Our Ref:

Your Ref:

Date: April 2008

To: All Recipients of the Serviced Grid Code

Regulatory Frameworks
Electricity Codes

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Dear Sir/Madam

THE SERVICED GRID CODE – ISSUE 3 REVISION 26

Revision 26 of Issue 3 of the Grid Code has been approved by the Authority for implementation on **1st April 2008**.

I have enclosed the replacement pages that incorporate the agreed changes necessary to update the Grid Code Issue 3 to Revision 26 standard.

The enclosed note provides a brief summary of the changes made to the text.

Yours faithfully

L Macleod
Electricity Codes

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Registered in
England and Wales
No 2366977

THE GRID CODE

Issue 3

Revision 26
1st April 2008

THIS DOCUMENT IS ISSUED BY:-

NATIONAL GRID ELECTRICITY TRANSMISSION plc
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THE GRID CODE – ISSUE 3 REVISION 26

INCLUSION OF REVISED PAGES

Title Page			
Glossary and Definitions	G&D	-	**Pages 1 to 2, 7 – 32 and 35 – 48**
Planning Code	PC	-	**Contents Pages, Pages 3 to 4, 17 to 18 and 21 - 69**
Connection Conditions	CC	-	**Content Pages, Pages 1 to 2 and 13 - 74**
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Data Registration Code	DRC	-	**Content Pages, Pages 15 to 16, 33 to 34 and 51 - 57**
Revisions		-	**Pages 23 and 24**

NOTE: See Page 1 of the Revisions section of the Grid Code for details of how the revisions are indicated on the pages.

NATIONAL GRID ELECTRICITY TRANSMISSION PLC

THE GRID CODE – ISSUE 3 REVISION 26

SUMMARY OF CHANGES

The changes arise from the implementation of modifications proposed in the following Consultation Paper:

- **G/06** – Power Park Modules and Synchronous Generating Units

Summary of Proposals

- **Fault Ride Through Power Recovery**
  A relaxation to the current fault ride through requirement to allow a conditional power swing in active power recovery *(Power Park Modules and Synchronous Generating Units)*
- **Additional Power Park Unit Data**
  An increase to the volume of Power Park Unit parameters that a generator would need to provide to National Grid *(Power Park Modules)*
- **Power Park Module Single Line Diagram**
  Amendment to existing data provision obligation to specify options for preventing information available to generator *(Power Park Modules)*
- **Short Circuit Contribution to the GB Transmission System**
  An increase to the volume of fault infeed data that generators are required to provide in respect of Power Park Modules *(Power Park Modules)*
- **Voltage Control and Reactive range below 20% Power Output**
  A change to current capability requirements to permit generators to provide voltage control when operating below 20% of Rated MW *(Power Park Modules)*
- **Manned Control Rooms**
  A change to clarify the requirements for manned Control Points in Scotland *(Power Park Modules and Synchronous Generating Units)*
- **Generic Performance Specifications for Synchronous Generating Units and Power Park Modules**
  Changes to incorporate technical requirements currently defined in bilateral agreements between National Grid and generators in the Grid Code *(Power Park Modules and Synchronous Generating Units – applicable for new connections and/or modifications with a completion date of or after 1st January 2009)*
- **Definition of Power Park Module**
  Amend the current definition to include synchronous generating plant that is powered by intermittent power sources *(Power Park Modules)*
- **Frequency Response**
  Clarification of frequency response requirements that are applicable to Power Park Modules *(Power Park Modules and Synchronous Generating Units)*
- **Amendment of Schedule 5 Data Requirements - Protection Settings**
  A change to clarify the requirement applies only to Power Park Modules with a completion date after 1st January 2005 *(Power Park Modules)*
- **Negative Phase Sequence withstanding capability for Power Park Modules**
  A change that would require generators to provide setting information for rotor overspeed and underspeed protection for Power Park Modules *(Power Park Modules)*
- **Reactive Power Output with Voltage Variation**
  Extension of the current relaxation which applies in England and Wales to Scotland *(Power Park Modules in Scotland)*
- **Cross Referencing for LEEMPS Provisions**
  Updates reference list of Grid Code clauses relevant LEEPMS to reflect relevant Grid Code changes proposed in consultation G/06

Affected Parties

- Synchronous Generating Units
- Power Park Modules
- DNOs

- **F/07** – Current Sourced DC Links

  Summary of Proposals

  - Reactive power transfer, for current sourced DC links, remains within the reactive range specified within the Bilateral Agreement rather than the generic Grid Code provisions specified for this technical performance requirement

  Affected Parties

  - DC Converters

GLOSSARY AND DEFINITIONS
(G & D)

1. In the **Grid Code** the following words and expressions shall, unless the subject matter or context otherwise requires or is inconsistent therewith, bear the following meanings:

Act	The Electricity Act 1989 (as amended by the Utilities Act 2000 and the Energy Act 2004)
Active Energy	The electrical energy produced, flowing or supplied by an electric circuit during a time interval, being the integral with respect to time of the instantaneous power, measured in units of watt-hours or standard multiples thereof, ie: 1000 Wh = 1 kWh 1000 kWh = 1 MWh 1000 MWh = 1 GWh 1000 GWh = 1 TWh.
Active Power	The product of voltage and the in-phase component of alternating current measured in units of watts and standard multiples thereof, ie: 1000 Watts = 1 kW 1000 kW = 1 MW 1000 MW = 1 GW 1000 GW = 1 TW.
Affiliate	In relation to any person, any holding company or subsidiary of such person or any subsidiary of a holding company of such person, in each case within the meaning of Section 736, 736A and 736B of the Companies Act 1985 as substituted by section 144 of the Companies Act 1989 and, if that latter section is not in force at the **Transfer Date**, as if such section were in force at such date.
Ancillary Service	A **System Ancillary Service** and/or a **Commercial Ancillary Service**, as the case may be.
Ancillary Services Agreement	An agreement between a **User** and **NGET** for the payment by **NGET** to that **User** in respect of the provision by such **User** of **Ancillary Services**.
Annual Average Cold Spell Conditions or **ACS Conditions**	A particular combination of weather elements which gives rise to a level of peak **Demand** within a **Financial Year** which has a 50% chance of being exceeded as a result of weather variation alone.

Apparent Power	The product of voltage and of alternating current measured in units of voltamperes and standard multiples thereof, ie: 1000 VA = 1 kVA 1000 kVA = 1 MVA.
Apparatus	Other than in **OC8**, means all equipment in which electrical conductors are used, supported or of which they may form a part. In **OC8** it means **High Voltage** electrical circuits forming part of a **System** on which **Safety Precautions** may be applied to allow work and/or testing to be carried out on a **System**.
Authorised Electricity Operator	Any person (other than **NGET** in its capacity as operator of the **GB Transmission System**) who is authorised under the **Act** to generate, participate in the transmission of, distribute or supply electricity.
Automatic Voltage Regulator or **AVR**	The continuously acting automatic equipment controlling the terminal voltage of a **Synchronous Generating Unit** by comparing the actual terminal voltage with a reference value and controlling by appropriate means the output of an **Exciter**, depending on the deviations.
Authority for Access	An authority which grants the holder the right to unaccompanied access to sites containing exposed **HV** conductors.
Authority, **The**	The **Authority** established by section 1 (1) of the Utilities Act 2000
Auxiliaries	Any item of **Plant** and/or **Apparatus** not directly a part of the boiler plant or **Generating Unit** or **DC Converter** or **Power Park Module**, but required for the boiler plant's or **Generating Unit's** or **DC Converter's** or **Power Park Module's** functional operation.
Auxiliary Diesel Engine	A diesel engine driving a **Generating Unit** which can supply a **Unit Board** or **Station Board**, which can start without an electrical power supply from outside the **Power Station** within which it is situated.
Auxiliary Gas Turbine	A **Gas Turbine Unit**, which can supply a **Unit Board** or **Station Board**, which can start without an electrical power supply from outside the **Power Station** within which it is situated.
Average Conditions	That combination of weather elements within a period of time which is the average of the observed values of those weather elements during equivalent periods over many years (sometimes referred to as normal weather).
Back-Up Protection	**Protection** equipment or system which is intended to operate when a system fault is not cleared in due time because of failure or inability of the **Main Protection** to operate or in case of failure to operate of a circuit-breaker other than the associated circuit breaker.

Common Collection Busbar	A busbar within a **Power Park Module** to which the higher voltage side of two or more **Power Park Unit** generator transformers are connected.
Completion Date	Has the meaning set out in the **Bilateral Agreement** with each **User** to that term or in the absence of that term to such other term reflecting the date when a **User** is expected to connect to or start using the **GB Transmission System**. In the case of an **Embedded Medium Power Station** or **Embedded DC Converter Station** having a similar meaning in relation to the **Network Operator's System** as set out in the **Embedded Development Agreement**.
Complex	A **Connection Site** together with the associated **Power Station** and/or **Network Operator** substation and/or associated **Plant** and/or **Apparatus**, as appropriate.
Connection Conditions or **CC**	That portion of the **Grid Code** which is identified as the **Connection Conditions**.
Connection Entry Capacity	Has the meaning set out in the **CUSC**
Connected Planning Data	Data which replaces data containing estimated values assumed for planning purposes by validated actual values and updated estimates for the future and by updated forecasts for **Forecast Data** items such as **Demand**.
Connection Point	A **Grid Supply Point** or **Grid Entry Point**, as the case may be.
Connection Site	A **Transmission Site** or **User Site**, as the case may be.
Construction Agreement	Has the meaning set out in the **CUSC**
Contingency Reserve	The margin of generation over forecast **Demand** which is required in the period from 24 hours ahead down to real time to cover against uncertainties in **Large Power Station** availability and against both weather forecast and **Demand** forecast errors.
Control Calls	A telephone call whose destination and/or origin is a key on the control desk telephone keyboard at a **Transmission Control Centre** and which, for the purpose of **Control Telephony**, has the right to exercise priority over (ie. disconnect) a call of a lower status.
Control Centre	A location used for the purpose of control and operation of the **GB Transmission System** or **DC Converter Station** owner's **System** or a **User System** other than a **Generator's System** or an **External System**.

Control Engineer A person nominated by the relevant party for the control of its **Plant** and **Apparatus**.

Control Person The term used as an alternative to "**Safety Co-ordinator**" on the **Site Responsibility Schedule** only.

Control Phase The **Control Phase** follows on from the **Programming Phase** and covers the period down to real time.

Control Point The point from which:-

a) A **Non-Embedded Customer's Plant** and **Apparatus** is controlled; or

b) A **BM Unit** at a **Large Power Station** or at a **Medium Power Station** or representing a **Cascade Hydro Scheme** or with a **Demand Capacity** with a magnitude of:

(i) 50MW or more in **NGET's Transmission Area**; or
(ii) 30MW or more in **SPT's Transmission Area**; or
(iii) 10MW or more in **SHETL's Transmission Area**,

is physically controlled by a **BM Participant**; or

c) In the case of any other **BM Unit** or **Generating Unit**, data submission is co-ordinated for a **BM Participant** and instructions are received from **NGET**,

as the case may be. For a **Generator** this will normally be at a **Power Station** but may be at an alternative location agreed with **NGET**. In the case of a **DC Converter Station**, the **Control Point** will be at a location agreed with **NGET**. In the case of a **BM Unit** of an **Interconnector User**, the **Control Point** will be the **Control Centre** of the relevant **Externally Interconnected System Operator**.

Control Telephony The principal method by which a **User's Responsible Engineer/Operator** and **NGET Control Engineer(s)** speak to one another for the purposes of control of the **Total System** in both normal and emergency operating conditions.

CUSC Has the meaning set out in **NGET's Transmission Licence**

CUSC Contract One or more of the following agreements as envisaged in Standard Condition C1 of **NGET's Transmission Licence**:

(a) the **CUSC Framework Agreement**;

(b) a **Bilateral Agreement**;

(c) a **Construction Agreement**

or a variation to an existing **Bilateral Agreement** and/or **Construction Agreement**;

CUSC Framework Agreement	Has the meaning set out in **NGET's Transmission Licence**
Customer	A person to whom electrical power is provided (whether or not he is the same person as the person who provides the electrical power).
Customer Demand Management	Reducing the supply of electricity to a **Customer** or disconnecting a **Customer** in a manner agreed for commercial purposes between a **Supplier** and its **Customer**.
Customer Demand Management Notification Level	The level above which a **Supplier** has to notify **NGET** of its proposed or achieved use of **Customer Demand Management** which is 12 MW in England and Wales and 5 MW in Scotland.
Customer Generating Plant	A **Power Station** or **Generating Unit** of a **Customer** to the extent that it operates the same exclusively to supply all or part of its own electricity requirements, and does not export electrical power to any part of the **Total System**.
Data Registration Code or **DRC**	That portion of the **Grid Code** which is identified as the **Data Registration Code**.
Data Validation, **Consistency and Defaulting Rules**	The rules relating to validity and consistency of data, and default data to be applied, in relation to data submitted under the **Balancing Codes**, to be applied by **NGET** under the **Grid Code** as set out in the document "Data Validation, Consistency and Defaulting Rules" - Issue 7, dated 11th October 2004. The document is available on the National Grid website or upon request from **NGET**.
DC Converter	Any **Apparatus** with a **Completion Date** after 1 April 2005 used to convert alternating current electricity to direct current electricity, or vice-versa. A **DC Converter** is a standalone operative configuration at a single site comprising one or more converter bridges, together with one or more converter transformers, converter control equipment, essential protective and switching devices and auxiliaries, if any, used for conversion. In a bipolar arrangement, a **DC Converter** represents the bipolar configuration.
DC Converter Station	An installation comprising one or more **DC Converters** connecting a direct current interconnector: to the **NGET Transmission System;** or, (if the installation has a rating of 50MW or more) to a **User System**, and it shall form part of the **External Interconnection** to which it relates.

DC Network	All items of **Plant** and **Apparatus** connected together on the direct current side of a **DC Converter**.
De-Load	The condition in which a **Genset** has reduced or is not delivering electrical power to the **System** to which it is **Synchronised**.
Demand	The demand of MW and Mvar of electricity (i.e. both **Active** and **Reactive Power**), unless otherwise stated.
Demand Capacity	Has the meaning as set out in the **BSC**.
Demand Control	Any or all of the following methods of achieving a **Demand** reduction: (a) **Customer** voltage reduction initiated by **Network Operators** (other than following an instruction from **NGET**); (b) **Customer Demand** reduction by **Disconnection** initiated by **Network Operators** (other than following an instruction from **NGET**); (c) **Demand** reduction instructed by **NGET**; (d) automatic low **Frequency Demand Disconnection**; (e) emergency manual **Demand Disconnection**.
Demand Control Notification Level	The level above which a **Network Operator** has to notify **NGET** of its proposed or achieved use of **Demand Control** which is 12 MW in England and Wales and 5 MW in Scotland.
Designed Minimum Operating Level	The output (in whole MW) below which a **Genset** or a **DC Converter** at a **DC Converter Station** (in any of its operating configurations) has no **High Frequency Response** capability.
De-Synchronise	a) The act of taking a **Generating Unit**, **Power Park Module** or **DC Converter** off a **System** to which it has been **Synchronised**, by opening any connecting circuit breaker; or b) The act of ceasing to consume electricity at an importing **BM Unit**; and the term "**De-Synchronising**" shall be construed accordingly.
De-synchronised Island(s)	Has the meaning set out in OC9.5.1(a)
Detailed Planning Data	Detailed additional data which **NGET** requires under the **PC** in support of **Standard Planning Data**. Generally it is first supplied once a **Bilateral Agreement** is entered into.

Discrimination — The quality where a relay or protective system is enabled to pick out and cause to be disconnected only the faulty **Apparatus**.

Disconnection — The physical separation of **Users** (or **Customers**) from the **GB Transmission System** or a **User System** as the case may be.

Disputes Resolution Procedure — The procedure described in the **CUSC** relating to disputes resolution.

Distribution Code — The distribution code required to be drawn up by each **Electricity Distribution Licence** holder and approved by the **Authority**, as from time to time revised with the approval of the **Authority**.

Droop — The ratio of the steady state change in speed in the case of a **Generating Unit,** or in **Frequency** in the case of a **Power Park Module,** to the steady state change in power output of the **Generating Unit** or **Power Park Module.**

Dynamic Parameters — Those parameters listed in Appendix 1 to **BC1** under the heading **BM Unit Data** – **Dynamic Parameters**.

Earth Fault Factor — At a selected location of a three-phase **System** (generally the point of installation of equipment) and for a given **System** configuration, the ratio of the highest root mean square phase-to-earth power **Frequency** voltage on a sound phase during a fault to earth (affecting one or more phases at any point) to the root mean square phase-to-earth power **Frequency** voltage which would be obtained at the selected location without the fault.

Earthing — A way of providing a connection between conductors and earth by an **Earthing Device** which is either:

(a) Immobilised and **Locked** in the earthing position. Where the **Earthing Device** is **Locked** with a **Safety Key**, the **Safety Key** must be secured in a **Key Safe** and the **Key Safe Key** must be, where reasonably practicable, given to the authorised site representative of the **Requesting Safety Co-Ordinator** and is to be retained in safe custody. Where not reasonably practicable the **Key Safe Key** must be retained by the authorised site representative of the **Implementing Safety Co-Ordinator** in safe custody: or

(b) maintained and/or secured in position by such other method which must be in accordance with the **Local Safety Instructions** of **NGET** or the **Safety Rules** of the **Relevant Transmission Licensee** or that **User**, as the case may be.

Earthing Device — A means of providing a connection between a conductor and earth being of adequate strength and capability.

Electrical Standard	A standard listed in the Annex to the **General Conditions**.
Electricity Council	That body set up under the Electricity Act, 1957.
Electricity Distribution Licence	The licence granted pursuant to Section 6(1) (c) of the **Act.**
Electricity Supply Industry Arbitration Association	The unincorporated members' club of that name formed inter alia to promote the efficient and economic operation of the procedure for the resolution of disputes within the electricity supply industry by means of arbitration or otherwise in accordance with its arbitration rules.
Electricity Supply Licence	The licence granted pursuant to Section 6(1) (d) of the **Act.**
Electromagnetic Compatibility Level	Has the meaning set out in **Engineering Recommendation** G5/4.
Embedded	Having a direct connection to a **User System** or the **System** of any other **User** to which **Customers** and/or **Power Stations** are connected, such connection being either a direct connection or a connection via a busbar of another **User** or of a **Transmission Licensee** (but with no other connection to the **GB Transmission System**).
Embedded Development	Has the meaning set out in PC.4.4.3(a)
Embedded Development Agreement	An agreement entered into between a **Network Operator** and an **Embedded Person**, identifying the relevant site of connection to the **Network Operator's System** and setting out other site specific details in relation to that use of the **Network Operator's System**.
Embedded Person	The party responsible for a **Medium Power Station** not subject to a **Bilateral Agreement** or **DC Converter Station** not subject to a **Bilateral Agreement** connected to or proposed to be connected to a **Network Operator's System**.
Emergency Instruction	An instruction issued by **NGET** in emergency circumstances, pursuant to BC2.9, to the **Control Point** of a **User**. In the case of such instructions applicable to a **BM Unit**, it may require an action or response which is outside the **Dynamic Parameters**, **QPN** or **Other Relevant Data**, and may include an instruction to trip a **Genset**.
Engineering Recommendations	The documents referred to as such and issued by the Electricity Association or the former Electricity Council.

Estimated Registered Data	Those items of **Standard Planning Data** and **Detailed Planning Data** which either upon connection will become **Registered Data**, or which for the purposes of the **Plant** and/or **Apparatus** concerned as at the date of submission are **Registered Data**, but in each case which for the seven succeeding **Financial Years** will be an estimate of what is expected.
European Specification	A common technical specification, a **British Standard** implementing a European standard or a European technical approval. The terms "common technical specification", "European standard" and "European technical approval" shall have the meanings respectively ascribed to them in the **Regulations**.
Event	An unscheduled or unplanned (although it may be anticipated) occurrence on, or relating to, a **System** (including **Embedded Power Stations**) including, without limiting that general description, faults, incidents and breakdowns and adverse weather conditions being experienced.
Exciter	The source of the electrical power providing the field current of a synchronous machine.
Excitation System	The equipment providing the field current of a machine, including all regulating and control elements, as well as field discharge or suppression equipment and protective devices.
Excitation System No-Load Negative Ceiling Voltage	The minimum value of direct voltage that the **Excitation System** is able to provide from its terminals when it is not loaded, which may be zero or a negative value.
Excitation System Nominal Response	Shall have the meaning ascribed to that term in **IEC** 34-16-1:1991 [equivalent to **British Standard BS**4999 Section 116.1 : 1992]. The time interval applicable is the first half-second of excitation system voltage response.
Excitation System On-Load Positive Ceiling Voltage	Shall have the meaning ascribed to the term 'Excitation system on load ceiling voltage' in **IEC** 34-16-1:1991[equivalent to **British Standard BS**4999 Section 116.1 : 1992].
Excitation System No-Load Positive Ceiling Voltage	Shall have the meaning ascribed to the term 'Excitation system no load ceiling voltage' in **IEC** 34-16-1:1991[equivalent to **British Standard BS**4999 Section 116.1 : 1992].
Exemptable	Has the meaning set out in the **CUSC**.

Existing AGR Plant The following nuclear advanced gas cooled reactor plant (which was commissioned and connected to the **Total System** at the **Transfer Date**):-

Dungeness B
Hinkley Point B
Heysham 1
Heysham 2
Hartlepool
Hunterston B
Torness.

Existing AGR Plant Flexibility Limit In respect of each **Genset** within each **Existing AGR Plant** which has a safety case enabling it to so operate, 8 (or such lower number which when added to the number of instances of reduction of output as instructed by **NGET** in relation to operation in **Frequency Sensitive Mode** totals 8) instances of flexibility in any calendar year (or such lower or greater number as may be agreed by the Nuclear Installations Inspectorate and notified to **NGET**) for the purpose of assisting in the period of low **System NRAPM** and/or low **Localised NRAPM** provided that in relation to each **Generating Unit** each change in output shall not be required to be to a level where the output of the reactor is less than 80% of the reactor thermal power limit (as notified to **NGET** and which corresponds to the limit of reactor thermal power as contained in the "Operating Rules" or "Identified Operating Instructions" forming part of the safety case agreed with the Nuclear Installations Inspectorate).

Existing Gas Cooled Reactor Plant Both **Existing Magnox Reactor Plant** and **Existing AGR Plant**.

Existing Magnox Reactor Plant The following nuclear gas cooled reactor plant (which was commissioned and connected to the **Total System** at the **Transfer Date**):-

Calder Hall
Chapelcross
Dungeness A
Hinkley Point A
Oldbury-on-Severn
Bradwell
Sizewell A
Wylfa.

Export and Import Limits Those parameters listed in Appendix 1 to **BC1** under the heading **BM Unit Data** – **Export and Import Limits**.

External Interconnection **Apparatus** for the transmission of electricity to or from the **GB Transmission System** or a **User System** into or out of an **External System**. For the avoidance of doubt, a single **External Interconnection** may comprise several circuits operating in parallel.

Externally Interconnected System Operator or **EISO**	A person who operates an **External System** which is connected to the **GB Transmission System** or a **User System** by an **External Interconnection**.
External System	In relation to an **Externally Interconnected System Operator** means the transmission or distribution system which it owns or operates which is located outside **Great Britain** and any **Apparatus** or **Plant** which connects that system to the **External Interconnection** and which is owned or operated by such **Externally Interconnected System Operator**.
Fault Current Interruption Time	The time interval from fault inception until the end of the break time of the circuit breaker (as declared by the manufacturers).
Fast Start	A start by a **Genset** with a **Fast Start Capability**.
Fast Start Capability	The ability of a **Genset** to be **Synchronised** and **Loaded** up to full **Load** within 5 minutes.
Final Generation Outage Programme	An outage programme as agreed by **NGET** with each **Generator** at various stages through the **Operational Planning Phase** and **Programming Phase** which does not commit the parties to abide by it, but which at various stages will be used as the basis on which **GB Transmission System** outages will be planned.
Final Physical Notification Data	Has the meaning set out in the **BSC**.
Final Report	A report prepared by the **Test Proposer** at the conclusion of a **System Test** for submission to **NGET** (if it did not propose the **System Test**) and other members of the **Test Panel**.
Financial Year	Bears the meaning given in Condition A1 (Definitions and Interpretation) of **NGET's Transmission Licence**.
Flicker Severity (Long Term)	A value derived from 12 successive measurements of **Flicker Severity** (**Short Term**) (over a two hour period) and a calculation of the cube root of the mean sum of the cubes of 12 individual measurements, as further set out in **Engineering Recommendation** P28 as current at the **Transfer Date**.
Flicker Severity (Short Term)	A measure of the visual severity of flicker derived from the time series output of a flickermeter over a 10 minute period and as such provides an indication of the risk of **Customer** complaints.
Forecast Data	Those items of **Standard Planning Data** and **Detailed Planning Data** which will always be forecast.

Frequency	The number of alternating current cycles per second (expressed in Hertz) at which a **System** is running.
Frequency Sensitive AGR Unit	Each **Generating Unit** in an **Existing AGR Plant** for which the **Generator** has notified **NGET** that it has a safety case agreed with the Nuclear Installations Inspectorate enabling it to operate in **Frequency Sensitive Mode**, to the extent that such unit is within its **Frequency Sensitive AGR Unit Limit**. Each such **Generating Unit** shall be treated as if it were operating in accordance with BC3.5.1 provided that it is complying with its **Frequency Sensitive AGR Unit Limit**.
Frequency Sensitive AGR Unit Limit	In respect of each **Frequency Sensitive AGR Unit**, 8 (or such lower number which when added to the number of instances of flexibility for the purposes of assisting in a period of low **System** or **Localised NRAPM** totals 8) instances of reduction of output in any calendar year as instructed by **NGET** in relation to operation in **Frequency Sensitive Mode** (or such greater number as may be agreed between **NGET** and the **Generator**), for the purpose of assisting with **Frequency** control, provided the level of operation of each **Frequency Sensitive AGR Unit** in **Frequency Sensitive Mode** shall not be outside that agreed by the Nuclear Installations Inspectorate in the relevant safety case.
Frequency Sensitive Mode	A **Genset** operating mode which will result in **Active Power** output changing, in response to a change in **System Frequency**, in a direction which assists in the recovery to **Target Frequency**, by operating so as to provide **Primary Response** and/or **Secondary Response** and/or **High Frequency Response**.
Fuel Security Code	The document of that title designated as such by the **Secretary of State**, as from time to time amended.
Gas Turbine Unit	A **Generating Unit** driven by a gas turbine (for instance by an aero-engine).
Gas Zone Diagram	A single line diagram showing boundaries of, and interfaces between, gas-insulated **HV Apparatus** modules which comprise part, or the whole, of a substation at a **Connection Site**, together with the associated stop valves and gas monitors required for the safe operation of the **GB Transmission System** or the **User System**, as the case may be.
Gate Closure	Has the meaning set out in the **BSC**.

GB National Demand

The amount of electricity supplied from the **Grid Supply Points** plus:-

- that supplied by **Embedded Large Power Stations**, and
- **GB Transmission System Losses**,

minus:-

- the **Demand** taken by **Station Transformers** and **Pumped Storage Units'**

and, for the purposes of this definition, does not include:-

- any exports from the **GB Transmission System** across **External Interconnections.**

GB Transmission System

The system consisting (wholly or mainly) of high voltage electric lines owned or operated by **Transmission Licensees** within **Great Britain** and used for the transmission of electricity from one **Power Station** to a sub-station or to another **Power Station** or between sub-stations or to or from any **External Interconnection**, and includes any **Plant** and **Apparatus** and meters owned or operated by any **Transmission Licensee** within **Great Britain** in connection with the transmission of electricity but does not include any **Remote Transmission Assets**.

GB Transmission System Demand

The amount of electricity supplied from the **Grid Supply Points** plus:-

- that supplied by **Embedded Large Power Stations**, and
- exports from the **GB Transmission System** across **External Interconnections**, and
- **GB Transmission System Losses**,

and, for the purposes of this definition, includes:-

- the **Demand** taken by **Station Transformers** and **Pumped Storage Units.**

GB Transmission System Losses

The losses of electricity incurred on the **GB Transmission System**.

GB Transmission System Study Network Data File

A computer file containing details of transmission plant and **Large Power Stations** and the configuration of the connection between them, together with data on **Demand** and on the **GB Transmission System**. These details, when read together as represented in the file, form **NGET's** view of an appropriate representation of the **GB Transmission System** for technical analysis purposes only. The file will only deal with the **GB Transmission System**

GB Transmission System Warning	A warning issued by **NGET** to **Users** (or to certain **Users** only) in accordance with OC7.4.8.2, which provides information relating to **System** conditions or **Events** and is intended to : (a) alert **Users** to possible or actual **Plant** shortage, **System** problems and/or **Demand** reductions; (b) inform of the applicable period; (c) indicate intended consequences for **Users**; and (d) enable specified **Users** to be in a state of readiness to receive instructions from **NGET**.
GB Transmission System Warning - Demand Control Imminent	A warning issued by **NGET**, in accordance with OC7.4.8.7, which is intended to provide short term notice, where possible, to those **Users** who are likely to receive **Demand** reduction instructions from **NGET** within 30 minutes.
GB Transmission System Warning - High Risk of Demand Reduction	A warning issued by **NGET**, in accordance with OC7.4.8.6, which is intended to alert recipients that there is a high risk of **Demand** reduction being implemented and which may normally result from an inadequate **System Margin**.
GB Transmission System Warning - Inadequate System Margin	A warning issued by **NGET**, in accordance with OC7.4.8.5, which is intended to alert recipients of an inadequate **System Margin** and which if not improved may result in **Demand** reduction being instructed.
GB Transmission System Warning - Risk of System Disturbance	A warning issued by **NGET**, in accordance with OC7.4.8.8, which is intended to alert **Users** of the risk of widespread and serious **System** disturbance which may affect **Users**.
General Conditions or **GC**	That portion of the **Grid Code** which is identified as the **General Conditions**.
Generating Plant Demand Margin	The difference between **Output Usable** and forecast **Demand**.
Generating Unit	Unless otherwise provided in the **Grid Code**, any **Apparatus** which produces electricity, including, a **Synchronous Generating Unit** and **Non-synchronous Generating Unit**.

Generating Unit Data	The **Physical Notification**, **Export and Import Limits and Other Relevant Data** only in respect of each **Generating Unit**: (a) which forms part of the **BM Unit** which represents that **Cascade Hydro Scheme**; (b) at an **Embedded Exemptable Large Power Station**, where the relevant **Bilateral Agreement** specifies that compliance with **BC1** and/or **BC2** is required: i) to each **Generating Unit**, or ii) to each **Power Park Module** where the **Power Station** comprises **Power Park Modules**
Generation Capacity	Has the meaning set out in the **BSC**.
Generation Planning Parameters	Those parameters listed in Appendix 2 of **OC2**.
Generator	A person who generates electricity under licence or exemption under the **Act** acting in its capacity as a generator in **Great Britain**.
Generator Performance Chart	A diagram which shows the MW and Mvar capability limits within which a **Generating Unit** will be expected to operate under steady state conditions.
Genset	A **Generating Unit, Power Park Module** or **CCGT Module** at a **Large Power Station** or any **Generating Unit, Power Park Module** or **CCGT Module** which is directly connected to the **GB Transmission System**.
Good Industry Practice	The exercise of that degree of skill, diligence, prudence and foresight which would reasonably and ordinarily be expected from a skilled and experienced operator engaged in the same type of undertaking under the same or similar circumstances.
Governor Deadband	The total magnitude of the change in steady state speed (expressed as a range of Hz (± x Hz) where "x" is a numerical value) within which there is no resultant change in the position of the governing valves of the speed/load Governing System.
Great Britain or **GB**	Has the meaning set out in Schedule 1 of **NGET's Transmission Licence**.
Grid Code Review Panel or **Panel**	The panel with the functions set out in GC.4.
Grid Entry Point	A point at which a **Generating Unit** or a **CCGT Module** or a **CCGT Unit** or a **DC Converter** or **a Power Park Module**, as the case may be, which is directly connected to the **GB Transmission System** connects to the **GB Transmission System**.

Grid Supply Point	A point of supply from the **GB Transmission System** to **Network Operators** or **Non-Embedded Customers**.
Group	Those **GB Transmission System** sub-stations bounded solely by the faulted circuit(s) and the overloaded circuit(s) excluding any third party connections between the **Group** and the rest of the **GB Transmission System**, the faulted circuit(s) being a **Secured Event**.
High Frequency Response	An automatic reduction in **Active Power** output in response to an increase in **System Frequency** above the **Target Frequency** (or such other level of **Frequency** as may have been agreed in an **Ancillary Services Agreement**). This reduction in **Active Power** output must be in accordance with the provisions of the relevant **Ancillary Services Agreement** which will provide that it will be released increasingly with time over the period 0 to 10 seconds from the time of the **Frequency** increase on the basis set out in the **Ancillary Services Agreement** and fully achieved within 10 seconds of the time of the start of the **Frequency** increase and it must be sustained at no lesser reduction thereafter. The interpretation of the **High Frequency Response** to a + 0.5 Hz frequency change is shown diagrammatically in Figure CC.A.3.3.
High Voltage or **HV**	In England and Wales, a voltage exceeding 650 volts. In Scotland, a voltage exceeding 1000 volts.
HV Connections	**Apparatus** connected at the same voltage as that of the **GB Transmission System**, including **Users'** circuits, the higher voltage windings of **Users'** transformers and associated connection **Apparatus**.
HP Turbine Power Fraction	Ratio of steady state mechanical power delivered by the HP turbine to the total steady state mechanical power delivered by the total steam turbine at **Registered Capacity**.
IEC	International Electrotechnical Commission.
IEC Standard	A standard approved by the International Electrotechnical Commission.
Implementing Safety Co-ordinator	The **Safety Co-ordinator** implementing **Safety Precautions**.
Import Usable	That portion of **Registered Import Capacity** which is expected to be available and which is not unavailable due to a **Planned Outage**.

Incident Centre	A centre established by **NGET** or a **User** as the focal point in **NGET** or in that **User**, as the case may be, for the communication and dissemination of information between the senior management representatives of **NGET**, or of that **User**, as the case may be, and the relevant other parties during a **Joint System Incident** in order to avoid overloading **NGET's**, or that **User's**, as the case may be, existing operational/control arrangements.
Indicated Constraint Boundary Margin	The difference between a constraint boundary transfer limit and the difference between the sum of **BM Unit** Maximum Export Limits and the forecast of local **Demand** within the constraint boundary.
Indicated Imbalance	The difference between the sum of **Physical Notifications** for **BM Units** comprising **Generating Units** or **CCGT Modules** and the forecast of **Demand** for the whole or any part of the **System**.
Indicated Margin	The difference between the sum of **BM Unit** Maximum Export Limits submitted and the forecast of **Demand** for the whole or any part of the **System**
Instructor Facilities	A device or system which gives certain **Transmission Control Centre** instructions with an audible or visible alarm, and incorporates the means to return message acknowledgements to the **Transmission Control Centre**
Integral Equipment Test or **IET**	A test on equipment, associated with **Plant** and/or **Apparatus**, which takes place when that **Plant** and/or **Apparatus** forms part of a **Synchronised System** and which, in the reasonable judgement of the person wishing to perform the test, may cause an **Operational Effect**.
Interconnection Agreement	An agreement made between **NGET** and an **Externally Interconnected System Operator** and/or an **Interconnector User** and/or other relevant persons for the **External Interconnection** relating to an **External Interconnection** and/or an agreement under which an **Interconnector User** can use an **External Interconnection**.
Interconnector User	Has the meaning set out in the **BSC**.
Interface Agreement	Has the meaning set out in the **CUSC**.
Intermittent Power Source	The primary source of power for a **Generating Unit** that can not be considered as controllable, e.g. wind, wave or solar.
Intertripping	(a) The tripping of circuit-breaker(s) by commands initiated from **Protection** at a remote location independent of the state of the local **Protection**; or (b) **Operational Intertripping**.

Intertrip Apparatus — **Apparatus** which performs **Intertripping**.

IP Turbine Power Fraction — Ratio of steady state mechanical power delivered by the IP turbine to the total steady state mechanical power delivered by the total steam turbine at **Registered Capacity**.

Isolating Device — A device for achieving **Isolation**.

Isolation — The disconnection of **HV Apparatus** (as defined in OC8A.1.6.2 and OC8B.1.7.2) from the remainder of the **System** in which that **HV Apparatus** is situated by either of the following:

(a) an **Isolating Device** maintained in an isolating position. The isolating position must either be:

(i) maintained by immobilising and **Locking** the **Isolating Device** in the isolating position and affixing a **Caution Notice** to it. Where the **Isolating Device** is **Locked** with a **Safety Key**, the **Safety Key** must be secured in a **Key Safe** and the **Key Safe Key** must be, where reasonably practicable, given to the authorised site representative of the **Requesting Safety Co-Ordinator** and is to be retained in safe custody. Where not reasonably practicable the **Key Safe Key** must be retained by the authorised site representative of the **Implementing Safety Co-Ordinator** in safe custody; or

(ii) maintained and/or secured by such other method which must be in accordance with the **Local Safety Instructions** of **NGET** or the **Safety Rules** of the **Relevant Transmission Licensee** or that **User**, as the case may be; or

(b) an adequate physical separation which must be in accordance with and maintained by the method set out in the **Local Safety Instructions** of **NGET** or the **Safety Rules** of the **Relevant Transmission Licensee** or that **User**, as the case may be.

Joint BM Unit Data — Has the meaning set out in the **BSC**.

Joint System Incident — An **Event** wherever occurring (other than on an **Embedded Medium Power Station** or an **Embedded Small Power Station**) which, in the opinion of **NGET** or a **User**, has or may have a serious and/or widespread effect, in the case of an **Event** on a **User(s) System(s)** (other than on an **Embedded Medium Power Station** or **Embedded Small Power Station**), on the **GB Transmission System**, and in the case of an **Event** on the **GB Transmission System**, on a **User(s) System(s)** (other than on an **Embedded Medium Power Station** or **Embedded Small Power Station**).

Key Safe — A device for the secure retention of keys.

Key Safe Key

A key unique at a **Location** capable of operating a lock, other than a control lock, on a **Key Safe**.

Large Power Station

A **Power Station** which is

(A) directly connected to:

(a) **NGET's Transmission System** where such **Power Station** has a **Registered Capacity** of 100MW or more; or

(b) **SPT's Transmission System** where such **Power Station** has a **Registered Capacity** of 30MW or more; or

(c) **SHETL's Transmission System** where such **Power Station** has a **Registered Capacity** of 10MW or more;

or,

(B) **Embedded** within a **User System** (or part thereof) where such **User System** (or part thereof) is connected under normal operating conditions to:

(a) **NGET's Transmission System** and such **Power Station** has a **Registered Capacity** of 100MW or more; or

(b) **SPT's Transmission System** and such **Power Station** has a **Registered Capacity** of 30MW or more; or

(c) **SHETL's Transmission System** and such **Power Station** has a **Registered Capacity** of 10MW or more;

or,

(C) **Embedded** within a **User System** (or part thereof) where the **User System** (or part thereof) is not connected to the **GB Transmission System**, although such **Power Station** is in:

(a) **NGET's Transmission Area** where such **Power Station** has a **Registered Capacity** of 100MW or more; or

(b) **SPT's Transmission Area** where such **Power Station** has a **Registered Capacity** of 30MW or more; or

(c) **SHETL's Transmission Area** where such **Power Station** has a **Registered Capacity** of 10MW or more;

Licence

Any licence granted to **NGET** or a **Relevant Transmission Licensee** or a **User**, under Section 6 of the **Act**.

Licence Standards

Those standards set out or referred to in Condition C17 of **NGET's Transmission Licence** and/or Condition D3 of a **Relevant Transmission Licensee's Transmission Licence**.

Limited Frequency Sensitive Mode

A mode whereby the operation of the **Genset** (or **DC Converter** at a **DC Converter Station** exporting **Active Power** to the **Total System)** is **Frequency** insensitive except when the **System Frequency** exceeds 50.4Hz, from which point **Limited High Frequency Response** must be provided.

Limited High Frequency Response

A response of a **Genset** (or **DC Converter** at a **DC Converter Station** exporting **Active Power** to the **Total System)** to an increase in **System Frequency** above 50.4Hz leading to a reduction in **Active Power** in accordance with the provisions of BC3.7.2.

Load	The **Active**, **Reactive** or **Apparent Power**, as the context requires, generated, transmitted or distributed.
Loaded	Supplying electrical power to the **System**.
Load Factor	The ratio of the actual output of a **Generating Unit** to the possible maximum output of that **Generating Unit**.
Load Management Block	A block of **Demand** controlled by a **Supplier** or other party through the means of radio teleswitching or by some other means.
Local Joint Restoration Plan	A plan produced under OC9.4.7.11 detailing the agreed method and procedure by which a **Genset** at a **Black Start Station** (possibly with other **Gensets** at that **Black Start Station**) will energise part of the **Total System** and meet complementary blocks of local **Demand** so as to form a **Power Island**. In Scotland, the plan may also: cover more than one **Black Start Station**; include **Gensets** other than those at a **Black Start Station** and cover the creation of one or more **Power Islands**.
Local Safety Instructions	For safety co-ordination in England and Wales, instructions on each **User Site** and **Transmission Site**, approved by the relevant **NGET** or **User's** manager, setting down the methods of achieving the objectives of **NGET's** or the **User's Safety Rules**, as the case may be, to ensure the safety of personnel carrying out work or testing on **Plant** and/or **Apparatus** on which his **Safety Rules** apply and, in the case of a **User**, any other document(s) on a **User Site** which contains rules with regard to maintaining or securing the isolating position of an **Isolating Device**, or maintaining a physical separation or maintaining or securing the position of an **Earthing Device**.
Local Switching Procedure	A procedure produced under OC7.6 detailing the agreed arrangements in respect of carrying out of **Operational Switching** at **Connection Sites** and parts of the **GB Transmission System** adjacent to those **Connection Sites**.
Localised Negative Reserve Active Power Margin or **Localised NRAPM**	That margin of **Active Power** sufficient to allow transfers to and from a **System Constraint Group** (as the case may be) to be contained within such reasonable limit as **NGET** may determine.
Location	Any place at which **Safety Precautions** are to be applied.
Locked	A condition of **HV Apparatus** that cannot be altered without the operation of a locking device.

Locking	The application of a locking device which enables **HV Apparatus** to be **Locked**.
Low Frequency Relay	Has the same meaning as **Under Frequency Relay**.
Low Voltage or **LV**	In England and Wales a voltage not exceeding 250 volts. In Scotland, a voltage exceeding 50 voltage but not exceeding 1000 volts.
Main Protection	**Protection** equipment or system expected to have priority in initiating either a fault clearance or an action to terminate an abnormal condition in a power system.
Material Effect	An effect causing **NGET** or a **Relevant Transmission Licensee** to effect any works or to alter the manner of operation of **Transmission Plant** and/or **Transmission Apparatus** at the **Connection Site** (which term shall, in this definition and in the definition of "**Modification**" only, have the meaning ascribed thereto in the **CUSC**) or the site of connection or a **User** to effect any works or to alter the manner of operation of its **Plant** and/or **Apparatus** at the **Connection Site** or the site of connection which in either case involves that party in expenditure of more than £10,000.
Maximum Generation Service, MGS	A service utilised by **NGET** in accordance with the **CUSC** and the **Balancing Principles Statement** in operating the **Total System**.
Maximum Generation Service Agreement	An agreement between a **User** and **NGET** for the payment by **NGET** to that **User** in respect of the provision by such **User** of a **Maximum Generation Service**.
Medium Power Station	A **Power Station** which is (A) directly connected to **NGET's Transmission System** where such Power Station has a **Registered Capacity** of 50MW or more but less than 100MW; or, (B) **Embedded** within a **User System** (or part thereof) where such **User System** (or part thereof) is connected under normal operating conditions to **NGET's Transmission System** and such **Power Station** has a **Registered Capacity** of 50MW or more but less than 100MW; or, (C) **Embedded** within a **User System** (or part thereof) where the **User System** (or part thereof) is not connected to the **GB Transmission System**, although such **Power Station** is in **NGET's Transmission Area** and such **Power Station** has a **Registered Capacity** of 50MW or more but less than 100MW.
Medium Voltage or **MV**	In England and Wales a voltage exceeding 250 volts but not exceeding 650 volts.

