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HYDRO POWER AND ENERGY PLANNING PROJECT (HPEP)

REPORT ON GEORGIAN DISTRIBUTION CODE

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LIST OF ABBREVIATIONS

A	ampere
AC	alternating current
ANSI	American National Standards Institute
AVR	Automatic Voltage Regulator
CT	Current Transformer
DC	direct current
DPD	Detailed Planning Data
(E)HV	**(**Extra) High Voltage
TGCSC	Grid Code Supervisory Committee
HV	High Voltage
Hz	hertz
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
ITU	International Telecommunication Union
kA	kilo ampere
kV	kilo volt
kvar	kilo var
kW	kilo watt
kWh	kilo watt hour
kvarh	kilo var hour
LV	Low Voltage
min	minute
MV	mega volt ampere
Mvar	mega var
Mvarh	mega var hour
MW	mega watt
MWh	mega watt hour
NIOM	Notification of Inadequate Operating Margin
NMDR	Negative Minimum Demand Regulation
OD	Operational Data
P_{lt}	Flicker Severity Index (Long-term)
P_{st}	Flicker Severity Index (Short-term)
PSS	Power System Stabilizer
PSS/E	Power System Simulator/Engineering
PTI	Power Technologies International
RMS	root mean square
RPM	revolutions per minute
RTU	remote terminal unit
s	second
SCADA	supervisory control and data acquisition
SPD	Standard Planning Data
STPM	Short Term Planned Maintenance
TC	Transmission Company
TSO	Transmission System Operator

U	Generating Unit
V	volt
VA	volt ampere
var	volt ampere reactive
VT	Voltage Transformer
W	watt
Wh	watt hour

CONTENTS

1.0 FOREWORD

This is the first issue of the **Georgian Distribution Code**. The **Distribution Code** is designed to indicate the procedures for both planning and operational purposes and covers both normal and exceptional circumstances. It is however a live working 4.ument. It will be, from time to time, subjected to changes and/or revisions to reflect stages of development of the legal and regulatory framework of the energy sector and changes to comply with legislations and **Good Industry Practice**s.

The proposals for changes will be received by the **Distribution Code Review Panel (DCRP)**. The rules and responsibilities of the **DCRP** are prescribed in section 1.7 of this **Distribution Code**. Upon receipt of such proposals for changes, the **DCRP** will carry out the necessary process as appropriate to study these proposals and officially prepare a proposal to **GNERC** for its approval. The **DCSC** is a stakeholder representative panel and its composition is laid down in section 1.7 of the **Distribution Code**.

This **Georgian Distribution Code** does not replace or substitute the existing **Technical Standards** & **Procedures** but rather provides a general framework for their revision to ensure the **Safe**, **Secure** and **Reliable Operation** of **Electrical Distribution Networks** of Georgia under the Competitive Electricity Market Environment. It is intended to work in conjunction with other Legal and Regulatory 4.uments, including but not limited to the **Georgian Law on Electricity and Natural Gas**; **Electricity Market Rules** (to be developed and approved by **GNERC**); **Georgian Transmission Grid Code** and other **Regulatory Guidelines** issued by the **GNERC**.

As a **User** of this **Distribution Code**, it is your responsibility to ensure that you acquire the most up to date issue of the **Distribution Code** which can be downloaded from **GNERC**'s web site.

The Foreword and Preface are provided to **User**s and to prospective **User**s for their information only and do not constitute a part of the **Distribution Code**.

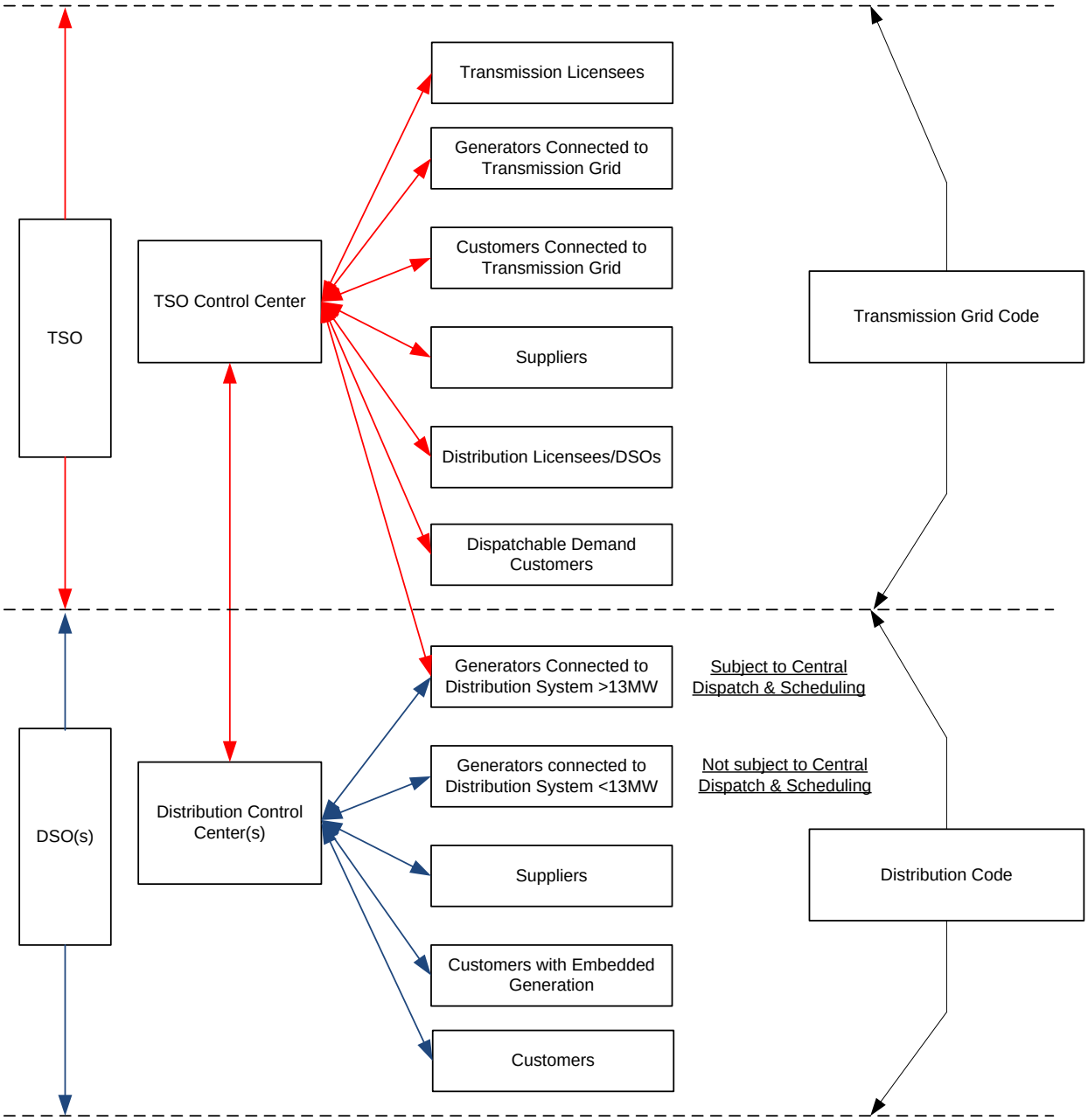
2.0 INTRODUCTION

The **Georgian Distribution Code** has been developed to define the rules and regulations for various **Participants** for accessing and using the **Electrical Distribution Networks** of Georgia.

The objective is to establish the obligations of the **Distribution Licensees, Distribution Network Operators** (**DNO**), and **Distribution Network Users — Generators** and **Customers,** for accessing and using the **Distribution Network**, in specific to (i) define obligations, responsibilities, and accountabilities of all the parties towards ensuring open, transparent, non-discriminatory, and economic access and use of the **Distribution Network** while maintaining its safe, reliable, and efficient operation; (ii) define minimum technical requirements for the **Participants**; and (iii) set out the information exchange obligations of the **Participants**.

The relationship between the **Transmission Grid Code** and **Distribution Code** is shown diagrammatically in Figure 1 below.

3.0 FIGURE 1: TRANSMISSION GRID CODE AND DISTRIBUTION CODE BOUNDARIES



Through its chapters, the **Georgian Distribution Code** attempts to cover matters such as defining of technical, design, and operational criteria for **Distribution System** access and use, planning for **Distribution System** development and reinforcement, **Operation Criteria and Standards**, exchange of data and information, and metering policies and **System**s.

4.0 DISTRIBUTION CODE STRUCTURE

The **Distribution Code** is divided into five parts as follows:

(a) Chapter -1: The **Distribution General Conditions (1.) sets** out the legal framework guiding the operation of the **Distribution Code**.

(b) Chapter -2: The **Distribution Planning Code (2.)** contains details of the standard of supply offered as well as the design principles to which the **Distribution System** is constructed. The **2.** enables **Users** to obtain from **DSO** certain information on the **Distribution System** in certain circumstances.

(c) Chapter -3: The **Distribution Connection Conditions (3.)** provides details of the technical and other requirements to be met by those requiring connection to the **Distribution System**. Special conditions pertaining to **Generator**s are contained in **3. 9**.

(d) Chapter -4: The **Distribution Operating Code (4.)** deals with the various operational matters affecting **Users** such as providing forecasts of **Demand**, planning **Distribution System** outages, **Generation** outages, **Transmission Grid** outages, reporting of operational changes and events, safety matters and procedures for dealing with emergency situations.

(e) Chapter -5: The **Distribution Data Registration Code** summarizes in tabular form the data requirements under the **Distribution Code**.

The **Glossary and Definitions** section at the end provides brief definitions and explanation of the various terms that have been used in the various parts of the **Distribution Code**. These terms appear in the **Distribution Code** with their initial letters in uppercase and **Bold** format.

5.0 CATEGORIES OF USERS OF THE DISTRIBUTION SYSTEM

A1. Generating **Plant** >13MW and subject to central **Dispatch** by **TSO**

A2. Generating **Plant** >2MW and not subject to central **Dispatch**

A3. **Generator**s <2MW

A4. **Customers** with Embedded Generation/Auto-production

A5. **Customers** with Stand-by **Generator**s

B1. Major **Customers** (**Customers** connected at High Voltage)

B2. **Customers** connected at Medium Voltage

B3. Industrial and commercial **Customers** connected at **Low Voltage**

B4. End-Use **Customers**

B5. **Dispatchable Demand Customers**

C. Suppliers

D. The **Distribution System** Operator

6.0 APPLICABILITY

Sections of the **Distribution Code** Applying to Particular Categories of **User**s of the **Distribution System** are defined in below.

CATEGORY OF USERS

D Code Ref	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C	D
1.	D	D	D	D	D	D	D	D	D	D	D	D
2.1	R	R	R	R	R	R	R	R	R	R	R	R
2.2	R	R	R	R	R	R	R	R	R	R	R	R
2.3	R	R	R	R	R	R	R	R	R	R	R	R
2.4	R	R	R	R	R	R	R	R	R	R	R	D
2.5	D	D	D	D	D	D	D	D	R	D	R	D
3.1	R	R	R	R	R	R	R	R	R	R	R	R
3.2	R	R	R	R	R	R	R	R	R	R	R	R
3.3	R	R	R	R	R	R	R	R	R	R	R	R
3.4	D	D	D	D	N	D	D	D	D	D	R	D
3.5	D	D	D	D	N	D	D	R	R	D	R	D
3.6	D	D	D	D	N	D	D	D	D	D	R	D
3.7	D	D	D	D	N	D	D	R	R	D	R	D
3.8	N	N	N	N	N	D	D	D	D	D	R	D
3.9	D	D	D	D	D	D	D	D	N	D	R	R
3.10	D	D	D	D	D	N	N	N	N	D	N	D
3.11	D	D	D	D	D	N	N	N	N	D	R	D
4.1	N	D	N	N	N	D	D	N	N	D	N	D
4.2	N	D	D	D	N	D	N	N	N	D	N	D
4.3	R	R	R	R	R	R	R	R	R	R	N	D
4.7	D	D	D	R	N	D	N	N	N	D	N	D
4.8	D	D	D	R	N	D	N	N	N	D	N	D
4.9	D	D	D	R	N	D	N	N	N	D	R	D
4.10	D	D	D	D	D	D	D	D	D	D	R	D
4.11	D	D	D	D	D	D	D	D	D	D	R	D
5.	D	D	D	D	D	D	D	N	N	N	N	D

N - Not Applicable

D - Applicable with specific obligations

R - Relevant for information but no specific obligations.

Note: Customers represented in Categories A4 and A5 must comply with the code sections relevant to that category and additionally to the relevant sections of the category of Customer to which they belong.

7.0 DISTRIBUTION GENERAL CONDITIONS

1.1 INTRODUCTION

1.1.1 While each Chapter - **Code** in the **Distribution Code** contains the rules and provisions relating specifically to that Chapter, there are provisions which are of more general application. These are covered in the **Distribution General Conditions Code (1.)**.

1.2 OBJECTIVE

1.2.1 The **Distribution General Conditions** contain provisions that are of general application to all provisions of the **Distribution Code**. Their objective is to ensure, to the extent possible, that the various sections of the **Distribution Code** apply consistently to all electricity **Customers**.

1. 3 SCOPE

1. 3.1 The **Distribution General Conditions** apply to all **Users**.

1. 4 ASSISTANCE IN IMPLEMENTATION

1.4.1 The **Distribution System Operator License** imposes a duty upon the **Distribution System Operator (DSO)** to implement and enforce the **Distribution Code**. In order to do this the **DSO** may need access across boundaries, services, and facilities from **Users** or to issue instructions to **Users**, for example to isolate or disconnect **Plant** or **Apparatus**.

1.4.2 All **Users** are required to abide by the **Distribution Code** and also to provide the **DSO** with such rights of access, services and facilities and to comply with such instructions as it may reasonably require implementing and enforcing the **Distribution Code**.

1.5 UNFORESEEN CIRCUMSTANCES

1.5.1 If circumstances arise which the provisions of the **Distribution Code** have not foreseen, the **DSO** shall to the extent reasonably practicable in the circumstances, consult promptly and in good faith with affected **Users** in an effort to reach agreement as to what should be done. If agreement cannot be reached in the time available the **DSO** will determine what is to be done.

1.5.2 Whenever the **DSO** makes a determination, it shall have regard, wherever possible to the views expressed by **Users**, and in any event, to what is reasonable in all the circumstances.

1.5.3 Each **User** shall comply with all instructions given to it by the **DSO** following such a determination provided that the instructions are consistent with the then current technical parameters of the particular **User's System** registered under the **Distribution Code**. The **DSO** shall promptly refer all such unforeseen circumstances and any such determination to the **Distribution Code Review Panel** in accordance with **1.7.2**.

1.6 HIERARCHY

1.6.1 In the event of any conflict between the provisions of any direction of the Regulatory Authority (**GNERC)** on the one hand and the provisions of the **Distribution Code** on the other, the provisions of such direction shall prevail (provided that such direction or ruling is binding upon the person to whom it is addressed).

1.6.2 In the event of any conflict between the provisions of the **Distribution Code** and any contract, agreement or arrangement between the **DSO** and a **User**, the provisions of the **Distribution Code** shall prevail unless the **Distribution Code** expressly provides otherwise.

[1.7 This section will be inserted to be consistent with transmission grid code (Artice 5, paragraph 1)

1.7 COMMUNICATIONS BETWEEN THE DSO AND USERS

1.8.1 Unless otherwise specified in the **Distribution Code** the methods of operational communication and data transfer shall be agreed between the **DSO** and **Users** from time to time.

1.8 EMERGENCY SITUATIONS

1.9.1 **Users** should note that in case of Emergency Situation the provisions of the **Distribution Code** may be suspended, in whole or in part, pursuant to any directions given and / or orders made by the **Government of Georgia**.

1.9 CODE RESPONSIBILITIES

1.10.1 The **Distribution Code** sets out the procedures and principles governing the relationship between the **DSO** and all **Users** of the **Distribution System**.

1.10 DEROGATIONS

1.11.1 If a **User** finds that it is, or will be unable to comply with any provision of the **Distribution Code**, then it shall without delay report such non-compliance to the **DSO** and shall, subject to the provisions of 1.11.2 make such reasonable efforts as are required to remedy such non-compliance as soon as reasonably practicable.

1.11.2 Where the non-compliance is:

(a) with reference to **Plant** and/or **Apparatus** connected to the **Distribution System** and is caused solely or mainly as a result of a revision to the **Distribution Code**; or

(b) with reference to **Plant** and/or **Apparatus** which is connected, approved to connect, or for which approval to connect to the **Distribution System** is being sought;

and the **User** believes either that it would be unreasonable (including cost and technical considerations) to require it to remedy such non-compliance or that it should be granted an extended period to remedy such non-compliance it shall promptly submit to the **GNERC** a request for a derogation from such provision in accordance with the requirements of 1.11.3 and shall provide the **DSO** with a copy of such application.

1.11.3 A request for derogation from any provision of the **Distribution Code** shall contain:

(a) the issue number and the date of the **Distribution Code** provision against which the non-compliance or predicted non-compliance was identified;

(b) identification of the **Plant** and/or **Apparatus** in respect of which a derogation is sought and, if relevant, the nature and extent to which the non-compliance exists;

(c) identification of the provision with which the **User** is, or will be, unable to comply;

(d) the reason for the non-compliance; and

(e) the date by which compliance will be achieved (if remedy of the non-compliance is possible) subject to 1.11.2 (b).

1.11.4 If the **DSO** finds that it is, or will be, unable to comply with any provision of the **Distribution Code**, then it shall, subject to the remaining provisions of 1.11 make such reasonable efforts as are required to remedy such non-compliance as soon as reasonably practicable.

1.11.5 In the case where the **DSO** requests a derogation, the **DSO** shall submit the information set out in 1.11.3 to the **GNERC**.

1.11.6 On receipt of any request for derogation, the **GNERC** shall promptly consider such request and provided that the **GNERC** considers that the grounds for the derogation are reasonable, the **GNERC** shall grant such derogation unless the derogation would, or it is likely that it would have a material adverse impact on the security and stability of the **Distribution System** or imposes unreasonable costs on the operation of the **Distribution System** or **Transmission Grid** or on other **Users**. In its consideration of a derogation request by a **User**, the **GNERC** may contact the relevant **User** and or the **DSO** to obtain clarification of the request to discuss changes to request. Where the derogation may have an impact on the **Transmission Grid**, the **DSO** shall consult with the **TSO** prior to providing an assessment to the **GNERC**.

Derogation from any provision of the **Distribution Code** shall contain:

(a) The issue number and the date of the **Distribution Code** provision against which the derogation applies;

(b) Identification of the provision with which the derogation applies;

(c) Identification of the **Plant** and/or **Apparatus** in respect of which a derogation applies and, if relevant, the nature and extent to which the derogation applies including alternate compliance provision;

(d) The reason for the non-compliance requiring derogation;

(e) The date by which the derogation ends if compliance will be achieved, or by which such derogation expires.

1.11.7 To the extent of any derogation granted in accordance with this 1.11, the **DSO** and/or the **User** (as the case may be) shall be relieved form its obligation to comply with the applicable provision of the **Distribution Code** and shall not be liable for failure to so comply but shall comply with any alternate provision as set forth in the derogation.

1.11.8 **DSO** shall:

(a) Keep a register of all derogations which have been granted, identifying the name of the person in respect of whom the derogation has been granted, the relevant provision of the **Distribution Code** and the period of the derogation; and

(b) On request from any **User**, provide a copy of such register of derogations to such **User**.

1.11.9 Where a material change in circumstance has occurred a review of any existing derogations, and any derogations under consideration, may be initiated by the **GNERC** at the request of the **GNERC**, **DSO**, or **Users**.

8.0 (2) DISTRIBUTION PLANNING CODE

2. INTRODUCTION

2.1.1 The **Distribution Planning Code** specifies the technical and design criteria and the procedures to be complied with by the **DSO** in the Planning and Development of the **Distribution System**. It also applies to **Users** in the planning and development of their installations in so far as they affect the **Distribution System**.

2.1.2 The **Users'** requirements may necessitate the reinforcement of, or an extension, to the **Distribution System** and for reinforcement of, or extension to, the relevant **Transmission / Distribution** interface capacity, such work being identified by the **DSO** or **TSO** as appropriate.

2.1.3 The time required for the planning and development of the **Distribution System** and any consequential requirement of the interface with the **Transmission Grid**, shall depend on the type and extent of the necessary reinforcement and/or extension work, the time required for obtaining **Authority Permissions**, including any associated hearings, and the degree of complexity in undertaking the new work while maintaining satisfactory security and quality of supply.

2.1.4 Reference is made in the **2.** to the **DSO** supplying information or advice to **Users**. For avoidance of doubt, unless the context otherwise requires, such information or advice shall be provided by the **DSO** as soon as practical following a request by the **User** (whether during the application for connection process or otherwise).

2.2 OBJECTIVES

2.2.1 The objectives of the **Distribution Planning Code** are to:-

(a) enable the **Distribution System** to be planned, designed and constructed to operate economically, securely and safely.

(b) facilitate the use of the **Distribution System** by others and to specify a standard of supply to be provided.

(c) provide sufficient information for a **User** to assess opportunities for connection and to plan and develop his or her installation so as to be compatible with the **Distribution System**.

(d) formalize **System Planning Data** requirements.

2.3 SCOPE

2.3.1 The **Distribution Planning Code** specifies the planning and design requirements for the **Distribution System**.

2.3.2 The **Users** to whom the **Distribution Planning Code** applies are those who use or intend to use the **Distribution System** and comprise the following:-

(a) all **Generator**s connected to the **Distribution System**.

(b) all **Customers** connected to the **Distribution System**.

(c) Suppliers.

2.4 DESIGN STANDARDS

2.4.1 Frequency

2.4.1.1 The frequency of supply is outside the control of the **DSO** however the expected standard frequency range is as follows:

The **Transmission Grid Frequency** is nominally 50 Hz:

(a) Normal operating range: 49.8 to 50.2 Hz.

(b) During **System** disturbances: 48.0 to 52.0 Hz.

(c) During exceptional **System** disturbances 47.0Hz to 52.0Hz

2.4.2 Voltage

2.4.2.1 The **Distribution System** includes networks operating at the following nominal voltages:

TABLE 1: DISTRIBUTION NOMINAL VOLTAGES

Low Voltage (LV)	230 volts – phase to neutral 400 volts – phase to phase
Medium Voltage (MV)	6,300 volts (6.3kV) 10,000 volts (10kV) 20,000 volts (20kV) 35,000 volt (35kV)
High Voltage (HV)	110,000 volts (110kV)

2.4.2.2 The **DSO** shall operate the **Distribution System** so as ensure that the voltage at the *supply terminals*, as defined in EN 50160, complies with that standard. The **Low Voltage** range tolerance shall be 230V +/- 10%. The resulting voltage at different points on the **System** depends on several factors, but at the **Connection Point** with **Customers** can be expected to be in accordance with Table 2 under steady state and normal operating conditions.

TABLE 2 – OPERATING VOLTAGE RANGE

Nominal voltage	Highest voltage	Lowest voltage
230V	253V	207
400V	440V	360
6.3[1]kV	6.93kV	5.67kV
10kV	11kV	9kV
20kV	22kV	18kV
35kV	38.5kV	31.5kV
110kV	121kV	99kV

Higher maximum voltages can arise at the **Connection Point** with **Generator**s as per Table 5 in clause 3.10.5.

2.4.2.3 The **Distribution System** and any **User** connections to that **System** shall be designed to enable normal operating **Frequency** and **Voltages** supplied to **Customers** to comply with European Standard EN 50160:1995 "Voltage characteristics of electricity supplied by public **Distribution System**". Characteristics of the voltage, frequency, dips, interruptions, unbalance and harmonics are set out in this CENELEC approved standard. It should be noted that the standard describes the main characteristics of the voltage that may be expected at the supply terminals under *normal* operating conditions.

