

Data Provision Position Paper

Fault Ride Through

Obligations of EirGrid as the Transmission System Operator (TSO) with Regard to the Provision of Information and the Adequacy and Timelines of the Information

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1 Background

Recent interactions between the TSO and a number of conventional Generators have highlighted that there may be a lack of clarity with regards to the level and type of information that should be exchanged between EirGrid and Generators to enable plant design in compliance with the Fault Ride Through (FRT) requirements of the Grid Code. A Working Group has been established to review the appropriate Grid Code requirements for FRT and the timely provision of sufficient information by EirGrid for Generators to comply with these requirements.

This position paper constitutes one of the deliverables of the Working Group:

- **Information Provision:** what data currently provided where and any additional information required by IPP at design stage

2 Discussion on Provision of Information

EirGrid has a statutory obligation to “provide all using and seeking to use the transmission system with the information they need, on a timely basis, for efficient access to the transmission system”. This obligation constitutes Condition 26 “Provision of Information” of the TSO Licence. In addition Section 38 of the Electricity Regulation Act, 1999, states that the TSO shall publish a Statement including forecasts of fault levels at each electricity transmission node. The obligation to publish a Forecast Statement is also included in the Grid Code, clause PC.4.1, “to enable prospective Users to assess for each of the seven succeeding years, the opportunities available for connecting to and using the Transmission System and to assess those parts of the Transmission System most suited to new connections and transport of further quantities of electricity”.

The issue discussed here is whether the provision of the Transmission Forecast Statement (TFS) constitutes the information needed by generators when assessing FRT compliance with the Grid Code.

2.1 What Data is required by the Prospective User to Design the Plant in Compliance with C.C.7.3.1.1.h?

Some Generators have expressed different views regarding the type of information and level of detail required for FRT assessment and plant design. Two options have been presented and discussed in the Working Group. The following subsections highlight those options and justify the preferred option.

2.1.1 Option 1: Full Dynamic Model of the Transmission Network

Confidentiality agreements with existing Transmission Users prevent EirGrid from releasing a full dynamic model of the Transmission Network.

Even if the confidentiality issues were resolved, Users should be aware of the following points related to the use of complex dynamic models:

- a) the full dynamic model of the transmission network includes dynamic details of all generators, control systems, FACTS and demand;
- b) the full dynamic model is based on one single software platform: PSS/E;
- c) this is a highly complex study. Certain dynamic models are prone to initialisation errors. High level of expertise in the models is required to produce meaningful results; and
- d) this approach requires a high level of knowledge of the planning and operation criteria of the Transmission Network. There is a risk that the User could base FRT studies and plant design on assumptions that do not reflect the actual conditions experienced or likely to be experienced in the Transmission Network.

2.1.2 Option 2: Minimum Fault Level at the Connection Point

Provision of Minimum Fault level at the connection point will enable the prospective User to derive a Thevenin Network Equivalent. The FRT compliance assessment is based on dynamic studies carried out with a simplified Transmission Network model comprising an infinite bus representation behind the Thevenin Network Equivalent impedance. This approach yields a simple study without requirements for in depth knowledge of third party specific dynamic models or operational practices/limitations in the Transmission Network. Furthermore, this methodology is not restricted to the use of PSS/E software. Any other software tool with dynamic simulation capabilities can be employed by the User.

2.1.3 Discussion on Adequacy of Each Option and EirGrid Preferred Option

EirGrid's experience indicates that FRT compliance assessments carried out with an infinite bus representation produce very similar results to the Full Dynamic Network Model. The level of discrepancy observed in these studies is considered to be immaterial for the purposes of Generator self-assessment of FRT compliance. For that reason, combined with the risks and difficulties associated with the use of a full dynamic model, EirGrid considers the simplified modelling approach to be adequate for the purposes of Generator self-assessment of FRT compliance. EirGrid acknowledges that the simplified model has limitations as it cannot capture inter-area oscillatory modes. However, it is EirGrid's sole responsibility to carry-out detailed dynamic studies, in accordance with the Transmission Planning Criteria, to ensure the integrity and stability of the transmission system as a "whole".

