CONNECTION CONDITIONS

CC1. INTRODUCTION

CC1.1 (a) The **Connection Conditions** specify the technical, design and certain operational criteria which must be complied with by **Users** **whose Plant and Apparatus is** connected to, or **who are** seeking **a** connection to**,** the **NIE System**.

(b) They also set out the procedures by which **NIE** shall seek to ensure compliance with these criteria as a pre requisite to granting approval for the connection of a **User** ~~to the **NIE System**.~~ **'s Plant and Apparatus.**

(c) **Users** are defined for the purpose of these **Connection Conditions** in **CC3**.

CC1.2 Procedures by which **NIE** and **Users** may conclude a **Connection Agreement** are reflected in the **Planning Code**. Each **Connection Agreement** shall require **Users** to comply with the terms of the **Grid Code** and **NIE** will not grant approval to connect the **User's** installation to the **NIE System** unless and until it is satisfied that the criteria laid down by the **Connection Conditions** have, subject to any derogations issued by the **Director**, been met.

CC1.3 The provisions of the **Connection Conditions** shall apply to all connections to the **NIE System**:-

(a) existing at the date of commencement of the **NIE Licences**; and

(b) established or modified thereafter.

CC1.4 The Connection Conditions are structured such that certain provisions are dealt with in the Schedules to these Connection Conditions, with separate schedules for different types of Plant.

CC2. OBJECTIVES

CC2.1 The **Connection Conditions** are designed to ensure that:-

(a) no new or modified connection will impose unacceptable effects on the **NIE System** or on any **User System** nor will it be subject itself to unacceptable effects by its connection to the **NIE System**; and

(b) the basic rules for connection treat all **Users** of an equivalent category in a non-discriminatory fashion, in accordance with **NIE's** statutory and **Licence** obligations.

CC3. SCOPE

CC3.1 The **Connection Conditions** apply to **NIE** and to **Users** which, in the **Connection Conditions**, means:-

(a) **Generators**; and

(b) ~~(b)~~ **Non-Tariff Customers**.

CC3.2 Persons whose prospective activities would place them in any of the above categories of **User** will, either pursuant to a **Licence** or as a result of the application procedures for a **Connection Agreement**, become bound by the **CC** prior to their generating or consuming, as the case may be, and references to the various categories (or to the general category) of **User** should, therefore, be taken as referring to them in that prospective role as well as to **Users** actually connected.

CC4. CONNECTION PRINCIPLES

CC4.1 The design of connections between the **NIE System** and **Users' Systems** shall be in accordance with the **Licence Standards**.

CC4.2 **NIE** will determine the point, including the voltage, at which each **User** may be connected to the **NIE System**.

CC4.3 The **User's Plant** and **Apparatus** shall comply with the principles outlined in Regulation 28 of the Electricity Supply Regulations (N.I.) 1991 and Regulations 4-12 and 15 of the Electricity at Work Regulations (N.I.) 1991 or any amendments to or re-statements of those provisions.

CC5. SUPPLY STANDARDS

CC5.1 The **Frequency**, voltage and harmonic design criteria of the **NIE System** are set out in **CC5.3** to **CC5.5**.

CC5.2 Each **User** shall ensure that its **Plant** and **Apparatus** at **Connection Points** is capable of operating under any variation in the **System Frequency** and voltage as set out in **CC5.3** to **CC5.5**.

CC5.3 **Frequency** Variations

CC5.3.1 The **Frequency** of the **NIE System** shall be nominally 50 Hz and shall normally be controlled within the limits of 49.5 **Hz to** 50.5 Hz and in accordance with the Electricity Supply Regulations (N.I.) 1991.

CC5.3.2 In exceptional circumstances, **System Frequency** could rise to 52 Hz or fall to 47 Hz but sustained operation outside the range specified in the Electricity Supply Regulations (N.I.) 1991 is not envisaged. **Users** should take these factors into account in the design of **Plant** and **Apparatus**.

CC5.4 Voltage Variations

CC5.4.1 The voltage variation on the **NIE Transmission System** shall comply with the Electricity Supply Regulations (N.I.) 1991, that is, will normally remain within the limits ± 10% of the nominal value or as otherwise agreed.

CC5.4.2 The voltage variation to **Customers** connected to the **NIE Distribution System** shall comply with the Electricity Supply Regulations (N.I.) 1991, that is, will normally remain within ± 6% of the nominal value or as otherwise agreed.

CC5.4.3 The design criteria in respect of voltage fluctuations and unbalance shall be in accordance with the **Licence Standards**.

CC5.4.4 Under fault and circuit switching conditions the rated **Frequency** component of voltage may fall or rise transiently. The fall and rise in voltage will be affected by the method of earthing of the respective system voltage neutral point.

CC5.4.5 Each connection to the **NIE System** must not adversely affect the method of voltage control employed by **NIE**. Information on the voltage regulation and control arrangements will be made available by **NIE** on request by the **User**.

CC5.5 Harmonic Content

The design criteria in respect of harmonic distortion shall be in accordance with the **Licence Standards**.

CC5.6 Phase Unbalance

The design criteria in respect of phase unbalance shall be in accordance with the **Licence Standards**.

CC6. TECHNICAL CRITERIA:-
~~**PLANT AND APPARATUS AT THE CONNECTION POINT**~~

CC6.1 **Plant and Apparatus at the Connection Point**

At the **Connection Point**, all **Users' Plant** and **Apparatus** shall meet the following technical design and operational criteria. Detailed information relating to a particular connection will, where indicated below, be made available by **NIE** on request by the **User**.

CC6.2 **Plant** and **Apparatus**

CC6.2.1 (a) Subject as provided in (b) below, the principles of design, manufacture, installation and testing of overhead lines, underground cables and other **Plant** and **Apparatus** of **NIE** and **Users** designed after the date of commencement of the **NIE Licences** shall conform to (and such equipment shall comply with) all applicable statutory obligations and the applicable requirements of the following standards, each as current at the date of design of such **Plant** and **Apparatus**, which shall apply (to the extent of any inconsistency) in the following order of precedence:-

(i) relevant European Technical and Quality Assurance Standards or European Specification;

(ii) relevant IEC Publications or other international standards; and

(iii) relevant British Standards or other equivalent national standard.

(b) In the case of **Plant** or **Apparatus**:-

(i) designed prior to the date of commencement of the **NIE Licences** and in use or awaiting re-use at such date (or about to be used at such date); and

(ii) designed after the date of commencement of the **NIE Licences** and subsequently re-used;

the applicable standards under (a) above shall be those which were current at the date when the **Plant** or **Apparatus** was originally designed, provided that **NIE** reasonably considers the **Plant** and/or **Apparatus** to be fit for its purpose having full regard to the respective obligations of **NIE** and the relevant **User**, and otherwise shall be those current at the date of re-use.

CC6.2.2 The short circuit rating and insulation level of a **User~~'~~'s Plant** and **Apparatus** at the relevant **Connection Point** shall not be less than that specified in the relevant **Connection Agreement**.

CC6.2.3 Each of **NIE** and a **User** shall ensure that the specification of their respective **Plant** and **Apparatus** at the **Connection Point** shall be such as to permit operation within the applicable **Local Safety Instructions**.

CC6.3 Metering

CC6.3.1 The requirements to be met by each **User** in respect of metering equipment are set out in the **Metering Code**.

CC6.4 **Protection**

CC6.4.1 All **User Systems** and the **NIE System** must incorporate **Protection** in accordance with the requirements of the Electricity Supply Regulations (N.I.) 1991 as amended or re-stated.

CC6.4.2 The basic requirement in all cases is that **Users~~'~~'** arrangements for **Protection** at the **Connection Point**, including types of equipment and **Protection** settings must be compatible with standard practices on the **NIE System** from time to time, whilst maintaining necessary discrimination and coordination. Relevant details of the application of these requirements to a particular connection will be made available to the **User** upon request pursuant to **CC6.1**.

In particular:-

(a) maximum fault clearance times (from fault inception to arc extinction) must be within the limits established by **NIE** in accordance with the **Protection** and equipment short circuit rating policy adopted by **NIE** from time to time for the **NIE System**;

(b) auto reclosing or sequential switching features may be in use on the **NIE System**. **NIE** will on request provide details of the auto-reclose or sequential switching features;

(c) the **Protection** arrangements on some parts of the **NIE System** may cause disconnection of, or low voltages on, one or more phases only of a three phase supply for certain types of fault. **Users** should make provision to safeguard their equipment from the effects of such events; and

(d) in the case of a three phase and neutral supply system, a fault disconnecting the neutral can lead to higher than normal voltage appearing on one or more phases.

CC6.4.3 During the course of an application for a **Connection Agreement NIE** shall specify the **Protection** standards applicable to the **NIE System** and agree with the **User** (or, in the event that agreement cannot be reached, **NIE** will determine acting reasonably) any conditions for compatibility with the **NIE Protection** arrangements which shall be complied with by the **User**.

In particular:-

(a) in order to ensure satisfactory operation of the **NIE System, Protection** systems, operating times, discrimination and sensitivity at the **Connection Point** shall be agreed between **NIE** and the **User** (or, in the event that agreement cannot be reached, shall be determined by **NIE**) and may be reviewed from time to time by **NIE**. If, as a consequence of such review, **NIE** identifies a requirement for some variation to such **Protection** arrangements, the relevant provisions of the **Connection Agreement** shall apply;

(b) in order to cover a circuit breaker or equipment having a similar function failing to operate correctly to interrupt fault current on a **High Voltage System**, back-up **Protection** by operation of other circuit breakers or equipment having a similar function must normally be provided by the **User**. **NIE** will inform the **User** if it is not required. If the back-up circuit breaker is owned by **NIE**, it may be equipped with **Protection** that is limited to that required to provide excess energy **Protection** to the **NIE System**; and

(c) unless **NIE** specifies otherwise, it is not acceptable for **Users** to limit the fault current infeed to the **NIE System** by the use of **Protection** and associated equipment if the failure of the **Protection** and associated equipment to operate as intended in the occurrence of a fault could cause equipment owned by **NIE** to operate outside its short-circuit rating.

Certain provisions on working on certain **Protection** equipment are included in **CC9**.

