

Grid Code Alternative Form

GC0151 Alternative Request X: Unexpected Generation Failure Management

Overview: This alternative emphasises what was set out in the [open letter](#) written by NGESO; reminding Users of their requirements under the Grid Code and that the inability of Users to ride through 'normal' faults on the NETS is a serious risk to system security. NGESO needs to have the ability to manage fault ride through (FRT) non-compliances **quickly and effectively** i.e. in the minutes, hours and days after an apparent 'non-compliance' is observed.

If managing this through restricting a User that has failed to ride through a fault is not possible, then either NGESO will incur additional operational costs due to the need to hold more reserves or the likelihood of a risk of disruption to the NETS will increase. Either way, consumers will be impacted.

When NGESO identifies a potential FRT issue, they will notify the User in writing. This may be through the SIR process. The User should then be prepared to immediately take action up to and including restricting their output in agreement with NGESO.

This applies to all the Users required to comply with CC.6.3.15 or ECC.6.3.15 regardless of their size, location, type, operational status (FON, ION or LON) etc.

This alternative also includes for a requirement for NGESO to provide a summary of the fault ride through non-compliances that have occurred to date as immediate learning points for industry and an obligation to provide this information on an enduring basis. The Grid Code will also be updated with an additional obligation to provide the largest infeed loss data at a given time. This alternative also includes for an update of the CC.6.3.15 and ECC.6.3.15 legal text (Appendix 2) to provide clarity on the requirements.

Proposer: Laetitia Wamala, NGESO

Contents

- **What is the proposed alternative solution?**
 - Difference between this and the Original Proposal
- **What is the impact of this change?**
- **When will the change take place?**
- **Acronyms, key terms and reference material**

What is the proposed alternative solution?

This alternative solution applies to all the Users required to comply with CC.6.3.15 or ECC.6.3.15 regardless of their size, location, type, operational status (FON, LON, ION) etc.

The letter published by NGESO on 6th May 2021 reminding Users of their Grid Code obligations to ride through faults on the transmission system was published because of increasing system security concerns from NGESO over fault ride through non-compliances. In the 3 months of February to April 2021, there were 9 network fault incidents resulting in 33 unexpected generation losses. A summary of this has been provided in the Appendix 1.

This alternative focusses on putting a clear process in place that allows NGESO to maintain the security of the system by ensuring that any potential FRT issue is addressed as soon as it is identified. The approach to have immediate action is not achieved in the original proposal.

When NGESO identifies a potential FRT issue, they will notify the User in writing. This may be through the SIR process by ENCC or via other NGESO teams (Compliance team / Technical Operations Policy team). In both cases, the User should be prepared to take immediate action up to and including restricting their output in agreement with NGESO.

The steps are summarised below:

- **User's output reducing coincident with a network fault:** NGESO identifies a potential FRT issue (via ENCC or other NGESO teams) and notifies the relevant Users
- The **immediate action** is for a User to consider if they are potentially FRT non-compliant and be prepared to take immediate action up to and including restricting their output in agreement with NGESO. Upon being contacted, the User should respond explaining why the User believes that they are FRT compliant or outlining the steps to be taken to resolve FRT non-compliance e.g. proposing a new output level with rationale behind it for a given period. This period could be that required to rectify the non-compliance or required to provide an explanation to NGESO.

Timelines for responding vary depending on who contacts the User as below:

- **If contacted by ENCC**, provide an SIR response within 2 hours (or another timeline agreed with NGESO) of receipt of the notification from ENCC.
- **If contacted by either the NGESO Compliance team or Technical Operations Policy team**, provide a response as soon as practicable.
- **Without delay:** Upon receipt of an SIR response from a User, NGESO will discuss with the User and agree the proposed next steps which may include;
 - The User declaring that they are FRT compliant and thus returning to service
 - The User requiring time to rectify their non-compliance and thus receiving a Limited Operational Notification (LON) or
 - The ION being updated to include any additional FRT related requirements.

This approach is to ensure that we avoid the potential for repeated instances of FRT failure (as seen recently when a User tripped twice within 3 hours) which compromises the security of the NETS. The approach also limits the impact on consumers that would otherwise be incurred either through increased risk of disruption or increased operational costs due to NGENSO having to carry greater levels of reserves.

All Users connected to the NETS have a licence obligation to **maintain system security** **comply with the requirements of the Grid Code.**

In discussions at workgroup meetings, Users are clear that in the event of a trip, they would not generally restore plant until an investigation has taken place. We also know that in 95% of cases, the reasons for failing to ride through a normal fault, and any solution, are obvious and easily remedied where required; often to do with protection settings.

This alternative also includes for an update of the CC.6.3.15 and ECC.6.3.15 legal text to provide clarity on the requirements as in Appendix 2.