2.4.3 Earthing Requirements

2.4.3.1 The treatment of the neutral is different for the various supply voltages. The present treatments are described below but these could change in the future.

2. 4.3.2 The electrical installations of all new consumers connected at **Low Voltage** shall be protected by the **TN-C-S System** unless otherwise advised in line with the requirements of the **Georgian National Minimum Power Quality Standards**.

2.4.3.3 The main earthing terminal block shall be connected via an appropriately sized main protective conductor to the incoming neutral conductor. An earthing conductor of appropriate size should be taken from the main earthing terminal to the consumer's earth electrode.

2.4.3.4 For voltages above LV the following applies:

Voltage Neutral Treatment

- 6.3kV and 10kV - Isolated neutral.
- 20kV Earthed through a 20 ohm resistor which limits earth fault current to 500 amps.

[1] This industrial voltage level widely used in former USRR will be gradually upgraded and abandoned. New developments of the Distribution Systems shall not be planned for 6.3kV.

- 35kV Earthed through an arc suppression coil (series inductance) at source 110kV substations.
- 110kV Effectively Earthed neutral **System** with an earth fault factor less than 1.4.

2.4.3.5 With the exception of LV networks where the **TN-C-S System** is permitted, multiple zero phase sequence paths are currently prohibited in the design of the **Distribution System**.

2.4.4 Security of Supply

2.4.4.1 The security standard for the **Distribution System** will be set out in **"Distribution System Security and Planning Standards"** (to be developed and approved by **GNERC**).

2.4.4.2 The **DSO** shall use reasonable endeavors to maintain a supply from the **System**. This cannot be ensured, since faults, planned maintenance and new works outages and other circumstances outside **DSO'**s control can cause interruptions. On such occasions, the **DSO** shall use reasonable endeavors to restore the supply or connection as soon as practicable but shall be under no liability for any direct or indirect damage or associated loss incurred by the **User**.

2.4.4.3 Restoration times for different outage types are as follows:

- **Fault Outages**: The **DSO** shall endeavor to restore access to the System as soon as reasonably practical but within twenty- four hours. In major storm conditions the outage duration may be longer and, in such circumstances, the **DSO** shall endeavor to keep the **User** advised of progress.
- **Planned Outages:** The **DSO** shall endeavor to give three days notice of planned supply interruptions. In some situations - to facilitate emergency repairs or local outages affecting a small number of **Customers** - shorter notice may be given.
- **Supply Curtailments**: In some circumstances, it may be necessary to request **Customers** to reduce load or to use standby supplies where appropriate. In these situations the **DSO** shall endeavor to maintain access to the **System**. In extreme cases where this may not be possible the **DSO** shall endeavor to provide two days notice to the **User**.
- **Load Shedding:** In extreme situations there may be generation shortages and load shedding may be required. In these circumstances the **DSO** shall notify **Customers** if possible but as this is an emergency situation this may not be possible.

2.4.4.4 The **DSO** may disconnect **Users** under certain circumstances. These circumstances shall include:

(a) Where the customer's installation or use of electricity is such as to interfere with the satisfactory operation of the **Distribution System** or **Transmission Grid** or to cause electrical disturbance to other **Customers**.

(b) Where the **DSO** considers that the customer's installation is in a potentially dangerous condition.

(c) Where alterations, repairs, renewal or maintenance of the **Distribution System** or **DSO** assets or means of connection require the de-energization of the **Connection Point**.

(d) Where a customer extends supply for use by another party whom the **DSO** considers to be a separate customer.

(e) In any other circumstances in which discretion is necessary or appropriate to enable the **DSO** to comply with the **Distribution Code** and/or to operate the **Distribution System** in accordance with **Good Industry Practice** or is required by any law, direction, rule or regulation having the force of law.

2.5 TRANSFER OF PLANNING DATA

2.5.1 Planning Information to be provided by **Users**

2.5.1.1 **Users** of the **Distribution System** shall provide sufficient planning data/information as can reasonably be expected to be made available, when requested by the **DSO** from time to time to enable the **DSO** to comply with the requirements under its **Distribution License**.

2.5.1.2 **Generators**, **Customers** connected to the **Distribution System** including **Dispatchable Demand Customers** and **Suppliers** shall provide such planning data as the DSO may require for specific future time periods updated annually as necessary and including projected **Demand** requirements, anticipated changes in maximum **Demand**, or generating capacity, as appropriate. The data and timescales over which the data is required is given in **Distribution Operating Code 1 (4.1)** and the associated data schedule is Schedule 2 of the **Distribution Data Registration Code (5.)**.

2.5.1.3 In addition to periodic updates of planning information a **User** shall give adequate notice of any significant change to their **System** or operating regime to enable the **DSO** to prepare its development plans and implement any necessary **System** modifications. In the event of unplanned changes in a **User's System** or operating regime a **User** shall notify the **DSO** as soon as is practically possible to ensure any necessary measures can be implemented.

2.5.1.4 **Users** shall also provide details of reactive compensation **Plant** directly or indirectly connected to the **Distribution System** other than at **Low Voltage**, including its rating and operational control.

2.5.1.5 **Users** may be required to provide the **DSO** with detailed data relating to the interface between their **System** and that of the **Distribution System** covering circuit parameters, switchgear and **Protection** arrangements of **Equipment** directly connected to or affecting the **Distribution System** to enable the **DSO** to assess any implications associated with these points of connection.

2.5.2 Information Exchange

2.5.2.1 Upon the request of a **User**, the **DSO** shall provide such information, as may be reasonably required, on the design and other characteristics of the **Distribution System**.

2.5.2.2 Where the **DSO** proposes to make certain modifications to its **System** or where it has received information from a **User** under 2.5.1 above, which may impact on other **User Installations** then the **DSO** will notify **Users** of the proposal, subject to any constraint of confidentiality or timing.

2.5.2.3 The **DSO** shall provide information on request to **Users** regarding the local network conditions to enable them to determine their **Protection** requirements.

2.5.2.4 Where the **User's** installation is connected to the busbars of the **Distribution System** sufficient details may need to be exchanged with respect to **User/the DSO Ownership Boundary** to enable an assessment to be made of transient overvoltage effects. The request for information may be initiated by either the **DSO** or the **User**.

2.5.2.5 Information may be exchanged between the **DSO** and the **User** on fault infeed levels at the feeding busbar or point of connection to the **Distribution System** as appropriate, in the form of:

- three phase and single phase earth short circuit infeed.
- The X/R ratio under three phase fault conditions.

2.5.2.6 Information shall be exchanged between the **DSO** and **User** on **Demand Transfer Capability** where the same **Demand** can be supplied from alternate **User** points of supply. This shall include the proportion of **Demand** normally fed from each point of supply and the arrangements (manual or automatic) for transfer under planned/fault outage conditions.

2.5.3 Planning Studies

2.5.3.1 In order to facilitate connections to the **Distribution System** the **DSO** shall prepare on request a study showing the implications of a connection at a particular point on the **System**.

2.5.3.2 Under the terms of the **Distribution License** a reasonable charge may be levied by the **DSO** for the planning study. Details of these charges are set out in **"Distribution System Connection Charging Methodology"** (to be developed and published by **DSO(s)** upon approval by **GNERC**).

2.5.3.3 **Users** or potential **Users** shall provide to the **DSO** information regarding the proposed facility including load details, interface arrangements, proposed **Connection Point** and import/export requirements.

2.5.3.4 The studies shall normally be prepared within 28 days after the date of receipt of the information or the agreement of the person making the request to pay the cost of the study, whichever is the longer. In the case of **Generators** and **Major Customers** seeking connection, depending on the nature and complexity of the request, this period may extend up to 100 days or a further 28 days from the receipt of planning information from the **TSO** whichever is the greater.

2.5.3.5 Details of the procedures for application for connection to the **Distribution System** are contained in "**Distribution System Connection Charging Methodology"** (to be developed and published by **DSO(s)** upon approval by **GNERC**).

2.5.3.6 Rules applied by the **DSO** in determining the connection requirements are outlined in the **"Distribution System Security & Planning Standards"** (to be developed and approved by **GNERC**).

2.5.3.7 Where such information is available the **DSO** shall provide on request a statement of present and future circuit capacities, forecast power flows and loadings on part or parts of the **Distribution System** specified in the request and shall include fault levels at each **Distribution Node** covered by the request. The **DSO** may levy a charge for the provision of this statement as approved by the **GNERC** on account of the reasonable costs incurred by the **DSO** in preparing this statement. The statement shall be prepared within 28 days after the date of receipt of the information or the agreement of the person making the request to pay the cost of the statement, whichever is the longer. In the case of **Generators** and **Major Customers** seeking connection this period may extend up to 110 days depending on the nature and complexity of the request.

2.5.3.8 The dates given in this 2. 5.3 are target dates only and do not constitute a legal commitment. The **DSO** shall however use reasonable endeavors to abide by them.

9.0 (3) DISTRIBUTION CONNECTION CONDITIONS

3.1 INTRODUCTION

3.1.1 It is necessary to require certain minimum technical, design and operational criteria to be met by **Users' Plant** and **Apparatus** in order to maintain, insofar as is permitted by **Good Industry Practice**, stable and secure operation of the **Distribution System** for the benefit of all **Users** and for the **Protection** of the **Distribution System** and **Users' Plant** and **Apparatus** directly connected to the **Distribution System**.

3.1.2 The **Distribution Connection Conditions** establish certain principles and standards relating to the provision of the connection, method of connection, and technical and performance standards.

3.1.3 The **Distribution Connection Conditions** specifies the information to be provided by **Users** to ensure that adequate provision can be made by the **DSO** for new connections or increases in existing load. It also applies to **Generators** who operate in parallel with the **Distribution System**, where a connection is required. **Prospective Users** shall provide to the **DSO** in good time all the details set out in this section.

3.1.4 In conjunction with the **Connection Conditions**, there are **Connection Agreements**, which are bilateral agreements between the **DSO** and each **User**, and which contain the detail specific to each **User's** connection to and use of the **Distribution System**. The **Connection Agreement** requires the **User** and the **DSO** to comply with the terms of the **Distribution Code**.

3.2 OBJECTIVE

3.2.1 The **Connection Conditions** define the minimum standards for the method of connection to the **Distribution System** and the technical, design and operational standards to which **Users** connecting to the **Distribution System** shall comply.

3.2.2 The **Connection Conditions** specify the technical arrangements required at the **Ownership Boundary** between the **Distribution System** and the Installation of the **User** and is applicable at all voltage levels covered by the **Distribution Code**.

3.2.3 The **Connection Conditions** outline the types of signals and indications that will be required to be made available to the **DSO** by each **User**.

3.3 SCOPE

3.3.1 The **Connection Conditions** apply to the **DSO** and to all **Users** connected to or planning a connection to the **Distribution System**.

3.4 INFORMATION REQUIRED FOR CONNECTION

3.4.1 For connections at **Low Voltage** it is possible in most cases to assess whether a proposed connection is acceptable, and to determine the necessary supply arrangements, from analysis of the following data:

(a) Maximum kVA requirements.

(b) Type and electrical loading of **Equipment** to be connected, such as number and size of motors, cookers, showers, space and water electrical heating loads and nature of disturbing loads e.g. welding **Equipment**.

(c) The date when connection is required.

If a preliminary examination of this data indicates that more detailed information is reasonably required then it shall be provided to the **DSO** upon request.

3.4.2 Information Requirements and timeframes for quotation and connection are provided in **"Distribution System Connection Charging Methodology"** (to be developed and published by **DSO(s)** upon approval by **GNERC**). This also contains the application forms that **Users** requiring a connection or extension to the **Distribution System** are obliged to complete. Copies of this 4.ument are available on request from the **DSO**.

3.4.3 For connections at **High** and **Medium Voltages** the provisions of 3.4.1 also apply. Additionally, the following information may be required as detailed in the **Distribution Data Registration Code (5.)**.

(a) All types of **Demand**:

(i) **Maximum and Minimum Active Power** requirements.

(ii) **Maximum** and **Minimum Reactive Power** requirement.

(iii) Type of load and control arrangements (e.g. type of motor start, controlled rectifier or large motor drives).

(iv) Maximum load on each phase.

(v) Maximum harmonic currents that may be imposed on the **Distribution System**.

(vi) Details of cyclic load variations or fluctuating loads (as below).

(b) Disturbing Loads:

Comprehensive schedule of new installed **Equipment** including details of disturbing loads. These are loads which have the potential to introduce harmonics, flicker or unbalance to the **System**. This could adversely affect the supply quality to other **Customers**. Disturbing loads could be non-linear loads, power converters/regulators and loads with a widely fluctuating **Demand**. The type of load information required for motive power loads, welding **Equipment**, harmonic producing / non linear loads and generating **Equipment** can be obtained from the **DSO** on request.

In the case of compensating **Equipment** associated with disturbing loads, details and mode of operation to be provided so as to ensure compliance with emission limits specified in 3.6.8.3.

(c) Fluctuating Loads:

Details of cyclic variation, and where applicable the duty cycle, of active Power (and Reactive Power if appropriate), in particular:-

(i) the rates of change of **Active Power** and **Reactive Power**, both increasing and decreasing;

(ii) the shortest repetitive time interval between fluctuations in **Active Power** and **Reactive Power**; and,

(iii) the magnitude of the largest step changes in **Active Power** and **Reactive Pow**er, both increasing and decreasing

3.4.4 In some cases, more detailed information may be required to permit a full assessment of the effect of the **User's load** on the **Distribution System**. Such information may include an indication of the pattern of buildup of load and a proposed commissioning program. This information shall be specifically requested by the **DSO** when necessary and shall be provided by the **User** within a reasonable time.

3.4.5 **Users** shall contact the **DSO** in advance if it is proposed to make any significant change to the connection, electric lines or electric **Equipment**, install or operate any generating **Equipment** or do anything else that could affect the **Distribution System** or require alterations to connection.

3.4.6 **Users** shall provide to the **DSO** any information reasonably required by the **DSO** about the nature, or use by the **User**, of electrical **Equipment** on the **Users'** premises.

3.5 CONNECTION ARRANGEMENTS

3.5.1 Connection Voltage

3.5.1.1 During the application for connection process the **DSO** shall, in consultation with the **User**, specify the voltage level to which a **User** will be connected in accordance with normal practice for the type of load to be supplied and network characteristics.

3.5.1.2 Generally, the voltage level will be the minimum nominal voltage in standard use on the **System**, (subject to 3.5.1.3), assessed against:

(a) Satisfactory operation of the installation

(b) Isolation of disturbance from other **Customers**

(c) Lifecycle costs

(d) Cost of connection

3.5.1.3 Ongoing development of the **Distribution System** is leading to a newer and more efficient voltage regime. The 10kV nominal **System** shall be converted progressively to 20kV while the 35kV **System** shall be curtailed in favor of the 110kV and 20kV **System**s. Because of this:

(i) Connections at 10kV shall have provision for conversion to 20kV at the same time as the local network is being converted.

(ii) The **DSO** shall advise prospective **Customers** at the time of application if there are firm plans to change from 35kV to 110kV or 20kV operation at a future date. In such cases **Customers** shall make provision for such a changeover.

3.5.1.4 The **DSO** may, on occasion, specify a different connection voltage from normal in order to avoid potential disturbances caused by the **User's Apparatus** to other **Users** of the **Distribution System** or for other technical reasons or may agree alternative methods for minimizing the effects of disturbing loads.

3.5.2 Information provided by **DSO**

Based on the information provided by the **User** for a connection to the **Distribution System**, the **DSO** shall prepare a statement containing as many of the following elements as are necessary for, or relevant to, the proposed installation:

(a) Nominal voltage at which connection will be made

(b) Method of connection, extension and/or reinforcement details

(c) The normal impedance to source at the point of connection

(d) Method of earthing

(e) Maximum Import Capacity

(f) Individual customer limits relating to:

(i) Harmonic Distortion

(ii) Voltage Flicker

(iii) Unbalance

(g) Expected lead time of providing connection (following formal acceptance of terms for Supply).

(h) Cost of connection

3.5.3 **Ownership Boundaries**

3.5.3.1 The point or points at which supply is given or taken between the **Distribution System** and **User's Installation** shall be agreed between the **DSO** and the **User** as required.

3.5.3.2 For **LV** supplies the **DSO's** responsibility extends up to the **Customer's Connection Point** which is normally:

(a) In major installations:

At the main fuses on the **Supply side** of **Customer's** main circuit breaker.

(b) In **Single Domestic Premises** at the **Connection Point** of **Customers** tails on the **Supply** side of special isolator.

3.5.3.3 For **Medium** and **High Voltages** supplies the ownership boundaries shall be subject to specific agreement between the parties in each case. Changes in the **Ownership Boundary** arrangements proposed by either party shall be agreed in advance.

3.5.3.4 All **Equipment** at the **Ownership Boundary** shall meet the design principles contained in 2.4 and 3.5. Connections for entry to and exit from the **Distribution System** shall incorporate a means of disconnection of the **User's Installation** by the **DSO**.

3.5.3.5 The respective ownership of **Plant** or **Apparatus** shall be recorded in a written agreement between the **DSO** and the **User** or in diagrammatic form, as required. In the absence of a separate agreement between the parties to the contrary, construction, control, operation and maintenance responsibilities follow ownership.

3.6 TECHNICAL REQUIREMENTS FOR CONNECTIONS

3.6.1 Connection Standards

3.6.1.1 A connection to the **Distribution System** may be by means of an overhead line, an underground cable or a combination of both. The network configuration at the **Connection Point** may take a number of forms suitable to the nature of the load and network arrangements.

3.6.1.2 All **Equipment** in an installation connected to the **Distribution System** shall be designed, manufactured, tested and installed in accordance with all applicable statutory obligations and shall conform to the relevant Georgian National, CENELEC or IEC standards current at the time of the connection of the installation to the **Distribution System**.

3.6.1.3 If there is no relevant European specification, such other relevant standard which is in common use in the European Union, as current at the date of the **User's** applicable **Connection Agreement**, shall apply. If the **DSO** considers it necessary,

however, the **DSO** may notify **User**s that supplemental specifications and/or standards shall be complied with, in which case **User Plant** and **Apparatus** shall so comply.

3.6.1.4 All **Equipment** in an installation connected to the **Distribution System** shall be suitable for use at the operating frequency of the **Distribution System** and at the voltage and short-circuit rating of the **Distribution System** as shown in Table 3, at the **Connection Point**. The **DSO** may require certification that the **Equipment** has been designed and installed in a satisfactory manner. The **DSO** may also seek evidence that the **Equipment** has been tested for conformance with the standards.

3.6.1.5 For **Users** connected at **Low Voltage**, installations shall comply with the **National Rules for Electrical Installations** approved by GNERC. **Users** complying with these rules and regulations shall be deemed to comply with the requirements of the **Distribution Code** as regards design and safety. The **DSO** may seek evidence that the **Equipment** has been tested for compliance with standards.

3.6.1.6 Before entering into a **Connection Agreement** it will be necessary for the **DSO** to be reasonably satisfied that the **User's System** at the boundary with the **Distribution System** shall comply with the appropriate requirements of the **Distribution Code**.

3.6.2 **Protection** Requirements

3..6.2.1 **Users** shall ensure that faults in the **User's Plant** and **Apparatus** do not unreasonably cause disturbances to the **Distribution System** or to other **Users**. Without limiting this obligation, a **User** shall prior to connection of the **User's** Installation to the **Distribution System**, install the **Protection Equipment** specified in 3.6.2.4.

3.6.2.2 Faults on the **Distribution System** can cause damage to **User's Plant** and **Apparatus**. These faults could result in a loss of a phase, over Voltage, or under Voltage. The **User** shall take account of the established practices of the particular network to which a connection is to be made, and ensure that **Protection** installed is compatible with that used by the **DSO**. The adequacy of the **Protection** installed by the **User** is the **User's** responsibility.

3.6.2.3 The **User's Protection** arrangements at the **Ownership Boundary**, including types of **Equipment** and **Protection** settings, shall be compatible with existing **System** conditions and the **Distribution System Protection** practice as specified by the **DSO** at the time of application. In particular

(a) The maximum clearance times (from fault current inception to arc extinction) shall be within the limits established by the **DSO** in accordance with **Protection** and **Equipment** short circuit rating policy adopted for the **Distribution System**.

(b) In connecting to the **Distribution System** the **User** should be aware that fast and slow speed automatic reclosing is a feature of **Power System** operation. This is characterized by sudden de/re-energization of the power supply.

(c) **User**s should also be aware that disconnection of one or two phases only of a three phase **System** may be effected by **Distribution Protection** arrangements for certain types of faults.

3.6.2.4 The minimum **Protection** required for a **User Installation** connected to the **Distribution System** will vary according to type, size, method of connection (loop/tail/tee) and earthing of the **User System**. **Low Voltage Customers** shall comply with the **National Rules for Electrical Installations** approved by GNERC. Other **User** installations will vary. It is anticipated that a new connection may require all or some of the following **Protection** facilities:

(a) Three-phase overcurrent

(b) Earth fault **Protection** (suited to the local supply **System**)

(c) Distance

(d) Intertripping

(e) Other

3.6.2.5 Where interface circuit breakers are used they shall be fitted with relays of a type acceptable to the **DSO**. These relays shall have three phase overcurrent elements and one earth fault element and shall have time-current characteristics complying with standard types A, B and C of IEC 60255. Maximum permissible relay settings at the **Ownership Boundary**, necessary to provide selectivity with **Distribution Equipment**, will be provided by the **DSO**, and these settings may be reviewed at any time in the future by the **DSO**. Distribution **Protection** aims to minimize the impact of faults including voltage dip duration and must not be adversely affected by customer's **Protection** limitations.

(a) In order to ensure satisfactory operation of the **Distribution System**, **Protection System**s, operating times, discrimination, and sensitivity at the **Ownership Boundary** shall be agreed between the **DSO** and the **User** during the application for connection process, and may be reviewed from time to time by the **DSO**.

(b) In order to cover a **Circuit Breaker**, or **Equipment** having similar function, failing to operate correctly to interrupt fault current on the **System**, back-up **Protection** by operation of other circuit breakers or **Equipment** having a similar function shall normally be provided.

(c) Unless the **DSO** advises otherwise, it is not acceptable for **User**s to limit the fault current infeed to the **Distribution System** by the use of **Protection** and associated **Equipment** if the failure of that **Protection** and associated **Equipment** to operate as intended in the event of a fault, could cause **Equipment** owned by the **DSO** to operate outside its short-circuit rating.

3.6.2.6 **Protection** relays shall be commissioned on site by the **User** who shall ensure that the settings are below the maximum permitted levels. In certain cases the **DSO** may wish to witness these tests and it shall be the responsibility of the **User** to ensure that sufficient notice is given to the **DSO** in such cases. **User**s shall ensure that the **Protection** settings remain below the maximum permitted levels. This may require regular testing of the relays.

3.6.3 Earthing

3.6.3.1 Earthing of the part of the **User's Installation** that is connected to the **Distribution System** shall comply with the requirements of 2.4.3.

3.6.3.2 The arrangements for connecting the **User's Installation** with earth shall be designed to comply with the relevant standards.

3.6.3.3 The method of earthing the **Distribution System**, for example, whether it is connected solidly to earth or through an impedance, shall be advised by the **DSO**. The specification of associated **Equipment** shall meet the voltages which will be imposed on the **Equipment** as a result of the method of earthing.

3.6.3.4 **User**s shall take precautions to limit the occurrence and effects of circulating currents in respect of neutral points connected with earth where there is more than one source of energy.

3.6.4 **Voltage Regulation and Control**

Extensions or connections to the **Distribution System** shall be designed such that they do not prevent the necessary control of voltage on the **Distribution System**. Information on the voltage regulation and control arrangements shall be made available by the **DSO** if requested by the **User**.