CC6.5 **Intertripping**

In all circumstances where the isolation of faults or **System** abnormalities is dependent upon the operation of both **NIE's** and the **User's** circuit breakers, **Intertripping** facilities shall be provided. These **Intertripping** facilities shall be in accordance with the requirements of the relevant **Connection Agreement**.

CC6.6 Automatic Reclosure

Where automatic reclosure of **NIE** circuit breakers is required following faults on the **User's System**, automatic switching equipment shall be provided in accordance with the requirements of the relevant **Connection Agreement**.

CC6.7 Voltage Fluctuations and Unbalance and Harmonic Distortion

The design criteria to be applied to **Users'' Loads** connected to the **NIE System** to limit voltage fluctuations and unbalance and harmonic distortion will be notified to the **User** in the course of an application for connection to the **NIE System** and will be in accordance with the **Licence Standards**. In the event that a **User** causes any such limits to be breached, **NIE** shall be entitled to require the **User** to take such steps as **NIE** reasonably considers to be necessary in order to prevent such breach from continuing and the **User** shall comply with **NIE's** instructions without delay.

CC6.8 Neutral Earthing

CC6.8.1 The specification of a **User's Apparatus** shall meet the voltages which will be imposed on the **Apparatus** as a result of the method of earthing of the **NIE System** as specified in the relevant **Connection Agreement**.

CC6.8.2 The higher voltage windings of each transformer of a **User** connected to the **NIE Transmission System** shall be star connected with the star point earthed. If the earth electrode system to which the **User's** star point is earthed is not independent from the earth electrode system of any substation owned or operated by **NIE**, it shall be connected to the earth electrode system of that substation.

The higher voltage windings of each transformer of a User connected to the NIE Distribution System shall have no earth connection during any period while it is so connected to the NIE Distribution System.

CC6.8.3 The earthing of a **User's Apparatus** at the **Connection Point** must be in accordance with current **NIE** practice which will be notified to the **User**, initially, during the course of an application for connection to the **NIE System**. In the event that **NIE** wishes to change its current practice, it will notify the **User** as soon as reasonably practicable in advance of the change and any modifications which such change will require to be undertaken on the **User's System** will be implemented in accordance with the modifications procedure set down in the **User's Connection Agreement**, if it is applicable.

CC6.8.4 **Users** shall take all reasonable precautions in relation to a particular **Connection Point** to limit the occurrence and effects of circulatory currents in respect of neutral points of any interconnected **System** (e.g. where there is more than one source of energy).

CC6.9 **Automatic Load Shedding Devices**

A **User** may be required by the **Connection Agreement** to be subject to arrangements for **Automatic Load Shedding** at selected **Connection Points**. One of the purposes of these facilities is to improve the overall security of supply by providing some measure of **Demand** relief to assist in preventing **Total System** collapse under emergency conditions involving low **System Frequency**. **OC4** contains a section dealing with **Automatic Load Shedding**. The setting levels and demand block sizes for the relevant supply points shall be determined by **NIE** and specified in the relevant **Connection Agreement**. Technical requirements relating to **Low Frequency Relays** are given in Appendix 3.

CC6.10 Superimposed Signals

Where a **User** proposes to use mains borne signalling equipment to superimpose signals on the **NIE System**, the prior written agreement of **NIE** is required (which agreement will not be unreasonably withheld).

CC7. TECHNICAL CRITERIA:-

~~**GENERATING UNITS**~~

~~CC7.1 (a) At the **Connection Point** all **Generating Units** with an output in excess of **5MW** shall, in addition to the requirements of **CC6**, meet the following technical design and operational criteria. **CC7** contains more detailed requirements for **Generating Units** than those set out in **CC6** and is intended to be complementary to **CC6.** However, in the event of any conflict between the requirements of **CC6** and the requirements of **CC7**, the provisions of **CC7** shall prevail. Detailed information relating to a particular connection will, where indicated below, be made available by **NIE** on request by the **Generator**.~~

~~(b) **Generating Units** with an output not exceeding 5 **MW** connected to the **NIE System** at or below 20kV shall, as a minimum requirement, and in addition to the requirements of **CC6**, comply with the requirements of Engineering Recommendation G59 (NI), "Recommendations for the Connection of Private Generating Plant to Northern Ireland Electricity's Distribution Systems" and with all other relevant Engineering Recommendations and relevant regulations and the particular requirements of **NIE** which will take account of the conditions prevailing on the **NIE System** at the point of connection at the relevant time. **NIE** will notify its particular requirements to the **Generator** during the course of the **Generator's** application for connection to the **NIE System**.~~

~~CC7.2 **Generating Unit** Connections~~

~~Each connection between a **Generating Unit** and the **NIE System** unless specified otherwise in the **Connection Agreement** must be controlled by a circuit breaker~~

capable of interrupting the maximum short circuit current at the point of connection. The short circuit current design values at a **Connection Point** will be set out in the **Connection Agreement.**

CC7.3 **Generating Plant** Performance Requirements

CC7.3.1 For **Generating Units** not subject to **Central Despatch** the electrical parameters required to be achieved at the **Generator Terminals** shall be specified by **NIE** in the **Connection Agreement** or in a **Request for Proposal**, as the case may be.

CC7.3.2 For **CDGUs** and for **CD CCGT Installations** (in relation to the **CCGT Modules** therein) the electrical parameters required are:

(i) rated power factor (lagging) = 0.8;

(ii) rated power factor (leading) = 0.95; and

(iii) short circuit ratio not less than 0.5.

CC7.3.3 For **CDGUs** and **CD CCGT Installations** the **Generator** and **Generator Transformer** impedances will be specified in the **Connection Agreement**. **NIE's** requirements for the impedances will reflect the needs of the **NIE System** from the fault level and stability points of view.

CC7.3.4 A **Generating Unit** must be capable of continuously supplying its **Registered Capacity** at a stable output within the **System Frequency** range 49.5 to 50.5 Hz. Within the **Frequency** range 49.5 to 50.5Hz there must be no reduction in output whilst **Frequency** is falling. Any decrease of output power to a level below **Registered Capacity** occurring in the **Frequency** range 49.5 to 47 Hz must not be more than pro rata with any decrease below nominal **Frequency**.

CC7.3.5 The output power should not be affected by voltage changes in the normal operating range specified in **CC5.4.**

CC7.3.6 A **Generating Unit** must be capable of remaining synchronised to the **NIE System** at an output which is no greater than the lower of 80MW or 40% of maximum continuous rating.

CC7.3.7 Start-up and Ramp Rates

(a) A **Generating Unit** must be capable of start-up:-

(i) from cold within 14 hours
(ii) from warm within 5 hours
(iii) from hot within 3 hours

The block load on synchronising must be no greater than 40MW.

(b) A **Generating Unit** which is in a hot condition must be capable of ramping up from part-load pursuant to a **Despatch** instruction at a rate of at least 3% of MCR per minute.

(c) A **Generating Unit** must be capable of de-loading at a rate of at least 3% of MCR per minute.

CC7.4 **Black Start** Capability

(a) The **NIE System** as at the **Transfer Date** is equipped with a **Black Start** capability (to be utilised in accordance with **OC7**) achieved by incorporating such a capability at a number of strategically located **Power Stations**.

(b) Each **Connection Agreement** relating to a **Power Station** containing **CDGUs** or **CD-CCGT Installations** will reflect whether any of such **CDGUs** or **CD-CCGT Installations** has a restart capability without connection to an external power supply (ie. power which has not been generated at the **Power Station**). Such **Generating Plant** will be specified as a **Black Start Station** in the **Connection Agreement**.

(c) In order to ensure that the **NIE System** continues to have a **Black Start** capability, **NIE** will require, as a condition of an offer of connection or as a term of the **Request for Proposal**, certain new **Generating Plants** to be **Black Start Stations** and **Users** must, in relation to such new **Generating Plant**, ensure that it has a **Black Start** capability.

CC7.5 **Generating Unit** Control Arrangements

CC7.5.1 Each **Generating Unit** must be capable, in accordance with **CC7.5.2** and **CC7.5.3**, of contributing appropriately, as reasonably specified by **NIE**, to **Frequency** and voltage control by continuous modulation of **Active** and **Reactive Power** supplied to the **NIE System**.

CC7.5.2 Each **Generating Unit** with a **Registered Capacity** of greater than 5 **MW** must be fitted with a fast acting proportional turbine speed governor to provide **Frequency** control under normal operational conditions as specified by **NIE** in the relevant **Connection Agreement**. Where a **Generating Unit** or **Power Station** becomes isolated from the rest of the **Total System** but is still supplying **Customers**, the speed governor must also be able to contribute to controlling **NIE System Frequency** to below 52Hz. As stated in **CC5.3.2**, the **NIE System Frequency** could rise to 52 Hz or fall to 47 Hz. For steam turbine **Generating Units** the governor must be designed and operated to the relevant requirements of BS132. For gas turbine **Generating Units** the governor must be capable of operating with a nominal droop characteristic of 4%.

CC7.5.3 **NIE** may specify in the relevant **Connection Agreement** that a continuously acting fast response automatic excitation control system is required to control the generator voltage without instability over the entire operating range of the **Generating Unit** or **Power Station**. This will be dependent on the size and type of **Generating Unit** or **Power Station** and the part of the **NIE System** to which it is connected.