Mills	Milling plant which supplies pulverised fuel to the boiler of a coal fired **Power Station**.
Minimum Generation	The minimum output (in whole MW) which a **Genset** can generate or **DC Converter** at a **DC Converter Station** can import or export to the **Total System** under stable operating conditions, as registered with **NGET** under the **PC** (and amended pursuant to the **PC**). For the avoidance of doubt, the output may go below this level as a result of operation in accordance with BC3.7.
Minimum Import Capacity	The minimum input (in whole MW) into a **DC Converter** at a **DC Converter Station** (in any of its operating configurations) at the **Grid Entry Point** (or in the case of an **Embedded DC Converter** at the **User System Entry Point**) at which a **DC Converter** can operate in a stable manner, as registered with **NGET** under the **PC** (and amended pursuant to the **PC**).
Modification	Any actual or proposed replacement, renovation, modification, alteration or construction by or on behalf of a **User** or **NGET** to either that **User's Plant** or **Apparatus** or **Transmission Plant** or **Apparatus**, as the case may be, or the manner of its operation which has or may have a **Material Effect** on **NGET** or a **User**, as the case may be, at a particular **Connection Site**.
Mothballed DC Converter at a **DC Converter Station**	A **DC Converter** at a **DC Converter Station** that has previously imported or exported power which the **DC Converter Station** owner plans not to use to import or export power for the remainder of the current **Financial Year** but which could be returned to service.
Mothballed Generating Unit	A **Generating Unit** that has previously generated which the **Generator** plans not to use to generate for the remainder of the current **NGET Financial Year** but which could be returned to service.
Mothballed Power Park Module	A **Power Park Module** that has previously generated which the **Generator** plans not to use to generate for the remainder of the current **Financial Year** but which could be returned to service.
Multiple Point of Connection	A double (or more) **Point of Connection**, being two (or more) **Points of Connection** interconnected to each other through the **User's System**.
Network Data	The data to be provided by **NGET** to **Users** in accordance with the **PC**, as listed in Part 3 of the Appendix to the **PC**.
Network Operator	A person with a **User System** directly connected to the **GB Transmission System** to which **Customers** and/or **Power Stations** (not forming part of the **User System**) are connected, acting in its capacity as an operator of the **User System**, but shall not include a person acting in the capacity of an **Externally Interconnected System Operator**.

NGET	National Grid Electricity Transmission plc (NO: 2366977) whose registered office is at 1-3 Strand, London, WC2N 5EH.
NGET Control Engineer	The nominated person employed by **NGET** to direct the operation of the **GB Transmission System** or such person as nominated by **NGET**.
NGET Operational Strategy	**NGET's** operational procedures which form the guidelines for operation of the **GB Transmission System**.
No-Load Field Voltage	Shall have the meaning ascribed to that term in **IEC** 34-16-1:1991 [equivalent to **British Standard BS**4999 Section 116.1 : 1992].
No System Connection	As defined in OC8A.1.6.2 and OC8B.1.7.2
Non-Embedded Customer	A **Customer** in **Great Britain**, except for a **Network Operator** acting in its capacity as such, receiving electricity direct from the **GB Transmission System** irrespective of from whom it is supplied.
Non-Synchronous Generating Unit	A **Generating Unit** that is not a **Synchronous Generating Unit** including for the avoidance of doubt a **Power Park Unit**.
Normal CCGT Module	A **CCGT Module** other than a **Range CCGT Module**.
Novel Unit	A tidal, wave, wind, geothermal, or any similar, **Generating Unit**.
OC9 De-synchronised Island Procedure	Has the meaning set out in OC9.5.4.
On-Site Generator Site	A site which is determined by the **BSC Panel** to be a Trading Unit under the **BSC** by reason of having fulfilled the Class 1 or Class 2 requirements as such terms are used in the **BSC**.
Operating Code or **OC**	That portion of the **Grid Code** which is identified as the **Operating Code**.
Operating Margin	**Contingency Reserve** plus **Operating Reserve**.
Operating Reserve	The additional output from **Large Power Stations** or the reduction in **Demand**, which must be realisable in real-time operation to respond in order to contribute to containing and correcting any **System Frequency** fall to an acceptable level in the event of a loss of generation or a loss of import from an **External Interconnection** or mismatch between generation and **Demand**.

Operation	A scheduled or planned action relating to the operation of a **System** (including an **Embedded Power Station**).
Operational Data	Data required under the **Operating Codes** and/or **Balancing Codes**.
Operational Day	The period from 0500 hours on one day to 0500 on the following day.
Operation Diagrams	Diagrams which are a schematic representation of the **HV Apparatus** and the connections to all external circuits at a **Connection Site**, incorporating its numbering, nomenclature and labelling.
Operational Effect	Any effect on the operation of the relevant other **System** which causes the **GB Transmission System** or the **System** of the other **User** or **Users**, as the case may be, to operate (or be at a materially increased risk of operating) differently to the way in which they would or may have operated in the absence of that effect.
Operational Intertripping	The automatic tripping of circuit-breakers to prevent abnormal system conditions occurring, such as over voltage, overload, **System** instability, etc. after the tripping of other circuit-breakers following power **System** fault(s) which includes **System** to **Generating Unit**, **System** to **CCGT Module, System** to **Power Park Module, System** to **DC Converter** and **System** to **Demand** intertripping schemes.
Operational Planning	Planning through various timescales the matching of generation output with forecast **GB Transmission System Demand** together with a reserve of generation to provide a margin, taking into account outages of certain **Generating Units**, of parts of the **GB Transmission System** and of parts of **User Systems** to which **Power Stations** and/or **Customers** are connected, carried out to achieve, so far as possible, the standards of security set out in **NGET's Transmission Licence**, each **Relevant Transmission Licensee's Transmission Licence** or **Electricity Distribution Licence**, as the case may be.
Operational Planning Margin	An operational planning margin set by **NGET**.
Operational Planning Phase	The period from 8 weeks to the end of the 5th year ahead of real time operation.
Operational Procedures	Management instructions and procedures, both in support of the **Safety Rules** and for the local and remote operation of **Plant** and **Apparatus**, issued in connection with the actual operation of **Plant** and/or **Apparatus** at or from a **Connection Site**.

Operational Switching	Operation of **Plant** and/or **Apparatus** to the instruction of the relevant **Control Engineer.** For the avoidance of doubt, the operation of **Transmission Plant** and/or **Apparatus** forming part of the **GB Transmission System** in England and Wales, will be to the instruction of **NGET** and in Scotland will be to the instruction of the **Relevant Transmission Licensee**.
Other Relevant Data	The data listed in BC1.4.2(f) under the heading **Other Relevant Data**
Out of Synchronism	The condition where a **System** or **Generating Unit** cannot meet the requirements to enable it to be **Synchronised**.
Output Usable or **OU**	The (daily or weekly) forecast value (in MW), at the time of the (daily or weekly) peak demand, of the maximum level at which the **Genset** can export to the **Grid Entry Point**, or in the case of **Embedded Power Stations**, to the **User System Entry Point**.
Over-excitation Limiter	Shall have the meaning ascribed to that term in **IEC** 34-16-1:1991 [equivalent to **British Standard BS**4999 Section 116.1 : 1992].
Part 1 System Ancillary Services	**Ancillary Services** which are required for **System** reasons and which must be provided by **Users** in accordance with the **Connection Conditions**. An exhaustive list of **Part 1 System Ancillary Services** is included in that part of CC.8.1 headed Part 1.
Part 2 System Ancillary Services	**Ancillary Services** which are required for **System** reasons and which must be provided by a **User** if the **User** has agreed to provide them under a **Bilateral Agreement**. A non-exhaustive list of **Part 2 System Ancillary Services** is included in that part of CC.8.1 headed Part 2.
Part Load	The condition of a **Genset**, or **Cascade Hydro Scheme** which is **Loaded** but is not running at its Maximum Export Limit.
Permit for Work for proximity work	In England and Wales, a document issued by **NGET** or a **User** in accordance with its respective **Safety Rules** to enable work to be carried out in accordance with OC8A.8 and which provides for **Safety Precautions** to be applied and maintained. An example format of **NGET**'s permit for work is attached as Appendix E to **OC8A**. In Scotland, a document issued by a **Relevant Transmission Licensee** or a **User** in accordance with its respective **Safety Rules** to enable work to be carried out in accordance with OC8B.8 and which provides for **Safety Precautions** to be applied and maintained. Example formats of the **Relevant Transmission Licensees'** permits for work are attached as Appendix E to **OC8B**.

Partial Shutdown	The same as a **Total Shutdown** except that all generation has ceased in a separate part of the **Total System** and there is no electricity supply from **External Interconnections** or other parts of the **Total System** to that part of the **Total System** and, therefore, that part of the **Total System** is shutdown, with the result that it is not possible for that part of the **Total System** to begin to function again without **NGET's** directions relating to a **Black Start**.
Phase (Voltage) Unbalance	The ratio (in percent) between the rms values of the negative sequence component and the positive sequence component of the voltage.
Physical Notification	Data that describes the **BM Participant**'s best estimate of the expected input or output of **Active Power** of a **BM Unit** and/or (where relevant) **Generating Unit**.
Planning Code or **PC**	That portion of the **Grid Code** which is identified as the **Planning Code**.
Planned Maintenance Outage	An outage of **NGET** electronic data communication facilities as provided for in CC.6.5.8 and **NGET's** associated computer facilities of which normally at least 5 days notice is given, but in any event of which at least twelve hours notice has been given by **NGET** to the **User** and which is anticipated to last no longer than 2 hours. The length of such an outage may in exceptional circumstances be extended where at least 24 hours notice has been given by **NGET** to the **User**. It is anticipated that normally any planned outage would only last around one hour.
Planned Outage	An outage of a **Large Power Station** or of part of the **GB Transmission System**, or of part of a **User System**, co-ordinated by **NGET** under **OC2**.
Plant	Fixed and movable items used in the generation and/or supply and/or transmission of electricity, other than **Apparatus**.
Point of Common Coupling	That point on the **GB Transmission System** electrically nearest to the **User** installation at which either **Demands** or **Loads** are, or may be, connected.
Point of Connection	An electrical point of connection between the **GB Transmission System** and a **User's System**.
Point of Isolation	The point on **Apparatus** (as defined in OC8A.1.6.2 and OC8B.1.7.2) at which **Isolation** is achieved.
Post-Control Phase	The period following real time operation.
Power Factor	The ratio of **Active Power** to **Apparent Power**.

Power Island	**Gensets** at an isolated **Power Station**, together with complementary local **Demand**. In Scotland a **Power Island** may include more than one **Power Station.**
Power Park Module	A collection of **Generating Units** (registered as a **Power Park Module** under the **PC**) that are powered by an **Intermittent Power Source**, joined together by a **System** with a single electrical point of connection to the **GB Transmission System** (or **User System** if **Embedded).** The connection to the **GB Transmission System** (or **User System** if **Embedded**) may include a **DC Converter.**
Power Park Module Availability Matrix	The matrix described in Appendix 1 to BC1 under the heading **Power Park Module Availability Matrix**.
Power Park Module Planning Matrix	A matrix in the form set out in Appendix 4 of OC2 showing the combination of **Power Park Units** within a **Power Park Module** which would be expected to be running under normal conditions.
Power Park Unit	A **Generating Unit** within a **Power Park Module**.
Power Station	An installation comprising one or more **Generating Units** or **Power Park Modules** (even where sited separately) owned and/or controlled by the same **Generator**, which may reasonably be considered as being managed as one **Power Station**.
Power System Stabiliser or **PSS**	Equipment controlling the **Exciter** output via the voltage regulator in such a way that power oscillations of the synchronous machines are dampened. Input variables may be speed, frequency or power (or a combination of these).
Preface	The preface to the **Grid Code** (which does not form part of the **Grid Code** and therefore is not binding).
Preliminary Notice	A notice in writing, sent by **NGET** both to all **Users** identified by it under OC12.4.2.1 and to the **Test Proposer**, notifying them of a proposed **System Test**.
Preliminary Project Planning Data	Data relating to a proposed **User Development** at the time the **User** applies for a **CUSC Contract** but before an offer is made and accepted.

Primary Response The automatic increase in **Active Power** output of a **Genset** or, as the case may be, the decrease in **Active Power Demand** in response to a **System Frequency** fall. This increase in **Active Power** output or, as the case may be, the decrease in **Active Power Demand** must be in accordance with the provisions of the relevant **Ancillary Services Agreement** which will provide that it will be released increasingly with time over the period 0 to 10 seconds from the time of the start of the **Frequency** fall on the basis set out in the **Ancillary Services Agreement** and fully available by the latter, and sustainable for at least a further 20 seconds. The interpretation of the **Primary Response** to a – 0.5 Hz frequency change is shown diagrammatically in Figure CC.A.3.2.

Programming Phase The period between **Operational Planning Phase** and the **Control Phase**. It starts at the 8 weeks ahead stage and finishes at 17:00 on the day ahead of real time.

Proposal Notice A notice submitted to **NGET** by a **User** which would like to undertake a **System Test**.

Proposal Report A report submitted by the **Test Panel** which contains:

a) proposals for carrying out a **System Test** (including the manner in which the **System Test** is to be monitored);

b) an allocation of costs (including un-anticipated costs) between the affected parties (the general principle being that the **Test Proposer** will bear the costs); and

c) such other matters as the **Test Panel** considers appropriate.

The report may include requirements for indemnities to be given in respect of claims and losses arising from a **System Test**.

Protection The provisions for detecting abnormal conditions on a **System** and initiating fault clearance or actuating signals or indications.

Protection Apparatus A group of one or more **Protection** relays and/or logic elements designated to perform a specified **Protection** function.

Pumped Storage Generator A **Generator** which owns and/or operates any **Pumped Storage Plant**.

Pumped Storage Plant The Dinorwig, Ffestiniog, Cruachan and Foyers **Power Stations**.

Pumped Storage Unit A **Generating Unit** within a **Pumped Storage Plant**.

Regulations	The Utilities Contracts Regulations 1996, as amended from time to time.
Reheater Time Constant	Determined at **Registered Capacity**, the reheater time constant will be construed in accordance with the principles of the IEEE Committee Report "Dynamic Models for Steam and Hydro Turbines in Power System Studies" published in 1973 which apply to such phrase.
Relevant Transmission Licensee	Means SP Transmission Ltd (**SPT**) in its **Transmission Area** and Scottish Hydro-Electric Transmission Ltd (**SHETL**) in its **Transmission Area**.
Remote Transmission Assets	Any **Plant** and **Apparatus** or meters owned by **NGET** which: a) are **Embedded** in a **User System** and which are not directly connected by **Plant** and/or **Apparatus** owned by **NGET** to a sub-station owned by **NGET**; and b) are by agreement between **NGET** and such **User** operated under the direction and control of such **User**.
Requesting Safety Co-ordinator	The **Safety Co-ordinator** requesting **Safety Precautions**.
Responsible Engineer/ Operator	A person nominated by a **User** to be responsible for **System** control.
Responsible Manager	A manager who has been duly authorised by a **User** or **NGET** to sign **Site Responsibility Schedules** on behalf of that **User** or **NGET**, as the case may be. For **Connection Sites** in Scotland a manager who has been duly authorised by the **Relevant Transmission Licensee** to sign **Site Responsibility Schedules** on behalf of that **Relevant Transmission Licensee**.
Re-synchronisation	The bringing of parts of the **Network Operator's User System** which have become **Out of Synchronism** with each other back into **Synchronism**, and like terms shall be construed accordingly.
Safety Co-ordinator	A person or persons nominated by **NGET** and each **User** in relation to **Connection Points** in England and Wales and/or by the **Relevant Transmission Licensee** and each **User** in relation to **Connection Points** in Scotland to be responsible for the co-ordination of **Safety Precautions** at each **Connection Point** when work (which includes testing) is to be carried out on a **System** which necessitates the provision of **Safety Precautions** on **HV Apparatus** (as defined in OC8A.1.6.2 and OC8B.1.7.2), pursuant to **OC8**.

Safety From The System	That condition which safeguards persons when work is to be carried out on or near a **System** from the dangers which are inherent in the **System**.
Safety Key	A key unique at the **Location** capable of operating a lock which will cause an **Isolating Device** and/or **Earthing Device** to be **Locked**.
Safety Log	A chronological record of messages relating to safety co-ordination sent and received by each **Safety Co-ordinator** under **OC8**.
Safety Precautions	**Isolation** and/or **Earthing**.
Safety Rules	The rules of **NGET** (in England and Wales) and the **Relevant Transmission Licensee** (in Scotland) or a **User** that seek to ensure that persons working on **Plant** and/or **Apparatus** to which the rules apply are safeguarded from hazards arising from the **System**.
Secondary Response	The automatic increase in **Active Power** output of a **Genset** or, as the case may be, the decrease in **Active Power Demand** in response to a **System Frequency** fall. This increase in **Active Power** output or, as the case may be, the decrease in **Active Power Demand** must be in accordance with the provisions of the relevant **Ancillary Services Agreement** which will provide that it will be fully available by 30 seconds from the time of the start of the **Frequency** fall and be sustainable for at least a further 30 minutes. The interpretation of the **Secondary Response** to a -0.5 Hz frequency change is shown diagrammatically in Figure CC.A.3.2.
Secretary of State	Has the same meaning as in the **Act**.
Secured Event	Has the meaning set out in the **Security and Quality of Supply Standard**.
Security and Quality of Supply Standard	The version of the document entitled 'Security and Quality of Supply Standard' established pursuant to the **Transmission Licence** in force at the time of entering into the relevant **Bilateral Agreement**.
Setpoint Voltage	The value of voltage at the **Grid Entry Point**, or **User System Entry Point** if **Embedded**, on the automatic control system steady state operating characteristic, as a percentage of the nominal voltage, at which the transfer of **Reactive Power** between a **Power Park Module**, **DC Converter** or **Non-Synchronous Generating Unit** and the **Transmission System,** or **Network Operator's** system if **Embedded**, is zero.
Settlement Period	A period of 30 minutes ending on the hour and half-hour in each hour during a day.

Seven Year Statement A statement, prepared by **NGET** in accordance with the terms of **NGET's Transmission Licence**, showing for each of the seven succeeding **Financial Years**, the opportunities available for connecting to and using the **GB Transmission System** and indicating those parts of the **GB Transmission System** most suited to new connections and transport of further quantities of electricity.

SF_6 Gas Zone A segregated zone surrounding electrical conductors within a casing containing SF_6 gas.

SHETL Scottish Hydro-Electric Transmission Limited

Shutdown The condition of a **Generating Unit** where the generator rotor is at rest or on barring.

Significant Incident An **Event** which either:

a) was notified by a **User** to **NGET** under **OC7**, and which **NGET** considers has had or may have had a significant effect on the **GB Transmission System**, and **NGET** requires the **User** to report that **Event** in writing in accordance with **OC10** and notifies the **User** accordingly; or

b) was notified by **NGET** to a **User** under **OC7**, and which that **User** considers has had or may have had a significant effect on that **User's System**, and that **User** requires **NGET** to report that **Event** in writing in accordance with the provisions of **OC10** and notifies **NGET** accordingly.

Simultaneous Tap Change A tap change implemented on the generator step-up transformers of **Synchronised Gensets**, effected by **Generators** in response to an instruction from **NGET** issued simultaneously to the relevant **Power Stations**. The instruction, preceded by advance notice, must be effected as soon as possible, and in any event within one minute of receipt from **NGET** of the instruction.

Single Line Diagram A schematic representation of a three-phase network in which the three phases are represented by single lines. The diagram shall include (but not necessarily be limited to) busbars, overhead lines, underground cables, power transformers and reactive compensation equipment. It shall also show where **Large Power Stations** are connected, and the points at which **Demand** is supplied.

Single Point of Connection A single **Point of Connection**, with no interconnection through the **User's System** to another **Point of Connection**.

Site Common Drawings Drawings prepared for each **Connection Site** which incorporate **Connection Site** layout drawings, electrical layout drawings, common protection/ control drawings and common services drawings.

Site Responsibility Schedule

A schedule containing the information and prepared on the basis of the provisions set out in Appendix 1 of the **CC**.

Slope

The ratio of the steady state change in voltage, as a percentage of the nominal voltage, to the steady state change in **Reactive Power** output, in per unit of **Reactive Power** capability. For the avoidance of doubt, the value indicates the percentage voltage reduction that will result in a 1 per unit increase in **Reactive Power** generation.

Small Power Station

A **Power Station** which is

(A) directly connected to:

(a) **NGET's Transmission System** where such **Power Station** has a **Registered Capacity** of less than 50MW; or

(b) **SPT's Transmission System** where such **Power Station** has a **Registered Capacity** of less than 30MW; or

(c) **SHETL's Transmission System** where such a **Power Station** has a **Registered Capacity** of less than 10 MW;

or,

(B) **Embedded** within a **User System** (or part thereof) where such **User System** (or part thereof) is connected under normal operating conditions to:

(a) **NGET's Transmission System** and such **Power Station** has a **Registered Capacity** of less than 50MW; or

(b) **SPT's Transmission System** and such **Power Station** has a **Registered Capacity** of less than 30MW; or

(c) **SHETL's Transmission System** and such **Power Station** has a **Registered Capacity** of less than 10MW;

or,

(C) **Embedded** within a **User System** (or part thereof) where the **User System** (or part thereof) is not connected to the **GB Transmission System**, although such Power Station is in:

(a) **NGET's Transmission Area** and such **Power Station** has a **Registered Capacity** of less than 50MW; or

(b) **SPT's Transmission Area** and such **Power Station** has a **Registered Capacity** of less than 30MW; or

(c) **SHETL's Transmission Area** and such **Power Station** has a **Registered Capacity** of less than 10MW;

Speeder Motor Setting Range

The minimum and maximum no-load speeds (expressed as a percentage of rated speed) to which the turbine is capable of being controlled, by the speeder motor or equivalent, when the **Generating Unit** terminals are on open circuit.

SPT

SP Transmission Limited

Standard Planning Data

The general data required by **NGET** under the **PC**. It is generally also the data which **NGET** requires from a new **User** in an application for a **CUSC Contract**, as reflected in the **PC**.

Start Time	The time named as such in an instruction issued by **NGET** pursuant to the **BC**s.
Start-Up	The action of bringing a **Generating Unit** from **Shutdown** to **Synchronous Speed**.
Statement of Readiness	Has the meaning set out in the **Bilateral Agreement** and/or **Construction Agreement**.
Station Board	A switchboard through which electrical power is supplied to the **Auxiliaries** of a **Power Station**, and which is supplied by a **Station Transformer**. It may be interconnected with a **Unit Board**.
Station Transformer	A transformer supplying electrical power to the **Auxiliaries** of • a **Power Station**, which is not directly connected to the **Generating Unit** terminals (typical voltage ratios being 132/11kV or 275/11kV),or • a **DC Converter Station**.
STC Committee	The committee established under the **STC**.
Steam Unit	A **Generating Unit** whose prime mover converts the heat-energy in steam to mechanical energy.
Subtransmission System	The part of a **User's System** which operates at a single transformation below the voltage of the relevant **Transmission System**.
Supergrid Voltage	Any voltage greater than 200kV.
Supplier	(a) A person supplying electricity under an **Electricity Supply Licence**; or (b) A person supplying electricity under exemption under the **Act**; in each case acting in its capacity as a supplier of electricity to **Customers** in **Great Britain**.

Surplus

A MW figure relating to a **System Zone** equal to the total **Output Usable** in the **System Zone:**

a) minus the forecast of **Active Power Demand** in the **System Zone**, and

b) minus the export limit in the case of an export limited **System Zone**,

or

plus the import limit in the case of an import limited **System Zone**,

and

c) (only in the case of a **System Zone** comprising the **GB Transmission System**) minus the **Operational Planning Margin**.

For the avoidance of doubt, a **Surplus** of more than zero in an export limited **System Zone** indicates an excess of generation in that **System Zone**; and a **Surplus** of less than zero in an import limited **System Zone** indicates insufficient generation in that **System Zone.**

Synchronised

a) The condition where an incoming **Generating Unit or Power Park Module** or **DC Converter** or **System** is connected to the busbars of another **System** so that the **Frequencies** and phase relationships of that **Generating Unit, Power Park Module**, **DC Converter** or **System**, as the case may be, and the **System** to which it is connected are identical, like terms shall be construed accordingly.

b) The condition where an importing **BM Unit** is consuming electricity.

Synchronising Generation

The amount of MW (in whole MW) produced at the moment of synchronising.

Synchronising Group

A group of two or more **Gensets**) which require a minimum time interval between their **Synchronising** or **De-Synchronising** times.

Synchronous Compensation

The operation of rotating synchronous **Apparatus** for the specific purpose of either the generation or absorption of **Reactive Power**.

Synchronous Generating Unit

A **Generating Unit** including, for the avoidance of doubt, a **CCGT Unit** in which, under all steady state conditions, the rotor rotates at a mechanical speed equal to the electrical frequency of the **GB Transmission System** divided by the number of pole pairs of the **Generating Unit** .

Synchronous Speed

That speed required by a **Generating Unit** to enable it to be **Synchronised** to a **System**.

System — Any **User System** and/or the **GB Transmission System**, as the case may be.

System Ancillary Services — Collectively **Part 1 System Ancillary Services** and **Part 2 System Ancillary Services**.

System Constraint — A limitation on the use of a **System** due to lack of transmission capacity or other **System** conditions.

System Constrained Capacity — That portion of **Registered Capacity** or **Registered Import Capacity** not available due to a **System Constraint**.

System Constraint Group — A part of the **GB Transmission System** which, because of **System Constraints**, is subject to limits of **Active Power** which can flow into or out of (as the case may be) that part.

System Fault Dependability Index or **Dp** — A measure of the ability of **Protection** to initiate successful tripping of circuit-breakers which are associated with a faulty item of **Apparatus**. It is calculated using the formula:

$$\mathbf{Dp} = 1 - F_1/A$$

Where:

A = Total number of **System** faults

F_1 = Number of **System** faults where there was a failure to trip a circuit-breaker.

System Margin — The margin in any period between

(a) the sum of Maximum Export Limits and

(b) forecast **Demand** and the **Operating Margin**,

for that period.

System Negative Reserve Active Power Margin or **System NRAPM** — That margin of **Active Power** sufficient to allow the largest loss of **Load** at any time.

System Operator - Transmission Owner Code or **STC** — Has the meaning set out in **NGET's Transmission Licence**

System Telephony	An alternative method by which a **User's Responsible Engineer/Operator** and **NGET Control Engineer(s)** speak to one and another for the purposes of control of the **Total System** in both normal operating conditions and where practicable, emergency operating conditions.
System Tests	Tests which involve simulating conditions, or the controlled application of irregular, unusual or extreme conditions, on the **Total System**, or any part of the **Total System**, but which do not include commissioning or recommissioning tests or any other tests of a minor nature.
System to Demand Intertrip Scheme	An intertrip scheme which disconnects **Demand** when a **System** fault has arisen to prevent abnormal conditions occurring on the **System**.
System to Generator Operational Intertripping	A **Balancing Service** involving the initiation by a **System to Generator Operational Intertripping Scheme** of automatic tripping of the **User's** circuit breaker(s) resulting in the tripping of **BM Unit(s)** or (where relevant) **Generating Unit(s)** comprised in a **BM Unit** to prevent abnormal system conditions occurring, such as over voltage, overload, **System** instability, etc, after the tripping of other circuit-breakers following power **System** fault(s).
System to Generator Operational Intertripping Scheme	A **System** to **Generating Unit** or **System** to **CCGT Module Intertripping Scheme** forming a condition of connection and specified in Appendix F3 of the relevant **Bilateral Agreement**, being either a **Category 1 Intertripping Scheme, Category 2 Intertripping Scheme, Category 3 Intertripping Scheme** or **Category 4 Intertripping Scheme.**
System Zone	A region of the **GB Transmission System** within a described boundary or the whole of the **GB Transmission System**, as further provided for in OC2.2.4, and the term "**Zonal**" will be construed accordingly.
Target Frequency	That **Frequency** determined by **NGET**, in its reasonable opinion, as the desired operating **Frequency** of the **Total System**. This will normally be 50.00Hz plus or minus 0.05Hz, except in exceptional circumstances as determined by **NGET**, in its reasonable opinion when this may be 49.90 or 50.10Hz. An example of exceptional circumstances may be difficulties caused in operating the **System** during disputes affecting fuel supplies.
Technical Specification	In relation to **Plant** and/or **Apparatus**, a) the relevant **European Specification**; or b) if there is no relevant **European Specification**, other relevant standards which are in common use in the European Community.
Test Co-ordinator	A person who co-ordinates **System Tests**.

Test Panel	A panel, whose composition is detailed in **OC12**, which is responsible, inter alia, for considering a proposed **System Test**, and submitting a **Proposal Report** and a **Test Programme**.
Test Programme	A programme submitted by the **Test Panel** to **NGET**, the **Test Proposer**, and each **User** identified by **NGET** under OC12.4.2.1, which states the switching sequence and proposed timings of the switching sequence, a list of those staff involved in carrying out the **System Test** (including those responsible for the site safety) and such other matters as the **Test Panel** deems appropriate.
Test Proposer	The person who submits a **Proposal Notice**.
Total Shutdown	The situation existing when all generation has ceased and there is no electricity supply from **External Interconnections** and, therefore, the **Total System** has shutdown with the result that it is not possible for the **Total System** to begin to function again without **NGET's** directions relating to a **Black Start**.
Total System	The **GB Transmission System** and all **User Systems** in **Great Britain**.
Trading Point	A commercial and, where so specified in the **Grid Code**, an operational interface between a **User** and **NGET**, which a **User** has notified to **NGET**.
Transfer Date	Such date as may be appointed by the **Secretary of State** by order under section 65 of the **Act**.
Transmission	Means, when used in conjunction with another term relating to equipment or a site, whether defined or not, that the associated term is to be read as being part of or directly associated with the **GB Transmission System**, and not of or with the **User System**.
Transmission Area	Has the meaning set out in the **Transmission Licence** of a **Transmission Licensee**.
Transmission Entry Capacity	Has the meaning set out in the **CUSC**.
Transmission Licence	A licence granted under Section 6(1)(b) of the **Act**.
Transmission Licensee	Means the holder for the time being of a **Transmission Licence**.

Transmission Site	In England and Wales, means a site owned (or occupied pursuant to a lease, licence or other agreement) by **NGET** in which there is a **Connection Point**. For the avoidance of doubt, a site owned by a **User** but occupied by **NGET** as aforesaid, is a **Transmission Site**. In Scotland, means a site owned (or occupied pursuant to a lease, licence or other agreement) by a **Relevant Transmission Licensee** in which there is a **Connection Point**. For the avoidance of doubt, a site owned by a **User** but occupied by the **Relevant Transmission Licensee** as aforesaid, is a **Transmission Site**.
Transmission System	Has the same meaning as the term "licensee's transmission system" in the **Transmission Licence** of a **Transmission Licensee**.
Turbine Time Constant	Determined at **Registered Capacity**, the turbine time constant will be construed in accordance with the principles of the IEEE Committee Report "Dynamic Models for Steam and Hydro Turbines in Power System Studies" published in 1973 which apply to such phrase.
Two Shifting Limit	The maximum number of times in any **Operational Day** that a **Genset** may **De-Synchronise**.
Unbalanced Load	The situation where the **Load** on each phase is not equal.
Under-excitation Limiter	Shall have the meaning ascribed to that term in **IEC** 34-16-1:1991 [equivalent to **British Standard BS**4999 Section 116.1 : 1992].
Under Frequency Relay	An electrical measuring relay intended to operate when its characteristic quantity (**Frequency**) reaches the relay settings by decrease in **Frequency**.
Unit Board	A switchboard through which electrical power is supplied to the **Auxiliaries** of a **Generating Unit** and which is supplied by a **Unit Transformer**. It may be interconnected with a **Station Board**.
Unit Transformer	A transformer directly connected to a **Generating Unit's** terminals, and which supplies power to the **Auxiliaries** of a **Generating Unit**. Typical voltage ratios are 23/11kV and 15/6.6Kv.
Unit Load Controller Response Time Constant	The time constant, expressed in units of seconds, of the power output increase which occurs in the **Secondary Response** timescale in response to a step change in **System Frequency**.
User	A term utilised in various sections of the **Grid Code** to refer to the persons using the **GB Transmission System**, as more particularly identified in each section of the **Grid Code** concerned. In the **Preface** and the **General Conditions** the term means any person to whom the **Grid Code** applies.

User Development

In the **PC** means either **User's Plant** and/or **Apparatus** to be connected to the **GB Transmission System**, or a **Modification** relating to a **User's Plant** and/or **Apparatus** already connected to the **GB Transmission System**, or a proposed new connection or **Modification** to the connection within the **User System**.

User Site

In England and Wales, a site owned (or occupied pursuant to a lease, licence or other agreement) by a **User** in which there is a **Connection Point**. For the avoidance of doubt, a site owned by **NGET** but occupied by a **User** as aforesaid, is a **User Site**.

In Scotland, a site owned (or occupied pursuant to a lease, licence or other agreement) by a **User** in which there is a **Connection Point**. For the avoidance of doubt, a site owned by a **Relevant Transmission Licensee** but occupied by a **User** as aforesaid, is a **User Site**.

User System

Any system owned or operated by a **User** comprising:-

(a) **Generating Units**; and/or

(b) Systems consisting (wholly or mainly) of electric lines used for the distribution of electricity from **Grid Supply Points** or **Generating Units** or other entry points to the point of delivery to **Customers**, or other **Users**;

and **Plant** and/or **Apparatus** connecting:-

(c) The system as described above; or

(d) **Non-Embedded Customers** equipment;

to the **GB Transmission System** or to the relevant other **User System**, as the case may be.

The **User System** includes any **Remote Transmission Assets** operated by such **User** or other person and any **Plant** and/or **Apparatus** and meters owned or operated by the **User** or other person in connection with the distribution of electricity but does not include any part of the **GB Transmission System**.

User System Entry Point

A point at which a **Generating Unit**, a **CCGT Module** or a **CCGT Unit** or a **Power Park Module** or a **DC Converter**, as the case may be, which is **Embedded** connects to the **User System**.

Water Time Constant

Bears the meaning ascribed to the term "Water inertia time" in **IEC**308.

Weekly ACS Conditions	Means that particular combination of weather elements that gives rise to a level of peak **Demand** within a week, taken to commence on a Monday and end on a Sunday, which has a particular chance of being exceeded as a result of weather variation alone. This particular chance is determined such that the combined probabilities of **Demand** in all weeks of the year exceeding the annual peak **Demand** under **Annual ACS Conditions** is 50%, and in the week of maximum risk the weekly peak **Demand** under **Weekly ACS Conditions** is equal to the annual peak **Demand** under **Annual ACS Conditions**.
Zonal System Security Requirements	That generation required, within the boundary circuits defining the **System Zone**, which when added to the secured transfer capability of the boundary circuits exactly matches the **Demand** within the **System Zone**.

A number of the terms listed above are defined in other documents, such as the **Balancing and Settlement Code** and the **Transmission Licence**. Appendix 1 sets out the current definitions from the other documents of those terms so used in the **Grid Code** and defined in other documents for ease of reference, but does not form part of the **Grid Code**.

2. Construction of References

In the **Grid Code**:

(i) a table of contents, a Preface, a Revision section, headings, and the Appendix to this **Glossary and Definitions** are inserted for convenience only and shall be ignored in construing the **Grid Code**;

(ii) unless the context otherwise requires, all references to a particular paragraph, sub-paragraph, Appendix or Schedule shall be a reference to that paragraph, sub-paragraph Appendix or Schedule in or to that part of the **Grid Code** in which the reference is made;

(iii) unless the context otherwise requires, the singular shall include the plural and vice versa, references to any gender shall include all other genders and references to persons shall include any individual, body corporate, corporation, joint venture, trust, unincorporated association, organisation, firm or partnership and any other entity, in each case whether or not having a separate legal personality;

(iv) references to the words "include" or "including" are to be construed without limitation to the generality of the preceding words;

(v) unless there is something in the subject matter or the context which is inconsistent therewith, any reference to an Act of Parliament or any Section of or Schedule to, or other provision of an Act of Parliament shall be construed at the particular time, as including a reference to any modification, extension or re-enactment thereof then in force and to all instruments, orders and regulations then in force and made under or deriving validity from the relevant Act of Parliament;

(vi) where the **Glossary and Definitions** refers to any word or term which is more particularly defined in a part of the **Grid Code**, the definition in that part of the **Grid Code** will prevail (unless otherwise stated) over the definition in the **Glossary & Definitions** in the event of any inconsistency;

(vii) a cross-reference to another document or part of the **Grid Code** shall not of itself impose any additional or further or co-existent obligation or confer any additional or further or co-existent right in the part of the text where such cross-reference is contained;

(viii) nothing in the **Grid Code** is intended to or shall derogate from **NGET's** statutory or licence obligations;

(ix) a "holding company" means, in relation to any person, a holding company of such person within the meaning of section 736, 736A and 736B of the Companies Act 1985 as substituted by section 144 of the Companies Act 1989 and, if that latter section is not in force at the **Transfer Date**, as if such latter section were in force at such date;

(x) a "subsidiary" means, in relation to any person, a subsidiary of such person within the meaning of section 736, 736A and 736B of the Companies Act 1985 as substituted by section 144 of the Companies Act 1989 and, if that latter section is not in force at the **Transfer Date**, as if such latter section were in force at such date;

(xi) references to time are to London time; and

(xii) (a) Save where (b) below applies, where there is a reference to an item of data being expressed in a whole number of MW, fractions of a MW below 0.5 shall be rounded down to the nearest whole MW and fractions of a MW of 0.5 and above shall be rounded up to the nearest whole MW;

(b) In the case of the definition of **Registered Capacity**, fractions of a MW below 0.05 shall be rounded down to one decimal place and fractions of a MW of 0.05 and above shall be rounded up to one decimal place.

< End of GD >

PLANNING CODE

CONTENTS

(This contents page does not form part of the Grid Code)

The above categories of **User** will become bound by the **PC** prior to them generating, operating, or consuming or importing/exporting, 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.

PC.3.2 In the case of **Embedded Power Stations** and **Embedded DC Converter Stations**, unless provided otherwise, the following provisions apply with regard to the provision of data under this **PC**:

(a) each **Generator** shall provide the data direct to **NGET** in respect of (i) **Embedded Large Power Stations,** (ii) **Embedded Medium Power Stations** subject to a **Bilateral Agreement** and (iii) **Embedded Small Power Stations** which form part of a **Cascade Hydro Scheme**;

(b) each **DC Converter** owner shall provide the data direct to **NGET** in respect of **Embedded DC Converter Stations** subject to a **Bilateral Agreement**;

(c) each **Network Operator** shall provide the data to **NGET** in respect of each **Embedded Medium Power Station** not subject to a **Bilateral Agreement** or **Embedded DC Converter Station** not subject to a **Bilateral Agreement** connected, or proposed to be connected within such **Network Operator's System**;

(d) although data is not normally required specifically on **Embedded Small Power Stations** or on **Embedded** installations of direct current converters which do not form a **DC Converter Station** under this **PC**, each **Network Operator** in whose **System** they are **Embedded** should provide the data (contained in the Appendix) to **NGET** in respect of **Embedded Small Power Stations** or **Embedded** installations of direct current converters which do not form a **DC Converter Station** if:

(i) it falls to be supplied pursuant to the application for a **CUSC Contract** or in the **Statement of Readiness** to be supplied in connection with a **Bilateral Agreement** and/or **Construction Agreement,** by the **Network Operator**; or

(ii) it is specifically requested by **NGET** in the circumstances provided for under this **PC**.

PC.3.3 Certain data does not normally need to be provided in respect of certain **Embedded Power Stations** or **Embedded DC Converter Stations**, as provided in PC.A.1.12.

In summary, **Network Operators** are required to supply the following data in respect of **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** or **Embedded DC Converter Stations** not subject to a **Bilateral Agreement** connected, or is proposed to be connected, within such **Network Operator's System**:

PC.A.2.1.1
PC.A.2.2.2
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PC.4 PLANNING PROCEDURES

PC.4.1 Pursuant to Condition C11 of **NGET's Transmission Licence**, the means by which **Users** and proposed **Users** of the **GB Transmission System** are able to assess opportunities for connecting to, and using, the **GB Transmission System** comprise two distinct parts, namely:

(a) a statement, prepared by **NGET** under its **Transmission Licence**, showing for each of the seven succeeding **Financial Years**, the opportunities available for connecting to and using the **GB Transmission System** and indicating those parts of the **GB Transmission System** most suited to new connections and transport of further quantities of electricity (the "**Seven Year Statement**"); and

(b) an offer, in accordance with its **Transmission Licence**, by **NGET** to enter into a **CUSC Contract**. A **Bilateral Agreement** is to be entered into for every **Connection Site** (and for certain **Embedded Power Stations** and **Embedded DC Converter Stations**) within the first two of the following categories and the existing **Bilateral Agreement** may be required to be varied in the case of the third category:

(i) existing **Connection Sites** (and for certain **Embedded Power Stations**) as at the **Transfer Date;**

(ii) new **Connection Sites** (and for certain **Embedded Power Stations** and for **Embedded DC Converter Stations**) with effect from the **Transfer Date**;

(iii) a **Modification** at a **Connection Site** (or in relation to the connection of certain **Embedded Power Stations** and for **Embedded DC Converter Stations** whether or not the subject of a **Bilateral Agreement**) (whether such **Connection Site** or connection exists on the **Transfer Date** or is new thereafter) with effect from the **Transfer Date**.

In this **PC**, unless the context otherwise requires, "connection" means any of these 3 categories.

parts of the **User's Subtransmission System** throughout **Great Britain** operating at a voltage greater than 50kV, and, in Scotland, also all parts of the **User's Subtransmission System** operating at a voltage greater than 30kV, which, under either intact network or **Planned Outage** conditions:-

(a) normally interconnects separate **Connection Points**, or busbars at a **Connection Point** which are normally run in separate sections; or

(b) connects **Embedded Large Power Stations,** or **Embedded Medium Power Stations**, or **Embedded DC Converter Stations** connected to the **User's Subtransmission System**, to a **Connection Point.**

At the **User's** discretion, the **Single Line Diagram** can also contain additional details of the **User's Subtransmission System** not already included above, and also details of the transformers connecting the **User's Subtransmission System** to a lower voltage. With **NGET's** agreement, the **Single Line Diagram** can also contain information about the **User's System** at a voltage below the voltage of the **Subtransmission System**.

The **Single Line Diagram** for a **Power Park Module** must include all parts of the System connecting generating equipment to the **Grid Entry Point** (or **User System Entry Point** if **Embedded**). As an alternative the **User** may choose to submit a **Single Line Diagram** with the equipment between the equivalent **Power Park Unit** and the **Common Collection Busbar** reduced to an electrically equivalent network. The format for a **Single Line Diagram** for a **Power Park Module** electrically equivalent system is shown in Appendix B.

The **Single Line Diagram** must include the points at which **Demand** data (provided under PC.A.4.3.4) and fault infeed data (provided under PC.A.2.5) are supplied.

PC.A.2.2.3 The above mentioned **Single Line Diagram** shall include:

(a) electrical circuitry (ie. overhead lines, identifying which circuits are on the same towers, underground cables, power transformers, reactive compensation equipment and similar equipment); and

(b) substation names (in full or abbreviated form) with operating voltages.

In addition, for all load current carrying **Apparatus** operating at **Supergrid Voltage** throughout **Great Britain** and, in Scotland, also at 132kV, the **Single Line Diagram** shall include:-

(a) circuit breakers

(b) phasing arrangements.

PC.A.2.2.3.1 For the avoidance of doubt, the **Single Line Diagram** to be supplied is in addition to the **Operation Diagram** supplied pursuant to CC.7.4.

PC.A.2.2.4 For each circuit shown on the **Single Line Diagram** provided under PC.A.2.2.1, each **User** shall provide the following details relating to that part of its **User System:**

Circuit Parameters:

Rated voltage (kV)
Operating voltage (kV)
Positive phase sequence reactance
Positive phase sequence resistance
Positive phase sequence susceptance
Zero phase sequence reactance (both self and mutual)
Zero phase sequence resistance (both self and mutual)
Zero phase sequence susceptance (both self and mutual)

In the case of a **Single Line Diagram** for a **Power Park Module** electrically equivalent system the data should be on a 100MVA base. Depending on the equivalent system supplied an equivalent tap changer range may need to be supplied. Similarly mutual values, rated voltage and operating voltage may be inappropriate.

PC.A.2.2.5 For each transformer shown on the **Single Line Diagram** provided under PC.A.2.2.1, each **User** shall provide the following details:

Rated MVA
Voltage Ratio
Winding arrangement
Positive sequence reactance
(max, min and nominal tap)
Positive sequence resistance
(max, min and nominal tap)
Zero sequence reactance

PC.A.2.2.5.1. In addition, for all interconnecting transformers between the **User's Supergrid Voltage System** and the **User's Subtransmission System** throughout **Great Britain** and, in Scotland, also for all interconnecting transformers between the **User's** 132kV **System** and the **User's Subtransmission System** the **User** shall supply the following information:-

Tap changer range
Tap change step size
Tap changer type: on load or off circuit
Earthing method: Direct, resistance or reactance
Impedance (if not directly earthed)

PC.A.2.2.6 Each **User** shall supply the following information about the **User's** equipment installed at a **Transmission Site**:-

(a) Switchgear. For all circuit breakers:-

Rated voltage (kV)
Operating voltage (kV)

Stations not subject to a **Bilateral Agreement** and **Embedded DC Converter Stations** not subject to a **Bilateral Agreement** within such **Network Operator's Systems** are required to submit data in accordance with PC.A.2.5.5.

PC.A.2.5.3 Where prospective short-circuit currents on equipment owned, operated or managed by **NGET** are close to the equipment rating, and in **NGET's** reasonable opinion more accurate calculations of the prospective short circuit currents are required, then **NGET** will request additional data as outlined in PC.A.6.6 below.

PC.A.2.5.4 Data from **Network Operators** and **Non-Embedded Customers**

Data is required to be provided at each node on the **Single Line Diagram** provided under PC.A.2.2.1 at which motor loads and/or **Embedded Small Power Stations** and/or **Embedded Medium Power Stations** and/or **Embedded** installations of direct current converters which do not form a **DC Converter Station** are connected, assuming a fault at that location, as follows:-

The data items listed under the following parts of PC.A.2.5.6:-

(a) (i), (ii), (iii), (iv), (v) and (vi);

and the data items shall be provided in accordance with the detailed provisions of PC.A.2.5.6(c) - (f).