3.6.5 Short-Circuit Levels

3.6.5.1 The short circuit rating of **User's Equipment** at the **Connection Point** shall not be less than the design Fault Level of the **Distribution System** as shown in Table 3 below. The choice of **Equipment** for connection at **Low Voltage** may take into account attenuation in the service lines. The **DSO** shall take into account the contribution to Fault Level of the **User's** connected **System** and **Apparatus** in the design of its **System**.

TABLE 3: SHORT CIRCUIT RATINGS

Connection Voltage	Short Circuit Level (RMS Symmetrical) Normally	Short Circuit Level (RMS Symmetrical) Certain Designated Areas
LV (Domestic)	9.0kA	
LV (Industrial/Commercial)	37.0kA	
10kV	12.5kA	20kA
20kV	12.5kA	20kA
38kV	12.5kA	20kA
110kV	26.0kA	31.5kA

In certain 220kV/110kV substations at 110kV busbars the design short circuit level is 40KA.

3.6.5.2 The **User's** incoming supply shall be controlled by a main circuit breaker which shall be in accordance with a recognized international standard acceptable to the **DSO**.

3.6.6 Insulation levels

3.6.6.1 The design of an operators **Equipment** connected to the **Distribution System** shall be such as to enable it to withstand, under test, the AC and impulse (1.2/50 μS) voltages indicated in Table 4 below.

TABLE 4 : INSULATION LEVELS

Voltage of Equipment	AC Withstand Level	Impulse Level
LV	3kV	3kV
10kV	50kV	125kV
20kV	50kV	125kV
35kV	95kV	250kV
110kV	230kV	550kV

3.6.7 Capacitive and Inductive Effects

3.6.7.1 The **User** shall, when applying to make a connection, provide the **DSO** with information as detailed in 2.4. Details shall be required of any capacitor banks and reactors connected at Medium and High Voltage, which could affect the **Distribution System** and which it is proposed to connect if agreed with the **DSO**. When requested by the **DSO**, details shall also be provided of distributed circuit capacitance and inductance. Sufficient detail is required for the following:-

(a) to verify that controlling **Equipment** of the **Distribution System** is suitably rated;

(b) to show that the performance of the **Distribution System** will not be impaired; and

(c) to ensure that arc suppression coils on the **Distribution System** neutral are correctly installed and operated.

3.6.8 Voltage Disturbances

3.6.8.1 **User**s of the **Distribution System** should not generate voltage disturbances at a level that would affect other **User**s. **User**s should in their own interest select **Equipment** that is capable of functioning satisfactorily in the presence of disturbances at the levels permitted by EN50160.

3.6.8.2 It is a condition of connection that **Equipment** connected directly or indirectly to the **Distribution System** shall conform to the requirements of EU Directive 89/336/EEC (the EMC Directive) as amended.

3.6.8.3 Loads and installations shall comply with the following emission limits. Special conditions for **Generators** are outlined in 3.10.6.1

(a) Voltage Flicker

(i) Frequency of occurrence: 0.22 per min – 600 per min

Voltage Level	Pst	Plt
MV, LV	0.7	0.5

- Pst: Short Term Flicker Severity - an index of visual severity evaluated over a 10 minute period.
- Plt: Long Term Flicker Severity - an index of visual severity evaluated over a 2 hour period.

(ii) Frequency of occurrence: 0.02 per min – 0.22 per min

Magnitude of up to 3% is permitted.

(iii) Frequency of occurrence: =< 0.02 per min

Magnitude of up to 5% is permitted.

(b) Harmonic Distortion

(i) Individual Harmonic Orders:

% Harmonic Voltage Distortion (rms voltage as a % of rms value of the fundamental component)

Harmonic Order	**LV**	**10kV and 20 kV**	**35kV**
2	0.70	0.50	0.25
3	0.75	0.50	0.25
4	0.70	0.50	0.25
5	2.00	1.00	0.50
6	0.50	0.50	0.30
7	2.00	1.00	0.50
8	0.50	0.50	0.30
9	0.50	0.50	0.25
10	0.50	0.75	0.25
11	1.50	1.50	0.75
12	0.50	0.50	0.30
13	1.50	1.50	0.75
14	0.50	0.50	0.50
15	0.50	0.75	0.25
16	0.75	0.75	0.25
17	0.75	0.75	0.50
18	0.50	0.50	0.25
19	1.00	0.50	0.25

(ii) Total Harmonic Distortion

Voltage Level	% Harmonic Voltage Distortion
LV	2.5
10kV and 20	2.0

kV	
35kV	1.5

(c) Unbalance
The unbalance caused by the connection of an individual installation shall not exceed 1.3% at the **Point of Common Coupling (PCC)**.

3.6.8.4 Under fault and circuit switching conditions the rated frequency component of voltage may fall or rise transiently. The rise or fall in voltage will be affected by the method of earthing of the neutral point of the **Distribution System** and voltage may fall transiently to zero at the point of fault. Sections 2 and 3 of EN 50160, as amended from time to time, contains additional details of the variations and disturbances to the voltage which shall be taken into account in selecting **Equipment** from an appropriate specifications for installation on or connected to the **System**.

3.6.9 Power Factor and Phase Balance

3.6.9.1 The customer shall operate the **Plant** and the **Facility** to keep the power factor of the total load at the **Connection Point** for electricity extracted from the Distribution Network between 0.90 lagging and unity and for electricity injected to the Distribution Network between 0.95 lagging and unity. Wind **Generator**s must keep power factor between 0.92 and 0.95 lagging. For the purpose of this code, lagging power factor refers to the absorption of reactive power. These are minimum requirements. In certain instances specific requirements may apply in order to ensure that the **DSO** can comply with the requirements of the **Transmission Grid Code**.

3.6.9.2 **DSO** Phase Balance requirements are covered in EN50160.

3.7 METERING / TELEMETRY

3.7.1 The **User** may be required to provide such voltage, current, frequency, Active Power and Reactive Power pulses that are considered necessary by the **DSO** to ensure adequate **System** monitoring. Details will be specified in the **User's Connection Agreement**.

3.7.2 **Centrally Dispatched User**s shall provide signals to the **TSO** as required by the **Transmission Grid Code**.

3.7.3 If it is agreed between the parties that the **DSO** shall control the switchgear on the **User's System**, the **DSO** shall install the necessary telecontrol outstation. Notwithstanding the above, it shall be the responsibility of the **User** to provide the necessary control interface for the switchgear of the **User** which is to be controlled.

3.7.4 Metering principles applying to certain **User**s connected to the **Distribution System** are specified in the **Metering Code**.

3.7.5 Specific metering arrangements depend on the load type, size and nature of the installations being connected.

3.7.6 Personnel carrying out design or installation work for the customer/operator interface with the **DSO** should familiarize themselves with relevant standards and requirements. Unusual situations may arise which are not covered by this code. In such circumstances the **DSO** will be available to deal with queries.

3.8 SPECIFIC ARRANGEMENTS

3.8.1 The specific arrangements for connection, including substation layout requirements, **User Equipment** and Tariffs and Metering are set out clearly in a number of regulatory 4.uments. **User**s must comply with the provisions of the 4.uments relevant to their installations.

(a) "Conditions for Connection to the **Distribution System**" and "General Conditions for Connection of Industrial and Commercial **Customers** and **Generator**s to the **Distribution System**" (to be developed and approved by GNERC).

(b) Conditions Governing Connection to the **Distribution System**: "Connections at MV and **Generator**s at LV, MV"(to be developed and approved by GNERC).

(c) General Specification for MV Substation Buildings (to be developed and approved by GNERC).

3.8.2 Service standards relating to **Low Voltage** (230 / 400V) supplies are covered in:

(a) Customer Charter (to be developed and approved by GNERC).

The rules for **Low Voltage** supplies are published in somewhat greater detail in three other 4.uments:

(b) "Conditions for Connection to the **Distribution System**" and "General Conditions for Connection of Industrial and Commercial **Customers** and **Generator**s to the **Distribution System**" (to be developed and approved by GNERC).

(c) Domestic Supply: Procedures and Conditions for Supply to New House (to be developed and approved by GNERC).

(d) Domestic Supply: Specification of Requirements for Supply to Housing Schemes (to be developed and approved by GNERC).

Please note that all the 4.uments referred to in 3.8 are subject to updating and change. At the time of any proposed new connection, only the up-to-date versions of these 4.uments should be used.

3.9 ADDITIONAL REQUIREMENTS FOR ALL 110KV CONNECTED USERS

3.9.1 Plant Designations

3.9.1.1 The name of the **User** site shall be designated by the **User** and subsequently approved by the **DSO**.

3.9.1.2 The designation and proposed nomenclature of **User Plant** and **Apparatus** connected to **Distribution System** shall be in accordance with the **DSO** standard practice which, in particular, is designed to ensure that designation and nomenclature avoids confusion. The **User** shall notify the designation and proposed nomenclature of **User**s' **Plant** and/or **Apparatus** to the **DSO** who may, if the **DSO** determines that such proposed designation may lead to confusion or does not conform to the **DSO** standard practice, notify a substitute designation which shall apply to such **User Plant** and/or **Apparatus**.

3.9.1.3 The **DSO** standard practice currently requires that, unless otherwise agreed with the **DSO**, the standards outlined in schedule 6 shall apply.

3.9.1.4 Every **User** shall be responsible for the provision, erection and maintenance of clear and unambiguous labeling showing the designation and nomenclature of its **Plant** and **Apparatus** at the **User** Site.

3.9.2 Earthing

3.9.2.1 The earthing of all **User**s **Plant** and **Apparatus** and provision of an earthing **System** shall as a minimum requirement be in accordance with the recommendation contained in the "Guide for Safety in Alternating Current Substations", ANSI/IEEE No. 80 1986

3.9.2.2 The **DSO** shall consult with each **User** regarding the specification of the earthing grid to be provided.

3.9.2.3 Each **User's** earth disconnects must be earthed directly to the main station earth grid.

3.9.2.4 The **User** will be obliged to certify (by a competent body) that the remote earths have been isolated from the **User's** site plus any other affected third party sites and that adequate precautions shall be taken by the **User** to ensure that dangerous grid potential rises are not transferred outside the earthing zone. The **Distribution Station** cannot be energized until this certification has been received by the **DSO**.

3.9.2.5 Each **User's** earthing **System** shall be bonded to the **Distribution station** earth grid so that both earthing **System**s are effectively integrated.

3.9.3 Design

3.9.3.1 **User Plant** and **Apparatus** shall be designed with the following minimum capabilities:

Parameter (minimum)	mm
Clearance outdoor in air of live metal parts phase to earth	1100
Height of live parts above pedestrian passageways	3400
Height of bottom of unscreened live bushings above ground	2300
Height of live conductors above roadways	8000

3.9.3.2 LV cables and wiring

3.9.3.2.1 All multi-core control and **Protection** cables shall be provided with a suitable metallic screen. Facilities for earthing these screens at the base of cabinets shall be provided.

3.9.3.2.2 LV supply cable and auxiliary wiring shall be routed from the **Distribution Station** to each **User's** control building through a mutually agreed cable corridor. The cables will be laid in concrete troughs with reinforced concrete covers, or as mutually agreed, to the **User's** Marshalling rack, which will be situated near the **Distribution Station**.

3.9.3.3 Locking

3.9.3.3.1 The facility to lock in the open/closed position and interlocking facilities shall be provided by each **User** on appropriate disconnects and/or circuit breakers (with withdraw facilities) in order to ensure that the incoming feeder(s) to the facility can be safely isolated when required by the **DSO**. The specific details of this requirement will be outlined at the design phase.

3.9.3.4 110kV step up **Transformers**

3.9.3.4.1 **Generator**s shall provide on-load tap-changing (OLTC) facilities for all **Generator Transformers**. **Demand User** are advised to provide on-load tap-changing (OLTC) facilities for all 110kV step up **Transformers**. All **User**s shall coordinate with the **DSO** on the design specification for the performance of the tap-changing facility on 110kV **Connecter Transformers**.

3.9.3.4.2 **Generator Transformer** windings shall be connected in star (with the star point or neutral brought out) on the higher Voltage side and in delta on the lower Voltage side.

Other 110kV step up **Transformer**s may be connected either:

a. in delta on the lower voltage side and in star (with the star point or neutral brought out) on the higher Voltage side; or

b. in star on both higher and lower Voltage sides with a delta tertiary winding provided.

3.9.3.4.3 Provision should be made for the earthing of the neutral of each **Transformer** connected to the 110kV **System** by bringing out the neutral and ensuring that the insulation is such that the **Transformer** can be operated unearthed.

3.9.3.4.4 The **DSO** will provide the facility for the tripping of the 110kV step up **Transformer** HV circuit breaker from the **User's Transformer Protection**.

3.9.4 User Protection

3.9.4.1 Every **User** shall, acting in accordance with **Good Industry Practice**, be responsible, insofar as is reasonably practicable, for ensuring that faults on **Plant** and **Apparatus** cause minimal disturbance to the Power **System**. Faults on **Plant** and/or **Apparatus** connected to the **Distribution System** should be cleared as soon as possible with no deliberate time delay introduced and in any event should be cleared within a maximum time of 120 milliseconds on the 110kV **System**.

3.9.4.2 In order to ensure the secure operation of the **Distribution System** and correct co-ordination and discrimination between faults on the **Transmission Grid** and **Distribution System** and the **User's System**, settings for the **User's Protection System**s that may have an operational effect, shall be notified to the **DSO** and it will be necessary for the **DSO** to, and the **DSO** may, prohibit the settings of some **User Protection System**s within certain ranges. **Protection System** where such limitations will apply include, but are not limited to:

(i) **Generation Unit** under-frequency, over-current or distance **Protection**;

(ii) **Transformer** over-fluxing, over-current or distance **Protection**

Loss-of-mains **Protection** A mechanism for the notification and where applicable approval and determination, of such settings will be set out in the **User's Connection Agreement** or other agreements.

3.9.4.3 The **DSO** shall provide the **User** the information and signals necessary for the interface coordination and operation of the **User's Protection**, in accordance with the relevant provisions of the **Connection Agreement**, other agreements and 3.9.3.4.4.

3.9.4.4 Where it is feasible to do so **DSO** shall provide circuit breaker fail **Protection** on **Transmission Grid Connection Point** circuit breakers installed in new 110kV stations.

3.9.5 Power Quality

3.9.5.1 **User**s shall ensure that their connection to the **Distribution System** does not result in the level of distortion or fluctuation of the supply Voltage on the **Distribution System**, at the **Connection Point**, exceeding that allocated to them following consultation with the **DSO**. Distortion and fluctuations limits are outlined in IEC/TR3 61000-3-6 (Harmonics) and IEC/Tr3 61000-3-7 (Voltage Fluctuation). **User**s shall operate their **Plant** in a manner which will not cause the requirements contained in CENELEC Standard EN 50160 to be breached.

3.9.6 Signals to be provided by the **User**

3.9.6.1 Each **User** shall provide such signals and indications in relation to the **User's Plant** and **Apparatus** as are required by the **DSO** (acting reasonably) in accordance with the **Connection Agreement**.

3.9.6.2 Signals and indications required to be provided by **User**s will include but shall not be limited to the following:

a) LV switchgear positions to the status of each 110kV Connected **Transformer** through a set of two potential free auxiliary contacts (one contact open and one contact normally closed when the circuit breaker is open) for each circuit breaker;

b) kV at **Transformer Low Voltage** terminals; and

c) a minimum of four sets of normally open potential free auxiliary contacts in each **Transformer** LV bay for fault indication.

*d), e), f), g) and h) are applicable to **Generator**s only*

d) MW and +/-MVAr at alternator terminals of each Generation Unit;

e) kV at **Generator Transformer** LV terminals

f) **Generator Transformer** tap position

g) Measured or derived MW output on each fuel, from Generation Units that can continuously fire on more than one fuel simultaneously; and

h) Where it is agreed between the **DSO** and the **Generator** that signals are not available on the HV terminals, +/-MW and +/-MVAr shall be provided at the 110kV Connecter **Transformer Low Voltage** terminals.

i) Status of Governor Control **System** and any Load limiters.

*j) and k) are applicable to **Demand Customers** only:*

j) MW and +/- MVAr at the HV terminals of the 110kV step up **Transformer**.

k) 110kV Connecter **Transformer** tap position.

3.9.6.3 Where signals or indications required to be provided by the **User** under 3.9.6.2 become unavailable or do not comply with applicable standards due to failure of the **User's** technical **Equipment** or any other reason under the control of the **User**, the **User** shall, acting in accordance with **Good Industry Practice**, restore or correct the signals and/or indications as soon as possible.

3.9.6.4 Signals to be provided to the **User** shall be presented in such form as is nominated by the **DSO** or **TSO** where appropriate.

3.9.6.5 Where the **DSO**, acting reasonably, determines that because of a modification to the **Distribution System** or otherwise to meet a **Distribution System** requirement, additional signals and/or indications in relation to the **User's Plant** and **Apparatus** are required, the **DSO** shall notify that requirement to the **User**. On receipt of such a notification the **User** shall promptly, and in accordance with **Good Industry Practice**, ensuring that such signals and/or indications are made available at the relevant marshalling rack.

3.9.7 Power Supplies

3.9.7.1 Each **User** shall provide:

400 V ac / 230V ac power supplies as required by the **DSO** for Distribution Station Facilities, the capacity and detail of which shall by specified by the **DSO** and provided for the **User's Connection Agreement**.

A standby supply for all ac power supplies for Distribution Station facilities by a diesel **Generator**, unless alternative means are agreed with the **DSO**, such agreement not to be unreasonably withheld. In the event of loss of mains, standby supplies shall be capable of being sustained for a minimum of 10 hours.

3.9.8 Commissioning and Notification

3.9.8.1 The **DSO** and the **User** shall, in accordance with the provisions set out in the **Connection Agreement**, meet to discuss Commissioning, including **Commissioning Tests**. The **User's** obligations in relation to testing set out in this 3.9.8 are in addition to the requirements under the **Connection Agreement**.

3.9.8.2 **Users** are required to carry out such tests as required in order to confirm that the **User's Plant** and **Apparatus** meets all requirements of the Distribution Code and **Transmission Grid Code** which must be met prior to Operational Date. The **DSO** may, under the **Connection Agreement**, notify to the **User** such Tests as it requires the **User** to carry out. The **DSO** may not necessarily test for 3.9.10.1.1 a), b), c), d) and e) but reserves the right to test to establish design and operational compliance. For the avoidance of doubt it is the responsibility of **User**s at all times to ensure their compliance with the Distribution and **Transmission Grid** (where applicable) **Codes** and testing successfully or otherwise shall not in any way diminish or reduce such responsibilities.

3.9.8.3 Where Commissioning is likely to involve a requirement for a **Dispatch** for Test purposes, the **User** shall, as soon as possible, notify the **TSO** of this requirement, including reasonable details as to the duration and type of Testing

required. **User**s shall give the **TSO** reasonable advance notice (being not less than fifteen (15) Business Days) of the time of carrying out of the **Commissioning Test**s. The time and date of such Commissioning shall be reconfirmed not less than three (3) Business Days before the time of carrying out such tests. In event that, having given such confirmation the **User** (acting reasonably) determines that such tests must be carried out prior to the time and date previously confirmed, then provided the **User** gives the **TSO** reasonable notice of the re-scheduled tests, he shall not be deemed to have failed to give the notice required. The **User** shall as soon as it becomes aware of the same, subsequently notify the **TSO** of any material changes in the requirement and details so notified.

3.9.8.4 The information provided under 3.9.8.3 is for indicative purposes only, and the **User** shall subsequently make a formal request to the **TSO** for a **Commissioning Test** requiring a **Dispatch** in accordance with the following provisions of the 3.9.8, and shall not carry out such a **Commissioning Test** except as **Dispatch**ed in accordance with 3.9.8.

3.9.8.5 **User**s shall make a request in writing to the **TSO** for every **Commissioning Test** requiring **Dispatch**, in accordance with 3.9.8.4. Such request to include the following information:

3.9.8.5.1 Details of the proposed **Commissioning Test**;

3.9.8.5.2 **Dispatches**, where necessary, required by the **User** for completion of the **Commissioning Test**, if any, including the duration of the **Dispatch**. Where the **User** may not know the entire **Dispatches** required for completion of the Test until part of the Test is completed then the **User** when proposing the Test shall:

a) Divide the **Commissioning Test** in sections as appropriate;

b) Indicate and discuss which sections of the **Commissioning Test**s can be completed in stages and which cannot;

c) Indicate possible variations of the **Commissioning Test** for the sections which be completed in stages.

d) Additionally the factors which influence the completion of the stages should be outlined to the **TSO**, (namely, if the procedure to be followed for a certain stage depends on the outcome of a previous stage);

3.9.8.5.3 the preferred time or times for the **Commissioning Test**;

3.9.8.5.4 the milestones for individual sections of **Commissioning Test** (if any) which can be completed separately, and/or do not require to be repeated if the **Commissioning Test** is interrupted by the **TSO** after the completion of each section.

3.9.8.6 **Generators** will be subject to the **Scheduling and Dispatch Codes** a minimum of seven (7) days prior to the **Operational Date** and the **Generation Unit** will be available for **Dispatch** from the **Operational Date**.

3.9.8.7 Following the **Connection Date** but not later that the **Operational Date** **User**s shall verify (by giving the **TSO** such evidence as it may reasonably require including, without limitation, the results of the relevant **Commissioning Test** and Transmission Grid Code Tests) technical data provided under the Planning Code

and other technical data which the **TSO** reasonably requires to be verified to assess the compliance with the Transmission Grid Code or the **Connection Agreement**.

3.9.8.8 The values as confirmed or verified under 3.9.8 shall be included in the **User's** Registered Data.

3.9.9 ADDITIONAL REQUIREMENTS FOR DISPATCHABLE DEMAND CUSTOMERS

3.9.9.1 Signals, Communications and Control

3.9.9.1.1 The following signals and indications are required to be provided by **User**s to the **TSO**. They will include but shall not be limited to the following:

*a), b) and c) are applicable to **Dispatchable Demand Customers** who represent **Demand** Side Units which consists of an Individual **Demand** Site:*

a) KW and +/-KVAr at alternator terminals of each **Generator** where applicable;

b) Measured or derived KW Output for each **Generator** at the HV terminals of the **Transformer** where applicable; and

c) **Demand** Reduction aggregated at the HV terminals of the **Transformer**.

*d), e), f) and g) are applicable to **Dispatchable Demand Customers** who represent **Demand Side Units** which consists of an **Aggregated Demand Site**:*

d) The aggregated KW and +/-KVAr aggregated at alternator terminals of each **Generator** where applicable;

e) When requested by the **TSO**, the KW and +/-KVAr of each Individual **Demand** Site at alternator terminals of each **Generator** where applicable;

f) The aggregated measured or derived KW Output for each **Generator** aggregated at the HV terminals of the **Transformer** where applicable; and

g) The Aggregated **Demand** Reduction aggregated at the HV terminals of the **Transformer**.

3.9.9.1.2 **Dispatchable Demand Customers** shall provide the **TSO** the specification of the method of aggregation of SCADA from multiple sites. The minimum specifications shall be agreed with the **TSO** in advance.

3.9.9.2 Responsible Operator

3.9.9.2.1 For **Dispatchable Demand Customers**, the Control Facility shall be staffed by a **Responsible Operator**(s) who shall respond to communications from the **TSO** without undue delay (except where otherwise provided for by agreement between the **Dispatchable Demand** Customer or the and the **TSO**, such agreement not to be unreasonably withheld) and are of suitable experience and training and are authorized to perform functions on behalf of the **Dispatchable Demand** Customer as follows:

(a) to accept and execute **Dispatch** Instructions;

(b) to receive and acknowledge receipt of requests, for amongst other matters, operation outside the Declared values of **Demand Reduction**.