The alternative also provides the following that were requested by the proposer:

- Incidents that have occurred to date to provide benefit of immediate learning points. See Appendix 1.
- Going forward, NGENSO will publish **supergrid transmission system voltages'** fault data information i.e. faults that occur at voltages ≥ 200 kV **in England & Wales and voltages ≥ 132 kV in Scotland.**
- The solution proposed for the Grid Code to be amended to include additional obligations on NGENSO to provide industry with the largest infeed loss at a given time. Although the size and location of the largest infeed is not relevant to the FRT issue as the largest infeed is not defined by compliance shortcomings, the proposal has been accommodated in this alternative.

Worth noting is that NGENSO already provide this information on their data portal; [System Operating Plan \(SOP\) information](#) platform. To access this, download the CSV file, required information is in Column Y (Maximum_Loss_Generation).

Below are the modifications that are proposed for this alternative:

Amendments to OC5.4

OC5.4.2.1 In the event that a **BM Unit** fails persistently, in **The Company's** reasonable view, to follow, in any material respect, its expected input or output or a **User** fails **persistently** to comply with the **CC** or **ECC** as applicable and in the case of response to **Frequency**, **BC3** or to provide the **Ancillary Services** it is required, or has agreed, to provide, **The Company** may notify the relevant **User** giving details of the failure and of the monitoring that **The Company** has carried out.

OC5.4.2.2 The relevant **User** will, as soon as possible (and in the case of a failure to comply with the requirements of **CC.6.3.15** or **ECC.6.3.15** as applicable, within 2 hours in respect of a notification under OC10 or a longer time period only where agreed by **The Company**), provide **The Company** with an explanation of the reasons for the failure and details of the action that it proposes to take to:

(a) enable the **BM Unit** to meet its expected input or output or to provide the **Ancillary Services** it is required or has agreed to provide, within a reasonable period, or

(b) in the case of a **Power Generating Module, Generating Unit** (excluding a **Power Park Unit**), **CCGT Module, Power Park Module, OTSUA** (prior to the **OTSUA Transfer Time**), **HVDC Equipment** or **DC Converter** to comply with the **CC** or **ECC** as applicable and in the case of response to **Frequency, BC3** or to provide the **Ancillary Services** it is required or has agreed to provide, within a reasonable period.

For the avoidance of doubt in the case of **CC.6.3.15** or **ECC.6.3.15** as applicable, the explanation may indicate that the **User** has complied with **CC.6.3.15** or **ECC.6.3.15** as applicable on the basis that the **User** has provided recordings to show the voltage waveform is beyond the conditions specified in **CC.6.3.15** or **ECC.6.3.15** as applicable or the **User** connection point has been de-energised or by receipt of an inter trip from the **National Electricity Transmission System**, or that other information has been shared between the **User** and **The Company** enabling agreement between them that compliance with **CC.6.3.15** or **ECC.6.3.15** has been confirmed.

OC5.4.2.3 In the event of a **User** being notified by **The Company** of a potential failure to comply with the requirements of **CC.6.3.15** or **ECC.6.3.15** as applicable, the **User** shall take action to restrict the output of their **Power Generating Module, Generating Unit** (excluding a **Power Park Unit**), **CCGT Module, Power Park Module, OTSUA** (prior to the **OTSUA Transfer Time**), **HVDC Equipment** or **DC Converter** to a level and for a period as agreed with **The Company** or until an explanation has been provided by the **User** and agreed by between the **User** and **The Company** as set out under OC5.4.2.2.

OC5.4.2.4 **The Company** and the **User** will then discuss the action the **User** proposes to take and will endeavour to reach agreement as to:

(a) any short term operational measures necessary to protect other **Users**; and

(b) the parameters which are to be submitted for the **BM Unit** and the effective time(s) and date(s) for the application of the agreed parameters. For the avoidance of doubt in the case of a failure to comply with **CC.6.3.15** or **ECC.6.3.15** as applicable, this maybe to zero MW or another value if agreed between the **User** and **The Company**.

OC5.4.2.5 In the event that agreement cannot be reached within 10 days of notification of the failure (other than in respect of CC.6.3.15 or ECC.6.3.15 as applicable where testing is impractical) by **The Company** to the **User**, **The Company** or the **User** shall be entitled to require a test, as set out in OC5.5 and OC5.6, to be carried out.

OC5.4.2.6 In the case of a **Power Generating Module, Generating Unit (excluding a Power Park Unit), CCGT Module, Power Park Module, OTSUA (prior to the OTSUA Transfer Time), HVDC Equipment or DC Converter** to comply with the **CC.6.3.15 or ECC.6.3.15** as applicable **The Company** will as soon as reasonably practical, issue a **Limited Operational Notification** or amend any **Interim Operational Notification** in accordance with the **CP or ECP** as applicable.