PC.A.2.5.5 Data from **Generators**, **DC Converter Station** owners and from **Network Operators** in respect of **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** and **Embedded DC Converter Stations** not subject to a **Bilateral Agreement** within such **Network Operator's Systems**.

PC.A.2.5.5.1 For each **Generating Unit** with one or more associated **Unit Transformers**, the **Generator**, or the **Network Operator** in respect of **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** and **Embedded DC Converter** Stations not subject to a **Bilateral** Agreement within such **Network Operator's System** is required to provide values for the contribution of the **Power Station Auxiliaries** (including **Auxiliary Gas Turbines** or **Auxiliary Diesel Engines**) to the fault current flowing through the **Unit Transformer(s)**.

The data items listed under the following parts of PC.A.2.5.6(a) should be provided:-

(i), (ii) and (v);

(iii) if the associated **Generating Unit** step-up transformer can supply zero phase sequence current from the **Generating Unit** side to the **GB Transmission System;**

(iv) if the value is not 1.0 p.u;

and the data items shall be provided in accordance with the detailed provisions of PC.A.2.5.6(c) - (f), and with the following parts of this PC.A.2.5.5.

PC.A.2.5.5.2 Auxiliary motor short circuit current contribution and any **Auxiliary Gas Turbine Unit** contribution through the **Unit Transformers** must be represented as a combined short circuit current contribution at the **Generating Unit's** terminals, assuming a fault at that location.

PC.A.2.5.5.3 If the **Power Station** or **DC Converter Station** has separate **Station Transformers**, data should be provided for the fault current contribution from each transformer at its high voltage terminals, assuming a fault at that location, as follows:-

The data items listed under the following parts of PC.A.2.5.6

(a) (i), (ii), (iii), (iv), (v) and (vi);

and the data items shall be provided in accordance with the detailed provisions of PC.A.2.5.6(b) - (f).

PC.A.2.5.5.4 Data for the fault infeeds through both **Unit Transformers** and **Station Transformers** shall be provided for the normal running arrangement when the maximum number of **Generating Units** are **Synchronised** to the **System** or when all the **DC Converters** at a **DC Converter Station** are transferring **Rated MW** in either direction. Where there is an alternative running arrangement (or transfer in the case of a **DC Converter Station**) which can give a higher fault infeed through the **Station Transformers**, then a separate data submission representing this condition shall be made.

PC.A.2.5.5.5 Unless the normal operating arrangement within the **Power Station** is to have the **Station** and **Unit Boards** interconnected within the **Power Station**, no account should be taken of the interconnection between the **Station Board** and the **Unit Board**.

PC.A.2.5.5.6 Auxiliary motor short circuit current contribution and any auxiliary **DC Converter Station** contribution through the **Station Transformers** must be represented as a combined short circuit current contribution through the **Station Transformers.**

PC.A.2.5.5.7 For each **Power Park Module** and each type of **Power Park Unit (**eg. Doubly Fed Induction Generator)**,** including any **Auxiliaries**, positive, negative and zero sequence root mean square current values are to be provided of the contribution to the short circuit current flowing at

(i) the **Power Park Unit** terminals, or the **Common Collection Busbar** if an equivalent **Single Line Diagram** and associated data as described in PC.A.2.2.2 is provided, and
(ii) the **Grid Entry Point**, or **User System Entry Point** if **Embedded**

for the following solid faults at the **Grid Entry Point**, or **User System Entry Point** if **Embedded**:

(i) a symmetrical three phase short circuit
(ii) a single phase to earth short circuit
(iii) a phase to phase short circuit
(iv) a two phase to earth short circuit

For a **Power Park Module** in which one or more of the **Power Park Units** utilise a protective control such as a crowbar circuit, the data should indicate whether the protective control will act in each of the above cases and the effects of its action shall be included in the data. For any case in which the protective control will act, the data for the fault shall also be submitted for the limiting case in which the protective circuit will not act, which may involve the application of a non-solid fault, and the positive, negative and zero sequence retained voltages at

(i) the **Power Park Unit** terminals, or the **Common Collection Busbar** if an equivalent **Single Line Diagram** and associated data is provided and
(ii) the **Grid Entry Point**, or **User System Entry Point** if **Embedded**

in this limiting case shall be provided.

For each fault for which data is submitted, the data items listed under the following parts of PC.A.2.5.6(a) shall be provided:-

(iv), (vii), (viii), (ix), (x);

In addition, if an equivalent **Single Line Diagram** has been provided the data items listed under the following parts of PC.A.2.5.6(a) shall be provided:-

(xi), (xii), (xiii);

In addition, for a **Power Park Module** in which one or more of the **Power Park Units** utilise a protective control such as a crowbar circuit:-

the data items listed under the following parts of P.C.A.2.5.6(a) shall be provided:-

(xiv), (xv);

All of the above data items shall be provided in accordance with the detailed provisions of PC.A.2.5.6(c), (d), (f).

Should actual data in respect of fault infeeds be unavailable at the time of the application for a **CUSC Contract** or **Embedded Development Agreement**, a limited subset of the data, representing the maximum fault infeed that may result from all of the plant types being considered, shall be submitted. This data will, as a minimum, represent the root mean square of the positive, negative and zero sequence components of the fault current for both single phase and three phase solid faults at the **Grid Entry Point** (or **User System Entry Point** if **Embedded**) at the time of fault application and 50ms following fault application. Actual data in respect of fault infeeds shall be submitted to **NGET** as soon as it is available, in line with PC.A.1.2

PC.A.2.5.6 Data Items

(a) The following is the list of data utilised in this part of the **PC**. It also contains rules on the data which generally apply:-

(i) Root mean square of the symmetrical three-phase short circuit current infeed at the instant of fault, (I_1");

(ii) Root mean square of the symmetrical three-phase short circuit current after the subtransient fault current contribution has substantially decayed, (I_1');

(iii) the zero sequence source resistance and reactance values of the **User's System** as seen from the node on the **Single Line Diagram** provided under PC.A.2.2.1 (or **Station Transformer** high voltage terminals or **Generating Unit** terminals or **DC Converter** terminals, as appropriate) consistent with the infeed described in PC.A.2.5.1.(b);

(iv) root mean square of the pre-fault voltage at which the maximum fault currents were calculated;

(v) the positive sequence X/R ratio at the instant of fault;

(vi) the negative sequence resistance and reactance values of the **User's System** seen from the node on the **Single Line Diagram** provided under PC.A.2.2.1 (or **Station Transformer** high voltage terminals, or **Generating Unit** terminals or **DC Converter** terminals if appropriate) if substantially different from the values of positive sequence resistance and reactance which would be derived from the data provided above;

(vii) A continuous trace and a table showing the root mean square of the positive, negative and zero sequence components of the short circuit current between zero and 140ms at 10ms intervals;

(viii) The **Active Power** being generated pre-fault by the **Power Park Module** and by each type of **Power Park Unit**;

(ix) The reactive compensation shown explicitly on the **Single Line Diagram** that is switched in;

(x) The **Power Factor** of the **Power Park Module** and of each **Power Park Unit** type;

(xi) The positive sequence X/R ratio of the equivalent at the **Common Collection Busbar**;

(xii) The minimum zero sequence impedance of the equivalent seen from the **Common Collection Busbar**;

(xiii) The number of **Power Park Units** represented in the equivalent **Power Park Unit**;

(xiv) The additional rotor resistance and reactance (if any) that is applied to the **Power Park Unit** under a fault condition;

(xv) A continuous trace and a table showing the root mean square of the positive, negative and zero sequence components of the retained voltage at the fault point and **Power Park Unit** terminals, or the **Common Collection Busbar** if an equivalent **Single Line Diagram** and associated data as described in **PC.A.2.2.2** is provided, representing the limiting case, which may involve the application of a non-solid fault, required to not cause operation of the protective control;

(b) In considering this data, unless the **User** notifies **NGET** accordingly at the time of data submission, **NGET** will assume that the time constant of decay of the subtransient fault current corresponding to the change from I_1'' to I_1', (T'') is not significantly different from 40ms. If that assumption is not correct in relation to an item of data, the **User** must inform **NGET** at the time of submission of the data.

(c) The value for the X/R ratio must reflect the rate of decay of the d.c. component that may be present in the fault current and hence that of the sources of the initial fault current. All shunt elements and loads must therefore be deleted from any system model before the X/R ratio is calculated.

(d) In producing the data, the **User** may use "time step analysis" or "fixed-point-in-time analysis" with different impedances.

(e) If a fixed-point-in-time analysis with different impedances method is used, then in relation to the data submitted under (a) (i) above, the data will be required for "time zero" to give I_1''. The figure of 120ms is consistent with a decay time constant T'' of 40ms, and if that figure is different, then the figure of 120ms must be changed accordingly.

(f) Where a "time step analysis" is carried out, the X/R ratio may be calculated directly from the rate of decay of the d.c. component. The X/R ratio is not that given by the phase angle of the fault current if this is based on a system calculation with shunt loads, but from the Thévenin equivalent of the system impedance at the instant of fault with all non-source shunts removed.

PC.A.3 **GENERATING UNIT AND DC CONVERTER DATA**

PC.A.3.1 Introduction

Directly Connected

PC.A.3.1.1 Each **Generator** and **DC Converter Station** owner with an existing, or proposed, **Power Station** or **DC Converter Station** directly connected, or to be directly connected, to the **GB Transmission System**, shall provide **NGET** with data relating to that **Power Station** or **DC Converter Station**, both current and forecast, as specified in PC.A.3.2 to PC.A.3.4.

Embedded

PC.A.3.1.2 (a) Each **Generator** and **DC Converter Station** owner in respect of its existing, and/or proposed, **Embedded Large Power Stations** and/or **Embedded DC Converter Stations** and/or its **Embedded Medium Power Stations** subject to a **Bilateral Agreement** and each **Network Operator** in respect of its **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** and/or **Embedded DC Converter Stations** not subject to a **Bilateral Agreement** within such **Network Operator's System** in each case connected to the **Subtransmission System**, shall provide **NGET** with data relating to that **Power Station** or **DC Converter Station,** both current and forecast, as specified in PC.A.3.2 to PC.A.3.4.

(b) No data need be supplied in relation to any **Small Power Station** or any **Medium Power Station** or installations of direct current converters which do not form a **DC Converter Station,** connected at a voltage level below the voltage level of the **Subtransmission System** except:-

(i) in connection with an application for, or under, a **CUSC Contract**, or

(ii) unless specifically requested by **NGET** under PC.A.3.1.4.

PC.A.3.1.3 (a) Each **Network Operator** shall provide **NGET** with the data specified in PC.A.3.2.2(c) and PC.A.3.2.2(i).

(b) **Network Operators** need not submit planning data in respect of an **Embedded Small Power Station** unless required to do so under PC.A.1.2(b) or unless specifically requested under PC.A.3.1.4 below, in which case they will supply such data.

PC.A.3.1.4 (a) PC.A.4.2.4(b) and PC.A.4.3.2(a) explain that the forecast **Demand** submitted by each **Network Operator** must be net of the output of all **Small Power Stations** and **Medium Power Stations** and **Customer Generating Plant** and all installations of direct current converters which do not form a **DC Converter Station**, **Embedded** within that **Network Operator's System**. The **Network Operator** must inform **NGET** of the number of such **Embedded Power Stations** and such **Embedded** installations of direct current converters (including the number of **Generating Units** or **Power**

Park Modules or **DC Converters**) together with their summated capacity.

(b) On receipt of this data, the **Network Operator** or **Generator** (if the data relates to **Power Stations** referred to in PC.A.3.1.2) may be further required, at **NGET's** reasonable discretion, to provide details of **Embedded Small Power Stations** and **Embedded Medium Power Stations** and **Customer Generating Plant** and **Embedded** installations of direct current converters which do not form a **DC Converter Station**, both current and forecast, as specified in PC.A.3.2 to PC.A.3.4. Such requirement would arise where **NGET** reasonably considers that the collective effect of a number of such **Embedded Power Stations** and **Customer Generating Plants** and **Embedded** installations of direct current converters may have a significant system effect on the **GB Transmission System**.

Busbar Arrangements

PC.A.3.1.5 Where **Generating Units**, which term includes **CCGT Units** and **Power Park Modules,** and **DC Converters,** are connected to the **GB Transmission System** via a busbar arrangement which is or is expected to be operated in separate sections, the section of busbar to which each **Generating Unit, DC Converter** or **Power Park Module** is connected is to be identified in the submission.

PC.A.3.2 Output Data

PC.A.3.2.1 (a) **Large Power Stations** and **Gensets**

Data items PC.A.3.2.2 (a), (b), (c), (d), (e), (f) and (h) are required with respect to each **Large Power Station** and each **Generating Unit** and **Power Park Module** of each **Large Power Station** and for each **Genset** (although (a) is not required for **CCGT Units** and (b), (d) and (e) are not normally required for **CCGT Units** and (a), (b), (c), (d), (e), (f) and (h) are not normally required for **Power Park Units**).

(b) **Embedded Small Power Stations** and **Embedded Medium Power Stations**

Data item PC.A.3.2.2 (a) is required with respect to each **Embedded Small Power Station** and **Embedded Medium Power Station** and each **Generating Unit** and **Power Park Module** of each **Embedded Small Power Station** and **Embedded Medium Power Station** (although (a) is not required for **CCGT Units** or **Power Park Units**).

(c) **CCGT Units/Modules**

(i) Data item PC.A.3.2.2 (g) is required with respect to each **CCGT Unit**;

(ii) data item PC.A.3.2.2 (a) is required with respect to each **CCGT Module**; and

(iii) data items PC.A.3.2.2 (b), (c), (d) and (e) are required with respect to each **CCGT Module** unless **NGET** informs the relevant **User** in advance of the submission that it needs the data items with respect to each **CCGT Unit** for particular studies, in which case it must be supplied on a **CCGT Unit** basis.

Where any definition utilised or referred to in relation to any of the data items does not reflect **CCGT Units**, such definition shall be deemed to relate to **CCGT Units** for the purposes of these data items. Any **Schedule** in the DRC which refers to these data items shall be interpreted to incorporate the **CCGT Unit** basis where appropriate;

(d) **Cascade Hydro Schemes**

Data item PC.A.3.2.2(i) is required with respect to each **Cascade Hydro Scheme**.

(e) **Power Park Units/Modules**

Data items PC.A.3.2.2 (j) is required with respect to each **Power Park Module.**

(f) **DC Converters**

Data items PC.A.3.2.2 (a), (b), (c), (d) (e) (f) (h) and (i) are required with respect to each **DC Converter Station** and each **DC Converter** in each **DC Converter Station.** For installations of direct current converters which do not form a **DC Converter Station** only data item PC.A.3.2.2.(a) is required.

PC.A.3.2.2 Items (a), (b), (d), (e), (f), (g), (h), (i), (j) and (k) are to be supplied by each **Generator , DC Converter Station** owner or **Network Operator** (as the case may be) in accordance with PC.A.3.1.1, PC.A.3.1.2, PC.A.3.1.3 and PC.A.3.1.4. Item (c) is to be supplied by each **Network Operator** in all cases:-

(a) **Registered Capacity** (MW);

(b) **Output Usable** (MW) on a monthly basis;

(c) **System Constrained Capacity** (MW) ie. any constraint placed on the capacity of the **Embedded Generating Unit, Embedded Power Park Module,** or **DC Converter** at an **Embedded DC Converter Station** due to the **Network Operator's System** in which it is embedded. Where **Generating Units** (which term includes **CCGT Units**), **Power Park Modules** or **DC Converters** are connected to a

Network Operator's User System via a busbar arrangement which is or is expected to be operated in separate sections, details of busbar running arrangements and connected circuits at the substation to which the **Embedded Generating Unit**, **Embedded Power Park Module** or **Embedded DC Converter** is connected sufficient for **NGET** to determine where the **MW** generated by each **Generating Unit**, **Power Park Module** or **DC Converter** at that **Power Station** or **DC Converter Station** would appear onto the **GB Transmission System**;

(d) **Minimum Generation** (MW);

(e) MW obtainable from **Generating Units, Power Park Modules** or **DC Converters** at a **DC Converter Station** in excess of **Registered Capacity**;

(f) **Generator Performance Chart:**

(i) at the **Synchronous Generating Unit** stator terminals

(ii) at the electrical point of connection to the **GB Transmission System** (or **User System** if **Embedded**) for a **Non Synchronous Generating Unit** (excluding a **Power Park Unit), Power Park Module** and **DC Converter** at a **DC Converter Station**;

(g) a list of the **CCGT Units** within a **CCGT Module**, identifying each **CCGT Unit**, and the **CCGT Module** of which it forms part, unambiguously. In the case of a **Range CCGT Module**, details of the possible configurations should also be submitted, together:-

(i) (in the case of a **Range CCGT Module** connected to the **GB Transmission System)** with details of the single **Grid Entry Point** (there can only be one) at which power is provided from the **Range CCGT Module**;

(ii) (in the case of an **Embedded Range CCGT Module**) with details of the single **User System Entry Point** (there can only be one) at which power is provided from the **Range CCGT Module**;

Provided that, nothing in this sub-paragraph (g) shall prevent the busbar at the relevant point being operated in separate sections;

(h) expected running regime(s) at each **Power Station** or **DC Converter Station** and type of **Generating Unit**, eg. **Steam Unit**, **Gas Turbine Unit**, **Combined Cycle Gas Turbine Unit**, **Power Park Module, Novel Units** (specify by type), etc;

(i) a list of **Power Stations** and **Generating Units** within a **Cascade Hydro Scheme**, identifying each **Generating Unit** and **Power Station** and the **Cascade Hydro Scheme** of which each form part unambiguously. In addition:

(i) details of the **Grid Entry Point** at which **Active Power** is provided, or if **Embedded** the **Grid Supply Point(s)** within which the **Generating Unit** is connected;

(ii) where the **Active Power** output of a **Generating Unit** is split between more than one **Grid Supply Points** the percentage that would appear under normal and outage conditions at each **Grid Supply Point**.

(j) The following additional items are only applicable to **DC Converters** at **DC Converter Stations**.

Registered Import Capacity (MW);

Import Usable (MW) on a monthly basis;

Minimum Import Capacity (MW);

MW that may be absorbed by a **DC Converter** in excess of **Registered Import Capacity** and the duration for which this is available;

(k) the number and types of the **Power Park Units** within a **Power Park Module**, identifying each **Power Park Unit**, and the **Power Park Module** of which it forms part, unambiguously. In the case of a **Power Station** directly connected to the **GB Transmission System** with multiple **Power Park Modules** where **Power Park Units** can be selected to run in different **Power Park Modules**, details of the possible configurations should also be submitted.

PC.A.3.2.3 Notwithstanding any other provision of this PC, the **CCGT Units** within a **CCGT Module**, details of which are required under paragraph (g) of PC.A.3.2.2, can only be amended in accordance with the following provisions:-

(a) if the **CCGT Module** is a **Normal CCGT Module**, the **CCGT Units** within that **CCGT Module** can only be amended such that the **CCGT Module** comprises different **CCGT Units** if **NGET** gives its prior consent in writing. Notice of the wish to amend the **CCGT Units** within such a **CCGT Module** must be given at least 6 months before it is wished for the amendment to take effect;

(b) if the **CCGT Module** is a **Range CCGT Module**, the **CCGT Units** within that **CCGT Module** and the **Grid Entry Point** at which the power is provided can only be amended as described in BC1.A1.6.4.

PC.A.3.2.4 Notwithstanding any other provision of this **PC**, the **Power Park Units** within a **Power Park Module**, details of which are required under paragraph (j) of PC.A.3.2.2, can only be amended in accordance with the following provisions:-

(a) if the **Power Park Units** within that **Power Park Module** can only be amended such that the **Power Park Module** comprises different

Power Park Units due to repair/replacement of individual **Power Park Units** if **NGET** gives its prior consent in writing. Notice of the wish to amend a **Power Park Unit** within such a **Power Park Module** must be given at least 4 weeks before it is wished for the amendment to take effect;

(b) if the **Power Park Units** within that **Power Park Module** can be selected to run in different **Power Park Modules** as an alternative operational running arrangement the **Power Park Units** within the **Power Park Module** and the **Grid Entry Point** at which the power is provided can only be amended as described in BC1.A.1.7.4.

PC.A.3.3. Rated Parameters Data

PC.A.3.3.1 The following information is required to facilitate an early assessment, by **NGET**, of the need for more detailed studies;

(a) for all **Generating Units**(excluding **Power Park Units**) and **Power Park Modules**:

Rated MVA
Rated MW;

(b) for each **Synchronous Generating Unit**:

Short circuit ratio
Direct axis transient reactance;
Inertia constant (for whole machine), MWsecs/MVA;

(c) for each **Synchronous Generating Unit** step-up transformer:

Rated MVA
Positive sequence reactance (at max, min and nominal tap);

(d) for each **DC Converter** at a **DC Converter Station** or **DC Converter** connecting a **Power Park Module**

DC Converter type (e.g. current/voltage sourced)
Rated MW per pole for import and export
Number of poles and pole arrangement
Rated DC voltage/pole (kV)
Return path arrangement
Remote AC connection arrangement

(e) for each type of **Power Park Unit** in a **Power Park Module** not connected to the **Total System** by a **DC Converter**:

Rated MVA
Rated MW
Rated terminal voltage
Inertia constant, (MWsec/MVA)

Additionally, for **Power Park Units** that are squirrel-cage or doubly-fed induction generators driven by wind turbines:

Stator reactance.
Magnetising reactance.
Rotor resistance (at rated running)
Rotor reactance (at rated running)
The generator rotor speed range (minimum and maximum speeds in RPM) (for doubly-fed induction generators only)
Converter MVA rating (for doubly-fed induction generators only)

For a **Power Park Unit** consisting of a synchronous machine in combination with a back-to-back **DC Converter,** or for a **Power Park Unit** not driven by a wind turbine, the data to be supplied shall be agreed with **NGET** in accordance with PC.A.7.

This information should only be given in the data supplied in accordance with PC.4.4 and PC.4.5.

PC.A.3.4 General **Generating Unit Power Park Module** and **DC Converter** Data

PC.A.3.4.1 The point of connection to the **GB Transmission System** or the **Total System**, if other than to the **GB Transmission System**, in terms of geographical and electrical location and system voltage is also required.

PC.A.3.4.2 (a) Type of **Generating Unit** (ie **Synchronous Generating Unit, Non-synchronous Generating Unit , DC Converter** or **Power Park Module**).

(b) In the case of a **Synchronous Generating Unit** details of the **Exciter** category, for example whether it is a rotating **Exciter** or a static **Exciter** or in the case of a **Non-Synchronous Generating Unit** the voltage control system**.**

(c) Whether a **Power System Stabiliser** is fitted.

PC.A.4 **DEMAND** AND **ACTIVE ENERGY** DATA

PC.A.4.1 Introduction

PC.A.4.1.1 Each **User** directly connected to the **GB Transmission System** with **Demand** shall provide **NGET** with the **Demand** data, historic, current and forecast, as specified in PC.A.4.2, PC.A.4.3 and PC.A.4.5. Paragraphs PC.A.4.1.2 and PC.A.4.1.3 apply equally to **Active Energy** requirements as to **Demand** unless the context otherwise requires.

PC.A.4.1.2 Data will need to be supplied by:

(a) each **Network Operator**, in relation to **Demand** and **Active Energy** requirements on its **User System**;

(b) each **Non-Embedded Customer** (including **Pumped Storage Generators** with respect to Pumping **Demand**) in relation to its **Demand** and **Active Energy** requirements.

(c) each **DC Converter Station** owner, in relation to **Demand** and **Active Energy** transferred (imported) to its **DC Converter Station**.

Demand of **Power Stations** directly connected to the **GB Transmission System** is to be supplied by the **Generator** under PC.A.5.2.

PC.A.4.1.3 References in this **PC** to data being supplied on a half hourly basis refer to it being supplied for each period of 30 minutes ending on the hour or half-hour in each hour.

PC.A.4.2 **Demand** (**Active Power**) and **Active Energy** Data

PC.A.4.2.1 Forecast daily **Demand** (**Active Power**) profiles, as specified in (a), (b) and (c) below, in respect of each of the **User's User Systems** (each summated over all **Grid Supply Points** in each **User System**) are required for:

(a) peak day on each of the **User's User Systems** (as determined by the **User**) giving the numerical value of the maximum **Demand** (**Active Power**) that in the **Users'** opinion could reasonably be imposed on the **GB Transmission System**;

(b) day of peak **GB Transmission System Demand** (**Active Power**) as notified by **NGET** pursuant to PC.A.4.2.2;

(c) day of minimum **GB Transmission System Demand** (**Active Power**) as notified by **NGET** pursuant to PC.A.4.2.2.

In addition, the total **Demand** (**Active Power**) in respect of the time of peak **GB Transmission System Demand** in the preceding **Financial Year** in respect of each of the **User's User Systems** (each summated over all **Grid Supply Points** in each **User System**) both outturn and weather corrected shall be supplied.

PC.A.4.2.2 No later than calendar week 17 each year **NGET** shall notify each **Network Operator** and **Non-Embedded Customer** in writing of the following, for the current **Financial Year** and for each of the following seven **Financial Years,** which will, until replaced by the following year's notification, be regarded as the relevant specified days and times under PC.A.4.2.1:

a) the date and time of the annual peak of the **GB Transmission System Demand;**

b) the date and time of the annual minimum of the **GB Transmission System Demand**.

PC.A.4.2.3 The total **Active Energy** used on each of the **Network Operators'** or **Non-Embedded Customers' User Systems** (each summated over all **Grid Supply Points** in each **User System**) in the preceding **Financial Year**, both outturn and weather corrected, together with a prediction for the current financial year, is required. Each **Active Energy** submission shall be subdivided into the following categories of **Customer** tariff:

LV1
LV2
LV3
HV
EHV
Traction
Lighting

In addition, the total **User System** losses and the **Active Energy** provided by **Embedded Small Power Stations** and **Embedded Medium Power Stations** shall be supplied.

PC.A.4.2.4 All forecast **Demand** (**Active Power**) and **Active Energy** specified in PC.A.4.2.1 and PC.A.4.2.3 shall:

(a) in the case of PC.A.4.2.1(a), (b) and (c), be such that the profiles comprise average **Active Power** levels in 'MW' for each time marked half hour throughout the day;

(b) in the case of PC.A.4.2.1(a), (b) and (c), be that remaining after any deductions reasonably considered appropriate by the **User** to take account of the output profile of all **Embedded Small Power Stations** and **Embedded Medium Power Stations** and **Customer Generating Plant** and imports across **Embedded External Interconnections** including imports across **Embedded** installations of direct current converters which do not form a **DC Converter Station** and **Embedded DC Converter Stations** with a **Registered Capacity** of less than 100MW;

(c) in the case of PC.A.4.2.1(a) and (b), be based on **Annual ACS Conditions** and in the case of PC.A.4.2.1(c) and the details of the annual **Active Energy** required under PC.A.4.2.3 be based on **Average Conditions**.

PC.A.4.3 **Connection Point Demand** (**Active** and **Reactive Power**)

PC.A.4.3.1 Forecast **Demand** (**Active Power**) and **Power Factor** (values of the **Power Factor** at maximum and minimum continuous excitation may be given instead where more than 95% of the total **Demand** at a **Connection Point** is taken by synchronous motors) to be met at each are required for:

(a) the time of the maximum **Demand** (**Active Power**) at the **Connection Point** (as determined by the **User**) that in the **User's** opinion could reasonably be imposed on the **GB Transmission System**;

(b) the time of peak **GB Transmission System Demand** as provided by **NGET** under PC.A.4.2.2;

(c) the time of minimum **GB Transmission System Demand** as provided by **NGET** under PC.A.4.2.2.

PC.A.4.3.2 All forecast **Demand** specified in PC.A.4.3.1 shall:

(a) be that remaining after any deductions reasonably considered appropriate by the **User** to take account of the output of all **Embedded Small Power Stations** and **Embedded Medium Power Stations** and **Customer Generating Plant** and imports across **Embedded External Interconnections**, including **Embedded** installations of direct current converters which do not form a **DC Converter Station** and **Embedded DC Converter Stations** and such deductions should be separately stated;

(b) include any **User's System** series reactive losses but exclude any reactive compensation equipment specified in PC.A.2.4 and exclude any network susceptance specified in PC.A.2.3;

(c) in the case of PC.A.4.3.1(a) and (b) be based on **Annual ACS Conditions** and in the case of PC.A.4.3.1(c) be based on **Average Conditions**.

PC.A.4.3.3 Where two or more **Connection Points** normally run in parallel with the **GB Transmission System** under intact network conditions, and a **Single Line Diagram** of the interconnection has been provided under PC.A.2.2.2, the **User** may provide a single submission covering the aggregate **Demand** for all such **Connection Points**.

PC.A.4.3.4 Each **Single Line Diagram** provided under PC.A.2.2.2 shall include the **Demand (Active Power)** and **Power Factor** (values of the **Power Factor** at maximum and minimum continuous excitation may be given instead where more than 95% of the **Demand** is taken by synchronous motors) at the time of the peak **GB Transmission System Demand** (as provided under PC.A.4.2.2) at each node on the **Single Line Diagram**. These **Demands** shall be consistent with those provided under PC.A.4.3.1(b) above for the relevant year.

PC.A.4.3.5 So that **NGET** is able to assess the impact on the **GB Transmission System** of the diversified **GB Transmission System Demand** at various periods throughout the year, each **User** shall provide additional forecast **Demand** data as specified in PC.A.4.3.1 and PC.A.4.3.2 but with respect to times to be specified by **NGET**. However, **NGET** shall not make such a request for additional data more than once in any calendar year.

PC.A.4.4 **NGET** will assemble and derive in a reasonable manner, the forecast information supplied to it under PC.A.4.2.1, PC.A.4.3.1. and PC.A.4.3.4 above into a cohesive forecast and will use this in preparing **Forecast Demand** information in the **Seven Year Statement** and for use in **NGET's Operational Planning**. If any **User** believes that the cohesive forecast **Demand** information in the **Seven Year Statement** does not reflect its assumptions on **Demand**, it should contact **NGET** to explain its concerns and may require **NGET**, on reasonable request, to discuss these forecasts. In the absence of such expressions, **NGET** will assume that **Users** concur with **NGET's** cohesive forecast.

Demand Transfer Capability

PC.A.4.5 Where a **User's Demand** or group of **Demands (Active and Reactive Power)** may be offered by the **User** to be supplied from alternative **Connection Point(s)**, (either through non-**Transmission** interconnections or through **Demand** transfer facilities) and the **User** reasonably considers it appropriate that this should be taken into account (by **NGET**) in designing the **Connection Site** the following information is required:

(a) First Circuit (Fault) Outage Conditions

(i) the alternative **Connection Point(s)**;

(ii) the **Demand (Active and Reactive Power)** which may be transferred under the loss of the most critical circuit from or to each alternative **Connection Point** (to the nearest 5MW/5Mvar);

(iii) the arrangements (eg. manual or automatic) for transfer together with the time required to effect the transfer.

(b) Second Circuit (Planned) Outage Conditions

(i) the alternative **Connection Point(s)**;

(ii) the **Demand (Active and Reactive Power)** which may be transferred under the loss of the most critical circuit from or to each alternative **Connection Point** (to the nearest 5MW/5Mvar);

(iii) the arrangements (eg. manual or automatic) for transfer together with the time required to effect the transfer.

PC.A.4.6 Control of **Demand** or Reduction of Pumping Load Offered as Reserve

-	Magnitude of **Demand** or pumping load which is tripped	MW
-	**System Frequency** at which tripping is initiated	Hz
-	Time duration of **System Frequency** below trip setting for tripping to be initiated	s
-	Time delay from trip initiation to tripping	s

PC.A.4.7 General **Demand** Data

PC.A.4.7.1 The following information is infrequently required and should be supplied (wherever possible) when requested by **NGET**:

(a) details of any individual loads which have characteristics significantly different from the typical range of Domestic, Commercial or Industrial loads supplied;

(b) the sensitivity of the **Demand (Active and Reactive Power)** to variations in voltage and **Frequency** on the **GB Transmission System** at the time of the peak **Demand (Active Power)**. The sensitivity factors quoted for the **Demand (Reactive Power)** should relate to that given under PC.A.4.3.1 and, therefore, include any **User's System** series reactive losses but exclude any reactive compensation equipment specified in PC.A.2.4 and exclude any network susceptance specified in PC.A.2.3;

(c) details of any traction loads, e.g. connection phase pairs and continuous load variation with time;

(d) the average and maximum phase unbalance, in magnitude and phase angle, which the **User** would expect its **Demand** to impose on the **GB Transmission System**;

(e) the maximum harmonic content which the **User** would expect its **Demand** to impose on the **GB Transmission System**;

(f) details of all loads which may cause **Demand** fluctuations greater than those permitted under **Engineering Recommendation** P28, Stage 1 at a **Point of Common Coupling** including the **Flicker Severity (Short Term)** and the **Flicker Severity (Long Term)**.

PART 2

DETAILED PLANNING DATA

PC.A.5 **GENERATING UNIT, POWER PARK MODULE** AND **DC CONVERTER** DATA

PC.A.5.1 Introduction

Directly Connected

PC.A.5.1.1 Each **Generator**, with existing or proposed **Power Stations** directly connected, or to be directly connected, to the **GB Transmission System**, shall provide **NGET** with data relating to that **Plant** and **Apparatus**, both current and forecast, as specified in PC.A.5.2, PC.A.5.3 and PC.A.5.4 as applicable. Each **DC Converter Station** owner, with existing or proposed **DC Converter Stations** directly connected, or to be directly connected, to the **GB Transmission System**, shall provide **NGET** with data relating to that **Plant** and **Apparatus**, both current and forecast, as specified in PC.A.5.2 and PC.A.5.4.

Embedded

PC.A.5.1.2 Each **Generator**, in respect of its existing, or proposed, **Embedded Large Power Stations** and its **Embedded Medium Power Stations** subject to a **Bilateral Agreement** and each **Network Operator** in respect of **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** within its **System** shall provide **NGET** with data relating to each of those **Large Power Stations** and **Medium Power Stations**, both current and forecast, as specified in PC.A.5.2, PC.A.5.3 and PC.A.5.4 as applicable. Each **DC Converter Station** owner, or **Network Operator** in the case of an **Embedded DC Converter Station** not subject to a **Bilateral Agreement** within its **System** with existing or proposed **DC Converter Stations** shall provide **NGET** with data relating to each of those **DC Converter Stations**, both current and forecast, as specified in PC.A.5.2 and PC.A.5.4. However, no data need be supplied in relation to those **Embedded Medium Power Stations** or **Embedded DC Converter Stations** if they are connected at a voltage level below the voltage level of the **Subtransmission System** except in connection with an application for, or under a, **CUSC Contract** or unless specifically requested by **NGET** under PC.A.5.1.4.

PC.A.5.1.3 Each **Network Operator** need not submit **Planning Data** in respect of **Embedded Small Power Stations** unless required to do so under PC.A.1.2(b) or unless specifically requested under PC.A.5.1.4 below, in which case they will supply such data.

PC.A.5.1.4 PC.A.4.2.4(b) and PC.A.4.3.2(a) explained that the forecast **Demand** submitted by each **Network Operator** must be net of the output of all **Medium Power Stations** and **Small Power Stations** and **Customer Generating Plant Embedded** within that **User's System**. In such cases (PC.A.3.1.4 also refers), the **Network Operator** must inform **NGET** of the number of such **Power Stations** (including the number of **Generating**

Units) together with their summated capacity. On receipt of this data further details may be required at **NGET's** discretion as follows:

(i) in the case of details required from the **Network Operator** for **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** and **Embedded DC Converter Stations** not subject to a **Bilateral Agreement** and **Embedded Small Power Stations** and **Embedded DC Converters** in each case within such **Network Operator's System** and **Customer Generating Plant**; and

(ii) in the case of details required from the **Generator** of **Embedded Large Power Stations** and **Embedded Medium Power Stations** subject to a **Bilateral Agreement**; and

(iii) in the case of details required from the **DC Converter Station** owner of an **Embedded DC Converter** or **DC Converter Station** subject to a **Bilateral Agreement**.

both current and forecast, as specified in PC.A.5.2 and PC.A.5.3. Such requirement would arise when **NGET** reasonably considers that the collective effect of a number of such **Embedded Small Power Stations**, **Embedded Medium Power Stations**, **Embedded DC Converter Stations**, **DC Converters** and **Customer Generating Plants** may have a significant system effect on the **GB Transmission System**.

PC.A.5.2 **Demand**

PC.A.5.2.1 For each **Generating Unit** which has an associated **Unit Transformer**, the value of the **Demand** supplied through this **Unit Transformer** when the **Generating Unit** is at **Rated MW** output is to be provided.

PC.A.5.2.2 Where the **Power Station** or **DC Converter Station** has associated **Demand** additional to the unit-supplied **Demand** of PC.A.5.2.1 which is supplied from either the **GB Transmission System** or the **Generator's User System** the **Generator**, **DC Converter Station** owner or the **Network Operator** (in the case of **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** within its **System**), as the case may be, shall supply forecasts for each **Power Station** or **DC Converter Station** of:

a) the maximum **Demand** that, in the **User's** opinion, could reasonably be imposed on the **GB Transmission System** or the **Generator's User System** as appropriate;

b) the **Demand** at the time of the peak **GB Transmission System Demand**;

c) the **Demand** at the time of minimum **GB Transmission System Demand.**

PC.A.5.2.3 No later than calendar week 17 each year **NGET** shall notify each **Generator** in respect of its **Large Power Stations** and its **Medium Power Stations** and each **DC Converter** owner in respect of its **DC Converter**

Station subject to a **Bilateral Agreement** and each **Network Operator** in respect of each **Embedded Medium Power Station** not subject to a **Bilateral Agreement** and each **Embedded DC Converter Station** not subject to a **Bilateral Agreement** within such **Network Operator's System** in writing of the following, for the current **Financial Year** and for each of the following seven **Financial Years,** which will be regarded as the relevant specified days and times under PC.A.5.2.2:

a) the date and time of the annual peak of the **GB Transmission System Demand** at **Annual ACS Conditions;**

b) the date and time of the annual minimum of the **GB Transmission System Demand** at **Average Conditions.**

PC.A.5.2.4 At its discretion, **NGET** may also request further details of the **Demand** as specified in PC.A.4.6

PC.A.5.3 **Synchronous Generating Unit** and Associated Control System Data

PC.A.5.3.1 The data submitted below are not intended to constrain any **Ancillary Services Agreement**

PC.A.5.3.2 The following **Synchronous Generating Unit** and **Power Station** data should be supplied:

(a) **Synchronous Generating Unit** Parameters

Rated terminal volts (kV)
* Rated MVA
* **Rated MW**
* Minimum Generation MW
* Short circuit ratio
Direct axis synchronous reactance
* Direct axis transient reactance
Direct axis sub-transient reactance
Direct axis short-circuit transient time constant.
Direct axis short-circuit sub-transient time constant.
Quadrature axis synchronous reactance
Quadrature axis sub-transient reactance
Quadrature axis short-circuit sub-transient time constant.
Stator time constant
Stator leakage reactance
Armature winding direct-current resistance.

Note: The above data item relating to armature winding direct-current resistance need only be supplied with respect to **Generating Units** commissioned after 1st March 1996 and in cases where, for whatever reason, the **Generator** or the **Network Operator**, as the case may be is aware of the value of the relevant parameter.

* Turbogenerator inertia constant (MWsec/MVA)

Rated field current (amps) at **Rated MW** and Mvar output and at rated terminal voltage.

Field current (amps) open circuit saturation curve for **Generating Unit** terminal voltages ranging from 50% to 120% of rated value in 10% steps as derived from appropriate manufacturers test certificates.

(b) Parameters for **Generating Unit** Step-up Transformers

* Rated MVA
Voltage ratio
* Positive sequence reactance
(at max, min, & nominal tap)
Positive sequence resistance
(at max, min, & nominal tap)
Zero phase sequence reactance
Tap changer range
Tap changer step size
Tap changer type: on load or off circuit

(c) Excitation Control System parameters

Note: The data items requested under Option 1 below may continue to be provided in relation to **Generating Units** on the **System** at 09 January 1995 (in this paragraph, the "relevant date") or the new data items set out under Option 2 may be provided. **Generators** or **Network Operators**, as the case may be, must supply the data as set out under Option 2 (and not those under Option 1) for **Generating Unit** excitation control systems commissioned after the relevant date, those **Generating Unit** excitation control systems recommissioned for any reason such as refurbishment after the relevant date and **Generating Unit** excitation control systems where, as a result of testing or other process, the **Generator** or **Network Operator**, as the case may be, is aware of the data items listed under Option 2 in relation to that **Generating Unit**.

Option 1

DC gain of **Excitation Loop**
Rated field voltage
Maximum field voltage
Minimum field voltage
Maximum rate of change of field voltage (rising)
Maximum rate of change of field voltage (falling)

Details of **Excitation Loop** described in block diagram form showing transfer functions of individual elements.
Dynamic characteristics of **Over-excitation Limiter**.
Dynamic characteristics of **Under-excitation Limiter**

Option 2

Excitation System Nominal Response
Rated Field Voltage
No-Load Field Voltage
Excitation System On-Load Positive Ceiling Voltage
Excitation System No-Load Positive Ceiling Voltage
Excitation System No-Load Negative Ceiling Voltage

Details of **Excitation System** (including **PSS** if fitted) described in block diagram form showing transfer functions of individual elements.

Details of **Over-excitation Limiter** described in block diagram form showing transfer functions of individual elements.

Details of **Under-excitation Limiter** described in block diagram form showing transfer functions of individual elements.

(d) Governor Parameters

Incremental Droop values (in %) are required for each **Generating Unit** at six MW loading points (MLP1 to MLP6) as detailed in PC.A.5.5.1 (this data item needs only be provided for **Large Power Stations**)

Note: The data items requested under Option 1 below may continue to be provided by **Generators** in relation to **Generating Units** on the **System** at 09 January 1995 (in this paragraph, the "relevant date") or they may provide the new data items set out under Option 2. **Generators** must supply the data as set out under Option 2 (and not those under Option 1) for **Generating Unit** governor control systems commissioned after the relevant date, those **Generating Unit** governor control systems recommissioned for any reason such as refurbishment after the relevant date and **Generating Unit** governor control systems where, as a result of testing or other process, the **Generator** is aware of the data items listed under Option 2 in relation to that **Generating Unit**.

Option 1

(i) Governor Parameters (for Reheat **Steam Units**)

HP governor average gain MW/Hz

Speeder motor setting range
HP governor valve time constant
HP governor valve opening limits
HP governor valve rate limits
Reheater time constant (**Active Energy** stored in reheater)

IP governor average gain MW/Hz
IP governor setting range
IP governor valve time constant
IP governor valve opening limits
IP governor valve rate limits

Details of acceleration sensitive elements in HP & IP governor loop.
A governor block diagram showing transfer functions of individual elements.

(ii) Governor Parameters (for Non-Reheat **Steam Units** and **Gas Turbine Units**)

Governor average gain
Speeder motor setting range
Time constant of steam or fuel governor valve
Governor valve opening limits
Governor valve rate limits
Time constant of turbine
Governor block diagram

The following data items need only be supplied for **Large Power Stations:-**

(iii) Boiler & Steam Turbine Data

Boiler Time Constant (Stored **Active Energy**)
s
HP turbine response ratio:
proportion of **Primary Response**
%
arising from HP turbine.

HP turbine response ratio:
proportion of **High Frequency Response**
%
arising from HP turbine.

[End of Option 1]

Option 2

(i) Governor and associated prime mover Parameters - All **Generating Units**

Governor Block Diagram showing transfer function of individual elements including acceleration sensitive elements.
Governor Time Constant (in seconds)
Speeder Motor Setting Range (%)
Average Gain (MW/Hz)
Governor Deadband (this data item need only be provided for **Large Power Stations**)

- Maximum Setting ±Hz
- Normal Setting ±Hz
- Minimum Setting ±Hz

Where the **Generating Unit** governor does not have a selectable deadband facility, then the actual value of the deadband need only be provided

(ii) Governor and associated prime mover Parameters - **Steam Units**

HP Valve Time Constant (in seconds)
HP Valve Opening Limits (%)
HP Valve Opening Rate Limits (%/second)
HP Valve Closing Rate Limits (%/second)
HP Turbine Time Constant (in seconds)

IP Valve Time Constant (in seconds)
IP Valve Opening Limits (%)
IP Valve Opening Rate Limits (%/second)
IP Valve Closing Rate Limits (%/second)
IP Turbine Time Constant (in seconds)

LP Valve Time Constant (in seconds)
LP Valve Opening Limits (%)
LP Valve Opening Rate Limits (%/second)
LP Valve Closing Rate Limits (%/second)
LP Turbine Time Constant (in seconds)

Reheater Time Constant (in seconds)
Boiler Time Constant (in seconds)
HP Power Fraction (%)
IP Power Fraction (%)

(iii) Governor and associated prime mover Parameters - **Gas Turbine Units**

Inlet Guide Vane Time Constant (in seconds)
Inlet Guide Vane Opening Limits (%)
Inlet Guide Vane Opening Rate Limits (%/second)
Inlet Guide Vane Closing Rate Limits (%/second)

Fuel Valve Constant (in seconds)
Fuel Valve Opening Limits (%)
Fuel Valve Opening Rate Limits (%/second)
Fuel Valve Closing Rate Limits (%/second)

Waste Heat Recovery Boiler Time Constant (in seconds)

(iv) Governor and associated prime mover Parameters - Hydro Generating Units

Guide Vane Actuator Time Constant (in seconds)
Guide Vane Opening Limits (%)
Guide Vane Opening Rate Limits (%/second)
Guide Vane Closing Rate Limits (%/second)
Water Time Constant (in seconds)

[End of Option 2]

(e) Unit Control Options

The following data items need only be supplied with respect to **Large Power Stations**:

Maximum **Droop**	%
Normal **Droop**	%
Minimum **Droop**	%
Maximum **Frequency** deadband	±Hz
Normal **Frequency** deadband	±Hz
Minimum **Frequency** deadband	±Hz
Maximum output deadband	±MW
Normal output deadband	±MW
Minimum output deadband	±MW

Frequency settings between which Unit Load Controller **Droop** applies:

- Maximum	Hz
- Normal	Hz
- Minimum	Hz

State if sustained response is normally selected.

