

# GC0155 Clarification of Fault Ride Through Technical Requirements

**05 April 2023**

**Online Meeting via Teams**

# WELCOME



## Expectations of a Workgroup Member

Contribute to the discussion

Be respectful of each other's opinions

Language and Conduct to be consistent with the values of equality and diversity

Do not share commercially sensitive information

Be prepared - Review Papers and Reports ahead of meetings

Complete actions in a timely manner

Keep to agreed scope

## Your Roles

Help refine/develop the solution(s)

Bring forward alternatives as early as possible

Vote on whether or not to proceed with requests for Alternatives

Vote on whether the solution(s) better facilitate the Code Objectives

## Members / Alternates & Observers

Role	Name	Representing
Chair	Milly Lewis	Code Administrator (ESO)
Technical Secretary	Teri Puddefoot	Code Administrator (ESO)
Proposer	Terry Baldwin	NGESO
Workgroup Member	Alan Mason	Oceanwinds
Workgroup Member	Alan Creighton	Northern Powergrid
Workgroup Member	Alastair Frew	Drax Power Station
Workgroup Member	Andrew Vaudin	EDF
Workgroup Member	Bieshoy Awad	NGESO
Observer	David Griffiths	RWE Generation UK, RWE Renewables
Observer	Fiona Williams	NGESO
Workgroup Member	Forooz Ghassemi	NGET
Workgroup Member	Frank Martin	Siemens
Workgroup Member	Fraser Norris	SSE
Workgroup Member	Garth Graham	SSE Generation
Workgroup Member	Isaac Gutierrez	Scottish Power
Workgroup Member	John Fradley	ESO
Observer	Mike Kay	Independent
Workgroup Member	Nicola Barberis Negra	Orsted
Observer	Owen Curran	Siemens
Workgroup Member	Priyanka Mohapatra	Scottish Power
Workgroup Member	Ryan Tumilty	SSE
Workgroup Member	Sean Gauton	Uniper Energy
Workgroup Member	Tim Ellingham	RWE Generation UK, RWE Renewables
Workgroup Member (Alternate)	Julie Richmond	Scottish Power
Workgroup Member (Alternate)	Martin Aten	Uniper
Workgroup Member (Alternate)	Sridhar Sahukari	Orsted
Workgroup Member (Alternate)	Tobias Siepker	Siemens
Authority Representative	Shilen Shah	Ofgem



# **Actions, Timeline and Terms of Reference**

**Milly Lewis –ESO Code Administrator**

# Actions

Action number	Workgroup Raised	Owner	Action	Due by	Status
1 (27)	WG7	BJO	To share with the Workgroup an email sent from FW	WG8	Complete
2 (28)	WG7	AF/BA	To have a conversation offline re documents that are within the GC appendix	WG8	Open
3 (29)	WG7	SS/BC	To have a conversation offline on understand GEP parameters.	WG8	Open
4 (30)	WG7	CB	To share with the Workgroup to network design equipment requirements from SPN	WG8	Open
5 (31)	WG7	AM	To provide evidence of problem with low level injection requirements	WG8	Open
6 (32)	WG7	BA	To check that whether the evidence from OEMs can be shared with the Workgroup	ASAP	Open
7 (33)	WG7	BA	Comparison of international standards for HVRT	WG8	Open
8 (34)	WG7	BA/TB	Provide a strawman/draft legal text on the requirements	WG8	Open
9 (35)	WG7	BA	To check with the compliance team what checks they do in a FRT scenario	WG8	Open
10 (36)	WG7	JF	To provide where the document for ENTSO-E and clause has come from	WG8	Open