3.9.9.2.2 A designated **Responsible Operator** shall be contactable by **DSO** or **TSO** at all times to discuss operational matters without undue delay and in any case within at most 1 hour. Following a request from **DSO**, the Responsible Operator shall be present at the **Demand Side Unit (DSU)** Control Point without undue delay and in any case within two hours and shall be capable of taking any appropriate actions. The Responsible Operator shall be contactable 24 hours a day, 365 days a year. Specialist response shall be available on the next working day following a request from the **DSO** or **TSO**

3.9.9.2.3 The **Responsible Manager** shall be authorized to perform the following functions on behalf of the **Dispatchable Demand Customer**:

(a) to make estimates in accordance with **Good Industry Practice** as to the **Demand** Reduction;

(b) to make Declarations of the **Demand Reduction** for each **Demand Side Unit**;

(c) to communicate with respect to issues regarding Outages of each **DSU**.

The **Dispatchable Demand Customer** may, from time to time, notify a replacement contact location and personnel, which meets the foregoing requirements.

3.9.9.3 Supervisory Control and Data Acquisition (**SCADA**)

3.9.9.3.1 **SCADA** remote terminal **Equipment** shall be required in the control room of the Transmission Station at the **User Site** for the transmission of signals and indications to and from the **TSO's Control Center**. The signals and indications which must be provided by **User**s for transmission by SCADA **Equipment** to the **TSO's Control Center** are the signals and indications referred to under **Connection Conditions** together with such other information as the **TSO** may from time to time by notice to **User**s reasonably require.

3.9.9.3.2 For **Dispatchable Demand Customers**, SCADA remote terminal **Equipment** shall also be required at the Control Facility for the transmission of signals and indications to and from the **TSO's Control Center**. The signals and indications which must be provided by **Dispatchable Demand Customers** for transmission by SCADA **Equipment** to the **TSO's Control Center** are the signals and indications referred to under Connection Conditions together with such other information as the **TSO** may from time to time, by notice to **Dispatchable Demand Customers** or and s, reasonably require.

3.9.9.3.3 Interface cabinets shall be installed in the control room of the Transmission or Distribution Station at the or in **Dispatchable Demand Customer's** Control Facility. Provision and maintenance of wiring and signaling from the **Dispatchable Demand Customer's Plant** and **Apparatus** to the **Dispatchable Demand Customer's** interface cabinet shall be the responsibility of the **Dispatchable Demand Customer's**. The **TSO** shall provide the cables to interconnect these interface cabinets.

3.9.9.4 Monitoring, Testing and Investigation

3.9.9.4.1 The response of the **Dispatchable Demand Customer's Demand Side Units** to **Dispatch Instructions** and compliance with their **Availability Notice** shall be monitored, tested and checked in accordance with the provisions of the **Transmission Grid Code**.

3.9.9.5 Scheduling and **Dispatch** of **Demand Side Units**

3.9.9.5 .1 Scheduling, Declaration of Availability and Dispatch of the **Demand Side Units** shall be in accordance with the relevant provisions of **Transmission Grid Code**.

3.9.9.6 Outage Planning

3.9.9.6.1 The **Dispatchable Demand Customers** must adhere to the outage planning requirement as specified in the relevant provisions of **Transmission Grid Code**.

3.9.9.7 Additional Connection Conditions

3.9.9.7.1 Each **Demand** Side Unit shall, as a minimum, have the following capabilities:

(a) Able to provide **Demand** Reduction between 0 MW and the **Demand Reduction Capability**

(b) Max Ramp Up Capability not less than 1.5% of **Demand Reduction Capability** per minute when the **Demand Side Unit** is in **Normal Dispatch Condition**

(c) Max Ramp Down Capability not less than 1.5% of **Demand Reduction Capability** per minute when the **Demand Side Unit** is in **Normal Dispatch Condition**

(d) Minimum Down-Time Capability not greater than 30 minutes for **Demand Side Units**

(e) Maximum Down- Time Capability not less than 2 hours for **Demand Side Units**

Each **Demand Side Unit** with on-site **Generation**, shall, as a minimum, have the following capabilities:

(f) operate continuously at normal rated output at Frequencies in the range 49.5Hz to 50.5Hz;

(g) remain synchronized to the **Distribution System** at Frequencies within the range 47.5Hz to 52.0Hz for a duration of 60 minutes;

(h) remain synchronized to the **Distribution System** at Frequencies within the range 47.0Hz to 47.5Hz for a duration of 20 seconds required each time the Frequency is below 47.5Hz;

(i) remain synchronized to the **Distribution System** during a rate of change of Frequency of values up to and including 0.5 Hz per second;

3.9.9.7.2 Each **Demand Side Unit** will require Electronic Interface to receive **Dispatch Instructions** from the **TSO**.

3.10 GENERATOR REQUIREMENTS

3.10.1 **INTRODUCTION**

3.10.1.1 Distribution Connection Code 10 (3.10) is applicable to all existing or prospective **Generator**s, including **Customers** with CHP, **Customers** with Auto-production and **Generator**s using renewable or alternative sources of energy which

are connected to the **Distribution System**. **Customers** with stand-by **Generator**s who are connected to the **Distribution System** must comply with clause 3.10.9.

3.10.1.2 In addition to meeting the requirements of 3.10, **Generators** shall also comply with the requirements of the **General Conditions**, the **Planning Code**, the **Connection Conditions** and other relevant sections of the **Distribution Code**. **Generators** that are subject to central **Dispatch** shall additionally have to comply with certain sections of the **Transmission Grid Code**.

3.10.1.3 If existing generating **Plant** does not comply with the standards set down in, or cannot comply (for technical or economic or other reasons) with, the requirements of this section, they shall seek a derogation from the provision from the **GNERC**.

3.10.1.4 The **Generator** shall initiate discussions at a sufficiently early stage in design to allow the **DSO** to examine the impact of the **Generating Unit(s)** on the **Distribution System**.

3.10.1.5 The **DSO** may refuse permission for the connection of a **Generating Unit** at a point on the **Distribution System** or require revision to design or technical parameters of the generation unit, or impose certain restrictions in order to ensure that security and quality of supply standards as specified in 2.4 are maintained. In such instances, the **DSO** shall provide sufficient supporting information to justify the refusal or the required revisions.

3.10.2 SPECIFIC RULES FOR **GENERATORS**

3.10.2.1 The integrity of the **Distribution System** and the security and quality of supply to existing **User**s shall not fall below standard as a result of **Generator**s operating in parallel (synchronized) with the **Distribution System**. Conditions for operation shall guarantee the safety of:

- Members of general public
- Personnel
- Distribution **Equipment**

Supply quality to other **Customers** shall not fall below standard as a result of the presence or operation of Generating Units.

3.10.2.2 Generating Units connecting to the **Distribution System** and operating in parallel with, or which are capable of being operated in parallel with the **Distribution System** shall comply with "Conditions Governing Connection to the **Distribution System**: Connections at MV and **Generator**s at LV, MV" (to be developed and approved by GNERC). This 4.ument sets out the conditions to which Generating Units operating in parallel to the **Distribution System** shall comply.

3.10.2.3 **Protection** conditions and requirements set down in "Conditions Governing Connection to the **Distribution System**: Connections at MV and **Generator**s at LV, MV" (to be developed and approved by GNERC) are to protect the **Distribution System**. The **Generator** is responsible for **Protection** of its personnel and **Equipment** and the efficient operation of his **Generating Unit**.

3.10.2.4 Where a **Generator** Unit is to be installed in a premises the **DSO** shall be informed. The **DSO** shall have the right to inspect generating installations to ensure that the requirements are met. In some cases the **DSO** may require a demonstration

by operation of the **Generator**. Such demonstrations shall be by agreement with the **User**.

3.10.3 PROVISION OF INFORMATION

3.10.3.1 Information required from **Generator**s

Generators shall provide to the **DSO** information on (a) the Generating **Plant** and (b) the proposed interface arrangements between the Generating **Plant** and the **Distribution System**. The information required by the **DSO** before entering into an agreement to connect any Generating **Plant** to the **Distribution System** is shown below and is detailed in Schedules 1 (a), 1 (b) and 1 (c) in the **Distribution Data Registration Code (5.)**:-

(a) Generating **Plant** Data:

(i) Terminal Volts(kV)

(ii) Rated kVA

(iii) Rated kW

(iv) Maximum Active Power sent out (kW), Reactive Power requirements (kVAr)

(v) Type of Generating **Plant** – synchronous, asynchronous, etc.

(vi) Type of prime mover;

(vii) Anticipated operating regime of generation e.g. continuous, intermittent, peak lopping;

(viii) Fault Level Contribution – a calculation sheet showing the fault current available from the **Generator**s due to a metallic three-phase short circuit at the main incoming circuit breaker when all the **Generator**s are operating. Account should be taken of any large motors in the installation (ref: IEC 60909).

(ix) Method of voltage control

(x) **Generator Transformer** details, as applicable; and

(xi) Requirements for Top-up Supplies and / or Standby Supplies

Details will also be required on the following parameters:

(i) Inertia Constant MW secs/MVA (whole machine)

(ii) Stator resistance

(iii) Direct Axis Reactances

- Sub-transient
- Transient

- Synchronous

(iv) Time Constants:

- Direct Axis
- Sub-transient
- Transient

(v) Zero Sequence

- Resistance
- Reactance

(vi) Negative Sequence

- Resistance
- Reactance

(vii) **Generator Transformer**

- Resistance
- Reactance
- MVA Rating
- Tap Arrangement
- Vector Group
- Earthing

(b) Other **Plant** and **Equipment** Details:

A comprehensive schedule of installed new **Equipment** including details of disturbing loads as per 3.4 is required.

(c) Interface Arrangements:

(i) The means of synchronization between the **DSO** and **User**;

(ii) Details of arrangements for connecting with earth that part of the Generating **Plant** directly connected to the **Distribution System**;

(iii) The means of connection and disconnection which are to be employed; and

(iv) Precautions to be taken to ensure the continuance of safe conditions if any earthed neutral point of the **Generator**s **System** operated at High Voltage become disconnected from earth.

3.10.3.2 The details of information required will vary depending on the type and size of the **Generating Unit** or the point at which connection is to be made to the **Distribution System**. This information shall be provided by the **Generator** at the reasonable request of the **DSO**.

3.10.3.3 The **DSO** will use the information provided to model the **Generator Unit** to determine a technically acceptable method of connection. If the **DSO** reasonably concludes that the nature of the proposed connection or changes to an existing connection requires more detailed analysis then further information than that specified in 3.10.3.1 may be required.

3.10.3.4 Additional information may be required from **Generator**s larger than 2MW or connected at a voltage level above 20kV. This may include:

(a) Technical Data

(i) Generating **Plant** information (impedance per unit on rating)

- Type of prime mover
- Rated MVA
- MW
- Type of excitation **System**

(ii) Automatic Voltage Regulator (AVR)

- A block diagram for the model of the AVR **System** including the data on the gains, forward and feedback gains, time constraints and voltage control limits.

(iii) Speed Governor and Prime Mover Data

- A block diagram for the model of the generating **Plant** governor detailing the governor flyball, if applicable, and **System** control and turbine rating.

(iv) **Generator** Excitation **System**

(b) Capacity and standby Requirements

(i) Registered Capacity and minimum generation of each generating unit and power station in MW.

(ii) Generating unit and power station auxiliary **Demand** (active and reactive power) in MW and MVAr, at registered capacity conditions.

(iii) Generating Unit and power station auxiliary **Demand** (active and reactive power) in MW and MVAr, under minimum generation conditions.

3.10.3.5 In normal circumstances the information specified above will enable the **DSO** to assess the connection requirements. Occasionally additional information may be required. In such circumstances, the information shall be made available by the **Generator**, at the reasonable request of the **DSO**.

3.10.4 INFORMATION PROVIDED BY THE DSO

3.10.4.1 The **DSO** shall prepare a statement as per 3.5.2. for **Generator**s applying for connection to the **Distribution System**.

3.10.4.2 Where **Generator** paralleling or power export is intended the following additional information shall be provided including:

(a) Interface **Protection** settings

(b) **Equipment**, cabling, switchgear, metering requirements

(c) Substation site and building requirements (dimensions, access, planning permission, earthing, lighting and heating)

3.10.5 TECHNICAL REQUIREMENTS

3.10.5.1 Generating **Plant** Performance Requirements

(a) All centrally **Dispatch**ed **Generator**s shall comply with the relevant sections of the Transmission Grid Code.

(b) For **Generator**s not subject to central **Dispatch** the electrical parameters to be achieved at the Generating Unit terminals shall be specified by the **DSO** with the offer for connection.

(c) **Protection** associated with Generating **Plant** shall be required to co-ordinate with the **Distribution System Protection** regarding:

(i) clearance times for fault currents

(ii) co-ordination with auto recloser requirements

(iii) **Protection** settings of the controlling circuit breaker

Protection settings shall not be changed without agreement from the **DSO**.

These **Protection** requirements are additional to normal interface **Protection** requirements of the **User**.

(d) The emission limit for voltage fluctuations and flicker at the PCC caused by switching or continuous operation of wind / wave turbine installations is Pst = 0.35 and Plt = 0.35 where:

Pst: Short Term Flicker Severity - an index of visual severity evaluated over a 10 minute period.

Plt: Long Term Flicker Severity - an index of visual severity evaluated over a 2 hour period.

These values are consistent with IEC 1000-3-7.

(e) For **Generator**s the Total Harmonic Voltage Distortion (THVD) limit is given in the table below:

Voltage Level	**Total Harmonic Voltage Distortion (%)**
LV	2.5
10kV and 20kV	2.0
35kV	1.5

(e) The maximum voltage at the **Connection Point** with an **Generator** is as per Table 5.

Table 5 – maximum voltage at Connection Point with Generators

Nominal voltage	**Highest voltage**
230V	253V

400V	440V
10kV	11.3kV
20kV	22.5kV
35kV	38.5kV
110kV	120kV

3.10.6 ISLANDING

3.10.6.1 It is conceivable that a part of the **Distribution System**, to which **Generator**s are connected can, during emergency conditions, become detached from the rest of the **System**. The **DSO** may decide, dependent on local network conditions, if it is desirable for the **Generator**s to continue to generate onto the islanded **Distribution System**.

3.10.6.2 If no facilities exist for the subsequent resynchronization with the rest of the **Distribution System** then the **Generator** shall under **DSO** instruction ensure that the **Generating Plant** is disconnected for resynchronization.

3.10.6.3 Under emergency conditions there is an expectation that some generation will continue to operate outside the statutory frequency limits. However, for **Generators** connected to the **Distribution System** it is likely that this could mean connection within an automatic low frequency load disconnection zone. Consequently, **Generator**s should ensure that all **Protection** on **Generating Plant** should have settings to co-ordinate with those on the low frequency load disconnection **Equipment** which will be detailed by the **DSO** on request.

3.10.7 BLACK START CAPABILITY

3.10.7.1 **Generators** shall notify the **DSO** if its **Generating Plant** has a restart capability without connection to an external power supply, unless the **Generator** has previously notified the **TSO** accordingly under the provisions of **Transmission Grid Code**.

3.10.8 GENERATING PLANT COMMISSIONING TESTS

3.10.8.1 Where the Generating **Plant** requires connection to the **Distribution System** in advance of the Commissioning date, for the purposes of testing, the **Generator** shall comply with the requirements of the **Connection Agreement**. The **Generator** shall provide the **DSO** with a Commissioning program, approved by the **DSO** if reasonable in the circumstances, to allow **Commissioning Test**s to be coordinated.

3.10.9 STANDBY GENERATORS

3.10.9.1 Parallel operation with the **Distribution System** is generally not permitted for standby **Generators**. Specific agreement of the **DSO** is required for parallel operation.

3.10.9.2 **Customers** with standby generation shall ensure that any part of the installation supplied by the generating **Plant** has first been disconnected from the **Distribution System** and remains disconnected while the generating **Plant** is

connected to the installation. Methods of changeover and interlocking shall meet relevant IEC requirements and DSO approval.

3.10.9.3 **Low Voltage** Generating Units must comply with the relevant IEC requirements. Medium and High voltage standby Generating Units are rare and requirements shall be provided by the **DSO** on application.

3.10.10 ADDITIONAL REQUIREMENTS FOR 110kV CONNECTED GENERATORS > 2MW

3.10.10.1.1 Each Generation Unit shall, as a minimum, have the following capabilities:

(a) Operate continuously at normal rated output at the **Distribution System** Frequencies in the range of 49.5Hz to 50.5Hz;

(b) Remain synchronized to the **Distribution System** at **Distribution System** Frequencies within the range of 47.5Hz and 52.0Hz for a duration of 60 minutes;

(c) Remain synchronized to the **Distribution System** at **Distribution System** Frequencies within the range of 47.0Hz and 47.5Hz for a duration of 20 seconds required each time the Frequency is below 47.5Hz;

(d) Remain synchronized to the **Distribution System** during a rate of change of the **Distribution System** Frequency of values up to and including 0.5Hz per second.;

(e) Sustained operation at the specified Minimum Generation within the range 49.8 to 50.1 Hz;

(f) Remain synchronized to the **Distribution System** at normal rated output at **Distribution System** Voltages within the ranges in 3.8.3.8.3.2 for step changes in the **Distribution System** Voltage of up to 10%.

(g) Sustained operation in accordance with the Reactive Power capability as required by 3.10.10.2 at **Distribution System** Voltages within the ranges specified in 2.4.2.2, unless otherwise specified.

(h) Remain synchronized during Voltage dips at the HV terminals of the **Generator Transformer** of 95% of nominal Voltage (5% retained) for a duration of 0.6 seconds;

(i) Remain synchronized to the **Distribution System** during a negative phase sequence load unbalance in accordance with IEC 600034-1.

(j) Minimum Load: Not greater than 50% of Registered Capacity for CCGTs and not greater than 35% of Registered Capacity for all other Generation Units.

(k) Ramp up capability Not less than 1.5% of Registered Capacity per minute when the Unit is in the Normal Dispatch Condition.

(l) Ramp down capability Not less than 1.5% of Registered Capacity per minute when the Unit is in Normal Dispatch Condition.

(m) Minimum up-time Not greater than 4 hours for Thermal Units

(n) Minimum down-time Not greater than 4 hours for Thermal Units

(o) Forbidden Zones Within the range between normal minimum load plus 5% and Registered Capacity less 10%, not more than 2 specified zones each not greater than 10% of Registered Capacity.

(p) Block Loading Not greater than 10% of Registered Capacity

(q) Time off-load before going into longer standby conditions Remain in a hot condition for at least 12 hours and remain in a warm condition for at least 60 hours.

(r) Time to Synchronize (from instruction):

- Hot: not greater than 3 hours
- Warm: not greater than 8 hours
- Cold: not greater than 12 hours

(s) Time from Synchronizing to Minimum Load

- Hot: Not greater than 40 Minutes
- Warm: not greater than 90 minutes
- Cold: not greater than 180 minutes

(ii) Time to De-load from Minimum Load to De-Synchronizing

- Hot: not greater than 40 minutes
- Warm: not greater than 90 minutes
- Cold: not greater than 180minutes

(t) Operating Reserves: Unless otherwise stated in the **Transmission Grid Code** the **Primary**, **Secondary** and **Tertiary Operating Reserves** shall confirm to the following:

(i) **POR** not less than 5% of Registered Capacity

To be provided, at a minimum, at MW outputs in the range from 50% to 95% **Registered Capacity**, with provision in the range of 95% to 100% **Registered Capacity** to be not less than that indicated by a straight line with unity decay from 5% of **Registered Capacity** at 95% output to 0 at 100% output.

(ii) **SOR** not less than 5% **Registered Capacity**

To be provided, at a minimum, at MW outputs in the range from 50% to 95% **Registered Capacity**, with provision in the range of 95% to 100% **Registered Capacity** to not less than that indicated by a straight line with unity decay from 5% of **Registered Capacity** at 95% output to 0 at 100% output.

(iii) **TOR1**

To be provided, at a minimum, at MW outputs in the range from 50% to 92% **Registered Capacity**, with provision in the range of 92% to 100% **Registered Capacity** to be not less than that indicated by a straight line with unity decay from 8% of **Registered Capacity** at 92% output to 0 at 100%

(iv) **TOR2**

To be provided, at a minimum, at MW outputs in the range from 50% to 90% **Registered Capacity**, with provision in the range of 90% to 100% **Registered Capacity** to be not less than that indicated by a straight line with unity decay from 10% of **Registered Capacity** at 90% to 0 at 100%

3.10.10.1.3 Notwithstanding 3.10.10.1.1 combustion turbine, hydro or other technology based **Generation Units** shall as appropriate, register and perform to operating characteristics giving maximum flexibility of operation, consistent with their type and model of generation **Plant**, in accordance with **Good Industry Practice**. Where appropriate, operating characteristics and in particular start times, should be registered separately for normal (planned) starts, and for starts required under conditions of **System** stress, such as following the loss of a **Generation Unit**. The **Generator** will maintain operational procedures and practices, which ensures that there are no unnecessary delays in responding to **Dispatch** instructions in accordance with the technical capabilities of the **Generation Plant**.

3.10.10.1.4 Where the **TSO** approaches a **Generator**, the **Generator** will co-operate with the **TSO** in the development of procedures and facilities to improve the response of each **Generation Unit** during conditions of **System** stress, including for example, automatic start-up of fast-start **Generation Units** following a loss of a **Generation Unit(s)** or in advance of an anticipated loss of a **Generation Unit(s)**. This shall be subject to agreement of the **Generator** that the procedures are consistent with secure operation of the **Generator's Plant**, such agreement not to be reasonably withheld.

3.10.10.1.5 Where start-up time of **Generation Units** exceeds 30 minutes, they shall be designed to have the capability, where supply from the **Distribution System** is lost, to reduce output to match house load an sustain operation(i.e. tripping to Auxiliaries).

3.10.10.1.6 Control Synchronizing shall be provided by **Generators** at Circuit Breakers identified by the **DSO**, which, depending on the **Plant** configuration may include:

- The **Generation Unit** circuit breaker
- The **Generator Transformer** LV and HV circuit breakers

The **DSO** will provide to the **Generator** signals from the **DSO** operated **Plant** and **Apparatus** as are required to facilitate synchronizing on the **Generator Transformer** HV circuit breaker, in accordance with the relevant provisions of the **Connection Agreement**.

3.10.10.1.7 The Synchronizing facilities in 3.10.10.1.6 shall facilitate Synchronizing under the following conditions:

- **Distribution System** Frequency within the limits 48.0 to 52.0 Hz
- **Distribution System** Voltage within the limits +/-10% of nominal notwithstanding 3.10.10.2.

3.10.10.1.8 Each **Generation Unit** shall be designed, where practicable, to mitigate the risk of common failure with other **Generation Units**. In particular each **Generation Unit** shall be designed so that it can operate with its essential auxiliaries

supplied through the unit **Transformer** which shall be connected between the **Generation Unit** circuit breaker and the **Generator Transformer** LV terminals, or from another secure source as agreed with the **DSO**. Auxiliary suppliers may, provided that they are in accordance with **Good Industry Practice**, be taken from an alternative source during Commissioning, testing, start-up or emergencies.

3.10.10.2 Reactive Power capability

3.10.10.2.1 Each Generation Unit shall have the following Reactive Power capability as measured at their alternator terminal:

Voltage Range	**Connected at:**	**At 100% Registered Capacity**	**At 35% of Registered Capacity**
99kV ≤ V ≥ 123kV	110kV	0.95 power factor leading to 0.85 power factor lagging	0.7 power factor leading to 0.4 power factor lagging
85kV ≤ V ≥ 99kV		Unity power factor to 0.85 power factor lagging	0.7 power factor leading to 0.4 power factory lagging

3.10.10.2.2 At between **Registered Capacity** and 35% **Registered Capacity**, MVAr capability to be not less than indicated by a straight line drawn between the two points from the above, on a plot of MVAr capability against MW output.