Amendments to OC3

OC3.4 SYSTEM INCIDENTS REPORT

OC3.4.1 The **Company** shall prepare and submit to the **Grid Code Review Panel** monthly a report titled the **System Incidents Report**, which shall contain:

- (a) a record of each and all of any of the following **Events**, defined as **Significant Events**, on the **National Electricity Transmission System**:
 - (i) a loss of infeed or exfeed (import or export including generation, **Demand** and interconnection) of $\geq 250\text{MW}$;
 - (ii) a **Frequency** excursion outside the limits 49.7-50.3Hz;
 - (iii) a fault on the **National Electricity Transmission System** which:
 - A. could be linked to the known or reported tripping of 250MW or more as reported in (i) above; and/or
 - B. (as detailed in section CC6.1.4) is linked to a change in the **Transmission System** voltage of
 - I. 300kV or greater: $> \pm 5\%$ for $> 15\text{min}$; or
 - II. 132kV up to 300kV: $> \pm 10\%$ for $> 15\text{min}$;
 - (iv) any known demand disconnected $\geq 50\text{MW}$ from the **National Electricity Transmission System** or other lesser demand if notified to **The Company**; and
 - (v) any **Demand Control** action taken;
- (b) a report of each such **Significant Event** including the following data in relation to each **Significant Event** as appropriate and available:
 - (i) the time(s) in hh.mm.ss of the **Significant Event** and any potentially related occurrences;
 - (ii) any known or reported loss of **Embedded Power Station(s)** with locations and ratings where available;
 - (iii) the **Frequency** record (in table and graphical format) at ≤ 1 second intervals for 1 minute before and 1 minute after the **Significant Event**;
 - (iv) the **Frequency** (to 2 decimal places) immediately before the **Significant Event**;
 - (v) the **Frequency** (to 2 decimal places) immediately after the **Significant Event**;
 - (vi) the maximum rate of change of **Frequency** recorded during the **Significant Event** over a specified time period of 500ms;
 - (vii) where known, the MW of all individual losses or trips related to the **Significant Event**;
 - (viii) where known, the identity of the **Users** and **Network Operator** of all demand losses or trips related to the **Significant Event**;

- (ix) the location of any reported **Transmission** fault on the network diagram and geographically;
 - (x) the extent of any voltage dip associated with the **Significant Event**;
 - (xi) an estimate of system inertia in MWs at the time of the **Significant Event** along with how it has been calculated; and
 - (xii) any other data available that is of value to gain a clearer understanding of the **Significant Event** and its potential implications; and
- (c) an outline of progress towards reporting events and associated data on the **National Electricity Transmission System** including:
- (i) three phase faults;
 - (ii) three phase to earth faults;
 - (iii) phase to phase faults;
 - (iv) phase to earth faults;
 - (v) the associated voltage dips – durations and spreads;
 - (vi) over-voltages;
 - (vii) under-voltages;
 - (viii) voltage dips of >50%; and
 - (ix) lightning strikes.
 - (x)

OC3.5 REPORTING ON FAULT EVENTS

OC.3.5.1 The Company shall prepare and publish on their website a report giving date, time and location of three phase, three phase to earth, phase to phase and phase to earth fault events on the **National Electricity Transmission System**. Information shall be published as soon as reasonably practicable following an event.

OC3.6 REPORTING ON LEARNING

OC3.6.1 Where the analysis of incidents and events occurring on the **National Electricity Transmission System** gives rise to learning points which **The Company** believes are relevant to the industry, **The Company** will publish a report explaining the events, the analysis and information gained as applicable. The contents of the report will be anonymised to avoid identification of **Users**, connection sites and manufacturers of **Plant** and **Apparatus** except in circumstances where OC3.5.2 applies.

OC3.6.2 Where **The Company** believes that it is appropriate to identify a particular **User**, connection site or **Plant** and **Apparatus**, **The Company** shall in the first instance consult the relevant **User**, **Transmission Owner** and/or manufacturer as applicable for to seek agreement for publication. If permission for publication is not granted by the **User**, **Transmission Owner** and/or manufacturer and **The Company** believes that it is appropriate to identify a particular **User**, connection site or **Plant** and **Apparatus**, **The Company** may ask the Regulator for permission for publication.

Amendments to OC2

OC2.4.8 Each day **The Company** will publish the actual largest secured loss of generation (i.e. the loss of generation against which, as a requirement of the Licence Standards, the **National Electricity Transmission System** must be secured) or loss of import from **External Interconnections** in each settlement period in a location agreed with **Users** on **The Company's** website.

What is the difference between this and the Original Proposal?

The proposer’s solution does not address the concerns raised in the [Open Letter](#) regarding Grid Code compliance from NGESO to Users. Whilst we do agree with the aim of the proposal which is greater clarity on the process, the original proposal does not address NGESO’s need to be able to take immediate action following the suspected failure of a User to ride through a transmission system fault.

The table below provides responses to the proposer’s solution explaining why NGESO disagrees with the proposer’s approach.