# Objectives Timeline

Milestone	Date	Milestone	Date
Proposal Presented to Panel	16 December 2021	Workgroup Consultation (15 Working Days)	19 June 2023 – 10 July 2023
Workgroup 1 – Understand / discuss proposal and solution, note the scope and identify any possible alternative solutions, agree timeline and review terms of reference, agree next steps.	10 February 2022	Workgroup 11 (Post Workgroup Consultation) – Review / assess Workgroup consultation responses and Workgroup Report.	25 July 2023
Workgroup 2 – Refresher: review and agree timeline and Terms of Reference, Review/Develop solution(s) and legal text, identify/assess possible alternatives.	07 June 2022	Workgroup 12 – Finalise solution(s) and legal text, agree that Terms of Reference have been met, Review Workgroup Report and hold Workgroup Vote	22 August 2023
Workgroup 3 – Develop Solution(s), review of legal text and alternatives	05 July 2022	Workgroup Report issued to Panel	20 September 2023
Workgroup 4 – ESO to present plan and next steps re Definition of Overvoltage Requirements following a Fault, agree on the proposed plan	25 July 2022	Panel sign off that Workgroup Report has met its Terms of Reference	28 September 2023
Workgroup 5 – Review / assess on-going work on Overvoltage requirements	23 August 2022	Code Administrator Consultation	05 October 2023 – 06 November 2023
Workgroup 6 – Review / assess ongoing work on Overvoltage requirements; consider HVRT findings	07 September 2022	Draft Final Modification Report (DFMR) issued to Panel	15 November 2023
Workgroup 7 – Review of ESO findings, look through of draft legal text, consideration of alternatives	19 January 2023	Panel undertake DFMR recommendation vote	23 November 2023
Workgroup 8 - Review draft legal text and any ESO updates, consideration of alternatives, draft consultation questions	5 April 2023	Final Modification Report issued to Panel to check votes recorded correctly (5 working days)	27 November 2023 – 01 December 2023
Workgroup 9 – Finalise draft legal text for consultation, draft consultation questions, review consultation documents	4 May 2023	Final Modification Report issued to Ofgem	5 December 2023
Workgroup 10 – Review and finalise consultation documents	8 June 2023	Ofgem decision	TBC
		Implementation Date	10 working days after Ofgem decision

# Terms of Reference

Workgroup Term of Reference	Current status
a) Implementation and costs;	<b>To be covered depending on outcome of e(iv)</b>
b) Review draft legal text should it have been provided. If legal text is not submitted within the Grid Code Modification Proposal the Workgroup should be instructed to assist in the developing of the legal text; and	<b>In progress</b>
c) Consider whether any further Industry experts or stakeholders should be invited to participate within the Workgroup to ensure that all potentially affected stakeholders have the opportunity to be represented in the Workgroup. Demonstrate what has been done to cover this clearly in the report	Experts have been invited into meetings as and when required
d) Consider Electricity Balancing Regulation (EBR) implications	There are no EBR implications
e) Minor changes and clarifications to the existing Grid Code Fault Ride Through (FRT) requirements specifically but not limited to consideration of the following areas:  i. Clarify instances where User plant is required to trip in order to clear transmission system faults  ii. Amending requirements for generating maximum reactive current during faults where these may be unachievable for some generators  iii. Amending post-fault active power requirements to consider whether generators at low load may have greater levels of oscillation than permitted  iv. To consider clarifying and or defining requirements for over-voltage following a fault	Considered and discussed  Considered and discussed  Still in considerations. Some tweaks to be made to initial requirements  In progress.
f) Identify and address any cross code impacts on other codes especially Distribution Code (e.g. G99 requirements)	No impact on Dcode. Legal text will be drafted/sectioned in a way that there won't be impact on G99.



**Draft Temporary Overvoltage Requirements Legal Text**  
**John Fradley / Bieshoy Awad – ESO**

Temporary Overvoltage Requirements draft clauses:

- CC.6.1.11 Under normal operating conditions and following any planned event, switching event, or any unplanned **Secured Event**, the magnitude of any temporary power frequency overvoltage at a **Connection Site** measured in per unit with basis equal to the maximum steady state voltage applicable at the site as specified in CC.6.1.4 shall not exceed the levels specified in Figure 6.1.11