3.10.10.2.3 At below 35% **Registered Capacity**, MVAr capability to be not less than that at 35% **Registered Capacity**.

3.10.10.2.4 The **Generator Transformer** shall be designed such that the **Reactive Power** capability is possible over the full range of **Distribution System Voltages** (Specified in 3.10.10.2.1)

3.10.10.2.5 The **DSO** and the **Generator** will coordinate on matters related to 3.10.10.2 at the design stage.

3.10.10.3 Each **Generation Unit** must be fitted with a fast acting proportional turbine speed governor and unit load controller or equivalent control device to provide **Frequency Response** under normal operating conditions in accordance with the requirements of **Transmission Grid Code**.

3.10.10.4 All **Generation Units** shall be capable of contributing to control of the **Distribution System Voltage** by continuous modulation of **Generator Voltage** by means of a suitable continuous acting Automatic Voltage Regulation (AVR) which shall comply with relevant IEC Standards and the characteristics of which have been accepted by the **DSO** prior to the Connection Date, such acceptance not to be unreasonably withheld.

3.10.10.5 Each **Generator Transformer** shall have on-load tap-changing (OLTC). The tap step shall not alter the Voltage ratio at the HV terminals by more than:

- 2.5% on the 110kV **System**

3.10.10.6 Protection

3.10.10.5.1 **Generator**s will provide:

(i) Differential **Protection** on the **Generator Transformer**. The connections between the Grid **Connection Point** circuit breaker and the HV terminals of the **Generator Transformer** shall be included in the protected zone of this differential **Protection**.

(ii) Backup **Protection** (to the **Distribution System**) on Generation Units. The **DSO** acting reasonably shall require one or more of the following to be installed: **Generator** overcurrent **Protection**, voltage controlled **Generator**, overcurrent **Protection** or **Generator** distance **Protection**;

(iii) Under frequency **Protection**; and

(iv) Generation Unit loss of excitation **Protection**.

3.10.10.5.2 The **DSO** may require an individual **Generator**, or group of **Generator**s, to install additional **Protection** and/or control schemes, where the **DSO** can reasonably show that it is prudent or necessary to do so. These schemes may include but are not limited to:

(i) Generation Unit over/under-voltage **Protection**

(ii) Generation Unit over-frequency **Protection**

(iii) Generation Unit **Transformer** neutral displacement voltage detection.

(iv) Loss of mains **Protection** (rate of change of frequency or vector shift)

(v) Generation Unit pole slip **Protection**

(vi) Power **System** stabiliser

3.10.10.5.3 Distance **Protection** shall be provided by the **DSO** at the **Connection Point** circuit breaker of the **Generator Transformer**.

10.0 (4) DISTRIBUTION OPERATING CODE

4.1 - DISTRIBUTION OPERATING CODE 1 - DEMAND FORECASTING

4.1.1 INTRODUCTION

4.1.1.1 In order for the **DSO** to operate the **Distribution System** efficiently and to ensure maximum **System** security and **System** Stability, there is a need for those **User**s specified in 4.1.3 to provide loading and generation output information to the **DSO**.

4.1.1.2 The **Transmission Grid Code** specifies the **TSO** requirements for **Demand Forecasting** for **User**s subject to **Central Dispatch**. Distribution Operating Code1

(4.1) specifies the information to be provided to the **DSO** by other **User**s of the **Distribution System** so that these requirements can be met.

4.1.1.3 The information to be provided under 4.1 is required to enable the **DSO** to maintain the integrity of the **Distribution System**.

4.1.1.4 Where **Demand** data is required from the **User**, this means the MW **Demand** of electricity at the **Connection Point**. The **DSO** may in certain cases specify that the **Demand** data shall include the MVAr **Demand**.

4.1.1.5 The means of providing the information to the **DSO** and its confirmation includes any non-transitory written form, or any other suitable means of electronic transfer which enables the recipient to retain information.

4.1.2 OBJECTIVE

The objectives of 4.1 are to:

(a) Set out the **Demand** forecast and the generating **Plant Output** information to be provided by **User**s to enable the **DSO** to operate the **Distribution System**; and

(b) Specify the information to be provided by **User**s to the **DSO** to enable it to comply with its obligations under the **Transmission Grid Code**.

4.1.3 SCOPE

4.1 applies to the following **User**s of the **Distribution System**:

(a) Customers connected at High Voltage and medium where DSO considers it appropriate..

(b) **Generator**s with Generating **Plant** over 2MW.

4.1.4 INFORMATION FLOW AND COORDINATION

4.1.4.1 The **DSO** shall coordinate **Demand** forecast information to meet the requirements of the **Transmission Grid Code**. The **DSO** shall aggregate forecast information provided by **User**s, where appropriate, and provide forecast information to the **TSO** where **Demand**, or change in **Demand**, is greater than 4MW at any **Connection Point**.

4.1.4.2 Generation information for **Generating Plant** in the **Distribution System**, which is not subject to **Central Dispatch**, shall be provided where specified to the **DSO**. **Customers** with CHP and **Customers** with Embedded generation/Auto-production may also be required to supply information.

4.1.4.3 **Centrally Dispatched Users** shall comply with the requirements of the **Transmission Grid Code**. Information shall be provided directly to the **TSO**.

4.1.5 DEMAND FORECAST DATA

4.1.5.1 **Generating Units** greater than 2MW and not subject to **Central Dispatch** shall provide to the **DSO** information regarding output and planned shutdowns for specified future periods. This shall be provided on an annual basis when requested by the **DSO**. The information required is given in Schedule 2 of the **Distribution Data Registration Code (5.)**.

4.1.5.2 **Major Customers** shall provide to the **DSO** information regarding **Demand** and planned shutdowns for specified future periods. This shall be provided on an

annual basis when requested by the **DSO**. The information required is given in Schedule 2 of the **Distribution Data Registration Code (5.)**.

4.1.5.3 **Dispatchable Demand Customers** shall provide to the **DSO** information regarding **Demand** and planned shutdowns for specified future periods. This shall be provided on an annual basis when requested by the **DSO**. The information required is given in Schedule 2 of the **Distribution Data Registration Code (5.)**.

10.1 4.2 DISTRIBUTION OPERATING CODE 2 - OPERATIONAL PLANNING

4.2.1 INTRODUCTION

4.2.1.1 **Distribution Operating Code 2 (4.2)** is concerned with the co-ordination of **Planned Outages** of **Plant** and **Apparatus** which affect the Operation of the **Distribution System** or require the commitment of **DSO** resources.

4.2.1.2 4.2 supplements the obligation of the **DSO** to provide certain information to the **TSO** under the **Transmission Grid Code** and establishes procedures to enable the collection of such data from **User**s specified in 4.2.3.

4.2.1.3 The means of providing the information to the **DSO** and its confirmation includes any non-transitory written form, or any other suitable means of electronic transfer which enables the recipient to retain information.

4.2.1.4 In order for the **DSO** to fulfill the requirements of this 4.2 it should be noted that the information set out in **Transmission Grid Code**, to be provided by the **TSO** will form the basis of Operational Planning under this 4.2.

4.2.2 OBJECTIVE

4.2.2.1 The objectives of 4.2 are to:-

(a) Set out the Operational Planning procedure and typical timetable for the co-ordination of outage requirements for **Plant** and **Apparatus** to be provided by **User**s to enable the **DSO** to operate the **Distribution System**.

(b) Specify the information to be provided by **User**s to the **DSO** to allow it to comply with the **Transmission Grid Code.**

4.2.3 SCOPE

4.2.3.1 4.2 applies to the following **User**s of the **Distribution System**:

(a) **Major Customers** connected to the **Distribution System** where the **DSO** considers it appropriate;

(b) **Generating Plant** not subject to **Central Dispatch**;

(c) **Customers** with CHP and **Customers** with Embedded generation/Auto-production;

(d) **Centrally Dispatched Users**

4.2.4 PROVISION OF INFORMATION

4.2.4.1 Information on **Generating Plant** not subject to **Central Dispatch** (including **Customers** with CHP and **Customers** with Auto-production) shall be provided, where specified, directly to the **DSO**. This information to be provided to the **DSO** is shown in Schedule 3(a) and Schedule 3(b) of the **5.**.

4.2.4.2 **Centrally Dispatched Users** shall comply with the requirements of the Transmission Grid Code. Information shall be provided directly to the **TSO**.

4.2.5 TIMESCALES AND DATA

4.2.5.1 For **User**s that are not subject to Central **Dispatch** detailed implementation of data gathering and timescales shall be determined by the **DSO** and each **User**. Due recognition shall be given by the **DSO** to voltage levels and capacities of **Plant** and **Apparatus** when assessing information requirements.

4.2.5.2 The information may be required for different timescales as may be determined by the **TSO** or the **DSO** planning needs.

4. 2.5.3 For **User**s that are subject to Central **Dispatch**, implementation of data gathering and timescales shall be determined by the **User**, **DSO** and **TSO**. Due recognition shall be given by the **DSO** to voltage levels and capacities of **Plant** and **Apparatus** when assessing information requirements.

4.2.6 INFORMATION FROM **GENERATOR**S

4.2.6.1 Information from Generating **Plant** greater than 2MW and not subject to central **Dispatch** shall include details of planned outages for maintenance or other purposes as well as the expected time of return to service.

4.2.6.2 The **Generator** shall not synchronise without first obtaining permission from the **DSO** unless prior agreement has been reached with the **DSO**.

4.2.7 INFORMATION TO **USER**S

4.2.7.1 The **DSO** shall advise Major **Customers**, **Dispatchable Demand Customers** or **Generator**s who may be significantly affected by particular outages of Distribution **Plant** and **Apparatus**, of the likely dates and duration of the outages. If there are objections from **User**s these shall be considered by the **DSO** and alternative arrangements proposed if possible.

4.3 DISTRIBUTION OPERATING CODE 3 - DEMAND CONTROL

4.3.1 INTRODUCTION

4.3.1.1 Distribution Operating Code 3 (4.3) is concerned with provisions to be made by the **DSO** or **User**s of the **Distribution System**, in certain circumstances, to permit reductions in **Demand** in the event of insufficient **Generating Plant** and transfers from **External Interconnections** being available to meet **Demand** or to avoid disconnection of **Customers** or in the event of breakdown and / or operating problems (such as in respect of **System Frequency**, **System Voltage** levels or **System** thermal overloads) on any part of the **Transmission Grid** or **Distribution System**.

4.3.1.2 The **Demand** Control procedures ensure that hardship to **User**s and **Customers** is minimized and that in so far as is practicable, all parties affected are treated equitably.

4.3.1.3 4.3 deals with the following means of reducing **Demand**:

(a) Automatic low frequency or voltage **Demand** disconnection;

(b) **Customer Demand** reduction including **Voltage Reduction**;

(c) Customer **Demand** management initiated by **Suppliers** or other parties, other than following an instruction by the **TSO** or the **DSO**;

(d) **Dispatchable Demand Customers**

(e) **Customer Demand** reduction instructed by the **TSO** or the **DSO**;

(f) Emergency manual **Demand** disconnection;

The term **Demand** Control is used to describe any or all of these methods of achieving a **Demand** reduction.

4.3.1.4 Where **Demand Control** is exercised by the **DSO** it shall be done in a manner that in so far as reasonably practicable does not discriminate against any customer or supplier and shall use reasonable endeavors to ensure that the burden is shared fairly among **Customers**. Exemptions may apply to vital and priority **Customers** as defined in the **Distribution load shedding plan** approved by the **GNERC**.

4.3.2 OBJECTIVE

To establish procedures to enable the **DSO**, following an instruction of the **TSO** or otherwise to achieve a reduction in **Demand** that will either avoid or relieve operating problems on the **Transmission Grid** and / or the **Distribution System**, in whole or in part, in a manner that does not unduly discriminate against or unduly prefer any one or group of **Suppliers** or their **Customers** in accordance with the distribution license.

4.3.3 SCOPE

4.3.3.1 4.3 applies to the **DSO** and all **User**s of the **Distribution System**.

4.3.3.2 Implementation of **Demand Control** by the **DSO** may affect all **Customers** of **Suppliers** connected to the **Distribution System** and where applicable, contractual arrangements between **Suppliers** and their **Customers** may need to reflect this.

4.3.4 METHODS OF **DEMAND** CONTROL

4.3.4.1 Customer **Demand** may be disconnected automatically at selected locations in accordance with the requirements of the **Transmission Grid Code**, in the event of a sudden fall in frequency. Such an arrangement shall be carefully coordinated as part of an overall scheme and may take into account any operational requirements or essential load.

4.3.4.2 Automatic disconnection by under voltage relay may be used to discriminately disconnect load at either HV, or MV in order to maintain voltage within acceptable limits, so as to avoid widespread load shedding.

4.3.4.3 Deliberate reduction of voltage may be used to achieve a temporary reduction in load **Demand**.

4.3.4.4 Deliberate reduction in **System** frequency may also be used to achieve a temporary reduction in load **Demand** in accordance with the **Transmission Grid Code**.

4.3.4.5 Emergency manual load shedding may be carried out on the **Distribution** or **Transmission Grids** for reasons of shortfall in supply or other reasons.

4.3.4.6 In the event of a sustained period of shortfall then planned rotating load shedding may be used to share the available power among affected **Customers**.

4.3.5 IMPLEMENTATION OF **DEMAND** CONTROL

4.3.5.1 Where **Demand Control** is exercised by the **DSO** in order to safeguard the **Distribution System**, the **DSO** shall liaise with and inform **Users** accordingly as far as is practicable.

4.3.5.2 Where **Demand Control** is exercised by the **DSO** on instruction or request from the **TSO** in order to safeguard the **Total System** then the **DSO** is required to respond to these requests promptly but shall liaise with and inform other **Users** so far as is practical.

4.3.5.3 **Procedures** for load shedding including exemption policies, load shedding rotating plans, and customer communications are contained in the **Distribution load shedding plan** approved by the **GNERC**.

4.4 DISTRIBUTION OPERATING CODE 7 - OPERATIONAL COMMUNICATIONS AND LIAISON

4.4.1 INTRODUCTION

Distribution Operating Code 4 (4.4) sets out the requirements for the exchange of Information in relation to Operations and /or Events on the **Distribution System** or the **Installation** of any **User** connected to the **Distribution System** which have had or may have had, or will have or may have an **Operational Effect** on the **Distribution System** or the **Installation** of any other **User**.

4.4.2 OBJECTIVE

To provide for the exchange of information so that the implications of the Operation and / or Event can be considered and the possible risks arising from it can be assessed and appropriate action taken by the relevant party in order to maintain the integrity of the **Total System** and the **User's** Installation. 4.4 does not seek to deal with any actions arising from the exchange of information, but merely with that exchange.

4.4.3 SCOPE

4.4 applies to the following **User**s of the **Distribution System**:

(a) **Major Customers** connected to the **Distribution System** where the **DSO** considers it appropriate;

(b) **Generating Plant** with a capacity greater than 2MW;

(c) **Customers** with CHP and **Customers** with **Embedded Generation**/Auto-production where the **DSO** reasonably considers it appropriate;

(d) **Dispatchable Demand Customers**.

4.4.4 PROCEDURE

4.4.4.1 The **DSO** and **User**s connected to the **Distribution System** shall nominate persons and/or contact locations and agree communication channels for the necessary exchange of information to make effective the exchange of information required by 4.4.

4.4.4.2 SCADA **Equipment** may be required at a **User's** site for the transmission of information and data to and from the **DSO** or the **TSO Control Center**. The requirement to provide this information shall normally be included in the relevant **Connection Agreement**.

4.4.4.3 Information between the **DSO** and **User**s shall be exchanged on the reasonable request of either party. The request may follow a specific Operation, or be in accordance with a prior agreement to exchange information on particular types of **Event**.

This does not preclude the voluntary exchange of information which may be perceived as being relevant to the operation of the **Distribution** or **User Installation**, in accordance with **Good Industry Practice**.

4.4.4.4 In the case of an Operation on the **Distribution System** or on receipt of notification of an operation on the **Transmission Grid**, which will have or may have, in the opinion of the **DSO**, an **Operational Effect** on the **Installation** of a **User** connected to the **Distribution System**, the **DSO** shall notify the **User**.

4.4.4.5 In the case of an Operation on the **Installation** of a **User** connected to the **Distribution System**, which will have or may have an **Operational Effect** on the **Distribution System**, the **User** shall notify the **DSO** in accordance with 4.4.

4.4.4.6 In the case of an Operation on the **Installation** of a **Centrally Dispatched User** connected to the **Distribution System**, which will have or may have an **Operational Effect** on the **Distribution System**, the **User** shall notify both the **DSO** and **TSO** in accordance with 4.4.

4.4.4.7 A Notification under 4.4 shall be of sufficient detail to describe the Operation, although it need not state the cause, and to enable the recipient of the notification reasonably to consider and access the implications and risks arising and shall include the name of the individual reporting the Operation. The recipient may ask questions to clarify the notification.

4.4.4.8 A notification under 4.4 shall be given as far in advance as possible to allow the recipient to consider and assess the implications and risks arising.

4.4.5 SIGNIFICANT INCIDENTS

4.4.5.1 Where an event on the **Distribution System** has had or may have had a significant effect on the **User's** I**nstallation** or where an event in the **User's Installation** has had or may have had a significant effect on the **Distribution System**, the event shall be deemed to be a **Significant Incident** by the **DSO** in consultation with the **User**. Significant Incidents shall be reported in writing to the affected party in accordance with the provisions of 4.5.

4.4.5.2 A **Significant Incident** shall include events which result in, or may result in, the following:

(a) **Voltage** limits outside statutory limits;

(b) **System** frequency outside statutory limits; or

(c) **System** stability failure

4.5 EVENT REPORTING

4.5.1 INTRODUCTION

4.5.1.1 **Distribution Operating Code 5 (4.5)** sets out the requirements for reporting in writing those Events deemed to be "**Significant Incidents**" under 4.4.

Information between the **DSO** and **Major Users** shall be exchanged on the reasonable request of both parties.

4.5.1.2 4.5 also provides for the joint investigation of **Significant Incidents** by the **User**s involved.

4.5.2 OBJECTIVES

4.5.2.1 The objective of 4.5 is to facilitate the provision of more detailed information in writing and where agreed between the **DSO** and the **Users** involved, joint investigation of those **Significant Incidents** reported verbally under 4.4.

4.5.3 SCOPE

4.5.3.1 4.5 applies to the following **User**s of the **Distribution System**:

(a) **Major Customers** connected to the **Distribution System** where the **DSO** considers it appropriate;

(b) **Generating Plant** with a capacity greater than 2MW;

(c) **Customers** with CHP and **Customers** with Embedded Generation/Auto-production where the **DSO** reasonably considers it appropriate;

(d) **Dispatchable Demand Customers**.

4.5.4 PROCEDURES

4.5.4.1 The **DSO** and each **User** specified in 4.5.3.1 shall nominate responsible persons and establish communication channels to ensure the effectiveness of this 4.5. Such responsible persons and communication channels may be the same as those established under 4.4.

4.5.4.2 Communication shall, as far as possible, be direct between the **User** and the operator of the **Distribution System**. However, this does not preclude communication with the **User**s nominated representative.

4.5.4.3 In the case of an event which has been reported to the **DSO** under 4.4 and subsequently has been determined by the **DSO** to be a **Significant Incident**, a written report shall be given to the **DSO** by the **User** in accordance with 4.5.

4.5.4.4 In the case of an event which has been reported to the **User** under 4.4 and subsequently has been determined by the **DSO** to be a **Significant Incident**, a written report shall be given to the **User** by the **DSO** in accordance with 4.5. In the case where the **User** is subject to **Central Dispatch**, the written report shall be shared with the **TSO**, where the **DSO** deems it to be appropriate.

4.5.4.5 A Report shall be in writing or in electronic form and shall be sent to the **DSO** or **User**, as the case may be. It shall contain confirmation of the notification given under 4.4 together with more details relating to the **Significant Incident** including information which has become known relating to the **Significant Incident** since the notification. The report shall, as a minimum, contain those matters specified in 4.5.6.

4.5.4.6 A report under 4.5 shall be given as soon as reasonably practical after the notification under 4.4.

4.5.5 JOINT INVESTIGATIONS

4.5.5.1 Where a **Significant Incident** has been declared and a report submitted under 4.5 either party or parties may request in writing that a joint investigation be carried out.

4.5.5.2 The composition of such an investigation panel shall be appropriate to the incident to be investigated and agreed by all parties involved.

4.5.5.3 A joint investigation shall only take place where all parties affected by it agree to it. The form and rules of, and procedures for, and all matters relating to the joint investigation shall be agreed at the time of a joint investigation and in the absence of agreement the joint investigation shall not take place.

4.5.6 MATTERS TO BE INCLUDED IN A WRITTEN REPORT OF A SIGNIFICANT INCIDENT

4.5.6.1 Matters applicable to the **DSO** and **Generator**s and **Dispatachable Demand Customers**:

(a) Date and time of **Significant Incident**;

(b) Location;

(c) **Equipment** involved;

(d) Brief description of **Significant Incident**;

(e) Details of any **Demand Control** undertaken;

(f) Conclusions and recommendations if applicable.

4.5.6.2 Matters applicable to the **DSO**:

Effect on **User**s where appropriate:

(a) Duration of **incident**; and

(b) Estimated date and time of return to normal service

4.5.6.3 Matters applicable to **Generator**:

Effect on generation including, where appropriate:

(a) Generation interrupted;

(b) Frequency response achieved;

(c) MVAr performance achieved; and

(d) Estimated date and return to normal service.

4.5.6.4 Matters applicable to **Dispatchable Demand Customers**:

Effect on **Demand** including, where appropriate:

(a) **Demand** Reduction Interrupted;

(b) Duration of Incident

(c) Estimated Date and Time of return to service.

4.6 SYSTEM TESTS

4.6.1 INTRODUCTION

4.6.1.1 **Distribution Operating Code 6 (4.6)** sets out the responsibilities and procedures for arranging and carrying out **System Tests** which have or may have an effect on the **System**s of the **DSO** or **Users**. **System Tests** are those tests which involve either simulated 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 **re-Commissioning Tests** or any other tests of a minor nature.

4.6.2 OBJECTIVES

4.6.2.1 The objectives of 4.6 are to:

(a) ensure that the procedures for arranging and carrying out **System Tests** are such that, so far as practicable, **System Tests** do not threaten the safety of personnel or the general public and cause minimum threat to the security of supplies, the integrity of **Plant** or **Equipment** and are not detrimental to the **DSO** and **User**s; and

(b) set out procedures to be followed for establishing and reporting **System Tests**.

4.6.3 SCOPE

4.6.3.1 4.6 applies to the following **User**s of the **Distribution System**:

(a) **Major Customers** connected to the **Distribution System** where the **DSO** considers it appropriate;

(b) **Generating Plant** with a capacity greater than 2MW;

(c) **Customers** with CHP and **Customers** with Embedded Generation/Auto-production where the **DSO** reasonably considers it appropriate.

(d) **Dispatachable Demand Customers**

4.6.4 PROCEDURES

4.6.4.1 If the **System Test** is proposed by the **DSO** or the **User** connected to the **Distribution System** or if the test will or may have an affect on the **Transmission Grid** then the provisions of 4.6 or the **Transmission Grid Code** shall apply.

4.6.4.2 **System Tests** which have a minimal effect on the **Distribution System** or the **Systems** of others will not be subject to this procedure; minimal effect shall be taken to mean variations in voltage, frequency and waveform distortion of a value not greater than those figures which are defined in the **Distribution Planning Code**.

4.6.4.3 When the **DSO** or a **User** intend to undertake a **System Test** which may have significant effect on the **System** of others normally twelve months notice, or as otherwise agreed by the **DSO**, shall be given by the person proposing the **System Test** (**Test Proposer**) to the **DSO** and to those **Users** who may be affected by such a **System Test**.