~~CC7.5.4 **NIE** may specify the requirement for tap changing facilities on the **Generator Transformers** for all **Generating Units**. The tapping range and the step sizes will then be specified in the respective **Connection Agreements**.~~

~~CC7.5.5 **NIE** may specify in the relevant **Connection Agreement** that a **Generating Unit** must be fitted with a **Unit Load Controller**. Where so specified, the **Generator** must ensure that the **Unit Load Controller** is in operation at all times and in accordance with the settings for **Frequency** trigger and reset point, time delay and droop as specified in the relevant **Connection Agreement** or such other settings as **NIE** may notify to the **Generator** in writing on not less than two **Business Days'** notice, unless directed otherwise by **NIE**.~~

~~CC7.6 Coordination with Existing **Protection**~~

~~CC7.6.1 Each **Generator** must meet, in relation to each of its **Generating Units**, the target clearance times for fault current interchange with the **NIE System** in order to reduce to a minimum the impact on the **NIE System** of faults on circuits owned by **Generators**. The target clearance times are measured from fault current inception to arc extinction and will be specified by **NIE** to meet the requirements of the relevant part of the **NIE System.** A **Generator** may obtain relevant details specific to its **Generating Units** pursuant to **CC7.1.** **NIE** shall ensure that (subject to any necessary discrimination) the same target fault clearance times can be achieved by its own **Plant** and **Apparatus** at each **Connection Point**.~~

~~CC7.6.2 Unless otherwise agreed, the fault clearance times specified in the **Connection Agreement** shall not be faster than:~~

~~(a) 100 ms at 275kV; and~~

~~(b) 120 ms at 110kV and below;~~

~~but, if otherwise agreed, nothing in this **CC7.6.2** shall prevent a **Generating Unit** or **NIE's Plant** and **Apparatus** at the **Connection Point** from having faster clearance times (subject to necessary discrimination being maintained). The times specified in the **Connection Agreement** will reflect **NIE's** view of the requirements of both the **NIE System** and the **User's System** for the expected life time of the **Protection** (for example, 15 years). The probability that the fault clearance times stated in the **Connection Agreement** will be exceeded by any given fault must be less than 2%.~~

~~CC7.6.3 To cover for failure of the above **Protection** systems to meet the above fault clearance times, back up **Protection** shall be provided by the **Generator**. The back up **Protection** shall be required to discriminate with other protections fitted on the **NIE System**. Relevant details will be made available to a **Generator** upon request pursuant to **CC7.1**.~~

~~CC7.6.4 For **Generating Units** connected to the **NIE Transmission System** the **Connection Agreement** will specify the **Protection** to be fitted which may include:~~

(a) circuit breaker fail protection; and/or

(b) loss of excitation protection; and/or

(c) pole slipping protection.

CC7.6.5 The setting of any **Protection** controlling a circuit breaker or the operating values of any automatic switching device at any **Connection Point** shall have been agreed between **NIE** and the **User** during the course of the application for a **Connection Agreement.** The settings and operating values will only be changed if both **NIE** and the **User** agree provided that neither **NIE** nor the **User** shall unreasonably withhold their consent.

CC7.6.6 If in the opinion of **NIE** following an overall review of **NIE System Protection** requirements improvements to any **Generating Unit Protection** scheme are necessary, the relevant provisions of the **Connection Agreement** shall be followed.

CC7.6.7 The **Generating Unit Protection** must co-ordinate with any auto reclose policy specified by **NIE**.

CC7.7 Negative Phase Sequence Loadings

Generating Units shall be capable of withstanding, without tripping, a negative phase sequence loading incurred by clearance of a close up phase to phase fault by **System** back up **Protection** which will be within the **Apparatus** short time rating. **NIE** will inform the **Generator** of the expected negative phase sequence loadings during the course of an application for a **Connection Agreement**.

CC7.8 Neutral Earthing

CC7.8.1 The winding configuration and method of earthing of **Generating Units** and associated **Generator Transformers** shall be agreed with **NIE** or, if agreement cannot be reached, determined by **NIE**.

CC7.9 **Automatic Load Shedding Devices**

CC7.9.1 There is an expectation that **Generating Units** will continue to operate outside statutory **Frequency** limits. However, it is likely that this could mean connection within an **Automatic Load Shedding** zone as detailed in **OC4**. Consequently, **Users** shall ensure that **Protection** on **Generating Units** shall have settings to co-ordinate with the settings on the **Automatic Load Shedding** equipment as detailed by **NIE** on request by the **User**.

CC7.9.2 (a) Each **Generating Unit** shall be capable of satisfactory operation at any **Frequency** within the range of 47 Hz to 52 Hz unless **NIE** has agreed to the use of any **Frequency** level relays which will trip the **Generating Unit** within this **Frequency** range.

(b) Where **Generating Units** are equipped with rate-of-change-of-**Frequency** relays or other devices which measure and operate in relation to a rate-of-change-of **Frequency** (e.g. a governor) the procedure in CC7.9.2(c) below will be followed to ensure satisfactory operation of the **Generating Units**.

(c) (i) At a reasonable time prior to a **Generating Unit** being connected to the **NIE System**, and prior to any relevant modification to a **Generating Unit** or any relevant **Power Station Equipment**, the **Generator** shall contact **NIE** with details of the proposed rate-of-change-of-**Frequency** setting.

(ii) **NIE** shall, within a reasonable period and in any case no more than 28 days, discuss with the **Generator** whether the proposed settings are satisfactory. The agreed settings shall be specified in the **Connection Agreement**.

(iii) In relation to any **Generator** which has agreed the settings with **NIE** under these provisions, **NIE** shall notify that **Generator** of any change of which it is aware in the expected rate-of-change-of-**Frequency** on the **NIE System** which may require new settings to be agreed.

CC7.9.3 Each **Generator** shall be responsible for protecting the **Generating Units** owned or operated by it against the risk of damage which might result from any **Frequency** excursion outside the range 52 Hz to 47 Hz and for deciding whether or not to interrupt the connection between its **Plant** and/or **Apparatus** and the **NIE System** in the event of such a **Frequency** excursion.

CC7.9.4 Certain **Open Cycle Gas Turbine Units** will be required to have a **Fast start Capability**. These **Generating Units** may be used for **Operating Margin** and their start up may be initiated by **Frequency** level relays with settings normally in the range of 49.5 Hz to 50 Hz.

CC7.1 Technical Criteria for Wind Farm Power Stations and other Generating Units

The Schedules to these Connection Conditions contain certain technical requirements for Users, divided into type of Plant or User connection. Schedule 1 sets out technical criteria that Generators must comply with in respect of their CCGT Modules, Steam Turbine Units and Gas Turbine Units. Schedule 2 sets out technical criteria that Generators must comply with in respect of their Wind Farm Power Stations.

CC8. TECHNICAL CRITERIA:-

CC8.1 COMMUNICATIONS EQUIPMENT
CC8.1 Communications Equipment

Where required by **NIE** in order to ensure control of the **NIE System**, communications between **Users** and **NIE** shall be established in accordance with the relevant **Connection Agreement**.

CC8.2 Primary Speech Facility

CC8.2.1 Equipment shall be provided for connection to **NIE's** Corporate Control Telephone Network and Corporate Telephone Network by means of which routine and emergency control telephone calls may be established between each **User** and **NIE**. Provision of this equipment shall be in accordance with the relevant **Connection Agreement**.

CC8.2.2 Connection to **NIE's** Corporate Telephone Network and any circuit or circuits required to connect the **User** with the point of connection shall be provided in accordance with the relevant **Connection Agreement**.

CC8.2.3 The **User** shall furnish **NIE** with all relevant information associated with its connection to the **NIE** Corporate Telephone Network to enable **NIE** to meet its obligations under the "Temporary Licence For The Electricity Association Member Companies To Run Certain Telecommunications Systems", issued by the Department of Trade and Industry and/or any other applicable requirements.

CC8.2.4 All equipment **NIE** requires to be connected to the **NIE** Corporate Control Telephone Network shall be provided and maintained by **NIE** at its own cost.

CC8.2.5 All equipment connected to the **NIE** Corporate Telephone Network shall be maintained by a Registered Maintainer as defined by Statutory Regulations administered by the British Standards Institute on behalf of the DTI.

CC8.3 Facsimile Machine

Each **Generator** with a **CDGU** or a **CD CCGT Installation** shall provide and maintain in full working order a facsimile machine at each **Power Station** Control Centre and each will notify **NIE** of the telephone number. **NIE** shall provide and maintain in full working order a facsimile machine at Castlereagh House Grid Control Centre and will notify each **Generator** of the number.

CC8.4 Telemetry

(a) In addition to the requirements of the **MC**, each **User** shall provide such voltage, current, **Frequency**, **Active** and **Reactive Power** measurements and status points and alarms and controls at the **NIE** telemetry outstation interface (if any) as required and specified by **NIE** in the relevant **Connection Agreement**. **NIE** shall provide, install and maintain the telemetry outstation. Each **User** shall be responsible for providing a secure AC power supply to the telemetry outstation.

(b) If it is agreed between **NIE** and a **User** that **NIE** will telecontrol the **User's** switchgear on the **User's Site**, **NIE** shall install the necessary telecontrol facilities. It shall be the responsibility of the **User** to provide the necessary control interface for the switchgear of the **User** which is to be controlled.

CC8.5 Instructor Facilities

Where required by **NIE**, the **User** shall provide accommodation for special ~~**Instructor**~~**instructor** facilities provided by **NIE** for the receipt of operational messages.

CC8.6 Telecontrol Connection ~~Standard~~**Standards**

All communication connections between each **User** and **NIE** shall conform to **:**

(a) appropriate CCITT standards and other standards required by licensed public telephone operators**; and/or**

(b) appropriate standards for radio systems as required by the Radiocommunications Agency from time to time.

In respect of (b) above, each User shall where required by NIE provide facilities on which a small radio aerial can be mounted and shall obtain where necessary any planning permissions required therefor.

CC8.7 Data Entry Terminals

The **User** shall accommodate **NIE** data entry terminals at points and in a manner determined reasonably by the **User** for the purpose of information exchange.

CC8.8 **Plant** and **System** Monitoring

Operational Metering shall be installed in accordance with **MC3.7** and Sub-Code 3 of the **MC**.

CC9. **SITE** RELATED CONDITIONS

CC9.1 Ownership, Control, Operation & Maintenance at the **Connection Point**

CC9.1.1 The ownership boundary between the **NIE System** and a **User's System** shall be agreed between the **User** and **NIE**. For supplies at **Low Voltage** the general rule is that the ownership boundary will be at the **User's** terminals of **NIE** owned metering equipment. For **High Voltage** supplies and busbar connected supplies at **Low Voltage**, the ownership boundary will be subject to specific agreement between **NIE** and the **User** in each case.

CC9.1.2 In the absence of a separate written agreement between the parties to the contrary, construction, commissioning, control, operation and maintenance responsibilities follow ownership.