(f) Plant Flexibility Performance

The following data items need only be supplied with respect to **Large Power Stations,** and should be provided with respect to each **Genset:**

Run-up rate to **Registered Capacity,**
Run-down rate from **Registered Capacity**,
Synchronising Generation,
Regulating range
Load rejection capability while still **Synchronised** and able to supply **Load.**

Data items marked with a hash (#) should be applicable to a **Genset** which has been **Shutdown** for 48 hours.

* Data items marked with an asterisk are already requested under part 1, PC.A.3.3.1, to facilitate an early assessment by **NGET** as to whether detailed stability studies will be required before an offer of terms for a **CUSC Contract** can be made. Such data items have been repeated here merely for completeness and need not, of course, be resubmitted unless their values, known or estimated, have changed.

PC.A.5.4 **Non-Synchronous Generating Unit** and Associated Control System Data

PC.A.5.4.1 The data submitted below are not intended to constrain any **Ancillary Services Agreement**

PC.A.5.4.2 The following **Power Park Unit, Power Park Module** and **Power Station** data should be supplied in the case of a **Power Park Module** not connected to the **Total System** by a **DC Converter**:

(a) **Power Park Unit** model

A mathematical model of each type of **Power Park Unit** capable of representing its transient and dynamic behaviour under both small and large disturbance conditions. The model shall include non-linear effects and represent all equipment relevant to the dynamic performance of the **Power Park Unit** as agreed with **NGET**. The model shall be suitable for the study of balanced, root mean square, positive phase sequence time-domain behaviour, excluding the effects of electromagnetic transients, harmonic and sub-harmonic frequencies.

The model shall accurately represent the overall performance of the **Power Park Unit** over its entire operating range including that which is inherent to the **Power Park Unit** and that which is achieved by use of supplementary control systems providing either continuous or stepwise control. Model resolution should be sufficient to accurately represent **Power Park Unit** behaviour both in response to operation of transmission system protection and in the context of longer-term simulations.

The overall structure of the model shall include:
(i) any supplementary control signal modules not covered by (c), (d) and (e) below.
(ii) any blocking, deblocking and protective trip features that are part of

the **Power Park Unit** (e.g. “crowbar”).

(iii) any other information required to model the **Power Park Unit** behaviour to meet the model functional requirement described above.

The model shall be submitted in the form of a transfer function block diagram and may be accompanied by dynamic and algebraic equations. This model shall display all the transfer functions and their parameter values, any non wind-up logic, signal limits and non-linearities.

The submitted **Power Park Unit** model shall have been validated and this shall be confirmed by the **Generator**. The validation shall be based on comparing the submitted model simulation results against measured test results. Validation evidence shall also be submitted and this shall include the simulation and measured test results. The latter shall include appropriate short-circuit tests. In the case of an **Embedded Medium Power Station** not subject to a **Bilateral Agreement** the **Network Operator** will provide **NGET** with the validation evidence if requested by **NGET**.

(b) **Power Park Unit** parameters

* Rated MVA
* **Rated MW**
* Rated terminal voltage
* Average site air density (kg/m^3), maximum site air density (kg/m^3) and minimum site air density (kg/m^3) for the year
  Year for which the air density is submitted
  Number of pole pairs
  Blade swept area (m^2)
  Gear box ratio

Mechanical drive train

For each **Power Park Unit**, details of the parameters of the drive train represented as an equivalent two mass model should be provided. This model should accurately represent the behaviour of the complete drive train for the purposes of power system analysis studies and should include the following data items:-

Equivalent inertia constant (MWsec/MVA) of the first mass (e.g. wind turbine rotor and blades) at minimum, synchronous and rated speeds
Equivalent inertia constant (MWsec/MVA) of the second mass (e.g. generator rotor) at minimum, synchronous and rated speeds
Equivalent shaft stiffness between the two masses (Nm/electrical radian)

Additionally, for **Power Park Units** that are induction generators (e.g. squirrel cage, doubly-fed) driven by wind turbines:

* Stator resistance
* Stator reactance
* Magnetising reactance.
* Rotor resistance.(at starting)
* Rotor resistance.(at rated running)
* Rotor reactance (at starting)
* Rotor reactance (at rated running)

Additionally for doubly-fed induction generators only:

The generator rotor speed range (minimum and maximum speeds in RPM)

The optimum generator rotor speed versus wind speed submitted in tabular format

Power converter rating (MVA)

The rotor power coefficient (C_p) versus tip speed ratio (λ) curves for a range of blade angles (where applicable) together with the corresponding values submitted in tabular format. The tip speed ratio (λ) is defined as $\Omega R/U$ where Ω is the angular velocity of the rotor, R is the radius of the wind turbine rotor and U is the wind speed.

The electrical power output versus generator rotor speed for a range of wind speeds over the entire operating range of the **Power Park Unit**, together with the corresponding values submitted in tabular format.

The blade angle versus wind speed curve together with the corresponding values submitted in tabular format.

The electrical power output versus wind speed over the entire operating range of the **Power Park Unit**, together with the corresponding values submitted in tabular format. Transfer function block diagram, including parameters and description of the operation of the power electronic converter and fault ride through capability (where applicable).

For a **Power Park Unit** consisting of a synchronous machine in combination with a back to back **DC Converter,** or for a **Power Park Unit** not driven by a wind turbine, the data to be supplied shall be agreed with **NGET** in accordance with PC.A.7.

(c) Torque / speed and blade angle control systems and parameters

For the **Power Park Unit**, details of the torque / speed controller and blade angle controller in the case of a wind turbine and power limitation functions (where applicable) described in block diagram form showing transfer functions and parameters of individual elements.

(d) Voltage/**Reactive Power**/**Power Factor** control system parameters

For the **Power Park Unit** and **Power Park Module** details of voltage/**Reactive Power**/**Power Factor** controller (and **PSS** if fitted) described in block diagram form showing transfer functions and parameters of individual elements.

(e) **Frequency** control system parameters

For the **Power Park Unit** and **Power Park Module** details of the **Frequency** controller described in block diagram form showing transfer functions and parameters of individual elements.

(f) Protection

Details of settings for the following protection relays (to include): Under **Frequency**, over **Frequency**, under voltage, over voltage, rotor over current, stator over current, high wind speed shut down level.

(g) Complete **Power Park Unit** model, parameters and controls

An alternative to PC.A.5.4.2 (a), (b), (c), (d), (e) and (f), is the submission of a single complete model that consists of the full information required under PC.A.5.4.2 (a), (b), (c), (d), (e) and (f) provided that all the information required under PC.A.5.4.2 (a), (b), (c), (d), (e) and (f) individually is clearly identifiable.

(h) Harmonic and flicker parameters

When connecting a **Power Park Module**, it is necessary for **NGET** to evaluate the production of flicker and harmonics on **NGET** and **User's Systems**. At **NGET's** reasonable request, the **User** (a **Network Operator** in the case of an **Embedded Power Park Module** not subject to a **Bilateral Agreement**) is required to submit the following data (as defined in IEC 61400-21 (2001)) for each **Power Park Unit**:-

Flicker coefficient for continuous operation.
Flicker step factor.
Number of switching operations in a 10 minute window.
Number of switching operations in a 2 hour window.
Voltage change factor.
Current Injection at each harmonic for each **Power Park Unit** and for each **Power Park Module**

* Data items marked with an asterisk are already requested under part 1, PC.A.3.3.1, to facilitate an early assessment by **NGET** as to whether detailed stability studies will be required before an offer of terms for a **CUSC Contract** can be made. Such data items have been repeated here merely for completeness and need not, of course, be resubmitted unless their values, known or estimated, have changed.

PC.A.5.4.3 **DC Converter**

PC.A.5.4.3.1 For a **DC Converter** at a **DC Converter Station** or a **Power Park Module** connected to the **Total System** by a **DC Converter** the following information for each **DC Converter** and **DC Network** should be supplied:

(a) **DC Converter** parameters
* **Rated MW** per pole for transfer in each direction;
* **DC Converter** type (i.e. current or voltage source);
* Number of poles and pole arrangement;
* Rated DC voltage/pole (kV);
* Return path arrangement;

(b) **DC Converter** transformer parameters
Rated MVA
Nominal primary voltage (kV);
Nominal secondary (converter-side) voltage(s) (kV);
Winding and earthing arrangement;
Positive phase sequence reactance at minimum, maximum and nominal tap;
Positive phase sequence resistance at minimum, maximum and nominal tap;
Zero phase sequence reactance;
Tap-changer range in %;
number of tap-changer steps;

(c) **DC Network** parameters
Rated DC voltage per pole;
Rated DC current per pole;
Single line diagram of the complete **DC Network**;
Details of the complete **DC Network**, including resistance, inductance and capacitance of all DC cables and/or DC lines;
Details of any DC reactors (including DC reactor resistance), DC capacitors and/or DC-side filters that form part of the **DC Network**;

(d) AC filter reactive compensation equipment parameters

Note: The data provided pursuant to this paragraph must not include any contribution from reactive compensation plant owned by **NGET.**

Total number of AC filter banks.
Type of equipment (e.g. fixed or variable)
Single line diagram of filter arrangement and connections;
Reactive Power rating for each AC filter bank ,capacitor bank or operating range of each item of reactive compensation equipment, at rated voltage;
Performance chart showing **Reactive Power** capability of the **DC Converter,** as a function of MW transfer, with all filters and reactive compensation plant, belonging to the **DC Converter Station** working correctly.

Note: Details in PC.A.5.4.3.1 are required for each **DC Converter** connected to the **DC Network**, unless each is identical or where the data has already been submitted for an identical **DC Converter** at another **Connection Point**.

Note: For a **Power Park Module** connected to the **Grid Entry point** or (**User System Entry Point** if **Embedded**) by a **DC Converter** the equivalent inertia and fault infeed at the **Power Park Unit** should be given.

DC Converter control system models

PC.A.5.4.3.2 The following data is required by **NGET** to represent **DC Converters** and associated **DC Networks** in dynamic power system simulations, in which the AC power system is typically represented by a positive sequence equivalent. **DC Converters** are represented by simplified equations and are not modeled to switching device level.

(i) Static V_{DC}-I_{DC} (DC voltage - DC current) characteristics, for both the rectifier and inverter modes for a current source converter. Static V_{DC}-P_{DC} (DC voltage - DC power) characteristics, for both the rectifier and inverter modes for a voltage source converter. Transfer function block diagram including parameters representation of the control systems of each **DC Converter** and of the **DC Converter Station**, for both the rectifier and inverter modes. A suitable model would feature the **DC Converter** firing angle as the output variable.

(ii) Transfer function block diagram representation including parameters of the **DC Converter** transformer tap changer control systems, including time delays

(iii) Transfer function block diagram representation including parameters of AC filter and reactive compensation equipment control systems, including any time delays.

(iv) Transfer function block diagram representation including parameters of any **Frequency** and/or load control systems.

(v) Transfer function block diagram representation including parameters of any small signal modulation controls such as power oscillation damping controls or sub-synchronous oscillation damping controls, that have not been submitted as part of the above control system data

(vi) Transfer block diagram representation of the **Reactive Power** control at converter ends for a voltage source converter.

Plant Flexibility Performance

PC.A.5.4.3.3 The following information on plant flexibility and performance should be supplied:

(i) Nominal and maximum (emergency) loading rate with the **DC Converter** in rectifier mode.

(ii) Nominal and maximum (emergency) loading rate with the **DC Converter** in inverter mode.

(iii) Maximum recovery time, to 90% of pre-fault loading, following an AC system fault or severe voltage depression.

(iv) Maximum recovery time, to 90% of pre-fault loading, following a transient **DC Network** fault.

PC.A.5.4.3.4 Harmonic Assessment Information

DC Converter owners shall provide such additional further information as required by **NGET** in order that compliance with CC.6.1.5 can be demonstrated.

* Data items marked with an asterisk are already requested under part 1, PC.A.3.3.1, to facilitate an early assessment by **NGET** as to whether detailed stability studies will be required before an offer of terms for a **CUSC Contract** can be made. Such data items have been repeated here merely for completeness and need not, of course, be resubmitted unless their values, known or estimated, have changed.

PC.A.5.5 Response data for **Frequency** changes

The information detailed below is required to describe the actual frequency response capability profile as illustrated in Figure CC.A.3.1 of the **Connection Conditions,** and need only be provided for each:

(i) **Genset** at **Large Power Stations**; and
(ii) **Generating Unit**, **Power Park Module** or **CCGT Module** at a **Medium Power Station** or **DC Converter Station** that has agreed to provide **Frequency** response in accordance with a **CUSC Contract**.

In the case of (ii) above for the rest of this PC.A.5.5 where reference is made to **Gensets**, it shall include such **Generating Units**, **CCGT Modules**, **Power Park Modules** and **DC Converters** as appropriate.

In this **PC.A.5.5**, for a **CCGT Module** with more than one **Generating Unit**, the phrase **Minimum Generation** applies to the entire **CCGT Module** operating with all **Generating Units Synchronised** to the **System**. Similarly for a **Power Park Module** with more than one **Power Park Unit**, the phrase **Minimum Generation** applies to the entire **Power Park Module** operating with all **Power Park Units Synchronised** to the

System.

PC.A.5.5.1 MW loading points at which data is required

Response values are required at six MW loading points (MLP1 to MLP6) for each **Genset**. **Primary** and **Secondary Response** values need not be provided for MW loading points which are below **Minimum Generation**. MLP1 to MLP6 must be provided to the nearest MW.

Prior to the **Genset** being first **Synchronised**, the MW loading points must take the following values :-

MLP1	**Designed Minimum Operating Level**
MLP2	**Minimum Generation**
MLP3	70% of **Registered Capacity**
MLP4	80% of **Registered Capacity**
MLP5	95% of **Registered Capacity**
MLP6	**Registered Capacity**

When data is provided after the **Genset** is first **Synchronised**, the MW loading points may take any value between **Designed Minimum Operating Level** and **Registered Capacity** but the value of the **Designed Minimum Operating Level** must still be provided if it does not form one of the MW loading points.

PC.A.5.5.2 **Primary** and **Secondary Response** to **Frequency** fall

Primary and **Secondary Response** values for a -0.5Hz ramp are required at six MW loading points (MLP1 to MLP6) as detailed above

PC.A.5.5.3 **High Frequency Response** to **Frequency** rise

High Frequency Response values for a +0.5Hz ramp are required at six MW loading points (MLP1 to MLP6) as detailed above.

PC.A.5.6 **Mothballed Generating Unit Mothballed Power Park Module** or **Mothballed DC Converter** at a **DC Converter Station** and Alternative Fuel Information

Data identified under this section PC.A.5.6 must be submitted as required under PC.A.1.2 and at **NGET**'s reasonable request.

In the case of **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** and **Embedded DC Converter Stations** not subject to a **Bilateral Agreement**, upon request from **NGET** each **Network Operator** shall provide the information required in PC.A.5.6.1, PC.A.5.6.2, PC.A.5.6.3 and PC.A.5.6.4 on respect of such **Embedded Medium Power Stations** and **Embedded DC Converters Stations** with their **System**.

PC.A.5.6.1 **Mothballed Generating Unit** Information

Generators and **DC Converter Station** owners must supply with respect to each **Mothballed Generating Unit, Mothballed Power Park Module** or **Mothballed DC Converter** at a **DC Converter Station** the estimated MW

output which could be returned to service within the following time periods from the time that a decision to return was made:

< 1 month;

1-2 months;

2-3 months;

3-6 months;

6-12 months; and

>12 months.

The return to service time should be determined in accordance with **Good Industry Practice** assuming normal working arrangements and normal plant procurement lead times. The MW output values should be the incremental values made available in each time period as further described in the **DRC**.

PC.A.5.6.2 **Generators** and **DC Converter Station** owners must also notify **NGET** of any significant factors which may prevent the **Mothballed Generating Unit, Mothballed Power Park Module** or **Mothballed DC Converter** at a **DC Converter Station** achieving the estimated values provided under PC.A.5.6.1 above, excluding factors relating to **Transmission Entry Capacity**.

PC.A.5.6.3 Alternative Fuel Information

The following data items must be supplied with respect to each **Generating Unit** whose main fuel is gas.

For each alternative fuel type (if facility installed):

(a) Alternative fuel type e.g. oil distillate, alternative gas supply

(b) For the changeover from main to alternative fuel:

- Time to carry out off-line and on-line fuel changeover (minutes).
- Maximum output following off-line and on-line changeover (MW).
- Maximum output during on-line fuel changeover (MW).
- Maximum operating time at full load assuming typical and maximum possible stock levels (hours).
- Maximum rate of replacement of depleted stocks (MWh electrical/day) on the basis of **Good Industry Practice.**
- Is changeover to alternative fuel used in normal operating arrangements?

- Number of successful changeovers carried out in the last **NGET Financial Year** (choice of 0, 1-5, 6-10, 11-20, >20).

(c) For the changeover back to main fuel:

- Time to carry out off-line and on-line fuel changeover (minutes).

- Maximum output during on-line fuel changeover (MW).

PC.A.5.6.4 **Generators** must also notify **NGET** of any significant factors and their effects which may prevent the use of alternative fuels achieving the estimated values provided under PC.A.5.6.3 above (e.g. emissions limits, distilled water stocks etc.)

PC.A.6 **USERS' SYSTEM** DATA

PC.A.6.1 Introduction

PC.A.6.1.1 Each **User**, whether connected directly via an existing **Connection Point** to the **GB Transmission System** or seeking such a direct connection, shall provide **NGET** with data on its **User System** which relates to the **Connection Site** containing the **Connection Point** both current and forecast, as specified in PC.A.6.2 to PC.A.6.6.

PC.A.6.1.2 Each **User** must reflect the system effect at the **Connection Site(s)** of any third party **Embedded** within its **User System** whether existing or proposed.

PC.A.6.1.3 PC.A.6.2, and PC.A.6.4 to PC.A.6.6 consist of data which is only to be supplied to **NGET** at **NGET's** reasonable request. In the event that **NGET** identifies a reason for requiring this data, **NGET** shall write to the relevant **User**(s), requesting the data, and explaining the reasons for the request. If the **User**(s) wishes, **NGET** shall also arrange a meeting at which the request for data can be discussed, with the objective of identifying the best way in which **NGET**'s requirements can be met.

PC.A.6.2 Transient Overvoltage Assessment Data

PC.A.6.2.1 It is occasionally necessary for **NGET** to undertake transient overvoltage assessments (e.g. capacitor switching transients, switchgear transient recovery voltages, etc). At **NGET's** reasonable request, each **User** is required to provide the following data with respect to the **Connection Site**, current and forecast, together with a **Single Line Diagram** where not already supplied under PC.A.2.2.1, as follows:-

(a) busbar layout plan(s), including dimensions and geometry showing positioning of any current and voltage transformers, through bushings, support insulators, disconnectors, circuit breakers, surge arresters, etc. Electrical parameters of any associated current and voltage transformers, stray capacitances of wall bushings and support insulators, and grading capacitances of circuit breakers;

(b) Electrical parameters and physical construction details of lines and cables connected at that busbar. Electrical parameters of all plant e.g., transformers (including neutral earthing impedance or zig-zag transformers, if any), series reactors and shunt compensation equipment connected at that busbar (or to the tertiary of a transformer) or by lines or cables to that busbar;

(c) Basic insulation levels (BIL) of all **Apparatus** connected directly, by lines or by cables to the busbar;

(d) characteristics of overvoltage **Protection** devices at the busbar and at the termination points of all lines, and all cables connected to the busbar;

(e) fault levels at the lower voltage terminals of each transformer connected directly or indirectly to the **GB Transmission System** without intermediate transformation;

(f) the following data is required on all transformers operating at **Supergrid Voltage** throughout **Great Britain** and, in Scotland, also at 132kV: three or five limb cores or single phase units to be specified, and operating peak flux density at nominal voltage;

(g) an indication of which items of equipment may be out of service simultaneously during **Planned Outage** conditions.

PC.A.6.3 **User's Protection Data**

PC.A.6.3.1 **Protection**

The following information is required which relates only to **Protection** equipment which can trip or inter-trip or close any **Connection Point** circuit-breaker or any **Transmission** circuit-breaker. This information need only be supplied once, in accordance with the timing requirements set out in PC.A.1.4(b), and need not be supplied on a routine annual basis thereafter, although **NGET** should be notified if any of the information changes

(a) a full description, including estimated settings, for all relays and **Protection** systems installed or to be installed on the **User's System;**

(b) a full description of any auto-reclose facilities installed or to be installed on the **User's System**, including type and time delays;

(c) a full description, including estimated settings, for all relays and **Protection** systems or to be installed on the generator, generator transformer, **Station Transformer** and their associated connections;

(d) for **Generating Units** (other than **Power Park Units**) or **Power Park Modules** or **DC Converters** at a **DC Converter Station** having (or intended to have) a circuit breaker at the generator terminal voltage, clearance times for electrical faults within the **Generating Unit** (other than a **Power Park Unit**) or **Power Park Module** zone;

(e) the most probable fault clearance time for electrical faults on any part of the **User's System** directly connected to the **GB Transmission System.**

PC.A.6.4 Harmonic Studies

PC.A.6.4.1 It is occasionally necessary for **NGET** to evaluate the production/magnification of harmonic distortion on **NGET** and **User's Systems**, especially when **NGET** is connecting equipment such as capacitor banks. At **NGET**'s reasonable request, each **User** is required to

submit data with respect to the **Connection Site**, current and forecast, and where not already supplied under PC.A.2.2.4 and PC.A.2.2.5, as follows:-

PC.A.6.4.2 Overhead lines and underground cable circuits of the **User's Subtransmission System** must be differentiated and the following data provided separately for each type:-

Positive phase sequence resistance;
Positive phase sequence reactance;
Positive phase sequence susceptance;

and for all transformers connecting the **User's Subtransmission System** to a lower voltage:-

Rated MVA;
Voltage Ratio;
Positive phase sequence resistance;
Positive phase sequence reactance;

and at the lower voltage points of those connecting transformers:-

Equivalent positive phase sequence susceptance;
Connection voltage and Mvar rating of any capacitor bank and component design parameters if configured as a filter;
Equivalent positive phase sequence interconnection impedance with other lower voltage points;
The minimum and maximum **Demand** (both MW and Mvar) that could occur;
Harmonic current injection sources in Amps at the Connection voltage points. Where the harmonic injection current comes from a diverse group of sources, the equivalent contribution may be established from appropriate measurements;
Details of traction loads, eg connection phase pairs, continuous variation with time, etc;
An indication of which items of equipment may be out of service simultaneously during **Planned Outage** conditions.

PC.A.6.5 Voltage Assessment Studies

It is occasionally necessary for **NGET** to undertake detailed voltage assessment studies (e.g., to examine potential voltage instability, voltage control co-ordination or to calculate voltage step changes). At **NGET's** reasonable request, each **User** is required to submit the following data where not already supplied under PC.A.2.2.4 and PC.A.2.2.5:-

For all circuits of the **User's Subtransmission System**:-

Positive Phase Sequence Reactance;
Positive Phase Sequence Resistance;
Positive Phase Sequence Susceptance;
Mvar rating of any reactive compensation equipment;

and for all transformers connecting the **User's Subtransmission System** to a lower voltage:-

Rated MVA;
Voltage Ratio;
Positive phase sequence resistance;
Positive Phase sequence reactance;
Tap-changer range;
Number of tap steps;
Tap-changer type: on-load or off-circuit;
AVC/tap-changer time delay to first tap movement;
AVC/tap-changer inter-tap time delay;

and at the lower voltage points of those connecting transformers:-

Equivalent positive phase sequence susceptance;
Mvar rating of any reactive compensation equipment;
Equivalent positive phase sequence interconnection impedance with other lower voltage points;
The maximum **Demand** (both MW and Mvar) that could occur;
Estimate of voltage insensitive (constant power) load content in % of total load at both winter peak and 75% off-peak load conditions.

PC.A.6.6 Short Circuit Analysis:

PC.A.6.6.1 Where prospective short-circuit currents on equipment owned, operated or managed by **NGET** are greater than 90% of the equipment rating, and in **NGET's** reasonable opinion more accurate calculations of short-circuit currents are required, then at **NGET's** request each **User** is required to submit data with respect to the **Connection Site**, current and forecast, and where not already supplied under PC.A.2.2.4 and PC.A.2.2.5, as follows:

PC.A.6.6.2 For all circuits of the **User's Subtransmission System**:-

Positive phase sequence resistance;
Positive phase sequence reactance;
Positive phase sequence susceptance;
Zero phase sequence resistance (both self and mutuals);
Zero phase sequence reactance (both self and mutuals);
Zero phase sequence susceptance (both self and mutuals);

and for all transformers connecting the **User's Subtransmission System** to a lower voltage:-

Rated MVA;
Voltage Ratio;
Positive phase sequence resistance (at max, min and nominal tap);
Positive Phase sequence reactance (at max, min and nominal tap);
Zero phase sequence reactance (at nominal tap);
Tap changer range;
Earthing method: direct, resistance or reactance;
Impedance if not directly earthed;

and at the lower voltage points of those connecting transformers:-

The maximum **Demand** (in MW and Mvar) that could occur;

Short-circuit infeed data in accordance with PC.A.2.5.6 unless the **User**'s lower voltage network runs in parallel with the **User**'s **Subtransmission System**, when to prevent double counting in each node infeed data, a π equivalent comprising the data items of PC.A.2.5.6 for each node together with the positive phase sequence interconnection impedance between the nodes shall be submitted.

PC.A.7 ADDITIONAL DATA FOR NEW TYPES OF **POWER STATIONS, DC CONVERTER STATIONS** AND CONFIGURATIONS

Notwithstanding the **Standard Planning Data** and **Detailed Planning Data** set out in this Appendix, as new types of configurations and operating arrangements of **Power Stations** and **DC Converter Stations** emerge in future, **NGET** may reasonably require additional data to represent correctly the performance of such **Plant** and **Apparatus** on the **System**, where the present data submissions would prove insufficient for the purpose of producing meaningful **System** studies for the relevant parties.

PART 3

NETWORK DATA

PC.A.8 To allow a **User** to model the **GB Transmission System**, **NGET** will provide the following **Network Data** to **Users**, calculated in accordance with **Good Industry Practice**:-

PC.A.8.1 **Single Point of Connection**

For a **Single Point of Connection** to a **User's System**, as an equivalent 400kV or 275kV source and also in Scotland as an equivalent 132kV source, the data (as at the HV side of the **Point of Connection** reflecting data given to **NGET** by **Users**) will be given to a **User** as follows:-

The data items listed under the following parts of PC.A.8.3:-

(a) (i), (ii), (iii), (iv), (v) and (vi)

and the data items shall be provided in accordance with the detailed provisions of PC.A.8.3 (b) - (e).

PC.A.8.2 **Multiple Point of Connection**

For a **Multiple Point of Connection** to a **User's System**, the equivalent will normally be in the form of a π model or extension with a source at each node and a linking impedance. The data at the **Connection Point** will be given to a **User** as follows:-

The data items listed under the following parts of PC.A.8.3:-

(a) (i), (ii), (iv), (v), (vi), (vii) and (viii)

and the data items shall be provided in accordance with the detailed provisions of PC.A.8.3 (b) - (e).

When an equivalent of this form is not required **NGET** will not provide the data items listed under the following parts of PC.A.8.3:-

(a) (vii) and (viii)

PC.A.8.3 Data Items

(a) The following is a list of data utilised in this part of the **PC**. It also contains rules on the data which generally apply.

(i) symmetrical three-phase short circuit current infeed at the instant of fault from the **GB Transmission System**, (I_1");

(ii) symmetrical three-phase short circuit current from the **GB Transmission System** after the subtransient fault current contribution has substantially decayed, (I_1');

(iii) the zero sequence source resistance and reactance values at the **Point of Connection**, consistent with the maximum infeed below;

(iv) the pre-fault voltage magnitude at which the maximum fault currents were calculated;

(v) the positive sequence X/R ratio at the instant of fault;

(vi) the negative sequence resistance and reactance values of the **GB Transmission System** seen from the **Point of Connection**, if substantially different from the values of positive sequence resistance and reactance which would be derived from the data provided above;

(vii) the initial positive sequence resistance and reactance values of the two (or more) sources and the linking impedance(s) derived from a fault study constituting the (π) equivalent and evaluated without the **User** network and load and;

(viii) the corresponding zero sequence impedance values of the (π) equivalent.

(b) To enable the model to be constructed, **NGET** will provide data based on the following conditions.

(c) The initial symmetrical three phase short circuit current and the transient period three phase short circuit current will normally be derived from the fixed impedance studies. The latter value should be taken as applying at times of 120ms and longer. Shorter values may be interpolated using a value for the subtransient time constant of 40ms. These fault currents will be obtained from a full **System** study based on load flow analysis that takes into account any existing flow across the point of connection being considered.

(d) Since the equivalent will be produced for the 400kV or 275kV and also in Scotland 132kV parts of the **GB Transmission System NGET** will provide the appropriate supergrid transformer data.

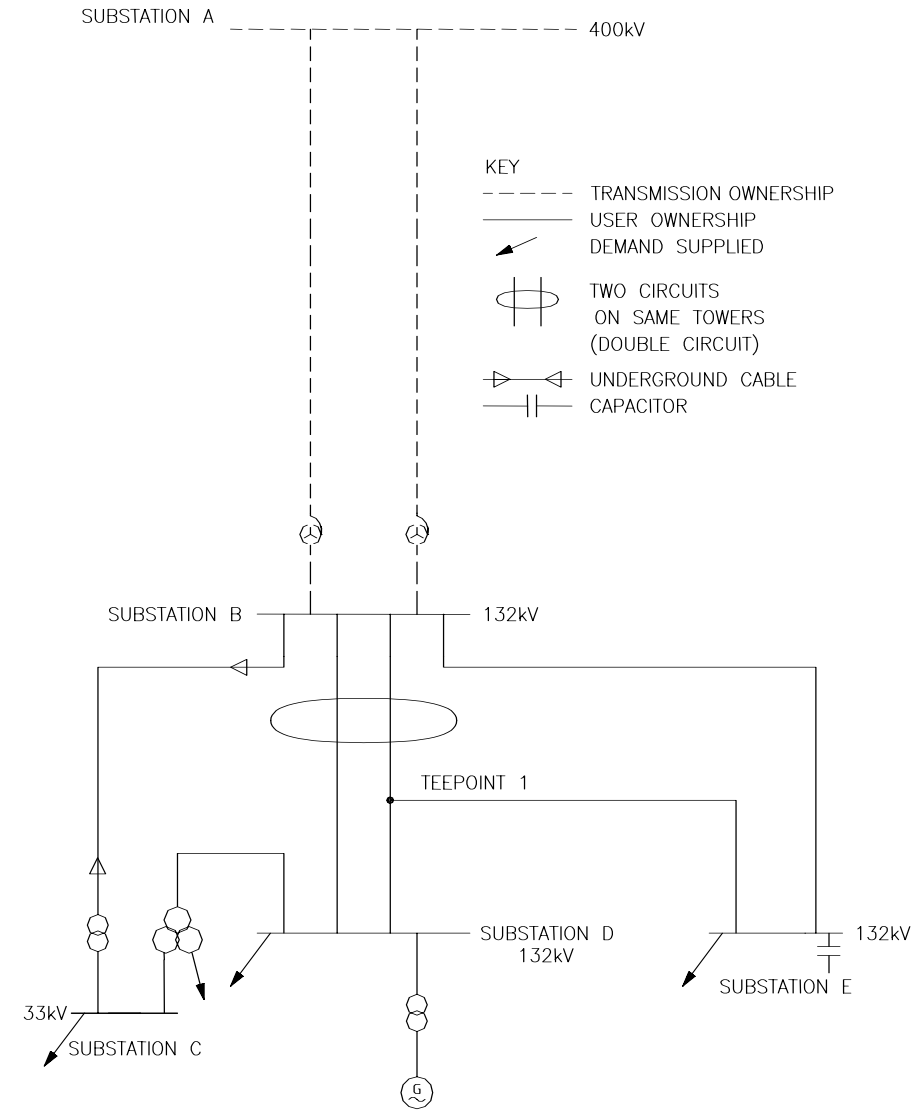
(e) The positive sequence X/R ratio and the zero sequence impedance value will correspond to the **NGET** source network only, that is with the section of network if any with which the equivalent is to be used excluded. These impedance values will be derived from the condition when all **Generating Units** are **Synchronised** to the **GB Transmission System** or a **User's System** and will take account of active sources only including any contribution from the load to the fault current. The passive component of the load itself or other system shunt impedances should not be included.

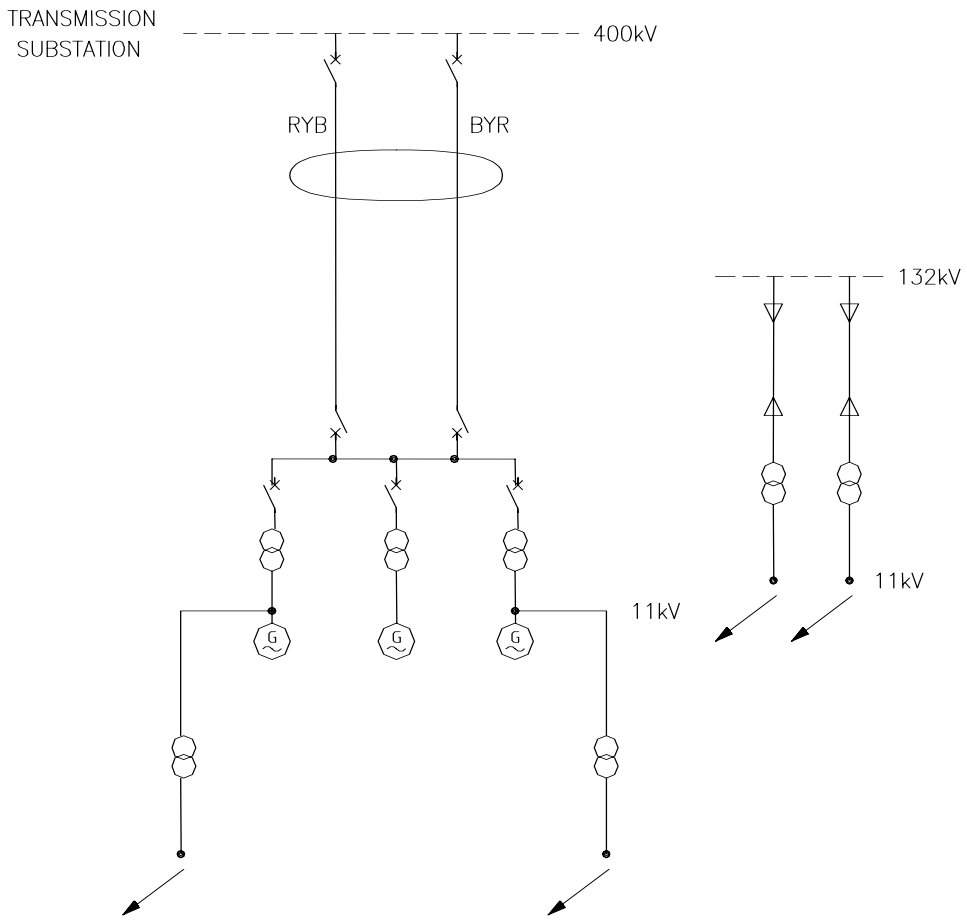
(f) A **User** may at any time, in writing, specifically request for an equivalent to be prepared for an alternative **System** condition, for example where the **User's System** peak does not correspond to the **GB Transmission System** peak, and **NGET** will, insofar as such request is reasonable,

provide the information as soon as reasonably practicable following the request.

Single Line Diagram

The diagrams below show three examples of single line diagrams, showing the detail that should be incorporated in the diagram. The first example is for an **Network Operator** connection, the second for a **Generator** connection, the third for a **Power Park Module** electrically equivalent system.





KEY

- TRANSMISSION OWNERSHIP
- USER OWNERSHIP
- DEMAND SUPPLIED
- TWO CIRCUITS ON SAME TOWERS (DOUBLE CIRCUIT)
- UNDERGROUND CABLE

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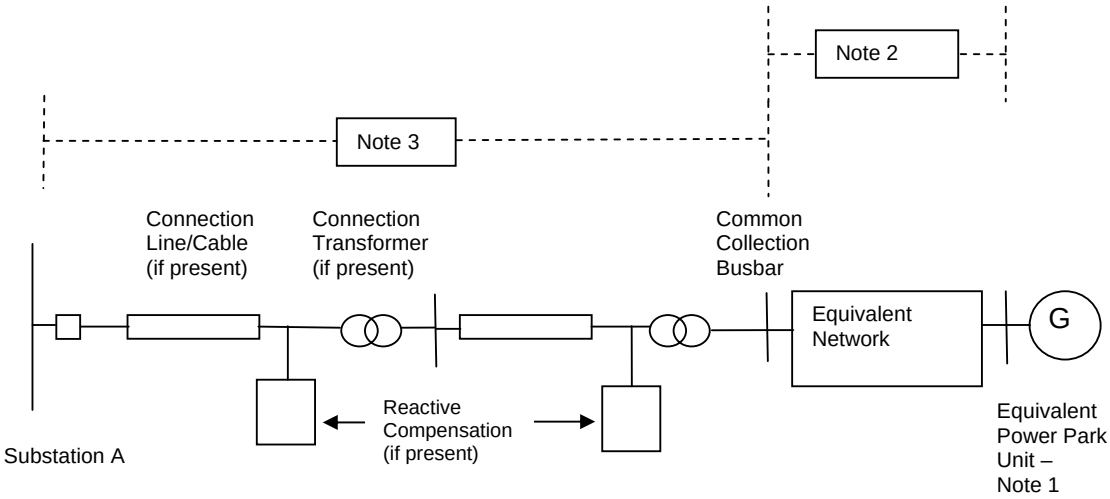
Power Park Module Single Line Diagram



Notes:

1) The electrically equivalent **Power Park Unit** consists of a number of actual **Power Park Units** of the same type ie. any equipment external to the **Power Park Unit** terminals is considered as part of the Equivalent Network. **Power Park Units** of different types shall be included in separate electrically equivalent **Power Park Units**. The total number of equivalent **Power Park Units** shall represent all of the actual **Power Park Units** in the **Power Park Module**.
2) Separate electrically equivalent networks are required for each different type of electrically equivalent **Power Park Unit**. The electrically equivalent network shall include all equipment between the **Power Park Unit** terminals and the **Common Collection Busbar**.
3) All **Plant** and **Apparatus** including the circuit breakers, transformers, lines, cables and reactive compensation plant between the **Common Collection Busbar** and Substation A shall be shown.

PLANNING CODE APPENDIX C

C1.1 Planning and design of the **SPT** and **SHETL Transmission Systems** is based generally, but not totally, on criteria which evolved from joint consultation among various **Transmission Licensees** responsible for design of the **GB Transmission System.**

C1.2 The above criteria are set down within the standards, memoranda, recommendations and reports and are provided as a guide to system planning. It should be noted that each scheme for reinforcement or modification of the **Transmission System** is individually designed in the light of economic and technical factors associated with the particular system limitations under consideration.

C1.3 The tables below identify the literature referred to above, together with the main topics considered within each document.

PART 1 – SHETL's TECHNICAL AND DESIGN CRITERIA

ITEM No.	DOCUMENT	REFERENCE No.
1	GB Security and Quality of Supply Standard	Version 1
2	System Phasing	TPS 13/4
3	not used	
4	Planning Limits for Voltage Fluctuations Caused by Industrial, Commercial and Domestic Equipment in the United Kingdom	ER P28
5	EHV or HV Supplies to Induction Furnaces Voltage unbalance limits. Harmonic current limits.	ER P16 (Supported by ACE Report No.48)
6	Planning Levels for Harmonic Voltage Distortion and the Connection of Non-Linear Loads to Transmission Systems and Public Electricity Supply Systems in the United Kingdom Harmonic distortion (waveform). Harmonic voltage distortion. Harmonic current distortion. Stage 1 limits. Stage 2 limits. Stage 3 Limits Addition of Harmonics Short Duration Harmonics Site Measurements	ER G5/4 (Supported by ACE Report No.73)

ITEM No.	DOCUMENT	REFERENCE No.
7	AC Traction Supplies to British Rail Type of supply point to railway system. Estimation of traction loads. Nature of traction current. System disturbance estimation. Earthing arrangements.	ER P24
8	Operational Memoranda Main System operating procedure. Operational standards of security. Voltage and reactive control on main system. System warnings and procedures for instructed load reduction. Continuous tape recording of system control telephone messages and instructions. Emergency action in the event of an exceptionally serious breakdown of the main system.	(SOM) SOM 1 SOM 3 SOM 4 SOM 7 SOM 10 SOM 15
9	Planning Limits for Voltage Unbalance in the United Kingdom.	ER P29

PART 2 – SPT's TECHNICAL AND DESIGN CRITERIA

ITEM No.	DOCUMENT	Reference No.
1	GB Security and Quality of Supply Standard	Version 1
2	System Phasing	TDM 13/10,002 Issue 4
3	not used	
4	Planning Limits for Voltage Fluctuations Caused by Industrial, Commercial and Domestic Equipment in the United Kingdom	ER P28
5	EHV or HV Supplies to Induction Furnaces Voltage Unbalance limits. Harmonic current limits.	ER P16 (Supported by ACE Report No.48)
6	Planning Levels for Harmonic Voltage Distortion and the Connection of Non-Linear Loads to Transmission Systems and Public Electricity Supply Systems in the United Kingdom Harmonic distortion (waveform). Harmonic voltage distortion. Harmonic current distortion. Stage 1 limits. Stage 2 limits. Stage 3 Limits Addition of Harmonics Short Duration Harmonics Site Measurements	ER G5/4 Supported by ACE Report No.73)
7	AC Traction Supplies to British Rail Type of supply point to railway system. Estimation of traction loads. Nature of traction current. System disturbance estimation. Earthing arrangements.	ER P24

< End of **Planning Code (PC) >**

CONTENTS

(This contents page does not form part of the Grid Code)

CONNECTION CONDITIONS

CC.1 INTRODUCTION

CC.1.1 The **Connection Conditions** ("**CC**") specify both the minimum technical, design and operational criteria which must be complied with by any **User** connected to or seeking connection with the **GB Transmission System** or **Generators** (other than in respect of **Small Power Stations**) or **DC Converter Station** owners connected to or seeking connection to a **User's System** which is located in **Great Britain**, and the minimum technical, design and operational criteria with which **NGET** will comply in relation to the part of the **GB Transmission System** at the **Connection Site** with **Users**.

CC.2 OBJECTIVE

CC.2.1 The objective of the **CC** is to ensure that by specifying minimum technical, design and operational criteria the basic rules for connection to the **GB Transmission System** and (for certain **Users**) to a **User's System** are similar for all **Users** of an equivalent category and will enable **NGET** to comply with its statutory and **Transmission Licence** obligations.

CC.3 SCOPE

CC.3.1 The **CC** applies to **NGET** and to **Users**, which in the **CC** means:

(a) **Generators** (other than those which only have **Embedded Small Power Stations**)

(b) **Network Operators**;

(c) **Non-Embedded Customers;**

(d) **DC Converter Station** owners; and

(e) **BM Participants** and **Externally Interconnected System Operators** in respect of CC.6.5 only**.**

CC.3.2 The above categories of **User** will become bound by the **CC** prior to them generating, distributing, supplying or consuming, as the case may be, and references to the various categories should, therefore, be taken as referring to them in that prospective role as well as to **Users** actually connected.

CC.3.3 The obligations within the **CC** that are expressed to be applicable to **Generators** in respect of **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** and **DC Converter Station** Owners in respect of **Embedded DC Converter Stations** not subject to a **Bilateral Agreement** (where the obligations are in each case listed in CC.3.4) shall be read and construed as obligations that the **Network Operator** within whose **System** any such **Medium Power Station** or **DC Converter Station** is **Embedded** must ensure are performed and discharged by the **Generator** or the **DC Converter Station** owner.