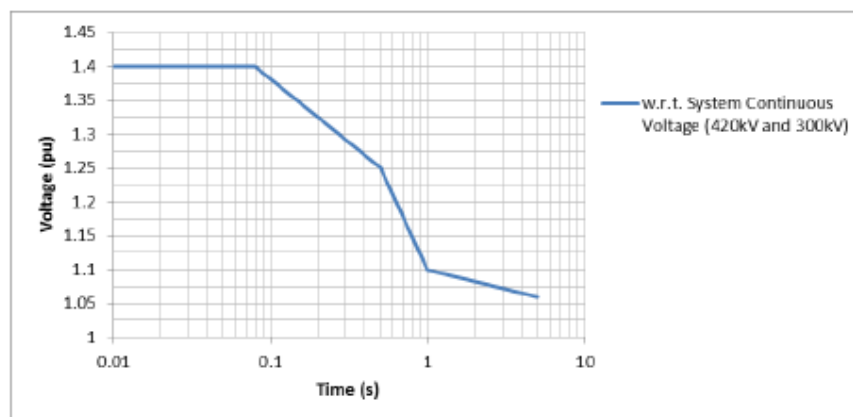


Figure 6.1.11

- CC.A.7.2.3.3 During voltage transients where the voltage at the **Connection Site** exceeds the levels specified in CC.6.1.4, an **Onshore Non-Synchronous Generating Unit**, **Onshore DC Converter**, **OTSDUW Plant and Apparatus** or **Onshore Power Park Module** shall

- (a) not cause any voltage rise above the limits specified in CC.6.1.11 and
- (b) continue to provide voltage control in order to reduce the magnitude of the voltage excursion.

- CC.6.3.15.1 Fault Ride through applicable to Generating Units, Power Park Modules and DC Converters and OTSDUW Plant and Apparatus

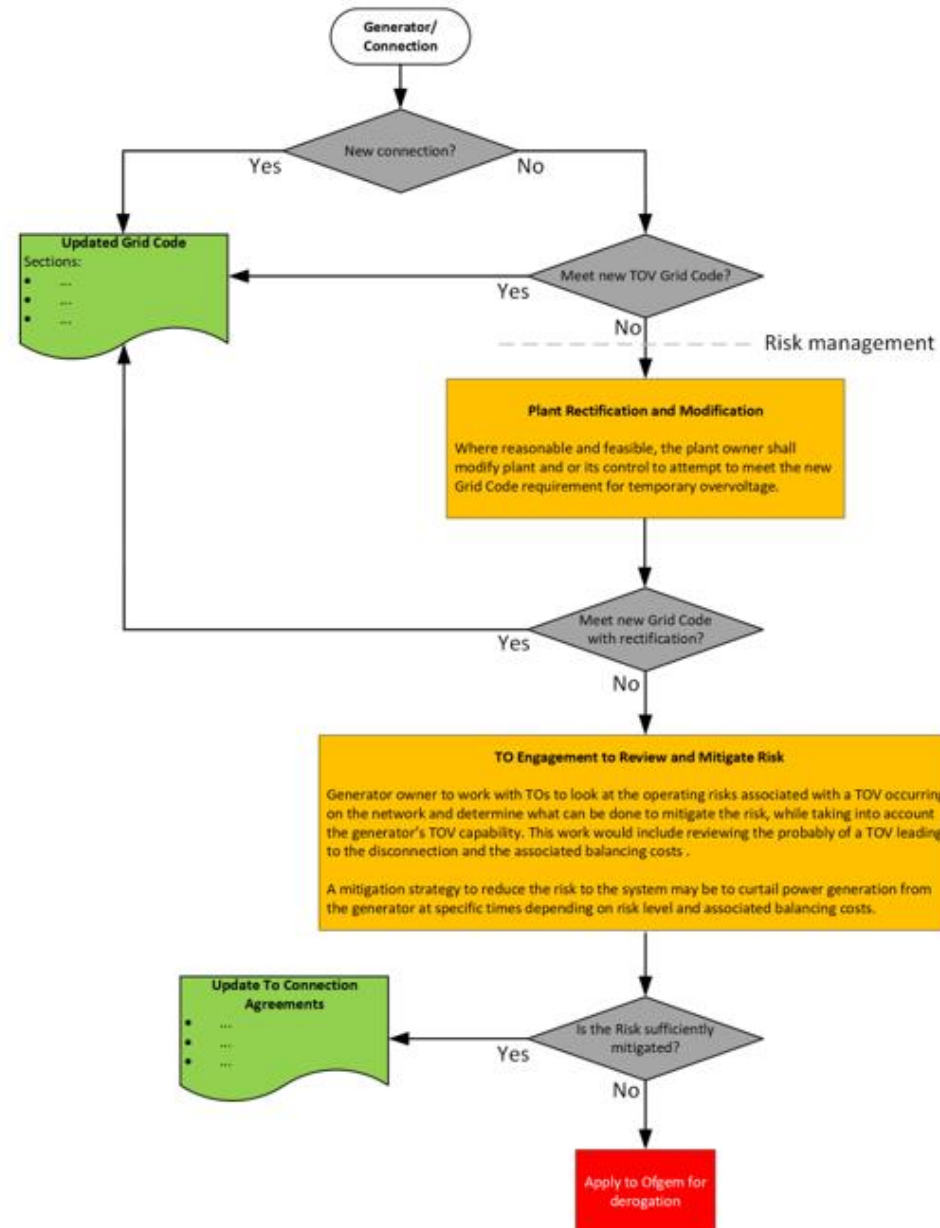
- (a) Short circuit faults on the Onshore Transmission System (which may include an Interface Point) at Supergrid Voltage up to 140ms in duration.
  - (i) Each Generating Unit, DC Converter, or Power Park Module and any constituent Power Park Unit thereof and OTSDUW Plant and Apparatus shall remain transiently stable and connected to the System without tripping of any Generating Unit, DC Converter or Power Park Module and / or any

