

## WAGCM2 - Grid Code Alternative Form

# GC0141: Preferred permutation across all GC0141 “Sub-Modification” workstreams

### Overview:

The Alternative has been raised to cover the proposers chosen permutation in relation to the elements that comprise the modification.

Details of the chosen permutation as attached and summarised below:

Solution	Independent Engineer	Sharing for SSTI / SSCI	RMS & EMT Models	Fault Ride Through Definition & Retrospective Requirements	Compliance Repeat Plan	Enhanced FRT Studies	Torsional Data
WAGCM2	No requirement for IE	ESO/TO share models as required	Specification of RMS & EMT model (fully encrypted)	No time duration or respective requirements	No requirement to submit compliance statement and DRC Schedules	Additional studies for complex connections agreed at start of process	User provides data when asked prior to a completion date of 1st April 2015
	No change from Baseline						
	Original Proposal						
	Alternative Option						

**Requirement for an Independent Engineer** – Current Baseline

**Sharing of SSTI/ SSCI Models** – Original Proposal

**Specification for RMS & EMT Models** – Original Proposal

**Fault Ride Through Definition and Retrospective Requirements** – Current Baseline

**Compliance Repeat Plan** – Current Baseline

**Enhanced Fault Ride Through Studies** – Original Proposal

**Provision of Torsional Data for Older Plant** – Alternative Option – 7a (requirement for User to only provide Torsional Data for Generating Units with a completion date before 01 April 2015 on request)

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## What is the proposed alternative solution?

The alternative covers the proposers chosen elements of the modification, with some elements differing from the Original Proposal.

## What is the difference between this and the Original Proposal?

See “Overview” section.

## What is the impact of this change?

This Alternative Modification Proposal will have generally the same impact as the Original Modification Proposal for the introduction of the modelling requirements. It will not introduce the Independent Engineer, nor will it retrospectively introduce additional fault ride through requirements and will not retrospectively mandate older plants to submit torsional data unless it is needed.

Each of the 7 different aspects of this modification will be dealt with separately in the sections below.

### **Independent Engineer Changes to sections CP.A.3.1.4 & ECP.A3.1.4**

This Alternative Modification Proposal will not introduce an Independent Engineering, by not adding the additional text into CP.A.3.1.4 and ECP.A.3.1.4 as proposed in the Original Proposal and leaving these sections as per the Baseline.

We believe the proposed introduction of a third-party Independent Engineer appears to be a further step in the reduction in the ESO duties whilst passing them on to Users to contract third parties along with the additional costs. It also seems to assume that the User and their suppliers are not capable of doing these activities and these are being passed on to a third party who does not appear to have any responsibility as the final agreements are between the ESO and the User.

### **Sharing of SSCI SSTI models changes to sections PC.3.8 & PC.3.9**

This Alternative Modification Proposal will introduce the changes to making sharing of models easier, by adding the additional text into PC.3.8 and PC.3.9 as proposed in the Original Proposal. We believe to ensure safe and stable system development more modelling is required and there must be a simpler arrangement to allow all parties to share their individual plant models. Given the ESO is running the system and have contractually agreements with all the other parties it would most appropriate that they have this role as per the Original Proposal.

### **RMS & EMT requirements new section PC.A.9**

This Alternative Modification Proposal will introduce the changes to detail to be submitted in models, by adding the new section PC.A.9 and the associated changes as proposed in the Original Proposal. We believe to ensure safe and stable system development more modelling is required and there must be a simpler arrangement to allow all parties to share their individual plant models.

### **Fault Ride Through Changes to sections CC.6.3.15 & ECC.6.3.15**

This Alternative Modification Proposal will not retrospectively introduce additional fault ride through requirements which the Proposer of this Alternative believes may be impossible to achieve and could unintentionally introduce safety risks, by not adding the additional text into CC.6.3.15 and ECC.6.3.15 as proposed in the Original Proposal and leaving these sections as per the Baseline. The reason behind not including these changes are as follows:

The Proposer is justifying this section of the proposed modification by stating it is only a clarification to the existing fault ride through requirements in CC.6.3.15 and ECC.6.3.15 and hence the 30 minutes was always the original intent of the baseline text.

Originally the fault ride through (FRT) requirements were introduced at the same time as BETTA and were dealt with simultaneously by modifications H/04 and SA/2004, which were introducing new requirements for non-synchronous Power Park Modules. Whilst the main aim of the modification was to introduce requirements for non-synchronous units in-order to appear even-handed, FRT requirements for synchronous units were also added. As well as applying these requirements to new units, some requirements were applied retrospectively to existing units - as discussed in the Impact Assessment sections 6.4 & 6.5 of the Authority's consultation<sup>[ref 1]</sup> issued on the 17 January 2005:

#### ***Existing conventional synchronous generation***

- 6.4. The only proposed change to the Grid Code that could affect existing synchronous generators relates to FRT. FRT is the ability of a generator to remain connected to a network in the event that a fault occurs on the system and is subsequently cleared by protection. The existing grid codes do not contain an explicit requirement for FRT as it is generally accepted that synchronous generators have this ability; a case supported by their operational history. The requirement for FRT is now proposed to ensure that non-synchronous generators also have this ability (most early wind turbine designs were vulnerable to disconnection from the system owing to short voltage depressions caused by grid faults). For consistency, and to avoid discrimination between different classes of generators, NGC and the STL have applied the FRT requirement to both synchronous and non-synchronous generators.
- 6.5. Ofgem understands that the new FRT requirements can be met by synchronous generators without modification or any kind of change in their operation. Ofgem also understands that it is not the intention of the licensees that the introduction of the new connection conditions should have any significant impact on existing generators. If cases are identified where this is not the case Ofgem and the appropriate licensee will work together to address them. Ofgem therefore considers that accepting the proposals would have no impact on existing conventional synchronous generators.

This consultation was primarily related to non-synchronous PPMs. Out of the 12 responses there was only one respondent (Magnox) who gave a response related to the retrospective application of FRT requirements to synchronous generators. The key sections of their response are<sup>[ref 2]</sup>:

In my comments on the wording proposed in H/04, I pointed out that there was a difficulty with the "fault ride through" proposals as they were made retrospective on all existing synchronous generating plant, and I was not convinced that all existing synchronous plant could demonstrate that it was compliant with all the requirements, particularly the extended voltage depression. The latest proposals distinguish between the requirements during a fault up to 140 milliseconds which are applicable retrospectively on all generating plant [CC.6.3.15 (a) (i)], and the requirements for a prolonged voltage depression, which are only applicable to generating plant with a completion date after the change implementation date [CC.6.3.15 (b) (i)]. The latter requirement has also been relaxed slightly with regard to the duration of 80% voltage. The difficulty arises because the wording has been strengthened to include the words "without tripping .... any constituent element". It is not clear what is meant by a 'constituent element', and how far it is all-embracing. In any large power station there are many auxiliary systems and ancillary systems, and some of these are traditionally supplied via electrically held contactors, which are likely to trip out if the local supply voltage falls momentarily below 75% (see BS 774 Part 2 and BS EN 60947-4-1). In some power stations during normal operations, the auxiliaries are supplied via a unit transformer and unit board fed from the generator terminals, so are protected by the generator against grid voltage depressions. Hence this is probably not an issue for them. However, other power stations supply some of their auxiliaries from a station transformer and station board that is directly grid connected, so the auxiliaries will see the voltage depression. I know of at least one example when a generating unit had to be shut down a few minutes after a grid fault and severe voltage depression because a number of auxiliaries had tripped or locked out.

I would agree that it is desirable for system security for all generating plant to be able to ride through system faults and severe voltage depressions. This is demonstrated by the blackouts which occurred in Italy and the USA recently, which I understand were exacerbated by some power stations tripping off early on low voltage. But perhaps the impact of the fault ride-through requirements on the design of the auxiliary systems in large power stations is greater than has been realised. It is unrealistic to expect existing elderly power stations to make major modifications to their auxiliary systems, but it is reasonable to expect new power stations to be designed to meet the requirements, which I am sure is possible. But I don't know how one could easily demonstrate compliance.

The key points in the consultation document are the phrases "it is generally accepted that synchronous generators have this ability; a case supported by their operational history" and "If cases are identified where this is not the case Ofgem and the appropriate licensee will work together to address them" which suggest the application to synchronous generators is based anecdotal evidence. Whilst at the time and now, generally generators successfully ride through the vast majority of faults, most of these faults are at remote locations and are not actually applied close to the generator terminals or as required at the connection point - so synchronous generators at the time might not have been able to comply with the requirements. This is also the point made by Magnox - that there is no real evidence that for faults which are at the connection point an existing generator will be able of complying. The Authority's decision<sup>[ref 3]</sup> is based mostly on the non-synchronous PPM requirements. Originally, when the FRT requirements here were introduced there were no compliance requirements and level of compliance monitoring was very low as infrequent tripping of generators did not create a problem and it is very probable that units did not fully comply. Even now, there are only simulations required to assess potential compliance, however these are limited and cannot guarantee that a generator will ride through a fault at the connection point. Following the events of 9 August 2019, more attention has been given to generators failing to FRT based on the understanding that existing generators have always been capable of doing this. However this original capability was in our opinion only based on anecdotal evidence.

### 30-minute requirement

In our opinion it is difficult to accept that the addition of the 30 minute requirement is a clarification of the baseline text which we believe was based on anecdotal belief that existing generator were capable without a fuller assessment.