EirGrid's position is that the provision of minimum fault level at the connection point is sufficient information for the prospective User to assess FRT compliance in a simplified manner at the design stage of the facility.

2.2 Where/When can the Prospective User Access the Information Required to Design the Plant in Compliance with C.C.7.3.1.1.h?

Two options have been presented and discussed in the Working Group. The following subsections highlight those options and introduce EirGrid's proposed process for the provision of information related to FRT compliance.

2.2.1 Option 1: Transmission Forecast Statement

To allow generators to assess the implications of a specific connection point, EirGrid annually produces a TFS that enables prospective Users of the electricity network to avail themselves of grid information for each of the succeeding seven years. This publicly available document contains prospective fault current levels for maximum and minimum system demand conditions at existing and committed network nodes. The annual release of this document assures that the changing network configuration due to augmentations and reinforcements is adequately captured and available to prospective Users of the Transmission System.

2.2.2 Option 2: Minimum Fault Levels provided by EirGrid on a case-by-case basis

EirGrid will carry-out minimum fault level studies, upon request, for specific generator connections. These studies will be based on the most up-to-date information available at the time of issuance.

2.2.3 Discussion on Adequacy of Information Provided in Transmission Forecast Statement

The data included in each TFS comprises the best informed estimation at the time of data-freeze. This data includes both Transmission Network reinforcement projects and committed Customer Connections (i.e. generation and demand).

This data is used by EirGrid to calculate the prospective fault current levels for maximum and minimum system demand conditions at each existing and committed Transmission Node. It should be noted that, due to practical limitations, the TFS fault level calculations are based on a single generation dispatch scenario and intact network conditions. This simplification is deemed adequate for the purposes of the publication of TFS and also screening studies for prospective Users. However, detailed analysis of an individual generator connection including the specific shallow connection method and subjected to more severe, yet credible, generation dispatches and/or maintenance outage conditions may result in lower prospective minimum fault levels than those published in the most recent TFS.

Concerns have been expressed by various prospective Users with regards to the adequacy of the data published in the TFS for the purposes of FRT compliance assessment. The main concerns have been related to prospective new Connection Nodes, not included in the TFS, or variations in fault levels published in subsequent TFS as a result of evolving Transmission Network conditions.

EirGrid acknowledges the concerns raised regarding the information published in the TFS not being adequate in all cases for the purposes of designing the generation plant in accordance with clause C.C.7.3.1.1(h) as currently drafted. To address these concerns EirGrid proposes a new process for the provision of data as described in next section.

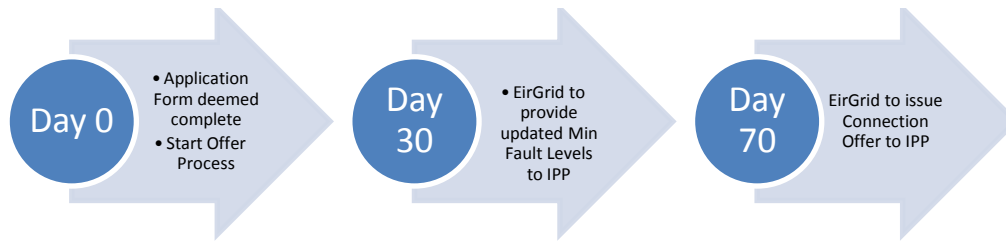
3 EirGrid proposed Process for the Provision of Sufficient Information to New Generators

