-Up Protection provided on the National Electricity Transmission System and other Users' Systems
	(c) When the Power Generating Module (other than Power Park Units), or the HVDC Equipment 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 DC Connected Power Park Modules) or the HVDC System owner, or the Relevant Transmission Licensee, as the case may be, to interrupt fault current interchange with the National Electricity Transmission System, or Generator's System, or HVDC System Owner's System, as the case may be, circuit breaker fail	(c) When the Power Generating Module (other than Power Park Units), or the HVDC Equipment or OTSDUW Plant and Apparatus is connected to the National Electricity Transmission System at nominal System voltage of greater than 132kV ~~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 DC Connected Power Park Modules) or the HVDC System owner, or the Relevant Transmission Licensee, as the case may be, to interrupt fault current interchange with the National Electricity Transmission System, or Generator's System,

	Protection shall be provided by the Generator (including in respect of OTSDUW Plant and Apparatus or DC Connected Power Park Modules) or HVDC System Owner, or the Relevant Transmission Licensee, 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 200ms	or HVDC System 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 Connected Power Park Modules) or HVDC System Owner, or the Relevant Transmission Licensee, 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 200ms.
Protection arrangements for EU Code Users in respect of Network Operators and NonEmbedded Customers User Systems directly connected to the National Electricity Transmission System, shall meet the requirements given below: ECC.6.2.3.1.1	(a) The required fault clearance 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 each Bilateral Agreement. The fault clearance time specified in the Bilateral Agreement shall not be shorter than the durations specified below: (i) 80ms at 400kV (ii) 100ms at 275kV (iii) 120ms at 132kV and below but this shall not prevent the User or The Company or Relevant Transmission Licensee 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 ECC.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 an EU Grid Supply Point, irrespective of the ownership of the equipment at the EU Grid Supply Point.	(a) The required fault clearance 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 each Bilateral Agreement. The fault clearance time specified in the Bilateral Agreement shall not be shorter than the durations specified below: (i) 80ms ~~at 400kV~~ for connections with a nominal System voltage of greater than 300kV (ii) 100ms ~~at 275kV~~ for connections with a nominal System voltage of greater than 132kV up to 300kV (iii) 120ms ~~at~~ for connections with a nominal System voltage of 132kV and belowbut this shall not prevent the User or The Company or Relevant Transmission Licensee 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 ECC.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 an EU Grid Supply Point, irrespective of the ownership of the equipment at the EU Grid Supply Point.
	(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) The Relevant Transmission Licensee will also provide Back-Up Protection, which will result in a fault clearance time longer than that specified for the Network Operator or Non-Embedded Customer Back-Up Protection so as to provide	(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) The Relevant Transmission Licensee will also provide Back-Up Protection, which will result in a fault clearance time 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 NonEmbedded Customer, as the case may be, with a fault clearance time not longer than 300ms for faults on the Network Operator's or Non-Embedded Customer's Apparatus.	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 nominal System Voltage greater than 132kV ~~400kV or 275kV~~, the Back-Up Protection will be provided by the Network Operator or NonEmbedded Customer, as the case may be, with a fault clearance time not longer than 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 NonEmbedded Customer's Back-Up Protection, as the case may be, 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 NonEmbedded Customer, or the Relevant Transmission Licensee, 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 the Relevant Transmission Licensee, 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.	(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 Supergrid Voltage ~~400kV or 275kV~~. This will permit discrimination between Network Operator's Back-Up Protection or NonEmbedded Customer's Back-Up Protection, as the case may be, 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 a nominal System voltage greater than or equal to 132kV, and in Scotland also at 132kV, ~~400kV or 275kV, and in Scotland also at 132kV~~, and a circuit breaker is provided by the Network Operator or NonEmbedded Customer, or the Relevant Transmission Licensee, 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 the Relevant Transmission Licensee, 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.

Voltage Fluctuations ECC.6.1.7	Table ECC.6.7.1(b) — Planning levels for flicker on Grid Code Tables Tab	Supply system Nominal voltage / Planning level (Flicker Severity Short Term (Pst) / Flicker Severity Long Term (Plt)): 3.3 kV, 6.6 kV, 11 kV, 20 kV, 33 kV — 0.9 / 0.7; 66 kV and greater ~~, 110 kV, 132 kV, 150 kV, 200 kV, 220 kV, 275 kV, 400 kV~~ — 0.8 / 0.6. NOTE 1: The magnitude of Pst is linear with respect to the magnitude of the voltage changes giving rise to it. NOTE 2: Extreme caution is advised in allowing any excursions of Pst and Plt above the planning level.

Supply system Nominal voltage	Planning level	
	Flicker Severity Short Term (Pst)	Flicker Severity Long Term (Plt)
3.3 kV, 6.6 kV, 11 kV, 20 kV, 33 kV	0.9	0.7
66 kV and greater ~~, 110 kV, 132 kV, 150 kV, 200 kV, 220 kV, 275 kV, 400 kV~~	0.8	0.6
NOTE 1: The magnitude of Pst is linear with respect to the magnitude of the voltage changes giving rise to it. NOTE 2: Extreme caution is advised in allowing any excursions of Pst and Plt above the planning level.		

10 Recommendations

Proposer's Recommendation to Panel

Panel is asked to:

- Agree that standard governance procedures should apply
- Agree that this modification can proceed to Consultation
- Refer this proposal to a Workgroup for assessment, only if deemed necessary by panel.