CC.3.4 The **Network Operator** within whose **System** a **Medium Power Station** not subject to a **Bilateral Agreement** is **Embedded** or a **DC Converter Station** not subject to a

Bilateral Agreement is **Embedded** must ensure that the following obligations in the **CC** are performed and discharged by the **Generator** in respect of each such **Embedded Medium Power Station** or the **DC Converter Station** owner in the case of an **Embedded DC Converter Station**:

CC.5.1
CC.5.2.2
CC.5.3
CC.6.1.3
CC.6.1.5 (b)
CC.6.3.2, CC.6.3.3, CC.6.3.4, CC.6.3.6, CC.6.3.7, CC.6.3.8, CC.6.3.9, CC.6.3.10, CC.6.3.12, CC.6.3.13, CC.6.3.15, CC.6.3.16
CC.6.4.4
CC.6.5.6 (where required by CC.6.4.4)

In respect of CC.6.2.2.2, CC.6.2.2.3, CC.6.2.2.5, CC.6.1.5(a), CC.6.1.5(b) and CC.6.3.11 equivalent provisions as co-ordinated and agreed with the **Network Operator** and **Generator** or **DC Converter Station** owner may be required. Details of any such requirements will be notified to the **Network Operator** in accordance with CC.3.5.

CC.3.5 In the case of **Embedded Medium Power Stations** not subject to a **Bilateral Agreement** and **Embedded DC Converter Stations** not subject to a **Bilateral Agreement** the requirements in:

CC.6.1.6
CC.6.3.8
CC.6.3.12
CC.6.3.15
CC.6.3.16

that would otherwise have been specified in a **Bilateral Agreement** will be notified to the relevant **Network Operator** in writing in accordance with the provisions of the **CUSC** and the **Network Operator** must ensure such requirements are performed and discharged by the **Generator** or the **DC Converter Station** owner.

CC.4 PROCEDURE

CC.4.1 The **CUSC** contains provisions relating to the procedure for connection to the **GB Transmission System** or, in the case of **Embedded Power Stations** or **Embedded DC Converter Stations,** becoming operational and includes provisions relating to certain conditions to be complied with by **Users** prior to **NGET** notifying the **User** that it has the right to become operational.

CC.5. CONNECTION

CC.5.1 The provisions relating to connecting to the **GB Transmission System** (or to a **User's System** in the case of a connection of an **Embedded Large Power Station** or **Embedded Medium Power Station** or **Embedded DC Converter Station)** are contained in

(a) the **CUSC** and/or **CUSC Contract** (or in the relevant application form or offer for a **CUSC Contract**);

Discrimination between **Network Operator** or **Non-Embedded Customer**, as the case may be, **Back-Up Protection** and **Back-Up Protection** provided on the **GB Transmission System** and other **User Systems**. The requirement for and level of **Discrimination** required will be specified in the **Bilateral Agreement**.

(c) (i) Where the **Network Operator** or **Non-Embedded Customer** is connected to the **GB Transmission System** at 400kV or 275kV, and in Scotland also at 132kV, and a circuit breaker is provided by the **Network Operator** or **Non-Embedded Customer**, or **NGET**, as the case may be, to interrupt the interchange of fault current with the **GB Transmission System** or the **System** of the **Network Operator** or **Non-Embedded Customer**, as the case may be, circuit breaker fail **Protection** will be provided by the **Network Operator** or **Non-Embedded Customer**, or **NGET**, as the case may be, on this circuit breaker.

(ii) In the event, following operation of a **Protection** system, of a failure to interrupt fault current by these circuit-breakers within the **Fault Current Interruption Time**, the circuit breaker fail **Protection** is required to initiate tripping of all the necessary electrically adjacent circuit-breakers so as to interrupt the fault current within the next 200 ms.

(d) The target performance for the **System Fault Dependability Index** shall be not less than 99%. This is a measure of the ability of **Protection** to initiate successful tripping of circuit breakers which are associated with the faulty items of **Apparatus**.

CC.6.2.3.2 Fault Disconnection Facilities

(a) Where no **Transmission** circuit breaker is provided at the **User's** connection voltage, the **User** must provide **NGET** with the means of tripping all the **User's** circuit breakers necessary to isolate faults or **System** abnormalities on the **GB Transmission System**. In these circumstances, for faults on the **User's System**, the **User's Protection** should also trip higher voltage **Transmission** circuit breakers. These tripping facilities shall be in accordance with the requirements specified in the **Bilateral Agreement**.

(b) **NGET** may require the installation of a **System to Generator Operational Intertripping Scheme** in order to enable the timely restoration of circuits following power **System** fault(s). These requirements shall be set out in the relevant **Bilateral Agreement**.

CC.6.2.3.3 Automatic Switching Equipment

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

CC.6.2.3.4 Relay Settings

Protection and relay settings will be co-ordinated (both on connection and subsequently) across the **Connection Point** in accordance with the **Bilateral Agreement** to ensure effective disconnection of faulty **Apparatus**.

CC.6.2.3.5 Work on **Protection** equipment

Where a **Transmission Licensee** owns the busbar at the **Connection Point**, no busbar **Protection**, mesh corner **Protection** relays, AC or DC wiring (other than power supplies or DC tripping associated with the **Network Operator** or **Non-Embedded Customer's Apparatus** itself) may be worked upon or altered by the **Network Operator** or **Non-Embedded Customer** personnel in the absence of a representative of **NGET** or in Scotland, a representative of **NGET**, or written authority from **NGET** to perform such work or alterations in the absence of a representative of **NGET**.

CC.6.2.3.6 Equipment to be provided

CC.6.2.3.6.1 **Protection** of Interconnecting Connections

The requirements for the provision of **Protection** equipment for interconnecting connections will be specified in the **Bilateral Agreement**.

CC.6.3 GENERAL **GENERATING UNIT** REQUIREMENTS

CC.6.3.1 This section sets out the technical and design criteria and performance requirements for **Generating Units, DC Converters** and **Power Park Modules** (whether directly connected to the **GB Transmission System** or **Embedded**) which each **Generator** or **DC Converter Station** owner must ensure are complied with in relation to its **Generating Units**, **DC Converters** and **Power Park Modules** but does not apply to **Small Power Stations** or individually to **Power Park Units**. References to **Generating Units, DC Converters** and **Power Park Modules** in this CC.6.3 should be read accordingly.

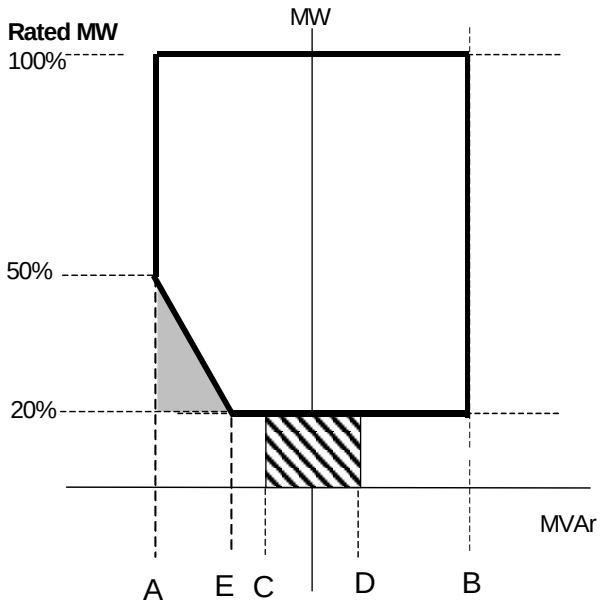
Plant Performance Requirements

CC.6.3.2 (a) All **Synchronous Generating Units** must be capable of supplying **Rated MW** at any point between the limits 0.85 **Power Factor** lagging and 0.95 **Power Factor** leading at the **Synchronous Generating Unit** terminals. The short circuit ratio of **Synchronous Generating Units** shall be not less than 0.5.

(b) Subject to paragraph (c) below, all **Non-Synchronous Generating Units, DC Converters** and **Power Park Modules** must be capable of maintaining zero transfer of **Reactive Power** at the **Grid Entry Point** (or **User System Entry Point** if **Embedded**) at all **Active Power** output levels under steady state voltage conditions. For **Non-Synchronous Generating Units** and **Power Park Modules** the steady state tolerance on **Reactive Power** transfer to and from the **GB Transmission System** expressed in MVAr shall be no greater than 5% of the **Rated MW**. For **DC Converters** the steady state tolerance on **Reactive Power** transfer to and from the **GB Transmission System** shall be specified in the **Bilateral Agreement**.

(c) Subject to the provisions of CC.6.3.2(d) below, all **Non-Synchronous Generating Units, DC Converters** (excluding current source technology) and **Power Park Modules** (excluding those connected to the **Total System** by a current source **DC Converter**) with a **Completion Date** on or after 1

January 2006 must be capable of supplying **Rated MW** output at any point between the limits 0.95 **Power Factor** lagging and 0.95 **Power Factor** leading at the **Grid Entry Point** in England and Wales or at the HV side of the 33/132kV or 33/275kV or 33/400kV transformer for **Generators** directly connected to the **GB Transmission System** in Scotland (or **User System Entry Point** if **Embedded**). With all **Plant** in service, the **Reactive Power** limits defined at **Rated MW** at Lagging **Power Factor** will apply at all **Active Power** output levels above 20% of the **Rated MW** output as defined in Figure 1. With all **Plant** in service, the **Reactive Power** limits defined at **Rated MW** at Leading **Power Factor** will apply at all **Active Power** output levels above 50% of the **Rated MW** output as defined in Figure 1. With all **Plant** in service, the **Reactive Power** limits will reduce linearly below 50% **Active Power** output as shown in Figure 1 unless the requirement to maintain the **Reactive Power** limits defined at **Rated MW** at Leading **Power Factor** down to 20% **Active Power** output is specified in the **Bilateral Agreement**. These **Reactive Power** limits will be reduced pro rata to the amount of **Plant** in service.



Point A is equivalent (in MVAr) to: 0.95 leading **Power Factor** at **Rated MW** output
Point B is equivalent (in MVAr) to: 0.95 lagging **Power Factor** at **Rated MW** output
Point C is equivalent (in MVAr) to: -5% of **Rated MW** output
Point D is equivalent (in MVAr) to: +5% of **Rated MW** output
Point E is equivalent (in MVAr) to: -12% of **Rated MW** output

Figure 1

(d) All **Non-Synchronous Generating Units** and **Power Park Modules** in Scotland with a **Completion Date** after 1 April 2005 and before 1 January 2006 must be capable of supplying **Rated MW** at the range of power factors either:-

(i) from 0.95 lead to 0.95 lag as illustrated in Figure 1 at the **User System Entry Point** for **Embedded Generators** or at the HV side of the 33/132kV or 33/275kV or 33/400kV transformer for **Generators** directly connected to the **GB Transmission System.** With all **Plant** in service, the **Reactive Power**

limits defined at **Rated MW** will apply at all **Active Power** output levels above 20% of the **Rated MW** output as defined in Figure 1. These **Reactive Power** limits will be reduced pro rata to the amount of **Plant** in service.

or,

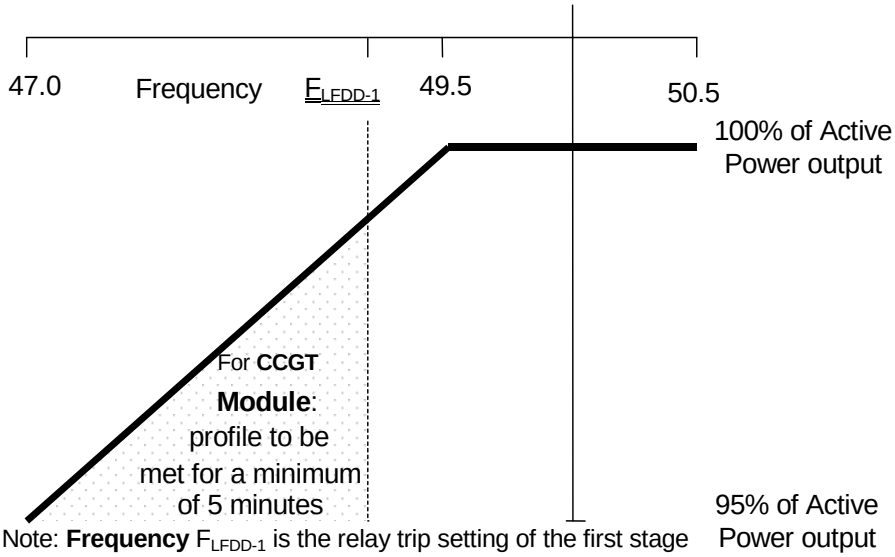
(ii) from 0.95 lead to 0.90 lag at the **Non-Synchronous Generating Unit** (including **Power Park Unit**) terminals. For the avoidance of doubt **Generators** complying with this option (ii) are not required to comply with CC.6.3.2(b).

CC.6.3.3 Each **Generating Unit, DC Converter, Power Park Module** and/or **CCGT Module** must be capable of

(a) continuously maintaining constant **Active Power** output for **System Frequency** changes within the range 50.5 to 49.5 Hz; and

(b) (subject to the provisions of CC.6.1.3) maintaining its **Active Power** output at a level not lower than the figure determined by the linear relationship shown in Figure 2 for **System Frequency** changes within the range 49.5 to 47 Hz, such that if the **System Frequency** drops to 47 Hz the **Active Power** output does not decrease by more than 5%.

In the case of a **CCGT Module**, the above requirement shall be retained down to the **Low Frequency Relay** trip setting of 48.8 Hz, which reflects the first stage of the Automatic Low **Frequency Demand Disconnection** scheme notified to **Network Operators** under OC6.6.2. For **System Frequency** below that setting, the existing requirement shall be retained for a minimum period of 5 minutes while **System Frequency** remains below that setting, and special measure(s) that may be required to meet this requirement shall be kept in service during this period. After that 5 minutes period, if **System Frequency** remains below that setting, the special measure(s) must be discontinued if there is a materially increased risk of the **Gas Turbine** tripping. The need for special measure(s) is linked to the inherent **Gas Turbine Active Power** output reduction caused by reduced shaft speed due to falling **System Frequency**



Note: **Frequency** F_{LFDD-1} is the relay trip setting of the first stage of the Automatic Low **Frequency Demand Disconnection** Scheme

Figure 2

(c) For the avoidance of doubt in the case of a **Generating Unit** or **Power Park Module** using an **Intermittent Power Source** where the mechanical power input will not be constant over time, the requirement is that the **Active Power** output shall be independent of **System Frequency** under (a) above and should not drop with **System Frequency** by greater than the amount specified in (b) above.

(d) A **DC Converter Station** must be capable of maintaining its **Active Power** input (i.e. when operating in a mode analogous to **Demand**) from the **GB Transmission System** (or **User System** in the case of an **Embedded DC Converter Station**) at a level not greater than the figure determined by the linear relationship shown in Figure 3 for **System Frequency** changes within the range 49.5 to 47 Hz, such that if the **System Frequency** drops to 47.8 Hz the **Active Power** input decreases by more than 60%.

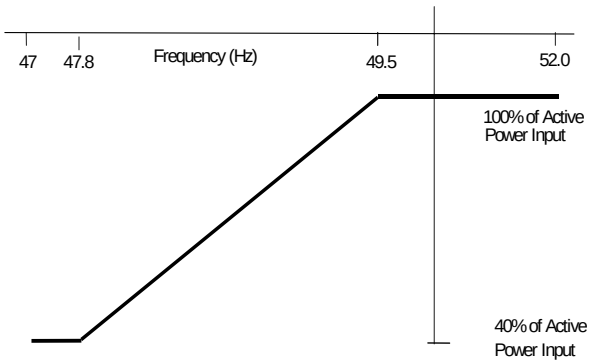


Figure 3

CC.6.3.4 At the **Grid Entry Point** the **Active Power** output under steady state conditions of any **Generating Unit, DC Converter** or **Power Park Module** directly connected to the **GB Transmission System** should not be affected by voltage changes in the normal operating range specified in paragraph CC.6.1.4 by more than the change in **Active Power** losses at reduced or increased voltage. The **Reactive Power** output under steady state conditions should be fully available within the voltage range ±5% at 400kV, 275kV and 132kV and lower voltages, except for a **Power Park Module** or **Non-synchronous Generating Unit** if **Embedded** at 33kV and below (or directly connected to the **GB Transmission System** at 33kV and below) where the requirement shown in Figure 4 applies.

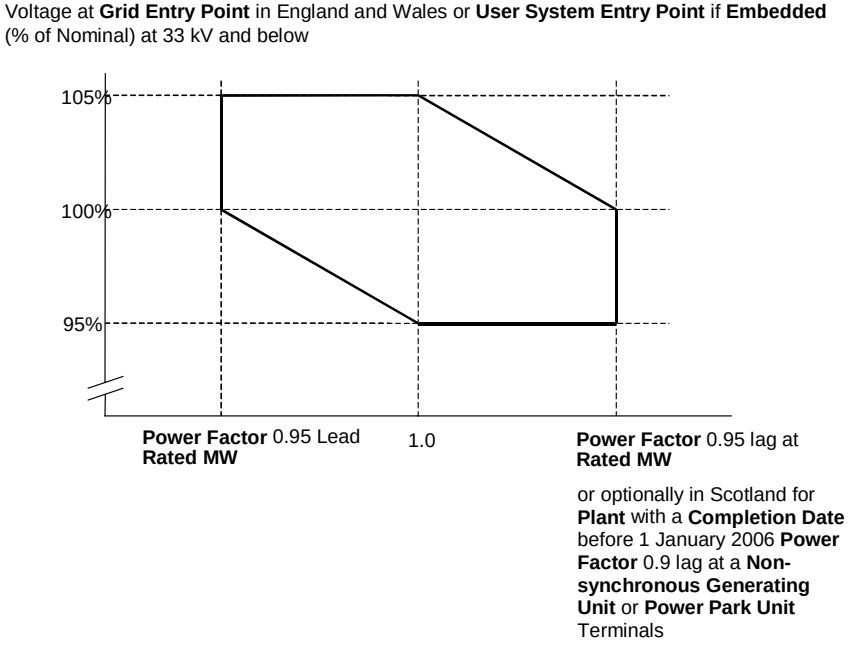


Figure 4

CC.6.3.5 It is an essential requirement that the **GB Transmission System** must incorporate a **Black Start Capability**. This will be achieved by agreeing a **Black Start Capability** at a number of strategically located **Power Stations**. For each **Power Station NGET** will state in the **Bilateral Agreement** whether or not a **Black Start Capability** is required.

Control Arrangements

CC.6.3.6 (a) Each:

(i) **Generating Unit**; or,

(ii) **DC Converter** with a **Completion Date** on or after 1 April 2005; or,

(iii) **Power Park Module** in England and Wales with a **Completion Date** on or after 1 January 2006; or,

(iv) **Power Park Module** in operation in Scotland on or after 1 January 2006 (with a **Completion Date** after 1 July 2004 and in a **Power Station** with a **Registered Capacity** of 50MW or more),

must be capable of contributing to **Frequency** control by continuous modulation of **Active Power** supplied to the **GB Transmission System** or the **User System** in which it is **Embedded**.

(b) Each:

(i) **Generating Unit**; or,

(ii) **DC Converter** (with a **Completion Date** on or after 1 April 2005 excluding current source technologies); or

(iii) **Power Park Module** in England and Wales with a **Completion Date** on or after 1 January 2006; or,

(iv) **Power Park Module** in Scotland irrespective of **Completion Date,**

must be capable of contributing to voltage control by continuous changes to

the **Reactive Power** supplied to the **GB Transmission System** or the **User System** in which it is **Embedded**.

CC.6.3.7 (a) Each **Generating Unit, DC Converter** or **Power Park Module** (excluding **Power Park Modules** in Scotland with a **Completion Date** before 1 July 2004 or **Power Park Modules** in a **Power Station** in Scotland with a **Registered Capacity** less than 50MW) must be fitted with a fast acting proportional **Frequency** control device (or turbine speed governor) and unit load controller or equivalent control device to provide **Frequency** response under normal operational conditions in accordance with **Balancing Code 3** (**BC3**). In the case of a **Power Park Module** the frequency or speed control device(s) may be on the **Power Park Module** or on each individual **Power Park Unit** or be a combination of both. The Frequency control device(s) (or speed governor(s)) must be designed and operated to the appropriate:

(i) **European Specification**; or

(ii) in the absence of a relevant **European Specification**, such other standard which is in common use within the European Community (which may include a manufacturer specification);

as at the time when the installation of which it forms part was designed or (in the case of modification or alteration to the **Frequency** control device (or turbine speed governor)) when the modification or alteration was designed.

The **European Specification** or other standard utilised in accordance with sub-paragraph CC.6.3.7 (a) (ii) will be notified to **NGET** by the **Generator** or **DC Converter Station** owner or, in the case of an **Embedded Medium Power Station** not subject to a **Bilateral Agreement** or **Embedded DC Converter Station** not subject to a **Bilateral Agreement**, the relevant **Network Operator**:

(i) as part of the application for a **Bilateral Agreement;** or

(ii) as part of the application for a varied **Bilateral Agreement;** or

(iii) in the case of an **Embedded Development**, within 28 days of entry into the **Embedded Development Agreement** (or such later time as agreed with **NGET**); or

(iv) as soon as possible prior to any modification or alteration to the **Frequency** control device (or governor); and

(b) The **Frequency** control device (or speed governor) in co-ordination with other control devices must control the **Generating Unit, DC Converter** or **Power Park Module Active Power Output** with stability over the entire operating range of the **Generating Unit, DC Converter** or **Power Park Module**; and

(c) The **Frequency** control device (or speed governor) must meet the following minimum requirements:

(i) Where a **Generating Unit, DC Converter** or **Power Park Module** becomes isolated from the rest of the **Total System** but is still supplying **Customers**, the **Frequency** control device (or speed governor) must also be able to control **System Frequency** below 52Hz unless this

causes the **Generating Unit, DC Converter** or **Power Park Module** to operate below its **Designed Minimum Operating Level** when it is possible that it may, as detailed in BC 3.7.3, trip after a time. For the avoidance of doubt the **Generating Unit, DC Converter** or **Power Park Module** is only required to operate within the **System Frequency** range 47 - 52 Hz as defined in CC.6.1.3.;

(ii) the **Frequency** control device (or speed governor) must be capable of being set so that it operates with an overall speed **Droop** of between 3% and 5%. For the avoidance of doubt, in the case of a **Power Park Module** the speed **Droop** should be equivalent of a fixed setting between 3% and 5% applied to each **Power Park Unit** in service;

(iii) in the case of all **Generating Units, DC Converter** or **Power Park Module** other than the **Steam Unit** within a **CCGT Module** the **Frequency** control device (or speed governor) deadband should be no greater than 0.03Hz (for the avoidance of doubt, ±0.015Hz). In the case of the **Steam Unit** within a **CCGT Module**, the speed governor deadband should be set to an appropriate value consistent with the requirements of CC.6.3.7(c)(i) and the requirements of BC3.7.2 for the provision of **Limited High Frequency Response**;

For the avoidance of doubt, the minimum requirements in (ii) and (iii) for the provision of **System Ancillary Services** do not restrict the negotiation of **Commercial Ancillary Services** between **NGET** and the **User** using other parameters; and

(d) A facility to modify, so as to fulfil the requirements of the **Balancing Codes**, the **Target Frequency** setting either continuously or in a maximum of 0.05 Hz steps over at least the range 50 ±0.1 Hz should be provided in the unit load controller or equivalent device.

(e) (i) Each **Generating Unit** and/or **CCGT Module** which has a **Completion Date** after 1 January 2001 in England and Wales, and after 1 April 2005 in Scotland, must be capable of meeting the minimum **Frequency** response requirement profile subject to and in accordance with the provisions of Appendix 3.

(ii) Each **DC Converter** at a **DC Converter Station** which has a **Completion Date** on or after 1 April 2005 must be capable of meeting the minimum **Frequency** response requirement profile subject to and in accordance with the provisions of Appendix 3**.**

(iii) Each **Power Park Module** in operation in England and Wales with a **Completion Date** on or after 1 January 2006 must be capable of meeting the minimum **Frequency** response requirement profile subject to and in accordance with the provisions of Appendix 3.

(iv) Each **Power Park Module** in operation on or after 1 January 2006 in Scotland (with a **Completion Date** on or after 1 April 2005 and a **Registered Capacity** of 50MW or more) must be capable of meeting the minimum **Frequency** response requirement profile subject to and in accordance with the provisions of Appendix 3.

(f) For the avoidance of doubt, the requirements of Appendix 3 do not apply to:

(i) **Generating Units** and/or **CCGT Modules** which have a **Completion Date** before 1 January 2001 in England and Wales, and before 1 April 2005 in Scotland, for whom the remaining requirements of this clause CC.6.3.7 shall continue to apply unchanged: or

(ii) **DC Converters** at a **DC Converter Station** which have a **Completion Date** before 1 April 2005; or

(iii) **Power Park Modules** in England and Wales with a **Completion Date** before 1 January 2006 for whom only the requirements of **Limited Frequency Sensitive Mode** (BC.3.5.2) operation shall apply; or

(iv) **Power Park Modules** in operation in Scotland before 1 January 2006 for whom only the requirements of **Limited Frequency Sensitive Mode** (BC.3.5.2) operation shall apply; or

(v) **Power Park Modules** in operation after 1 January 2006 in Scotland which have a **Completion Date** before 1 April 2005 for whom the remaining requirements of this clause CC.6.3.7 shall continue to apply unchanged.

CC.6.3.8 (a) A continuously-acting automatic excitation control system is required to provide constant terminal voltage control of the **Synchronous Generating Unit** without instability over the entire operating range of the **Generating Unit**.

(b) In respect of **Synchronous Generating Units** with a **Completion Date** before 1 January 2009, the requirements for excitation control facilities, including **Power System Stabilisers**, where in **NGET's** view these are necessary for system reasons, will be specified in the **Bilateral Agreement**. If any **Modification** to the excitation control facilities of such **Synchronous Generating Units** is made on or after 1 January 2009 the requirements that shall apply may be specified in the **Bilateral Agreement** as varied. To the extent that the **Bilateral Agreement** does not specify, the requirements given or referred to in CC.A.6 shall apply. The performance requirements for a continuously acting automatic excitation control system that shall be complied with by the User in respect of **Synchronous Generating** Units with a **Completion Date** on or after 1 January 2009 are given or referred to in CC.A.6. Reference is made to on-load commissioning witnessed by **NGET** in BC2.11.2.

(c) In the case of a **Non-synchronous Generating Unit, DC Converter** or **Power Park Module** a continuously-acting automatic control system is required to provide control of the voltage (or zero transfer of **Reactive Power** as applicable to CC.6.3.2) at the **Grid Entry Point** or **User System Entry Point** without instability over the entire operating range of the **Non-Synchronous Generating Unit, DC Converter** or **Power Park Module**. Any **Plant** or **Apparatus** used in the provisions of such voltage control within a **Power Park Module** may be located at the **Power Park Unit** terminals, an appropriate intermediate busbar or the **Connection Point**. In the case of a **Power Park Module** in Scotland with a **Completion Date** before 1 January 2009, voltage control may be at the **Power Park Unit** terminals, an appropriate intermediate busbar or the **Connection Point** as specified in the

Bilateral Agreement. When operating below 20% **Rated** MW the automatic control system may continue to provide voltage control utilising any available reactive capability. If voltage control is not being provided, the automatic control system shall be designed to ensure a smooth transition between the shaded area bound by CD and the non shaded area bound by AB in Figure 1 of CC6.3.2 (c).

(d) The performance requirements for a continuously acting automatic voltage control system in respect of **Power Park Modules**, **Non-Synchronous Generating Units** and **DC Converters** with a **Completion Date** before 1 January 2009 will be specified in the **Bilateral Agreement**. If any **Modification** to the continuously acting automatic voltage control system of such **Power Park Modules**, **Non-Synchronous Generating Units** and **DC Converters** is made on or after 1 January 2009 the requirements that shall apply may be specified in the **Bilateral Agreement** as varied. To the extent that the **Bilateral Agreement** does not specify, the requirements given or referred to in CC.A.7 shall apply. The performance requirements for a continuously acting automatic voltage control system that shall be complied with by the **User** in respect of **Power Park Modules**, **Non-Synchronous Generating Units** and **DC Converters** with a **Completion Date** on or after 1 January 2009 are given or referred to in CC.A.7.

(e) In particular, other control facilities, including constant **Reactive Power** output control modes and constant **Power Factor** control modes (but excluding VAR limiters) are not required. However, if present in the excitation or voltage control system they will be disabled unless the **Bilateral Agreement** records otherwise. Operation of such control facilities will be in accordance with the provisions contained in **BC2.**

Steady state **Load** Inaccuracies

CC.6.3.9 The standard deviation of **Load** error at steady state **Load** over a 30 minute period must not exceed 2.5 per cent of a **Genset's Registered Capacity.** Where a **Genset** is instructed to **Frequency** sensitive operation, allowance will be made in determining whether there has been an error according to the governor droop characteristic registered under the **PC**.

For the avoidance of doubt in the case of a **Power Park Module** allowance will be made for the full variation of mechanical power output.

Negative Phase Sequence Loadings

CC.6.3.10 In addition to meeting the conditions specified in CC.6.1.5(b), each **Synchronous Generating Unit** will be required to withstand, without tripping, the negative phase sequence loading incurred by clearance of a close-up phase-to-phase fault, by **System Back-Up Protection** on the **GB Transmission System** or **User System** in which it is **Embedded**.

Neutral **Earthing**

CC.6.3.11 At nominal **System** voltages of 132kV and above the higher voltage windings of a transformer of a **Generating Unit, DC Converter** or **Power Park Module** must be star connected with the star point suitable for connection to earth. The earthing and lower voltage winding arrangement shall be such as to ensure that the **Earth Fault Factor** requirement of paragraph CC.6.2.1.1 (b) will be met on the **GB Transmission System** at nominal **System** voltages of 132kV and above.

Frequency Sensitive Relays

CC.6.3.12 As stated in CC.6.1.3, the **System Frequency** could rise to 52Hz or fall to 47Hz. Each **Generating Unit, DC Converter, Power Park** Module or any constituent element must continue to operate within this **Frequency** range for at least the periods of time given in CC.6.1.3 unless **NGET** has agreed to any **Frequency**-level relays and/or rate-of-change-of-**Frequency** relays which will trip such **Generating Unit, DC Converter, Power Park Module** and any constituent element within this **Frequency** range, under the **Bilateral Agreement**.

CC.6.3.13 **Generators** and **DC Converter Station** owners will be responsible for protecting all their **Generating Units, DC Converters** or **Power Park Modules** against damage should **Frequency** excursions outside the range 52Hz to 47Hz ever occur. Should such excursions occur, it is up to the **Generator** or **DC Converter Station** owner to decide whether to disconnect his **Apparatus** for reasons of safety of **Apparatus**, **Plant** and/or personnel.

CC.6.3.14 It may be agreed in the **Bilateral Agreement** that a **Genset** shall have a **Fast-Start Capability**. Such **Gensets** may be used for **Operating Reserve** and their **Start-Up** may be initiated by **Frequency**-level relays with settings in the range 49Hz to 50Hz as specified pursuant to **OC2**.

CC.6.3.15 Fault Ride Through

(a) Short circuit faults at **Supergrid Voltage** up to 140ms in duration

(i) Each **Generating Unit, DC Converter,** or **Power Park Module** and any constituent **Power Park Unit** thereof shall remain transiently stable and connected to the **System** without tripping of any **Generating Unit, DC Converter** or **Power Park Module** and / or any constituent **Power Park Unit**, for a close-up solid three-phase short circuit fault or any unbalanced short circuit fault on the **GB Transmission System** operating at **Supergrid Voltages** for a total fault clearance time of up to 140 ms. A solid three-phase or unbalanced earthed fault results in zero voltage on the faulted phase(s) at the point of fault. The duration of zero voltage is dependent on local protection and circuit breaker operating times. This duration and the fault clearance times will be specified in the **Bilateral Agreement**. Following fault clearance, recovery of the **Supergrid Voltage** to 90% may take longer than 140ms as illustrated in Appendix 4 Figures CC.A.4.1 (a) and (b).

(ii) Each **Generating Unit** or **Power Park Module** shall be designed such that upon both clearance of the fault on the **GB Transmission System** as detailed in CC.6.3.15 (a) (i) and within 0.5 seconds of the restoration of the **voltage at the Grid Entry Point** to the minimum levels specified in CC.6.1.4 (or within 0.5 seconds of restoration of the voltage at the **User System Entry Point** to 90% of nominal or greater if **Embedded**), **Active Power** output shall be restored to at least 90% of the level available immediately before the fault. Once the **Active Power** output has been restored to the required level, **Active Power** oscillations shall be acceptable provided that:

- the total **Active Energy** delivered during the period of the oscillations is at least that which would have been delivered if the **Active Power** was constant

- the oscillations are adequately damped.

During the period of the fault as detailed in CC.6.3.15 (a) (i) each **Generating Unit** or **Power Park Module** shall generate maximum reactive current without exceeding the transient rating limit of the **Generating Unit** or **Power Park Module** and / or any constituent **Power Park Unit**.

(iii) Each **DC Converter** shall be designed to meet the **Active Power** recovery characteristics as specified in the **Bilateral Agreement** upon clearance of the fault on the **GB Transmission System** as detailed in CC.6.3.15 (a) (i).

(b) **Supergrid Voltage** dips greater than 140ms in duration

In addition to the requirements of CC.6.3.15 (a) each **Generating Unit** or **Power Park Module** and / or any constituent **Power Park Unit**, each with a **Completion Date** on or after the 1 April 2005 shall:

(i) remain transiently stable and connected to the **System** without tripping of any **Generating Unit** or **Power Park Module** and / or any constituent **Power Park Unit**, for balanced **Supergrid Voltage** dips and associated durations anywhere on or above the heavy black line shown in Figure 5. Appendix 4 and Figures CC.A.4.3 (a), (b) and (c) provide an explanation and illustrations of Figure 5; and,

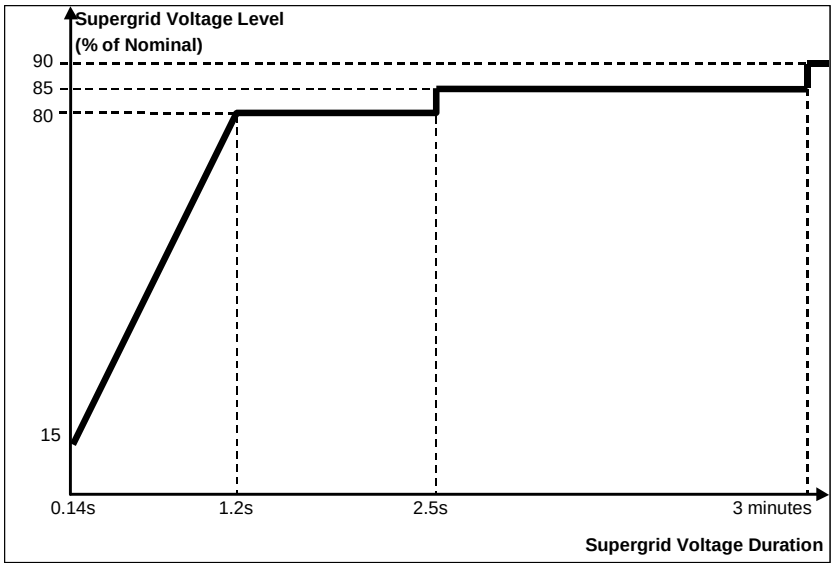


Figure 5

(ii) provide **Active Power** output, during **Supergrid Voltage** dips as described in Figure 5, at least in proportion to the retained balanced voltage at the **Grid Entry Point** (or the retained balanced voltage at the **User System Entry Point** if **Embedded**) except in the case of a **Non-Synchronous Generating Unit** or **Power Park Module** where there has been a reduction in the **Intermittent Power Source** in the time range in Figure 5 that restricts the **Active Power** output below this level and shall generate maximum reactive current without exceeding the

transient rating limits of the **Generating Unit** or **Power Park Module** and any constituent **Power Park Unit**; and,

(iii) restore **Active Power** output, following **Supergrid Voltage** dips as described in Figure 5, within 1 second of restoration of the voltage at the **Grid Entry Point** to the minimum levels specified in CC.6.1.4 (or within 1 second of restoration of the voltage at the **User System Entry Point** to 90% of nominal or greater if **Embedded**), to at least 90% of the level available immediately before the occurrence of the dip except in the case of a **Non-Synchronous Generating Unit** or **Power Park Module** where there has been a reduction in the **Intermittent Power Source** in the time range in Figure 5 that restricts the **Active Power** output below this level. Once the **Active Power** output has been restored to the required level, **Active Power** oscillations shall be acceptable provided that:

- the total **Active Energy** delivered during the period of the oscillations is at least that which would have been delivered if the **Active Power** was constant

- the oscillations are adequately damped.

For the avoidance of doubt a balanced **Supergrid Voltage** meets the requirements of CC.6.1.5 (b) and CC.6.1.6.

(c) Other Requirements

(i) In the case of a **Power Park Module** (comprising of wind-turbine generator units), the requirements in CC.6.3.15(a) and CC.6.3.15(b) do not apply when the **Power Park Module** is operating at less than 5% of its **Rated MW** or during very high wind speed conditions when more than 50% of the wind turbine generator units in a **Power Park Module** have been shut down or disconnected under an emergency shutdown sequence to protect **User's Plant** and **Apparatus**.

(ii) In addition to meeting the conditions specified in CC.6.1.5(b) and CC.6.1.6, each **Non-Synchronous Generating Unit** or **Power Park Module** with a **Completion Date** after 1 April 2005 and any constituent **Power Park Unit** thereof will be required to withstand, without tripping, the negative phase sequence loading incurred by clearance of a close-up phase-to-phase fault, by **System Back-Up Protection** on the **GB Transmission System** operating at **Supergrid Voltage**.

(iii) In the case of a **Power Park Module** in Scotland with a **Completion Date** before 1 January 2004 and a **Registered Capacity** less than 30MW the requirements in CC.6.3.15 (a) do not apply. In the case of a **Power Park Module** in Scotland with a **Completion Date** on or after 1 January 2004 and before 1 July 2005 and a **Registered Capacity** less than 30MW the requirements in CC.6.3.15 (a) are relaxed from the minimum **Supergrid Voltage** of zero to a minimum **Supergrid Voltage** of 15% of nominal. In the case of a **Power Park Module** in Scotland with a **Completion Date** before 1 January 2004 and a **Registered Capacity** of 30MW and above the requirements in CC.6.3.15 (a) are relaxed from the minimum **Supergrid Voltage** of zero to a minimum **Supergrid Voltage** of 15% of nominal.

(iv) To avoid unwanted island operation, **Non-Synchronous Generating Units** in Scotland or **Power Park Modules** in Scotland shall be tripped for the following conditions:-

(1) Frequency above 52Hz for more than 2 seconds
(2) Frequency below 47Hz for more than 2 seconds
(3) Voltage as measured at the **Connection Point** or **User System Entry Point** below 80% for more than 2 seconds
(4) Voltage as measured at the **Connection Point** or **User System Entry Point** above 120% (115% for 275kV) for more than 1 second.

The times in sections (1) and (2) are maximum trip times. Shorter times may be used to protect the **Non-Synchronous Generating Units** or **Power Park Modules.**

Additional Damping Control Facilities for **DC Converters**

CC.6.3.16 (a) **DC Converter** owners or **Network Operators** in the case of an **Embedded DC Converter Station** not subject to a **Bilateral Agreement** must ensure that any of their **DC Converters** will not cause a sub-synchronous resonance problem on the **Total System**. Each **DC Converter** is required to be provided with sub-synchronous resonance damping control facilities.

(b) Where specified in the **Bilateral Agreement**, each **DC Converter** is required to be provided with power oscillation damping or any other identified additional control facilities.

System to Generator Operational Intertripping Scheme

CC.6.3.17 **NGET** may require that a **System to Generator Operational Intertripping Scheme** be installed as part of a condition of the connection of the **Generator**. Scheme specific details shall be included in the relevant **Bilateral Agreement**.

CC.6.4 GENERAL **NETWORK OPERATOR** AND **NON-EMBEDDED CUSTOMER** REQUIREMENTS

CC.6.4.1 This part of the **Grid Code** describes the technical and design criteria and performance requirements for **Network Operators** and **Non-Embedded Customers**.

Neutral **Earthing**

CC.6.4.2 At nominal **System** voltages of 132kV and above the higher voltage windings of three phase transformers and transformer banks connected to the **GB Transmission System** must be star connected with the star point suitable for connection to earth. The earthing and lower voltage winding arrangement shall be such as to ensure that the **Earth Fault Factor** requirement of paragraph CC.6.2.1.1 (b) will be met on the **GB Transmission System** at nominal **System** voltages of 132kV and above.

Frequency Sensitive Relays

CC.6.4.3 As explained under **OC6**, each **Network Operator**, will make arrangements that will facilitate automatic low **Frequency Disconnection** of **Demand** (based on **Annual ACS Conditions**). CC.A.5.5. of Appendix 5 includes specifications of the local percentage **Demand** that shall be disconnected at specific frequencies. The manner in which **Demand** subject to low **Frequency** disconnection will be split into discrete MW blocks is specified in OC6.6. Technical requirements relating to **Low Frequency Relays** are also listed in Appendix 5.

Operational Metering

CC.6.4.4 Where **NGET** can reasonably demonstrate that an **Embedded Medium Power Station** or **Embedded DC Converter Station** has a significant effect on the **GB Transmission System**, it may require the **Network Operator** within whose **System** the **Embedded Medium Power Station or Embedded DC Converter Station** is situated to ensure that the operational metering equipment described in CC.6.5.6 is installed such that **NGET** can receive the data referred to in CC.6.5.6. In the case of an **Embedded Medium Power Station** subject to, or proposed to be subject to a **Bilateral Agreement NGET** shall notify such **Network Operator** of the details of such installation in writing within 3 months of being notified of the application to connect under **CUSC** and in the case of an **Embedded Medium Power Station** not subject to, or not proposed to be subject to a **Bilateral Agreement** in writing as a **Site Specific Requirement** in accordance with the timescales in CUSC 6.5.5. In either case the **Network Operator** shall ensure that the data referred to in CC.6.5.6 is provided to **NGET**.

CC.6.5 COMMUNICATIONS PLANT

CC.6.5.1 In order to ensure control of the **GB Transmission System**, telecommunications between **Users** and **NGET** must, if required by **NGET**, be established in accordance with the requirements set down below.

CC.6.5.2 **Control Telephony** and **System Telephony**

CC.6.5.2.1 **Control Telephony** is the principle method by which a **User's Responsible Engineer/Operator** and **NGET Control Engineers** speak to one another for the purposes of control of the **Total System** in both normal and emergency operating conditions. **Control Telephony** provides secure point to point telephony for routine **Control Calls,** priority **Control Calls** and emergency **Control Calls**.

CC.6.5.2.2 **System Telephony** is an alternate method by which a **User's Responsible Engineer/Operator** and **NGET Control Engineers** speak to one another for the purposes of control of the **Total System** in both normal operating conditions and where practicable, emergency operating conditions. **System Telephony** uses the Public Switched Telephony Network to provide telephony for **Control Calls**, inclusive of emergency **Control Calls**.

CC.6.5.2.3 Calls made and received over **Control Telephony** and **System Telephony** may be recorded and subsequently replayed for commercial and operational reasons.

CC.6.5.3 Supervisory Tones

CC.6.5.3.1 **Control Telephony** supervisory tones indicate to the calling and receiving parties dial, engaged, ringing, secondary engaged (signifying that priority may be exercised) and priority disconnect tones.

CC.6.5.3.2 **System Telephony** supervisory tones indicate to the calling and receiving parties dial, engaged and ringing tones.

CC.6.5.4 Obligations in respect of **Control Telephony** and **System Telephony**

CC.6.5.4.1 Where **NGET** requires **Control Telephony**, **Users** are required to use the **Control Telephony** with **NGET** in respect of all **Connection Points** with the **GB Transmission System** and in respect of all **Embedded Large Power Stations** and **Embedded DC Converter Stations**. **NGET** will install **Control Telephony** at the **User's Control Point** where the **User's** telephony equipment is not capable of providing the required facilities or is otherwise incompatible with the **Transmission Control Telephony**. Details of and relating to the **Control Telephony** required are contained in the **Bilateral Agreement**.

CC.6.5.4.2 Where in **NGET's** sole opinion the installation of **Control Telephony** is not practicable at a **User's Control Point(s)**, **NGET** shall specify in the **Bilateral Agreement** whether **System Telephony** is required. Where **System Telephony** is required by **NGET**, the **User** shall ensure that **System Telephony** is installed.

CC.6.5.4.3 Where **System Telephony** is installed, **Users** are required to use the **System Telephony** with **NGET** in respect of those **Control Point(s)** for which it has been installed. Details of and relating to the **System Telephony** required are contained in the **Bilateral Agreement**.

CC.6.5.4.4 Where **Control Telephony** or **System Telephony** is installed, routine testing of such facilities may be required by **NGET** (not normally more than once in any calendar month). The **User** and **NGET** shall use reasonable endeavours to agree a test programme and where **NGET** requests the assistance of the **User** in performing the agreed test programme the **User** shall provide such assistance.

CC.6.5.4.5 **Control Telephony** and **System Telephony** shall only be used for the purposes of operational voice communication between **NGET** and the relevant **User**.

CC.6.5.4.6 **Control Telephony** contains emergency calling functionality to be used for urgent operational communication only. Such functionality enables **NGET** and **Users** to utilise a priority call in the event of an emergency. **NGET** and **Users** shall only use such priority call functionality for urgent operational communications.