4.6.4.4 The proposal shall be in writing and shall contain details of the nature and purpose of the proposed **System Test** and shall indicate the extent and situation of the **Plant** or **Apparatus** involved.

4.6.4.5 If the information set out in the proposal notice is considered insufficient by the recipient they shall contact the **Test Proposer** with a written request for further information which shall be supplied as soon as reasonably practicable. The **DSO** shall not be required to do anything under 4.6 until it is satisfied with the details supplied in the proposal or pursuant to a request for further information.

4.6.4.6 If the **DSO** wishes to undertake a **System Test**, the **DSO** shall be deemed to have received a proposal of that **System Test**.

4.6.4.7 The **DSO** shall have overall co-ordination of the **System Test**, using the information supplied to it under 4.6 and shall identify in its reasonable estimation, which **Users** other than the **Test Proposer**, may be affected by the proposed **System Test**.

4.6.4.8 Following receipt of the **System Test** proposal the **DSO** shall evaluate the impact of the **System Test** and discuss the proposals with **Users** identified as being affected.

4.6.4.9 Within one month of receiving the **System Test** proposal the **DSO** shall submit a report to the **Test Proposer** which shall contain:-

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

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

(c) such other matters that the **DSO** consider appropriate; outline the procedure to be followed and the proposed test schedule and advise of any costs.

4.6.4.10 The proposal report shall be submitted to all those who received a notice under 4.6.4.3.

4.6.4.11 If the proposal report (or a revised proposal report as agreed between the **DSO** and the **Test Proposer**) is approved by all recipients, the **System Test** can proceed.

4.6.4.4.12 At least one month prior to the date of the proposed **System Test**, the **DSO** shall submit to all recipients of the proposal notice a program which in this 4.6 shall be called a final test program stating the switching sequence and proposed timings, a list of those staff involved in carrying out the **System Test** (including those responsible for site safety) and such other matters as the **DSO** deem appropriate.

4.6.4.4.13 The final test program shall bind all recipients to act in accordance with the provisions contained within the program in relation to the proposed **System Test**.

4.6.4.14 At the conclusion of the **System Test**, the **Test Proposer** shall be responsible for preparing a written report (the “final report”) of the **System Test** for submission to the **DSO**.

4.6.4.15 The final report shall include a description of the **Plant** and /or **Apparatus**, tested and of the **System Test** carried out, together with the results, conclusions and recommendation.

4.6.4.16 Results of tests shall be reported to relevant parties, taking into account confidentiality issues.

4.6.4.17 All **System Test** procedures shall comply with all applicable legislation.

4.7 DISTRIBUTION OPERATING CODE - MONITORING, TESTING AND INVESTIGATION

4.7.1 INTRODUCTION

4.7.1.1 In order to properly discharge its responsibilities in respect of safe, secure and economic operation of the **Distribution System** and in accordance with its license conditions the **DSO** shall organize and carry out monitoring, testing and investigation on the effect of **User**s' electrical **Apparatus** or electrical Installation on the **Distribution System**.

4.7.2 OBJECTIVE

4.7.2.1 The objective is to specify the **DSO** requirements to test and /or monitor the **Distribution System** to ensure that **Users** are not operating outside the technical parameters required by the **Distribution General Codes** and **Operating Codes**.

4.7.3 SCOPE

4.7.3.1 4.7 applies to the following **User**s of the **Distribution System**:

(a) all **Generators**.

(b) all **Customers** who are connected to the **Distribution System**.

4.7.4 PROCEDURES

4.7.4.1 The **DSO** shall, from time to time, determine the need to test or monitor the quality of supply at various points on the **Distribution System**.

4.7.4.2 In the case of a **Centrally Dispatched User** of the **Distribution System**, the **TSO** shall, from time to time, determine the need to test or monitor the functionality and operational response of the **User**. This testing and monitoring may be carried out at various points on the **Distribution System**, subject to the prior agreement between the **DSO** and **TSO**.

4.7.4.3 The requirement for specific testing and /or monitoring may be initiated by the receipt of specific complaints as to the quality of supply on the **Distribution System**.

4.7.4.4 Where testing or monitoring is required at the **Connection Point** with a **User** then the **DSO** shall advise the **User** involved and the **DSO** shall make available the results of such tests to the **User**. In the case of a **Centrally Dispatched User**, the **DSO** shall make available the results of such tests to the **TSO** on request.

4.7.4.5 Where a **User** is found to be operating outside the technical limits specified in the **Distribution General Code** then the **User** shall rectify the situation or disconnect the **Apparatus** causing the problem from its electrical **System** connected to the **Distribution System** immediately or within such time as agreed with the **DSO**. In the case of a **Centrally Dispatched User**, the **DSO** shall inform the **TSO** of the issue on request.

4.7.4.6 Continued failure to rectify the situation shall result in the **User** being disconnected in accordance with the **Connection Agreement**.

4.7.4.7 The **DSO** shall, from time to time, monitor the affects of the **User** on the **Distribution System**.

4.7.4.8 The monitoring shall normally be related to the amount of **Active Power** and **Reactive Power** or flicker or harmonics transferred across the **Connection Point**.

4.7.4.9 Where the **User** is exporting or importing **Active Power** or **Reactive Power** in excess of those defined in the **Connection Agreement** or causing disturbances, the **DSO** shall inform the **User** and the **User** shall restrict the power transfer to within the specified parameters

4.7.4.10 The **DSO** may check from time to time that **User**s are in compliance with agreed **Protection requirements** and **Protection settings**.

10.2 4.8 DISTRIBUTION OPERATING CODE - SAFETY COORDINATION

4.8.1 INTRODUCTION

4.8.1.1 Distribution Operating Code 8 (4.8) specifies the Safety Management **System** criteria to be applied by the **DSO** to meet statutory requirements and **Distribution License** conditions and obligations.

4.8.1.2 Similar criteria and standards of **Safety Management Systems** shall be provided by other **User**s of the **Distribution System** when carrying out work or tests at the operational interface with the **DSO**.

4.8.2 OBJECTIVES

4.8.2.1 To lay down the safety management criteria to be applied to ensure safety of persons working on the **Distribution System** and at or across operational and **Ownership Boundaries**.

4.8.3 SCOPE

4.8.3.1 **4.8** specifies the **Safety Management** criteria that applies to the **DSO** and the following **User**s of the **Distribution System**

(a) **Generators**;

(b) **Major Customers;**

(c) Any other party reasonably specified by the **DSO** including **Users** connected at **Medium** or **Low Voltage** for appropriate sections of 4.8 when necessary.

(c) Agents of the **DSO** or **Users** working on the **Distribution System** or at or across operational boundaries.

(d) **Centrally Dispatched Users**

4.8.4 PROCEDURES

4.8.4.1 The **Safety Management** principles and procedures (**Safety Management System**) for ensuring the health and safety of all relevant personnel shall be specified by the **DSO** and **Users** for work on their respective **System**s or **Plant** or **Apparatus** connected to them.

4.8.4.2 There shall be joint agreement by the **DSO** and **Users** on which **Safety Management System** is to be used for sites or locations where an operational boundary exists and proper 4.umentation of the safety precautions to be taken shall be maintained.

4.8.4.2 There shall be written authorization of personnel who do the work of control, operation, work or testing of **Plant** or **Apparatus** forming part of or connected to the **Distribution System**.

4.8.4.3 There shall be joint agreement between the **DSO** and **User**s which specifies responsibility for **System** or control **Equipment** which shall ensure that only one party is responsible for any item of **Plant** or **Apparatus** at any one time.

4.8.4.4 The **DSO** and each **User** shall at all times have nominated a person or persons responsible for the coordination of safety on the respective **System**s.

4.8.4.5 The **DSO** and each **User** shall maintain a suitable **System of 4.umentation** which records all relevant operational events that have taken place on the **Distribution System** or other **System** connected to it and the co-ordination of relevant safety precautions for work.

4.8.4.6 **System** diagrams which show sufficient information for control personnel to carry out their duties shall be exchanged between the **DSO** and **User** as required.

4.8.5 SAFETY AT THE DSO-USER INTERFACE

4.8.5.1 The following procedure set down the basic safety requirements at the operator and the **DSO** interfaces. These procedures are necessary to ensure the safety of all who may have to work at either side of the interface or on the interface (boundary).

(a) Written Rules for Safe Working and Communicating Procedures shall be available and used by all persons who may have to work at or use the facilities provided at the Interface.

(b) Electrical **Equipment** connected to either side of the interface and interface **Equipment** shall be under the control of a named person at either side.

(c) Each item of **Equipment** shall be controlled by only one identifiable person at any one time.

(d) Adequate means of isolation shall be provided at the interface to allow work to be carried out safely at either side of the interface.

(e) Where necessary to prevent danger adequate facilities for earthing shall be provided at either side of the interface to allow work to be carried out safely at the interface or at either side of the interface.

(f) Adequate working space, adequate means of access and egress and, where necessary, adequate lighting shall be provided at all electrical **Equipment** on or near which work is being done in circumstances which may cause danger.

(g) All electrical **Equipment** shall be suitably identified where necessary to prevent danger.

(h) Electrical installations and **Equipment** shall comply with the relevant standards.

4.8.6 SAFETY RULES

4.8.6.1 Operation and Maintenance of the **User**s' **Equipment** shall only be carried out by authorized personnel. Before first **Commissioning** the **Plant**, operating procedures shall be agreed with the **DSO**.

4.8.6.2 Instructions for operating and / or earthing the **User**s' electrical **Equipment** shall be clearly displayed in the **User**s' **Medium and High Voltage** switchroom.

4.8.6.3 The **Electrical Safety Rules** detail the safety procedures to be observed for all personnel working on or in close proximity to **Distribution System Plant** or **Equipment**.

11.0 (5) DISTRIBUTION DATA REGISTRATION CODE

5.1 INTRODUCTION

5.1.1 The various sections of the **Distribution Code** require the **DSO** and **Users** to exchange and update data from time to time. The data which is specified in each section of the **Distribution Code** is summarized in the **Distribution Data Registration Code (Chapter 5)**.

5.1.2 The **Distribution Data Registration Code** provides a series of schedules summarizing all requirements for information of a particular type. Each class of **User** is then referred to the appropriate schedule or group of schedules for a statement of the total data requirements in his case.

5.1.3 The Chapter 5 specifies procedures and timings for the supply of data and subsequent updating, where the timings are covered by detailed timetables laid down in other sections of the **Distribution Code** they are not necessarily repeated in full in the **Distribution Data Registration Code**.

5.1.4 In the case of a **Generator** seeking a connection to the **Distribution System** then irrespective of its potential involvement in the **Balancing Mechanism,** discussions on connection will be with the **DSO** concerned with the connection arrangements, in addition to any discussions required with **TSO** under the **Transmission Grid Code**. References to "**Generator**" in the **Distribution Data Registration Code** shall include existing and prospective **Generators**.

5.2 OBJECTIVE

The objective of this Chapter is to collate and list in a readily identifiable form all the data to be provided by:

(a) Each category of **User** to the **DSO** under the **Distribution Code**.

(b) The **DSO** to each category of **User** under the **Distribution Code.**

5.3 SCOPE

The **Distribution Data Registration Code** will apply to the **DSO** and to all **Users** which for the purpose of the **Distribution Data Registration Code** are listed below:

(a) **Customers -** It is not intended that the **Distribution Code** shall generally apply to small **Customers** individually; their obligations will be dealt with on their behalf by their **Supplier**.

(b) **Generators**;

(c) **Suppliers;**

(d) Any other person who is making application for use of or connection to the **Distribution System**.

5.4 DATA CATEGORIES

5.4.1 Categories of Data

Within the **Distribution Data Registration Code** the data required by the **DSO** is allocated to one of the following three categories:

(a) **Standard Planning Data (SPD)**

(b) **Detailed Planning Data (DPD)**

(c) **Operational Data (OD)**

5.4.2 **Standard Planning Data (SPD)**

5.4.2.1 **Standard Planning Data** is that data which is required to be supplied by all **Users** when making application for connection to and/or use of the **Distribution System** in order that the **DSO** may assess the implications for making the connection.

5.4.2.2 **Standard Planning Data** will be provided to the **DSO** in accordance with the provisions of **Chapters 2** and **3**.

5.2.3 Following an agreement for connection/use of **System** any estimated **SPD** supplied by **Users** should be replaced by actual values prior to connection which will be referred to as **Registered Data.**

5.4.3 **Detailed Planning Data (DPD)**

5.4.3.1 **Detailed Planning Data** is that data which is required to be supplied by the **Users** specified for connection to and/or use of the **Distribution System**.

5.4.3.2 **Detailed Planning Data** will be provided to the **DSO** in accordance with the provisions of **Chapters 2** and **3**.

5.4.3.3 Following an agreement for connection/use of **System** any estimated **DPD** supplied by **Users** should be replaced by measured values prior to connection.

5.4.4 **Operational Data (OD)**

5.4.4.1 **Operational Data** is data, which is required by the **Distribution Operating Codes**.

5.4.4.2 **Operational Data** is required to be supplied in accordance with timetables set down in the schedules attached to this **Distribution Data Registration Code.**

5.5 PROCEDURES AND RESPONSIBILITIES

5.5.1 Responsibility for Submission and Updating of Data

In accordance with the provisions of the various sections of the **Distribution Code** and unless otherwise agreed or specified by the **DNO,** each **User** is required to submit data as defined in 5.6 following and the attached schedules.

5.5.2 Methods of Submitting Data

5.5.2.1 Data must be submitted to the **DSO** in writing and where possible in the format specified by the **DSO** and must indicate the name of the person who is submitting those schedules.

5.5.2.2 If a **User** wishes to change any data item then this must first be discussed with the **DSO** concerned in order for the implications to be considered and the change if agreed (such agreement not to be unreasonably withheld), should be confirmed by the submission of a revised data scheduler by verbal means with confirmation in writing if short timescales are involved.

5.5.2.3 The **DSO** will supply data as requested by **Users** and as agreed by the **DSO** where no obligation of confidentiality exists.

5.5.3 Changes to User's Data

Whenever a **User** becomes aware of a change to an item of data, which is registered with the **DSO** the **User**, must notify the **DSO** in accordance with the appropriate section of the **Distribution Code.**

5.5.4 Data Accuracy and Data not Supplied

5.5.4.1 The **User** is solely responsible for the accuracy of data (or of changes to data) supplied to the **DSO**.

5.5.4.2 Any data which the **User** fails to supply when required by any section of the **Distribution Code** may be estimated by the **DSO** if and when, in the **DSO's** view, it is necessary to do so. Such estimates will be based upon data supplied previously for the same **Plant** or **Apparatus** or upon corresponding data for similar **Plant** or **Apparatus** or upon such other information as the **DSO** deems appropriate.

5.5.4.3 The **DSO** will advise a **User** in writing of any estimated data it intends to use pursuant to 5.5.4.2 relating directly to that **User's Plant** or **Apparatus** in the event of data not being supplied. The **DSO** will not be liable as a result of using that estimated data; the responsibility for the accuracy of that data will rest with the **User** as if the data has been supplied by that **User**.

5.5.4.4 It is a requirement of the **Distribution Code** that **Registered Project Planning Data** is updated by the **User** annually.

5.6 DATA TO BE REGISTERED

5.6.1 Schedules 1a, 1b and 1c – **Generator Technical Information**

5.6.2 Schedule 1e – **Customer's HV or MV Network System**

5.6.3 Schedule 2 - **Demand Forecasts**

5.6.4 Schedule 3 - **Operational Planning**

5.6.5 Schedule 4 - **System Design Information**

5.6.6 Schedule 5 - **Load Characteristics** - comprising the forecast data for load points indicating for example, the maximum load, the equipment that comprises the load, and the harmonic content of the load.

5.6.7 The schedules applicable to each class of **User** are as follows:

Schedule Number:	Title	Applicable to:
Schedule 1a	**Power Station Data**	All **Power Stations**
Schedule 1b	**Generation Set Data**	All **Customer's Generation Sets**
Schedule 1c	**Generation Set Data**	For specified types of **Generation Set** and ancillary **Plant and Apparatus** (i) Synchronous **Generation Set** (ii) Fixed speed induction Generation Set (iii) Doubly fed induction Generation Set (iv) Series Converter Connected Generation Set (v) Transformers
Schedule 1d	**DSO Network Data**	Respective **DSO**
Schedule 1e	All **Customer's HV or MV Network System**	All **Customer's HV or MV Network System**
Schedule 2	**Demand Forecasts**	All **Customer's Generators** greater than 1MW; All **Suppliers**; All **Customers** connected at **HV** whose **Demand** is greater than 5MW
Schedule 3a	**Operational Planning**	All **Customer's Generators** greater than 1MW; All **Suppliers**; All **Customers** connected at **HV** whose **Demand** is greater than 5MW
Schedule 4 & Schedule 5	**System** Design Information and Load Characteristics	**Customer's Generators;** All **Suppliers**; All **Customers**

Schedule 1a: POWER STATION DATA

FOR ALL GENERATION

DATA DESCRIPTION 1a Power Station Data	UNITS	DATA CATEGORY
APPLICANT'S DETAILS		
Customer's Details		
Company name	Text	**SPD**
Company registered number	Text	**SPD**
Postal address	Text	**SPD**
Contact name	Text	**SPD**
Email address	Text	**SPD**
Telephone number	Text	**SPD**
Facsimile number	Text	**SPD**
Consultant's Details (if applicable)		
Consultant's name	Text	**SPD**
Postal address	Text	**SPD**
Contact name	Text	**SPD**
Email address	Text	**SPD**
Telephone number	Text	**SPD**
Facsimile number	Text	**SPD**
POWER STATION LOCATION AND OPERATION		
Power Station name	Text	**SPD**
Details of any existing **Connection Agreements** for this **Power Station**	Text	**SPD**
Target date for the provision of the connection / commissioning of the **Power Station**	Text	**SPD**
Postal address or site boundary plan (1/500)	Text / Plan	**SPD**
Connection Point (grid reference or description)	Text	**SPD**
Connection Point voltage	V	**SPD**
Single line diagram of any on-site existing or proposed electrical plant or, where available, **Operation Diagrams**	Diagram	**SPD**
What security is required for the connection? (see note 1)	Text	**SPD**
Number of **Generation Sets** in **Power Station**	Number	**SPD**
Are all **Generation Sets** of the same design/rating? (If not complete the relevant Schedules 5b and 5c for each type)	Y/N	**SPD**
Will the **Power Station** operate in islanded mode?	Y/N	**SPD**
Will **Generating Plant** supply electricity to on-site premises?	Y/N	**SPD**
POWER STATION STANDBY IMPORT REQUIREMENTS		

DATA DESCRIPTION 1a Power Station Data	UNITS	DATA CATEGORY
(see note 2)		
Maximum **Active Power** import	MW	**SPD**
Maximum **Reactive Power** import (lagging)	MVAr	**SPD**
Maximum **Reactive Power** export (leading)	MVAr	**SPD**
POWER STATION TOP-UP IMPORT REQUIREMENTS (see note 3)		
Maximum **Active Power** import	MW	**SPD**
Maximum **Reactive Power** import (lagging)	MVAr	**SPD**
Maximum **Reactive Power** export (leading)	MVAr	**SPD**
POWER STATION EXPORT REQUIREMENTS (see note 4)		
Total **Power Station** output at **Registered Capacity** (net of auxiliary loads)		
Registered Capacity (maximum **Active Power** export)	MW	**SPD**
Maximum **Reactive Power** export (lagging)	MVAr	**SPD**
Maximum **Reactive Power** import (leading)	MVAr	**SPD**
Total **Power Station** output at **Minimum Generation** (net of auxiliary loads)		
Minimum Generation (minimum **Active Power** export)	MW	**DPD**
Maximum **Reactive Power** export (lagging)	MVAr	**DPD**
Maximum **Reactive Power** import (leading)	MVAr	**DPD**
Power Station performance chart (net, at **Connection Point)**	Figure	**DPD**
POWER STATION MAXIMUM FAULT CURRENT CONTRIBUTION (see note 5)		
Peak asymmetrical short circuit current at 10ms (i_p) for a 3φ short circuit fault at the **Connection Point**	kA	**SPD**
RMS value of the initial symmetrical short circuit current (I_k") for a 3φ short circuit fault at the **Connection Point**	kA	**SPD**
RMS value of the symmetrical short circuit current at 100ms ($I_{k(100)}$) for a 3φ short circuit fault at the **Connection Point**	kA	**SPD**
Short circuit time constant T", corresponding to the change from I_k" to $I_{k(100)}$	s	**DPD**
Positive sequence X/R ratio at the instant of fault	-	**DPD**
POWER STATION INTERFACE ARRANGEMENTS		

DATA DESCRIPTION 1a Power Station Data	UNITS	DATA CATEGORY
(see note 6)		
Means of connection, disconnection and synchronizing between **DSO** and **User**	Method statement	**SPD**
Site protection / co-ordination arrangements with DSO	Report	**DPD**
Precautions should neutral become disconnected from earth (LV only)	Report	**DPD**
Site communications, control and monitoring (HV / LV)	Report	**DPD**

Notes:

1. The **DSO** will assume a single circuit connection to the **Power Station** is required unless stated otherwise. Options include:
    a. Single circuit connection;
    b. Manually switched alternative connection;
    c. Automatic switched alternative connection; and,
    d. Firm connection (secure for first circuit outage)

2. This section relates to operating conditions when the **Power Station** is importing **Active Power**, typically when it is not generating. The maximum **Active Power** import requirement and the associated maximum **Reactive Power** import and/or export requirements should be stated.

3. This section relates to operating conditions when the **Power Station** is importing **Active Power**, typically when it is generating, but is not generating sufficient power to cater for all the on-site demand. The maximum **Active Power** import requirement and the associated maximum **Reactive Power** import and/or export requirements should be stated.

4. This section relates to operating conditions when the **Power Station** is exporting **Active Power**. The **Active Power** export and associated maximum **Reactive Power** range should be stated for operation at **Registered Capacity** and for operation at **Minimum Generation**.

5. See IEC 60909 for guidance on fault current data. Additionally, fault current contribution data may be provided in the form of detailed graphs, waveforms and/or tables. This information need not be provided where detailed fault level contribution / impedance data is provided for each **Generation Set** in Schedules 1b or 1c.

6. The interface arrangements need to be agreed and implemented between the **User** and the **DSO** before the energization and consideration should be given to addressing the all relevant requirements of this **Distribution Code**.

