

Distribution Code –final Version

# **DISTRIBUTION CODE**



# **DISTRIBUTION CODE**

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# **DISTRIBUTION CODE**

# PART 1: GENERAL CONDITIONS (GC)

# 1. SECTION: ORGANISATION AND OBJECTIVES

#### **1.1. SCOPE AND PURPOSE**

- 1.1.1. The **Distribution Code** (this Code) establishes the technical aspects of the connection, operation and use of a **Distribution System**, and the relationships between the **Distributor** and the **Users** of the **Distribution System**.
- 1.1.2. The **Distributor** must provide connection and deliver electric **Energy** to the **Users** in accordance with applicable Laws, its licence or concession and the **Distribution Code**, at a level of service quality consistent with the applicable **Distribution Performance Standards**.
- 1.1.3. The Users of the Distribution System must comply with the conditions and standards specified in this Code, to avoid adverse effect on the Distribution System or other User Systems.
- 1.1.4. The objective of these General Conditions are,
  - (a) To establish the conditions applicable to all the Distribution Code and , to the extent possible, ensure that the various parts and sections of the Distribution Code work together for the benefit of the Distributor and all Users, and apply consistently to all Users;
  - (b) To provide the principles and procedures for the development and application of the **Distribution Code**.
- 1.1.5. The **Distribution Code** contains procedures and provisions to permit equitable management of day to day technical situations encountered by **Distributors** and **Users**, taking account of a wide range of operational conditions likely to be encountered under both normal and exceptional circumstances.

# **1.2. UNFORESEEN CIRCUMSTANCES**

1.2.1. The **Distribution Code** cannot predict and address all possible operational situations. In case of circumstances unforeseen in this Code, or in the case of difference in interpretation, the **Distributor** has the right (and all **Users** must accept) to act in the course of the reasonable and **Prudent Industry Practice** discharge to its responsibilities within the following general principles and priorities:





- (a) As first priority, preserve or restore the integrity of the **Distribution System** or the **Transmission System**, including the avoidance of breakdown, separation or collapse (total or partial).
- (b) Compliance by the Distributor with the General Electricity Law, conditions in its Distribution Licence or Concession agreement, as applicable, and the Grid Code.
- (c) Preserve the safety of equipment, to prevent damage to **Plant** and/or **Apparatus**, and public safety to prevent personal injury.
- (d) The achievement of objectives specifically identified in the **Distribution Code**.
- 1.2.2. In case of an unforeseen circumstance that can not be resolved with the general principles defined in the previous condition, the **Distributor** shall act according to the following:
  - (a) The application of a policy aimed at the equitable sharing amongst **Users** of any temporary restriction that might be necessary in exceptional circumstances, and
  - (b) The application of **Prudent Industry Practice**.
- 1.2.3. If circumstances not envisaged by the provisions of the **Distribution Code** should arise, the **Distributors** shall, to the extent reasonably practicable in the circumstances, consult promptly and in good faith with the **Panel** or/and affected **Users** in an effort to reach agreement as to what should be done. If agreement between the **Distributor** and the **Panel** or affected **Users** cannot be reached in the time available, the **Distributor** shall determine what shall be done in accordance to this **Distribution Code**
- 1.2.4. The **Distributor** shall promptly refer any unforeseen circumstance identified, together with the determinations and interpretations made, to the **Distribution Code Review Panel** for consideration.
- 1.2.5. Each **User** shall comply with all instructions given to it by the **Distributor** following a determination for an unforeseen circumstance or a difference in interpretation, provided that such instructions are consistent with the technical characteristics of the **User**'s **System** and the principles established in the **Distribution Code**, and do not endanger the safety of its equipment or staff.

# **1.3. APPLICABILITY**

- 1.3.1. This **Distribution Code** must be applied and used together with the **Grid Code** and with the **Distribution Performance Standards Code**.
- 1.3.2. The General Conditions apply to:
  - (a) All **Distributors**
  - (b) All Users



# **1.4. EMRC ROLE**

- 1.4.1. The General Electricity Law assigns to the EMRC the authority to establish the appropriate operating codes and safety, security, and reliability standards. Within such powers, the EMRC has the authority to establish the initial Distribution Code and to approve amendments from time to time, as reviewed with the Distributors and affected Users.
- 1.4.2. The **Distributor** shall monitor compliance of **Users** with this **Distribution Code**. The **EMRC** will monitor compliance of the **Distributor** with the provisions of this **Distribution Code**.

#### **1.5. DEFINITIONS**

1.5.1. Any word or expression defined in the **General Electricity Law** or the **Grid Code** and that is not defined otherwise in this **Distribution Code** shall have, unless the contrary intention appears, the same meaning and interpretation when used in this **Distribution Code**, including its **Annexes**.

When applying the provisions contained in this **Distribution Code**, and unless otherwise specified or the subject matter or context otherwise requires:

- Active Power Active power is that instantaneous power derived from the product of voltage and current and the cosine of the voltage-current phase angle which is measured in watts or multiples.
- Ancillary Services means electrical services that enhance the stability and reliability of **Transmission System** or **Distribution System**, including frequency regulations, spinning reserves, voltage control and black start capability. Ancillary Services will be under the control of the System Operator, or the Distributor in those cases that the Generator does not have an impact on the Transmission System.
- Annex means an annex of this Distribution Code.
- Apparatus means electrical apparatus and includes all machines, fittings, accessories and appliances in which conductors are used;
- **Black Start Generator** means a Generator having an ability to start up from Shutdown without connections to external power supplies.
- **Bulk Supply Licensee** means the holder of the licence that authorises bulk supply, granted *pursuant to* Article 28 and 35 of the **General Electricity Law**.
- Business Day means any day other than Friday, Saturday or a public holiday in Jordan.
- **Condition** means a condition in this **Distribution Code**.



- Connection Agreement means an agreement between a User and the Distributor, which specifies the terms and conditions pertaining to the connection of the User's system or Equipment to the Distribution System.
- Connection Capacity means the capacity of a Connection Point as specified in the Connection Agreement.
- Connection Point means the point of connection of a User's System or Equipment to the Distribution System.
- Connection Point Drawing means the drawings prepared for each Connection Point, which indicates the Equipment layout.
- Consumer means a natural or juridical person or entity connected to the Distribution System, supplied and purchasing electric power for its own needs under a contract with a Distributor
- **Control Person** means a person who has been nominated by an appropriate officer of the **Distributor**, **Transmission Licensee** or a **User** to be responsible for controlling and coordinating safety activities necessary to achieve Safety FromThe **System**.
- **Demand** means the demand of MW or MVAr of electricity (i.e. both **Active Power** and **Reactive Power** respectively) unless otherwise stated.
- **Detailed Planning Data** means detailed additional data that the **Distributor** requires under the Distribution Planning and Connection Code in support of the **Standard Planning Data**.
- **Distribution Code** means this **Distribution Code** established by the **EMRC** as revised and amended from time to time with the approval of, or by the direction of, the **EMRC**.
- **Distribution Code Review Panel** or **Panel** means the standing body established under the **Distribution Code** Glossary and Definitions.
- Distribution Code Standards means the standards identified in Annex 1 of this Distribution Code.
- **Distribution Performance Standards** means the **Distribution Performance Standards Code** issued by the **EMRC** and reviewed from time to time by the **EMRC**.
- **Distribution System** means a system consisting of cables, overhead lines, electrical **Plant** and **Apparatus**, having a design voltage of 33 kV or lower, used for the distribution of electric power from **Connection Points** between the **Transmission System** and the **Distribution System** to the point of delivery to **Consumers** or other **Users**, but shall not include any part of a **Transmission System**, as defined in the **General Electricity Law**.
- **Distributor** means a holder of a Distribution and Retail Supply Licence or concession.



- Electric System has the meaning given to it in the General Electricity Law
- **Electrical Diagrams** means a schematic representation, using standard electrical symbols, which shows the connection of **Equipments** to each other or to the external circuits.
- **Embedded Generation** has the meaning given to it in the **<u>General Electricity Law</u>**.
- Energy means, unless otherwise qualified, active Energy.
- **Equipment** means all **Plant** and/or **Apparatus**, machines, conductors, etc. used as part of, or in connection with, an electrical installation..
- EMRC means the Electricity Sector Regulatory Commission constituted under the General Electricity Law.
- Fluctuating Load means a load that causes a series or cyclical voltage changes.
- Force Majeure means any circumstance not within the reasonable control of the affected party, but only if and to the extent that (i) such circumstance, despite the exercise of reasonable diligence and observing **Prudent Industry Practice**, cannot be, or be caused to be, prevented, avoided or removed by such party, and (ii) such circumstance materially and adversely affects the ability of the affected party to comply with its performance obligations under this Code, and such party has taken all reasonable precautions, due care and reasonable alternative measures in order to avoid the effect of such event on the affected party's ability to perform its obligations under its performance obligations under this Code and to mitigate the consequences thereof.
- General Electricity Law means the General Electricity Law No. 64 of the Year 2002 or any amendments thereto or any other law that replaces the said law.
- Generating Plant means a facility, consisting of one or more Generating Units, where electric Energy is produced from some other form of Energy by means of a suitable Apparatus.
- Generating Unit means a conversion Apparatus including auxiliaries and associated Equipment functioning as a single unit, which is used to produce electric Energy from some other form of energy.
- Generator Connected to Distribution means any Generator connected to the Distribution System. It includes Embedded Generators and any other Generating Unit connected to the Distribution System regardless on whether it holds or not a generation licence or concession.
- Grid Code has the meaning given to it in the General Electricity Law.
- Grid Code Review Panel means the review panel established under the Grid Code for the review and amendment proposals to such code.



- **Harmonics** means sinusoidal voltages and currents having frequencies that are integral multiples of the fundamental frequency.
- **High Voltage (HV):** means a voltage level exceeding 33 kV.
- Individual Current Harmonic Distortion (I<sub>IHD</sub>) means the ratio of the RMS current of the specific harmonic to the RMS value of the fundamental current.

$$I_{IHD} = \frac{Ii}{I_1} * 100\%$$
; where

Ii = Current component of harmonic order i II = Current component of fundamental frequency (50 Hz)

- Interruption means the interruption of electricity supply to a User or to a group of Users.
- Large Connection means a connection where the Connection Capacity is greater than [4 MVA] or connections with generation facilities greater than [300 kW].
- Load means an entity or electrical Equipment that consumes Energy.
- Long Duration Voltage Variation means a variation of the RMS value of the voltage from nominal voltage for a time greater than one minute.
- Low Voltage (LV) means a voltage level not exceeding 1000 volts.
- Maximum Load (in the Distribution Metering Code –DMC) means the monthly maximum load in kW which occurs and continues for a period of at least 30 minutes during the pre-specified periods or system conditions, as indicated in the approved electricity tariffs.
- Medium Connection means a connection where the Connection Capacity is greater than [50 KVA] and up to and including [4MVA] where no generation facility greater than [50 kW] exists for an LV connection and no generation facility greater than [300 kW] exists for an MV connection
- Medium Voltage (MV) means a voltage level greater than one (1) kV up to 33 kV.
- Meter means a device for measuring active Energy, reactive Energy or Maximum Demand.
- Metering Equipment means Meters, measurement transformers (voltage, current or combination units), metering protection equipment including alarms, circuitry, associated communications equipment and outstations and wiring
- Metering Point means the point on a Distribution System at which electrical energy and/or Maximum Demand:
  - (a) is measured or is intended to be measured; or



- (b) was measured or was intended to be measured; or
- (c) in the case of an un-metered **Connection Point**, is deemed to be measured
- Metering System means particular commissioned Metering Equipment
- **NEPCO Metering Code** means the Hashemite Kingdom of Jordan National Electric Power Company Metering Code
- Normal Conditions means the condition in the Transmission or Distribution System, as applicable, when the system frequency, voltage, and transmission and/or distribution lines and equipment loading are within their Normal Operation limits.
- Normal Operation has the same meaning given to it in the Grid Code.
- **Operation** means a scheduled or planned action relating to the operation of the **System**.
- **Operational Boundary** means the boundary between the **Apparatus** operated by the **Distributor** or a **User** and the **Apparatus** operated by Other **Distributor**(s) or other **User**(s), as specified in the relevant **Connection Agreement**.
- Output Usable (for a generator) means the portion of Registered Capacity which is available due to a Planned Outage or breakdown.
- Distribution Performance Standards Code means the Distribution Performance Standards Code issued and revised from time to time by the EMRC.
- **Plant** means fixed and movable items used in the generation and/or supply and/or transmission of electricity other than **Apparatus**.
- **Power quality** means the quality of the voltage, including its frequency and the resulting current that exists at the connection point during **Normal Conditions**.
- **Prudent Industry Practice** means those standards, practices, methods and procedures conforming to safety and legal requirements which are 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 power sector activities under the same or similar circumstances;
- **Reactive Power** means the product of voltage and current and the sine of the phase angle between them, measured in Kilovar (kVAr) or Megavar (MVAr).
- **RMS** means the root-mean-square.
- Rural Consumer means a Consumer that does not qualify as Urban Consumer;
- Safety from the System means that condition which safeguards persons working on or testing Apparatus from the dangers that are inherent in working on items of Apparatus,



which are used separately or in combination in any process associated with the generation, transmission or distribution of electricity.