CC.6.5.5 Technical Requirements for **Control Telephony** and **System Telephony**

CC.6.5.5.1 Detailed information on the technical interfaces and support requirements for **Control Telephony** applicable in **NGET's Transmission Area** is provided in the **Control Telephony Electrical Standard** identified in the Annex to the **General Conditions**. Where additional information, or information in relation to **Control Telephony** applicable in Scotland, is requested by **Users**, this will be provided, where possible, by **NGET**.

CC.6.5.5.2 **System Telephony** shall consist of a dedicated Public Switched Telephone Network telephone line that shall be installed and configured by the relevant **User**. **NGET** shall provide a dedicated free phone number (UK only), for the purposes of receiving incoming calls to **NGET**, which **Users** shall utilise for **System Telephony**. **System Telephony** shall only be utilised by the **NGET Control Engineer** and the **User's Responsible Engineer/Operator** for the purposes of operational communications.

Operational Metering

CC.6.5.6 (a) **NGET** shall provide system control and data acquisition (SCADA) outstation interface equipment. The **User** shall provide such voltage, current, **Frequency**, **Active Power** and **Reactive Power** measurement outputs and plant status indications and alarms to the **Transmission** SCADA outstation interface equipment as required by **NGET** in accordance with the terms of the **Bilateral Agreement**.

(b) For the avoidance of doubt, for **Active Power** and **Reactive Power** measurements, circuit breaker and disconnector status indications from:

(i) **CCGT Modules** at **Large Power Stations**, the outputs and status indications must each be provided to **NGET** on an individual **CCGT Unit** basis. In addition, where identified in the **Bilateral Agreement, Active Power** and **Reactive Power** measurements from **Unit Transformers** and/or **Station Transformers** must be provided.

(ii) **DC Converters** at **DC Converter Stations**, the outputs and status indications must each be provided to **NGET** on an individual **DC Converter** basis. In addition, where identified in the **Bilateral Agreement, Active Power** and **Reactive Power** measurements from converter and/or station transformers must be provided.

(iii) **Power Park Modules** at **Embedded Large Power Stations** and at directly connected **Power Stations,** the outputs and status indications must each be provided to **NGET** on an individual **Power Park Module** basis. In addition, where identified in the **Bilateral Agreement, Active Power** and **Reactive Power** measurements from station transformers must be provided.

(c) For the avoidance of doubt, the requirements of CC.6.5.6(a) in the case of a **Cascade Hydro Scheme** will be provided for each **Generating Unit** forming part of that **Cascade Hydro Scheme**. In the case of **Embedded Generating Units** forming part of a **Cascade Hydro Scheme** the data may be provided by means other than a **NGET** SCADA outstation located at the **Power Station**, such as, with the agreement of the **Network Operator** in whose system such **Embedded Generating Unit** is located, from the **Network Operator's** SCADA system to **NGET**. Details of such arrangements will be contained in the relevant **Bilateral Agreements** between **NGET** and the **Generator** and the **Network Operator**.

(d) In the case of a **Power Park Module** an additional energy input signal (e.g. wind speed) may be specified in the **Bilateral Agreement** . The signal may be used to establish the level of energy input from the **Intermittent Power Source** for monitoring pursuant to CC.6.6.1 and **Ancillary Services** and will, in the case of a wind farm, be used to provide **NGET** with advanced warning of excess wind speed shutdown.

Instructor Facilities

CC.6.5.7 The **User** shall accommodate **Instructor Facilities** provided by **NGET** for the receipt of operational messages relating to **System** conditions.

Electronic Data Communication Facilities

CC.6.5.8 (a) All **BM Participants** must ensure that appropriate electronic data communication facilities are in place to permit the submission of data, as required by the **Grid Code**, to **NGET.**

(b) In addition, any **User** that wishes to participate in the **Balancing Mechanism** must ensure that appropriate automatic logging devices are installed at the **Control Points** of its **BM Units** to submit data to and to receive instructions from **NGET**, as required by the **Grid Code**. For the avoidance of doubt, in the case of an **Interconnector User** the **Control Point** will be at the **Control Centre** of the appropriate **Externally Interconnected System Operator**.

(c) Detailed specifications of these required electronic facilities will be provided by **NGET** on request and they are listed as **Electrical Standards** in the Annex to the **General Conditions**.

Facsimile Machines

CC.6.5.9 Each **User** and **NGET** shall provide a facsimile machine or machines:-

(a) in the case of **Generators,** at the **Control Point** of each **Power Station** and at its **Trading Point**;

(b) in the case of **NGET** and **Network Operators**, at the **Control Centre(s);** and

(c) in the case of **Non-Embedded Customers** and **DC Converter Station** owners at the **Control Point**.

Each **User** shall notify, prior to connection to the **System** of the **User's Plant and Apparatus**, **NGET** of its or their telephone number or numbers, and will notify **NGET** of any changes. Prior to connection to the **System** of the **User's Plant** and **Apparatus NGET** shall notify each **User** of the telephone number or numbers of its facsimile machine or machines and will notify any changes.

CC.6.5.10 Busbar Voltage

NGET shall, subject as provided below, provide each **Generator** or **DC Converter Station** owner at each **Grid Entry Point** where one of its **Power Stations** or **DC Converter Stations** is connected with appropriate voltage signals to enable the **Generator** or **DC Converter Station** owner to obtain the necessary information to permit its **Gensets or DC Converters** to be **Synchronised** to the **GB Transmission System.** The term **"voltage signal"** shall mean in this context, a point of connection on (or wire or wires from) a relevant part of **Transmission Plant** and/or **Apparatus** at the **Grid Entry Point**, to which the **Generator** or **DC Converter Station** owner**,** with **NGET's** agreement (not to be unreasonably withheld) in relation to the **Plant** and/or **Apparatus** to be attached, will be able to attach its **Plant** and/or **Apparatus** (normally a wire or wires) in order to obtain measurement outputs in relation to the busbar.

CC.6.5.11 Bilingual Message Facilities

(a) A Bilingual Message Facility is the method by which the **User's Responsible Engineer/Operator,** the **Externally Interconnected System Operator** and **NGET Control Engineers** communicate clear and unambiguous information in two languages for the purposes of control of the **Total System** in both normal and emergency operating conditions.

(b) A Bilingual Message Facility, where required, will provide up to two hundred pre-defined messages with up to five hundred and sixty characters each. A maximum of one minute is allowed for the transmission to, and display of, the selected message at any destination. The standard messages must be capable of being displayed at any combination of locations and can originate from any of these locations. Messages displayed in the UK will be displayed in the English language.

(c) Detailed information on a Bilingual Message Facility and suitable equipment required for individual **User** applications will be provided by **NGET** upon request.

CC.6.6 **SYSTEM** MONITORING

CC.6.6.1 Monitoring equipment is provided on the **GB Transmission System** to enable **NGET** to monitor its power system dynamic performance conditions. Where this monitoring equipment requires voltage and current signals on the **Generating Unit** (other than **Power Park Unit**), **DC Converter** or **Power Park Module** circuit from the **User**, **NGET** will inform the **User** and they will be provided by the **User** with both the timing of the installation of the equipment for receiving such signals and its exact position being agreed (the **User's** agreement not to be unreasonably withheld) and the costs being dealt with, pursuant to the terms of the **Bilateral Agreement**.

CC.7 SITE RELATED CONDITIONS

CC.7.1 Not used.

CC.7.2 RESPONSIBILITIES FOR SAFETY

CC.7.2.1 In England and Wales, any **User** entering and working on its **Plant** and/or **Apparatus** on a **Transmission Site** will work to the **Safety Rules** of **NGET**.

In Scotland, any **User** entering and working on its **Plant** and/or **Apparatus** on a **Transmission Site** will work to the **Safety Rules** of the **Relevant Transmission Licensee**, as advised by **NGET**.

CC.7.2.2 **NGET** entering and working on **Transmission Plant** and/or **Apparatus** on a **User Site** will work to the **User's Safety Rules**. For **User Sites** in Scotland, **NGET** shall procure that the **Relevant Transmission Licensee** entering and working on **Transmission Plant** and/or **Apparatus** on a **User Site** will work to the **User's Safety Rules**.

CC.7.2.3 A **User** may, with a minimum of six weeks notice, apply to **NGET** for permission to work according to that **Users** own **Safety Rules** when working on its **Plant** and/or **Apparatus** on a **Transmission Site** rather than those set out in CC.7.2.1. If **NGET** is of the opinion that the **User's Safety Rules** provide for a level of safety

commensurate with those set out in CC.7.2.1, **NGET** will notify the **User**, in writing, that, with effect from the date requested by the **User**, the **User** may use its own **Safety Rules** when working on its **Plant** and/or **Apparatus** on the **Transmission Site**. For a **Transmission Site** in Scotland, in forming its opinion, **NGET** will seek the opinion of the **Relevant Transmission Licensee**. Until receipt of such written approval from **NGET**, the **User** will continue to use the **Safety Rules** as set out in CC7.2.1.

CC.7.2.4 In the case of a **User Site** in England and Wales, **NGET** may, with a minimum of six weeks notice, apply to a **User** for permission to work according to **NGET's Safety Rules** when working on **Transmission Plant** and/or **Apparatus** on that **User Site**, rather than the **User's Safety Rules**. If the **User** is of the opinion that **NGET's Safety Rules** provide for a level of safety commensurate with that of that **User's Safety Rules**, it will notify **NGET**, in writing, that, with the effect from the date requested by **NGET**, **NGET** may use its own **Safety Rules** when working on its **Transmission Plant** and/or **Apparatus** on that **User Site**. Until receipt of such written approval from the **User**, **NGET** shall continue to use the **User's Safety Rules**.

In the case of a **User Site** in Scotland, **NGET** may, with a minimum of six weeks notice, apply to a **User** for permission for the **Relevant Transmission Licensee** to work according to the **Relevant Transmission Licensee's Safety Rules** when working on **Transmission Plant** and/or **Apparatus** on that **User Site**, rather than the **User's Safety Rules**. If the **User** is of the opinion that the **Relevant Transmission Licensee's Safety Rules**, provide for a level of safety commensurate with that of that **User's Safety Rules**, it will notify **NGET**, in writing, that, with effect from the date requested by **NGET**, that the **Relevant Transmission Licensee** may use its own **Safety Rules** when working on its **Transmission Plant** and/or **Apparatus** on that **User's Site**. Until receipt of such written approval from the **User**, **NGET** shall procure that the **Relevant Transmission Licensee** shall continue to use the **User's Safety Rules**.

CC.7.2.5 For a **Transmission Site** in England and Wales, if **NGET** gives its approval for the **User's Safety Rules** to apply to the **User** when working on its **Plant** and/or **Apparatus**, that does not imply that the **User's Safety Rules** will apply to entering the **Transmission Site** and access to the **User's Plant** and/or **Apparatus** on that **Transmission Site**. Bearing in mind **NGET's** responsibility for the whole **Transmission Site**, entry and access will always be in accordance with **NGET's** site access procedures. For a **User Site** in England and Wales, if the **User** gives its approval for **NGET's Safety Rules** to apply to **NGET** when working on its **Plant** and **Apparatus**, that does not imply that **NGET's Safety Rules** will apply to entering the **User Site**, and access to the **Transmission Plant** and **Apparatus** on that **User Site**. Bearing in mind the **User's** responsibility for the whole **User Site**, entry and access will always be in accordance with the **User's** site access procedures.

For a **Transmission Site** in Scotland, if **NGET** gives its approval for the **User's Safety Rules** to apply to the **User** when working on its **Plant** and/or **Apparatus**, that does not imply that the **User's Safety Rules** will apply to entering the **Transmission Site** and access to the **User's Plant** and/or **Apparatus** on that **Transmission Site**. Bearing in mind the **Relevant Transmission Licensee's** responsibility for the whole **Transmission Site**, entry and access will always be in accordance with the **Relevant Transmission Licensee's** site access procedures. For a **User Site** in Scotland, if the **User** gives its approval for **Relevant Transmission Licensee Safety Rules** to apply to the **Relevant Transmission Licensee** when working on its **Plant** and **Apparatus**, that does not imply that the **Relevant Transmission Licensee's Safety Rules** will apply to entering the **User Site**, and access to the **Transmission Plant** and **Apparatus** on that **User Site**.

Bearing in mind the **User's** responsibility for the whole **User Site**, entry and access will always be in accordance with the **User's** site access procedures.

CC.7.2.6 For **User Sites** in England and Wales, **Users** shall notify **NGET** of any **Safety Rules** that apply to **NGET's** staff working on **User Sites**. For **Transmission Sites** in England and Wales, **NGET** shall notify **Users** of any **Safety Rules** that apply to the **User's** staff working on the **Transmission Site**.

For **User Sites** in Scotland, **Users** shall notify **NGET** of any **Safety Rules** that apply to the **Relevant Transmission Licensee's** staff working on **User Sites**. For **Transmission Sites** in Scotland **NGET** shall procure that the **Relevant Transmission Licensee** shall notify **Users** of any **Safety Rules** that apply to the **User's** staff working on the **Transmission Site**.

CC.7.2.7 Each **Site Responsibility Schedule** must have recorded on it the **Safety Rules** which apply to each item of **Plant** and/or **Apparatus**.

CC.7.3 SITE RESPONSIBILITY SCHEDULES

CC.7.3.1 In order to inform site operational staff and **NGET Control Engineers** of agreed responsibilities for **Plant** and/or **Apparatus** at the operational interface, a **Site Responsibility Schedule** shall be produced for **Connection Sites** in England and Wales for **NGET** and **Users** with whom they interface, and for **Connection Sites** in Scotland for **NGET**, the **Relevant Transmission Licensee** and **Users** with whom they interface.

CC.7.3.2 The format, principles and basic procedure to be used in the preparation of **Site Responsibility Schedules** are set down in Appendix 1.

CC.7.4 OPERATION AND GAS ZONE DIAGRAMS

Operation Diagrams

CC.7.4.1 An **Operation Diagram** shall be prepared for each **Connection Site** at which a **Connection Point** exists using, where appropriate, the graphical symbols shown in Part 1A of Appendix 2. **Users** should also note that the provisions of **OC11** apply in certain circumstances.

CC.7.4.2 The **Operation Diagram** shall include all **HV Apparatus** and the connections to all external circuits and incorporate numbering, nomenclature and labelling, as set out in **OC11**. At those **Connection Sites** where gas-insulated metal enclosed switchgear and/or other gas-insulated **HV Apparatus** is installed, those items must be depicted within an area delineated by a chain dotted line which intersects gas-zone boundaries. The nomenclature used shall conform with that used on the relevant **Connection Site** and circuit. The **Operation Diagram** (and the list of technical details) is intended to provide an accurate record of the layout and circuit interconnections, ratings and numbering and nomenclature of **HV Apparatus** and related **Plant**.

CC.7.4.3 A non-exhaustive guide to the types of **HV Apparatus** to be shown in the **Operation Diagram** is shown in Part 2 of Appendix 2, together with certain basic principles to be followed unless equivalent principles are approved by **NGET**.

Gas Zone Diagrams

CC.7.4.4 A **Gas Zone Diagram** shall be prepared for each **Connection Site** at which a **Connection Point** exists where gas-insulated switchgear and/or other gas-insulated **HV Apparatus** is utilised. They shall use, where appropriate, the graphical symbols shown in Part 1B of Appendix 2.

CC.7.4.5 The nomenclature used shall conform with that used in the relevant **Connection Site** and circuit.

CC.7.4.6 The basic principles set out in Part 2 of Appendix 2 shall be followed in the preparation of **Gas Zone Diagrams** unless equivalent principles are approved by **NGET**.

Preparation of **Operation** and **Gas Zone Diagrams** for **Users' Sites**

CC.7.4.7 In the case of a **User Site**, the **User** shall prepare and submit to **NGET**, an **Operation Diagram** for all **HV Apparatus** on the **User** side of the **Connection Point** and **NGET** shall provide the **User** with an **Operation Diagram** for all **HV Apparatus** on the **Transmission** side of the **Connection Point**, in accordance with the timing requirements of the **Bilateral Agreement** and/or **Construction Agreement** prior to the **Completion Date** under the **Bilateral Agreement** and/or **Construction Agreement.**

CC.7.4.8 The **User** will then prepare, produce and distribute, using the information submitted on the **User's Operation Diagram** and **NGET Operation Diagram**, a composite **Operation Diagram** for the complete **Connection Site**, also in accordance with the timing requirements of the **Bilateral Agreement** and/or **Construction Agreement** .

CC.7.4.9 The provisions of CC7.4.7 and CC.7.4.8 shall apply in relation to **Gas Zone Diagrams** where gas-insulated switchgear and/or other gas-insulated **HV Apparatus** is utilised.

Preparation of **Operation** and **Gas Zone Diagrams** for **Transmission Sites**

CC.7.4.10 In the case of an **Transmission Site**, the **User** shall prepare and submit to **NGET** an **Operation Diagram** for all **HV Apparatus** on the **User** side of the **Connection Point**, in accordance with the timing requirements of the **Bilateral Agreement** and/or **Construction Agreement**.

CC.7.4.11 **NGET** will then prepare, produce and distribute, using the information submitted on the **User's Operation Diagram**, a composite **Operation Diagram** for the complete **Connection Site**, also in accordance with the timing requirements of the **Bilateral Agreement** and/or **Construction Agreement** .

CC.7.4.12 The provisions of CC7.4.10 and CC.7.4.11 shall apply in relation to **Gas Zone Diagrams** where gas-insulated switchgear and/or other gas-insulated **HV Apparatus** is utilised.

CC.7.4.13 Changes to **Operation** and **Gas Zone Diagrams**

CC.7.4.13.1 When **NGET** has decided that it wishes to install new **HV Apparatus** or it wishes to change the existing numbering or nomenclature of **Transmission HV Apparatus** at a **Transmission Site**, **NGET** will (unless it gives rise to a **Modification** under the **CUSC**, in which case the provisions of the **CUSC** as to the timing apply) one month prior to the installation or change, send to each such **User** a revised **Operation Diagram** of that **Transmission Site**, incorporating the new **Transmission HV**

Apparatus to be installed and its numbering and nomenclature or the changes, as the case may be. **OC11** is also relevant to certain **Apparatus**.

CC.7.4.13.2 When a **User** has decided that it wishes to install new **HV Apparatus**, or it wishes to change the existing numbering or nomenclature of its **HV Apparatus** at its **User Site**, the **User** will (unless it gives rise to a **Modification** under the **CUSC**, in which case the provisions of the **CUSC** as to the timing apply) one month prior to the installation or change, send to **NGET** a revised **Operation Diagram** of that **User Site** incorporating the new **User HV Apparatus** to be installed and its numbering and nomenclature or the changes as the case may be. **OC11** is also relevant to certain **Apparatus**.

CC.7.4.13.3 The provisions of CC7.4.13.1 and CC.7.4.13.2 shall apply in relation to **Gas Zone Diagrams** where gas-insulated switchgear and/or other gas-insulated **HV Apparatus** is installed.

Validity

CC.7.4.14 (a) The composite **Operation Diagram** prepared by **NGET** or the **User**, as the case may be, will be the definitive **Operation Diagram** for all operational and planning activities associated with the **Connection Site**. If a dispute arises as to the accuracy of the composite **Operation Diagram**, a meeting shall be held at the **Connection Site**, as soon as reasonably practicable, between **NGET** and the **User**, to endeavour to resolve the matters in dispute.

(b) An equivalent rule shall apply for **Gas Zone Diagrams** where they exist for a **Connection Site.**

CC.7.5 SITE COMMON DRAWINGS

CC.7.5.1 **Site Common Drawings** will be prepared for each **Connection Site** and will include **Connection Site** layout drawings, electrical layout drawings, common **Protection**/control drawings and common services drawings.

Preparation of **Site Common Drawings** for a **User Site**

CC.7.5.2 In the case of a **User Site**, **NGET** shall prepare and submit to the **User**, **Site Common Drawings** for the **Transmission** side of the **Connection Point** in accordance with the timing requirements of the **Bilateral Agreement** and/or **Construction Agreement**.

CC.7.5.3 The **User** will then prepare, produce and distribute, using the information submitted on the **Transmission Site Common Drawings**, **Site Common Drawings** for the complete **Connection Site** in accordance with the timing requirements of the **Bilateral Agreement** and/or **Construction Agreement** .

Preparation of **Site Common Drawings** for a **Transmission Site**

CC.7.5.4 In the case of a **Transmission Site**, the **User** will prepare and submit to **NGET Site Common Drawings** for the **User** side of the **Connection Point** in accordance with the timing requirements of the **Bilateral Agreement** and/or **Construction Agreement**.

CC.7.5.5 **NGET** will then prepare, produce and distribute, using the information submitted in the **User's Site Common Drawings**, **Site Common Drawings** for the complete

Connection Site in accordance with the timing requirements of the **Bilateral Agreement** and/or **Construction Agreement**.

CC.7.5.6 When a **User** becomes aware that it is necessary to change any aspect of the **Site Common Drawings** at a **Connection Site** it will:

(a) if it is a **User Site**, as soon as reasonably practicable, prepare, produce and distribute revised **Site Common Drawings** for the complete **Connection Site**; and

(b) if it is a **Transmission Site**, as soon as reasonably practicable, prepare and submit to **NGET** revised **Site Common Drawings** for the **User** side of the **Connection Point** and **NGET** will then, as soon as reasonably practicable, prepare, produce and distribute, using the information submitted in the **User's Site Common Drawings**, revised **Site Common Drawings** for the complete **Connection Site**.

In either case, if in the **User's** reasonable opinion the change can be dealt with by it notifying **NGET** in writing of the change and for each party to amend its copy of the **Site Common Drawings** (or where there is only one set, for the party holding that set to amend it), then it shall so notify and each party shall so amend. If the change gives rise to a **Modification** under the **CUSC**, the provisions of the **CUSC** as to timing will apply.

CC.7.5.7 When **NGET** becomes aware that it is necessary to change any aspect of the **Site Common Drawings** at a **Connection Site** it will:

(a) if it is a **Transmission Site**, as soon as reasonably practicable, prepare, produce and distribute revised **Site Common Drawings** for the complete **Connection Site**; and

(b) if it is a **User Site**, as soon as reasonably practicable, prepare and submit to the **User** revised **Site Common Drawings** for the **Transmission** side of the **Connection Point** and the **User** will then, as soon as reasonably practicable, prepare, produce and distribute, using the information submitted in the **Transmission Site Common Drawings**, revised **Site Common Drawings** for the complete **Connection Site**.

In either case, if in **NGET's** reasonable opinion the change can be dealt with by it notifying the **User** in writing of the change and for each party to amend its copy of the **Site Common Drawings** (or where there is only one set, for the party holding that set to amend it), then it shall so notify and each party shall so amend. If the change gives rise to a **Modification** under the **CUSC**, the provisions of the **CUSC** as to timing will apply.

Validity

CC.7.5.8 The **Site Common Drawings** for the complete **Connection Site** prepared by the **User** or **NGET**, as the case may be, will be the definitive **Site Common Drawings** for all operational and planning activities associated with the **Connection Site**. If a dispute arises as to the accuracy of the **Site Common Drawings**, a meeting shall be held at the **Site**, as soon as reasonably practicable, between **NGET** and the **User**, to endeavour to resolve the matters in dispute.

CC.7.6 ACCESS

CC.7.6.1 The provisions relating to access to **Transmission Sites** by **Users**, and to **Users' Sites** by **Transmission Licensees**, are set out in each **Interface Agreement** with, for **Transmission Sites** in England and Wales, **NGET** and each **User,** and for **Transmission Sites** in Scotland, the **Relevant Transmission Licensee** and each **User**.

CC.7.6.2 In addition to those provisions, where a **Transmission Site** in England and Wales contains exposed **HV** conductors, unaccompanied access will only be granted to individuals holding an **Authority for Access** issued by **NGET** and where a **Transmission Site** in Scotland contains exposed **HV** conductors, unaccompanied access will only be granted to individuals holding an **Authority for Access** issued by the **Relevant Transmission Licensee**.

CC.7.6.3 The procedure for applying for an **Authority for Access** is contained in the **Interface Agreement**.

CC.7.7 MAINTENANCE STANDARDS

CC.7.7.1 It is a requirement that all **User's Plant** and **Apparatus** on **Transmission 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 **Transmission Plant, Apparatus** or personnel on the **Transmission Site**. **NGET** will have the right to inspect the test results and maintenance records relating to such **Plant** and **Apparatus** at any time. In Scotland, it is the **User's** responsibility to ensure that all the **User's Plant** and **Apparatus**, including protection systems, are tested and maintained and remain rated for the duty required. An annual update of system fault levels is available as part of the **Seven Year Statement**.

CC.7.7.2 It is a requirement that all **Transmission Plant** and **Apparatus** on **User's Sites** is maintained adequately for the purposes for which it is intended and to ensure that it does not pose a threat to the safety of any of the **User's Plant**, **Apparatus** or personnel on the **User Site**. **Users** will have the right to inspect the test results and maintenance records relating to such **Plant** and **Apparatus**, at any time.

CC.7.8 SITE OPERATIONAL PROCEDURES

CC.7.8.1 **NGET** and **Users** with an interface with **NGET**, must make available staff to take necessary **Safety Precautions** and carry out operational duties as may be required to enable work/testing to be carried out and for the operation of **Plant** and **Apparatus** connected to the **Total System**.

CC.7.9 **Generators** and **DC Converter Station** owners shall provide a **Control Point** in respect of each **Power Station** directly connected to the **GB Transmission System** and **Embedded Large Power Station** or **DC Converter Station** to receive and act upon instructions pursuant to OC7 and BC2 at all times that **Generating Units** or **Power Park Modules** at the **Power Station** are generating or available to generate or **DC Converters** at the **DC Converter Station** are importing or exporting or available to do so. The **Control Point** shall be continuously manned except where the **Bilateral Agreement** in respect of such **Embedded Power Station** specifies that compliance with BC2 is not required, where the **Control Point** shall be manned between the hours of 0800 and 1800 each day.

CC.8 ANCILLARY SERVICES

CC.8.1 System Ancillary Services

The **CC** contain requirements for the capability for certain **Ancillary Services**, which are needed for **System** reasons ("**System Ancillary Services**"). There follows a list of these **System Ancillary Services**, together with the paragraph number of the **CC** (or other part of the **Grid Code**) in which the minimum capability is required or referred to. The list is divided into two categories: Part 1 lists the **System Ancillary Services** which

(a) **Generators** in respect of **Large Power Stations** are obliged to provide (except **Generators** in respect of **Large Power Stations** which have a **Registered Capacity** of less than 50MW and comprise **Power Park Modules**); and,

(b) Generators in respect of **Large Power Stations** which a **Registered Capacity** of less than 50MW and comprise **Power Park Modules** are obliged to provide in respect of **Reactive Power** only; and,

(c) **DC Converter Station** owners are obliged to have the capability to supply; and

(d) **Generators** in respect of **Medium Power Stations** (except **Embedded Medium Power Stations**) are obliged to provide in respect of **Reactive Power** only:

and Part 2 lists the **System Ancillary Services** which **Generators** will provide only if agreement to provide them is reached with **NGET**:

Part 1

(a) **Reactive Power** supplied (in accordance with CC.6.3.2) otherwise than by means of synchronous or static compensators (except in the case of a **Power Park Module** where synchronous or static compensators within the **Power Park Module** may be used to provide **Reactive Power**)

(b) **Frequency** Control by means of **Frequency** sensitive generation - CC.6.3.7 and BC3.5.1

Part 2

(c) **Frequency** Control by means of **Fast Start** - CC.6.3.14

(d) **Black Start Capability** - CC.6.3.5

(e) **System to Generator Operational Intertripping**

CC.8.2 Commercial Ancillary Services

Other **Ancillary Services** are also utilised by **NGET** in operating the **Total System** if these have been agreed to be provided by a **User** (or other person) under an **Ancillary Services Agreement** or under a **Bilateral Agreement**, with payment being dealt with under an **Ancillary Services Agreement** or in the case of **Externally Interconnected System Operators** or **Interconnector Users**, under

any other agreement (and in the case of **Externally Interconnected System Operators** and **Interconnector Users** includes ancillary services equivalent to or similar to **System Ancillary Services**) ("**Commercial Ancillary Services**"). The capability for these **Commercial Ancillary Services** is set out in the relevant **Ancillary Services Agreement** or **Bilateral Agreement** (as the case may be).

CONNECTION CONDITIONS

APPENDIX 1

FORMAT, PRINCIPLES AND BASIC PROCEDURE TO BE USED IN THE PREPARATION OF **SITE RESPONSIBILITY SCHEDULES**

CC.A.1.1 PRINCIPLES

Types of Schedules

CC.A.1.1.1 At all **Complexes** the following **Site Responsibility Schedules** shall be drawn up using the relevant proforma attached or with such variations as may be agreed between **NGET** and **Users**, but in the absence of agreement the relevant 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, DC Converter, Power Park Module** and **Power Station** locations, the schedules referred to in (b) and (c) may be combined.

New **Connection Sites**

CC.A.1.1.2 In the case of a new **Connection Site** each **Site Responsibility Schedule** for a **Connection Site** shall be prepared by **NGET** in consultation with relevant **Users** at least 2 weeks prior to the **Completion Date** under the **Bilateral Agreement** and/or **Construction Agreement** for that **Connection Site** (which may form part of a **Complex**). Each **User** shall, in accordance with the timing requirements of the **Bilateral Agreement** and/or **Construction Agreement** , provide information to **NGET** to enable it to prepare the **Site Responsibility Schedule**.

Sub-division

CC.A.1.1.3 Each **Site Responsibility Schedule** will be subdivided to take account of any separate **Connection Sites** on that **Complex**.

Scope

CC.A.1.1.4 Each **Site Responsibility Schedule** shall detail for each item of **Plant** and **Apparatus**:-

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

(b) Site Manager (Controller) (except in the case of **Plant/Apparatus** located in **SPT's Transmission Area**);

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

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

(e) Responsibility to undertake statutory inspections, fault investigation and maintenance.

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

Detail

CC.A.1.1.5 (a) In the case of **Site Responsibility Schedules** referred to in CC.A.1.1.1(b) and (c), with the exception of **Protection Apparatus** and **Intertrip Apparatus** operation, it will be sufficient to indicate the responsible **User** or **Transmission Licensee**, as the case may be.

(b) In the case of the **Site Responsibility Schedule** referred to in CC.A.1.1.1(a) and for **Protection Apparatus** and **Intertrip Apparatus**, the responsible management unit must be shown in addition to the **User** or **Transmission Licensee**, as the case may be.

CC.A.1.1.6 The **HV Apparatus Site Responsibility Schedule** for each **Connection Site** must include lines and cables emanating from or traversing[1] the **Connection Site**.

Issue Details

CC.A.1.1.7 Every page of each **Site Responsibility Schedule** shall bear the date of issue and the issue number.

Accuracy Confirmation

CC.A.1.1.8 When a **Site Responsibility Schedule** is prepared it shall be sent by **NGET** to the **Users** involved for confirmation of its accuracy.

CC.A.1.1.9 The **Site Responsibility Schedule** shall then be signed on behalf of **NGET** by its **Responsible Manager** (see CC.A.1.1.16) and on behalf of each **User** involved by its **Responsible Manager** (see CC.A.1.1.16), by way of written confirmation of its accuracy. For **Connection Sites** in Scotland, the **Site Responsibility Schedule** will also be signed on behalf of the **Relevant Transmission Licensee** by its **Responsible Manager**.

Distribution and Availability

CC.A.1.1.10 Once signed, two copies will be distributed by **NGET**, 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.A.1.1.11 **NGET** and **Users** must make the **Site Responsibility Schedules** readily available to operational staff at the **Complex** and at the other relevant control points.

[1] Details of circuits traversing the **Connection Site** are only needed from the date which is the earlier of the date when the **Site Responsibility Schedule** is first updated and 15th October 2004. In Scotland, from a date to be agreed between **NGET** and **the Relevant Transmission Licensee**.

Alterations to Existing **Site Responsibility Schedules**

CC.A 1.1.12 Without prejudice to the provisions of CC.A.1.1.15 which deals with urgent changes, when a **User** identified on a **Site Responsibility Schedule** becomes aware that an alteration is necessary, it must inform **NGET** 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). This will cover the commissioning of new **Plant** and/or Apparatus at the **Connection Site,** whether requiring a revised **Bilateral Agreement** or not, de-commissioning of **Plant** and/or **Apparatus**, and other changes which affect the accuracy of the **Site Responsibility Schedule.**

CC.A 1.1.13 Where **NGET** 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.1.1.8 shall be followed with regard to the revised **Site Responsibility Schedule**.

CC.A 1.1.14 The revised **Site Responsibility Schedule** shall then be signed in accordance with the procedure set out in CC.A.1.1.9 and distributed in accordance with the procedure set out in CC.A.1.1.10, accompanied by a note indicating where the alteration(s) has/have been made, the new issue number and the date of implementation.

Urgent Changes

CC.A.1.1.15 When a **User** identified on a **Site Responsibility Schedule**, or **NGET**, 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 which has arisen outside its control, the **User** shall notify **NGET**, or **NGET** 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;

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

NGET 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 **NGET** and **Users** (by the persons referred to in CC.A.1.1.9) as soon as possible after it has been prepared and sent to **Users** for confirmation.

Responsible Managers

CC.A.1.1.16 Each **User** shall, prior to the **Completion Date** under each **Bilateral Agreement** and/or **Construction Agreement**, supply to **NGET** a list of Managers who have been duly authorised to sign **Site Responsibility Schedules** on behalf of the **User** and **NGET** shall, prior to the **Completion Date** under each **Bilateral Agreement** and/or **Construction Agreement**, supply to that **User** the name of its **Responsible Manager** and for **Connection Sites** in Scotland, the name of the **Relevant Transmission Licensee's Responsible Manager** and each shall supply to the other any changes to such list six weeks before the change takes effect where the

change is anticipated, and as soon as possible after the change, where the change was not anticipated.

De-commissioning of **Connection Sites**

CC.A.1.1.17 Where a **Connection Site** is to be de-commissioned, whichever of **NGET** or the **User** who is initiating the de-commissioning must contact the other to arrange for the **Site Responsibility Schedule** to be amended at the relevant time.

ATTACHMENT TO APPENDIX 1 OF **CONNECTION CONDITIONS**

PROFORMA FOR **SITE RESPONSIBILITY SCHEDULE**

_____ AREA

COMPLEX: _____ SCHEDULE: _____

CONNECTION SITE: _____

ITEM OF PLANT/ APPARATUS	PLANT APPARATUS OWNER	SITE MANAGER	SAFETY		OPERATIONS		PARTY RESPONSIBLE FOR UNDERTAKING STATUTORY INSPECTIONS, FAULT INVESTIGATION & MAINTENANCE	REMARKS
			SAFETY RULES	CONTROL OR OTHER RESPONSIBLE PERSON (SAFETY CO-ORDINATOR	OPERATIONAL PROCEDURES	CONTROL OR OTHER RESPONSIBLE ENGINEER		

PAGE: _____ ISSUE NO: _____ DATE: _____

ATTACHMENT TO APPENDIX 1 OF **CONNECTION CONDITIONS**

PROFORMA FOR **SITE RESPONSIBILITY SCHEDULE**

_____ AREA

COMPLEX: _____ SCHEDULE: _____

CONNECTION SITE: _____

ITEM OF PLANT/ APPARATUS	PLANT APPARATUS OWNER	SITE MANAGER	SAFETY		OPERATIONS		PARTY RESPONSIBLE FOR UNDERTAKING STATUTORY INSPECTIONS, FAULT INVESTIGATION & MAINTENANCE	REMARKS
			SAFETY RULES	CONTROL OR OTHER RESPONSIBLE PERSON (SAFETY CO-ORDINATOR	OPERATIONAL PROCEDURES	CONTROL OR OTHER RESPONSIBLE ENGINEER		

NOTES:

SIGNED: _____ NAME: _____ COMPANY: _____ DATE: _____

SIGNED: _____ NAME: _____ COMPANY: _____ DATE: _____

SIGNED: _____ NAME: _____ COMPANY: _____ DATE: _____

SIGNED: _____ NAME: _____ COMPANY: _____ DATE: _____

PAGE: _____ ISSUE NO: _____ DATE: _____

SP TRANSMISSION Ltd
SITE RESPONSIBILITY SCHEDULE
OWNERSHIP, MAINTENANCE AND OPERATIONS OF EQUIPMENT
IN JOINT USER SITUATIONS

Network Area:

Sheet No.
Revision:
Date:

SECTION 'A' BUILDING AND SITE

OWNER		ACCESS REQUIRED:-	
LESSEE			
MAINTENANCE		SPECIAL CONDITIONS:-	
SAFETY			
SECURITY		LOCATION OF SUPPLY TERMINALS:-	

SECTION 'B' CUSTOMER OR OTHER PARTY

NAME:-					
ADDRESS:-					
TEL NO:-					
SUB STATION:-					
LOCATION:-					

SECTION 'C' PLANT

ITEM Nos.	EQUIPMENT	IDENTIFICATION	OWNER	SAFETY RULES APPLICABLE	OPERATION				MAINTENANCE		FAULT INVESTIGATION			TESTING		RELAY SETTINGS	REMARKS
					Tripping	Closing	Isolating	Earthing	Primary Equip.	Protection Equip.	Primary Equip.	Protection Equip	Reclosure	Trip and Alarm	Primary Equip.		

SECTION 'D' CONFIGURATION AND CONTROL

ITEM Nos.	CONFIGURATION RESPONSIBILITY	TELEPHONE NUMBER	REMARKS
ITEM Nos.	CONTROL RESPONSIBILITY	TELEPHONE NUMBER	REMARKS

SECTION 'E' ADDITIONAL INFORMATION

ABBREVIATIONS:-
D - SP AUTHORISED PERSON - DISTRIBUTION SYSTEM
NGC - NATIONAL GRID COMPANY
SPD - SP DISTRIBUTION Ltd
SPPS - POWERSYSTEMS
SPT - SP TRANSMISSION Ltd
ST - SCOTTISH POWER TELECOMMUNICATIONS
T - SP AUTHORISED PERSON - TRANSMISSION SYSTEM
U - USER

SIGNED _____ FOR SP Transmission DATE _____

SIGNED _____ FOR SP Distribution DATE _____

SIGNED _____ FOR PowerSystems/User DATE _____

Scottish Hydro-Electric Transmission Limited

Site Responsibility Schedule

Substation Type				Number:			Revision:		
Equipment	**Owner**	**Controller**	**Maintainer**	**Responsible System User**	**Responsible Management Unit**	**Control Authority**	**Safety Rules**	**Operational Procedures**	**Notes**

CONNECTION CONDITIONS

APPENDIX 2

PART 1A

PROCEDURES RELATING TO OPERATION DIAGRAMS

FIXED CAPACITOR

EARTH

EARTHING RESISTOR

LIQUID EARTHING RESISTOR

ARC SUPPRESSION COIL

FIXED MAINTENANCE EARTHING DEVICE

CARRIER COUPLING EQUIPMENT
(WITHOUT VT)

R&Y

CARRIER COUPLING EQUIPMENT
(WITH VT ON ONE PHASE)

Y

R&Y

CARRIER COUPLING EQUIPMENT
(WITH VT ON 3 PHASES)

R&Y

AC GENERATOR

G

SYNCHRONOUS COMPENSATOR

SC

CIRCUIT BREAKER

CIRCUIT BREAKER
WITH DELAYED AUTO RECLOSE

DAR

WITHDRAWABLE METALCLAD
SWITCHGEAR

SWITCH DISCONNECTOR

SWITCH DISCONNECTOR
WITH INCORPORATED
EARTH SWITCH

S

DISCONNECTOR
(CENTRE ROTATING POST)

DISCONNECTOR
(SINGLE BREAK
DOUBLE ROTATING)

DISCONNECTOR
(SINGLE BREAK)

DISCONNECTOR
(NON-INTERLOCKED)

NI

DISCONNECTOR
(POWER OPERATED)
NA - NON-AUTOMATIC
A - AUTOMATIC
SO - SEQUENTIAL OPERATION
FI - FAULT INTERFERING OPERATION

NA

EARTH SWITCH

FAULT THROWING SWITCH
(PHASE TO PHASE)

FT

FAULT THROWING SWITCH
(EARTH FAULT)

FT

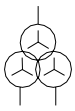
SURGE ARRESTOR

THYRISTOR

TRANSFORMERS
(VECTORS TO INDICATE
WINDING CONFIGURATION)

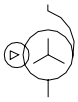
TWO WINDING

THREE WINDING



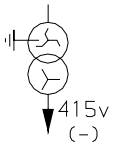
AUTO

AUTO WITH DELTA TERTIARY



EARTHING OR AUX. TRANSFORMER

(-) INDICATE REMOTE SITE
IF APPLICABLE



VOLTAGE TRANSFORMERS

SINGLE PHASE WOUND

THREE PHASE WOUND

SINGLE PHASE CAPACITOR

TWO SINGLE PHASE CAPACITOR

THREE PHASE CAPACITOR

* CURRENT TRANSFORMER
(WHERE SEPARATE PRIMARY
APPARATUS)

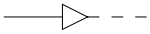
* COMBINED VT/CT UNIT
FOR METERING

REACTOR

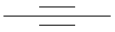
* BUSBARS

* OTHER PRIMARY CONNECTIONS

* CABLE & CABLE SEALING END

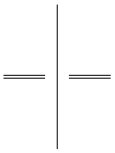


* THROUGH WALL BUSHING



* BYPASS FACILITY

* CROSSING OF CONDUCTORS
(LOWER CONDUCTOR
TO BE BROKEN)



PREFERENTIAL ABBREVIATIONS

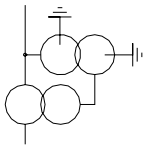
AUXILIARY TRANSFORMER	Aux T
EARTHING TRANSFORMER	ET
GAS TURBINE	Gas T
GENERATOR TRANSFORMER	Gen T
GRID TRANSFORMER	Gr T
SERIES REACTOR	Ser Reac
SHUNT REACTOR	Sh Reac
STATION TRANSFORMER	Stn T
SUPERGRID TRANSFORMER	SGT
UNIT TRANSFORMER	UT

* NON-STANDARD SYMBOL

PORTABLE MAINTENANCE
EARTH DEVICE

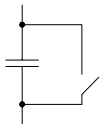
DISCONNECTOR
(PANTOGRAPH TYPE)

QUADRATURE BOOSTER



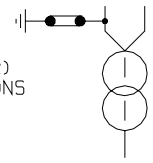
DISCONNECTOR
(KNEE TYPE)

SHORTING/DISCHARGE SWITCH

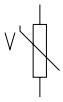


CAPACITOR
(INCLUDING HARMONIC FILTER)

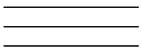
SINGLE PHASE TRANSFORMER(BR)
NEUTRAL AND PHASE CONNECTIONS

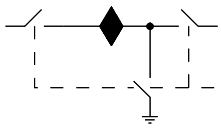


RESISTOR WITH INHERENT
NON-LINEAR VARIABILITY,
VOLTAGE DEPENDANT

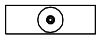


PROCEDURES RELATING TO GAS ZONE DIAGRAMS

GAS INSULATED BUSBAR 

DOUBLE-BREAK DISCONNECTOR 

GAS BOUNDARY

EXTERNAL MOUNTED CURRENT TRANSFORMER (WHERE SEPARATE PRIMARY APPARATUS) 

GAS/GAS BOUNDARY 

STOP VALVE NORMALLY CLOSED 

GAS/CABLE BOUNDARY 

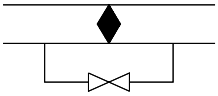
STOP VALVE NORMALLY OPEN 

GAS/AIR BOUNDARY 

GAS MONITOR 

GAS/TRANSFORMER BOUNDARY 

FILTER 

MAINTENANCE VALVE 

QUICK ACTING COUPLING 

CONNECTION CONDITIONS

APPENDIX 2

NON-EXHAUSTIVE LIST OF **APPARATUS** TO BE INCLUDED ON **OPERATION DIAGRAMS**

PART 2

Basic Principles

1. Where practicable, all the **HV Apparatus** on any **Connection Site** shall be shown on one **Operation 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**.

2. Where more than one **Operation Diagram** is unavoidable, duplication of identical information on more than one **Operation Diagram** must be avoided.

3. The **Operation Diagram** must show accurately the current status of the **Apparatus** eg. whether commissioned or decommissioned. Where decommissioned, the associated switchbay will be labelled "spare bay".

4. Provision will be made on the **Operation Diagram** for signifying approvals, together with provision for details of revisions and dates.

5. **Operation Diagrams** will be prepared in A4 format or such other format as may be agreed with **NGET**.

6. The **Operation Diagram** should normally be drawn single line. However, where appropriate, detail which applies to individual phases shall be shown. For example, some **HV Apparatus** is numbered individually per phase.

APPARATUS TO BE SHOWN ON **OPERATION DIAGRAM**

1. Busbars
2. Circuit Breakers
3. Disconnector (Isolator) and Switch Disconnecters (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.
14. Synchronous Compensators
15. Static Variable Compensators
16. Capacitors (including Harmonic Filters)
17. Series or Shunt Reactors (Referred to as "Inductors" at nuclear power station sites)
18. Supergrid and Grid Transformers
19. Tertiary Windings
20. Earthing and Auxiliary Transformers
21. Three Phase VT's
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. Single Phase Transformers (BR) Neutral and Phase Connections
30. Current Transformers (where separate plant items)
31. Wall Bushings
32. Combined VT/CT Units
33. Shorting and Discharge Switches
34. Thyristor
35. Resistor with Inherent Non-Linear Variability, Voltage Dependent
36. Gas Zone

CONNECTION CONDITIONS

APPENDIX 3

MINIMUM FREQUENCY RESPONSE REQUIREMENT PROFILE AND OPERATING RANGE for new Power Stations and DC Converter Stations.

