MODIFICATION RECOMMENDATION FORM

RECOMMENDATION TO CER BY EIRGRID OF MODIFICATION TO GRID CODE.

ABSTRACT / TITLE OF MODIFICATION	**Fault Ride-Through (FRT) Recommended Modifications**
MODIFICATION NUMBER	**215**
RECOMMENDED AT GCRP MEETING NUMBER	**28**
LIST OF GRID CODE SECTION(S) AFFECTED BY PROPOSED MODIFICATION:	**CC.7.3 and Glossary**
CURRENT GRID CODE VERSION :	**3.5**

MODIFICATION DESCRIPTION Overview

SUMMARY DESCRIPTION OF:

a) THE REASON FOR THE RECOMMENDED MODIFICATION

b) HISTORY OF PROGRESSION THROUGH GCRPS, WORKING GROUP AND/OR CONSULTATION

c) SUMMARY NOTE OF ANY OBJECTIONS TO THE RECOMMENDED CHANGE FROM GCRP MEMBERS OR CONSULTATION RESPONSES

d) OUTCOME OF ANY GCRP MEETING ACTIONS RELATING TO THE RECOMMENDED MODIFICATION

The Reason for the Recommended Modification

Interactions between the TSO and a number of generators has highlighted that there may be a lack of clarity on the requirements the fault ride through capabilities in the Grid Code and/or the measures used to identify non-compliance. In addition the TSO has completed a significant series of studies to examine the impact of high penetration of windfarms on the operation of the power system and because of these issues and in light of the renewable policy targets the TSO suggested to the CER that a review of these standards would be timely.

History of Progression Through GCRPs, Working Group and/or Consultation

A cross industry FRT Working Group was set up to discuss these standards and the group met on a monthly basis from 16 June 2010. A Terms of Reference was developed by the group and approved by the GCRP #26. The Terms of Reference covered the scope of the group and their deliverables, as outlined below:

- Any changes to CC.7.3.1.1 with supporting documentation: history, technical justification, impacts;
- Principles document regarding assessment of Grid Code Compliance Pre and Post Commissioning;
- Information Provision: what data currently provided where and any additional information required by IPP at design stage;
- International Best Practice Report;
- EirGrid Paper on the apparent inconsistency in fault clearance times between the Grid Code and the Transmission Planning Criteria;

All deliverables were issued and presented at GCRP meeting #28, 8th June 2011. The following papers are also attached to the email for information:

- FRT Principles and Grid Code (Vers 1.3)
- FRT ToR (Approved by GCRP26) version 1.0
- FRT_Assessment of Grid Code Compliance (Vers 1.3)
- FRT_KEMA Report 16010829 FRT to EirGrid FINAL_24Nov2010
- FRT_Provision of Data - Position Paper_v1.3
- FRT_TPC Fault Ride Through Position Paper (Post to Working Group Meeting29112010) VerTS (2)
- FRT PowerPoint Presentation

Summary Note of any Objections to the Recommended Change from GCRP Members or Consultation Responses

The recommendations have unanimous support from the FRT Working Group and no objections or concerns were raised by the GCRP panel members.

Outcome of any GCRP Meeting Actions Relating to the Recommended Modification

No actions were raised.

Recommended Modifications to the Grid Code

The following is the proposed changes to the Grid Code as put forward by the FRT Working Group and recommended by the GCRP members. Proposed text is highlighted in blue and deleted text is highlighted in red strike-through. Please note that the Figure entitled Fault Ride-Through Envelopes is also a new addition to clause CC.7.3.1.1 of the Grid Code.

CC.7.3 Generators

CC.7.3.1 The conditions specified in this section of the code apply to all **Generation Units** connected to or connecting to the **Transmission System**. Unless explicitly stated all conditions specified apply over the full operating capabilities of the **Generation Unit** at the **Connection Point**.

For all **Generation Units** where **Secondary Fuel Registered Capacity** is different than **Primary Fuel Registered Capacity** all appropriate **Connection Conditions** must be met or agreed with the **TSO**.

CC.7.3.1.1 Each **Generation Unit,** shall, as a minimum, have the following capabilities:

(a) operate continuously at normal rated output at **Transmission System Frequencies** in the range 49.5Hz to 50.5Hz;

(b) remain synchronised to the **Transmission System** at **Transmission System Frequencies** within the range 47.5Hz to 52.0Hz for a duration of 60 minutes;

(c) remain synchronised to the **Transmission System** at **Transmission System Frequencies** within the range 47.0Hz to 47.5Hz for a duration of 20 seconds required each time the **Frequency** is below 47.5Hz;

(d) remain synchronised to the **Transmission System** during rate of change of **Transmission System Frequency** of values up to and including 0.5 Hz per second;