CC9.1.3 For connections to the **NIE System** for which a **Connection Agreement** is required and those covered by Regulation 26 and Parts 1 and 2 of Schedule 3 of the Electricity Supply Regulations (N.I.) 1991, as amended or re-stated from time to time, a **Site**

Responsibility Schedule shall be prepared by **NIE** (reflecting the details agreed between **NIE** and the **User**) in respect of each **Connection Site** pursuant to the relevant **Connection Agreement** and signed by both parties (by way of confirmation of its accuracy), detailing the division of responsibilities at interface sites in respect of ownership, control, operation, maintenance and safety. The format, principles and basic procedure to be used in the preparation of **Site Responsibility Schedules** are set down in Appendix 1.

CC9.1.4 An **Ownership Diagram** shall be included in the above **Site Responsibility Schedule**. The diagram shall show all **HV Apparatus** and the connections to all external circuits and shall incorporate numbering, nomenclature and labelling as set out in **OC9**. A guide to the types of **HV Apparatus** to be shown in the **Ownership Diagram** is shown in Appendix 2 together with the principles to be followed in the preparation of the diagram and the preferred graphical symbols to be used.

CC9.1.5 A copy of the **Site Responsibility Schedule** and any **Ownership Diagrams** shall be retained by **NIE** and by the **User**.

CC9.1.6 The **User** shall notify **NIE** of any changes at or relating to the **Connection Site** which may affect the **Site Responsibility Schedule** or **Ownership Diagrams** and **NIE** shall carry out any necessary updating and the principles set out in **CC9.1.3** shall apply to such updating.

CC9.2 Access to Sites

The provisions relating to access to **NIE Sites** by **Users** and to **User's Sites** by **NIE** shall be set out in the relevant **Connection Agreement** and/or **Lease**.

CC9.3 Work on **Protection** at **Connection Points**

No busbar **Protection**, mesh corner **Protection**, circuit breaker fail **Protection**, AC or DC wiring (other than power supplies or DC tripping associated with a **Generating Unit**) shall be worked upon or altered by or on behalf of a **User** unless **NIE** has been given a reasonable opportunity to arrange for an **NIE** representative to attend. **NIE** shall not work upon or alter any **Generating Unit Protection** unless it has given the **Generator** a reasonable opportunity for a representative of the **Generator** to attend.

CC9.4 Standard of Maintenance

CC9.4.1 (a) It is a requirement that all **User's Plant** and **Apparatus** on **NIE Sites** is maintained adequately for the purpose for which it is intended and to ensure that it does not pose a threat to the safety of any of **NIE's Plant**, **Apparatus** or personnel on the **NIE Site**.

(b) All of **NIE's Plant** and **Apparatus** on **Users' Sites** must be maintained adequately for the purpose for which it is intended and to ensure that it does not pose a threat to the safety of any **User's Plant, Apparatus** or personnel on the **User's Site**.

(c) **NIE** or the **User** (as the case may be) will have the right to inspect the test results and maintenance records relating to such **Plant** and **Apparatus** at any time.

CC9.5 Responsibility for Safety

CC9.5.1 The **Site Responsibility Schedule** referred to in **CC9.1.3** shall detail the demarcation of responsibility for safety of persons carrying out work or testing at **Connection Sites** and on circuits which cross a **Connection Site** at any point.

CC9.5.2 More detailed information on procedures and responsibilities involved in the provision of **Safety Precautions** is set out in **OC6**.

CC10. APPROVAL TO CONNECT

CC10.1 Readiness to Connect

CC10.1.1 A **User** whose development is under construction in accordance with the relevant **Connection Agreement** and who wishes to establish connection with the **NIE System** shall apply to **NIE** by submitting a standard connection card or otherwise in writing, stating readiness to connect and giving the following:-

(a) confirmation that the **User's** installation complies with the principles outlined in Regulation 28 of the Electricity Supply Regulations (N.I.) 1991 and Regulations 4-12 and 15 of the Electricity at Work Regulations (N.I.) 1991 (or as amended or re-stated);

(b) where relevant, updated **Planning Code** data based on actual values; and

(c) a proposed connection date.

CC10.1.2 **NIE** may require a **User** to provide in addition to its written application to **NIE** for connection in accordance with **CC10.1.1**, a report, prepared by such person as **NIE** may reasonably consider to be competent to issue the same, certifying to **NIE** that all matters required by **CC5** have been considered and that **CC6** to **CC8** inclusive have been complied with by the **User** and incorporating:-

(a) type test reports and test certificates produced by Nationally Accredited Laboratories (or other equivalent testing organisations) showing that the **Plant** and **Apparatus** specified in the **Connection Conditions** meets the criteria specified;

(b) copies of the manufacturer's test certificates relating to **Plant** and **Apparatus** referred to in the **Connection Conditions**, including measurements of positive and zero sequence impedance of **Apparatus** which will contribute to the fault current at the **Connection Point**;

(c) details of **Protection** arrangements and settings under **CC6.4**;

(d) a certificate declaring the maximum short circuit current in amperes which the **User's System** would contribute to a three-phase short circuit at the **Connection**

Point, and the minimum zero sequence impedance of the **User's System** at the **Connection Point** and taking into account the contributions of any **Generating Unit** or **Power Station** motors and transformers; and

(e) confirmation that design conforms with the standards referred to in **CC6**.

CC10.1.3 A **User** shall, in all cases, supply the following information to **NIE** together with its notification under **CC10.1.1**:-

(a) a list of persons proposed to be appointed by the **User** to undertake, and to be responsible for, the application and removal of **Safety Precautions** on those parts of the **User's System** which are directly connected to the **NIE System**;

(b) a list of persons appointed by the **User** to undertake operational duties on the **User's System** and to issue and receive operational messages and instructions in relation to the **User's System**;

(c) a list of names and telephone numbers of responsible management representatives in accordance with **OC7**;

(d) site common drawings as specified in the **Connection Agreement**;

(e) a single line diagram of the **User's Apparatus** showing all items to which these **Connection Conditions** apply; and

(f) information to enable **NIE** to prepare a **Site Responsibility Schedule**.

CC10.1.4 In order that **NIE** may verify that the requirements of these **Connection Conditions** can be met, the **User** shall provide a proposed commissioning programme, giving at least six weeks (or such longer period as **NIE** may reasonably consider to be appropriate in the circumstances) notice of the proposed connection date, and detailing all proposed site testing of main and ancillary equipment, together with the names of the organisations which are to carry out such testing and the proposed timetable for such testing. The required period of notice will be notified to the **User** by **NIE** during the course of an application for connection. **NIE** will consider the proposed commissioning programme and, as soon as reasonably practicable, will notify the **User**:-

(a) that it approves the programme, in which case **NIE** and the **User** shall take all reasonable steps to ensure that the **Commissioning/Acceptance Testing** is undertaken in accordance with the commissioning programme (subject to **NIE System** conditions); or

(b) that it considers that the **Commissioning/Acceptance Testing** proposed in the programme may involve the application of irregular, unusual or extreme conditions and which may have a material effect on the **Total System**, beyond the **User's System** and that such testing therefore falls within the scope of **OC10**, **"System Tests"**, in which event the proposed commissioning programme shall be

treated as a **Proposal Notice** submitted under **OC10.4.1** and the relevant provisions of **OC10** shall apply to the proposed testing; or

(c) that it requires the proposed commissioning programme to be amended in which event the **User** and **NIE** shall endeavour to agree an appropriate amendment to the commissioning programme, failing which the programme will be as determined by **NIE** acting reasonably and, in either case, **NIE** and the **User** shall take all reasonable steps to ensure that the **Commissioning/Acceptance Testing** is undertaken in accordance with the commissioning programme as amended; or

(d) that it rejects the proposed commissioning programme and the reasons for such rejection in which event, subject to the resolution of any dispute in accordance with the relevant **Connection Agreement**, the proposed **Commissioning/Acceptance Testing** shall not take place but the **User** shall be entitled to submit a revised commissioning programme for **NIE's** consideration.

CC10.1.5 **NIE** shall be entitled to witness site testing of equipment whose performance can reasonably be regarded as affecting the integrity of the **NIE System**. The **User** shall provide **NIE** with certified results of all such tests and **NIE** may withhold agreement to energise the **User's** equipment where test results establish that the **Connection Conditions** have not been complied with.

CC10.1.6 Where in advance of the proposed connection date, a **Generator** requires connection to the **NIE System** for the purpose of testing, the **Generator** will be required to satisfy **NIE** of the following:-

(a) compliance with those requirements of the **Connection Conditions** and **Connection Agreement** necessary to give assurance that it is safe to connect; and

(b) where applicable, provision of a commissioning programme in accordance with **CC10.1.4**.

CC10.2 Confirmation of Approval to Connect

CC10.2.1 Within 30 days of notification by a **User** pursuant to **CC10.1.1 NIE** shall (except where it has rejected the **User's** application in accordance with **CC10.1.4(d)**) inform the **User** whether or not the requirements of **CC10.1** and the other requirements of the **Connection Conditions** are satisfied and the making of the connection is approved subject to satisfactory results of those tests (including **Commissioning/Acceptance Tests**) which cannot be performed prior to energisation of the **User's Plant** and **Apparatus**. Where approval is withheld, reasons shall be stated by **NIE**.

CC10.2.2 Where the notification given by **NIE** pursuant to **CC10.2.1** is in the affirmative, **NIE** will in addition supply to the **User** the following information:-

(a) a list of persons proposed to be appointed by **NIE** to undertake, and to be responsible for, the application and removal of **Safety Precautions** in relation to the **Connection Site**;

(b) a list of persons appointed by **NIE** to undertake operational duties on the **NIE System** and to issue and receive operational messages and instructions in relation to the **User's System**; and

(c) a list of names and telephone numbers of responsible management representatives in accordance with **OC7**.

CC10.2.3 When indicating agreement to the energising of a connection, **NIE** shall, to the extent not previously determined in a commissioning programme, specify the contents and sequence of the energising programme and associated testing. In either case, **NIE** shall be entitled to postpone or suspend the programme where, due to circumstances which could not reasonably have been foreseen by **NIE**, continuation of the programme would impose an unacceptable level of risk to the integrity of the **NIE System**.

