

Approach to Developing Technical Requirements for New Generation Technologies in the Grid Code

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Introduction

This paper sets out the approach taken to the development of technical requirements for new generation technologies within the Grid Code.

The majority of these requirements were put in place following the Grid Code consultation H/04 (Grid Code changes to Incorporate New Generation Technologies and DC Inter-connectors (Generic Provisions)). Detailed aspects of these requirements are the subject of regular discussion at the GCRP.

At the September 2010 Panel meeting, some panel members expressed a wish to elevate these debates to question the overall approach taken to new generation technologies within the Grid Code. This paper provides information on the approach taken to date with reference to the requirements implemented by Amendment H/04.

Background

National Grid has a Licence obligation (C14) to have a Grid Code in place which is designed to promote, amongst other things, the security and efficiency of the electricity generation, transmission and distribution systems in Great Britain and Offshore.

In 2003, National Grid presented proposals for "Grid Code changes to Incorporate New Generation Technologies and DC Inter-connectors (Generic Provisions)" in the Grid Code consultation D/03. These covered subject areas also raised by the Scottish Transmission Licensees in the "Proposed Amendments for Windfarms" (SB/2002) relating to the Scottish Grid Code.

The two sets of proposals were developed because the original drafting of the England and Wales and Scottish Grid Codes made the implicit assumption that all generators connecting to the transmission system would be synchronous plant and there was a need to recognise the particular characteristics of the non-synchronous plant which was then seeking to connect to the transmission system at an increasing rate.

A sequence of consultations were undertaken, culminating in the industry's proposals as set out in H/04 for changes to the single GB Grid Code (as put in place at BETTA go-live).

The proposals were implemented in 2005 following review by Ofgem's consultants, completion of Ofgem's Impact Assessment and the addition of supplementary changes. The areas covered are summarised in Table 1 below.

Requirement	Description
Fault Ride Through	The ability of a generating unit to return to normal operation following clearance of a fault on the transmission system

Requirement	Description
Frequency Range	The ability of a generating unit to be able to deliver power and remain connected to the network when the system frequency deviates from 50Hz
Frequency Control	The ability of a generating unit to be able to increase or decrease power output with falling or rising frequency
Reactive Range and Voltage Control	The ability of a generating unit to supply leading/lagging reactive power and control the voltage at the grid connection point
Negative Phase Sequence and	The ability of a generating unit to withstand negative phase sequence currents

Assessment

The provisions implemented under H/04 were assessed at the time to have to the following benefits:

- Increasing the amount of renewable generation that could be connected to the transmission system whilst maintaining security of supply for electricity consumers;
- Clarity and transparency of requirements reducing uncertainty for manufacturers and developers;
- Removing the need for a case by case assessment of new wind generation; and
- Avoiding discrimination between different classes of generators.

The proposals were acknowledged to increase the cost of wind turbines designed for connection to the transmission system. It was also acknowledged that some suppliers might not be able to produce fully compliant machines. However, the benefits of a more secure transmission system and the ability to allow higher penetrations of wind generation were judged to outweigh this.

Overall, the cost of implementing the provisions was assessed in 2005 to be between £6 to £24/kW, with the cost of not implementing the provisions estimated at £48/kW.

Large parts of the Transmission System would be sterilised if the technical requirements could not be met. This is particularly the case for Fault Ride Through capability. If generators could not provide this capability, the amount of generation connecting and operating within any geographical area would be limited by virtue of the loss of generation triggered by a secured event on the transmission system. This would mean that less renewable generation could connect and generate than is currently the case.

To-date, these provisions have facilitated the connection of 4.9GW of renewable generation. There is currently over 30GW of renewable generation contracted to connect to the Transmission System by 2020 which if constructed is sufficient to meet Government targets for renewable energy and emissions reductions¹.

As highlighted above, this volume of connections to the transmission system would not be feasible in the absence of the current Grid Code requirements.

¹ compared to National Grid's 'Gone Green' scenario, which is designed to be consistent with targets across all energy sectors