Comparison of Alternative with the Proposer’s Solution		
No.	Proposer	Alternative
1.	In the event of a User site or Network Operator asset trip/de-load coincident with a system fault, data is required from the ESO to help the User or Network Operator investigate the problem and time is required for the User or Network Operator to investigate the root cause of the trip/de-load.	<p>R1. The impression given here by the proposer is that the User would not be able to commence investigations without data from NGESO. Our understanding is that some Users connected to the NETS have a requirement to install monitoring equipment (CC.6.6.1 and ECC.6.6.1) which provides them with Voltage (V), Active Power (MW), Reactive Power (MVar), and Frequency signals. The data obtained from the monitoring equipment is sufficient to inform an investigation once NGESO identifies that there is a suspected case of FRT non-compliance.</p> <p>Therefore, an investigation of a trip of equipment should not be solely based on the data from NGESO.</p> <p>Should the User provide recordings to show the voltage waveform is beyond the conditions specified in CC.6.3.15 or ECC.6.3.15 as applicable or the User has been de-energised at the connection point by receipt of an inter trip from the NETS, it will cease to be treated as an FRT case.</p>

		<p>For any SIR request, in line with Grid Code OC10.4.1.4, the User will have 2 hours to respond with a preliminary report into the loss of output.</p>
<p>2.</p>	<p>Where User's site or Network Asset TEC/ asset capability is < 100 MW; no immediate export limitation would be immediately applied but the User or Network Operator would have three months from the date of submission of waveform data by NGESO to investigate and if necessary, resolve the cause of any non-compliance.</p>	<p>R2. This proposal does not align with the requirement to maintain the security of the NETS.</p> <p>As mentioned in NGESO's Open Letter, inability of Users to ride through 'normal' faults on the NETS is a serious risk that NGESO need to manage quickly and effectively i.e. in the minutes, hours and days after an apparent 'non-compliance' is observed.</p> <p>Return to normal operation should not be undertaken without agreement from NGESO. All Users regardless of size should remain out of operation until there is enough evidence that, if reconnected it will not trip, that is, it will not compromise the security of the system. It is worth noting that FRT performance and fault current are inherent characteristics of machine size or controller settings such that restriction of output, while potentially limiting impact, doesn't necessarily solve the issue or restore compliance.</p> <p>Proposing a 3-months period ignores the severe security risks posed on the NETS associated with FRT non-compliance which if exacerbated could result in a black out.</p> <p>R3. It is proposing a period of 3 months during which the consumers are subjected to incurring additional costs associated with NGESO holding additional reserves to cover for Users that may trip again coincident with a fault. It should be the Users' responsibility to determine the cause of a trip as quickly as possible.</p>

DRAFT for DISCUSSION

<p>3. a</p>	<p>Where Users' sites or Network Asset TEC/ asset capability is > 100 MW:</p> <p>a. Where the User or Network Operator is in receipt of an ION: a MW export constraint would be applied immediately to a level of either:</p> <p>i) 70% of the station TEC/ asset capability; or</p> <p>ii) the prevailing largest infeed limit (whichever is lowest)</p> <p>Note – the export limit will not be reduced below 100 MW (i.e. a User with 130 MW would only be constrained to 100 MW)</p> <p>The User or Network Operator would have 3 months from the date of submission of waveform data by NGENSO to investigate and if necessary, resolve the cause of any non-compliance.</p>	<p>This approach is not in line with the content of the letter for the following reasons:</p> <p>R4. For export limitation, see response R2</p> <p>R5. It is proposing maintaining at least 100MW connected despite being unable to demonstrate compliance. In such circumstances where a User is unable to demonstrate compliance but chooses to remain connected to the NETS, they would be in breach of their licence obligations which require Users to ensure compliance with the Grid Code and STC is maintained at all times.</p>
<p>1. b</p>	<p>Where Users' sites or Network Asset TEC/ asset capability is > 100 MW:</p> <p>b. Where the User or Network Operator is in receipt of a FON: no immediate export limitation would be immediately applied but the User or Network Operator would have three months from the date of submission of waveform data by NGENSO to investigate and if necessary, resolve the cause of any non-compliance</p>	<p>This approach is not in line with the content of the letter for the following reasons:</p> <p>R6. 3-month period – See response R2.</p> <p>R7. Capacity of the assets – See response R2</p> <p>R8. The User suggests that due to the Operational Status of the User/Network Operator as FON, measures should not be taken to address FRT concerns on the NETS. This approach assumes that equipment on a FON is 'perfect / fault-proof' which is not true.</p> <p>In such circumstances where a User is unable to demonstrate compliance but chooses to remain connected to the NETS, they would be in breach of their licence obligations which require Users to ensure compliance with the Grid Code is always maintained. This requirement (to always maintain compliance) cuts across all Users regardless of their Operational Status.</p>