CC10.3 Approval of Staff

CC10.3.1 At the same time that the **User** submits to **NIE** the list of information pursuant to **CC10.1.3** it shall submit to **NIE** a list of staff which will be used to implement **Safety Precautions**. **NIE** may ask the **User** questions to clarify the suitability of persons named on the list.

CC10.3.2 At the same time that **NIE** submits to the **User** the list of information pursuant to **CC10.2.2** it shall submit to the **User** a list of staff which will be used to implement **Safety Precautions**. The **User** may ask **NIE** questions to clarify the suitability of persons named on the list.

CC10.3.3 Each of **NIE** and each **User** have the right to object to the inclusion of particular members of staff on the other's list, on technical grounds, and in the event of objection which is accepted by the other, that member of staff will not be used to implement **Safety Precautions**.

CC10.3.4 A party must accept an objection to the extent it is reasonable to do so. In the event of a disagreement, the Disputes Resolution Procedure in the relevant **Connection Agreement** will be used.

CC10.3.5 As part of the approval process, each party may (upon reasonable notice and at reasonable times) interview members of staff on the other's list or the parties may agree to hold joint interviews.

CC10.3.6 If the list of **NIE** or a **User**, as the case may be, changes, the relevant party must notify the other without delay and the relevant provisions of this **CC10.3** shall apply to any new names included as part of that change.

CC10.3.7 Neither **NIE** nor any **User** shall have any liability to the other by reason of or arising from their approval under this **CC10.3** of the other's list of staff entitled to implement **Safety Precautions**.

SCHEDULE 1

TECHNICAL CRITERIA FOR GENERATING UNITS OTHER THAN WIND FARM POWER STATIONS

CC.S1.1 Applicability of Technical Design and Operational Criteria

(a) In this Schedule 1 all references to Generating Units shall be read and construed as references only to CCGT Modules, Steam Turbine Units and/or Gas Turbine Units. Such references shall not be read or construed as references to Generating Units that form part of a Wind Farm Power Station.

(b) At the Connection Point all Generating Units with an output in excess of 5MW shall, in addition to the requirements of CC6, meet the following technical design and operational criteria. CC.S1 contains more detailed requirements for Generating Units than those set out in CC6 and is intended to be complementary to CC6. However, in the event of any conflict between the requirements of CC6 and the requirements of CC.S1, the provisions of CC.S1 shall prevail. Detailed information relating to a particular connection will, where indicated below, be made available by NIE on request by the Generator.

(c) Generating Units with an output not exceeding 5MW connected to the NIE System at or below 20kV shall, as a minimum requirement, and in addition to the requirements of CC6, comply with the requirements of Engineering Recommendation G59 (NI), "Recommendations for the Connection of Private Generating Plant to Northern Ireland Electricity's Distribution Systems" and with all other relevant Engineering Recommendations and relevant regulations and the particular requirements of NIE which will take account of the conditions prevailing on the NIE System at the point of connection at the relevant time. NIE will notify its particular requirements to the Generator during the course of the Generator's application for connection to the NIE System.

CC.S1.2 Generating Unit Connections

Each connection between a Generating Unit and the NIE System unless specified otherwise in the Connection Agreement must be controlled by a circuit breaker capable of interrupting the maximum short circuit current at the point of connection. The short circuit current design values at a Connection Point will be set out in the Connection Agreement.

CC.S1.3 Generating Plant Performance Requirements

CC.S1.3.1 For Generating Units not subject to Central Despatch the electrical parameters required to be achieved at the Generator Terminals shall be specified by NIE in the Connection Agreement or in a Request for Proposal, as the case may be.

CC.S1.3.2 For CDGUs and for CD CCGT Installations (in relation to the CCGT Modules therein) the reactive power capability shall as a minimum be:-

(i) rated power factor (lagging) = 0.8;

(ii) rated power factor (leading) = 0.95; and

(iii) short circuit ratio not less than 0.5.

CC.S1.3.3 For CDGUs and CD CCGT Installations the minimum connected impedance applicable to the generator and Generator Transformer will be specified in the Connection Agreement. NIE's requirements for the impedances will reflect the needs of the NIE System from the fault level and stability points of view.

CC.S1.3.4 A Generating Unit must be capable of continuously supplying its Registered Capacity at a stable output within the System Frequency range 49.5Hz to 50.5Hz. Within the Frequency range 49.5Hz to 50.5Hz there must be no reduction in output whilst Frequency is falling. Any decrease in output whilst Frequency is falling to a level below Registered Capacity occurring in the Frequency range 49.5Hz to 47Hz must not be more than pro rata with any decrease below nominal Frequency.

CC.S1.3.5 The output power should not be affected by voltage changes in the normal operating range specified in CC5.4.

CC.S1.3.6 A Generating Unit must be capable of remaining synchronised to the NIE System at an output which is no greater than the lower of 80MW or 40% of maximum continuous rating.

CC.S1.3.7 Start-up and Ramp Rates

(a) A Generating Unit must be capable of start-up:-

(i) from cold within 14 hours;
(ii) from warm within 5 hours;
(iii) from hot within 3 hours.

The block load on synchronising must be no greater than 40MW.

(b) A Generating Unit which is in a hot condition must be capable of ramping up from part-load pursuant to a Despatch instruction at a rate of at least 3% of MCR per minute.

(c) A Generating Unit must be capable of de-loading at a rate of at least 3% of MCR per minute.

CC.S1.4 Black Start Capability

(a) **The NIE System is equipped with a Black Start capability (to be utilised in accordance with OC7) achieved by incorporating such a capability at a number of strategically located Power Stations.**

(b) **Each Connection Agreement relating to a Power Station containing CDGUs or CD CCGT Installations will reflect whether any of such CDGUs or CD CCGT Installations has a restart capability without connection to an external power supply (i.e. power which has not been generated at the Power Station). Such Generating Plant will be specified as a Black Start Station in the Connection Agreement.**

(c) **In order to ensure that the NIE System continues to have a Black Start capability, NIE will require, as a condition of an offer of connection or as a term of the Request for Proposal, certain new Generating Plants to be Black Start Stations and Users must, in relation to such new Generating Plant, ensure that it has a Black Start capability.**

CC.S1.5 Generating Unit Control Arrangements

CC.S1.5.1 **Each Generating Unit must be capable, in accordance with CC.S1.5.2 and CC.S1.5.3, of contributing appropriately, as reasonably specified by NIE, to Frequency and voltage control by continuous modulation of Active and Reactive Power supplied to the NIE System.**

CC.S1.5.2 **Each Generating Unit with a Registered Capacity of greater than 5MW must be fitted with a fast acting proportional turbine speed governor to provide Frequency control under normal operational conditions as specified by NIE in the relevant Connection Agreement. Where a Generating Unit or Power Station becomes isolated from the rest of the Total System but is still supplying Customers, the speed governor must also be able to contribute to controlling NIE System Frequency to below 52Hz. As stated in CC5.3.2, the NIE System Frequency could rise to 52Hz or fall to 47Hz. For steam turbine Generating Units the governor must be designed and operated to the relevant requirements of BS132. For gas turbine Generating Units the governor must be capable of operating with a nominal droop characteristic of 4%.**

CC.S1.5.3 **NIE may specify in the relevant Connection Agreement that a continuously acting fast response automatic excitation control system is required to control the generator voltage without instability over the entire operating range of the Generating Unit or Power Station. This will be dependent on the size and type of Generating Unit or Power Station and the part of the NIE System to which it is connected.**

CC.S1.5.4 **NIE may specify the requirement for tap changing facilities on the Generator Transformers for all Generating Units. The tapping range and the step sizes will then be specified in the respective Connection Agreements.**

CC.S1.5.5 **NIE may specify in the relevant Connection Agreement that a Generating Unit must be fitted with a Unit Load Controller. Where so specified, the Generator**

must ensure that the Unit Load Controller is in operation at all times and in accordance with the settings for Frequency trigger and reset point, time delay and droop as specified in the relevant Connection Agreement or such other settings as NIE may notify to the Generator in writing on not less than two Business Days' notice, unless directed otherwise by NIE.

CC.S1.6 Coordination with Existing Protection

CC.S1.6.1 **Each Generator must meet, in relation to each of its Generating Units, the target clearance times for fault current interchange with the NIE System in order to reduce to a minimum the impact on the NIE System of faults on circuits owned by Generators. The target clearance times are measured from fault current inception to arc extinction and will be specified by NIE to meet the requirements of the relevant part of the NIE System. A Generator may obtain relevant details specific to its Generating Units pursuant to CC.S1.1. NIE shall ensure that (subject to any necessary discrimination) the same target fault clearance times can be achieved by its own Plant and Apparatus at each Connection Point.**

CC.S1.6.2 **Unless otherwise agreed, the fault clearance times specified in the Connection Agreement shall not be faster than:-**

(a) 100 ms at 275kV; and

(b) 120 ms at 110kV and below;

but, if otherwise agreed, nothing in this CC.S1.6.2 shall prevent a Generating Unit or NIE's Plant and Apparatus at the Connection Point from having faster clearance times (subject to necessary discrimination being maintained). The times specified in the Connection Agreement will reflect NIE's view of the requirements of both the NIE System and the User's System for the expected life time of the Protection (for example, 15 years). The probability that the fault clearance times stated in the Connection Agreement will be exceeded by any given fault must be less than 2%.

CC.S1.6.3 **To cover for failure of the above Protection systems to meet the above fault clearance times, back up Protection shall be provided by the Generator. The back up Protection shall be required to discriminate with other protections fitted on the NIE System. Relevant details will be made available to a Generator upon request pursuant to CC.S1.1.**

CC.S1.6.4 **For Generating Units connected to the NIE Transmission System the Connection Agreement will specify the Protection to be fitted which may include:-**

(a) circuit breaker fail protection; and/or

(b) loss of excitation protection; and/or

(c) pole slipping protection.