- Safety Management System means the procedure adopted by the Distributor or a User to ensure the safe **Operation** of the System and the safety of personnel required to work on that System.
- SCADA means Supervisory Control and Data Acquisition
- Schedule Outage means an outage to a Consumer decided by the Distributor, provided that it has been advertised to the affected Consumers at least [72 hours] in advance.
- Section means a section of this Distribution Code.
- Site Responsibility Schedule means a schedule defining the ownership, operation and maintenance responsibility of Plant and Apparatus at a Connection Point between a Distribution System and a User's System. The Site Responsibility Schedule will be included in the Connection Agreement
- Small Connection means a Low Voltage connection with a Connection Capacity of up to and including [50 kVA], and where there is no Generation Unit rated greater than [16A] per phase,
- **Standard Planning Data** means the general information required by the **Distributor** under the Distribution Planning Code.
- **System** means an electrical network running at various voltages.
- System Losses means in a Distribution System, the difference between the Energy purchased plus the energy generated by the Distributor and the Energy sold by the Distributor or exported to other distribution networks.
- System Operator means the holder of the licence that authorises system operation granted under Articles 28 and 34 of the General Electricity Law.
- **Tariff Methodology** means the principles for tariff calculation and review, approved by the **EMRC** and applicable to the **Distributor** and modified from time to time by the **EMRC**, in accordance to article 9 B and 47 of the **General Electricity Law**.
- Total Current Harmonic Distortion (I<sub>THD</sub>) means the ratio of the RMS voltage of the harmonic content to the RMS value of the fundamental voltage, expressed in percent.

$$I_{THD} = \sqrt{\frac{\sum I_1^2}{I_1^2}} *100\%$$
; where

Ii = Current of harmonic order Ii

 $I_1$  = Current component of fundamental frequency (50 Hz)

• **Total Harmonic Distortion (THD)** means the ratio of the **RMS** voltage of the harmonic content to the **RMS** value of the fundamental voltage, expressed in percent.



 $THD = \sqrt{\frac{\sum V_i^2}{V_1^2}} *100\% \text{ ; where}$  Vi = Voltage component of harmonic order i  $V_l = \text{Voltage component of fundamental frequency (50 Hz)}$ 

- **Transmission Licensee** means the holder of the transmission licence granted under Articles 28 and 33 of the **General Electricity Law**, and that during the single buyer model is also the system operation licensee and the single bulk supply licensee.
- Total System means the Transmission System to which the Distribution System is connected and all Systems of Transmission System Users within Jordan.
- Transmission System has the meaning given to it in the General Electricity Law.
- Transmission System User means any person or entity other than the Transmission System Operator making use of the Transmission System.
- Urban Consumer means a Consumer that is located in a village with more than [3.500] distribution connections, with the exceptions granted by the EMRC according to the procedures indicated in the Distribution Performance Standards Code.
- Urgent Metering Services means urgent unplanned work by a Distributor on a Metering System as a result of actual or potential equipment failure or suspected theft
- User means a person or entity that uses or seeks to use the Distribution System, including another Distributor but excluding the Transmission Licensee.
- Voltage Unbalance means the absolute value of the maximum deviation of the line voltage from the average voltage on a three-phase System, divided by the average voltage.

# **1.6. INTERPRETATION**

- 1.6.1. In this **Distribution Code** (including the **Annexes**), unless the context otherwise specifies or requires:
  - (a) references to "the **Distribution Code**" or "this **Distribution Code**" or "this **Code**" are a reference to the whole of the **Distribution Code**, including any **Annexes** or other documents attached to any part of this **Distribution Code**;
  - (b) the **Annexes** shall be deemed to be part of this **Distribution Code**;
  - (c) capitalised words used shall have the meanings assigned to them in the Definition chapter of the General Conditions **Section**;
  - (d) words corresponding to persons or parties shall include any individual, firm, joint venture and corporation, and all references to persons shall include their legal successors and permitted assignees;
  - (e) words in singular only also include the plural and vice versa where the context requires;



- (f) words in the masculine shall include the feminine and vice versa;
- (g) any reference to a day, month or year shall be construed as reference to a calendar day, month or year, as the case may be, and all references to specific dates shall be to the day commencing on such date at 00:00 hours;
- (h) the headings are for ease of reference only and shall not be deemed part of and shall neither affect nor be used in the interpretation or construction of this **Distribution Code**;
- (i) the word "include" or "including" shall be construed without limitation;
- (j) the word "shall" refers to a rule, procedure, requirement or any provision of this **Distribution Code** that requires mandatory compliance;
- (k) where reference is made to an amount or sum, it is to an amount or sum denominated in Jordanian Dinar (JD);
- all references to a numbered Annex, Section or Condition is respectively a reference to the Annex, Section or Condition bearing that number in this Distribution Code as well as the case for a numbered table or section in a Condition or Annex
- (m) references to the consent or approval of the **EMRC** shall be references to the approval or consent of the **EMRC** in writing, which may be given subject to such conditions as may be determined by the **EMRC**, as that consent or approval may be amended, modified, supplemented or replaced from time to time and to any proper order, instruction or requirement or decision of the **EMRC** given, made or issued under it; and
- (n) reference to any law, by-law, code, regulation made under any law, directive or other document issued by the EMRC shall be construed to refer to such law, bylaw, code, regulation made under any law, directive or other document issued by the EMRC as amended, modified or replaced from time to time. In particular, any reference to a licence shall be to that licence as amended, modified or replaced from time to time and to any rule, document, decision or arrangement promulgated or established under that licence.

# **1.7. HIERARCHY**

- 1.7.1. In the event of any inconsistency between this **Distribution Code** and the **General Electricity Law** or the license or concession of a **Distributor** or a Licensee that is a **User**, the **General Electricity Law** or the license or concession respectively shall prevail to the extent of such inconsistency.
- 1.7.2. In the event of any inconsistency between this **Distribution Code** and the **Grid Code**, the latter shall prevail to the extent of such inconsistency unless the contrary intention is explicit in this **Distribution Code**.
- 1.7.3. Nothing in this **Distribution Code** is intended to or shall derogate from a **Distributor** or a Licensee any license or concession obligation.



- 1.7.4. If any provision of this **Distribution Code** should be found to be unlawful or wholly or partially invalid for any reason, the validity of all remaining provisions of this **Distribution Code** shall not be affected.
- 1.7.5. If part of a provision of this **Distribution Code** is found to be unlawful or invalid but the rest of such provision would remain valid if part of the wording were deleted, the provision shall apply with such minimum modification as may be:
  - (a) necessary to make it valid and effective; and
  - (b) most closely achieves the result of the original wording but without affecting the meaning or validity of any other provision of this **Distribution Code**.
- 1.7.6. In the event of any conflict between the provisions of this **Distribution Code** and any contract, agreement or arrangement between the **Distributor** and a **User**, the provisions of this **Distribution Code** shall prevail unless this **Distribution Code** expressly provides otherwise, provided that in the case of **Connection Agreements** with **Consumers** or **Users** signed prior to the approval of this **Distribution Code**, the conditions in such agreement shall prevail unless
  - (a) the parties agree an amendments: or
  - (b) the **User** registers a non-compliance situation that negatively affects the security of the **Distribution System**, in which case the **User** must accept the necessary amendments to ensure full compliance with this **Distribution Code**, except for any derogation.

# **1.8. DEROGATIONS**

- 1.8.1. If a **User** finds that it is, or will be, unable to comply with any provision of this **Distribution Code**, then the **User** shall, without delay, report such non-compliance to its **Distributor** (to whose Distribution Network the **User** is connected) and shall make such reasonable efforts as are required to remedy such non-compliance as soon as is reasonably practicable.
- 1.8.2. When the non compliance described in the previous **Condition** arises upon the issuance of this **Distribution Code**, or a revision to this **Distribution Code** or the **Grid Code** relating to **Equipment** already connected to the **Electric System** or **Equipment** approved to be connected to the **Distribution System** where the **User** has commenced the procurement or works prior to the issuance of this **Distribution Code** or the revision to this **Distribution Code**, and the **User** believes either that it would be unreasonable (including on the grounds of cost and technical considerations) to remedy such non-compliance or that it should be granted an extended period to remedy such non-compliance, the **User** shall promptly submit to the **Distributor** a request for derogation from such provision in accordance with this **Section**. The burden of proof shall rest with the **User** to show good reason why it cannot comply.
- 1.8.3. If a **Distributor** finds that it is, or will be, unable to comply with any provision of this **Distribution Code**, then it shall, without delay, report such non-compliance to the **EMRC**



and shall make such reasonable efforts as are required to remedy such non-compliance as soon as is reasonably practicable.

- 1.8.4. When the non compliance described in the previous **Conditions** arises upon the issuance of this **Distribution Code**, or a revision to this **Distribution Code** or the **Grid Code** relating to **Equipment** already connected to the **Electric System** or **Equipment** approved to be connected to the **Distribution System** where the **Distributor** has commenced the procurement or works prior to the issuance of this **Distribution Code** or the revision to this **Distribution Code**, and the **Distributor** believes either that it would be unreasonable (including on the grounds of cost and technical considerations) to remedy such non-compliance or that it should be granted an extended period to remedy such non-compliance, the **Distributor** shall promptly submit to the **EMRC** a request for derogation from such provision in accordance with this **Section**. The burden of proof shall rest with the **Distributor** to show good reason why it cannot comply.
- 1.8.5. A request for derogation from any provision of this **Distribution Code** shall contain:
  - (a) the detail of the **Equipment** and **Connection Point** in respect of which derogation is sought and if relevant, the nature and extent of non-compliance;
  - (b) the provision of this **Distribution Code** with which the **Distributor** or **User** that requests the derogation is, or will be, unable to comply;
  - (c) the reason for the non-compliance; and
  - (d) the remedial actions and the date by which compliance could be achieved (if remedy of the non-compliance is possible).
- 1.8.6. Every six months, the **Distributor** shall report to the **EMRC**:
  - (a) the list of derogations requested during the last quarter, including requests by the **Distributor**, and the status of each request;
  - (b) the list of approved derogations during the last quarter indicating type of derogation and party; and
  - (c) for each approved derogation, the progress of remedial actions in achieving compliance.
- 1.8.7. On receipt of any request for derogation, the **Distributor** or the **EMRC**, as applicable, shall promptly consider such a request provided that the **Distributor** or the **EMRC** considers that the grounds for the derogation are reasonable. In its consideration of a derogation request, the **Distributor** or the **EMRC** as applicable may contact the relevant **Distributor** or **User** to obtain clarifications of the request or request additional information or to discuss changes to the request, and review possible remedial actions to achieve compliance as soon as reasonably practicable.

#### 1.8.8. The **Distributor** shall:

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



- (b) on request from the **EMRC** or any **User**, provide a copy of such register of derogations.
- 1.8.9. The **EMRC** shall keep a register of all derogations that have been granted to **Distributors**, identifying the name of the **Distributor** in respect of whom the derogation has been granted, the relevant provision of this **Distribution Code** and the period of the derogation.
- 1.8.10. The **EMRC** may initiate at its own initiative or at the request of a **Distributor**, or in view of a **User** complaint, a review of any existing derogations, and any derogations under consideration where a relevant and material change in circumstance has occurred.

# **1.9. DATA AND NOTICES**

- 1.9.1. Submission of data under this **Distribution Code** shall be in electronic format or any suitable format established by the **Distributor**.
- 1.9.2. Submission of notice(s) under this **Distribution Code** shall be by hand delivery, registered first-class mail, telex or facsimile transfer or e-mail. Exceptions to this requirement may be made with the agreement of the party with the **Distributor** or the **EMRC**.
- 1.9.3. Any notice required to be given by this **Distribution Code** shall be deemed to have been given or received:
  - (a) if sent by hand, at the time of delivery;
  - (b) if sent by post, from and to any address within Jordan, [four (4) **Business Days**] after posting unless otherwise proven; or
  - (c) if sent by facsimile, subject to confirmation of uninterrupted transmission report, or by e-mail, [one hour] after being sent, provided that any transmission sent after [14:00 hours] on any day shall be deemed to have been received at [08:00 hours] on the following **Business Day** unless the contrary is shown to be the case.

# **1.10. CONFIDENTIALITY**

- 1.10.1. The **Distribution Code** contains procedures under which a **Distributor**, in pursuance of its obligations as a **Distributor**, will receive information from **Users** relating to the intentions of such **Users**. Unless otherwise specifically stated in this **Distribution Code**, the **Distributor** shall be at liberty to share all data with **Users** likely to be affected by the matters concerned and for the specific technical matters and uses provided in this **Distribution Code**. In all cases the **Distributor** shall and may be required to share the data with the **EMRC**.
- 1.10.2. The **Distributor** shall not, except in pursuance of specific requirements of the **Distribution Code** or other applicable codes approved by the **EMRC** or conditions in its licence or concession, disclose such information for other uses than those provided in this **Distribution Code** to any other **User** or other person without the prior written consent of the provider of the information, provided that this inhibition shall not apply to information required by the **EMRC**.