DRAFT FOR DISCUSSION

<p>2.</p>	<p>Where Users' sites or Network Asset TEC/ asset capability is > 100 MW:</p> <ul style="list-style-type: none"> c. Where the User or Network Operator is in receipt of a LON: <ul style="list-style-type: none"> i. if the reason for the LON relates to equipment changes that could reasonably be expected to affect the FRT performance (e.g. a generator replacement or software update that fundamentally changes the FRT capability or protection settings that are tighter than were applied previously) then the User or Network Operator would be managed as for an ION (see (a) above). ii. For all other reasons (e.g. a software upgrade that only affects a windfarm's central control unit) the User or Network Operator would be managed as for a User or Network Operator in receipt of a FON. 	<p>R9. The Compliance Process in the Grid Code already outlines steps to be undertaken to transition from a LON to a FON. This includes completing a self-certification of compliance proforma and a compliance statement. The former includes for confirmation that at the time of seeking a FON, the User is compliant with FRT requirements.</p> <p>Therefore, including this would be a duplication of information within the Grid Code.</p> <p>R10. See responses R6 to R8</p>
<p>3.</p>	<p>3. For any User or Network Operator: if the cause of the FRT non-compliance is not resolved after three months from issue of the waveform data by NGENSO, the User or Network Operator would have to constrain the station TEC/ asset capability to 50% until the non-compliance was resolved</p>	<p>R11. As previously stated, the consequences of an FRT non-compliance are severe and need immediate action. See response R2</p>
<p>4.</p>	<p>Three Months to Investigate</p> <p>The existing LON process permits generators/interconnectors up to two years to rectify grid compliance issues. We recognise this is unnecessarily long for a User or Network Operator to correct a fault that could present a risk to the system but in our experience three months is the minimum reasonable time that User or Network Operator would need to complete the tasks that would be expected to fully investigate the fault, namely:</p>	<p>R12. NGENSO acknowledge that time is required to undertake investigations which should be done without compromising the security of the system. Thus, NGENSO's Open Letter and this alternative propose that upon being contacted by NGENSO, the User immediately considers if they are potentially FRT non-compliant and be prepared to take immediate action up to and including restricting their output in agreement with NGENSO. The User should respond (within 2 hours if contacted by ENCC and as soon as practical if contacted by other NGENSO teams) explaining why the User believes that they are FRT compliant or outlining the steps to be taken to resolve FRT non-compliance e.g. proposing a new output</p>

	<ul style="list-style-type: none"> o gather relevant SCADA error logs and protection settings o obtain system fault level data at the time of the fault o if required, commission consultants to provide the necessary modelling services to model generator/interconnector/network asset controls o repeat required FRT modelling scenarios o Implement any setting changes 	<p>level with rationale behind it for a given period. This period could be that required to rectify the non-compliance or required to provide an explanation to NGENSO. See response R2.</p>
<p>5.</p>	<p>100 MW Threshold</p> <p>The degree of constraint that should be applied is clearly dependent on the impact repeated FRT failures of a generator/interconnector/network asset could have on the wider system which in turn depends on the User's Transmission Entry Capacity or Network Operator's asset capability.</p> <p>The FRT requirements apply to interconnectors and all 'Large' generators, i.e those above 10 MW in the north of Scotland but do not apply to many distribution connected generators < 50 MW in England and Wales.</p> <p>Therefore, for simplicity we propose the Licence threshold of 100 MW is used since this was chosen to imply that below this level the User's asset (or, by inference, Network Operator's asset) would not have a significant impact on the system.</p>	<p>R13. The NGENSO alternative solution proposes that regardless of size, location, type, operational status etc., a User should immediately consider if they are potentially FRT non-compliant and be prepared to take immediate action up to and including restricting their output in agreement with NGENSO. The User should respond (within 2 hours if contacted by ENCC / as soon as practical if contacted by other NGENSO teams) explaining why the User believes that they are FRT compliant or outlining the steps to be taken to resolve FRT non-compliance.</p>
<p>6.</p>	<ul style="list-style-type: none"> • Degree of Forced Constraint: Lowest of 70% TEC or Largest Infeed Limit <p>The sudden loss of a large User (or large network asset) will erode frequency response the ESO holds to cater for the loss of a normal</p>	<p>R14. As stated in the Workgroup 1 meeting, there is no risk of a User infringing REMIT Article 5 obligations due to remaining out of operation to preserve the security of the system. Remaining out of operation will be justifiable by being in receipt of a notification from</p>

infeed. The larger the User's site (or network asset(s)), the greater the risk that the response holding could be eroded and therefore it could be argued that some action is needed to mitigate the potential risk that the generator (or interconnector or Network Operator) could be non-compliant and could trip again, in effect requiring the ESO to hold 'extra' response at a cost that would be passed through to BSUOS and the end customer.

However, there is also the possibility:

- o the User's site (or Network Operator asset) had received a FON (i.e deemed by the ESO to have satisfactorily demonstrated Grid Code FRT compliance) and the resulting investigation shows it had tripped for valid reasons but the investigation takes several days/weeks to conclude (e.g > 50% turbines unavailable, network over-voltages, repeated network faults). Imposing a hasty constraint on a User site that it turns out is (and was at the time of the event in question) Grid Code FRT compliant could put the User at **risk of infringing REMIT Article 5 obligations** and would be unreasonable given that the User may have operated for many years without issue and the balance of probability is that they are Grid Code FRT compliant.