CC.S1.6.5 **The setting of any Protection controlling a circuit breaker or the operating values of any automatic switching device at any Connection Point shall have been agreed between NIE and the User during the course of the application for a Connection Agreement. The settings and operating values will only be changed if both NIE and the User agree provided that neither NIE nor the User shall unreasonably withhold their consent.**

CC.S1.6.6 **If in the opinion of NIE following an overall review of NIE System Protection requirements improvements to any Generating Unit Protection scheme are necessary, the relevant provisions of the Connection Agreement shall be followed.**

CC.S1.6.7 **The Generating Unit Protection must co-ordinate with any auto reclose policy specified by NIE.**

CC.S1.7 Negative Phase Sequence Loadings

Generating Units shall be capable of withstanding, without tripping, a negative phase sequence loading incurred by clearance of a close-up phase-to-phase fault by System back-up Protection which will be within the Apparatus short time rating. NIE will inform the Generator of the expected negative phase sequence loadings during the course of an application for a Connection Agreement.

CC.S1.8 Neutral Earthing

CC.S1.8.1 **The winding configuration and method of earthing of Generating Units and associated Generator Transformers shall be agreed with NIE or, if agreement cannot be reached, determined by NIE.**

CC.S1.9 Automatic Load Shedding Devices

CC.S1.9.1 **There is an expectation that Generating Units will continue to operate outside statutory Frequency limits. However, it is likely that this could mean connection within an Automatic Load Shedding zone as detailed in OC4. Consequently, Users shall ensure that Protection on Generating Units shall have settings to co-ordinate with the settings on the Automatic Load Shedding equipment as detailed by NIE on request by the User.**

CC.S1.9.2 **(a) Each Generating Unit shall be capable of satisfactory operation at any Frequency within the range of 47Hz to 52Hz unless NIE has agreed to the use of any Frequency level relays which will trip the Generating Unit within this Frequency range.**

(b) Where Generating Units are equipped with rate-of-change-of-Frequency relays or other devices which measure and operate in relation to a rate-of-change-of Frequency (e.g. a governor) the procedure in CC.S1.9.2(c) below will be followed to ensure satisfactory operation of the Generating Units.

(c) (i) At a reasonable time prior to a Generating Unit being connected to the NIE System, and prior to any relevant modification to a Generating

Unit or any relevant Power Station Equipment, the Generator shall contact NIE with details of the proposed rate-of-change-of Frequency setting.

(ii) NIE shall, within a reasonable period and in any case no more than 28 days, discuss with the Generator whether the proposed settings are satisfactory. The agreed settings shall be specified in the Connection Agreement.

(iii) In relation to any Generator which has agreed the settings with NIE under these provisions, NIE shall notify that Generator of any change of which it is aware in the expected rate-of-change-of-Frequency on the NIE System which may require new settings to be agreed.

CC.S1.9.3 Each Generator shall be responsible for protecting the Generating Units owned or operated by it against the risk of damage which might result from any Frequency excursion outside the range 52Hz to 47Hz and for deciding whether or not to interrupt the connection between its Plant and/or Apparatus and the NIE System in the event of such a Frequency excursion.

CC.S1.9.4 Certain Open Cycle Gas-Turbine Units will be required to have a Fast-start Capability. These Generating Units may be used for Operating Margin and their start up may be initiated by Frequency-level relays with settings normally in the range of 49.5Hz to 50Hz.

SCHEDULE 2

TECHNICAL CRITERIA FOR WIND FARM POWER STATIONS

CC.S2.1 Applicability of Technical Design and Operational Criteria

(a) In this Schedule 2 all references to Generating Units shall be read and construed as references only to Generating Units that form part of a Wind Farm Power Station. It shall not be deemed to refer to CCGT Modules, Steam Turbine Units and/or Gas Turbine Units.

(b) In this Schedule 2 unless otherwise specified all references to measurements shall be deemed to be applicable at the Connection Point of the Wind Farm Power Station to the NIE System.

(c) A Wind Farm Power Station with a Registered Capacity in excess of 5MW shall, in addition to the requirements of CC6, meet the following technical design and operational criteria. CC.S2 contains more detailed requirements for Wind Farm Power Stations than those set out in CC6 and is intended to be complementary to CC6. However, in the event of any conflict between the requirements of CC6 and the requirements of CC.S2, the provisions of CC.S2 shall prevail. Detailed information relating to a particular connection will, where indicated below, be made available by NIE on request by the Generator.

(d) A Wind Farm Power Station with a Registered Capacity not exceeding 5MW connected to the NIE System at or below 20kV shall, as a minimum requirement, and in addition to the requirements of CC6, comply with the requirements of Engineering Recommendation G59 (NI), "Recommendations for the Connection of Private Generating Plant to Northern Ireland Electricity's Distribution Systems" and with all other relevant Engineering Recommendations and relevant regulations and the particular requirements of NIE which will take account of the conditions prevailing on the NIE System at the point of connection at the relevant time. NIE will notify its particular requirements to the Generator during the course of the Generator's application for connection to the NIE System.

CC.S2.2 Wind Farm Power Station Connections

Each connection between a Wind Farm Power Station and the NIE System unless specified otherwise in the Connection Agreement must be controlled by a circuit breaker capable of interrupting the maximum short circuit current at the point of connection. The short circuit current design values at a Connection Point will be set out in the Connection Agreement.

CC.S2.3 Wind Farm Power Station Performance Requirements

CC.S2.3.1 For Wind Farm Power Stations with a Registered Capacity not exceeding 5MW the electrical parameters required to be achieved at the Generator Terminals shall

be specified by NIE in the Connection Agreement or in a Request for Proposal, as the case may be.

CC.S2.3.2 For Wind Farm Power Stations reactive power capability shall as a minimum be:-

(i) rated power factor (absorbing) – 0.95;

(ii) rated power factor (generating) – 0.95;

within the voltage limits specified under CC5.4.

CC.S2.3.3 For Wind Farm Power Stations the minimum connected impedance applicable to the whole Wind Farm Power Station as a single unit will be specified in the Connection Agreement. NIE's requirements for the impedance will reflect the needs of the NIE System from the fault level and stability points of view.

CC.S2.3.4 Given wind speeds equal to or faster than the manufacturer's cut-in point, and equal to or slower than the manufacturer's cut-out point, for operation of the wind turbines in the Wind Farm Power Station, both as specified within the Connection Agreement for the particular site, a Wind Farm Power Station must be capable of continuously supplying its Registered Capacity at a stable output within the System Frequency range 49.5Hz to 50.5Hz. Within the Frequency range 49.5Hz to 50.5Hz there must be no reduction in output whilst Frequency is falling. Any decrease of output power to a level below Registered Capacity occurring in the Frequency range 49.5Hz to 47Hz must not be more than pro rata with any decrease below nominal Frequency.

CC.S2.3.5 The output power should not be affected by voltage changes in the normal operating range specified in CC5.4.

CC.S2.3.6 The speed of response of the Wind Farm Power Station voltage control system should be such that following a step change in voltage and recovery to the normal operating range the Wind Farm Power Station should achieve and maintain at least 90% of its steady state response measured at the Connection Point within 1 second of the step change.

CC.S2.3.7 Start-up and Ramp Rates

(a) The Generator shall ensure that a Wind Farm Power Station shall not start up more frequently than once in any ten-minute period. A Wind Farm Power Station shall have a positive ramp rate controller capable of being set within a range from 1MW per minute to 10MW per minute to control the ramp rate under normal operating conditions and including a zero ramp rate setting, which setting shall automatically take effect during a time period when a ramp blocking signal is present. Unless notified otherwise by NIE, the Generator will set the controller to the setting as specified by NIE from time to time in the Wind Farm Power Station Settings Schedule published on the SONI website (or such other place or by such other means as may be notified to the Generator from time to time).

(b) A Wind Farm Power Station shall have a ramp Frequency controller, which on start up and during normal operation of any Wind Farm Power Station shall only allow ramping when the System Frequency is below a set value and in the absence of a ramp blocking signal. The ramp Frequency controller should be capable of being set in the range 50.2Hz to 52.0Hz in steps of 0.1Hz. Unless notified otherwise by NIE, the Generator will set the controller to the setting as specified by NIE from time to time in the Wind Farm Power Station Settings Schedule published on the SONI website (or such other place or by such other means as may be notified to the Generator from time to time).

(c) During operation NIE may send to the Generator a positive ramp blocking signal if the NIE System would otherwise be at risk from excess Frequency movements. This signal is designed to restrain Wind Farm Power Stations from starting to ramp or from ramping above their level at the time of receiving the signal. NIE will remove the ramp blocking signal as soon as stable conditions on the NIE System are restored, as determined by NIE.

(d) If wind speeds equal to or faster than the manufacturer's cut-out point for operation of the wind turbines in the Wind Farm Power Station, as specified within the Connection Agreement for the particular site, require a reduction in the output of a Wind Farm Power Station, the Generator shall send a signal to NIE in advance of the reduction indicating that deloading will occur. Unless the Generator is notified otherwise by NIE, the format and timing of this signal shall be as specified by NIE from time to time in the Wind Farm Power Station Settings Schedule published on the SONI website (or such other place or by such other means as may be notified to the Generator from time to time). The Generator shall ensure that such reduction is phased over a period of at least 30 minutes and the deloading rate shall not exceed the Registered Capacity/30, MW per minute.

(e) The ramp rate requirements for Wind Farm Power Stations need not be met in the case of:

(i) wind speed falling at a greater rate than that which would be required to control the output to be within the ramp rate;

(ii) a Frequency deviation on the NIE System from 50Hz below the lower deadband setting or above the upper deadband setting (both as specified by NIE in accordance with CC.S2.5.2(a)) where the Wind Farm Power Station is (at NIE's request) providing Frequency Control, to the extent that the ramp rate requirements can not be met solely due to the provision of Frequency Control or the Generator's compliance with the other provisions of the Connection Conditions.

CC.S2.4 Black Start Capability

A Wind Farm Power Station is not required to provide energy to any part of the NIE System during the restoration of power process following a Black Start and

therefore does not require a Black Start capability. For the avoidance of doubt a Wind Farm Power Station will be disconnected from the NIE System until the NIE System is restored to a stable operating mode, as determined by NIE.

CC.S2.5 Wind Farm Power Station Control Arrangements

CC.S2.5.1 Each Wind Farm Power Station must be capable, in accordance with CC.S2.5.2 and CC.S2.5.3, of contributing appropriately, as reasonably specified by NIE, to Frequency and voltage control by continuous modulation of Active and Reactive Power supplied to the NIE System.