# 2. SECTION: REVIEW PROCESS AND CODE DISPUTES

### 2.1. DISTRIBUTION CODE REVIEW PANEL

- 2.1.1. The EMRC shall establish and maintain a Distribution Code Review Panel ("the Panel")
- 2.1.2. The **Panel** shall:
  - (a) Maintain and ensure publication of the current version of the **Distribution** Code;
  - (b) Keep the **Distribution Code** and its working under review;
  - (c) Review all proposals for amendment of the **Distribution Code** that the **EMRC**, a **Distributor**, or any User or the System Operator may submit for consideration by the **Panel**;
  - (d) Submit to the **EMRC** recommendations to each proposal for amendment to the **Distribution Code** and the reasons for the recommendations;
  - (e) Issue guidance in relation to the **Distribution Code** and its implementation, unforeseen circumstances and interpretation when asked to do so by the **EMRC**, any **Distributor** or **User**;
  - (f) Consider what changes are necessary to the **Distribution Code** arising out of any unforeseen circumstances referred to it by a **Distributor and submit to the EMRC the relevant amendment proposal**;
  - (g) Establish and maintain joint coordination arrangements with the **Grid Code Review Panel** to coordinate changes to and consistent development of the **Grid Code** and the **Distribution Code**.
- 2.1.3. The **Panel** shall consist of:
  - (a) One member from the **EMRC** who will act as Chairman, with no voting rights
  - (b) One member from each of the Distribution and Retail Supply Licensees.
  - (c) One member representing Generators Connected to Distribution.
  - (d) One member representing the commercial consumers, appointed by the Jordan Commercial Chamber-.
  - (e) One member representing the industrial consumers, appointed by Jordan Industry Chamber.
  - (f) One member representing the residential consumer, appointed by **Consumer**'s protection associations
  - (g) One member from the **System Operation** Licensee as observer with no voting rights.
- 2.1.4. As possible, the representative appointed by a **Distributor** shall also be a member of the **Grid Code Review Panel**.



2.1.5. The **Panel** shall establish, publish and comply with its own internal rules. These internal rules shall be approved by the **EMRC**.

# 2.2. DISTRIBUTION CODE AMENDMENTS

- 2.2.1. All revisions to the **Distribution Code** must be first reviewed by the **Distribution Code Review Panel** prior to submission to the **EMRC** for approval. All proposed revisions from **Users**, the **EMRC**, a **Distributor** or the **System Operator** shall be sent to the Chairman of the **Distribution Code Review Panel** for consideration by the **Panel**. The Chairman will advise the **Panel** of all proposed revisions to the **Distribution Code** with notice of no less than [20 **Business Days**] in advance of the next scheduled meeting of the **Distribution Code Review Panel**.
- 2.2.2. Following the review of a proposed revision by the **Distribution Code Review Panel**, the **EMRC** shall review the **Panel** recommendation. The **EMRC** shall consider the proposed revision, other views, and any further representations and shall determine whether the proposed revision should be made and, if so, whether in the form proposed or in an amended form.
- 2.2.3. If the EMRC decides that the revision shall be made, the Chairman shall notify each **Distributor**, in a manner approved by the EMRC, of the revision at least [10 Business **Days**] prior to the revision taking effect. The revision shall take effect with this **Distribution Code** deemed to be amended accordingly from [and including] the date specified in such notification or other such date as directed by the EMRC. The representatives of **Distributors** in the **Panel** shall have the responsibility of drafting the amended **Conditions**, unless the EMRC specifies that such amendment shall be drafted by the EMRC.
- 2.2.4. After any amendment to the **Distribution Code**, each **Distributor** shall publish the revised version.

# 2.3. DISTRIBUTION CODE DISPUTES

- 2.3.1. If any dispute arises between **Users** or between a **Distributor** and any **User** in relation to this **Distribution Code**, the parties in dispute shall use their best endeavours to resolve the dispute amicably between themselves.
- 2.3.2. If one or more of the parties is not a license holder, the party or parties may refer the dispute to the **EMRC** for determination, unless a contract between the parties in dispute provides otherwise.
- 2.3.3. If the dispute is between Licensees only, the dispute may be referred to the **EMRC** for determination if a contract so requires, or if all parties in dispute agree to such action.



# PART 2: PLANNING AND CONNECTION CODE (DPCC)

# 1. SECTION: PURPOSE AND SCOPE

# **1.1. INTRODUCTION**

- 1.1.1. The Distribution Planning and Connection Code (**DPCC**) specifies the technical and design criteria and the procedures to be complied with by the **Distributor** 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**
- 1.1.2. The User's requirement may necessitate the reinforcement of, or extension to the **Distribution System** and in some cases may require the **Distributor** to seek the reinforcement or extension to the capacity of the relevant point of interconnection, between the **Distribution System** and the **Transmission System**. This may arise for a number of reasons including but not limited to:
  - (a) A development on a User's System already connected to the Distribution System;
  - (b) Introduction of a new Connection Point between the User's System and the Distributor's System;
  - (c) To increase the **System** capacity, remove operating constraints and maintain standards of security to accommodate a general increase in electricity **Demand**.
- 1.1.3. Accordingly the reinforcement or extension of the **Distribution System** may involve work at the following locations:
  - (a) At a **Connection Point** between a **User**'s **System** and the **Distribution System**;
  - (b) On the **Distribution System** or other facilities which join a **Connection Point** to the remainder of the **Distribution System**;
  - (c) At or between points on the **Distribution System** remote from the **Connection Points**.
- 1.1.4. The time required for the planning and development of the **Distribution System** and any consequential development of the **Transmission System** will depend on the type and extent of the necessary reinforcement and / or extension work, and the degree of complexity of the new work, while maintaining satisfactory security and quality of supply. Development of the **Distribution System** shall be planned with sufficient lead time to allow for any foreseeable delay in the obtaining of any necessary statutory consents or way leaves including any associated hearing if required.
- 1.1.5. An offer by a **Distributor** to a **User** for connection to or use of the **Distribution System** may be conditional upon the grant of consents or other external factors. In such circumstances, the **Distributor** shall do all that is reasonably practicable to progress the matter expeditiously.



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

# **1.2. PURPOSE**

- 1.2.1. The purpose of the Distribution Planning and Connection Code is:
  - (a) to specify the technical, design, and operational criteria at each **Connection Point**;
  - (b) to ensure that there is no undue discrimination in the application of the **Distribution Code** between **Users**, classes of **User** or other **Distributors**;
  - (c) to facilitate the use of the Distribution System by any User connected to or seeking connection to the Distribution System, in accordance with a Connection Agreement;
  - (d) to define the requirements for a **User** seeking connection and/or for a modification of the current connection, and to define the procedures for the exchange of **System** planning data between the **Distributor** and **Users**;
  - (e) to list and collate the data to be provided by the **User** to the **Distributor** and to list the data to be provided by the **Distributor** to the **User**;
  - (f) to enable the **Distributor** to develop, maintain and operate the **Distribution System** in a coordinated and economic manner in compliance with the **Distributor**'s licence;
  - (g) to provide sufficient information for a **User** to assess opportunities for connection and to plan and develop its **System** so as to be compatible with the **Distribution System**.

# 1.3. SCOPE

- 1.3.1. The Distribution Planning and Connection Code (DPCC) applies to the following:
  - (a) The Distribution Licensees (**Distributors**)
  - (b) Users connected or seeking connection to the Distribution System.



# 2. SECTION: PROCEDURES FOR CONNECTION OR MODIFICATION

# 2.1. APPLICATION FOR CONNECTION

- 2.1.1. Any User seeking a new or modified connection to the **Distribution System** will submit to the **Distributor** a connection application. Suitable forms shall be provided by the **Distributor**, depending on the required **Connection Capacity** and the nature of the **User**'s **Equipment** to be connected.
- 2.1.2. When requested by the **User** seeking a new or modified connection, the **Distributor** shall furnish relevant **System** data. Detailed data relating to the interface between the **Distribution System** and that of the **User**, covering circuit parameters, switchgear and Protection arrangements of equipment directly connected to or affecting the **Distribution System** to enable the **Distributor** to assess any implications associated with these points of connection.

# All Connections

- 2.1.3. Users shall contact the **Distributor** in advance if it is proposed to make any significant change to the connection, electric lines or electrical **Equipment**, install or operate any generating equipment or do anything else that could affect the **Distribution System** or require alterations to the connection.
- 2.1.4. **Users** shall provide the **Distributor** with any information requested about the nature, or use by the **User**, of electrical equipment on the **User**'s premises. The **Distributor** will only ask for information that is needed by it in relation to its distribution license distribution concession or the **Distribution Code**.
- 2.1.5. Should a preliminary examination of this data indicate that more detailed information is required then it shall be provided to the **Distributor** on request. The **Distributor** will only ask for information that is needed by it in relation to its Distribution License or the **Distribution Code**.
- 2.1.6. In some cases, more detailed information may need to be provided 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 build up of load and a proposed commissioning programme. This information will be specifically requested by the **Distributor** when necessary.

#### **Small Connections**

- 2.1.7. For new or modified **Small Connections**, 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 limited **Standard Planning Data** provided by the **User**:
  - (a) The requested **Connection Capacity** in kVA<u>or in (Amp)</u>;
  - (b) Date when the new or modified connection is required.



### **Medium Connections**

- 2.1.8. For new or modified **Medium Connections** the required **Standard Planning Data** provided by the **User** will include, in addition to that required by **DPCC** 2.1.8:
  - (a) Expected Point of Connection to the **Distribution System** (geographical and electrical).
  - (b) The date when connection is required.
  - (c) Single line diagrams of existing and proposed arrangements of main **Plant** and **Apparatus** showing equipment rating and operating parameters.
  - (d) Type and electrical loading of equipment to be connected, e.g. number and size of motors, electrical heating arrangements, etc.
  - (e) For all types of load:
    - (i) Requested Connection Capacity (kVA) or (Amp).
    - (ii) Maximum Active Power Demand (kW)
    - (iii) Maximum Reactive Power requirements (kVAr).
  - (f) For **Fluctuating Loads**:
    - (i) The rate of change of the **Demand**;
    - (ii) The switching interval; and
    - (iii) The magnitude of the largest step change.
  - (g) The maximum phase unbalance which the User would expect the **Demand** to impose on the **Distribution System**.
  - (h) The maximum flicker and/or harmonic content which will be imposed on the **Distribution System**.
  - (i) Details of any load management scheme to be applied by the User on the User System.
  - (j) Three phase short circuit infeed from all sources within the User's System, based on Generation Set sub-transient reactance and the minimum zero phase sequence impedance of the User's System.
  - (k) **Reactive Power** switching arrangements:
    - (i) Rated Capacity (MVAR);
    - (ii) Rated Voltage (kV);
    - (iii) Type (e.g., shunt inductor, shunt capacitor, static var compensator); and
    - (iv) Operation and control details (*e.g.* fixed or variable, automatic, or manual).
  - (l) Grounding arrangements
  - (m) Standard load profiles
  - (n) In the cases the **User** is connected to the **Distribution System** through a step up transformer:



- (i) Rated MVA;
- (ii) Rated voltages (kV);
- (iii) Winding arrangement;
- (iv) Positive and zero sequence resistance and reactance
- (v) Tap changer range, step size and type (on-Load or off-Load); and
- (vi) Basic Lightning Impulse Insulation Level (kV).

#### **Large Connections**

- 2.1.9. For new or modified Large Connections the Standard Planning Data supplied by the User will include, in addition to that required by DPCC 2.1.8:
  - (a) **Load** data
    - (i) Type of load and control arrangements (e.g. controlled rectifier or large motor drives and type of starter employed).
    - (ii) Maximum load on each phase at the time of Peak Demand
    - (iii) **Demand** profiles (48 x half hour average estimates) for Active and **Reactive Power Demand** for the day of **Distribution System** Peak **Demand** and for the day of the **Transmission System** Peak **Demand**.
    - (iv) In relation to Fluctuating Loads
      - The rates of change of **Demand** (Active Power and Reactive Power) both increasing and decreasing.
      - The shortest repetitive time interval between fluctuations in **Demand** (Active Power and Reactive Power).
      - The magnitude of the largest step changes in Active Power and Reactive Power, both increasing and decreasing
      - Sensitivity of **Demand** to fluctuations in voltage and frequency of supply at the time of Peak **Demand**: Voltage sensitivity (kW/kV and kVAr/kV) and Frequency sensitivity (kW/Hz and kVAr/Hz).
  - (b) **Equipment** data
    - (i) Circuit parameters (positive and zero sequence resistance and reactance; positive and zero sequence shunt susceptance) of the overhead lines and/or underground cables from the User's substation to the Connection Point in the Distribution System (if they are different)
    - (ii) for the switchgear, including circuit breakers, Load break switches, and disconnect switches at the Connection Point and at the substation of the User (if they are different):
      - Rated voltage (kV);
      - $\circ$  Rated current (A);



- Rated symmetrical **RMS** short-circuit current (kA); and
- Basic Lightning Impulse Insulation Level (kV).

