**GCRP 02/21**
**5 September 2002**

**THE NATIONAL GRID COMPANY plc**

**GRID CODE REVIEW PANEL**

# GRID CODE PROVISIONS FOR 'GENERIC' CONNECTIONS INCLUDING RENEWABLE GENERATION

## 1. Introduction

1.1. This paper proposes the inclusion of requirements in the Grid Code of generic provisions relating to the connection to the NGC Transmission System of all anticipated generation systems or interconnectors (not including traction load etc.), including renewable generation. Government policy and increased commercial interest in renewable generation have in particular prompted these proposals across the UK. The paper outlines the areas considered for inclusion and the establishment of a team to develop resulting changes that would need to be included in the Grid Code.

## 2. Background

2.1. It is possible that over the next few years, connections to the NGC Transmission System of new generation systems or interconnectors could take a variety of different forms due to various technology developments, in particular those associated with renewable generation. There is a need for the inclusion of new integrated provisions in the Grid Code to accommodate commercial development of these technology developments for the following reasons :

i) to allow transparency of technical conditions, and for manufacturers or potential developers to have technical design guidelines. A clear set of basic technical requirements stated in the Grid Code will allow a readily available basis on which to develop tenders and gauge project costs. It is anticipated that detailed technical requirements would form part of site-specific bilateral agreements

ii) to anticipate the requirement for the above such that Grid Code provisions are in place when they are needed

iii) to prevent the requirement for modification of the Grid Code each time a new or variation of technology is employed

iv) to ensure the Grid Code does not become overly complex and of an unmanageable size

2.2. In particular for renewable generating units, currently there are no specific connection provisions within the Grid Code. However, CC.6.3.1 does refer to an exemption for small, hydro and renewable units not designed for frequency or voltage control. It is considered that the wording of CC.6.3.1 is confusing and this would be addressed in the revised provisions.

## 3. Main Technology Development Areas

3.1 Some of the areas for which technology developments could be anticipated and included for in the Grid Code are described briefly below.

Wind "Farms"

3.2 Large-scale wind farms up to 1GW based on induction generator technology are under consideration for connection across the UK. Economically, "farms" of the order of 100MW and above are likely to connect to the transmission network and therefore need to have a consistent level of specification across the UK. Discussion has occurred with other UK transmission operators as regards inclusions and a draft set of conditions has been produced for connections in Scotland. European network operators have also produced conditions that include additional issues (e.g. fault level contributions, fault ride-through capability etc.).

3.3 Generic provisions need to be included to cover the connection of wind farms to allow correct system design and operation for all users without undue restrictions on the developing technology employed. This would include connections via AC/DC converter/generator combinations.

Other Renewable Technology

3.4 Most of the emerging technologies for other sources of renewable energy are at output levels well below the 100MW output described above for wind farms. Such technologies include biomass, tidal, wave, photovoltaic, geothermal etc. Any large future installations might be combined with an energy storage device, associated electronic converter and/or conventional synchronous generating unit.

Hydro Generation

3.5 These units are of a conventional synchronous generator design although usually a slow-speed type. However, geographically, there is little potential in England and Wales for additional large installations.

Chemical Storage Systems

3.6 These include fuel cell technology and might be combined with intermittent renewable energy sources (such as wave and tidal) or be connected in their own right. They employ DC/AC converter technology to connect to an electrical network.

HVDC

3.7 Voltage-source converter (VSC) technology has already developed such that units of several hundred MW are now achievable. Connections to the NGC transmission system of this type of equipment have already been considered and there is a high probability of this type of equipment being actively considered in the near future.

3.8 A GCRP HVDC Interconnectors Working Group is already established and will shortly be reporting on draft proposals. This is only for ‘conventional’ (current-source converter) equipment such as Cross-Channel. Since the

provisions for this equipment would be included in the proposed generic provisions, a GCRP decision as to whether this Group would complete its work is required. One possible approach would be to take advantage of the work already carried out by this group making use of the proposed draft proposals, but not to go for consultation to modify the Grid Code.

## 4. Conclusion

**4.1.** It is considered necessary to develop a set of generic Grid Code provisions for new generation systems or interconnectors given the anticipated potential expansion of technology developments. A generic set of provisions would allow the Grid Code to be developed in an ordered, manageable way rather than as a collection of ill-timed piece-meal additions.

## 5. The Next Steps

5.1. It is proposed that the change areas identified be developed in conjunction with interested Grid Code Panel members. This could take place by the establishment of a Working Group (chaired by National Grid) by the end of September 2002 (Draft Terms of reference attached) of interested parties to allow provisions to be submitted for consultation to the May 2003 GCRP. It is suggested that the other electricity transmission and distribution companies (Scottish Power, Northern Ireland Electricity and Scottish and Southern Energy) in the UK are copied into the final proposals. This will allow operators in the other UK geographic areas to pursue a consistent approach for regulatory purposes.

## 6. Working Group Nominations

6.1. The Grid Code Review Panel is asked to nominate representatives to contribute to the proposed Working Group. The first Working Group meeting could be held in mid-October 2002, provided nominations are submitted to the Panel secretary by the 20th September 2002.

## 7. Recommendation

7.1. The Grid Code Review Panel is invited to agree the proposed way forward.

**Grid Code Review Panel - Generic Provisions Working Group (GPWG)**

**TERMS OF REFERENCE**

## 1. Objectives

The following two basic objectives have been identified as a viable starting point. However, subsequent investigations may lead to these being modified depending on outcomes :

- Develop generic provisions to include for all anticipated generation systems and interconnector technology developments where a 'constant' source or sink of energy is normally available. This will consider embedded and direct transmission system connection together with the technical interaction and operational co-ordination issues.

- As above, but develop generic provisions to include for all anticipated generation systems and interconnector technology developments where an 'intermittent' source or sink of energy is normally available.

## 2. Membership and Reporting

The group **GPWG** will comprise: -

Chairman (National Grid )
Secretary (National Grid)

A N Others – GCRP Representatives

The Chairman of the group will report to the **GCRP** on the work progress.

## 3. Deliverables

The group will produce: -

Grid Code change proposals as part of a report that covers the objectives of the Working Group and how these were met.

## 4. Timescales

A kick –off meeting is planned for mid-October 2002 at National Grid House.

A brief progress report would be produced for the 6th February 2003 GCRP meeting.

A final report and Grid Code change proposals would be produced for the 22nd May 2003 GCRP meeting.