CC.S2.5.2 (a) Each Wind Farm Power Station with a Registered Capacity of greater than 5MW must be fitted with a fast acting proportional wind power governor to provide Frequency control under normal operational conditions. This fast acting proportional governor should be equipped with controls which allow the droop to be set in the range 2% to 20% below 50.0Hz and from 2% to 20% at 50.0Hz and above, each setting being capable of being set independently above and below 50.0Hz. A deadband within which no control will be exercised must be capable of being set with a lower limit between 49.0Hz and 50.0Hz in steps of 0.05Hz and an upper limit between 50.0Hz and 51.0Hz in steps of 0.05Hz. In addition a high frequency trip facility must be provided capable of being set in the range 51.0Hz to 52.0Hz in steps of 0.1Hz. Unless the Generator is notified otherwise by NIE, the governor droop, deadband and high frequency trip settings shall be as specified by NIE from time to time in the Wind Farm Power Station Settings Schedule published on the SONI website (or such other place or by such other means as may be notified to the Generator from time to time). Where a Wind Farm Power Station becomes isolated from the rest of the NIE System the Wind Farm Power Station must immediately detect the condition and shut itself down.

(b) Under certain System conditions the System operator may require the Wind Farm Power Station to operate below its Registered Capacity and in a manner where the lower droop setting will come into operation should the System Frequency fall below the lower deadband setting (as specified by NIE in accordance with CC.S2.5.2(a)). In this mode of operation the Wind Farm Power Station will be providing some of the System reserve. The use of this constrained operating mode shall be kept to a minimum and is most likely to occur for a few hours only during summer night operation. The Wind Farm Power Station controller must be capable of being set to operate in a constrained manner within the range of 50% to 100%. Unless the Generator is notified otherwise by NIE, the setting of the controller shall be as specified by NIE from time to time in the Wind Farm Power Station Settings Schedule published on the SONI website (or such other place or by such other means as may be notified to the Generator from time to time).

CC.S2.5.3 (a) Each Wind Farm Power Station with a registered capacity greater than 5MW must be fitted with a fast acting control system capable of being switched to control the Wind Farm Power Station output voltage or the Wind Farm Power Station output power factor within a voltage band as specified within

the Connection Agreement for the particular site, and in any case within statutory limits as specified under CC5.4.2. If the voltage exceeds the specified band the power factor control must revert to emergency voltage control. The control of voltage and power factor must ensure stable operation over the entire operating range of the Wind Farm Power Station. In the event of voltage going beyond statutory limits, the Wind Farm Power Station must detect this and immediately shut down.

(b) Where a Wind Farm Power Station is connected to the NIE *System* through the same transformer as a Customer or Customers, the Generator must also install a power factor control loop as further provided in the Connection Agreement. The power factor control loop should be designed to be slow acting to allow the voltage control loop to respond to transient voltage changes. Where a transient voltage change occurs, the power factor control loop must restore the voltage to the set value over a period of 1 minute.

(c) Other voltage control schemes may be possible (e.g. control of Wind Farm Power Station 33kV busbar voltage using the wind turbines or other equipment), but agreement between the Generator and NIE must be reached at the application stage for connection about their suitability. If voltage control is implemented for the Wind Farm Power Station, rather than on individual turbines, then the range of power factor available should not be less than that which would have been available if voltage control had been on individual wind turbines. Voltage control schemes based upon equipment located on NIE's side of the connection may be possible, but such schemes are considered special, and the details, responsibilities and cost schedule must be agreed between the Generator and NIE in the Connection Agreement.

(d) In order to deal with Wind Farm Power Stations inducing power fluctuations, an additional control loop must be provided by the Generator to ensure that the wind turbine control system, wind turbulence or other factors in the Wind Farm Power Station cannot produce power oscillations between 0.25Hz and 1.75Hz. It should be designed and operated to ensure that the total peak-to-peak MW oscillation within this frequency range is less than 1% of the Registered Capacity of the Wind Farm Power Station.

CC.S2.5.4 NIE may specify the requirement for tap changing facilities on the Generator Transformers for Wind Farm Power Stations. The tapping range and the step sizes will then be specified in the respective Connection Agreements.

CC.S2.6 Coordination with Existing Protection

CC.S2.6.1 A Generator must meet, in relation to a Wind Farm Power Station, the target clearance times for fault current interchange with the NIE System in order to reduce to a minimum the impact on the NIE System of faults on circuits owned by Generators. The target clearance times are measured from fault current inception to arc extinction and will be specified by NIE to meet the requirements of the relevant part of the NIE System. A Generator may obtain relevant details specific to its Wind Farm Power Station pursuant to CC.S2.1.

CC.S2.6.2 **Unless otherwise agreed, the fault clearance times specified in the Connection Agreement shall not be faster than:-**

(a) 100 ms at 275kV; and

(b) 120 ms at 110kV and below;

but, if otherwise agreed, nothing in this CC.S2.6.2 shall prevent a Wind Farm Power Station or NIE's Plant and Apparatus at the Connection Point from having faster clearance times (subject to necessary discrimination being maintained). The times specified in the Connection Agreement will reflect NIE's view of the requirements of both the NIE System and the User's System for the expected life time of the Protection (for example, 15 years). The probability that the fault clearance times stated in the Connection Agreement will be exceeded by any given fault must be less than 2%.

CC.S2.6.3 **To cover for failure of the above Protection systems to meet the above fault clearance times, back up Protection shall be provided by the Generator. The back up Protection shall be required to discriminate with other protections fitted on the NIE System. Relevant details will be made available to a Generator upon request pursuant to CC.S2.1.**

CC.S2.6.4 **For Wind Farm Power Stations connected to the NIE Transmission System the Connection Agreement will specify the Protection to be fitted which may include:-**

(a) circuit breaker fail protection; and/or

(b) loss of excitation protection; and/or

(c) pole slipping protection.

CC.S2.6.5 **The setting of any Protection controlling a circuit breaker or the operating values of any automatic switching device at any Connection Point shall have been agreed between NIE and the User during the course of the application for a Connection Agreement. The settings and operating values will only be changed if both NIE and the User agree provided that neither NIE nor the User shall unreasonably withhold their consent.**

CC.S2.6.6 **If in the opinion of NIE following an overall review of NIE System Protection requirements improvements to any Wind Farm Power Station Protection scheme are necessary, the relevant provisions of the Connection Agreement shall be followed.**

CC.S2.6.7 **The Wind Farm Power Station Protection must co-ordinate with any auto reclose policy specified by NIE.**

CC.S2.7 Negative Phase Sequence Loadings

Wind Farm Power Stations shall be capable of withstanding, without tripping, a negative phase sequence loading incurred by clearance of a close-up phase-to-phase fault by System back-up Protection which will be within the Apparatus short time rating. NIE will inform the Generator of the expected negative phase sequence loadings during the course of an application for a Connection Agreement.

CC.S2.8 Neutral Earthing

CC.S2.8.1 The winding configuration and method of earthing of Wind Farm Power Stations and associated Generator Transformers shall be agreed with NIE or, if agreement cannot be reached, determined by NIE.

CC.S2.9 Automatic Load Shedding Devices

CC.S2.9.1 There is an expectation that Wind Farm Power Stations will continue to operate outside statutory Frequency limits. However, it is likely that this could mean connection within an Automatic Load Shedding zone as detailed in OC4. Consequently, Users shall ensure that Protection on Wind Farm Power Stations shall have settings to co-ordinate with the settings on the Automatic Load Shedding equipment as detailed by NIE on request by the User.

CC.S2.9.2 (a) Each Wind Farm Power Station shall be capable of satisfactory operation at any Frequency within the range of 47.0Hz to 52.0Hz for the minimum time periods specified by NIE from time to time in the Wind Farm Power Station Settings Schedule published on the SONI website (or such other place or by such other means as may be notified to the Generator from time to time) unless NIE has agreed to the use of any Frequency level relays which will trip the Wind Farm Power Station within this Frequency range.

(b) Where Wind Farm Power Stations are equipped with rate-of-change-of-Frequency relays or other devices which measure and operate in relation to a rate-of-change-of Frequency (e.g. a governor) the procedure in CC.S2.9.2(c) below will be followed to ensure satisfactory operation of the Wind Farm Power Stations.

(c) (i) At a reasonable time prior to a Wind Farm Power Station being connected to the NIE System, and prior to any relevant modification to a Wind Farm Power Station or any relevant Power Station Equipment, the Generator shall contact NIE with details of the proposed rate-of-change-of Frequency setting.

(ii) NIE shall, within a reasonable period and in any case no more than 28 days, discuss with the Generator whether the proposed settings are satisfactory. The agreed settings shall be specified in the Connection Agreement.

(iii) In relation to any Generator which has agreed the settings with NIE under these provisions, NIE shall notify that Generator of any change of which it is aware in the expected rate-of-change-of-Frequency on the NIE System which may require new settings to be agreed.

CC.S2.9.3 Each Generator shall be responsible for protecting the Wind Farm Power Stations owned or operated by it against the risk of damage which might result from any Frequency excursion outside the range 52Hz to 47Hz and for deciding whether or not to interrupt the connection between its Plant and/or Apparatus and the NIE System in the event of such a Frequency excursion.

CC.S2.10 Additional information

CC.S2.10.1 Each Generator shall provide the calculated output for the Wind Farm Power Station as part of the application for connection of that Wind Farm Power Station to the NIE System. This will take the form of a table giving expected output for a range of wind speeds and directions. Following connection, the Wind Farm Power Station shall be monitored for a period to confirm the validity of the calculations, which may be used for future output predictions. This monitoring shall be completed before a final Grid Code compliance certificate is issued.

APPENDIX 1

FORMAT, PRINCIPLES AND BASIC PROCEDURE TO BE USED IN THE

PREPARATION OF **SITE RESPONSIBILITY SCHEDULES**

CC.A1.1 PRINCIPLES

CC.A1.1.1 The following **Site Responsibility Schedules** shall be drawn up using the proforma attached or with such variations as may be agreed between **NIE** and the **User**, although in the absence of agreement the proforma attached will be used:

(a) Schedule of **HV Apparatus**;

(b) Schedule of **Plant, LV/MV Apparatus**, services and supplies;

(c) Schedule of telecommunications and measurements **Apparatus**.