# **Generators**

- 2.1.10. Users seeking connection to the Distribution System for Generation Connected to the Distribution System greater than 50 kW shall provide the following additional information of each Generation Unit:
  - (a) Rated Capacity (MW) on a monthly basis if applicable;
  - (b) Minimum Stable Loading (MW);
  - (c) **Reactive Power** capability;
  - (d) Stator armature resistance;
  - (e) Direct axis synchronous, transient, and subtransient reactances;
  - (f) Quadrature axis synchronous, transient, and subtransient reactance's;
  - (g) Direct axis transient and subtransient time constants;
  - (h) Quadrature axis transient and subtransient time constants;
  - (i) Turbine and Generating Unit inertia constant (MWsec/MVA);
  - (j) Rated field current (amps) at rated MW and MVAR output and at rated Terminal voltage; and
  - (k) Short circuit and open circuit characteristic curves.
  - (1) Information on Step-up Transformers:
    - (i) Rated MVA;
    - (ii) Rated voltage (kV);
    - (iii) Voltage ratio;
    - (iv) Positive sequence resistance and reactance (maximum, minimum, and nominal tap);
    - (v) Zero sequence resistance and reactance;
    - (vi) Tap changer range;
    - (vii) Tap changer step size; and
    - (viii) Tap changer type: on **Load** or off circuit.
- 2.1.11. In addition with the data specified in **DPCC** 2.1.10, the following data could be required by the **Distributor** for all **Generating Units** with Rated Capacity greater than 5 MW:
  - (a) Parameters for the excitation control **System**:
    - (i) DC gain of Excitation Loop;
    - (ii) Rated field voltage;



- (iii) Maximum field voltage;
- (iv) Minimum field voltage;
- (v) Maximum rate of change of field voltage (rising);
- (vi) Maximum rate of change of field voltage (falling);
- (vii) Details of Excitation Loop described in diagram form showing transfer functions of individual elements;
- (viii) Dynamic characteristics of over excitation limiter; and
- (ix) Dynamic characteristics of under excitation limiter.
- (b) Parameters for the speed-governing control system:
  - (i) Governor average gain;
  - (ii) Speeder motor setting range;
  - (iii) Speed droop characteristic curve;
  - (iv) Time constant of steam or fuel governor valve or water column inertia;
  - (v) Governor valve opening limits;
  - (vi) Governor valve rate limits; and
  - (vii) Time constant of turbine.
  - (viii) A governor block diagram showing the transfer functions of individual elements.
- (c) Auxiliaries data:
  - (i) Normal unit-supplied auxiliary **Load** for each **Generating Unit** at rated MW output; and
  - (ii) Each Generation Unit auxiliary **Load** other than (a) above and where the station auxiliary **Load** is supplied from the **Distribution System**.
- 2.1.12. The following **Plant** flexibility performance data for each **Generating Plant** shall be submitted:
  - (a) Existence of Black Start Capability
  - (b) Rate of Loading following Shutdown
  - (c) Rate of Load Reduction from normal rated MW; and
  - (d) Regulating range

# 2.2. PROCESSING OF APPLICATIONS

2.2.1. The **Distributor** shall establish the procedure for the processing of applications for connection or Modification of an existing connection to the **Distribution System**. The **Distributor** shall process the application for connection or Modification to an existing connection within the time frames indicated in the **Distribution Performance Standards Code**.



- 2.2.2. Any User applying for connection or a Modification of an existing connection to the **Distribution System** shall take all necessary measures to ensure that its proposed connection or Modification fulfils all the requirements stated on the "Technical Conditions at the **Connection Point**" section of this Code, and shall not result in the Degradation of the **Distribution System**.
- 2.2.3. Based on the data supplied by the **User**, the **Distributor** shall conduct Distribution Impact Studies it considers appropriate, to evaluate the impact of the proposed connection or modification to an existing connection on the **Distribution System**. The evaluation should include:
  - (a) Impact of short circuit in feed to the Distribution **Equipment**;
  - (b) Coordination of Protection **System**; and
  - (c) Impact of User Development on Power Quality.
- 2.2.4. Upon request of the **User**, the **Distributor** shall provide to the **User** adequate and sufficient information regarding the **Distribution System**, to enable the **User** conduct Impact Studies on the **User**'s system, and/or the **Distribution System** it considers appropriate.
- 2.2.5. During the application for connection process, based on the results of the Impact Studies, the **Distributor** will propose and agree with the **User** the voltage level *for connection* and point in the **Distribution System** to which a **User** will be connected in accordance with its normal practice for the type of load to be supplied. The **Distributor** may on occasion specify a different **Connection Point** or connection voltage from normal in order to avoid potential disturbance caused by the **User**'s **Equipment** to other **Users** of the **Distributor** or for other technical reasons or may agree alternative methods for minimizing the effects of disturbing loads.
- 2.2.6. After evaluating the application submitted by the User, the Distributor shall inform the User whether the proposed User Development is acceptable or not. The Distributor may disapprove an application for connection or a Modification of an existing connection to the Distribution System if it is determined through the Distribution Impact Studies that the proposed connection or Modification will do not fulfil the technical requirements or result in the Degradation of the Distribution System.
- 2.2.7. If the application of the User is not acceptable, the **Distributor** shall notify the User as to why its application is not acceptable. The **Distributor** shall include in its notification details of the amendments required to make the User's application acceptable to the **Distributor**. The **Distributor** shall report this situation to the **EMRC**.
- 2.2.8. The User shall accept the proposal of the **Distributor** within [30 days] or a longer period specified in the **Distributor** proposal, after which period the proposal will lapse.

# **2.3. CONNECTION AGREEMENTS**

2.3.1. The acceptance by the User of the Distributor proposal shall lead to the signing of a Connection Agreement or an amended Connection Agreement. If the Distributor and the User cannot reach agreement on the proposed connection, or Modification to an



existing connection, the or the User shall have the right to bring the matter before the **EMRC** for resolution. The **EMRC** shall have the reasonable right of access to any information that it deems fit in order to resolve such disagreement.

- 2.3.2. Before entering into a **Connection Agreement** and before connecting a **User's System** at a **Connection Point**, it will be necessary for the **Distributor** to be reasonably satisfied that the **User's System** at the boundary with the **Distribution System** will comply with all appropriate requirements of the **Distribution Code**.
- 2.3.3. The **Connection Agreement** shall include, and shall not be limited to, provisions for the submission of information and reports, **Safety Rules**, Test and Commissioning programs, **Electrical Diagrams**, statement of readiness to connect, certificate of approval to connect, and other requirements agreed between the parties..
- 2.3.4. If a **Connection Agreement** or an amended **Connection Agreement** is requested, the **User** shall submit to the **Distributor** the **Standard Planning Data** describing the proposed **User** Development.
- 2.3.5. Any User seeking to modify an existing connection to the Distribution System shall request an amended Connection Agreement with the Distributor prior to any modification to the User's System. The amended Connection Agreement shall include provisions for the submission of additional information required by the Distributor.
- 2.3.6. Submittals Prior to the Commissioning Date. The following shall be submitted by the User prior to the Commissioning date, pursuant to the terms and conditions and schedules specified in the Connection Agreement:
  - (a) Specifications of major **Equipment** not included in the **Standard Planning Data** and **Detailed Planning Data**;
  - (b) Details of the Protection arrangements and settings referred to in **Section** "Technical Conditions at the **Connection Point**" of this Code.
  - (c) **Electrical Diagrams** of the **User's Equipment** at the **Connection Point** as described in **DPCC** 2.6.1 and **DPCC** 2.6.2;
  - (d) Information that will enable the **Distributor** to prepare the **Connection Point Drawings**, referred to in **DPCC** 2.6.3;
  - (e) Copies of all **Safety Rules** and Local Safety Instructions applicable to the **User's Equipment** and a list of Safety Coordinators, pursuant to the requirements of **DOC Section** 9.
  - (f) A list of the names and telephone numbers of authorised representatives, including the confirmation that they are fully authorised to make binding decisions on behalf of the User, for Significant Incidents pursuant to the procedures specified in **DOC Section** 8;
  - (g) Proposed Maintenance Programme; and
  - (h) Test and Commissioning procedure for the **Connection Point** and the **User** Development.



# 2.4. COMMISSIONING OF EQUIPMENT AND PHYSICAL CONNECTION TO THE DISTRIBUTION SYSTEM.

- 2.4.1. Upon completion of the User Development, including work at the Connection Point, the Equipment at the Connection Point and the User Development shall be subjected to the Test and Commissioning procedure specified in DPCC 2.3.6 (h). The User shall then submit to the Distributor a statement of readiness to connect, which shall include a certified Test and Commissioning report. The Distributor shall be entitled to witness the tests. The Distributor may withhold agreement to energize the User's Equipment where test results do not demonstrate compliance with the Distribution Planning and Connection Code.
- 2.4.2. Upon acceptance of the User's statement of readiness to connect, the Distributor shall, issue a certificate of approval to connect. The physical connection to the Distribution System shall be made only after the certificate of approval to connect has been issued by the Distributor to the User and within the timeframes specified in the Distribution Performance Standards Code.

# 2.5. OWNERSHIP BOUNDARIES

- 2.5.1. The point or points at which supply is given or taken between the **Distribution System** and **Users** will be agreed between the **Distributor** and the **User** as required. For **MV** connections, including connections between the **Distributor** and **User**, and where necessary bus bar connected supplies at **LV**, the **Connection Points** will be subject to specific agreement between the parties in each case.
- 2.5.2. The respective ownership of **Plant** or **Apparatus** will be recorded in a written agreement between the **Distributor** and the **User** as required. In the absence of a separate agreement between the parties to the contrary, construction, commissioning, control, operation and maintenance responsibilities follow ownership.
- 2.5.3. For supplies to Generators Connected to Distribution that operate in parallel with the Distribution System and all supplies at MV the Distributor will with the User's agreement prepare a Site Responsibility Schedule, included in the Connection Agreement and, where determined by the Distributors during the application for connection process, Operation Diagrams showing the agreed Ownership Boundary.
- 2.5.4. The **Site Responsibility Schedule** shall detail the demarcation of responsibility for safety of persons carrying out work or testing at sites having a **Connection Point** to the **Distribution System** and/or circuits which cross an Ownership Boundary at any point.
- 2.5.5. More detailed information on procedures and responsibilities involved in the provision of safety at interfaces between the **Distribution System** and a **User's System** is set out in Distribution Operating Code **DOC** 9. Copies of these documents will be retained by the **Distributor** and the **User**. Changes in the boundary arrangements proposed by either party must be agreed in advance and will be recorded on the **Distributor's Operation** Diagrams.



# 2.6. ELECTRICAL DIAGRAMS AND DRAWING REQUIREMENTS

- 2.6.1. The **Distributor** shall specify the procedure and format to be followed in the preparation of the **Electrical Diagrams** and/or **Connection Point Drawings** as suitable required, for any **Connection Point**. The **User** shall prepare and submit to the **Distributor** an Electrical Diagram and/or **Connection Point Drawings** for all the **Equipment** on the **User**'s side of the **Connection Point**, in accordance with the schedule specified in the **Connection Agreement** or amended **Connection Agreement**.
- 2.6.2. If the **Connection Point** is at the **User**'s Site, the **User** shall prepare and distribute a composite Electrical Diagram and **Connection Point Drawing** for the entire **Connection Point**. Otherwise, the **Distributor** shall prepare and distribute the composite Electrical Diagram and **Connection Point Drawing** for the entire **Connection Point**.

# **Preparation of Electrical Diagrams**

2.6.3. The Electrical Diagrams and the Connection Point Drawing shall provide an accurate record of the layout and circuit connections, ratings and identification of Equipment, and related apparatus and devices at the Connection Point. The Connection Point Drawing shall represent, as closely as possible, the physical arrangement of the Equipment and their electrical connections. If possible, all the Equipment at the Connection Point shall be shown in one Electrical Diagram. When more than one Electrical Diagram is necessary, duplication of identical information shall be minimized. The Electrical Diagrams shall represent, as closely as possible, the physical arrangement of the Equipment and their electrical Diagrams shall be minimized. The Electrical Diagrams shall represent, as closely as possible, the physical arrangement of the Equipment and their electrical connections.