constituent Power Park Unit, OTSDUW Plant and Apparatus, and for Plant and Apparatus installed on or after 1 December 2017, reactive compensation equipment, for a close-up solid three phase short circuit fault or any unbalanced short circuit fault on the Onshore Transmission System (including in respect of OTSDUW Plant and Apparatus, the Interface Point) operating at Supergrid Voltages for a total fault clearance time of up to 140 ms. A solid three-phase or unbalanced earthed fault results in zero voltage on the faulted phase(s) at the point of fault. The duration of zero voltage is dependent on local Protection and circuit breaker operating times. This duration and the fault clearance times will be specified in the Bilateral Agreement. Following fault clearance, recovery of the Supergrid Voltage on the Onshore Transmission System to 90% may take longer than 140ms as illustrated in Appendix 4A Figures CC.A.4A.1 (a) and (b) and may involve temporary power frequency overvoltages of up to the levels specified in CC.6.1.11. It should be noted that

- (a) in the case of an Offshore Generating Unit, Offshore DC Converter or Offshore Power Park Module (including any Offshore Power Park Unit thereof) which is connected to an Offshore Transmission System which includes a Transmission DC Converter as part of that Offshore Transmission System, the Offshore Grid Entry Point voltage may not indicate the presence of a fault on the Onshore Transmission System.
- (b) A Generating Unit, DC Converter, or Power Park Module and any constituent Power Park Unit thereof and OTSDUW Plant and Apparatus that is required to be disconnected in order to clear the fault or in response to a signal from a **System to Generator Operational Intertripping Scheme** that is armed in accordance with an instruction from **The Company**, is not required to ride through the fault.
- (c) A Generating Unit, DC Converter, or Power Park Module and any constituent Power Park Unit thereof and OTSDUW Plant and Apparatus that has become isolated from the **Total System** with insufficient frequency response margins to regulate the **Frequency** within the range specified in CC.6.1.3 following fault clearance, is not required to ride through the fault.

- (iii) During the period of the fault as detailed in CC.6.3.15.1 (a) (i)(a) for which the voltage at the Grid Entry Point (or Interface Point in the case of OTSDUW Plant and Apparatus) is outside the limits specified in CC.6.1.4, each Generating Unit or Power Park Module or OTSDUW Plant and Apparatus shall generate maximum reactive current without exceeding the transient rating limit of the Generating Unit, OTSDUW Plant and Apparatus or Power Park Module and / or any constituent Power Park Unit or reactive compensation equipment. It should be noted that the maximum reactive current provided is dependent on the voltage at the Grid Entry Point.

## Process Flow Chart





# **Draft Workgroup Consultation Questions**

**Milly Lewis –ESO Code Administrator**



# **Any Other Business**

**Milly Lewis –ESO Code Administrator**



## Next Steps

Milly Lewis –ESO Code Administrator