CC.A.3.1 SCOPE

The frequency response capability is defined in terms of **Primary Response**, **Secondary Response** and **High Frequency Response**. This appendix defines the minimum frequency response requirement profile for:

(a) each **Generating Unit** and/or **CCGT Module** which has a **Completion Date** after 1 January 2001 in England and Wales and 1 April 2005 in Scotland,

(b) each **DC Converter** at a **DC Converter Station** which has a **Completion Date** on or after 1 April 2005.

(c) each **Power Park Module** in England and Wales with a **Completion Date** on or after 1 January 2006.

(d) each **Power Park Module** in operation in Scotland after 1 January 2006 with a **Completion Date** after 1 April 2005 and in **Power Stations** with a **Registered Capacity** of 50MW or more.

For the avoidance of doubt, this appendix does not apply to:-

(i) **Generating Units** and/or **CCGT Modules** which have a **Completion Date** before 1 January 2001 in England and Wales and before 1 April 2005 in Scotland,

(ii) **DC Converters** at a **DC Converter Station** which have a **Completion Date** before 1 April 2005.

(iii) **Power Park Modules** in England and Wales with a **Completion Date** before 1 January 2006.

(iv) **Power Park Modules** in operation in Scotland before 1 January 2006.

(v) **Power Park Modules** in Scotland with a **Completion Date** before 1 April 2005.

(vi) **Power Park Modules** in **Power Stations** with a **Registered Capacity** less than 50MW.

(vii) **Small Power Stations** or individually to **Power Park Units**.

The functional definition provides appropriate performance criteria relating to the provision of **Frequency** control by means of **Frequency** sensitive generation in addition to the other requirements identified in CC.6.3.7.

In this Appendix 3 to the **CC**, for a **CCGT Module** or a **Power Park Module** with more than one **Generating Unit**, the phrase **Minimum Generation** applies to the entire **CCGT**

Module or **Power Park Module** operating with all **Generating Units Synchronised** to the **System**.

The minimum **Frequency** response requirement profile is shown diagrammatically in Figure CC.A.3.1. The capability profile specifies the minimum required levels of **Primary Response**, **Secondary Response** and **High Frequency Response** throughout the normal plant operating range. The definitions of these **Frequency** response capabilities are illustrated diagrammatically in Figures CC.A.3.2 & CC.A.3.3.

CC.A.3.2 PLANT OPERATING RANGE

The upper limit of the operating range is the **Registered Capacity** of the **Generating Unit** or **CCGT Module** or **DC Converter** or **Power Park Module**.

The **Minimum Generation** level may be less than, but must not be more than, 65% of the **Registered Capacity**. Each **Generating Unit** and/or **CCGT Module** and/or **Power Park Module** and/or **DC Converter** must be capable of operating satisfactorily down to the **Designed Minimum Operating Level** as dictated by **System** operating conditions, although it will not be instructed to below its **Minimum Generation** level. If a **Generating Unit** or **CCGT Module** or **Power Park Module** or **DC Converter** is operating below **Minimum Generation** because of high **System Frequency**, it should recover adequately to its **Minimum Generation** level as the **System Frequency** returns to **Target Frequency** so that it can provide **Primary** and **Secondary Response** from **Minimum Generation** if the **System Frequency** continues to fall. For the avoidance of doubt, under normal operating conditions steady state operation below **Minimum Generation** is not expected. The **Designed Minimum Operating Level** must not be more than 55% of **Registered Capacity**.

In the event of a **Generating Unit** or **CCGT Module** or **Power Park Module** or **DC Converter** load rejecting down to no less than its **Designed Minimum Operating Level** it should not trip as a result of automatic action as detailed in BC3.7. If the load rejection is to a level less than the **Designed Minimum Operating Level** then it is accepted that the condition might be so severe as to cause it to be disconnected from the **System**.

CC.A.3.3 MINIMUM FREQUENCY RESPONSE REQUIREMENT PROFILE

Figure CC.A.3.1 shows the minimum **Frequency** response requirement profile diagrammatically for a 0.5 Hz change in **Frequency**. The percentage response capabilities and loading levels are defined on the basis of the **Registered Capacity** of the **Generating Unit** or **CCGT Module** or **Power Park Module** or **DC Converter**. Each **Generating Unit** and/or **CCGT Module** and/or **Power Park Module** and/or **DC Converter** must be capable of operating in a manner to provide **Frequency** response at least to the solid boundaries shown in the figure. If the **Frequency** response capability falls within the solid boundaries, the **Generating Unit** or **CCGT Module** or **Power Park Module** or **DC Converter** is providing response below the minimum requirement which is not acceptable. Nothing in this appendix is intended to prevent a **Generating Unit** or **CCGT Module** or **Power Park Module** or **DC Converter** from being designed to deliver a **Frequency** response in excess of the identified minimum requirement.

The **Frequency** response delivered for **Frequency** deviations of less than 0.5 Hz should be no less than a figure which is directly proportional to the minimum **Frequency** response requirement for a **Frequency** deviation of 0.5 Hz. For example, if the **Frequency** deviation is 0.2 Hz, the corresponding minimum **Frequency** response requirement is 40% of the level shown in Figure CC.A.3.1. The **Frequency** response delivered for **Frequency** deviations of more than 0.5 Hz should be no less than the response delivered for a **Frequency** deviation of 0.5 Hz.

Each **Generating Unit** and/or **CCGT Module** and/or **Power Park Module** and/or **DC Converter** must be capable of providing some response, in keeping with its specific operational characteristics, when operating between 95% to 100% of **Registered Capacity** as illustrated by the dotted lines in Figure CC.A.3.1.

At the **Minimum Generation** level, each **Generating Unit** and/or **CCGT Module** and/or **Power Park Module** and/or **DC Converter** is required to provide high and low frequency response depending on the **System Frequency** conditions. Where the **Frequency** is high, the **Active Power** output is therefore expected to fall below the **Minimum Generation** level.

The **Designed Minimum Operating Level** is the output at which a **Generating Unit** and/or **CCGT Module** and/or **Power Park Module** and/or **DC Converter** has no **High Frequency Response** capability. It may be less than, but must not be more than, 55% of the **Registered Capacity**. This implies that a **Generating Unit** or **CCGT Module** or **Power Park Module** or **DC Converter** is not obliged to reduce its output to below this level unless the **Frequency** is at or above 50.5 Hz (cf BC3.7).

CC.A.3.4 TESTING OF FREQUENCY RESPONSE CAPABILITY

The response capabilities shown diagrammatically in Figure CC.A.3.1 are measured by taking the responses as obtained from some of the dynamic response tests specified by **NGET** and carried out by **Generators** and **DC Converter Station** owners for compliance purposes and to validate the content of **Ancillary Services Agreements** using an injection of a **Frequency** change to the plant control system (i.e. governor and load controller). The injected signal is a linear ramp from zero to 0.5 Hz **Frequency** change over a ten second period, and is sustained at 0.5 Hz **Frequency** change thereafter, as illustrated diagrammatically in figures CC.A.3.2 and CC.A.3.3. In the case of an **Embedded Medium Power Station** not subject to a **Bilateral Agreement** or **Embedded DC Converter Station** not subject to a **Bilateral Agreement**, **NGET** may require the **Network Operator** within whose **System** the **Embedded Medium Power Station** or **Embedded DC Converter Station** is situated, to ensure that the **Embedded Person** performs the dynamic response tests reasonably required by NGET in order to demonstrate compliance within the relevant requirements in the **CC**s.

The **Primary Response** capability (P) of a **Generating Unit** or a **CCGT Module** or **Power Park Module** or **DC Converter** is the minimum increase in **Active Power** output between 10 and 30 seconds after the start of the ramp injection as illustrated diagrammatically in Figure CC.A.3.2. This increase in **Active Power** output should be released increasingly with time over the period 0 to 10 seconds from the time of the start of the **Frequency** fall as illustrated by the response in Figure CC.A.3.2.

The **Secondary Response** capability (S) of a **Generating Unit** or a **CCGT Module** or **Power Park Module** or **DC Converter** is the minimum increase in **Active Power** output between 30 seconds and 30 minutes after the start of the ramp injection as illustrated diagrammatically in Figure CC.A.3.2.

The **High Frequency Response** capability (H) of a **Generating Unit** or a **CCGT Module** or **Power Park Module** or **DC Converter** is the decrease in **Active Power** output provided 10 seconds after the start of the ramp injection and sustained thereafter as illustrated diagrammatically in Figure CC.A.3.3. This reduction in **Active Power** output should be released increasingly with time over the period 0 to 10 seconds from the time of the start of the **Frequency** rise as illustrated by the response in Figure CC.A.3.2

CC.A.3.5 REPEATABILITY OF RESPONSE

When a **Generating Unit** or **CCGT Module** or **Power Park Module** or **DC Converter** has responded to a significant **Frequency** disturbance, its response capability must befully restored as soon as technically possible. Full response capability should be restored no later than 20 minutes after the initial change of **System Frequency** arising from the **Frequency** disturbance.

Figure CC.A.3.1 - Minimum Frequency Response Requirement Profile

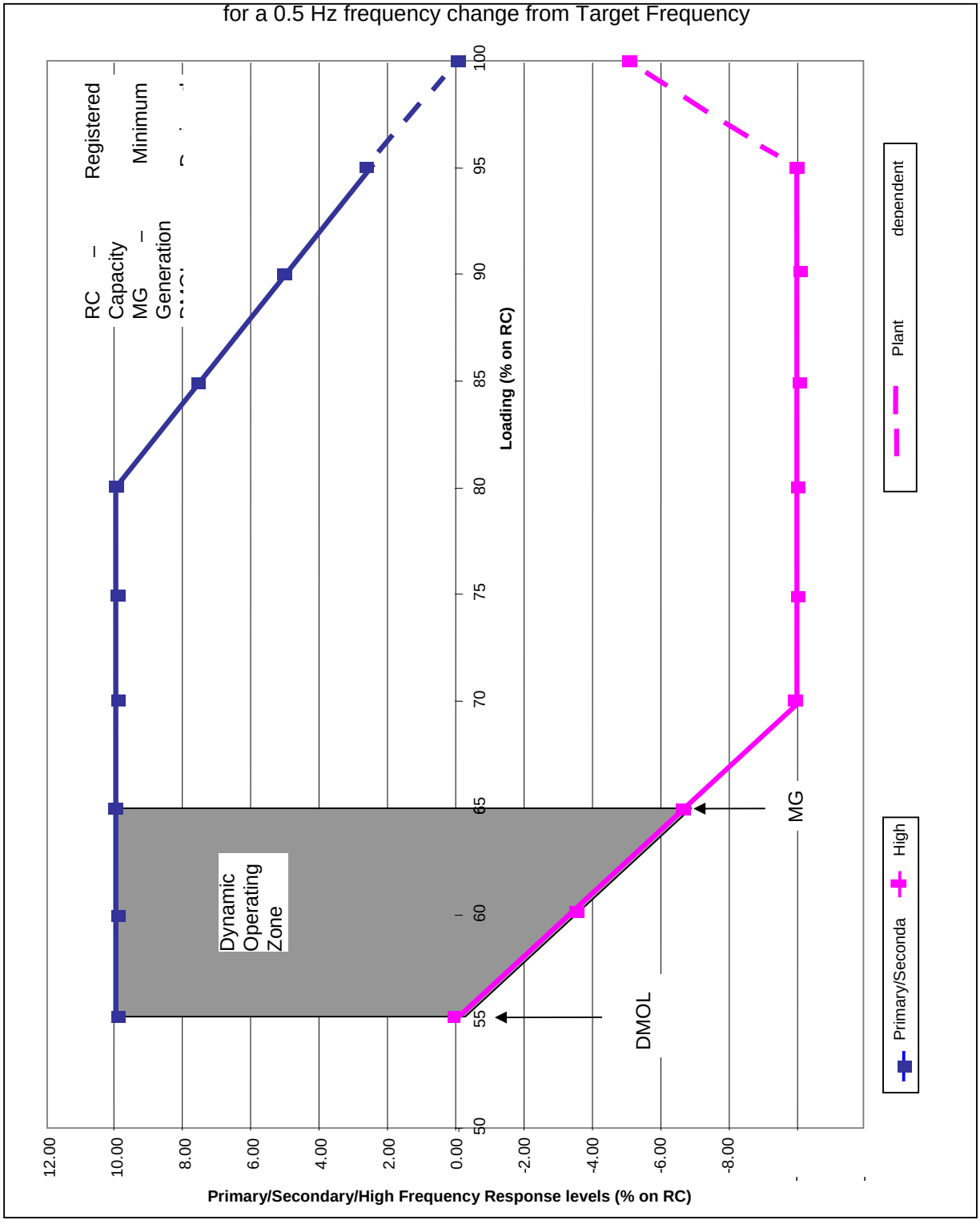


Figure CC.A.3.2 - Interpretation of Primary and Secondary Response Values

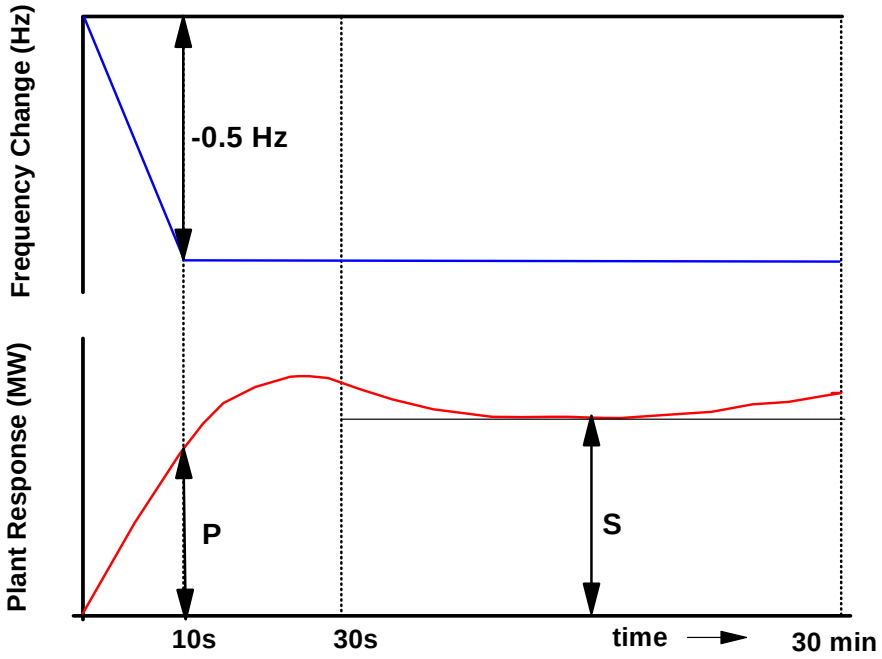
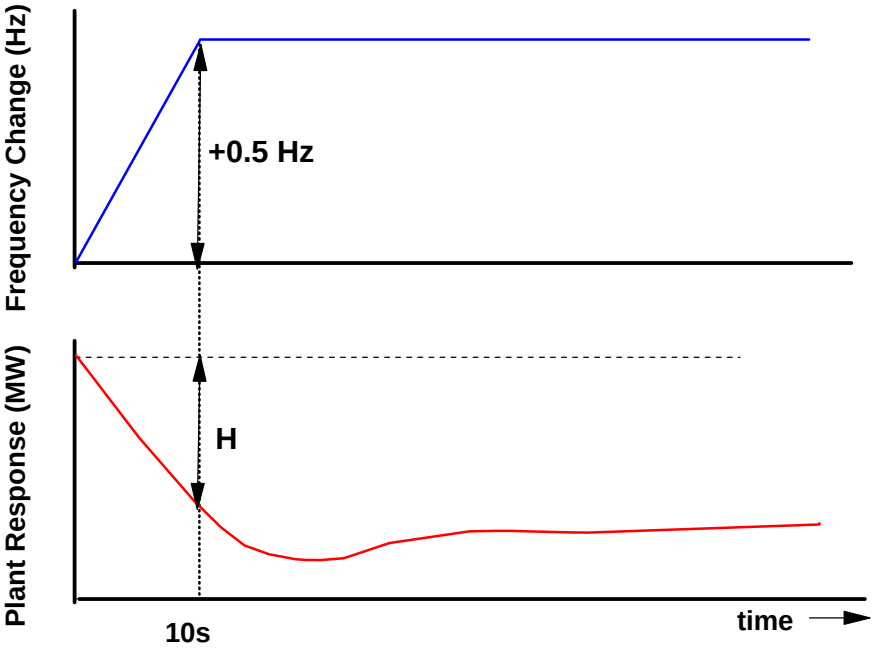


Figure CC.A.3.3 - Interpretation of High Frequency Response Values



APPENDIX 4

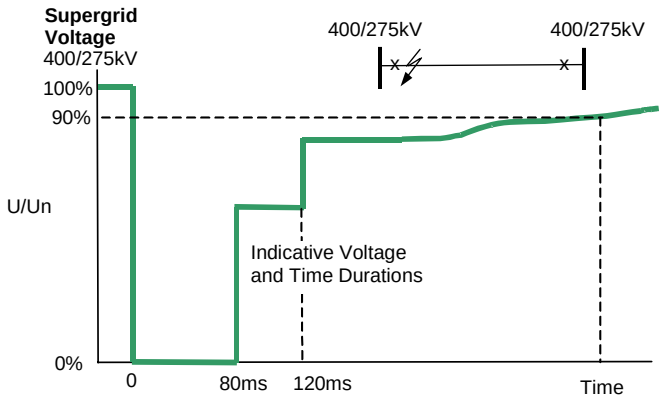
FAULT RIDE THROUGH REQUIREMENT FOR GENERATING UNITS, POWER PARK MODULES AND DC CONVERTERS

CC.A.4.1 SCOPE

The fault ride through requirement is defined in CC.6.3.15 (a), (b) and (c). This Appendix provides illustrations by way of examples only of CC.6.3.15 (a) (i) and further background and illustrations to CC.6.3.15 (b) (i) and is not intended to show all possible permutations.

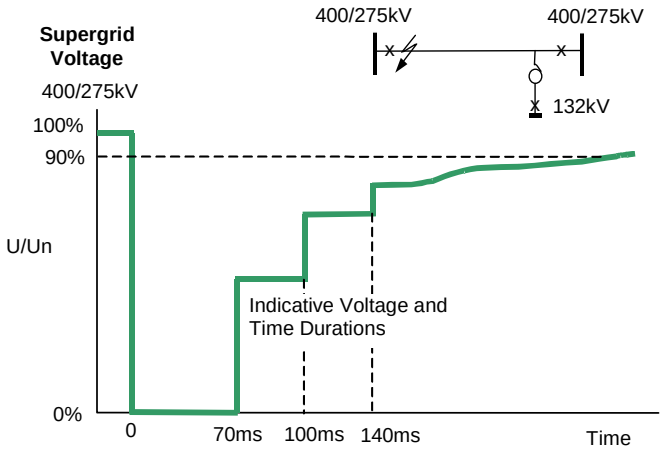
CC.A.4.2 SHORT CIRCUIT FAULTS AT **SUPERGRID VOLTAGE** UP TO 140MS IN DURATION

For short circuit faults at **Supergrid Voltage** up to 140ms in duration, the fault ride through requirement is defined in CC.6.3.15 (a) (i). Figures CC.A.4.1 (a) and (b) illustrate two typical examples of voltage recovery for short-circuit faults cleared within 140ms by two circuit breakers (a) and three circuit breakers (b) respectively.



Typical fault cleared in less than 140ms: 2 ended circuit

Figure CC.A.4.1 (a)



Typical fault cleared in 140ms:- 3 ended circuit

Figure CC.A.4.1 (b)

CCA.4.3 **SUPERGRID VOLTAGE** DIPS GREATER THAN 140MS IN DURATION

For balanced **Supergrid voltage** dips having durations greater than 140ms and up to 3 minutes the fault ride through requirement is defined in CC6.3.15 (b) (i) and Figure 5 which is reproduced in this Appendix as Figure CC.A.4.2 and termed the the voltage–duration profile.

This profile is not a voltage-time response curve that would be obtained by plotting the transient voltage response at a point on the **GB Transmission System** or **User System** to a disturbance. Rather, each point on the profile (ie the heavy black line) represents a voltage level and an associated time duration which connected **Generating Units, or Power Park Modules** must withstand or ride through.

Figures CC.A.4.3 (c), (d) and (e) illustrate the meaning of the voltage-duration profile for voltage dips having durations greater than 140ms.

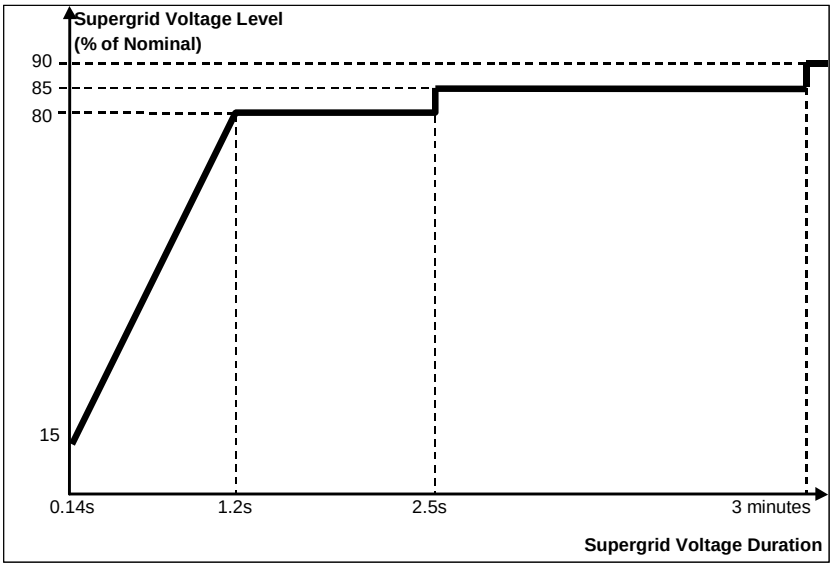
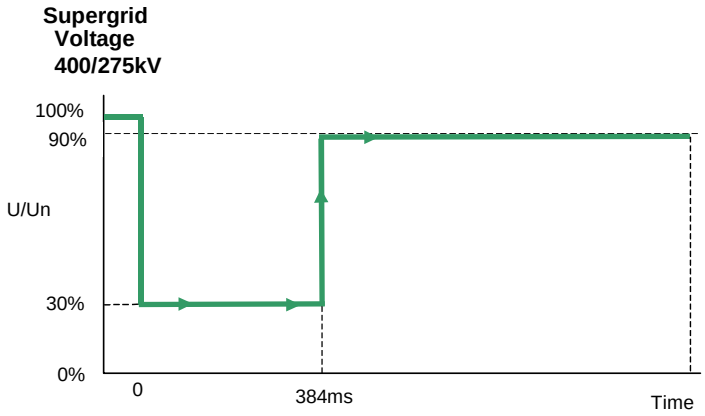
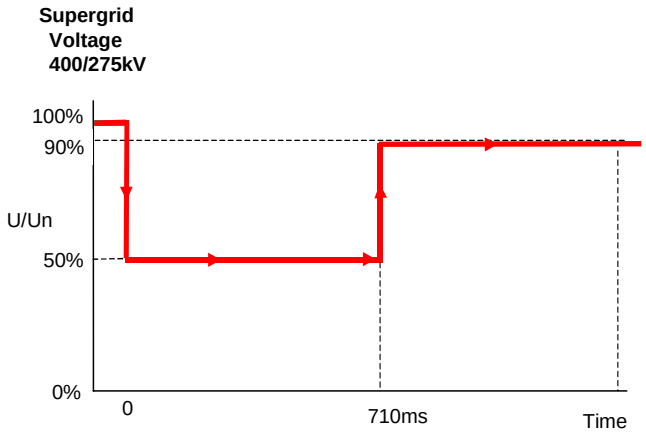


Figure CC.A.4.2



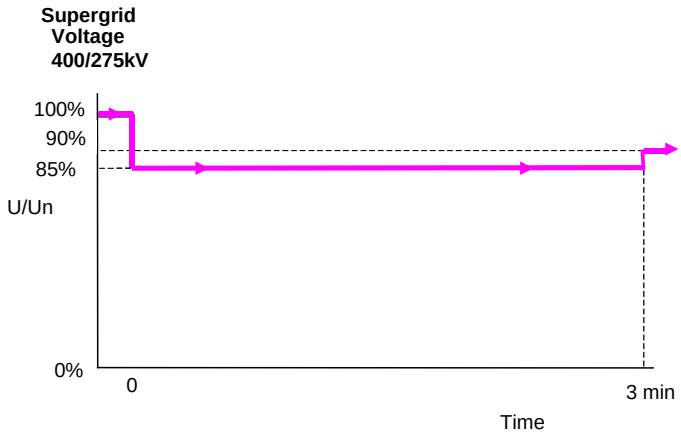
30% retained voltage, 384ms duration

Figure CC.A.4.3(a)



50% retained voltage, 710ms duration

Figure CC.A.4.3(b)



85% retained voltage, 3 minutes duration

Figure CC.A.4.3(c)

APPENDIX 5

TECHNICAL REQUIREMENTS
LOW FREQUENCY RELAYS FOR THE AUTOMATIC
DISCONNECTION OF SUPPLIES AT LOW **FREQUENCY**

CC.A.5.1 **LOW FREQUENCY RELAYS**

CC.A.5.1.1 The **Low Frequency Relays** to be used shall have a setting range of 47.0 to 50Hz and be suitable for operation from a nominal AC input of 63.5, 110 or 240V. The following general parameters specify the requirements of approved **Low Frequency Relays** for automatic installations installed and commissioned after 1st April 2007 and provide an indication, without prejudice to the provisions that may be included in a **Bilateral Agreement**, for those installed and commissioned before 1st April 2007:

(a)	**Frequency** settings:	47-50Hz in steps of 0.05Hz or better, preferably 0.01Hz;
(b)	Operating time:	Between 100 and 150ms dependent on measurement period setting;
(c)	Voltage lock-out:	Selectable within a range of 55 to 90% of nominal voltage;
(d)	Facility stages:	One or two stages of **Frequency** operation;
(e)	Output contacts:	Two output contacts per stage to be capable of repetitively making and breaking for 1000 operations:
(f)	Accuracy	0.01 Hz maximum error under reference environmental and system voltage conditions. 0.05 Hz maximum error at 8% of total harmonic distortion **Electromagnetic Compatibility Level**.

CC.A.5.2 **LOW FREQUENCY RELAY** VOLTAGE SUPPLIES

CC.A.5.2.1 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 concerned and is never derived from a standby

supply **Generating Unit** or from another part of the **User System**.

CC.A.5.3 SCHEME REQUIREMENTS

CC.A.5.3.1 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%, ie. 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 in Table CC.A.5.5.1a and is not reduced unacceptably during equipment outage or maintenance conditions.

CC.A.5.4 **LOW FREQUENCY RELAY** TESTING

CC.A.5.4.1 **Low Frequency Relays** installed and commissioned after 1st January 2007 shall be type tested in accordance with and comply with the functional test requirements for **Frequency Protection** contained in Energy Networks Association Technical Specification 48-6-5 Issue 1 dated 2005 "ENA Protection Assessment Functional Test Requirements – Voltage and Frequency Protection".

For the avoidance of doubt, **Low Frequency Relays** installed and commissioned before 1st January 2007 shall comply with the version of CC.A.5.1.1 applicable at the time such **Low Frequency Relays** were commissioned.

CC.A.5.5 SCHEME SETTINGS

CC.A.5.5.1 Table CC.A.5.5.1a shows, for each **Transmission Area**, the percentage of peak **Demand** (based on **Annual ACS Conditions**) that each **Network Operator** whose **System** is connected to the **GB Transmission System** within such **Transmission Area** shall disconnect by **Low Frequency Relays** at a range of frequencies. Where a **Network Operator's System** is connected to the **GB Transmission System** in more than one **Transmission Area**, the settings for the **Transmission Area** in which the majority of the **Demand** is connected shall apply.

Table CC.A.5.5.1a

Frequency Hz	%**Demand** disconnection for each **Network Operator** in **Transmission Area**		
	NGET	SPT	SHETL
48.8	5		
48.75	5		
48.7	10		
48.6	7.5		10
48.5	7.5	10	
48.4	7.5	10	10
48.3			
48.2	7.5	10	10
48.0	5	10	10
47.8	5		
Total % **Demand**	60	40	40

Note – the percentages in table CC.A.5.5.1a are cumulative such that, for example, should the frequency fall to 48.6 Hz in the **NGET Transmission Area**, 27.5% of the total **Demand** connected to the **GB Transmission System** in the **NGET Transmission Area** shall be disconnected by the action of **Low Frequency Relays**.

APPENDIX 6

PERFORMANCE REQUIREMENTS FOR CONTINUOUSLY ACTING AUTOMATIC EXCITATION CONTROL SYSTEMS FOR **SYNCHRONOUS GENERATING UNITS**

CC.A.6.1 SCOPE

CC.A.6.1.1 This Appendix sets out the performance requirements of continuously acting automatic excitation control systems for **Synchronous Generating Units** that must be complied with by the **User**. This Appendix does not limit any site specific requirements that may be included in a **Bilateral Agreement** where in **NGET's** reasonable opinion these facilities are necessary for system reasons.

CC.A.6.1.2 Where the requirements may vary the likely range of variation is given in this Appendix. It may be necessary to specify values outside this range where **NGET** identifies a system need, and notwithstanding anything to the contrary **NGET** may specify in the **Bilateral Agreement** values outside of the ranges provided in this Appendix 6. The most common variations are in the on-load excitation ceiling voltage requirements and the response time required of the **Exciter.** Actual values will be included in the **Bilateral Agreement**.

CC.A.6.1.3 Should a **Generator** anticipate making a change to the excitation control system it shall notify **NGET** under the **Planning Code** (PC.A.1.2(b) and (c)) as soon as the **Generator** anticipates making the change. The change may require a revision to the **Bilateral Agreement**.

CC.A.6.2 Requirements

CC.A.6.2.1 The **Excitation System** of a **Synchronous Generating Unit** shall include an excitation source (**Exciter**), a **Power System Stabiliser** and a continuously acting **Automatic Voltage Regulator** (**AVR**) and shall meet the following functional specification.

CC.A.6.2.2 In respect of **Synchronous Generating Units** with a **Completion Date** on or after 1 January 2009, and **Synchronous Generating Units** with a **Completion Date** before 1 January 2009 subject to a **Modification** to the excitation control facilities where the **Bilateral Agreement** does not specify otherwise, the continuously acting automatic excitation control system shall include a **Power System Stabiliser (PSS)** as a means of supplementary control. The functional specification of the **Power System Stabiliser** is included in CC.A.6.2.5.

CC.A.6.2.3 Steady State Voltage Control

CC.A.6.2.3.1 An accurate steady state control of the **Generating Unit** pre-set terminal voltage is required. As a measure of the accuracy of the steady-state voltage control, the **Automatic Voltage Regulator** shall have static zero frequency gain, sufficient to limit the change in terminal voltage to a drop not exceeding 0.5% of rated terminal voltage, when the **Generating Unit** output is gradually changed from zero to rated MVA output at rated voltage, **Active Power** and **Frequency**.

CC.A.6.2.4 Transient Voltage Control

CC.A.6.2.4.1 For a step change from 90% to 100% of the nominal **Generating Unit** terminal voltage, with the **Generating Unit** on open circuit, the **Excitation System** response shall have a damped oscillatory characteristic. For this characteristic, the time for the **Generating Unit** terminal voltage to first reach 100% shall be less than 0.6 seconds. Also, the time to settle within 5% of the voltage change shall be less than 3 seconds.

CC.A.6.2.4.2 To ensure that adequate synchronising power is maintained, when the **Generating Unit** is subjected to a large voltage disturbance, the **Exciter** whose output is varied by the **Automatic Voltage Regulator** shall be capable of providing its achievable upper and lower limit ceiling voltages to the **Generating Unit** field in a time not exceeding that specified in the **Bilateral Agreement**. This will normally be not less than 50 ms and not greater than 300 ms. The achievable upper and lower limit ceiling voltages may be dependent on the voltage disturbance.

CC.A.6.2.4.3 The **Exciter** shall be capable of attaining an **Excitation System On Load Positive Ceiling Voltage** of not less than a value specified in the **Bilateral Agreement** that will be

not less than 2 per unit (pu)
normally not greater than 3 pu
exceptionally up to 4 pu

of **Rated Field Voltage** when responding to a sudden drop in voltage of 10 percent or more at the **Generating Unit** terminals. **NGET** may specify a value outside the above limits where **NGET** identifies a system need.

CC.A.6.2.4.4 If a static type **Exciter** is employed:

(i) the field voltage should be capable of attaining a negative ceiling level specified in the **Bilateral Agreement** after the removal of the step disturbance of CC.A.6.2.4.3. The specified value will be 80% of the value specified in CC.A.6.2.4.3. **NGET** may specify a value outside the above limits where **NGET** identifies a system need.

(ii) the **Exciter** must be capable of maintaining free firing when the **Generating Unit** terminal voltage is depressed to a level which may be between 20% to 30% of rated terminal voltage

(iii) the **Exciter** shall be capable of attaining a positive ceiling voltage not less than 80% of the **Excitation System On Load Positive Ceiling Voltage** upon recovery of the **Generating Unit** terminal voltage to 80% of rated terminal voltage following fault clearance. **NGET** may specify a value outside the above limits where **NGET** identifies a system need.

(iv) The requirement to provide a separate power source for the **Exciter** will be specified in the **Bilateral Agreement** if **NGET** identifies a **Transmission System** need.

CC.A.6.2.5 Power Oscillations Damping Control

CC.A.6.2.5.1 To allow the **Generating Unit** to maintain second and subsequent swing stability and also to ensure an adequate level of low frequency electrical damping power, the **Automatic Voltage Regulator** shall include a **Power System Stabiliser** as a means of supplementary control.

CC.A.6.2.5.2 Whatever supplementary control signal is employed, it shall be of the type which operates into the **Automatic Voltage Regulator** to cause the field voltage to act in a manner which results in the damping power being improved while maintaining adequate synchronising power.

CC.A.6.2.5.3 The arrangements for the supplementary control signal shall ensure that the **Power System Stabiliser** output signal relates only to changes in the supplementary control signal and not the steady state level of the signal. For example, if generator electrical power output is chosen as a supplementary control signal then the **Power System Stabiliser** output should relate only to changes in generator electrical power output and not the steady state level of power output.

CC.A.6.2.5.4 The output signal from the **Power System Stabiliser** shall be limited to not more than 10% of the **Generating Unit** terminal voltage signal at the **Automatic Voltage Regulator** input. The gain of the **Power System Stabiliser** shall be such that an increase in the gain by a factor of 3 shall not cause instability.

CC.A.6.2.5.5 The **Power System Stabiliser** shall include elements that limit the bandwidth of the output signal. The bandwidth limiting must ensure that the highest frequency of response cannot excite torsional oscillations on other plant connected to the network. A bandwidth of 0-5Hz would be judged to be acceptable for this application.

CC.A.6.2.5.6 The **Generator** will agree **Power System Stabiliser** settings with **NGET** prior to the on-load commissioning detailed in BC2.11.2(d). To allow assessment of the performance before on-load commissioning the **Generator** will provide to **NGET** a report containing:

i. the **Excitation System** model including the **Power System Stabiliser** with settings as required under the **Planning Code** (PC.A.5.3.2(c)).
ii. on load time series simulations of the response of the **Excitation System** with and without the **Power System Stabiliser** to 2% and 10% steps in the reference voltage and a three phase short circuit fault applied to the higher voltage side of the **Generating Unit** transformer for 100 ms. The results should show field voltage, **Generating Unit** terminal voltage, **Power System Stabiliser** output and **Generating Unit Active Power** and **Reactive Power** output.
iii. gain and phase Bode diagrams for the open loop frequency domain response of the **Generating Unit Excitation System** with and without the **Power System Stabiliser**. These should be in a format to allow assessment of the phase contribution of the **Power System Stabiliser** and the gain and phase margin of the **Excitation System** with the **Power System Stabiliser**.

CC.A.6.2.6 Overall **Excitation System** Control Characteristics

CC.A.6.2.6.1 The overall **Excitation System** shall include elements that limit the bandwidth of the output signal. The bandwidth limiting must be consistent with the speed of response requirements and ensure that the highest frequency of response cannot excite torsional oscillations on other plant connected to the network. A bandwidth of 0-5 Hz will be judged to be acceptable for this application.

CC.A.6.2.6.2 The response of the **Automatic Voltage Regulator** combined with the **Power System Stabiliser** shall be demonstrated by injecting similar step signal disturbances into the **Automatic Voltage Regulator** reference with the **Generating Unit** operating at points specified by **NGET** (up to rated MVA output). The damping shall be judged to be adequate if the corresponding **Active Power** response to the disturbances decays within two cycles of oscillation.

CC.A.6.2.6.3 The frequency domain tuning of the **Power System Stabiliser** shall also be demonstrated by injecting a 0.2Hz-3Hz band limited random noise signal into the **Automatic Voltage Regulator** reference with the **Generating Unit** operating at points specified by **NGET** (up to rated MVA output). The tuning of the **Power System Stabiliser** shall be judged to be adequate if the corresponding **Active Power** response shows improved damping with the **Power System Stabiliser** in combination with the **Automatic Voltage Regulator** compared with the **Automatic Voltage Regulator** alone over the frequency range 0.3Hz – 2Hz.

CC.A.6.2.7 **Under-Excitation Limiters**

CC.A.6.2.7.1 The security of the power system shall also be safeguarded by means of MVAr **Under Excitation Limiters** fitted to the generator **Excitation System**. The **Under Excitation Limiter** shall prevent the **Automatic Voltage Regulator** reducing the generator excitation to a level which would endanger synchronous stability. The **Under Excitation Limiter** shall operate when the excitation system is providing automatic control. The **Under Excitation Limiter** shall respond to changes in the **Active Power** (MW) and the **Reactive Power** (MVAr), and to the square of the generator voltage in such a direction that an increase in voltage will permit an increase in leading MVAr. The characteristic of the **Under Excitation Limiter** shall be substantially linear from no-load to rated load at any setting and shall be readily adjustable.

CC.A.6.2.7.2 The performance of the **Under Excitation Limiter** shall be independent of the rate of change of the **Generating Unit** load and shall be demonstrated by testing its response to a step change corresponding to a 2% decrease in **Automatic Voltage Regulator** reference voltage when the generator is operating just off the limit line, as set up. The resulting maximum overshoot shall not exceed 4% of the **Generating Unit** rated MVA. The operating point of the **Generating Unit** shall be returned to a steady state value at the limit line and the final settling time shall not be greater than 5 seconds. When the step change in **Automatic Voltage Regulator** reference voltage is reversed, the field voltage should begin to respond without any delay and should not be held down by the **Under Excitation Limiter**. Operation into or out of the preset limit levels shall ensure that any resultant oscillations are damped so that the disturbance is within 0.5% of the **Generating Unit** MVA rating within a period of 5 seconds.

CC.A.6.2.7.3 The **Generator** shall also make provision to prevent the reduction of the **Generating Unit** excitation to a level which would endanger synchronous stability when the **Excitation System** is under manual control.

CC.A.6.2.8 **Over-Excitation Limiters**

CC.A.6.2.8.1 The settings of the **Over-Excitation Limiter**, where it exists, shall ensure that the generator excitation is not limited to less than the maximum value that can be achieved whilst ensuring the **Generating Unit** is operating within its design limits. If the generator excitation is reduced following a period of operation at a high level, the rate of reduction shall not exceed that required to remain within any time dependent operating characteristics of the **Generating Unit**.

CC.A.6.2.8.2 The performance of the **Over-Excitation Limiter**, where it exists, shall be demonstrated by testing its response to a step increase in the **Automatic Voltage Regulator** reference voltage that results in operation of the **Over Excitation Limiter**. Prior to application of the step the **Generating Unit** shall be generating **Rated Active Power** and operating within its continuous **Reactive Power** capability. The size of the step will be determined by the minimum value necessary to operate the **Over-Excitation Limiter** and will be agreed by **NGET** and the **Generator**. The resulting operation beyond the **Over-Excitation Limit** shall be controlled by the **Over-Excitation Limiter** without the operation of any protection that could trip the **Generating Unit**. The step shall be removed immediately on completion of the test.

CC.A.6.2.8.3 The **Generator** shall also make provision to prevent any over-excitation restriction of the generator when the **Excitation System** is under manual control, other than that necessary to ensure the **Generating Unit** is operating within its design limits.

APPENDIX 7

PERFORMANCE REQUIREMENTS FOR CONTINUOUSLY ACTING AUTOMATIC VOLTAGE CONTROL SYSTEMS FOR **NON-SYNCHRONOUS GENERATING UNITS**, **DC CONVERTERS** AND **POWER PARK MODULES**

CC.A.7.1 SCOPE

CC.A.7.1.1 This Appendix sets out the performance requirements of continuously acting automatic voltage control systems for **Non-Synchronous Generating Units**, **DC Converters** and **Power Park Modules** that must be complied with by the **User**. This Appendix does not limit any site specific requirements that may be included in a **Bilateral Agreement** where in **NGET's** reasonable opinion these facilities are necessary for system reasons.

CC.A.7.1.2 Proposals by **Generators** to make a change to the voltage control systems are required to be notified to **NGET** under the **Planning Code** (PC.A.1.2(b) and (c)) as soon as the **Generator** anticipates making the change. The change may require a revision to the **Bilateral Agreement**.

CC.A.7.2 Requirements

CC.A.7.2.1 **NGET** requires that the continuously acting automatic voltage control system for the **Non-Synchronous Generating Unit**, **DC Converter** or **Power Park Module** shall meet the following functional performance specification. If a **Network Operator** has confirmed to **NGET** that its network to which an **Embedded Non-Synchronous Generating Unit**, **DC Converter** or **Power Park Module** is connected is restricted such that the full reactive range under the steady state voltage control requirements (**CC.A.7.2.2**) cannot be utilised, **NGET** may specify in the **Bilateral Agreement** alternative limits to the steady state voltage control range that reflect these restrictions. Where the **Network Operator** subsequently notifies **NGET** that such restriction has been removed, **NGET** may propose a **Modification** to the **Bilateral Agreement** (in accordance with the **CUSC** contract) to remove the alternative limits such that the continuously acting automatic voltage control system meets the following functional performance specification. All other requirements of the voltage control system will remain as in this Appendix.

CC.A.7.2.2 Steady State Voltage Control

CC.A.7.2.2.1 The **Non-Synchronous Generating Unit**, **DC Converter** or **Power Park Module** shall provide continuous steady state control of the voltage at the **Grid Entry Point** (or **User System Entry Point** if **Embedded**) with a **Setpoint Voltage** and **Slope** characteristic as illustrated in Figure CC.A.7.2.2a. It should be noted that where the **Reactive Power** capability requirement of a directly connected **Non-Synchronous Generating Unit**, **DC Converter** or **Power Park Module** in Scotland, as specified in CC.6.3.2 (c), is not at the **Grid Entry Point**, the values of Qmin and Qmax shown in this figure will be as modified by the 33/132kV or 33/275kV or 33/400kV transformer.

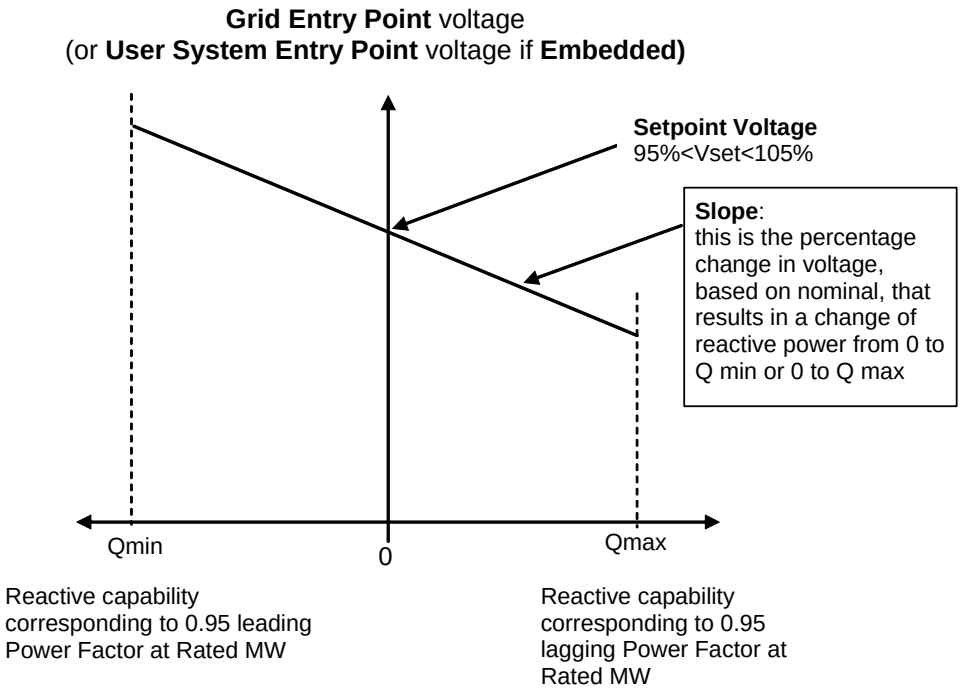


Figure CC.A.7.2.2a

CC.A.7.2.2.2 The continuously acting automatic control system shall be capable of operating to a **Setpoint Voltage** between 95% and 105% with a resolution of 0.25% of the nominal voltage. For the avoidance of doubt values of 95%, 95.25%, 95.5% … may be specified, but not intermediate values. The initial **Setpoint Voltage** will be 100%. The tolerance within which this **Setpoint Voltage** shall be achieved is specified in BC2.A.2.6. For the avoidance of doubt, with a tolerance of 0.25% and a Setpoint Voltage of 100%, the achieved value shall be between 99.75% and 100.25%. **NGET** may request the **Generator** to implement an alternative **Setpoint Voltage** within the range of 95% to 105%. For **Embedded Generators** the **Setpoint Voltage** will be discussed between **NGET** and the relevant **Network Operator** and will be specified to ensure consistency with CC.6.3.4.