#### **Changes to Electrical Diagrams and Connection Point Drawing**

- 2.6.4. If the **Distributor** or a **User** decides to add new **Equipment** or change an existing **Equipment** Identification, the **Distributor** or the **User**, as the case may be, shall provide the other party a revised Electrical Diagram and **Connection Point Drawing**, at least one [(1) month] prior to the proposed addition or change.
- 2.6.5. If the modification involves the replacement of existing **Equipment**, the revised Electrical Diagram and/or **Connection Point Drawing**, as suitable, shall be provided to the other party in accordance with the schedule specified in the amended **Connection Agreement**. The revised Electrical Diagram and/or **Connection Point Drawing** shall incorporate the new **Equipment** to be added, the existing **Equipment** to be replaced or the change in **Equipment** Identification.

# Validity of Electrical Diagrams and Drawings

2.6.6. The composite Electrical Diagram prepared by the **Distributor** or the **User**, in accordance with the provisions of **DPCC** 2.6.1, shall be the Electrical Diagram to be used for all operational and planning activities associated with the **Connection Point**.



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2.6.7. If a dispute involving the accuracy of the composite Electrical Diagram arises, a meeting between the **Distributor** and the **User** shall be held as soon as possible, to resolve the dispute.



# 3. SECTION: DISTRIBUTION PLANNING PROCEDURES

# 3.1. DISTRIBUTION PLANNING RESPONSIBILITY

- 3.1.1. The **Distributor** shall be responsible for Distribution Planning, including:
  - (a) Forecast the future **Demand** on its distribution area
  - (b) Analysing the impact of the connection of new facilities such as Generation Connected to the **Distribution System**, **Load**s, distribution lines, or substations.
  - (c) Planning the expansion of the **Distribution System** to ensure its adequacy to meet forecast **Demand** and the connection of new Generation Connected to the **Distribution System**, **Loads** ; and
  - (d) Identifying and correcting problems on Supply Quality, **Power Quality** and **System Losses** in the **Distribution System**
- 3.1.2. The Users of the Distribution System, including Generation Connected to Distribution and other entities that have a System connected to the Distribution System shall cooperate with the Distributors in maintaining the Distribution Planning data.
- 3.1.3. The **Distributor** shall develop and submit annually to the **EMRC** a [5 Year] Distribution Plan, as required in the **Tariff Methodology** section of its Licence.
  - (a) **Energy** and **Demand** Forecasts;
  - (b) Distribution feeder routing and sizing
    - (i) Detailed at above 11kV
    - (ii) Outline for 11kV;
  - (c) Distribution **Reactive Power** compensation plan;
  - (d) Distribution Losses reduction plan;
  - (e) Other Distribution reinforcement plans; and
  - (f) A summary of the technical and economic analysis performed to justify the [5 Year] Distribution Plan.

# 3.2. SUBMISSION, CONSOLIDATION AND MAINTENANCE OF PLANNING DATA

- 3.2.1. Any User applying for connection or a modification of an existing connection to the **Distribution System** shall submit to the **Distributor** the relevant **Standard Planning Data** and the **Detailed Planning Data**, in accordance with the requirements prescribed in the Distribution Planning and Connection Code.
- 3.2.2. When requested, Users shall submit to the **Distributor** the relevant historical planning data for the previous year and/or the forecast planning data for the [three (3)] succeeding years. These shall include the updated **Standard Planning Data** and the **Detailed Planning Data**.

- 3.2.3. The required **Standard Planning Data** shall consist of information necessary for the **Distributor** to evaluate the impact of any **User** Development on the **Distribution System**.
- 3.2.4. The **Detailed Planning Data** shall include additional information necessary for the conduct of a more accurate Distribution Planning study. This shall cover circuit parameters, switchgear, and Protection arrangements of **Equipment** directly connected to or affecting the **Distribution System**. The data shall be adequate to enable the **Distributor** to assess any implication associated with the **Connection Points**.
- 3.2.5. The **Standard Planning Data** and **Detailed Planning Data** shall be submitted by the **User** to the **Distributor** according to the following categories:
  - (a) Forecast Data;
  - (b) Estimated **Equipment** Data; and
  - (c) Registered **Equipment** Data.

The Forecast Data shall contain the User's best estimate of the data, including Energy and Power, being projected for the [five (5)] succeeding years.

The Estimated **Equipment** Data shall contain the User's best estimate of the values of parameters and information pertaining to its **Equipment**.

The Registered **Equipment** Data shall contain validated actual values of parameters and information about the User's **Equipment**, usually required at the time of connection.

- 3.2.6. All Users with Large Connections connected at MV shall provide yearly to the Distributor with its Energy and Demand Forecasts at each Connection Point for the 5 succeeding years. The Forecast Data for the first year shall include monthly Energy and Power Forecasts, while the remaining four years shall include only the annual Energy and Power Forecasts. All other Users with Large Connections shall provide the same type of data if so instructed by the Distributor.
- 3.2.7. In the case of Users having Generation Connected to the Distribution System, they shall provide the net values of Energy and Power Forecast after any deductions to reflect the output of the Generating Plant. Such deductions shall be stated separately in the Forecast Data, including the projected Energy and Demand to be generated by each Generating Unit in the Generating Plant.
- 3.2.8. The **Distributor** shall consolidate and maintain the Distribution planning data according to the following categories:
  - (a) Forecast Data;
  - (b) Estimated **Equipment** Data; and
  - (c) Registered **Equipment** Data.
- 3.2.9. If there is any change to its planning data, the **User** shall notify the **Distributor** of the change as soon as practicable. The notification shall contain the time and date when the



change took effect, or is expected to take effect, as the case may be. If the change is temporary, the time and date when the data is expected to revert to its previous registered value shall also be indicated in the notification.

3.2.10. The User shall give [48 hours] notice to the **Distributor** in the event that the Connection is no longer required.

# 3.3. LOAD FORECAST

- 3.3.1. The **Distributor** shall forecast the **Demand** for Power and **Energy** within the area of supply annually. The **Distributor** shall formulate its long term **Load** Forecast taking the previous financial year ending December 31st as the Base Year and projecting the **Demand** over the succeeding five years.
- 3.3.2. The **Distributor** shall forecast **Demand** using **Prudent Industry Practice**.
- 3.3.3. In conducting this **Load** Forecast the **Distributor** shall consider:
  - (a) **Energy** Sales per Tariff Class, adopting a suitable methodology to assess its trend, taking into account electricity prices, the growth in population, trends on the national economy, or any other parameter the **Distributor** consider suitable to forecast it.
  - (b) Assumed normal growth for non-specific loads, specific and identified loads of 1 MW and above, and the effects if any, due to **Demand** side management and loss reduction.
  - (c) Specific project, either Government or private sponsored (as for example free zones, large tourist complex, etc.) that will imply the appearance of new loads in the **Distributor**'s licence or concession area.
  - (d) Conservation programmes, **Demand** side management or off-peak usage programmes which the **Distributor** may be sponsoring, which are intended to reduce the **User**'s future **Energy** and peak **Demand**.
  - (e) Significant public Events;
  - (f) Expected schedules for Generators Connected to Distribution;
  - (g) Interconnection with adjacent **Distributors**, if exists; and
  - (h) Any other information under the **Distributor**'s knowledge that could have some influence in the **Load** Forecast.
- 3.3.4. The **Distributor** shall create a data base of loads for each **User** category and for each distribution substation connected to its **Distribution System** and update it on an annual basis.
- 3.3.5. The **Distributor** shall develop a load research programme with the objective of obtaining **User** load profile data that describes the usage characteristics of specific appliances, **Users** and group of **Users**. The load research will facilitate obtaining the following information:


- (a) **Demand** according to end use at the hour of **System** peak, daily, monthly, seasonally or annually.
- (b) Hourly end use **Demand** for the day of the **System** peak, monthly, seasonally or Hourly end use **Demand** for the average day of the **System** peak, monthly, seasonal or annually.
- (c) Category wise diversity or coincidence factors and load factors.
- (d) Total **Energy** consumption for each category by day, month, season or year.
- (e) Category wise non-coincident peak **Demands**.
- (f) Hourly **Demand** for end use appliances
- 3.3.6. The **Distributor** shall compute the aggregate **Energy** requirement at each of the **Connection Points** with the **Transmission System** after accounting for **System** losses. Based on the metering data at each **Connection Point** with the **Transmission System**, the **Distributor** shall develop load curves for the area fed by the concerned **HV/MV** substation. By compiling data from each **HV/MV** substation feeding its **Distributor** shall develop a **System** load curve for its area of supply by applying a suitable diversity factor. By reconciling actual **Energy** sales figures with the metering data at each substation, approximate losses in the **System** may be computed for any period. This data shall be furnished to the **EMRC** as stated in the **Distribution Performance Standards Code**.
- 3.3.7. If a **User** Finds that the cohesive forecast prepared by the **Distributor** does not accurately reflect its assumptions on the planning data, it shall promptly notify the **Distributor** of its concern. The **Distributor** and the **User** shall promptly meet to address the concern of the **User**.

### 3.4. DISTRIBUTION PLANNING

- 3.4.1. The **Distributor** shall conduct Distribution Planning studies and evaluations to ensure the safety and reliability of the **Distribution System** in order to:
  - (a) Evaluate the requirement of **Distribution System** reinforcement projects;
  - (b) Assure the requirement stated under the Technical Requirements section and in the **Distribution Performance Standards Code** are met for all the **Users** in the **Distribution System**; and
  - (c) Evaluate any proposed **User** development, which is submitted (or is expected to be submitted) in accordance with the applications and procedures stated in the Connection Code
- 3.4.2. The Distribution Planning studies shall be conducted to assess the impact on the **Distribution System** or to any **User System**, of the **Load** Forecast or any proposed **Equipment** change in the **Distribution System** or the **User System**, and to identify corrective measures to eliminate the deficiencies in the **Distribution System** or the **User System**.



- 3.4.3. The relevant technical studies and the required planning data specified in following sections shall be used in the conduct of the Distribution Planning studies. The **Distributor** shall conduct distribution planning analysis which shall include:
  - (a) The determination of optimum patterns for feeder development; taken into account existing Bulk Supply Points and those proposed in the Transmission Master Plan
  - (b) The development of optimum **Reactive Power** compensation programs; and
  - (c) The development of an optimum feeder configuration and switching controls for distribution feeders.
  - (d) The cost effectiveness of loss reduction measures without compromising the security standards.
- 3.4.4. The Distribution planning studies shall be performed using lifecycle costing methods. The cost of capital and the discount rate used in such analysis shall be consistent with what is prescribed in the **Tariff Methodology**
- 3.4.5. In addition to catering for Active Power Demand, Reactive components of power requirement should be studied and adequate measures should be taken by installing Reactive compensation equipment at different voltage levels in a phased manner to improve power factor and cause reduction of losses and other network benefits
- 3.4.6. Location of 33/11kV substations and distribution transformer substations shall be rationally determined with the objective of containing voltage regulation and transmission and distribution losses within permissible and reasonable limits.
- 3.4.7. The voltage regulation in the **Distribution System** shall be maintained at the levels prescribed in the **Distribution Performance Standards Code** and the distribution losses in the **System** shall be gradually reduced over the years to meet the targeted figure set out in the Performance Standard Code.
- 3.4.8. The capacity of transformers used in the **Distribution System** and the layout of bus bars, switchgear, transformers, capacitors, earthing, lightning arrestors, control panels, station battery, fire extinguishers and other accessories required for the safe operation of the substations shall as far as practicable be standardized by the **Distributor**.
- 3.4.9. Distribution transformers shall be provided with suitable fuses or circuit breakers on the low tension side for protection against overload and short circuit.

### **3.5. SYSTEM STUDIES**

- 3.5.1. Following **System** studies are expected to be carried out by the **Distributor** in order to develop the [5 Year] Distribution Plan:
  - (a) Voltage Drop Studies: Voltage drop studies shall be performed to determine that the expected voltages at the User's Connection Points comply with the requirements stated on the Technical Requirements section and in the Distribution Performance Standards Code. It shall take into account the

connection of new Generation Connected to the **Distribution System**, the Forecasted **Load**, and any planned expansion, reinforcement, or development in the **Distribution System**.

(b) Short Circuit Studies: Short circuit studies shall be performed to evaluate the effect on the **Distribution System Equipment** of the connection of new Generation Connected to the **Distribution System** and other facilities that will result in increased fault duties for the **Distribution System Equipment**. These studies shall identify the **Equipment** that could be damaged when current exceeds the design limit of the **Equipment**. The studies shall also identify the Circuit Breakers and fuses, which may fail when interrupting possible short circuit currents.

Three-phase short-circuit studies shall be performed for the most **Demanding** scenario (either maximum or minimum generation) and for different **System** circuit configurations. Single line-to-ground fault studies shall also be performed for critical **Distribution System** nodes. These studies shall identify the most severe conditions that the **Distribution System Equipment** may be exposed to, and to determine possible constraints in fulfilling the **Power Quality** standards set out in the **Distribution Performance Standards Code**. Alternative **Distribution System** circuit configurations may be studied to reduce the short circuit current within the limits of existing **Equipment**. The results shall be considered satisfactory when the short-circuit currents are within the design limits of **Equipment** and the proposed **Distribution System** configurations are suitable for flexible and safe operation.