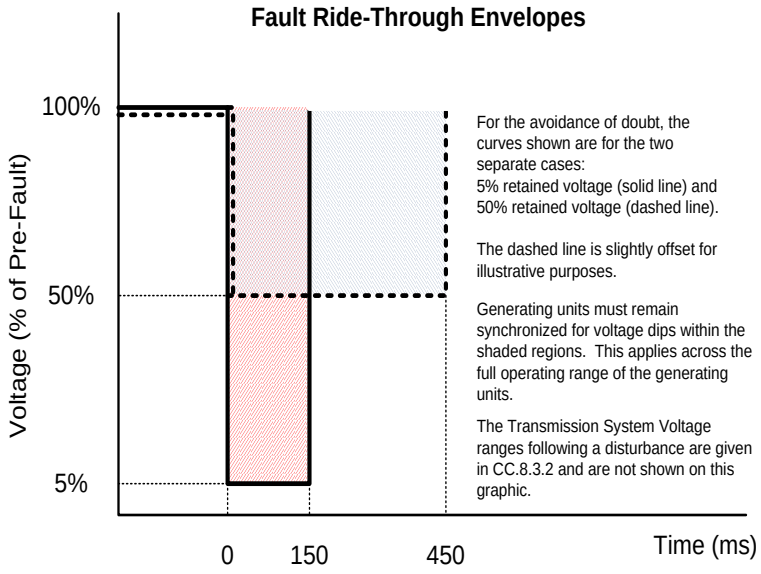
(e) sustained operation at the specified **Minimum Generation** within the range 49.8 to 51.0 Hz;

(f) remain synchronised to the **Transmission System** at normal rated output at **Transmission System Voltages** within the ranges specified in CC.8.3.2 for step changes in **Transmission System Voltage** of up to 10%.

(g) sustained operation in accordance with the **Reactive Power** capability as required by CC.7.3.6 at **Transmission System Voltages** within the ranges specified in CC.8.3.2, unless otherwise specified;

h) remain synchronised during and following any **Fault Disturbance** anywhere on the **Power System** which could result in **Voltage** dips at the **HV** terminals of the **Generator Transformer** of no greater than 95% of nominal **Voltage** (5% retained) for ~~duration 0.2 seconds~~ fault durations up to and including the **Fault Ride-Through Times** as defined in the table below and **Voltage** dips of no greater than 50% of nominal **Voltage** (i.e. 50% retained) for ~~duration of 0.6 seconds~~ fault durations up to and including the **Fault Ride-Through Times** as defined in the table below (see also **Fault Ride-Through** Envelopes below). Following the fault clearance the **Generation Unit** should return to prefault conditions subject to its normal **Governor Control System** and **Automatic Voltage Regulator** response~~;~~. The use of **Extraordinary Governor Response** and/or **Extraordinary AVR Response** to remain synchronised during and following a fault is prohibited unless specifically agreed with the **TSO**, such agreement not be unreasonably withheld.

VOLTAGE DIP MAGNITUDE	**Fault Ride-Through Times**		
	400 kV System	220 kV System	110 kV System
95% (5% retained)	150 ms	150 ms	150 ms
50% (50% retained)	450 ms	450 ms	450 ms



Fault Ride-Through Envelopes

(i) remain synchronised to the **Transmission System** during a negative phase sequence load unbalance in accordance with IEC 60034-1

(No other proposed amendments to CC.7.3.1.1, the remainder of CC.7.3.1.1 will remain the same.)

Glossary Definitions:

Fault Disturbance

Any type of fault including, but not limited to, single line to ground, line to line and three-phase short-circuits, in any single item of **Plant** anywhere in the **Transmission System** where the operation of the **TSO** protection will not disconnect the **Generator Plant** from the existing or planned **Transmission System** under normal or **Scheduled Outages** conditions. For the avoidance of doubt this **Fault Disturbance** can include bus zone protection.

Extraordinary Governor Response

Any response to a **Voltage Dip** that requires an extraordinary response from normal behaviour of the **Governor Control System** of a **Generation Unit.** For the avoidance of doubt any action other than **Governor Control System** with respect to **Frequency** dips is deemed to be an **Extraordinary Governor Response**. Where such schemes, including fast valving, are being considered by a **Generator** they need to be formally agreed with the **TSO** before implementation, such agreement not to be unreasonably withheld.

Extraordinary AVR Response

Any response to a **Voltage Dip** that requires an extraordinary response from normal behaviour of the **Automatic Voltage Regulator** of a **Generation Unit.** For the avoidance of doubt any action of an **Automatic Voltage Regulator,** which results in anything other than an adjustment of the excitation field current is deemed to be an **Extraordinary AVR Response**. Where such schemes, including fast valving, are being considered by a **Generator** they need to be formally agreed with the **TSO** before implementation, such agreement not to be unreasonably withheld.

Critical Fault Clearance Time

The longest fault duration not leading to out-of-step conditions such as pole-slipping in a **Generating Unit** following a **Fault Disturbance**. **Critical Fault Clearance Time** will vary according to the active and reactive power output of the **Generating Unit**. The minimum **Critical Fault Clearance Time** for a particular **Fault Disturbance** is likely to occur when the **Generating Unit** is at maximum **Active Power** output and maximum leading **Reactive Power** output.

	Fault Ride-Through The ability of a **Generating Unit** to stay **Synchronised** to the **Transmission System** during and following a **Fault Disturbance**. **Fault Ride-Through Time** The required fault duration that a **Generating Unit** shall ride through for a particular **Fault Disturbance**, and is equivalent to the **Critical Fault Clearance Time.**
IMPLICATION OF NOT IMPLEMENTING THE MODIFICATION	The continued possible misinterpretation of the FRT standards in the Grid Code. This could result in Generation Units with inadequate FRT capability connecting to the system and this in turn could lead to the Transmission System becoming unstable resulting in widespread unplanned outages. This is of critical importance for a system such as ours with targets to produce 40% of energy from renewable resources by 2020.