1. Prospective Users consult the TFS for indicative values of maximum/minimum fault levels in the area they intend to connect to prior to submitting an application for connection to the Transmission Network. As the shallow connection method is unknown at this stage, minimum fault levels at various Transmission Nodes in the area will give the prospective User a high-level indication of the strength of the network in the area. This information is deemed adequate at this very early stage in the project as detailed design of the plant is unlikely to commence until an application for connection has been submitted to the TSO. Prospective Users may carry-out screening studies to investigate FRT compliance based on minimum fault levels published in the latest TFS.
2. As part of the Connection Offer Process, EirGrid will carry-out detailed minimum fault level studies for the proposed facility. These studies will be based on an onerous, yet credible, generation dispatch that minimises synchronous generation infeed in the area of study. Analysis will be based on intact and single circuit maintenance outage conditions followed by the trip of another single circuit, with generation dispatches and network topology being in compliance with the Transmission Planning Criteria.
3. EirGrid will provide updated Minimum Fault Level values to the prospective User at the Connection Method Meeting¹ (normally c. 40 business days before issuance of Connection Offer). The information provided will comprise:
 - Pre-fault voltage at the Connection Point [in kV].
 - Pre-disturbance and post-disturbance² minimum 3-phase fault level [in kA] infeed of the Transmission Network at the Connection Point.
 - X/R ratio of the Transmission Network seen at the Connection Point corresponding to the minimum 3-phase fault level infeeds (pre and post disturbance) given above.

EirGrid will be open to discuss assumptions (i.e. generation dispatch, contingencies, network topology, etc) made for the calculations of minimum fault levels upon request.

¹ EirGrid cannot guarantee that fault levels will not drop below the minimum level provided to the prospective User.

² The post-disturbance minimum fault level includes the effect of tripping the faulted circuit.



Note: Other prospective Users seeking detailed minimum fault levels, over and above the level of detail provided in the latest TFS, prior to submitting an application for connection to the Transmission Network can always approach EirGrid and request a study to be carried out. EirGrid will advise on the need for that study based on updated knowledge of new projects or committed connections in the area. If appropriate, EirGrid will agree a Scope of Work with the prospective User for the requested detailed minimum fault level studies (i.e. nodes to be analysed, year of connection, etc). EirGrid will charge a nominal fee for these studies to cover internal costs.

4 EirGrid proposed Process for the Provision of Sufficient Information to Existing Generators

Existing generators planning to carry out any modification³ to their generating facility are obliged, under the terms of their connection agreement⁴, to submit an application form to the TSO.

If required, EirGrid will carry out detailed minimum fault level analysis, as described in section 3. This information would typically be provided to the generator around day 30 of the Connection Offer Process.

5 Summary

- EirGrid believes that, in the context of self-assessing generator capability to ride through voltage dips as defined in C.C.7.3.1 (h), the provision of Minimum Fault Levels is sufficient information.
- EirGrid advises prospective Users to consult the most recent Transmission Forecast Statement for indicative values of maximum/minimum fault levels in the area they intend to connect prior to submitting an application for connection to the Transmission Network. Prospective Users may carry-out screening studies to investigate FRT compliance based on the information included in the TFS.

³ Modification is defined as any replacement, renovation, modification, alteration or construction in respect of the Facility (including to its manner of operation).

⁴ Clause 21 of the General Conditions of Connection & Transmission Use Of System refers.

- EirGrid proposes to provide updated Minimum Fault Levels to prospective Users at the Connection Method Meeting – normally c. 40 business days before issuing a Connection Offer.
- EirGrid proposes to provide updated Minimum Fault Levels to existing Users planning to carry out modifications or refurbishment works resulting on a material change of the plant technical parameters or performance. This information will typically be provided in day 30 of the Connection Offer Process.
- EirGrid can carry-out specific minimum fault-level studies for prospective Users prior to submission of application for connection and payment of the relevant application fees. The scope of those studies will be agreed with the Customer and a nominal fee will be charged.
- It is the User's responsibility to carry out the required studies and design the plant to comply with C.C.7.3.1.1(h). Furthermore, if a User finds that it is, or will be, unable to comply with this requirement (or any other provision of the Grid Code), then it shall without delay report such non-compliance to the TSO and shall, subject to the provisions of GC.9.2 make such reasonable efforts as are required to remedy such non-compliance as soon as reasonably practicable [GC.9.1].