Schedule 1b: GENERATION SET DATA

FOR ALL GENERATION SETS

DATA DESCRIPTION 1b Generation Set Data	UNITS	Data Category for Generators connected at MV and LV	Data Category for Generators Connected at HV
GENERATION SET GENERAL DATA			
Number of **Generation Sets** to which this data applies	Value	**SPD**	**SPD**
Type of **Generation Set**: • Synchronous Generator, • Fixed Speed Induction Generator, • Double Fed Induction Generator, • Series Convertor Connected Generator, • Other (provide details)	Text	**SPD**	**SPD**
Type of prime mover	Text	**SPD**	**SPD**
Operating regime – intermittent or non-intermittent (see note 1)	Text	**SPD**	**SPD**
GENERATION SET OUTPUT DATA			
Rated terminal voltage (generator)	V	**SPD**	**SPD**
Rated terminal current (generator)	A	**SPD**	**SPD**
Generation Set Registered Capacity	MW	**SPD**	**SPD**
Generation Set apparent power rating (to be used as base for generator parameters)	MVA	**SPD**	**SPD**
Generation Set rated **Active Power**	MW	**SPD**	**SPD**
Maximum measured **Active Power** P_{60} (see note 2)	MW	**DPD**	**DPD**
Maximum measured **Active Power** $P_{0.2}$ (see note 2)	MW	**DPD**	**DPD**
Minimum Generation (set connected; net of auxiliary loads)	MW	**DPD**	**DPD**
Generation Set Reactive Power capability at rated **Active Power** (gross, at generator terminals)			
Maximum **Reactive Power** export (lagging)	MVAr	**DPD**	**SPD**
Maximum **Reactive Power** import (leading)	MVAr	**DPD**	**SPD**
Generation Set performance chart (gross, at generator terminals)	Figure	**DPD**	**DPD**
GENERATION SET MAXIMUM FAULT CURRENT CONTRIBUTION (see note 3)			

DATA DESCRIPTION 1b Generation Set Data	UNITS	Data Category for Generators connected at MV and LV	Data Category for Generators Connected at HV
Peak asymmetrical short circuit current at 10ms (i_p) for a 3φ short circuit fault at the **Generation Set** terminals	kA	None	**SPD**
RMS value of the initial symmetrical short circuit current (I_k") for a 3φ short circuit fault at the **Generation Set** terminals	kA	None	**SPD**
RMS value of the symmetrical short circuit current at 100ms ($I_{k(100)}$) for a 3φ short circuit fault at the **Generation Set** terminals	kA	**SPD**	**SPD**
Short circuit time constant T", corresponding to the change from I_k" to $I_{k(100)}$	s	None	**DPD**
Positive sequence X/R ratio at the instant of fault	-	None	**DPD**

Notes:

1. Intermittent and Non-intermittent Generation is defined as follows:
   a. Intermittent Generation: Generation plant where the energy source for the prime mover cannot be made available on demand;
   b. Non-intermittent Generation: Generation plant where the energy source for the prime mover can be made available on demand.

2. For wind turbines only - IEC 61400-21 (P_{60} and $P_{0.2}$)

3. See IEC 60909 for guidance on fault current data. Additionally, fault current contribution data may be provided in the form of detailed graphs, waveforms and/or tables. This information need not be provided where detailed fault level contribution / impedance data is provided for the site in Schedule 1a or for each Generation Set in Schedules 1c.

Schedule 1c (i) GENERATION SET DATA

FOR GENERATION SETS

DATA DESCRIPTION 1c (i) Synchronous Generation Sets (or Equivalent Synchronous Generation Sets – see note 1)	UNITS	Data Category for Generators connected at LV and MV	Data Category for Generators Connected at HV
GENERATION SET MODEL DATA			
Generation Set identifier	Text	**SPD**	**SPD**
Type of **Generation Set** (round rotor, salient pole or asynchronous equivalent – see note 1)	Text	**SPD**	**SPD**
Positive sequence resistance	per unit	**DPD**	**SPD**
Short circuit ratio (see note 2)	Number	**DPD**	**DPD**
Inertia constant (**Generation Set** and Prime Mover)	MWsec/ MVA	**DPD**	**SPD**
Direct axis reactances: Sub-transient (X''_d) – unsaturated / saturated Transient (X'_d) – unsaturated / saturated Synchronous (X_d) – unsaturated / saturated	 per unit per unit per unit	 **SPD / SPD** **DPD / DPD** **DPD / DPD**	 **SPD / SPD** **SPD / SPD** **SPD / SPD**
Quadrature axis reactances: Sub-transient (X''_q) – unsaturated / saturated Transient (X'_q) – unsaturated / saturated Synchronous (X_q) – unsaturated / saturated	 per unit per unit per unit	 None None None	 **DPD / DPD** **DPD / DPD** **DPD / DPD**
Time constants: State whether time constants are open or short circuit D-axis sub-transient – unsaturated / saturated D-axis transient – unsaturated / saturated Q-axis sub-transient – unsaturated / saturated Q-axis transient – unsaturated / saturated	 Text s s s s	 **DPD** **DPD / DPD** **DPD / DPD** None None	 **SPD** **SPD / SPD** **SPD / SPD** **DPD / DPD** **DPD / DPD**
Stator leakage reactance (unsaturated)	per unit	None	**DPD**
Zero sequence resistance (earthed star only, including any neutral earthing resistance)	per unit	**DPD**	**DPD**
Zero sequence reactance (earthed star only, including any neutral earthing reactance)	per unit	**DPD**	**DPD**
Negative sequence resistance	per unit	**DPD**	**DPD**
Negative sequence reactance	per unit	**DPD**	**DPD**
Rated field current	A	**DPD**	**DPD**
Field current open circuit saturation curve (from 50% to 120% of rated terminal voltage)	Graph	**DPD**	**DPD**

DATA DESCRIPTION 1c (i) Synchronous Generation Sets (or Equivalent Synchronous Generation Sets – see note 1)	UNITS	Data Category for Generators connected at LV and MV	Data Category for Generators Connected at HV
Potier reactance (if saturation factor available – see note 3)	per unit	**DPD**	**DPD**
Saturation factor (pu field current to produce 1.2pu terminal voltage on open circuit)	per unit	**DPD**	**DPD**
GENERATION SET MODELS			
Governor and prime mover model (see note 4)	Model	**DPD**	**DPD**
AVR / excitation model (see note 4)	Model	**DPD**	**DPD**

See Notes on the next page

Notes:

1. Asynchronous generators may be represented here by an equivalent synchronous generator data set
2. The short circuit ratio (**SCR**) of a **Generation Set** is one measure of the performance of a machine under short circuit conditions and is important in determining the unit's stability performance. The reciprocal of the per unit on rating saturated synchronous reactance, X_d(sat), is equal to the **SCR.**
3. The Potier reactance is only required if the saturation factor is available. The saturation factor is defined as the pu value of field current required to generate 1.2pu stator terminal voltage on open circuit.
4. **SPD** will normally be sufficient, except where the **DSO** considers that the stability and security of the network is at risk. Sufficient **DPD** should then be provided in order to build up a suitable **Generation Set** dynamic model for analysis. Alternatively a 'Black Box' dynamic model of the **Generation Set** may be provided. All models should be suitable for the software analysis package used by the **DNO**.

Schedule 1c (ii): GENERATION SET DATA

FOR GENERATION SETS

DATA DESCRIPTION 1c (ii) Fixed Speed Induction Generation Sets	UNITS	Data Category for Generators connected at LV and MV	Data Category for Generators Connected at HV
GENERATION SET MODEL DATA (see notes 1 and 2)			
Magnetizing reactance	per unit	**DPD**	**SPD**
Stator resistance	per unit	**DPD**	**SPD**
Stator reactance	per unit	**DPD**	**SPD**
Inner cage or running rotor resistance	per unit	**DPD**	**SPD**
Inner cage or running rotor reactance	per unit	**DPD**	**SPD**
Outer cage or standstill rotor resistance	per unit	**DPD**	**SPD**
Outer cage or standstill rotor reactance	per unit	**DPD**	**SPD**
State whether data is inner-outer cage or running-standstill	Text	**DPD**	**SPD**
Number of pole pairs	number	**DPD**	**DPD**
Gearbox ratio	number	**DPD**	**DPD**
Slip at rated output	%	**DPD**	**SPD**
Total effective inertia constant (generator and prime mover)	MWsec/MVA	**DPD**	**SPD**
Inertia constant of the generator rotor	MWsec/MVA	**DPD**	**DPD**
Inertia constant of the prime mover rotor	MWsec/MVA	**DPD**	**DPD**
Equivalent shaft stiffness between the two masses	Nm/Electrical radian	**DPD**	**DPD**
Describe method of adding star capacitance over operating range (see notes 3 and 4)	Text	**DPD**	**DPD**
Shunt capacitance connected in parallel at % of rated output: Starting 20% 40% 60% 80% 100%	kVAr or Graph	**SPD**	**SPD**
Active Power and **Reactive Power** import during start-up	MW-MVAr / Time Graphs	**SPD**	**SPD**
Active Power and **Reactive Power** import during switching operations (eg “6 to 4 pole” change-over)	MW-MVAr / Time Graphs	**DPD**	**SPD**
Under voltage protection setting & time delay	puV, s	**SPD**	**SPD**

Governor and prime mover model (see note 5)	Model	**DPD**	**DPD**

See Notes on the next page.

Notes:

1. Asynchronous generators may be represented by an equivalent synchronous data set

2. The User will need to provide the above data for each asynchronous Generation Set based on the number of pole sets (i.e. two data sets for dual speed 4/6 pole machines).

3. LV connected generators may just have a simple fixed capacitor bank.

4. If electronic power factor control (e.g. SVC) is installed, provide details of the operating range and characteristics e.g. pf or MVAr range - operating regime: constant or voltage set-point / slope and response times.

5. **SPD** will normally be sufficient, except where the **DSO** considers that the stability and security of the network is at risk. Sufficient **DPD** should then be provided in order to build up a suitable **Generation Set** dynamic model for analysis. Alternatively a "Black Box" dynamic model of the **Generation Set** may be provided. All models should be suitable for the software analysis package used by the **DSO**.

Schedule 1c (iii): GENERATION SET DATA

FOR GENERATION SETS

DATA DESCRIPTION **1c (iii) Doubly Fed Induction Generation Sets**	**UNITS**	**Data Category for Generators Connected at LV and MV**	**Data Category for Generators Connected at HV**
Generation Set maximum fault current contribution data (see note 1)	Schedule	**SPD**	**SPD**
GENERATION SET MODEL DATA (see note 2)			
Magnetizing reactance	per unit	**DPD**	**SPD**
Stator resistance	per unit	**DPD**	**SPD**
Stator reactance	per unit	**DPD**	**SPD**
Running rotor resistance	per unit	**DPD**	**SPD**
Running rotor reactance	per unit	**DPD**	**SPD**
Standstill rotor resistance	per unit	**DPD**	**SPD**
Standstill rotor reactance	per unit	**DPD**	**SPD**
Rotor current limit	A	**DPD**	**DPD**
Number of pole pairs	number	**DPD**	**DPD**
Gearbox ratio	number	**DPD**	**DPD**

Generator rotor speed range (minimum to rated speed)	rpm	**DPD**	**SPD**
Electrical power output versus generator rotor speed	Graph / Table	**DPD**	**DPD**
Total effective inertia constant (generator and prime mover) at rated speed	MWsec/MVA	**DPD**	**SPD**
Inertia constant of the generator rotor at rated speed	MWsec/MVA	**DPD**	**DPD**
Inertia constant of the prime mover rotor at rated speed	MWsec/MVA	**DPD**	**DPD**
Equivalent shaft stiffness between the two masses	Nm/ Electrical radian	**DPD**	**DPD**
DFIG unit models including excitation and prime mover control systems (see note 2)	Models	**DPD**	**DPD**

Notes:

1. Fault current contribution data should be provided under Schedule 1b.

2. **SPD** will normally be sufficient, except where the **DNO** considers that the stability and security of the network is at risk. Sufficient **DPD** should then be provided in order to build up a suitable **Generation Set** dynamic model for analysis. Alternatively a "Black Box" dynamic model of the **Generation Set** may be provided. All models should be suitable for the software analysis package used by the **DNO**.

Schedule 1c (iv) GENERATION SET DATA

FOR GENERATION SETS

DATA DESCRIPTION 1c (iv) Series Converter Connected Generation Sets	UNITS	Data Category for Generators connected at LV and MV	Data Category for Generators Connected at HV
Generation Set maximum fault current contribution data (see note 1)	Schedule	**SPD**	**SPD**
GENERATION SET MODEL DATA (see note 2)			
Gearbox ratio	number	**DPD**	**DPD**
Generator rotor speed range (minimum to rated speed)	rpm	**DPD**	**SPD**
Electrical power output versus generator rotor speed	Graph / Table	**DPD**	**DPD**
Total effective inertia constant (generator and prime mover)	MWsec/MVA	**DPD**	**SPD**
Inertia constant of the generator rotor at rated speed	MWsec/ MVA	**DPD**	**DPD**
Inertia constant of the prime mover rotor at rated speed	MWsec/ MVA	**DPD**	**DPD**
Equivalent shaft stiffness between the two masses	Nm/ Electrical radian	**DPD**	**DPD**
SCCG unit models including excitation, voltage/ **Reactive Power** and prime mover control systems (see note 2)	Models	**DPD**	**DPD**

Notes:

1. Fault current contribution data should be provided under Schedule 1b.

2. **SPD** will normally be sufficient, except where the **DNO** considers that the stability and security of the network is at risk. Sufficient **DPD** should then be provided in order to build up a suitable **Generation Set** dynamic model for analysis. Alternatively a "Black Box" dynamic model of the **Generation Set** may be provided. All models should be suitable for the software analysis package used by the **DSO**. Where required by the **DSO**, generator electrical parameters should be provided based on Schedule 1c (i) or 1c (ii), according to the type of machine used.

Schedule 1c (v): GENERATION SET DATA

FOR CUSTOMER'S GENERATION SETS

DATA DESCRIPTION 1c (v) Transformers	UNITS	Data Category for Generators connected at LV and MV	Data Category for Generators Connected at HV
Transformer identifier	Text	**SPD**	**SPD**
Transformer type (Unit/Station/Auxiliary)	Text	**SPD**	**SPD**
Number of identical units	Number	**SPD**	**SPD**
Type of cooling	Text	**SPD**	**SPD**
Rated (apparent) power	MVA	**SPD**	**SPD**
Rated voltage ratio (on principal tap)	kV/kV	**SPD**	**SPD**
Positive sequence resistance on principal tap	per unit	**DPD**	**SPD**
Positive sequence reactance at principal tap	per unit	**SPD**	**SPD**
Positive sequence reactance at minimum tap	per unit	None	**DPD**
Positive sequence reactance at maximum tap	per unit	None	**DPD**
Zero sequence resistance	per unit	**DPD**	**DPD**
Zero sequence reactance	per unit	**DPD**	**DPD**
Winding configuration (e.g. Dyn11)	Text	**DPD**	**SPD**
Type of tap changer (on load / off circuit)	Text	**SPD**	**SPD**
Tap step size	%	**SPD**	**SPD**
Maximum ratio tap	%	**SPD**	**SPD**
Minimum ratio tap	%	**SPD**	**SPD**
Tap position in service (for off load tap-changers only)	%	**DPD**	**DPD**
Method of voltage control	Text	**DPD**	**SPD**
Method of earthing of high-voltage winding	Text	**SPD**	**SPD**
Method of earthing of low-voltage winding	Text	**SPD**	**SPD**

Schedule 1d: DSO NETWORK DATA

(Data indicative of that which may be requested by **Users** for parts of the **Distribution System**)

DATA DESCRIPTION 1d DNO Network Data (see note 1)	UNITS
Fault Level at Connection Point prior to Power Station connection.	
Peak asymmetrical short circuit current at 10ms (i_p) for a 3φ short circuit fault at the **Connection Point**	kA
RMS value of the initial symmetrical short circuit current (I_k") for a 3φ short circuit fault at the **Connection Point**	kA
RMS value of the symmetrical short circuit current at 100ms ($I_{k(100)}$) for a 3φ short circuit fault at the **Connection Point**	kA
Peak asymmetrical short circuit current at 10ms (i_{p-e}) for a 1φ-E short circuit fault at the **Connection Point**	kA
RMS value of the initial symmetrical short circuit current (I_{k-e}") for a 1φ-E short circuit fault at the **Connection Point**	kA
RMS value of the symmetrical short circuit current at 100ms ($I_{k-e(100)}$) for a 1φ-E short circuit fault at the **Connection Point**	kA
Circuit Data	
Circuit schematic diagram and geographic diagram showing normal open points	Diagram
Circuit impedances (R, X, B positive & zero sequence)	Specify
Circuit ratings and any seasonal variations	Specify
Is the network operated radial or non-radial?	Text
Circuit transformer voltage ratios (e.g. MV/380/220)	kV/V/V
Are circuit transformers zoned by applying the progressively higher tap settings for each group of transformers in zones along the circuit to optimize voltage regulation?	Y/N
Transformer Data (for each transformer)	
Transformer identifier	Text
Rated voltage ratio (on principal tap)	kV/kV
Winding configuration (e.g. Dyn11)	Text
Rated (apparent) power	MVA
Type of tap changer (on load / off circuit)	Text
Tap changer rating (forward and reverse power)	MVA / MVA
Tap step size	%
Maximum ratio tap	%
Minimum ratio tap	%
Normal tap position	%
Method of voltage control (voltage / LDC / NRC / other)	Text / Report
Controlled busbar (high-voltage side / low-voltage side / remote busbar)	Text
Target voltage and limits	kV, ±%

DATA DESCRIPTION 1d DNO Network Data (see note 1)	UNITS
Normal system voltage on the high-voltage side	kV
Normal system voltage on the low-voltage side	kV
Positive sequence resistance	% on rating
Positive sequence reactance at principal tap	% on rating
Zero sequence resistance	% on rating
Zero sequence reactance	% on rating
Method of earthing of the high-voltage winding	Text
Method of earthing of the low-voltage winding	Text

Notes:

1. Users are advised to refer to network data items published in the **DSO's Long Term Development Statement**.

Schedule 1e: DATA FOR CUSTOMER'S HV OR MV NETWORK SYSTEMS

DATA DESCRIPTION 1e Customer's HV or MV Network System Data	UNITS	DATA CATEGORY
CUSTOMER'S HV OR MV NETWORK SYSTEM LOCATION & OPERATION		
Customer's HV or MV Network System name	Text	**SPD**
Postal address or site boundary plan (1/500)	Text / Plan	**SPD**
Connection Point (grid reference or description)	Text	**SPD**
Connection Point voltage	V	**SPD**
Single line diagram of existing and proposed connections or **Operation Diagrams** when available	Diagram	**SPD**
Number of **Power Stations** and/or **Generation Sets** connected to the **Customer's HV or MV Network System**	Number	**SPD**
Operating regime of **Power Station** and/or **Generation Sets** – intermittent or non-intermittent (see note 1)	Text	**SPD**
Means of carrying out voltage control and/or power factor control at the **Connection Point**	Report	**SPD**
Customer's HV or MV Network System performance chart (net, at **Connection Point**)	Figure	**DPD**
CUSTOMER'S HV OR MV NETWORK SYSTEM IMPORT REQUIREMENTS (see note 2)		
Maximum **Active Power** import	MW	**SPD**
Maximum **Reactive Power** import (lagging)	MVAr	**SPD**
Maximum **Reactive Power** export (leading)	MVAr	**SPD**

DATA DESCRIPTION 1e Customer's HV or MV Network System Data	UNITS	DATA CATEGORY
Requirements for **Top - Up** and / or **Standby** supplies	Text	**SPD**
CUSTOMER'S HV OR MV NETWORK SYSTEM EXPORT REQUIREMENTS (see note 3)		
Total **Customer's HV or MV Network System** output at **Registered Capacity** (net of auxiliary loads)		
Registered Capacity (maximum **Active Power** export)	MW	**SPD**
Maximum **Reactive Power** export (lagging)	MVAr	**SPD**
Maximum **Reactive Power** import (leading)	MVAr	**SPD**
Total **Customer's HV or MV Network System** output at **Minimum Generation** (net of auxiliary loads)		
Minimum Generation (minimum **Active Power** export)	MW	**DPD**
Maximum **Reactive Power** export (lagging)	MVAr	**DPD**
Maximum **Reactive Power** import (leading)	MVAr	**DPD**
Customer's HV or MV Network System MAXIMUM FAULT CURRENT CONTRIBUTION (see note 4)		
Peak asymmetrical short circuit current at 10ms (i_p) for a 3φ short circuit fault at the **Connection Point**	kA	**SPD**
RMS value of the initial symmetrical short circuit current (I_k") for a 3φ short circuit fault at the **Connection Point**	kA	**SPD**
RMS value of the symmetrical short circuit current at 100ms ($I_{k(100)}$) for a 3φ short circuit fault at the **Connection Point**	kA	**SPD**
Short circuit time constant T", corresponding to the change from I_k" to $I_{k(100)}$	s	**DPD**
Positive sequence X/R ratio at the instant of fault	-	**DPD**
Customer's HV or MV Network System INTERFACE ARRANGEMENTS (see note 5)		
Means of connection, disconnection and synchronizing between **DNO** and **User**	Method statement	**SPD**
Site protection / co-ordination arrangements with DNO	Report	**DPD**
Site communications, control and monitoring (HV / LV)	Report	**DPD**

Notes:

1. Intermittent and **Non-intermittent Generation** is defined as follows:

• **Intermittent Generation**: Generation plant where the energy source for the prime mover cannot be made available on demand

• **Non-intermittent Generation**: Generation plant where the energy source for the prime mover can be made available on demand

2. This section relates to operating conditions when the **Customer's HV or MV Network System** is importing **Active Power**, typically when it is not generating. The

maximum **Active Power** import requirement and the associated maximum **Reactive Power** import and/or export requirements should be stated.

3. This section relates to operating conditions when the **Customer's HV or MV Network System** is exporting **Active Power**. The **Active Power** export and associated maximum **Reactive Power** range should be stated for operation at **Registered Capacity** and for operation at **Minimum Generation**.

4. See IEC 60909 for guidance on short-circuit current data. Additionally, fault current contribution data may be provided in the form of detailed graphs, waveforms and/or tables.

5. The interface arrangements need to be agreed and implemented between the **User** and the **DSO** before energization and consideration should be given to addressing all relevant requirements of this **Distribution Code**.