Conversely, a User (or Network Operator) in receipt of an ION is likely to be for a new generator or interconnector (or new network asset) with limited operational history and has by definition not demonstrated to the ESO's satisfaction full compliance; including Grid Code FRT compliance. Therefore the balance of probability suggests that it is possible the User's site (or Network Operator's asset) could be non-compliant and some export limitation is justified.

ENCC as soon as a potential fault ride through issue is identified requesting for a Significant Incident Report (SIR).

R15. Largest Infeed Loss

Although the size and location of the largest infeed is not relevant to the FRT issue as the largest infeed is not defined by compliance shortcomings, the proposal has been accommodated in this alternative.

Worth noting is that NGENSO already provide this information on their data portal; [System Operating Plan \(SOP\) information](#) platform. To access this, download the CSV file; required information is in Column Y (Maximum_Loss_Generation).

	<ul style="list-style-type: none"> o Any forced outage of an in-merit generator or interconnector (or forced outage of network assets) will lead to higher costs to the end customer. Where this applies to a large generator (e.g one with a low CfD) or interconnector or substantial network asset this could add significantly to balancing costs and/or erode system margins creating other system security risks o On many windfarms, operating at a reduced output should improve the FRT capability such that, even though a windfarm may not be compliant at full output, the additional 'headroom' obtained from operating at a lower output (such as 70%) will increase the likelihood of a non-compliant windfarm (if that is actually the case) riding through faults. o If the constrained User is a windfarm then by setting the windfarm to Frequency Sensitive Mode (FSM) rather than applying a fixed MW, the 'headroom' could be used to obtain additional frequency response, which while it cannot be fully relied upon, would be fast-acting and would generally be expected to contribute to the stability of the system in the event of a fault of another User site or Network Operator asset. 	<p style="text-align: center; font-size: 48px; opacity: 0.2; transform: rotate(-30deg);">DRAFT FOR DISCUSSION</p>
<p>7.</p>	<ol style="list-style-type: none"> 1. By taking a pragmatic and 'risk-based approach' to the likelihood of a non-compliance, this process strikes the right balance between ensuring the security of the system whilst also minimising the cost to Users or Network Operator and the consumer. 2. It also provides certainty to all Users and Network Operators (as well as the ESO and Ofgem) of what is required such that they (as well as the ESO and Ofgem) can be confident they are meeting their licence obligations. 	<p>R16. The approach proposed herein ignores the consequences associated with FRT non-compliance. The consequence and severity (capable of black-out) are so high that immediate action is required.</p> <p>The existing process of what to do following an FRT failure is based on liaison taking place between the User and the NGESO Compliance team following a failure and relies on pragmatism - the modification instead seeks to achieve legal certainty in the process which we recognise may provide some benefit to Users but carries costs for consumers and risk for the NGESO.</p>

	<p>3. It uses existing established processes in the Grid Code; if the issue of a FON cannot be relied upon to have confidence of a User's site or Network Operator's asset FRT capability then it suggests there could be a defect in the application of the Compliance process. Similarly, it highlights that until a FON is issued, the User or Network Operator is at risk of potential restrictions in its output/operation – which may in turn, encourage Users and Network Operators to complete the ION stage more quickly than has historically been the case.</p>	
<p>8.</p>	<p>To provide further clarity to Users and Network Operators, it is proposed that wording along the following lines would be added to Section CC.6.3.15.3 and ECC.6.3.15.10 ('Other Fault Ride Through Requirements'):</p> <ul style="list-style-type: none"> • Users and Network Operators shall ensure voltage sensitive relays installed to protect the User's plant and / or apparatus or Network Operator's asset are configured such that they will not prevent correct operation of the Fault-Ride-Through capability of the User's equipment (or Network Operator's assets) against the relevant Voltage-Time curves. For example, <ul style="list-style-type: none"> o Over-voltage protection shall be configured to be insensitive to transient over-voltages of at least 1.20pu for at least 0.5 seconds. o Under-voltage protection shall be configured to be insensitive for transient under voltages of below 0.8pu for at least 3 seconds 	<p>R17. This purpose of this modification is to seek clarity on the process to be followed in case of a suspected FRT non-compliance. Hence, to avoid losing the focus on the process, NGESO propose that details of the content of CC.6.3.15.3 and ECC.6.3.15.10 be left out of this solution and be addressed within the legal text strawman provided by Alastair Frew and circulated to all workgroup members. An annex of the final agreed text will be added in Appendix 2.</p>
<p>9.</p>	<p>6.1) Safe Limit</p> <p>In its presentation to the 24th June 2021 GCRP meeting, the ESO has made reference to "Users are asked to restrict their output</p>	<p>R18. A safe limit is one that will be proposed with its associated rationale for a given period. It will be based on their site arrangements and the findings within their investigations.</p>