- (c) System Losses Studies: System Losses studies shall be performed to identify, classify, and quantify the losses in the Distribution System, and to propose measures for gradually reduce them if technically and economically feasible. System Loss studies shall be performed to determine the effects of any User Development and any development in the Distribution System on the efficiency of the Distribution System.
- (d) Distribution Reliability Studies: Distribution Reliability studies shall be performed to determine the frequency and duration of User Interruptions in the Distribution System, in order to assure the requirements stated in the Distribution Performance Standards Code are met. The historical Reliability performance of the Distribution System shall be determined from the Interruptions data of the Distribution System.



#### 4. SECTION: TECHNICAL REQUIREMENTS AT THE CONNECTION POINT

#### 4.1. SUPPLY QUALITY STANDARDS

4.1.1. The **Distributor** shall plan and operate its **System** to ensure that at any **User's Connection Point**, the Supply Quality standards specified in the **Distribution Performance Standards Code** are complied with. **Users** seeking connection to the **Distribution System** or Modification of an existing connection shall ensure that their **Equipment** does not suffer damage as a result of unscheduled outages, that can occur on the **Distribution System** from time to time.

#### 4.2. FREQUENCY VARIATIONS

- 4.2.1. The **System** frequency variations are as specified in the **Grid Code**.
- 4.2.2. Users shall ensure that their Equipment can operate reliably and safely within the specified limits during Normal Operation, and can withstand the limits specified under System Stress and extreme System fault conditions.

#### 4.3. VOLTAGE LEVELS

4.3.1. Nominal and Operational Voltages on the **Distribution System** are shown in the following Table.

TABLE 1: Distribution Nominal Voltages			
Low Voltage (LV)	230 volts - phase to neutral		
	400 volts – phase to phase		
Medium Voltage (MV)	6600 Volts (6,6 kV)		
	11000 volts <u>( 11kv)</u>		
	33000 volts (33kv)		

#### 4.4. VOLTAGE VARIATIONS

4.4.1. The Long Duration Voltage Variation at any Connection Point during Normal Conditions shall be within the limits indicated in the Distribution Performance Standards Code (reproduced in the following table). For the purpose of this Section, Voltage Variation shall be defined as the deviation of the root-mean-square (RMS) value of the voltage from its nominal value, integrated through a 15 minutes period, and expressed as a percentage.

Voltage level in kV	Steady state change
---------------------	---------------------

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< 1.0	± 10 %
1.0 and above	± 10 %

4.4.2. The **Distributor** shall design the **Distribution System** in accordance with the "Planning limits for voltage fluctuations caused by industrial, commercial and domestic equipment" standard in **Annex** 1.

### 4.5. TRANSIENT AND SHORT DURATION VOLTAGE VARIATIONS

- 4.5.1. A Short Duration Voltage Variation shall be defined as a variation of the **RMS** value of the voltage from nominal voltage for a time greater than one-half cycle of the power Frequency but not exceeding one minute.
- 4.5.2. Transient Voltages shall be defined as the high-frequency Over voltage that is generally shorter in duration compared to the Short Duration Voltage Variations.
- 4.5.3. Under fault and circuit switching conditions the rated frequency component of voltage may fall or rise transiently. The fall or rise 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 50160:1995 'Voltage Characteristics of Electricity Supplied by **Distribution Systems**', as amended from time to time, contain additional details of the variations and disturbances to the voltage which shall be taken into account in selecting **Equipment** from an appropriate specification for installation on or connected to the **Distribution System**.
- 4.5.4. The **Distribution System** and the **User System** shall be designed and operated to include devices that will mitigate the effects of transient over voltages on the **Distribution System** and the **User System**. The **Distributor** and the **User** shall take into account the effect of electrical transients when specifying the insulation of their electrical **Equipment**.

### 4.6. VOLTAGE UNBALANCE

- 4.6.1. The **Distribution System** shall be planned in accordance with the standard specified in **Annex** 1.
- 4.6.2. The maximum Voltage Unbalance at the Connection Point of any User, excluding the Voltage Unbalance passed on from the Transmission System shall not exceed the limits prescribed in Sections 2 and 3 of EN 50160:1995 'Voltage Characteristics of Electricity Supplied by Public Distribution Systems', as amended from time to time. normal operating conditions.
- 4.6.3. The User shall ensure that its System shall not cause the Voltage Unbalance in the Distribution System to exceed the limits specified in this Section.



## 4.7. HARMONICS

4.7.1. **Distributors** shall ensure that the Individual Harmonic Content and the **Total Harmonic Distortion** of the voltage at any **Connection Point**, shall not exceed the limits prescribed in **Sections** 2 and 3 of EN 50160:1995 'Voltage Characteristics of Electricity Supplied by Public **Distribution Systems**', as amended from time to time. Following table reproduced such values.

Harmonic Order (n)	<b>LV</b> V<1000 V	MV
(odds not multiples or 3)		
5	6,0	6,0
7	5,0	5,0
11	3,5	3,5
13	3,0	3,0
17	2,0	2,0
19	1,5	1,5
23	1,5	1,5
25	1,5	1,5
>25	-	-
(odds multiples of 3)		
3	5,0	5,0
9	1,5	1,5
15	0,5	0,5
21	0,5	0,5
>21	-	-
(even)		
2	2,0	2.0
4	1,0	1
6 to 24	0,5	0.5
Total Harmonic Distortion:	8,0	8 %

- 4.7.2. Distortion of the **System** voltage waveform, caused by certain types of **Equipment**, may result in annoyance to **Users** or damage to connected **Apparatus**. In order to limit these effects **Users' Equipment** connected to the **Distribution System** shall comply with the emission limits indicated in IEC 61000-3 Standards.
- 4.7.3. The level of harmonics generated by total **User**'s connected **Equipment** at the **Connection Point** shall not exceed the limits prescribed in the following table:

Limits of Harmonic Current Distortion



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Harmonic Order (n)	Low Voltage Contracted Power less than 10 kW	Low Voltage Contracted Power greater than 10 kW	Medium Voltage
	Α	%	%
(odds not multiples of 3)			
5	2,28	12	12
7	1,54	8.5	8.5
11	0,66	4.3	4.3
13	0,42	3,0	3,0
17	0,26	2.7	2.7
19	0,24	1.9	1.9
23	0,20	1.6	1.6
25	0,18	1.6	1.6
> 25	4,5/n	0.8 +0.8*25/n	0.8 +0.8*25/n
(odds multiples of 3)			
3	4,6	16.6	16.6
9	0,8	2.2	2.2
15	0,3	0.6	0.6
21	0,21	0.4	0.4
> 21	4,5/n	0.3	0.3
(even)			
2	2,16	10.0	10.0
4	0,86	2.5	2.5
6	0,60	1.0	1.0
8	0,46	0.8	0.8
10	0,37	0.8	0.8
12	0,31	0.4	0.4
> 12	3,68/n	0.3	0.3
Total	240 V Users: 5 A 415V Users: 14 A	20.0%	20.0%

Under certain circumstances the **Distributor** may agree to other limits or levels.

- 4.7.4. Measurements may be taken by the **Distributor** at the **User**'s **Connection Point**. Measurements shall be taken in accordance with methodologies of IEC 61000-4-7 lasting for at least 48 hours taken at 10 minute intervals.
- 4.7.5. In the event that the **User**'s **Equipment** operates outside the above specified limits causing annoyance or other injurious effects either to another **User**, or to the **Distribution System**, the **Distributor** shall give reasonable notice to remedy the defect and the **User** shall



remedy the defect at its own expense. In determining the period of notice, the **Distributor** shall have regard to the nature and degree of non compliance, the nature and degree of annoyance or other injurious effects as well as the prescriptions stated in the **Distribution Distribution Performance Standards**. The **Distributor** shall have the right to disconnect the **User**'s **Equipment** in the event that the **User** does not comply with such notice.

## 4.8. FLICKER

- 4.8.1. For the purpose of this **Section**, Flicker shall be defined as the impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time.
- 4.8.2. The Flicker Severity at the **Connection Point** of any **User** shall not be above the maximum values stated in IEC 61000-3 Standard for more than 3 % of the measured period.
- 4.8.3. The maximum emission limits produced by any **User** shall be below the maximum values stated in IEC 61000-3 Standard.
- 4.8.4. In the event that the **User**'s **Equipment** operates outside the above specified limits causing annoyance or other injurious effects either to another **User**, or to the **Distribution System**, the **Distributor** shall give reasonable notice to remedy the defect and the **User** shall remedy the defect at its own expense. In determining the period of notice, the **Distributor** shall have regard to the nature and degree of non compliance, the nature and degree of annoyance or other injurious effects as well as the prescriptions stated in the **Distribution Performance Standards**. The **Distributor** shall have the right to disconnect the **User**'s **Equipment** in the event that the **User** does not comply with such notice.

### 4.9. **PROTECTION**

- 4.9.1. The **Distribution System** shall be designed and operated with sufficient Protection to ensure safety and to limit the frequency and duration of **Interruptions** to **User**'s.
- 4.9.2. The requirements for the Protection **System** at the **Connection Point** shall be agreed upon by the **Distributor** and the **User** during the application for connection or Modification of an existing connection and shall be reviewed from time to time by the **Distributor**, with the concurrence of the **User**.
- 4.9.3. The User System shall be designed and operated and tested to achieve the desired level of speed, sensitivity, and selectivity in fault clearing in order to minimise the impact of faults on the Distribution System and in accordance with the requirements of the Distributor. Unless the Distributor advises otherwise, the User shall not use current limiting protective devices to limit the fault current in feed to the Distribution System.
- 4.9.4. The Fault Clearance Time shall be within the limits established by the **Distributor** in accordance with the Protection policy adopted for the **Distribution System**.

- 4.9.5. The **Distributor** shall provide the **User** with the details of any Auto reclosing or sequential switching features in the **Distribution System that could have some impact in the User's System**. The **User** should take this information into account in the design of its Protection System.
- 4.9.6. The User shall consider in the design of its Protection System the possible disconnection of only one phase or two phases during fault conditions on the **Distribution System**. For example, three phase motors shall be designed to withstand single phasing either by design or by suitable protection.

## 4.10. GROUNDING REQUIREMENTS

4.10.1. The method of Grounding at the User System shall comply with the Grounding standards and specifications of the Distributor. The Distributor shall supply to the User about these standards when applying for connection. Where there are multiple sources of power, the User shall ensure that the effects of circulating currents with respect to the grounded neutral are either prevented or mitigated.

## 4.11. EQUIPMENT SHORT CIRCUIT RATING

4.11.1. The **Distributor** shall inform the **User** of the design maximum Short Circuits Levels of the **Distribution System** at the **Connection Point**. The **User** shall consider the design maximum Short Circuits Levels at the **Connection Point** in the design and **Operation** of the **User System**.

### 4.12. MONITORING AND CONTROL EQUIPMENT REQUIREMENTS

4.12.1. The **Distributor** and the **User** shall agree on the mode of monitoring and control. If required, the **Distributor** shall provide, install, and maintain a telemetry outstation and all associated **Equipment** needed to monitor the **User System**. If the **User** agrees that the **Distributor** shall control the switchgear in the **User System**, the **Distributor** shall install the necessary control outstation, including the control interface for the switchgear.

### 4.13. EQUIPMENT AND MAINTENANCE STANDARDS

- 4.13.1. All **Equipment** at the **Connection Point** shall comply with the requirements of the IEC Standards or their equivalent national standards. All **Equipment** at the **Connection Point** shall be designed, manufactured, and tested in accordance with the quality assurance requirements of the *ISO9001 or equivalent*.
- 4.13.2. All **Equipment** at the **Connection Point** shall be operated and maintained in accordance with **Prudent Industry Practice** and in a manner that shall not pose a threat to the safety of any personnel or cause damage to the **Equipment** of the **Distributor** or the **User**.
- 4.13.3. The **Distributor** shall maintain an appropriate log containing the test results and maintenance records relating to its **Equipment** at the **Connection Point** and shall make this log available when requested by the **User** or **EMRC**.



4.13.4. The User shall maintain a log containing the test results and maintenance records relating to its **Equipment** at the **Connection Point** and shall make this log available when requested by the **Distributor**.

## 4.14. POWER FACTOR

- 4.14.1. All **MV Users** (or other **Users** as may be determined by the **EMRC** from time to time) of the **Distribution System** shall maintain a Power Factor not less the *figure that set in the tariff instructions which set by the EMRC* at the **Connection Point**, unless a different value have been agreed in the **Connection Agreement**.
- 4.14.2. The **Distributor** shall correct feeder and substation feeder bus **Reactive Power Demand** to a level, which will economically reduce feeder loss. The **Distribution System** shall be designed to have a Power Factor of not less the *figure that set in the tariff instructions which set by the EMRC* with the **Transmission System**, unless a different value have been agreed in the **Connection Agreement**.