Schedule 2: DEMAND FORECASTS

DATA DESCRIPTION	UNITS	TIME PERIOD COVERED	UPDATE TIME	DATA CATEGORY
1. Hourly **Active Power** and **Power Factor** at **Peak Demand Conditions** for specified time of the annual peak hour at the associated **Grid Supply Points** and at the specified time of the annual peak hour of the **Transmission Grid Demand**	MW/ MVAr	8 weeks - 3 years	Week 35	**OD**
2. Hourly **Active Power** and **Power Factor** at **Average Conditions** at the specified hourly of the annual minimum **Transmission Grid Demand.**	MW/ MVAr	8 weeks - 3 years	Week 35	**OD**
3. Hourly Power output of **Customer's Generating Plant** and/or **Customer's HV or MV Network System** at the specified hour of the annual peak.	MW	8 weeks - 3 years	Week 35	**OD**
4. Schedules for the operation of **Customer's Generation Sets** and/or **Customer's HV or MV Network Systems** whose output is greater than 5MW on hourly basis	MW Date Time	2 weeks to 8 weeks ahead	1600 hrs Friday	**OD**

DATA DESCRIPTION	UNITS	TIME PERIOD COVERED	UPDATE TIME	DATA CATEGORY
5. **Supplier**s will provide details of their proposed use of **Demand Control** measures aggregated to 5MW or more (averaged over any hour) on hourly basis for each **Distribution System Connection Point**.	MW Date Time	2 weeks to 8 weeks ahead	1600 hrs Friday	**OD**
6. **Customers, Suppliers,** Other Network Operators and other **DSOs** connected to the **DSO's Distribution System** shall notify the **DSO** where their or their **Customers** operations are likely to result in an aggregated change in **Demand** at the **DSO Connection Point** of supply of greater than 5MW of the **Demand** at that time on hourly basis.	MW Date Time	2 weeks to 8 weeks ahead	1600 hrs Friday	**OD**
7. Items 5, 6 and 7 above updated.		2 days to 12 days ahead	0900 hrs each Wednesday	**OD**
8. Details of differences greater than 5MW from the schedules of operation of any **Customer's Generating Plant** and/or **Customer's HV or MV Network System** on hourly basis submitted under item 5 above.	MW Date Time	0 - 24 hrs ahead	As specified	**OD**
9. Details from **Supplier**s of any differences of the amount and donation of their proposed use of **Customer Demand Control** (aggregated over any hourly basis submitted under item 6 above).	MW Date Time	0 - 24 hrs ahead	As specified	**OD**
10. Details from each **User** connected to the **Distribution System** of any change in aggregate **Demand** at the point of surplus of greater than 5MW of the **Demand**.	MW Date Time	0 - 24 hrs ahead	As specified	**OD**

DATA DESCRIPTION	UNITS	TIME PERIOD COVERED	UPDATE TIME	DATA CATEGORY
11. Details of hour **Active Power** and **Reactive Power** output sent out to the **Distribution System** by **Customer's Generating Plant** and/or **Customer's HV or MV Network System** during the previous day on hourly basis.	MW MVAr	Previous day	0300	**OD**
12.**Supplier**s, Other Network Operators and other **DSOs** connected to the **DSO's Distribution System** will provide details of the amount and duration of **Demand Control** at the **Connection Point** aggregated to 5MW or more (arranged over any hour) which was implemented during the previous **Operational Day**.	MW Time	Previous day	0300	**OD**

Schedule 3a: OPERATIONAL PLANNING – LONG TERM

YEARS 3 AHEAD

CUSTOMER'S GENERATORS CONNECTED TO THE DSO'S DISTRIBUTION SYSTEM AS SPECIFIED BY THE DSO

DATA DESCRIPTION	UNITS	TIME PERIOD COVERED	UPDATE TIME	DATA CATEGORY
1. For individual **Generation Sets** or **Customer's HV or MV Network Systems** the **Set/System** number and **Generation Set/ Customer's HV or MV Network System** capacity. Preferred outage dates earliest start date latest finish date.	MW Date	Years 3 ahead	Week 2	**OD**
2. **DSO** advise **Customer's Generators** of:-				
(a) details of **Customer's Generating Plant** or **Customer's HV or MV Network System** they may	Date	Years 3 ahead	Week 12	**OD**

withdraw from service.				
(b) **Output Usable** requirements.	MW Date	Years 3 ahead	Week 12	**OD**
3. **Customer's Generators** provide **DSO** with:				
(a) update of provisional **Customer's Generating Plant** or **Customer's HV or MV Network System** outage program.	Date	Years 3 ahead	Week 12	**OD**
(b) **Registered Capacity**.	MW	Years 3 ahead	Week 12	**OD**
(c) Average Weekly **Output Usable** forecasts.	Date	Years 3 ahead	Week 12	**OD**
4. **DSO** following discussion with **Customer's Generator** will notify, with reason, revision to the provisional **Customer's Generating Plant** or **Customer's HV or MV Network System** outage program.	Date	Years 3 ahead	Week 28	**OD**
5. **DSO** following discussion with **Customer's Generator** will notify, with reason, revisions to the provisional **Customer's Generating Plant** or **Customer's HV or MV Network System** outage program. (This taking into account **User** outages received in Week 28).	Date	Years 3 ahead	Week 42	**OD**
6. **DSO** following discussion with **Users** agree **Users** outages.	Date	Years 3 ahead	Week 43	**OD**

Schedule 3b: OPERATIONAL PLANNING – MEDIUM TERM

YEARS 1-2

CUSTOMER'S GENERATORS CONNECTED TO THE DSO'S DISTRIBUTION SYSTEM AS SPECIFIED BY THE DSO

DATA DESCRIPTION	UNITS	TIME PERIOD COVERED	UPDATE TIME	DATA CATEGORY
1. For individual **Generation Sets** or **Customer's HV or MV Network System** the Set/**System** numbers and **Customer's Generating Plant/**	MW Date	Years 1 - 2	Week 2	**OD**

Customer's HV or MV Network System capacity. Preferred outage dates earliest start date latest start date.				
2. **Customer's Generators** provide the **DSO** with estimates of:-				
(a) **Output Usable**	MW Date	Years 1 - 2	Week 10	**OD**
(b) outage program	Date	Year 1		
3. **DSO** following discussion with **Customer's Generator** provide:-	Date	Years 1 - 2	Week 12	**OD**
(a) Details of **Customer's Generating Plant** or **Customer's HV or MV Network System** they may withdraw from service for an outage				
(b) Update of **Customer's Generator** outage program.				
4. **DSO** notify each **Customer's Generator** of **Output Usable** requirements.	MW Date	Years 1 - 2	Week 12	**OD**
5. **Customer's Generator** provides estimates of **Output Usable** of each **Customer's Generating Plant** or **Customer's HV or MV Network System**	MW Date	Years 1 - 2	Week 41	**OD**

Schedule 3c: OPERATIONAL PLANNING

SHORT TERM

CUSTOMER'S GENERATORS CONNECTED TO THE DSO'S DISTRIBUTION SYSTEM AS SPECIFIED BY THE DSO

DATA DESCRIPTION	UNITS	TIME PERIOD COVERED	UPDATE TIME	DATA CATEGORY
1. For individual **Generation Sets** or **Customer's HV or MV Network Systems** the Set/**System** number and **Customer's Generating Plant/ Customer's HV or MV Network System** capacity. Duration of outage earliest start date latest finishing date / Output Usable estimates.	MW Date	Weeks 9 - 52	Week 2	**OD**
2. **DNO** informs **Customer's Generators** of **Output Usable** requirements.	MW Date	Weeks 9 - 52	Week 4	**OD**
3. **Customer's Generators provide DNO** with **Customer's Generating Plant** or **Customer's HV or MV Network System Output Usable** estimates.	MW Date	Weeks 18 - 52	Week 10	**OD**
4. **DNO** informs **Customer's Generators** of change to **Output Usable** requirements.	MW Date	Weeks 18 - 52	Week 12	**OD**
5. **Customer's Generators provide DNO** with **Customer's Generating Plant** or **Customer's HV or MV Network System Output Usable** estimates.	MW Date	Weeks 28 - 52	Week 25	**OD**
6. **DNO** informs **Customer's Generators** of changes to **Output Usable** requirements.	MW Date	Weeks 31 - 52	Week 27	**OD**
7. **Customer's Generators** will provide estimates of **Customer's Generating Plant or Customer's HV or MV Network System Output**	MW Date	Weeks 44 - 52	Week 41	**OD**

Usable .				
8. **DNO** inform contracted **Customer's Generators** of changes to **Output Usable** requirements.	MW Date	Weeks 44 - 52	Week 43	**OD**

Schedule 3d: OPERATIONAL PLANNING - USER PLANT, APPARATUS AND SYSTEMS

DATA DESCRIPTION	UNITS	TIME PERIOD COVERED	UPDATE TIME	DATA CATEGORY
Users provide the DSO with details of proposed outages which may affect the performance of the **Distribution System**. Details of trip testing, risks of trip and other information where known which may affect the security and stability of the **Distribution System** shall also be included.	Dates	Years 1 - 2 and Years 3 ahead	Week 28	**OD**
Update of previously submitted data for year 3 ahead.	Dates	Years 1 - 2 and Years 3 ahead	Week 43	**OD**
Following consultation with **Users** and **DSO** will include agreed outage proposals in the program.	Date	Years 1 - 2 and Years 3 ahead	Week 48	**OD**
As changes occur.	Update of **Users** proposals agreed in the Medium Term Plan.			

Schedule 4: SYSTEM DESIGN INFORMATION

DATA DESCRIPTION	UNITS	DATA CATEGORY
General Information:		
Type of load and control arrangements	Text/ Diagrams	**DPD**
Maximum load on each phase at time of **Peak Demand**	MW and MVAr	**DPD**
Fluctuating Loads:		
Rate of change of **Demand** – **Active Power** and **Reactive Power** increasing and decreasing	MW/s MVAr/s	**DPD**
Shortest repetitive time intervals between fluctuations in **Demand Active Power** and **Reactive Power**	s	**DPD**
Largest step change **Active Power** and **Reactive Power** increasing and decreasing	MW/s MVAr/s	**DPD**
Maximum energy **Demand per half hour**	MWh	**DPD**
Steady state residual **Demand** (MW) between **Demand** fluctuations	MW	**DPD**
Reactive Compensation		
Rating of individual shunt reactors (not associated with cables)	MVAr	**DPD**
Rating of individual capacitor banks	MVAr	**DPD**
Details of any automatic control logic such that operating characteristics can be determined.	Text/ Diagrams	**DPD**
Point of connection to the **System**	Diagram	**DPD**
Lumped Network Susceptance		
Details of the equivalent lumped network susceptance of the **User System** referred back to the connection with the **DNO's Distribution System**. Including shunt reactors which are an integrated part of a cable system and which are not normally in or out of service independent of the cable. Excluding independently switched reactive compensation connected to the User System and any susceptance of the User System inherent in the active and reactive Demand.	MVAr	**DPD**
Fault Infeeds		
Maximum and minimum short circuit infeeds into the **DNO's Distribution System**	MVA	**DPD**
X/R ratio under maximum and minimum short circuit conditions		**DPD**
Equivalent network information at the request of the **DNO**		**DPD**
Interconnection Impedance		**DPD**

DATA DESCRIPTION	UNITS	DATA CATEGORY
For **User** interconnections that operate in parallel with the **DNO's Distribution System** details of the interconnection impedance shall be exchanged between the **DNO** and **User**, including Positive Sequence Resistance Zero Sequence Resistance Positive Sequence Reactance Zero Sequence Reactance Susceptance	% on 100 % on 100 % on 100 % on 100 % on 100	**DPD DPD** **DPD DPD** **DPD**
If the impedance in the view of the **DNO** is low then more detailed information will be requested.		
Demand Transfer Capability		**DPD**
Information shall be exchanged on **Demand** transfer capability where the same **Demand** may be supplied from alternative **DNO** or **User** points of supply including the proportion of **Demand** normally fed from each point of supply	MW	**DPD**
The arrangements for manual/automatic transfer under planned/outage conditions should be provided		**DPD**
Non - **DNO System** Data		
The **DNO** will request information on circuit parameters, switchgear and **Protection** arrangements	Text/ Diagrams	**DPD**
Transient Overvoltages		**DPD**
Demand Profile For Day Of **Exit Point Peak Demand**		**DPD**
Demand Profile For Day Of Exit Point Minimum **Demand**		**DPD**

Schedule 5: LOAD CHARACTERISTICS

DATA DESCRIPTION	UNITS	DATA CATEGORY
Geographical and electrical point of connection and date connection required Diagrams existing and proposed connections	Text	**SPD**
Types of **Demand**:-		
Maximum **Active Power Demand Registered Capacity**	MW	**SPD**
Maximum and minimum **Reactive Power** requirement	MVAr	**SPD**

Type of load and control arrangements (e.g. variable speed motor type of starter employed)	Text	**SPD**
Maximum **Phase Voltage Unbalance**	Ratio/ Phase at the time	**SPD**
Maximum harmonic content	% THVD	**SPD**
Fluctuating Loads:- Graphical indication of typical cycle variation of **Demand** (Active / Reactive)	Graphical	**SPD**
Load Management Data	Text	
Maximum short circuit infeed based on **Generation Set** subtransient reactance	MVA	**SPD**
Maximum zero phase sequence impedance of the **User's System** at the connection point	% on 100 MVA	**SPD**
2 hour **Demand** profiles for **Peak Demand**	MW and MVAr	**SPD**
Monthly **Peak Demand** variation	MW and MVAr	**SPD**

12.0 GLOSSARY AND DEFINITIONS

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

AC Alternating Current.

Active Power The product of voltage and the in-phase component of alternating current (normally measured in kilowatts (kW) or megawatts (MW)).

Active Power Control The automatic change in Active Power output in a response to an Active Power Control Set-Point received from the TSO.

Active-Power Control Set-point The maximum amount of Active Power in MW, set by the TSO, that the Power Station is permitted to export.

Aggregated Demand Site A group of Individual Demand Sites represented by a Dispatchable Demand Customer, which together are capable of a Demand Reduction Capability equal to or above 4 MW (and which is therefore subject to Central Dispatch from the TSO). Unless otherwise specified, information submitted in respect of an Aggregated Demand Site shall always be at an aggregated level.

Available Active Power The amount of Active Power that the Power Station could produce based on current conditions. The Available Active Power shall only differ from the actual Active Power if the Power Station has been curtailed, constrained or is operating in a restrictive Frequency Response mode.

Availability Notice A notice to be submitted to the **TSO** pursuant to the Transmission Grid Code.

AVR Automatic Voltage Regulation

Back-up Protection That Protection system which will open a Circuit Breaker or other fault-current interrupting device in the absence of the current Protection operation of another Protection system.

Black Start The procedure necessary for recovery from a Total or Partial System shutdown.

Bulk Supply Point A point of connection between the Transmission System and the Distribution System or between the Transmission System and a directly connected customer.

CENELEC European Committee for Electrotechnical Standardisation.

Central Dispatch The Dispatch by the TSO.

Centrally Dispatched Generating Units Generating Units subject to Central Dispatch by the TSO.

Centrally Dispatched Users Users subject to Central Dispatch by the TSO.

Circuit Breaker A mechanical switching device, capable of making, carrying and breaking currents under normal circuit conditions and also of making, carrying for specified time and breaking currents under specified abnormal circuit conditions, such as those of short circuit.

Commissioning The final process of testing part of a System prior to that part of the System being considered suitable for normal use.

Connection Agreement An agreement between the DSO and each User setting out terms relating to a connection with the Distribution System .

Connection Point The physical point at which a User's Plant or apparatus is joined to the Distribution System.

Control Facility A location used for the purpose of monitoring, control and operation of the User's Plant and Apparatus.

Customer A User whose premises is connected to the Distribution System for the purpose of obtaining a supply of electricity at that premises.

Customer with Auto-production/Embedded Generation A Customer generating electricity for his or her own use.

DC Direct Current

Demand Unless otherwise stated, the demand expressed in MW or MVAr of Active Power and Reactive Power respectively.

Demand Profile The estimated consumption of MW Demand for an Individual Demand Site or aggregated consumption for each Individual Site.

Demand Reduction The reduction in MW Demand which can be achieved by a Demand Side Unit or Aggregated Demand Side Unit

Demand Reduction Capability The reduction capability in MW Demand that can be achieved by the Demand Side Unit

Demand Side Unit An Individual Demand Reduction Site or Aggregated Demand Site with a Demand Reduction Capability of at least 4 MW. The Demand Side Unit shall be subject to Central Dispatch.

Demand Site A premises owned by a Customer connected to the Distribution System with a Demand Reduction capability. The Demand Site shall have a Maximum Import Capacity and shall not have a Maximum Export Capacity.

Disconnector A device which provides in the open position a means of disconnecting apparatus from the Distribution System in accordance with specified requirements.

Dispatch The issue of instructions for Generating Units to achieve specific Active Power and Reactive Power outputs within Registered Data parameter and by stated times.

Dispatchable Demand Customer A person who operates a Demand Side Unit, with a Demand Reduction Capability not less than 4MW, and is subject to the Distribution Code pursuant to any agreement with the DSO or otherwise.

Distribution Code This 4.ument approved by GNERC.

Distribution Code Review Panel or Panel The panel with the functions set out in 1..

Distribution Data That portion of the Distribution Code which is identified as the Distribution Data

Distribution License The license issued to GNERC to distribute electricity.

Distribution Planning That portion of the Distribution Code which is identified as the Distribution Code Planning Code

Distribution Connection Code That portion of the Distribution Code which is identified as the Distribution Connection Code.

Distribution System The system which consists of electric lines, electric plant, transformers and switchgear and which is used for conveying electricity to final customers

Distribution System Operator Licensed entity/operator responsible for the ownership, maintenance and development of the Distribution System.

Distribution Use of System The agreement between the DSO and Suppliers for transport of electricity Agreement from the Transmission System or Generators and Centrally Dispatched Users through the Distribution System to Customers.

Disturbing Loads Loads which have the potential to introduce harmonics, flicker or unbalance into the system.

Earthing A way of providing a connection between conductors and earth by an earthing device.

Earthing Device A means of providing a connection between a conductor and earth of adequate strength and capability for the intended purpose.

Equipment Plant and/or Apparatus.

Event An unscheduled or unplanned occurrence on or relating to a System including, without limiting that general description, faults, incidents and breakdowns.

Fault level Prospective current that would flow into a short circuit at a stated point on the System and which may be expressed in kA or, if referred to a particular voltage, in MVA.

Flicker Impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time.

Frequency The number of Alternating Current cycles per second, expressed in Hertz at which the System normally operates, i.e 50 Hertz.

Frequency Response The automatic adjustment of Active Power output from a Generation Unit(s) in response to Frequency changes.

Frequency Response System A facility providing the means to automatically adjust the Active Power output from a Generation Unit(s) in response to changes in Frequency.

Generating Plant A Power Station including any Generating Unit therein.

Generating Unit Any apparatus which produces electricity.

Generator A person who generates electricity under license.

Good Industry Practice The standard of practice attained by exercising 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.

Grid Connected Any Plant or Apparatus connected to the Transmission Grid is referred to as being Grid Connected.

Harmonics Sinusoidal currents with a frequency equal to an integer multiple of the fundamental frequency of the connection voltage.

High Voltage (HV) A voltage, used for the supply of electricity, whose lower limit of nominal rms value is greater than 35kV.

IEC International Electrotechnical Commission.

Individual Demand Site A single premises of a Demand Customer connected to the Distribution System with a Demand Reduction Capability. The Individual Demand Site shall have a Maximum Import Capacity and shall not have a Maximum Export Capacity.

Initial Demand Reduction The Demand Reduction of a Demand Side Unit following a Dispatch Instruction from the TSO when the Demand Reduction is at 0 MW for a period greater than 24 Hours

Initial Demand Reduction Time The time as specified by the Dispatchable Demand Customer in the Technical Parameters and is the time it takes for the Dispatchable Demand Customer to be able to implement the Initial Demand Reduction from receipt of the Dispatch Instruction from the TSO.

Isolated Disconnected from associated Equipment by a Disconnector or adequate physical separation.

kVA Kilovolt-amp

Low Voltage A voltage, used for the supply of electricity, whose upper limit of nominal rms value is 1kV.

Major Customer A customer who is connected to the Distribution System at Medium and High Voltage.

Maximum Down Time The maximum period of time during which Demand Reduction at a Demand Side Unit can be Dispatched.

Max Ramp Down Rate The maximum Ramp Down Rate of a Demand Side Unit. In the case of a Demand Side Unit which consists of an Aggregated Demand Site this shall be the aggregated maximum Ramp Down Rate of the Individual Demand Sites.

Max Ramp Up Rate The maximum Ramp Up Rate of a Demand Side Unit. In the case of a Demand Side Unit which consists of an Aggregated Demand Site this shall be the aggregated maximum Ramp Up Rate of the Individual Demand Sites.

Medium Voltage A voltage, used for the supply of electricity, whose nominal rms value lies between 1kV and 35kV.

Minimum Down Time The minimum period of time during which Demand Reduction at a Demand Side Unit can be Dispatched

MVA Megavolt-amp

MVAr Megavar (1,000,000 vars).

MW Megawatt (1,000,000 watts).

National Control Centre (NCC) /TSO's Control The TSO's National Control Centre, as notified by the TSO to the Generator from time to time

Operating Reserve The additional MW output required from Generating Units (or Demand Reduction) which must be realizable in real time operation to contain and correct any potential Total System Frequency deviation to an acceptable level. It will include Primary Operating Reserve, Secondary Operating Reserve and Tertiary Operating Reserve.

Operation A scheduled or planned action carried out on a System.

Operational Effect Any operation which causes the Transmission Grid or the Distribution System, or the system of other Users, to operate (or be at a materially increased risk of operating) differently from the way in which they would or may have operated in the absence of such effect.

Ownership Boundary The boundary between the Distribution System and Equipment owned by the User.

Point of Common Coupling The point on the Distribution System which is electrically nearest to the connection point and from which other customers' loads are, or may be, connected.

Planned Outage An outage of Generating Plant or of part of the Transmission System or of part of the Distribution System other than a forced outage.

Plant Fixed and movable items used in the generation and/or supply and/or transmission of electricity other than Apparatus.

Power Station An installation consisting of Generating Unit(s)

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

Reactive Power The product of voltage and current and the sine of the phase angle between them which is normally measured in Kilovars (kVAr) or Megavars (MVAr).

Registered Capacity The normal full load capacity of a Generating Unit as declared by the Generator less the MW consumed when producing the same.

Registered Data Data referred to in the schedules to the Data Distribution Registration Code.

Remote Terminal Unit (RTU) A device that collects, codes and transmits data. An RTU collects information from a master device and implements processes that are directed by that master. RTUs are equipped with input channels for sensing or metering, output channels for control, indication or alarms and a communications port.

Safety Management The procedure adopted by the DSO or a User to ensure the safe Operation of its System and the safety of personnel required to work on that System.

Safety Procedures The procedures specified within a Safety Management System.

SCADA Supervisory Control and Data Acquisition

Scheduling The procedure for determining intended usage of Generating Plant.

Significant Incident Events which have had or may have an operational effect on the Transmission or Distribution System or a Users Installation.

Step up Transformer Step Change A step change is defined as a single, rapid change of the RMS voltage. Distribution System Voltage step changes can occur due to switching in and out of capacitors, lines, cables, transformers and other plant.

Supplier A person authorized by license by GNERC to supply electricity to the connection point under a supply agreement.

System Stability The state of the System whereby predicted changes in load and generation can be accommodated without any detrimental effect on the System.

System Tests Those tests which involve simulating conditions or the controlled application of irregular, unusual or extreme conditions on the Total System or any part of it, but not including routine testing, commissioning or re-commissioning tests.

TSO Telecommunication Interface Cabinet The physical interface point between the TSO’s telecommunications equipment and the Wind Farm Power Station’s control equipment.

User A term used in various sections of the Distribution Code to refer to the persons using the ESB Distribution System, more particularly identified in each section of the Distribution Code.

Voltage Dip A sudden reduction of the voltage to a value between 90% and 1% of the declared voltage followed by a voltage recovery after a short period of time.

Voltage Fluctuations A series of rapid voltage changes which may be regular or irregular.

Voltage Reduction The method to temporarily control Demand by reduction of System voltage.

Voltage Regulation The automatic adjustment of Reactive Power output from a Generation Unit(s) in response to Voltage changes.

Voltage Regulation Set-point The voltage in kV that the Voltage Regulation System will act to regulate by continuous modulation of the Wind Farm Power Station's Reactive Power.

Voltage Regulation System A facility providing the means to automatically adjust the Reactive Power output from a Generation Unit(s) in response to changes in Voltage.

Voltage Unbalance In three-phase networks condition in which the rms values of the phase voltages or the phase angles between consecutive phases are not equal.

13.0 APPENDIX1 – RELEVANT CODES AND STANDARDS

[TO BE ADDED from Transmission Grid Code]

14.0 APPENDIX2 - STANDARD NOMENCLATURE

DSO standard practice currently requires that, unless otherwise agreed with the **DSO**, the following standard nomenclature shall apply **[TO BE VERIFIED WITH THE GEORGIAN CURRENT PRACTICE]**:

Generation Units:	For Hydro and Wind: G1, G2, etc
	For Thermal: U1, U2, etc
Generator Transformers (i.e. Transformers for Generation Unit Production)	at 110kV: T101, T102, etc
Power Station Transformers (i.e. dedicated transformers supplying both the Generation Unit and the Power Station auxiliaries from the HV busbar)	at 110kV: ST101, ST102, etc
Unit Transformers (i.e. transformers supplying auxiliaries of a Generation Unit)	UT1, UT2, etc
Load Transformers	For 110/35kV: T141, T142, etc
	For 110/20kV: T121, T122, etc
	For 110/11kV and below: T101, T102, etc
Bus Sections, conventional busbars	Single bus: A1, A2, etc
	Double Bus: A1, A2, B1, B2, etc
Bus sections, ring busbars:	Each section identified by designation of Plant and/or Apparatus item connected to it.
Bus Couplers	K1, K2, etc

Line and cables	each line or cable at a station identified name of station or stations at the remote end or ends of the line or cable in alphabetical order.
Circuit Breakers	CB
Main Earth Disconnects	DE
Line Disconnects	DL
Busbar Disconnects	DA, DB, etc
Coupler Disconnects DA, DB, etc	DA, DB, etc

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