	<p>until a FRT issue is ruled out (either MEL to zero or to a safe level)". [emphasis added]</p> <p>However, as noted under (1) 'Legal Compliance' above, there is no transparency (for Users or Network Operators or Ofgem) of what the ESO is referring to.</p> <p>Is it, for example, (i) 'safe' for the system only; or (ii) 'safe' for the User(s) and / or Network Operator(s) only; or (iii) 'safe' for the system, the User(s) and / or the Network Operator(s)?</p> <p>Given this uncertainty, we believe it important for Users, Network Operators, the ESO and Ofgem that there is transparency (in the form of it being set out in the Grid Code, having been approved by Ofgem, via this Modification proposal) of what the 'safe level' is along with when (and when not) it applies.</p> <p>We elaborate further; in the 'What is the proposed solution' section below; what for the purposes of plant and apparatus (including network assets) could be considered as being a 'safe level' in our view.</p>	<p style="text-align: center; font-size: 48px; opacity: 0.2; transform: rotate(-30deg);">DRAFT for DISCUSSION</p>
<p>10.</p>	<p>6.2) Historic fault information</p> <p>There is a lack of transparency for stakeholders of the historic fault data in GB and therefore, we propose that the ESO be obliged (in the Grid Code) to provide the industry with historic fault data (i.e. timestamped records of voltage dips at GSPs or key nodes) that would enable Users (and Network Operators) to check for any unexpected changes in station output (or network asset performance) that could signify an apparent FRT compliance issue.</p> <p>The provision of this data by the ESO and the subsequent checking by the User (or Network Operator) of any unexpected changes</p>	<p>R19. Incidents that have occurred to date to provide benefit of immediate learning points have been provided. See Appendix 1.</p> <p>R20. Going forward, NGENSO will publish supergrid voltages' fault data information i.e. faults that occur at voltages ≥ 200 kV. The timelines for provision of this data will be as agreed for GC0105.</p>

	<p>in station output (or network asset performance) would provide significant confidence that a User's site (or network asset) was compliant and would be far more meaningful than, for example, a one-off confirmation letter.</p> <p>Given that this is historical data that already exists and given the importance that the ESO attached to this matter (as witnessed, for example, by the statements in the 7th May 2021 letter itself) we would expect that the ESO would wish to make this historic fault data available to stakeholders with the utmost alacrity (and thus perhaps ahead of the change needing to be codified).</p>	
<p>11.</p>	<p>6.3) Real-time post-event data</p> <p>It has come to our attention that when an FRT event occurs in Ireland that the system operator, EirGrid, provides to stakeholders, within 24 hours, the minimum retained / maximum voltage and duration associated with that event. This is not something that occurs in GB.</p> <p>In our view, the ESO should be obliged (within the Grid Code) to provide to Users and Network Operators the waveform data (or at least the minimum retained / maximum voltage and duration) following any Fault Ride Through incident on the NETS in a timely manner, as EirGrid does.</p> <p>This will allow Users and Network Operators to investigate and resolve the fault (if one has occurred on their equipment/asset(s)) and thus, in our view, is the starting point for the timeframe for reporting back to the ESO on matters pertaining to FRT compliance.</p>	<p>R21. See responses Error! Reference source not found. and R20.</p>

	<p>We also note that following the introduction of GC0105, the Grid Code now requires the ESO to report to the Panel its progress with reporting voltage transients¹⁹.</p> <p>In respect of items 6.2 and 6.3 above, we are also mindful of the current Ofgem consultation on the publication of data by Network Operators (including, in this case the ESO) where the emphasis on justification would switch from a presumption of not publishing (unless justified as to why to publish) to a presumption of publication (unless having justified why not).</p> <p>For the avoidance of doubt, we believe that our proposed approach, in this Modification proposal, as regards data publication by the ESO in respect of both 'Historic fault information' and 'Real time post event data' conforms with the Ofgem's intentions (as set out in its consultation).</p>	<p style="text-align: center; font-size: 48px; opacity: 0.2; transform: rotate(-45deg);">DRAFT for DISCUSSION</p>
<p>12.</p>	<p>6.4) After event reporting</p> <p>It is important that lessons learnt from FRT events in terms of the impacts etc., on User or Network Operator plant or apparatus (including network assets) are shared with stakeholders as, for example, happened after the 9th August 2019 event where information on the lessons learnt by the two transmission connected generators was shared with the wider stakeholder community to ensure, collectively as well as individually, that steps were taken to learn from what went 'right' or 'wrong' on the day.</p> <p>Therefore, in our view, the ESO should be obliged (within the Grid Code) to make available, in a timely manner, to Users and</p>	<p>R22. See response R20</p>

	<p>Network Operators any lessons learnt information that is provide to the ESO by any User(s) and / or Network Operator(s) after an FRT event.</p>	
<p>13.</p>	<p>6.5) Dynamic Largest infeed loss</p> <p>There is currently no visibility to Users of the dynamic largest infeed loss that is being applied by the ESO to operate the NETS. Whilst it has been generally set to 1,320MW there are, we understand, periods of time, such as when inertia is low, where the level has dropped to circa 800MW There is little real time visibility to stakeholders of this.</p> <p>In our view, as we set out in 'What is the proposed solution' below, and in order to support system security it is appropriate for the ESO to be obliged (in the Grid Code) to provide the industry (via the BMRS?) with the current largest infeed loss level at any moment in time that the ESO is operating the NETS to.</p>	<p>R23. See response R15</p>

DRAFT for DISCUSSION

What is the impact of this change?