Other than at **Generating Unit** and **Power Station** locations **(including Wind Farm Power Stations)**, the schedules referred to in (b) and (c) may be combined.

CC.A1.1.2 Each **Site Responsibility Schedule** for a **Connection Site** shall be prepared by **NIE** in consultation with other **Users** at least 2 weeks prior to the date for connection proposed by the **User** pursuant to **CC10.1.1(c)**. Each **User** shall provide information to **NIE** to enable it to prepare the **Site Responsibility Schedule**.

CC.A1.1.3 Each **Site Responsibility Schedule** shall detail for each item of **Plant** and **Apparatus**:-

(a) **Plant/Apparatus** ownership;

(b) Site Manager;

(c) Safety (applicable **Safety Rules** and **Control Person** or other responsible person (**Safety Co-ordinator**), or such other person who is responsible for safety);

(d) Operations (applicable **Operational Procedures** and control engineer);

(e) Responsibility to undertake maintenance.

Each **Connection Point** shall be precisely shown.

CC.A1.1.4 In the case of **Site Responsibility Schedules** referred to in **CC.A.1.1.1.(b)** and **(c)**, with the exception of **Protection** and **Intertrip Apparatus** operation, it will be sufficient to indicate the responsible **User** or **NIE**, as the case may be. In the case of the **Site Responsibility Schedule** referred to in **CC.A.1.1.1(a)** for **Protection** and **Intertrip Apparatus**, the responsible management unit must be shown in addition to the **User** or **NIE**, as the case may be.

CC.A1.1.5 The **HV Apparatus Site Responsibility Schedule** for each **Connection Site** must include lines and cables emanating from the **Connection Site**.

CC.A1.1.6 Every page of each **Site Responsibility Schedule** shall bear the date of issue and the issue number.

CC.A1.1.7 When a **Site Responsibility Schedule** is prepared it shall be sent by **NIE** to the **Users** involved for confirmation of its accuracy.

CC.A1.1.8 The **Site Responsibility Schedule** shall then be signed on behalf of **NIE** by the Manager responsible and on behalf of each **User** involved by its **Responsible Manager** (see **CC.A.1.1.15**), by way of written confirmation of its accuracy if they agree on its accuracy.

CC.A1.1.9 Once signed, two copies will be distributed by **NIE**, not less than two weeks prior to its implementation date, to each **User** which is a party on the **Site Responsibility Schedule**, accompanied by a note indicating the issue number and the date of implementation.

CC.A1.1.10 **NIE** and **Users** must make the **Site Responsibility Schedules** readily available to their respective operational staff at the **Site**.

Alterations to existing **Site Responsibility Schedules**

CC.A1.1.11 Without prejudice to the provisions of **CC.A.1.1.14**, when a **User** identified on a **Site Responsibility Schedule** becomes aware that an alteration is necessary, it must inform **NIE** immediately and in any event 8 weeks prior to any change taking effect (or as soon as possible after becoming aware of it, if less than 8 weeks remain when the **User** becomes aware of the change).

CC.A1.1.12 Where **NIE** has been informed of a change by a **User**, or itself proposes a change, it will prepare a revised **Site Responsibility Schedule** by not less than six weeks prior to the change taking effect (subject to it having been informed or knowing of the change eight weeks prior to that time) and the procedure set out in **CC.A.1.1.7** shall be followed with regard to the revised **Site Responsibility Schedule**.

CC.A1.1.13 The revised **Site Responsibility Schedule** shall then be signed in accordance with the procedure set out in **CC.A.1.1.8** and distributed in accordance with the procedure set out in **CC.A.1.1.9**, accompanied by a note indicating where the alteration(s) has/have been made, the new issue number and the date of implementation.

CC.A1.1.14 When a **User** identified on a **Site Responsibility Schedule**, or **NIE**, as the case may be, becomes aware that an alteration to the **Site Responsibility Schedule** is necessary urgently to reflect, for example, an emergency situation, the **User** shall notify **NIE**, or **NIE** shall notify the **User**, as the case may be, immediately and will discuss:

(a) what change is necessary to the **Site Responsibility Schedule**;

(b) whether the **Site Responsibility Schedule** is to be modified temporarily or permanently; and

(c) the distribution of the revised **Site Responsibility Schedule**.

NIE will prepare a revised **Site Responsibility Schedule** as soon as possible, and in any event within seven days of it being informed of or knowing the necessary alteration. The **Site Responsibility Schedule** will be confirmed by **Users** and signed on behalf of **NIE** and **Users** (by the persons referred to in **CC.A.1.1.8**) as soon as possible after it has been prepared and sent to **Users** for confirmation.

Responsible Managers

CC.A1.1.15 Each **User** and **NIE** shall, prior to the date for connection proposed by the **User** pursuant to **CC10.1.1(c)**, exchange names and status of managers with authority to sign **Site Responsibility Schedules**.

APPENDIX 2

PROCEDURES RELATING TO **OWNERSHIP DIAGRAMS**

CC.A2.1. Basic Principles

(a) Where practicable, all the **HV Apparatus** on any **Connection Site** shall be shown on one **Ownership Diagram**. Provided the clarity of the diagram is not impaired, the layout shall represent as closely as possible the geographical arrangement on the **Connection Site**.

(b) Where more than one **Ownership Diagram** is unavoidable, duplication of identical information on more than one **Ownership Diagram** must be avoided.

(c) The **Ownership Diagram** must show accurately the current status of the **Apparatus**, e.g. whether commissioned or decommissioned. Where decommissioned, the associated switchbay will be labelled "spare bay".

(d) Provision will be made on the **Ownership Diagram** for signifying approvals, together with provision for details of revisions and dates.

(e) **Ownership Diagrams** will be prepared in A4 format or such other format as may be agreed with **NIE**.

CC.A2.2 Apparatus to be shown on **Ownership Diagrams**

1. Busbars
2. Circuit Breakers
3. Disconnector (Isolator) and Switch Disconnectors (Switching Isolators)
4. Disconnectors (Isolators) - Automatic Facilities
5. Bypass Facilities
6. Earthing Switches
7. Maintenance Earths
8. Overhead Line Entries
9. Overhead Line Traps
10. Cable and Cable Sealing Ends
11. **Generating Unit**
12. **Generator Transformers**
13. **Generating Unit Transformers**, Station Transformers, including the lower voltage circuit-breakers

13A Wind Farm Power Station Transformers, including the lower voltage circuit-breakers

14. Synchronous Compensators
15. Static Variable Compensators
16. Capacitors (including Harmonic Filters)
17. Series or Shunt Reactors
18. Supergrid and Grid Transformers
19. Tertiary Windings
20. Earthing and Auxiliary Transformers

21. Three Phase VTs
22. Single Phase VT & Phase Identity
23. High Accuracy VT and Phase Identity
24. Surge Arrestors/Diverters
25. Neutral Earthing Arrangements on **HV Plant**
26. Fault Throwing Devices
27. Quadrature Boosters
28. Arc Suppression Coils
29. Current Transformers (where separate plant items)
30. Wall Bushings

CC.A2.3 Recommended Graphical Symbols

Where appropriate, the recommended graphical symbols shown in the attachment to this Appendix 2 shall be used in the preparation of an **Ownership Diagram**.

APPENDIX 3

TECHNICAL REQUIREMENTS

LOW FREQUENCY RELAYS FOR THE AUTOMATIC

DISCONNECTION OF SUPPLIES AT LOW **FREQUENCY**

CC.A3.1 **Low Frequency Relays**

CC.A3.1.1 The **Low Frequency Relays** to be used shall be in accordance with the requirements of the **Connection Agreement**. They should have a setting range of 47**Hz** to 50Hz and be suitable for operation from a nominal AC input of 63.5, 110 or 240V. The following general parameters on the requirements of approved **Low Frequency Relays** for automatic installations is given as an indication, without prejudice to the provisions that may be included in the **Connection Agreement**:

(a)	**Frequency** settings:	47**Hz to** 50Hz in steps of 0.05Hz or better, preferably 0.01Hz;
(b)	Measurement period settings:	Within a minimum selectable settings range of 4 to 6 cycles;
(c)	Operating time:	Between 100 and 150ms dependent on measurement period setting;
(d)	Voltage lock-out:	Selectable within a range of 55 to 90% of nominal voltage;
(e)	Facility stages:	One or two stages of **Frequency** operation;
(f)	Output contacts:	Two output contacts per stage to be capable of repetitively making and breaking for 1000 operations.

CC.A3.2 **Low Frequency Relay** Voltage Supplies

CC.A3.2.1 It is essential that the voltage supply to the **Low Frequency Relays** shall be derived from the primary **System** at the supply point concerned so that the **Frequency** of the **Low Frequency Relays** input voltage is the same as that of the primary **System**. This requires either:

(a) the use of a secure supply obtained from voltage transformers directly associated with the grid transformer(s) concerned, the supply being obtained where necessary via a suitable automatic voltage selection scheme; or

(b) the use of the substation 240V phase-to-neutral selected auxiliary supply, provided that this supply is always derived at the ~~supply point~~**Connection Point** concerned and **for the avoidance of doubt** is never derived from a standby supply **Generating Unit** or from another part of the **Distribution System**.

CC.A3.3 Scheme Requirements

CC.A3.3.1 The tripping facility should be engineered in accordance with the following reliability considerations:

(a) Dependability

Failure to trip at any one particular **Demand** shedding point would not harm the overall operation of the scheme. However, many failures would have the effect of reducing the amount of **Demand** under low **Frequency** control. An overall reasonable minimum requirement for the dependability of the **Demand** shedding scheme is 96%, i.e. the average probability of failure of each **Demand** shedding point should be less than 4%. Thus the **Demand** under low **Frequency** control will not be reduced by more than 4% due to relay failure.

(b) **Outages**

Low **Frequency Demand** shedding schemes will be engineered such that the amount of **Demand** under control is as specified by **NIE** and is not reduced unacceptably during equipment outage or maintenance conditions.