CC.A.7.2.2.3 The **Slope** characteristic of the continuously acting automatic control system shall be adjustable over the range 2% to 7% (with a resolution of 0.5%). For the avoidance of doubt values of 2%, 2.5%, 3% … may be specified, but not intermediate values. The initial **Slope** setting will be 4%. The tolerance within which this **Slope** shall be achieved is specified in BC2.A.2.6. For the avoidance of doubt, with a tolerance of 0.5% and a **Slope** setting of 4%, the achieved value shall be between 3.5% and 4.5%. **NGET** may request the **Generator** to implement an alternative slope setting within the range of 2% to 7%. For **Embedded Generators** the **Slope** setting will be discussed between **NGET** and the relevant **Network Operator** and will be specified to ensure consistency with CC.6.3.4.

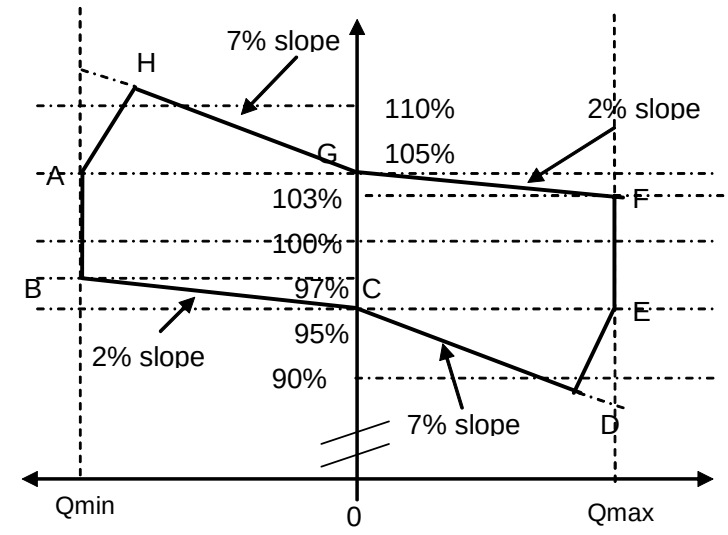


Figure CC.A.7.2.2b

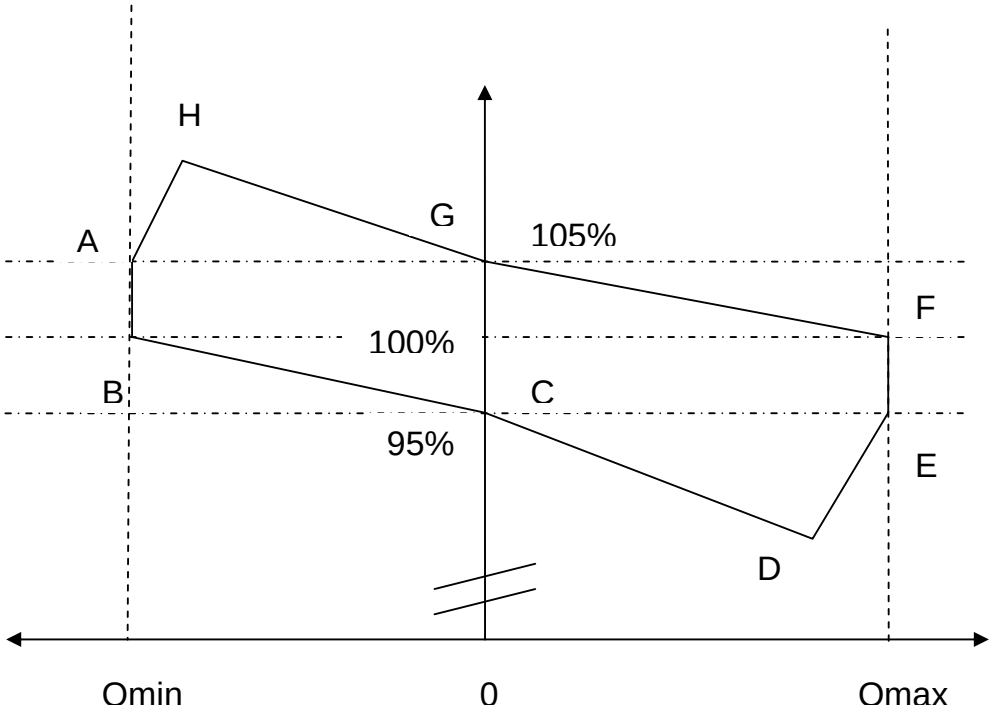


Figure CC.A.7.2.2c

CC.A.7.2.2.4 Figure CC.A.7.2.2b shows the required envelope of operation for **Non-Synchronous Generating Units**, **DC Converters** and **Power Park Modules** except for those **Embedded** at 33kV and below or directly connected to the **GB Transmission System** in England and Wales at 33kV and below. It should be noted that where the **Reactive Power** capability requirement of a directly connected **Non-Synchronous Generating Unit**, **DC Converter** or **Power Park Module** in Scotland, as specified in CC.6.3.2 (c), is not at the **Grid Entry Point**, the values of Qmin and Qmax shown in this figure will be as modified by the 33/132kV or 33/275kV or 33/400kV transformer. Figure CC.A.7.2.2c shows the required envelope of operation for **Non-Synchronous Generating Units**, **DC Converters** and **Power Park Modules Embedded** at 33kV and below or directly connected to the **GB Transmission System** in England and Wales at 33kV and below. The enclosed area within points ABCDEFGH is the required capability range within which the **Slope** and **Setpoint Voltage** can be changed.

CC.A.7.2.2.5 Should the operating point of the **Non-Synchronous Generating Unit**, **DC Converter** or **Power Park Module** deviate so that it is no longer a point on the operating characteristic (figure CC.A.7.2.2a) defined by the target **Setpoint Voltage** and **Slope**, the continuously acting automatic voltage control system shall act progressively to return the value to a point on the required characteristic within 5 seconds.

CC.A.7.2.2.6 Should the **Reactive Power** output of the **Non-Synchronous Generating Unit**, **DC Converter** or **Power Park Module** reach its maximum lagging limit at a **Grid Entry Point** voltage (or **User System Entry Point** voltage if **Embedded**) above 95%, the **Non-Synchronous Generating Unit**, **DC Converter** or **Power Park Module** shall maintain maximum lagging **Reactive Power** output for voltage reductions down to 95%. This requirement is indicated by the line EF in figures CC.A.7.2.2b and CC.A.7.2.2c. Should the **Reactive Power** output of the **Non-Synchronous Generating Unit**, **DC Converter** or **Power Park Module** reach its maximum leading limit at a **Grid Entry Point** voltage (or **User System Entry Point** voltage if **Embedded**) below 105%, the **Non-Synchronous Generating Unit**, **DC Converter** or **Power Park Module** shall maintain maximum leading **Reactive Power** output for voltage increases up to 105%. This requirement is indicated by the line AB in figures CC.A.7.2.2b and CC.A.7.2.2c.

CC.A.7.2.2.7 For **Grid Entry Point** voltages (or **User System Entry Point** voltages if **Embedded**) below 95%, the lagging **Reactive Power** capability of the **Non-Synchronous Generating Unit**, **DC Converter** or **Power Park Module** should be that which results from the supply of maximum lagging reactive current whilst ensuring the current remains within design operating limits. An example of the capability is shown by the line DE in figures CC.A.7.2.2b and CC.A.7.2.2c. For **Grid Entry Point** voltages (or **User System Entry Point** voltages if **Embedded**) above 105%, the leading **Reactive Power** capability of the **Non-Synchronous Generating Unit**, **DC Converter** or **Power Park Module** should be that which results from the supply of maximum leading reactive current whilst ensuring the current remains within design operating limits. An example of the capability is shown by the line AH in figures CC.A.7.2.2b and CC.A.7.2.2c. Should the **Reactive Power** output of the **Non-Synchronous Generating Unit**, **DC Converter** or **Power Park Module** reach its maximum lagging limit at a **Grid Entry Point** voltage (or **User System Entry Point** voltage if **Embedded**) below 95%, the **Non-Synchronous Generating Unit**, **DC Converter** or **Power Park Module** shall maintain maximum lagging reactive current output for further voltage decreases. Should the **Reactive Power** output of the **Non-Synchronous Generating Unit**, **DC Converter** or **Power Park Module** reach its maximum leading limit at a **Grid Entry Point** voltage (or **User System Entry Point** voltage if **Embedded**) above 105%, the **Non-Synchronous Generating Unit**, **DC**

Converter or **Power Park Module** shall maintain maximum leading **Reactive Power** output for further voltage increases.

CC.A.7.2.3 Transient Voltage Control

CC.A.7.2.3.1 For an on-load step change in **Grid Entry Point** or **User System Entry Point** voltage, the continuously acting automatic control system shall respond according to the following minimum criteria

i. the **Reactive Power** output response of the **Non-Synchronous Generating Unit**, **DC Converter** or **Power Park Module** shall commence within 0.2 seconds of the application of the step. It shall progress linearly although variations from a linear characteristic shall be acceptable provided that the MVAr seconds delivered at any time up to 1 second are at least those that would result from the response shown in figure CC.A.7.2.3.1a.

ii. the response shall be such that, for a sufficiently large step, 90% of the full reactive capability of the **Non-Synchronous Generating Unit**, **DC Converter** or **Power Park Module**, as required by **CC.6.3.2** (or, if appropriate, **CC.A.7.2.2.6** or **CC.A.7.2.2.7**), will be produced within 1 second

iii. the magnitude of the **Reactive Power** output response produced within 1 second shall vary linearly in proportion to the magnitude of the step change

iv. the settling time shall be no greater than 2 seconds from the application of the step change in voltage and the peak to peak magnitude of any oscillations shall be less than 5% of the change in steady state **Reactive Power** within this time.

v. following the transient response, the conditions of CC.A.7.2.2 apply.

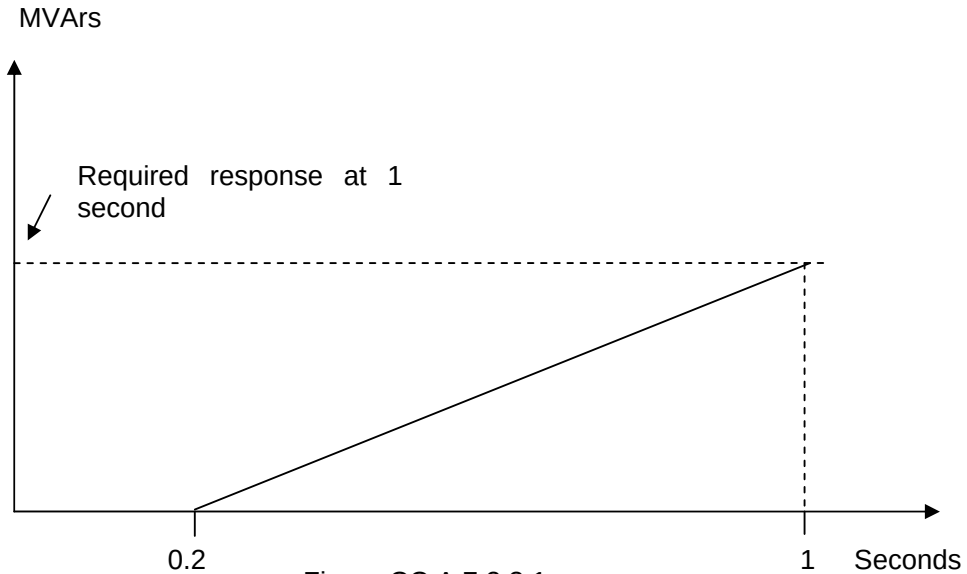


Figure CC.A.7.2.3.1a

CC.A.7.2.4 Power Oscillation Damping

CC.A.7.2.4.1 The requirement for the continuously acting voltage control system to be fitted with a **Power System Stabiliser (PSS)** shall be specified in the **Bilateral Agreement** if, in **NGET's** view, this is required for system reasons. However if a **Power System Stabiliser** is included in the voltage control system its settings and performance shall be agreed with **NGET** and commissioned in accordance with **BC.2.11.2**.

CC.A.7.2.5 Overall Voltage Control System Characteristics

CC.A.7.2.5.1 The continuously acting automatic voltage control system is required to respond to minor variations, steps, gradual changes or major variations in **Grid Entry Point** voltage (or **User System Entry Point** voltage if **Embedded**).

CC.A.7.2.5.2 The overall voltage control system shall include elements that limit the bandwidth of the output signal. The bandwidth limiting must be consistent with the speed of response requirements and ensure that the highest frequency of response cannot excite torsional oscillations on other plant connected to the network. A bandwidth of 0-5Hz would be judged to be acceptable for this application. All other control systems employed within the **Non-Synchronous Generating Unit**, **DC Converter** or **Power Park Module** should also meet this requirement

CC.A.7.2.5.3 The response of the voltage control system (including the **Power System Stabiliser** if employed) shall be demonstrated by applying suitable step disturbances into the voltage control system of the **Power Park Module** or **Power Park Unit**, or by changing the actual voltage at a suitable point, with the generator operating at points specified by **NGET** (up to rated MVA output). The damping shall be judged to be adequate if the corresponding **Active Power** response to the disturbances decays within 2 seconds of the application of the step.

< End of CC >

BALANCING CODE No 2

POST GATE CLOSURE PROCESS

CONTENTS

(This contents page does not form part of the Grid Code)

Appendix 2 - Type and Form of **Ancillary Service** Instructions

BC2.A.2.1 This part of the Appendix consists of a non-exhaustive list of the forms and types of instruction for a **Genset** to provide **System Ancillary Services.** There may be other types of **Commercial Ancillary Services** and these will be covered in the relevant **Ancillary Services Agreement**. In respect of the provision of **Ancillary Services** by **Generating Units** the forms and types of instruction will be in the form of this Appendix 2 unless amended in the **Ancillary Services Agreement**.

As described in CC.8, **System Ancillary Services** consist of Part 1 and Part 2 **System Ancillary Services.**

Part 1 System Ancillary Services comprise:

(a) **Reactive Power** supplied other than by means of synchronous or static compensators. This is required to ensure that a satisfactory **System** voltage profile is maintained and that sufficient **Reactive Power** reserves are maintained under normal and fault conditions. **Ancillary Service** instructions in relation to **Reactive Power** may include:

(i) Mvar Output
(ii) Target Voltage Levels
(iii) Tap Changes
(iv) Maximum Mvar Output ('maximum excitation')
(v) Maximum Mvar Absorption ('minimum excitation')

(b) **Frequency** Control by means **of Frequency** sensitive generation. **Gensets** may be required to move to or from **Frequency Sensitive Mode** in the combinations agreed in the relevant **Ancillary Services Agreement**. They will be specifically requested to operate so as to provide **Primary Response** and/or **Secondary Response** and/or **High Frequency Response**.

Part 2 System Ancillary Services comprise:

(c) **Frequency** Control by means of **Fast Start.**

(d) **Black Start Capability**

(e) **System to Generator Operational Intertripping**

BC2.A.2.2 As **Ancillary Service** instructions are not part of **Bid-Offer Acceptances** they do not need to be closed instructions and can cover any period of time, not just limited to the period of the **Balancing Mechanism**.

BC2.A.2.3 As described in BC2.6.1 **Ancillary Service** instructions are normally given by automatic logging device, but in the absence of, or in the event of failure of the logging device, instructions will be given by telephone.

BC2.A.2.4 INSTRUCTIONS GIVEN BY AUTOMATIC LOGGING DEVICE.

(a) The complete form of the **Ancillary Service** instruction is given in the EDL Message Interface Specification which is available to **Users** on request from **NGET**.

(b) **Ancillary Service** instructions for **Frequency** Control will normally follow the form:

(i) **BM Unit** Name
(ii) Instruction Reference Number
(iii) Time of instruction
(iv) Type of instruction (REAS)
(v) Reason Code
(vi) Start Time

(c) **Ancillary Service** instructions for **Reactive Power** will normally follow the form:

(i) **BM Unit** Name
(ii) Instruction Reference Number
(iii) Time of instruction
(iv) Type of instruction (MVAR, VOLT or TAPP)
(v) Target Value
(vi) Target Time

The times required in the instruction are input and displayed in London time, but communicated electronically in GMT.

BC2.A.2.5 INSTRUCTIONS GIVEN BY TELEPHONE

(a) **Ancillary Service** instructions for **Frequency** Control will normally follow the form:

(i) an exchange of operator names;
(ii) **BM Unit** Name;
(iii) Time of instruction;
(iv) Type of instruction;
(v) Start Time.

The times required in the instruction are expressed in London time.

For example, for **BM Unit** ABCD-1 instructed at 1400 hours to provide Primary and **High Frequency** response starting at 1415 hours:

"**BM Unit** ABCD-1 message timed at 1400 hours. Unit to **Primary and High Frequency Response** at 1415 hours"

(b) **Ancillary Service** instructions for **Reactive Power** will normally follow the form:

(i) an exchange of operator names;
(ii) **BM Unit** Name;
(iii) Time of instruction;
(iv) Type of instruction (MVAR, VOLT, SETPOINT, **SLOPE** or TAPP)
(v) Target Value
(vi) Target Time.

The times required in the instruction are expressed as London time.

For example, for **BM Unit** ABCD-1 instructed at 1400 hours to provide 100Mvar by 1415 hours:

"**BM Unit** ABCD-1 message timed at 1400 hours. MVAR instruction. Unit to plus 100 Mvar target time 1415 hours."

BC2.A.2.6 **Reactive Power**

As described in BC2.A.2.4 and BC2.A.2.5 instructions for **Ancillary Services** relating to **Reactive Power** may consist of any of several specific types of instruction. The following table describes these instructions in more detail:

Instruction Name	Description	Type of Instruction
Mvar Output	The individual Mvar output from the **Genset** onto the **GB Transmission System** at the **Grid Entry Point** (or onto the **User System** at the **User System Entry Point** in the case of **Embedded Power Stations**), namely on the higher voltage side of the generator step-up transformer. In relation to each **Genset**, where there is no HV indication, **NGET** and the **Generator** will discuss and agree equivalent Mvar levels for the corresponding LV indication. Where a **Genset** is instructed to a specific Mvar output, the **Generator** must achieve that output within a tolerance of +/-25 Mvar (for **Gensets** in England and Wales) or the lesser of +/- 5% of rated output or 25Mvar (for **Gensets** in Scotland) (or such other figure as may be agreed with **NGET**) by tap changing on the generator step-up transformer, unless agreed otherwise. Once this has been achieved, the **Generator** will not tap again without prior consultation with and the agreement of **NGET**, on the basis that Mvar output will be allowed to vary with **System** conditions.	MVAR
Target Voltage Levels	Target voltage levels to be achieved by the **Genset** on the **GB Transmission System** at the **Grid Entry Point** (or on the **User System** at the **User System Entry Point** in the case of **Embedded Power Stations**, namely on the higher voltage side of the generator step-up transformer. Where a **Genset** is instructed to a specific target voltage, the **Generator** must achieve that target within a tolerance of ±1 kV (or such other figure as may be agreed with **NGET**) by tap changing on the generator step-up transformer, unless agreed otherwise with **NGET**. In relation to each **Genset**, where there is no HV indication, **NGET** and the **Generator** will discuss and agree equivalent voltage levels for the corresponding LV indication. Under normal operating conditions, once this target voltage level has been achieved the **Generator** will not tap again without prior consultation with, and with the agreement of, **NGET**. However, under certain circumstances the **Generator** may be instructed to maintain a target voltage until otherwise instructed and this will be achieved by tap changing on the generator step-up transformer without reference to **NGET**.	VOLT

Instruction Name	Description	Type of Instruction
Setpoint Voltage	Where a **Non-Synchronous Generating Unit**, **DC Converter** or **Power Park Module** is instructed to a specific **Setpoint Voltage**, the **Generator** must achieve that **Setpoint Voltage** within a tolerance of ±0.25% (or such other figure as may be agreed with **NGET**). The **Generator** must maintain the specified **Setpoint Voltage** target until an alternative target is received from **NGET.**	SETPOINT
Slope	Where a **Non-Synchronous Generating Unit**, **DC Converter** or **Power Park Module** is instructed to a specific **Slope**, the **Generator** must achieve that **Slope** within a tolerance of ±0.5% (or such other figure as may be agreed with **NGET**). The **Generator** must maintain the specified **Slope** target until an alternative target is received from **NGET.** The **Generator** will not be required to implement a new **Slope** setting in a time of less than 1 week from the time of the instruction.	**SLOPE**
Tap Changes	Details of the required generator step-up transformer tap changes in relation to a **Genset**. The instruction for tap changes may be a **Simultaneous Tap Change** instruction, whereby the tap change must be effected by the **Generator** in response to an instruction from **NGET** issued simultaneously to relevant **Power Stations**. The instruction, which is normally preceded by advance notice, must be effected as soon as possible, and in any event within one minute of receipt from **NGET** of the instruction. For a **Simultaneous Tap Change,** change **Genset** generator step-up transformer tap position by one [two] taps to raise or lower (as relevant) **System** voltage, to be executed at time of instruction.	TAPP
Maximum Mvar Output (“maximum excitation”)	Under certain conditions, such as low **System** voltage, an instruction to maximum Mvar output at instructed MW output ("maximum excitation") may be given, and a **Generator** should take appropriate actions to maximise Mvar output unless constrained by plant operational limits or safety grounds (relating to personnel or plant).	
Maximum Mvar Absorption ("minimum excitation")	Under certain conditions, such as high **System** voltage, an instruction to maximum Mvar absorption at instructed MW output ("minimum excitation") may be given, and a **Generator** should take appropriate actions to maximise Mvar absorption unless constrained by plant operational limits or safety grounds (relating to personnel or plant).	

BC2.A.2.7 In addition, the following provisions will apply to **Reactive Power** instructions:

(a) In circumstances where **NGET** issues new instructions in relation to more than one **BM Unit** at the same **Power Station** at the same time tapping will be carried out by the **Generator** one tap at a time either alternately between (or in sequential order, if more than two), or at the same time on, each **BM Unit**.

(b) Where the instructions require more than two taps per **BM Unit** and that means that the instructions cannot be achieved within 2 minutes of the instruction time (or such longer period at **NGET** may have instructed), the instructions must each be achieved with the minimum of delay after the expiry of that period.

(c) It should be noted that should **System** conditions require, **NGET** may need to instruct maximum Mvar output to be achieved as soon as possible, but (subject to the provisions of paragraph (BC2.A.2.7(b) above) in any event no later than 2 minutes after the instruction is issued.

(d) An **Ancillary Service** instruction relating to **Reactive Power** may be given in respect of **CCGT Units** within a **CCGT Module** at a **Power Station** where running arrangements and/or **System** conditions require, in both cases where exceptional circumstances apply and connection arrangements permit.

(e) In relation to Mvar matters, Mvar generation/output is an export onto the **System** and is referred to as "lagging Mvar", and Mvar absorption is an import from the **System** and is referred to as "leading Mvar".

(f) It should be noted that the excitation control system constant **Reactive Power** output control mode or constant power factor output control mode will always be disabled, unless agreed otherwise with **NGET**.

Appendix 3 – Submission of Revised Mvar Capability

BC2.A.3.1 For the purpose of submitting revised Mvar data the following terms shall apply:

Full Output	In the case of a **Synchronous Generating Unit** (as defined in the Glossary and Definitions and not limited by BC2.2) is the MW output measured at the generator stator terminals representing the LV equivalent of the **Registered Capacity** at the **Grid Entry Point**, and in the case of a **Non-Synchronous Generating Unit** (excluding **Power Park Units**), **DC Converter** or **Power Park Module** is the **Registered Capacity** at the **Grid Entry Point**
Minimum Output	In the case of a **Synchronous Generating Unit** (as defined in the Glossary and Definitions and not limited by BC2.2) is the MW output measured at the generator stator terminals representing the LV equivalent of the **Minimum Generation** at the **Grid Entry Point**, and in the case of a **Non-Synchronous Generating Unit** (excluding **Power Park Units**), **DC Converter** or **Power Park Module** is the **Minimum Generation** at the **Grid Entry Point**

BC2.A.3.2 The following provisions apply to faxed submission of revised Mvar data:

(a) The fax must be transmitted to **NGET** (to the relevant location in accordance with GC6) and must contain all the sections from the relevant part of Annexures 1 and 2 but with only the data changes set out. The "notification time" must be completed to refer to the time of transmission, where the time is expressed as London time.

(b) Upon receipt of the fax, **NGET** will acknowledge receipt by sending a fax back to the **User**. The acknowledgement will either state that the fax has been received and is legible or will state that it (or part of it) is not legible and will request re-transmission of the whole (or part) of the fax.

(c) Upon receipt of the acknowledging fax the **User** will, if requested, re-transmit the whole or the relevant part of the fax.

(d) The provisions of paragraphs (b) and (c) then apply to that re-transmitted fax.

DATA REGISTRATION CODE

CONTENTS

(This contents page does not form part of the Grid Code)

DATA DESCRIPTION	UNITS	DATA CAT.	**POWER PARK UNIT** (OR **POWER PARK MODULE**, AS THE CASE MAY BE)						
			G1	G2	G3	G4	G5	G6	STN
Power Park Module Rated MVA	MVA	**SPD+**							
Power Park Module Rated MW	MW	**SPD+**							
*Performance Chart of a ~~at~~ **Power Park Module** at the connection point		**SPD**	(see **OC2** for specification)						
***Output Usable** (on a monthly basis)	MW	**SPD**	(except in relation to **CCGT Modules** when required on a unit basis under the **Grid Code,** this data item may be supplied under Schedule 3)						
Number & Type of **Power Park Units** within each **Power Park Module**									
Power Park Unit Model - A validated mathematical model in accordance with PC.5.4.2 (a)	Transfer function block diagram and algebraic equations, simulation and measured test results	**DPD**							
Power Park Unit Data (where applicable)									
Rated MVA	MVA	**SPD+**							
Rated MW	MW	**SPD+**							
Rated terminal voltage	V	**SPD+**							
Site minimum air density	kg/m^3	**SPD+**							
Site maximum air density	kg/m^3	**SPD+**							
Site average air density	kg/m^3	**SPD+**							
Year for which air density data is submitted		**SPD+**							
Number of pole pairs		**DPD**							
Blade swept area	m^2	**DPD**							
Gear box ratio		**DPD**							
Stator Resistance.	% on MVA	**SPD+**							
Stator Reactance.	% on MVA	**SPD+**							
Magnetising Reactance	% on MVA	**SPD+**							
Rotor Resistance (at starting).	% on MVA	**DPD**							
Rotor Resistance (at rated running)	% on MVA	**SPD+**							
Rotor Reactance (at starting).	% on MVA	**DPD**							
Rotor Reactance (at rated running)	% on MVA	**SPD**							
Equivalent inertia constant of the first mass (e.g. wind turbine rotor and blades) at minimum speed	MW secs / MVA	**SPD+**							
Equivalent inertia constant of the first mass (e.g. wind turbine rotor and blades) at synchronous speed	MW sec / MVA	**SPD+**							
Equivalent inertia constant of the first mass (e.g. wind turbine rotor and blades) at rated speed	MW secs / MVA	**SPD+**							
Equivalent inertia constant of the second mass (e.g. generator rotor) at minimum speed	MW secs / MVA	**SPD+**							
Equivalent inertia constant of the second mass (e.g. generator rotor) at synchronous speed	MW secs / MVA	**SPD+**							
Equivalent inertia constant of the second mass (e.g. generator rotor) at rated speed	MW secs / MVA	**SPD+**							
Equivalent shaft stiffness between the two masses	Nm / electrical radian	**SPD+**							

DATA DESCRIPTION	UNITS	DATA CAT.	**POWER PARK UNIT** (OR **POWER PARK MODULE**, AS THE CASE MAY BE)						
			G1	G2	G3	G4	G5	G6	STN
Minimum generator rotor speed (Doubly Fed Induction Generators)	RPM	**SPD+**							
Maximum generator rotor speed (Doubly Fed Induction Generators)	RPM	**SPD+**							
The optimum generator rotor speed versus wind speed	tabular format	**DPD**							
Power Converter Rating (Doubly Fed Induction Generators)	MVA	**SPD+**							
The rotor power coefficient (C_p) versus tip speed ratio (λ) curves for a range of blade angles (where applicable)	Diagram + tabular format	**DPD**							
The electrical power output versus generator rotor speed for a range of wind speeds over the entire operating range of the **Power Park Unit**.	Diagram + tabular format	**DPD**							
The blade angle versus wind speed curve	Diagram + tabular format	**DPD**							
The electrical power output versus wind speed over the entire operating range of **the Power Park Unit**.	Diagram + tabular format	**DPD**							
Transfer function block diagram, parameters and description of the operation of the power electronic converter including fault ride through capability (where applicable).	Diagram	**DPD**							
For a **Power Park Unit** consisting of a synchronous machine in combination with a back to back **DC Converter,** or for a **Power Park Unit** not driven by a wind turbine, the data to be supplied shall be agreed with **NGET** in accordance with PC.A.7.									

USER'S SYSTEM DATA
Switchgear Data

The data below is all **Standard Planning Data**, and should be provided for all switchgear (ie. circuit breakers, load disconnectors and disconnectors) operating at a **Supergrid Voltage**, and also in Scotland, operating at 132kV. In addition, data should be provided for all circuit breakers irrespective of voltage located at a **Connection Site** which is owned by a **Transmission Licensee** or operated or managed by **NGET**.

Years Valid	**Connect-ion Point**	Switch No.	Rated Voltage kV rms	Operating Voltage kV rms	Rated short-circuit breaking current		Rated short-circuit peak making current		Rated rms continuous current (A)	DC time constant at testing of asymmetrical breaking ability(s)
					3 Phase kA rms	1 Phase kA rms	3 Phase kA peak	1 Phase kA peak		

Notes

1. Rated Voltage should be as defined by IEC 694.

2. Data should be supplied for the current, and each of the seven succeeding Financial Years. This should be done by showing for which years the data is valid in the first column of the Table

USERS SYSTEM DATA

DATA DESCRIPTION	UNITS	DATA CATEGORY
PROTECTION SYSTEMS The following information relates only to **Protection** equipment which can trip or inter-trip or close any **Connection Point** circuit breaker or any **GB Transmission System** circuit breaker. The information need only be supplied once, in accordance with the timing requirements set out in PC.A.1.4 (b) and need not be supplied on a routine annual thereafter, although **NGET** should be notified if any of the information changes.		
(a) A full description, including estimated settings, for all relays and Protection systems installed or to be installed on the **User's System;**		**DPD**
(b) A full description of any auto-reclose facilities installed or to be installed on the **User's System**, including type and time delays;		**DPD**
(c) A full description, including estimated settings, for all relays and **Protection** systems installed or to be installed on the **Power Park Module** or **Generating Unit's** generator transformer, unit transformer, station transformer and their associated connections;		**DPD**
(d) For **Generating Units** (other than **Power Park Units**) having a circuit breaker at the generator terminal voltage clearance times for electrical faults within the **Generating Unit** zone must be declared.		**DPD**
(e) Fault Clearance Times: Most probable fault clearance time for electrical faults on any part of the **Users System** directly connected to the **GB Transmission System**.	mSec	**DPD**

DATA DESCRIPTION	UNITS	DATA CATEGORY
POWER PARK MODULE/UNIT PROTECTION SYSTEMS Details of settings for the **Power Park Module/Unit** protection relays (to include):		
(a) Under frequency,		**DPD**
(b) Over Frequency,		**DPD**
(c) Under Voltage, Over Voltage,		**DPD**
(d) Rotor Over current		**DPD**
(e) Stator Over current,.		**DPD**
(f) High Wind Speed Shut Down Level		**DPD**
(g) Rotor Underspeed		**DPD**
(h) Rotor Overspeed		**DPD**

FAULT INFEED DATA

The data in this Schedule 14 is all **Standard Planning Data,** and is to be provided by **Generators**, with respect to all directly connected **Power Stations**, all **Embedded Large Power Stations** and all **Embedded Medium Power Stations** connected to the **Subtransmission System**. A data submission is to be made each year in Week 24.

Fault infeeds via **Unit Transformers**

A submission should be made for each **Generating Unit** with an associated **Unit Transformer**. Where there is more than one **Unit Transformer** associated with a **Generating Unit**, a value for the total infeed through all **Unit Transformers** should be provided. The infeed through the **Unit Transformer(s)** should include contributions from all motors normally connected to the **Unit Board**, together with any generation (eg **Auxiliary Gas Turbines**) which would normally be connected to the **Unit Board**, and should be expressed as a fault current at the **Generating Unit** terminals for a fault at that location.

DATA DESCRIPTION	UNITS	F.Yr. 0	F.Yr. 1	F.Yr 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr. 6	F.Yr. 7
Name of **Power Station**									
Number of **Unit Transformer**									
Symmetrical three phase short-circuit current infeed through the **Unit Transformers**(s) for a fault at the **Generating Unit** terminals									
- at instant of fault	kA								
- after subtransient fault current contribution has substantially decayed	kA								
Positive sequence X/R ratio at instance of fault									
Subtransient time constant (if significantly different from 40ms)	ms								
Pre-fault voltage at fault point (if different from 1.0 p.u.)									
The following data items need only be supplied if the **Generating Unit** Step-up Transformer can supply zero sequence current from the **Generating Unit** side to the **GB Transmission System**									
Zero sequence source impedances as seen from the **Generating Unit** terminals consistent with the maximum infeed above:									
- Resistance	% on 100								
- Reactance	% on 100								

Fault infeeds via **Station Transformers**

A submission is required for each **Station Transformer** directly connected to the **GB Transmission System**. The submission should represent normal operating conditions when the maximum number of **Gensets** are **Synchronised** to the **System**, and should include the fault current from all motors normally connected to the **Station Board**, together with any Generation (eg **Auxiliary Gas Turbines**) which would normally be connected to the **Station Board**. The fault infeed should be expressed as a fault current at the hv terminals of the **Station Transformer** for a fault at that location.

If the submission for normal operating conditions does not represent the worst case, then a separate submission representing the maximum fault infeed that could occur in practice should be made.

DATA DESCRIPTION	UNITS	F.Yr. 0	F.Yr. 1	F.Yr. 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr. 6	F.Yr. 7
Name of **Power Station**									
Number of **Station Transformer**									
Symmetrical three phase short-circuit current infeed for a fault at the **Connection Point**									
- at instant of fault	kA								
- after subtransient fault current contribution has substantially decayed	kA								
Positive sequence X/R ratio At instance of fault									
Subtransient time constant (if significantly different from 40ms)	mS								
Pre-fault voltage (if different from 1.0 p.u.) at fault point (See note 1)									
Zero sequence source Impedances as seen from the **Point of Connection** Consistent with the maximum Infeed above:									
- Resistance	% on 100								
- Reactance	% on 100								

Note 1. The pre-fault voltage provided above should represent the voltage within the range 0.95 to 1.05 that gives the highest fault current

Note 2. % on 100 is an abbreviation for % on 100 MVA

Fault infeeds from **Power Park Modules**

A submission is required for the whole **Power Park Module** and for each **Power Park Unit** type or equivalent. The submission shall represent operating conditions that result in the maximum fault infeed. The fault current from all motors normally connected to the **Power Park Unit's electrical system** shall be included. The fault infeed shall be expressed as a fault current at the terminals of the **Power Park Unit,** or the **Common Collection Busbar** if an equivalent **Single Line Diagram** and associated data as described in PC.A.2.2.2 is provided, and the **Grid Entry Point**, or **User System Entry Point** if **Embedded**, for a fault at the **Grid Entry Point**, or **User System Entry Point** if **Embedded**.

Should actual data in respect of fault infeeds be unavailable at the time of the application for a **CUSC Contract** or **Embedded Development Agreement**, a limited subset of the data, representing the maximum fault infeed that may result from all of the plant types being considered, shall be submitted. This data will, as a minimum, represent the root mean square of the positive, negative and zero sequence components of the fault current for both single phase and three phase solid faults at the **Grid Entry Point** (or **User System Entry Point** if **Embedded**) at the time of fault application and 50ms following fault application. Actual data in respect of fault infeeds shall be submitted to **NGET** as soon as it is available, in line with PC.A.1.2

DATA DESCRIPTION	UNITS	F.Yr. 0	F.Yr. 1	F.Yr. 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr. 6	F.Yr. 7
Name of **Power Station**									
Name of Power Park Module									
Power Park Unit type									
A submission shall be provided for the contribution of the entire **Power Park Module** and each type of **Power Park Unit** or equivalent to the positive, negative and zero sequence components of the short circuit current at the **Power Park Unit** terminals, or **Common Collection Busbar**, and **Grid Entry Point** or **User System Entry Point** if **Embedded** for (i) a solid symmetrical three phase short circuit (ii) a solid single phase to earth short circuit (iii) a solid phase to phase short circuit (iv) a solid two phase to earth short circuit at the **Grid Entry Point** or **User System Entry Point** if **Embedded.** If protective controls are used and active for the above conditions, a submission shall be provided in the limiting case where the protective control is not active. This case may require application of a non-solid fault, resulting in a retained voltage at the fault point.									

- A continuous time trace and table showing the root mean square of the positive, negative and zero sequence components of the fault current from the time of fault inception to 140ms after fault inception at 10ms intervals	Graphical and tabular kA versus s								
- A continuous time trace and table showing the positive, negative and zero sequence components of retained voltage at the terminals or **Common Collection Busbar**, if appropriate	p.u. versus s								
- A continuous time trace and table showing the root mean square of the positive, negative and zero sequence components of retained voltage at the fault point, if appropriate	p.u. versus s								
For **Power Park Units** that utilise a protective control, such as a crowbar circuit,									
- additional rotor resistance applied to the **Power Park Unit** under a fault situation	% on MVA								
- additional rotor reactance applied to the **Power Park Unit** under a fault situation.	% on MVA								
Positive sequence X/R ratio of the equivalent at time of fault at the **Common Collection Busbar**									
Minimum zero sequence impedance of the equivalent at **Common Collection Busbar**									
Active Power generated pre-fault	MW								
Number of **Power Park Units** in equivalent generator									
Power Factor (lead or lag)									
Pre-fault voltage (if different from 1.0 p.u.) at fault point (See note 1)	p.u.								
Items of reactive compensation switched in pre-fault									

Note 1. The pre-fault voltage provided above should represent the voltage within the range 0.95 to 1.05 that gives the highest fault current

MOTHBALLED GENERATING UNIT MOTHBALLED POWER PARK MODULE OR **MOTHBALLED DC CONVERTER AT A DC CONVERTER STATION** INFORMATION

The following data items must be supplied with respect to each **Mothballed Generating Unit Mothballed Power Park Module** or **Mothballed DC Converter** at a **DC Converter station**

Power Station_____ **Generating Unit, Power Park Module** or **DC Converter** Name (e.g. Unit 1)
_____

DATA DESCRIPTION	UNITS	DATA CAT	**GENERATING UNIT** DATA						
			<1 month	1-2 months	2-3 months	3-6 months	6-12 months	>12 months	Total MW being returned
MW output that can be returned to service	MW	DPD							

Notes

1. The time periods identified in the above table represent the estimated time it would take to return the **Mothballed Generating Unit, Mothballed Power Park Module** or **Mothballed DC Converter** at a **DC Converter Station** to service once a decision to return has been made.
2. Where a **Mothballed Generating Unit, Mothballed Power Park Module** or **Mothballed DC Converter** at a **DC Converter Station** can be physically returned in stages covering more than one of the time periods identified in the above table then information should be provided for each applicable time period.
3. The estimated notice to physically return MW output to service should be determined in accordance with **Good Industry Practice** assuming normal working arrangements and normal plant procurement lead times.
4. The MW output values in each time period should be incremental MW values, e.g. if 150MW could be returned in 2 – 3 months and an additional 50MW in 3 – 6 months then the values in the columns should be Nil, Nil, 150, 50, Nil, Nil, 200 respectively.
5. Significant factors which may prevent the **Mothballed Generating Unit, Mothballed Power Park Module** or **Mothballed DC Converter** at a **DC Converter Station** achieving the estimated values provided in this table, excluding factors relating to **Transmission Entry Capacity**, should be appended separately.

ALTERNATIVE FUEL INFORMATION

The following data items for alternative fuels need only be supplied with respect to each **Generating Unit** whose primary fuel is gas.

Power Station_____ **Generating Unit** Name (e.g. Unit 1) _____

DATA DESCRIPTION	UNITS	DATA CAT	**GENERATING UNIT** DATA			
			1	2	3	4
Alternative Fuel Type (*please specify)	Text	DPD	Oil distillate	Other gas*	Other*	Other*
CHANGEOVER TO ALTERNATIVE FUEL						
For off-line changeover:						
Time to carry out off-line fuel changeover	Minutes	DPD				
Maximum output following off-line changeover	MW	DPD				
For on-line changeover:						
Time to carry out on-line fuel changeover	Minutes	DPD				
Maximum output during on-line fuel changeover	MW	DPD				
Maximum output following on-line changeover	MW	DPD				
Maximum operating time at full load assuming:						
Typical stock levels	Hours	DPD				
Maximum possible stock levels	Hours	DPD				
Maximum rate of replacement of depleted stocks of alternative fuels on the basis of **Good Industry Practice**	MWh(electrical) /day	DPD				
Is changeover to alternative fuel used in normal operating arrangements?	Text	DPD				
Number of successful changeovers carried out in the last **NGET Financial Year** (** delete as appropriate)	Text	DPD	0 / 1-5 / 6-10 / 11-20 / >20 **	0 / 1-5 / 6-10 / 11-20 / >20 **	0 / 1-5 / 6-10 / 11-20 / >20 **	0 / 1-5 / 6-10 / 11-20 / >20 **

DATA DESCRIPTION	UNITS	DATA CAT	GENERATING UNIT DATA			
			1	2	3	4
CHANGEOVER BACK TO MAIN FUEL						
For off-line changeover:						
Time to carry out off-line fuel changeover	Minutes					
For on-line changeover:						
Time to carry out on-line fuel changeover	Minutes					
Maximum output during on-line fuel changeover	MW					

Notes

1. Where a **Generating Unit** has the facilities installed to generate using more than one alternative fuel type details of each alternative fuel should be given.
2. Significant factors and their effects which may prevent the use of alternative fuels achieving the estimated values provided in this table (e.g. emissions limits, distilled water stocks etc.) should be appended separately.

< End of **Data Registration Code** (**DRC**) >

		CC.6.5.4 amended to heading CC.6.5.4 renumbered to CC.6.5.4.1 and amended CC.6.5.4.2 inserted CC.6.5.4.3 inserted CC.6.5.4.4 inserted CC.6.5.4.5 inserted CC.6.5.4.6 inserted CC.6.5.5 amended to heading CC.6.5.5 renumbered to CC.6.5.5.1 CC.6.5.5.2 inserted
General Conditions	3	GC.5.4 amended
General Conditions	4	GC.5.6 amended

Revision 26 Effective Date: 1 April 2008

CODE	PAGE	CLAUSE
G&D	2	Definition of Automatic Voltage Regulator amended
	7	Definition of Common Collection Busbar added
	31	Definition of Power Park Module amended
	36	Definition of Setpoint Voltage added
	38	Definition of Slope added
PC	4	PC.3.3 amended
	17	PC.A.2.2.2 amended
	22 and 23	PC.A.2.5.5.7 added
	24 and 25	PC.A.2.5.6 added
	47 and 48	PC.A.5.4.2(b) amended
	66	PC Appendix B amended

CC	2	CC.3.4 amended
	14	CC.6.3.2(b) amended
	17	CC.6.3.4 amended
	19	CC.6.3.7(a) amended
	20	CC.6.3.7(c)(ii) amended
	21	CC.6.3.8(b) amended CC.6.3.8(c) amended
	22	CC.6.3.8 (d) added CC.6.3.8 (e) renumbered and amended
	23 and 24	CC.6.3.15(a)(ii) amended
	25	CC.6.3.15(b)(iii) amended CC.6.3.15(c)(ii) amended
	37	CC.7.9 amended
	56	CC.A.3.4 amended
	65 to 68	CC Appendix 6 added
	69 to 74	CC Appendix 7 added
BC2	24	BC2.A.2.5(b) amended
	26	BC2.A.2.6 amended
DRC	15	Schedule 1, Page 9 amended
	16	Schedule 1, Page 10 amended
	34	Schedule 5, Page 6 amended
	53 and 54	Schedule 14, Page 3 added