The Original Proposal adds a requirement that a Unit must stay connected for 30 minutes and shall not trip off. In our opinion this appears to inadvertently prohibit shutdowns no matter what the circumstances are, if there has been a fault or disturbance within the last 30 minutes. This additional requirement is a safety concern as currently operators are permitted to trip or shut down units whenever a plant or apparatus moves into an unsafe operating condition. Whilst these events might have nothing to do with the fault or disturbance and could be permitted by drafting changes to the proposed text, there is still the possibility that the event has been caused by the fault and tripping needs to be permitted. For example, there are stations which can become completely disconnected from the main transmission system due to lightning strikes on the transmission system - these units must trip on overspeed protection in this situation. Similarly, a system fault could initiate an internal fault in an existing item of apparatus such as an ageing transformer which again would be required trip. This proposed change appears to be creating a situation where the transmission system faults are seen to be dangerous and need to be cleared, but other faults on other user's assets are not as important and are not required to be cleared as quickly as possible.

The Proposer of this Alternative believes the Original Proposal is not clear on what defines as a fault or disturbance to start the 30-minutes. For example it is unclear whether this is it a fault anywhere on the transmission network or whether there is a figure at which the voltage at unit's connection point has to drop below to start the clock.

Currently it is accepted that it is not in a party's commercial interest to trip off unplanned and they will incur out of balance costs, however modification appears to be making tripping a compliance issue with the arbitrary timing of system fault events determining their seriousness.

Whilst accepting the 30-minute requirement might be what the ESO wants or may need, there needs to be a better assessment of capability before such a requirement can be retrospectively introduced. Going forward we believe there should be a full review of all FRT requirements to confirm:

- if they are suitable for existing generators
- what fault levels which are needed for the system
- how reducing total system fault infeed capabilities are affecting the system response and the effect on generators
- And also the action a generator must take in situations where the only route to clear a network fault involves tripping the generator

### **Compliance Repeat Plan new sections CP.8 & ECP.8**

This Alternative Modification Proposal will not introduce the Compliance Repeat Plan, by not adding the new sections CP.8 and ECP.8 as proposed in the Original Proposal and leaving these sections as per the Baseline.

We believe the proposed introduction of the Compliance Repeat Plan is not required as there is already an annual week 24 process in the baseline.

### **Enhanced Fault Ride Through Studies new sections ECP.A.3.5.3-5 & CP.A.3.5.4-6**

This Alternative Modification Proposal will introduce the changes to introduce more Enhanced Fault Ride Through Studies, by adding the new section ECP.A.3.5.3,



ECP.A.3.5.4, ECP.A.3.5.5, CP.A.3.5.4, CP.A.3.5.5 & CP.A.3.5.6 as proposed in the Original Proposal. We believe that due to the increasing complexity of the system there needs to be more consideration of other events which could occur.

### **Provision of Torsional Data for Older Plant addition of new section PC.A.5.3.2**

This Alternative Modification Proposal will introduce a requirement for older plant to provide Torsional Data only if requested, by adding the new text to section PC.A.5.3.2. This is different to the Original Proposal which would mandate all older plants to submit the data whether it was required or not. We believe whilst this data can be needed for on-going system development and new installations, it can be very difficult and costly for existing users to obtain this data for older plants. Therefore, mandating all users to provide this data when it might only be required for certain plants in our opinion seems excessive. In our opinion, codifying the existing arrangements where plant only needs to provide the data when there is a need seems reasonable.

<b>Proposer's Assessment against Grid Code Objectives</b>	
<b>Relevant Objective</b>	<b>Identified impact</b>
(a) To permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity	<b>Positive</b> Additional modelling and sharing models are required to prevent plants interfering with each other and ensures better coordination between proposed developments.
(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);	<b>Positive</b> Ensuring all Users are required to supply the same model data and making it available gives equitable treatment to all parties.
(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;	<b>Positive</b> Additional modelling and sharing models are required to prevent plants interfering with each other and causing issues.
(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	<b>Neutral</b>

decisions of the European Commission and/or the Agency; and	
(e) To promote efficiency in the implementation and administration of the Grid Code arrangements	<b>Neutral</b>

### When will this change take place?

#### Implementation date:

In line with GC0141

#### Implementation approach:

### Acronyms, key terms and reference material

Acronym / key term	Meaning
BCA	Bilateral Connection Agreement - between a User and ESO
ECC	European Connection Conditions – part of Grid Code
PC	Planning Code – part of Grid Code
TO	Transmission Owner
NG ESO	National Grid Electricity System Operator

#### Reference material:

Ref 1 – Consultation on Technical Requirements for Windfarms The Authority's Minded To decision letter and Impact Assessment relating to the Scottish transmission licensees SA/2004 Report to the Authority

<https://www.ofgem.gov.uk/sites/default/files/docs/2005/01/9348-0805.pdf>

Ref 2 – Grid Code Modification H/04 & SA/2004 Response to OFGEM's consultations 07/05 & 08/05

<https://www.ofgem.gov.uk/sites/default/files/docs/2005/05/10873-14205b.pdf>

Ref 3 – Decision and direction in relation to consultations H/04, "Grid Code Changes to Incorporate New Generation Technologies and DC Inter-connector (Generic Provisions)" and SA/2004, "Consultation on Technical Requirements for Windfarms"

<https://www.ofgem.gov.uk/sites/default/files/docs/2005/05/10870-binder1.pdf>