Proposer's Assessment against 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	<p>Positive/Negative/None: Positive</p> <p>Addressing FRT non-compliance immediately ensuring that the security of the system is maintained</p>
(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);	<p>Positive/Negative/None: None – It applies to all Users with FRT requirements</p>
(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;	<p>Positive/Negative/None: Positive</p> <p>Addressing FRT non-compliance immediately ensures that:</p> <ol style="list-style-type: none"> 1. The security of the system is maintained 2. The risk to supply to consumers is minimised 3. The overall cost to consumers is minimised
(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	<p>Positive/Negative/None: Positive</p> <p>Clarity provided on the obligations of the Users and ESO in the event of FRT case.</p>
(e) To promote efficiency in the implementation and administration of the Grid Code arrangements	<p>Positive/Negative/None: None</p>

When will this change take place?**Implementation date:**

Immediately as FRT non-compliance is a concern in the operation of the NETS.

Implementation approach:

As soon as possible given that FRT failure results in either additional risk or operational costs, both of which impact consumers.

Acronyms, key terms and reference material

Acronym / key term	Meaning
FRT	Fault Ride Through
NETS	National Electricity Transmission System
ENCC	Electricity National Control Center

Reference material:

1. [Open Letter](#) to transmission connected generation and Network Operators.
2. Fault ride through strawman legal text; attached

Appendix 1 Summary of Fault Ride Through Events in 2021

Table A. 1 and Table A. 2 show the anonymised summary of incidents and FRT events in 2021 for which an investigation was undertaken.

Table A. 1: Anonymised Summary of Incidents in 2021

No.	Circuit Trip	No. Users	Approx. Unexpected MW Loss
1.	Dounreay – Connagill – Gordonbush – Strathbroira 275kV circuit	1	40
2.	Black Hill – Dun Hill – New Cumnock 2 132kV circuit	4	220
3.	WLHVDC (15th February 2021)	2	20
4.	Trip of Culham Jet X110, Bramley – Didcot 2	2	1,050
5.	Heysham MB 4 re-energisation 10:41:24 on 11 March 2021	1	10
6.	Heysham MB 4, RB5 Fault 05:39 on 11 March 2021	6	680
7.	Kintore-Peterhead 1 275kV trip on 04 April 2021 at 23:13:00	10	730
8.	Kintore-Peterhead 1 275kV trip on 05 April 2021 at 02:46:00	6	590
9.	Kintore - Dyce North 132kV circuit trip on 18 April 2021 at 06:56:15	1	40

Table A. 2 shows the anonymised summary of learning points for the **FRT events** in 2021 for which an investigation was undertaken; including both compliant and non-complaint cases.

Table A. 2: Anonymised Summary of Learning Points for the Fault Ride Through Events in 2021	
No.	Findings
1.	Incorrect operation of connection transformer protection
2.	Wind turbine over voltage protections operated
3.	Wind turbine control settings
4.	Tripped by Load management Scheme Voltage dip to zero at DNO connection point exceeded Grid Code
5.	Not covered by GC FRT, investigation not concluded
6.	Wind turbine control settings
7.	Small Embedded - no FRT requirement
8.	Incorrect settings on connection transformer earth fault protection
9.	Incorrect operation of connection transformer unit protection
10.	Partial output loss. FRT disabled on some turbines, faulty components on some turbines
11.	Wind turbine over voltage protections operated
12.	Not covered by GC FRT, investigation not concluded
13.	Not covered by GC FRT Tripped by Load management Scheme DNO intertrip
14.	FRT disabled on some turbines, faulty components on some turbines
15.	Two issues: wind turbine over voltage protection, hydraulic auxiliaries not supported by UPS
16.	Appears to be incorrect operation of connection transformer overcurrent protection
17.	Partial Loss - FRT modules failed on some turbines
18.	WF predates FRT requirement. Tripped by protection which is now being upgraded
19.	Rode through first fault, tripped on second fault as no repeatability
20.	Investigation not concluded
21.	Incorrect operation of connection transformer protection
22.	Wind turbine control settings
23.	User declared disconnected from connection point

Appendix 2 Clarified CC.6.3.15 and ECC.6.3.15 Legal Text

To be added once the legal text is agreed.

DRAFT for DISCUSSION