## 4.15. UNDER FREQUENCY RELAYS FOR AUTOMATIC LOAD SHEDDING

4.15.1. The **Connection Agreement** or amended **Connection Agreement** shall specify the manner in which **Demand**, subject to Automatic **Load** Dropping, will be split into discrete MW blocks to be actuated by Under Frequency Relays.

## 4.16. REQUIREMENTS FOR GENERATORS

- 4.16.1. Generators Connected to Distribution shall be connected to the Distribution System at the voltage level agreed to by the Distributor, based on the Distribution Impact Studies and in accordance with the standards specified in Annex 1. The Connection Point shall be controlled by a Circuit Breaker that is capable of interrupting the maximum short circuit current at the point of connection. Means shall also be provided for Circuit Breaker isolation for maintenance purposes.
- 4.16.2. The Generator Connected to Distribution shall be capable of continuously supplying its Active Power output, as specified in the Generator's declared data, within the System Frequency range specified in the Grid Code. Any decrease of power output occurring in the Frequency range of 48.75 to 51.25 Hz shall not be more than the required proportionate value of the System Frequency decay.
- 4.16.3. If the **System** frequency momentarily rises up to the value of 51.5 Hz or falls up to the value to 47.5 Hz, **Generators Connected to Distribution** shall remain in synchronism with the **Distribution System**, unless something different has been agreed in the **Connection Agreement**.
- 4.16.4. The User shall be responsible for protecting its Generator Connected to Distribution against damage for frequency excursions outside the range of 51.5 Hz and 47.5 Hz. The User shall decide whether or not to disconnect its Generation Unit from the Distribution System.

- 4.16.5. The Generators Connected to Distribution shall be capable of supplying its Reactive Power outputs, as specified in the Generator's declared data, within the Voltage Variation specified in this Code, during Normal Conditions.
- 4.16.6. The Generators Connected to Distribution shall meet the requirements for Voltage Unbalance as specified in this Distribution Code. The Generators Connected to Distribution shall also be required to withstand without tripping, the unbalance loading during clearance by the Backup Protection of a close-up phase-to-phase fault on the Distribution System.
- 4.16.7. The Protection of Generators Connected to Distribution, associated Equipment and the connection to the Distribution System shall be designed, coordinated, and tested to achieve the desired level of speed, sensitivity, and selectivity in fault clearing and to minimise the impact of faults on the Distribution System. The Distributor and the Generator Connected to Distribution shall be solely responsible for the Protection System of the electrical Equipment and facilities at their respective sides of the Connection Point. Table 1 and 2 summarises typical protection requirement of Generator of different types and sizes. As protection requirements could widely vary depending on the Generator and Distribution System characteristics, the information on the tables shall be used only as a guide. Detailed protection schemes should be arranged between the Distributor and the User, and stated in the Connection Agreement.



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YES denotes a requirement for t	his Guideline
Generation Size	
$15 \text{ kW or less}^3$	
Interconnection Disconnection Device	YES
Generator Disconnect Device	YES
Undervoltage Trip	YES
Overvoltage Trip	YES
Over & Under Frequency Trip	YES
Over current Trip	YES
Synchronising Control <sup>2</sup>	Manual or Automatic
Synch-Check <sup>2</sup> (At the <b>Connection Point</b> )	YES

- the **Distributor**.
- <sup>2</sup>. For synchronous and other types of Generators with stand alone capability.
  <sup>3</sup>. For single-phase Generators larger than 50 kW, consult with Distributor on the required interconnection control, Protection and safety equipment.



Table 2 – Protection for Three-Phase Generators					
Interconnection Control, Protection and Safety <b>Equipment</b> <sup>8</sup> <b>YES</b> denotes a requirement for this <i>Guideline</i> - All devices are three-phase unless otherwise specified.					
Generator Size Classifications	Small	Medium Large			
Device	<50 kW	50 - 499 kW	500 - 2000 kW	2001 - 10000 kW	>10000 Kw
Interconnect Disconnect Device	YES	YES	YES	YES	YES
Generator Disconnect Device	YES	YES	YES	YES	YES
Synchronising Control <sup>1</sup> Manual (M) or Automatic (A)	M or A	M or A	A	А	А
25 Synch-Check (at the Connection Point)	YES	YES	YES	YES	YES
Automatic Voltage Regulation (AVR) <sup>1</sup>				YES	YES
Undervoltage	YES	YES	YES	YES	YES
Overvoltage	YES	YES	YES	YES	YES
Neutral Overvoltage <sup>2</sup>	<b>YES</b> <sup>3</sup>	YES	YES	YES	YES
Instantaneous/Timed Over current	$\mathbf{YES}^4$	YES <sup>4</sup>	YES <sup>4</sup>	YES <sup>4</sup>	$\mathbf{YES}^4$
Instantaneous/Timed Neutral Over current	<b>YES</b> <sup>3</sup>	YES	YES	YES	YES
Over and Under Frequency	YES	YES	YES	YES	YES
Directional Power	YES <sup>5</sup>	YES <sup>5</sup>	YES <sup>5</sup>	YES <sup>5</sup>	YES <sup>5</sup>
Intertrip or Equivalent Relay		YES <sup>6</sup>	YES <sup>6</sup>	YES <sup>6</sup>	YES <sup>6</sup>
Telemetry Data Communication			YES <sup>7</sup>	YES <sup>7</sup>	YES
Anti-Islanding for Inverters (Loss of mains)	YES	YES	YES	YES	YES



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(IEEE Std. 929)			



## Notes:

- 1. For synchronous and other types of **Generator**s with stand alone capability.
- 2. Only required for **Generators** that have their interconnection transformer's primary winding ungrounded. Used in conjunction with three PT's in broken delta configuration rated for line-to-line voltage. For detecting ground faults on the **Distribution System**.
- 3. May not be required if the **Generator** is an inverter type voltage-following **System** of less than 50 kW aggregate. In this case, the **Distributor** will inform the Power Producer if this Protection is required.
- 4. A timed over current relay with voltage restraint may also be required to prevent nuisance trips.
- 5. Only required for non-exporting or export limited Generators.
- 6. Transfer trip or equivalent protective relay function required for all synchronous **Generators** rated 500 kW and larger with export capability. May also be required for exporting synchronous **Generators** under 500 kW, depending upon characteristics of the distribution circuit. **Distributor** will advise.
- 7. System Controller requirement for all Generators 5 MW and larger. Distributor may also require telemetry for smaller Generators depending upon location and distribution circuit characteristics.
- 8. Exporting to **Distribution System** may require additional operational/protection Devices and will require coordination of operations with the **Distributor**.
- 4.16.8. If designed to support islanding operation, the **Generator Connected to Distribution** could operate in an islanding mode even over its own Auxiliaries, of supplying other **User's** load or **Equipments**. If this kind of operation is allowed, the **User** shall be responsible for:
  - (a) Adequately design the protection and control schemes of the **Generator**, both for islanding and connected to the grid modes;
  - (b) Assure the protection schemes of the **Generator** and the rest of the **User System** are able to detect and trip internal faults, under the islanding situation (probably reduced short circuit power); and
  - (c) Assure adequate grounding when islanding operation.
- 4.16.9. A fault or maintenance Outage, could result in the disconnection of the **Generation Connected to Distribution** together with an associated section of the **Distribution System**, from the remainder of the **Total System**. Unless explicitly arranged with the **Distributor**, and clearly stated on the **Connection Agreement** or amended **Connection Agreement**, the **Generator** connected to **Distribution** should never supply load and/or maintain voltage in any part of the **Distribution System** if this part is isolated from the **Transmission System**, and if the **Generator** is capable of maintaining this voltage



because it is equipped with synchronous or self excited asynchronous **Generators**, the **User** should install adequate protection devices (that could include inter-tripping schemes) to assure the disconnection either of the **Generator** or the whole **User**'s facilities at the **Connection Point**.

- 4.16.10. In case the User facilities are connected to a feeder of the Distributor equipped with auto-reclosing, the protection System and switching arrangements should be designed to separate the Generator (or the Generator and other User's facilities below the Connection Point) following the first Distributor's Main Breaker, Recloser or Sectionaliser opening, and to remain disconnected until the System has completely restored.
- 4.16.11. The Generators Connected to Distribution providing Ancillary Services for Reactive Power supply shall be capable of contributing to Voltage Control by continuous regulation of the Reactive Power supplied to the Distribution System. The Generators Connected to Distribution providing Ancillary Services for Reactive Power supply shall be fitted with a continuously acting automatic excitation control System to control the terminal voltage without instability over the entire operating range of the Generators Connected to Distribution. The performance requirements for excitation control facilities, including power System stabilizers, where necessary for System operations shall be specified in the Distribution Connection Agreement or Amended Connection Agreement.
- 4.16.12. The Generator Connected to Distribution shall specify in its Application for a Connection or an Application for Modification if its Generator Connected to Distribution has a Black Start capability. In the case the Generator Connected to Distribution wishes to provide Ancillary Services for Black Start to the System Operator, it shall develop and sign the necessary agreements with it, and comply with the Grid Code.



## PART 3: DISTRIBUTION OPERATING CODE (DOC)

## 1. SECTION: PURPOSE AND SCOPE

### 1.1. PURPOSE

- 1.1.1. The purpose of the Operating Code is:
  - (a) To define the operational responsibilities of the **Distributor** and all **Users**;
  - (b) To specify the requirements and procedures for **Load** Forecast;
  - (c) To specify the maintenance programs for the **Equipment** and facilities in the **Distribution System**;
  - (d) To describe the **Demand** control strategies used for the control of the **Total System** frequency and the methods used for voltage control;
  - (e) To specify the requirements for communication and the notices to be issued by the **Distributor** to **Users** and the notices to be issued by **Users** to the **Distributor** and other **Users**.
  - (f) To specify the procedures to be followed by the **Distributor** and **Users** during emergency conditions;
  - (g) To specify the **Safety Management System** criteria to be applied by the **Distributors** and **Users** for the co-ordination, establishment and maintenance of necessary Safety Precautions when work or testing is to be carried out on **Plant** and/or **Apparatus** of a **Distributor** or a **User**
  - (h) To establish a procedure for the conduct of System Tests which involve the simulation of conditions or the controlled application of unusual or extreme conditions that may have an impact on the Distribution System or the User System;
  - (i) To identify the tests and the procedures that needs to be carried out to confirm the compliance of a **Generator Connected to Distribution** with its registered parameters and its ability to provide **Ancillary Services**; and
  - (j) To specify the requirements for Site and **Equipment** Identification at the **Connection Point**

### 1.2. SCOPE

- 1.2.1. This section applies to the following:
  - (a) The **Distributor**
  - (b) Other **Distributors** connected to the **Distribution System**;
  - (c) Generators Connected to the Distribution System greater than or equal to 1 MVA output or with a single Generating Unit over 500kVA;



- (d) Others Generators Connected to the Distribution System if so instructed in the Connection Agreement;
- (e) All **Users** with a contracted demand equal to or greater than 4 MVA, unless differently stated in the **Connection Agreement**.
- (f) Other **Users**, if so instructed in the **Connection Agreement**.



### 2. SECTION: OPERATIONAL RESPONSIBILITIES

#### 2.1. OPERATIONAL RESPONSIBILITIES OF THE DISTRIBUTOR

- 2.1.1. The **Distributor** is responsible for operating and maintaining Supply and **Power Quality** in the **Distribution System** during **Normal Conditions**, in accordance with the provision indicated in the **Distribution Performance Standards Code**, and in proposing solutions to Supply or **Power Quality** problems.
- 2.1.2. The **Distributor** is responsible for providing and maintaining all distribution **Equipment** and facilities within its licensed area.
- 2.1.3. The **Distributor** is responsible for preparing the Annual, Monthly Maintenance Plans for the adequate maintenance of its **Equipment** and facilities, as is described in this Code.
- 2.1.4. The **Distributor** is responsible for designing, installing, and maintaining distribution protection that will ensure selective and timely disconnection of faulted facilities and **Equipment**.
- 2.1.5. The **Distributor** has a responsibility for maintaining an Automatic **Load** Shedding scheme to meet the targets agreed to with the **System Operator** as defined in the **Grid Code** and also has responsibilities under the Defence Plan.

## 2.2. OPERATIONAL RESPONSIBILITIES OF GENERATION CONNECTED TO DISTRIBUTION

- 2.2.1. The Generator Connected to Distribution is responsible for ensuring that its Generating Units can deliver the capabilities declared in its Connection Agreement.
- 2.2.2. The **Generator Connected to Distribution** is responsible for providing accurate and timely planning and operations data to the **Distributor**.
- 2.2.3. The **Generator Connected to Distribution** is responsible for executing the instructions of the **Distributor** during emergency conditions.

#### 2.3. OPERATIONAL RESPONSIBILITIES OF OTHER DISTRIBUTION USERS

- 2.3.1. The User is responsible for assisting the Distributor in maintaining Power Quality in the Distribution System during Normal Conditions by correcting any User facility that causes Power Quality problems.
- 2.3.2. The User shall be responsible for ensuring that its System will not cause any Degradation of the Distribution System. It shall also be responsible in undertaking all necessary measures to remedy any degradation that the User System has caused to the Distribution System.
- 2.3.3. The **User** is responsible for executing the instructions of the **Distributor** during emergency conditions.



## **3. SECTION: OPERATIONAL PLANNING**

## 3.1. LOAD FORECAST

### Introduction

- 3.1.1. In order for the **Distributor** to operate the **Distribution System** efficiently and to ensure maximum **System** security, there is a need for those **Users** specified in **DOC** 1.2 to provide loading and generation output information to the **Distributor**. The information, required to be provided by **Users** under this Distribution Operating Code, will enable the Licensee to comply with these requirements of the **Grid Code**.
- 3.1.2. The **Grid Code** specifies the **Transmission Licensee**'s requirements for **Demand** forecasting for Centrally Dispatched Generation Units. This section of the Distribution Operating Code specifies the information to be provided by other Generation Units and the **Users** specified in **DOC** 1.2.
- 3.1.3. This **Demand** forecasting information is required to enable the **Distributor** to maintain the integrity of the **Distribution System**. The **Distributor** under its Distribution Licence has an obligation under the **Grid Code** to provide **Demand** forecast information to the **System Operator** in order that generation output can be matched with **Demand**.
- 3.1.4. Where **Demand** data is required from the **User**, this means the MW **Demand** of electricity at the **Connection Point**. The **Distributor** may, in certain cases, specify that the **Demand** data shall include the MVAr **Demand**.
- 3.1.5. In this sub-section of the Distribution Operating Code Year 0 means the current calendar year at anytime, Year 1 means the next calendar year at anytime, Year 2 means the calendar year after Year 1.

#### **Demand Forecast Information**

- 3.1.6. Information shall be supplied by **Users** to the **Distributor** for the following rolling timescales is required by the **Distributor**:
  - (a) Operational Planning Phase next year ahead
  - (b) Programming Phase 24 hours to 8 weeks ahead
  - (c) Control Phase -0 to 24 hours ahead
  - (d) The information supplied will be as specified below and as set out in the relevant Schedules of the Distribution Data Registration Code.

#### **Operational Planning Phase (next year ahead)**

3.1.7. The information required to be provided to the **Distributor** during the Operational Planning Phase is specified in **Annex** 3. The information shall be provided to the **Distributor** by Calendar week 35 each year.



Programming Phase (24 hours to 8 weeks ahead inclusive)

- 3.1.8. The following information shall be provided to the **Distributor** in the timescales specified in **Annex** 4
  - (a) Schedules for the operation of an **Generating Unit** with output greater than 1MW on an hourly basis where the **Distributor** reasonably considers it appropriate;
  - (b) From the **Distributor's** supply business, details of their proposed use of **Demand** Control measures aggregated to [3 MW] or more (averaged over any hour) on an hourly basis for each of the **Distributor's Connection Points**;
  - (c) From Users and Other Distributors connected to the Distribution System whose operations are likely to result in an aggregated change in Demand at the Connection Point of greater than [3 MW] of Demand at that time on an hourly basis;
  - (d) Any other relevant **Demand** forecast information reasonably required by the **Distributor**.

### **Control Phase (0 to 24 hours ahead)**

- 3.1.9. The following information shall be supplied to the **Distributor** at reasonable times to be specified by the **Distributor** for the un-expired period covered by the Control Phase:-
- 3.1.10. Details of any differences of greater than [2 MW] from the schedules of operation of any **Generation Connected to Distribution** on an hourly basis which were supplied under **DOC** 3.1.7;
- 3.1.11. Details from each **User** connected to the **Distribution System** of any change in aggregated **Demand** at the **Connection Point** of greater than [3 MW] of the **Demand**.

### **3.2. MAINTENANCE PLANS AND TIME SCALES**

- 3.2.1. In this **Section** Year 0 means the current calendar year at any time, Year 1 means the next calendar year, Year 2 means the calendar year after Year 1, etc. Where Week 52 is specific read Week 53 in the appropriate years.
- 3.2.2. The **Distributor** shall prepare the following Distribution Maintenance Programs:
  - (a) Long Term Maintenance Plan (Annual Maintenance Plan): Year 1 and 2
  - (b) Medium Term Program: 9 to 52 weeks in advance
  - (c) Short Term Programme (Programming Phase): 2 to 8 weeks in advance.
  - (d) Outage Schedule.

### Annual Maintenance Plan



- 3.2.3. Each year, the **Distributor** will prepare a Long Term Maintenance Plan, covering at least the next calendar year (Year 1). **Users** and Embedded Generators (not subject to Central Dispatch) will provide the **Distributor** with information in accordance with **Annex** 4.
- 3.2.4. The Annual Maintenance Plan and its proposed outage program shall be submitted to the **EMRC** and to the **Transmission Licensee** on a year ahead basis (January to December) by November 1<sup>st</sup> each year.
- 3.2.5. The Annual Maintenance Plan shall be developed taking into account the following:
  - (a) The forecast **Demand**;
  - (b) The Maintenance Plan actually implemented;
  - (c) The requests by Users for changes in their maintenance schedules;
  - (d) The requirements for the maintenance of the Grid;
  - (e) The need to minimise the total cost of the required maintenance; and
  - (f) Any other relevant factor.
- 3.2.6. Users and Generators Connected to Distribution shall provide to the Distributor information regarding their provisional Maintenance Plan for the next year. The following information shall be included in the User's provisional Maintenance Program for its System or Equipment.
  - (a) Identification of the **Equipment** and the MW capacity involved;
  - (b) Reasons for the maintenance;
  - (c) Expected duration of the maintenance work;
  - (d) Preferred start date for the maintenance work and the date by which the work shall have been completed; and
  - (e) If there is flexibility in dates, the earliest start date and the latest completion date.
- 3.2.7. If a **User** is not satisfied with the Maintenance Schedule allocated to its **Equipment**, the **User** may notify the **Distributor** to explain its concern and request changes in the Annual Maintenance Plan. The **Distributor** shall endeavour to accommodate the **User**'s request in preparing the Annual Maintenance Plan.
- 3.2.8. The **Distributor** shall advise **Users** or **Generators Connected to Distribution** who may be significantly affected by particular outages of Distribution **Plant** or **Apparatus**, of the dates and duration of the outages. If there are objections from **Users** the **Distributor** and the **User** shall attempt to resolve the problem. The **Distributor** shall make all reasonable attempts to revise the Annual Maintenance Plan to accommodate the **User**'s concerns. If no reasonable alternative exists, then the **Distributor** may take the outage despite that Large **User**'s or **Generator**'s concerns.

#### Medium Term Programme



- 3.2.9. The Annual Maintenance Plan shall be updated to form the basis of the Medium Term Programme. The **Distributor** shall continually review this Plan as necessary and periodically discuss it with the relevant parties as appropriate the availability of **Generators Connected to Distribution** not subject to Central Dispatch will also be updated.
- 3.2.10. **Users** and Generators Connected to Distribution will provide the **Distributor** with information in accordance with **Annex** 5.
- 3.2.11. In addition with the information supplied in accordance with the provisions in **Annex** 5, at any time and from time to time during the current calendar year up to the Programming Phase (8 weeks ahead), **Users** may notify reasonable changes and additions to the Outages previously notified. The **Distributor** shall consider whether the changes will adversely affect **Distribution System** security, or to other parties, and will discuss with the **User** in question. Where necessary, the **Distributor** shall inform other affected **Users** about changes or additions.

## Short Term Programme

- 3.2.12. The Medium Term Maintenance Plan shall be updated to form the basis of the Short Term Programme and a rolling suggested program for the following week and subsequent 7 weeks period respectively will be prepared weekly by the **Distributor**
- 3.2.13. Short Term Program shall provide the details required by the **System Operator** for the preparation of the Grid Operating Program, as specified in the **Grid Code**.
- 3.2.14. To develop the Short Term Program, the **Distributor** will obtain Scheduling information from the **Generators Connected to Distribution** where it considers it appropriate.
- 3.2.15. The Scheduling information will specify the following on an individual **Generating Unit** basis:
  - (a) The period the unit is required;
  - (b) The planned half-hourly output; and
  - (c) Any other information the **Distributor** reasonably considers necessary.
- 3.2.16. The Short Term Programme shall contain at least identification of electric lines and equipment of the **Distribution System** that will be taken out of service, outage start date, duration of outage, and quantum of load not to be drawn at any interconnection during the outage.

## **3.3. OUTAGE SHEDULE**

- 3.3.1. Notwithstanding any approved outage plan, the **Distributor** shall not take any circuit/equipment out of service at any interconnection without specific release from the **System Operator**. This shall however, not apply under the following circumstances:
  - (a) If the import or export at each interconnection point with the **Transmission** Licensee is not affected.



- (b) If removal of any circuit from service becomes necessary under emergency conditions or disconnection for violation of the **Connection Agreement**. In all cases the National Control Centre must be kept fully informed.
- 3.3.2. Maintenance of the **Distribution System** may require outages that interrupt the supply to a **User** or group of **Users**. In such cases, the **Distributor** shall:
  - (a) Notify the affected **Users** at least [72 hours] in advance. Longer notice periods may be agreed between a **User** and a **Distributor**. This notification could be made by advertising the interruption in at least two newspapers of major distribution. The notification should contain, as a minimum, a clear indication of the zone affected by the interruption, the interruption starting date, the expected duration, and the reason of the interruption, including the **Plant** or **Equipment** to be maintained.
  - (b) Notify, utilising the procedures indicated in **DOC** 7(Operational Liaison), to Large Users, Generators Connected to Distribution, and Users with Essential Loads.
- 3.3.3. If the above mentioned notification procedures are not fulfilled, the interruption produced to the affected **Users** should be classified and accounted as Unscheduled **Interruption**.



### 4. SECTION: CONTINGENCY PLANNING

#### 4.1. TYPES OF CONTINGENCIES

- 4.1.1. A contingency in the **Distribution System** may arise in the event of Total or Partial **System** Blackouts of the **Transmission System**. A Contingency may also affect a part of the **Distribution System** due to local breakdowns in the **Distribution System** itself or in the **Apparatus** of the transmission Licensee at the interconnection Point. This sub-**Section** lays down procedures which the **Distributor** shall follow under such contingencies to quickly and efficiently restore and maintain power supply to its **Users**.
- 4.1.2. These Contingencies are classified as:
  - (a) **System** Blackout (Total or Partial).
  - (b) Failure of **Equipments** of the transmission Licensee at the interconnection points *the tie line*.
  - (c) **Distribution System** failure.

#### 4.2. SYSTEM BLACKOUT

- 4.2.1. **Total System** Blackout is a situation when all generation has ceased with no electricity supply from External Interconnections.
- 4.2.2. Partial Blackout is a situation where all generation has ceased in a separate part of the **Total System** and there are no available interconnections to the other parts of the **Total System**.
- 4.2.3. In case of **Total System** Blackout or Partial Blackout at any point of interconnection, the **Distributor** shall abide by the black start procedures framed by <u>system operator</u> Licensee and incorporated in the **Grid Code**.
- 4.2.4. The **Distributor** shall be responsible for sectionalizing the **Distribution System** into discrete, unconnected blocks of **Demand**. It shall advise the **System Operator** regarding the amount of MW likely to be picked up when switching on each block of **Demand**.
- 4.2.5. The **Distributor** shall prepare a schedule of Essential and non Essential loads in order of priority at each **Connection Point** to the **Transmission System** to be picked up during the restoration process. The schedule is to be approved by the **System Operator** and forwarded to the **EMRC**. Such schedule shall be updated continually. The schedule shall conform to provisions of the **Grid Code**.
- 4.2.6. The **Distributor** shall maintain direct communications links with the **System Operator** and/or proposed area load dispatch centre, as the case may be, throughout the restoration process until the **System** is restored to normal.
- 4.2.7. To co-ordinate activities, **Users** and the **Distributor** will ensure that there are suitable communication paths available and that where appropriate senior members of staff are appointed to manage these abnormal situations. The **Distributor** shall furnish to the



**System Operator** the name and designation of person/persons, along with their telephone number/s and location, authorized to deal with any contingency operations. This list shall always be kept up to date.

## 4.3. SYSTEM RECOVERY

- 4.3.1. The **Distributors** will segregate its total **Demand** into suitably sized components to allow progressive re-energisation of the **Distribution System** from black start **Generators**. The size of the areas of **Demand** of these will be determined by the **System Operator** and will be commensurate with the size of the **Generators** being re-started.
- 4.3.2. The overall strategy of recovery will be to re-establish stable Islands of Supply and **Demand** and to re-synchronise these islands progressively. **Generators** Connected to Distribution other than Embedded **Generators** will be required to operate under the **Distributor** directives, to enable the **Distributor** to comply with its **Grid Code** and/or licence/concession obligations.
- 4.3.3. Where there are no Generators with a Black Start Capability within the **Distribution System**, then restoration of supply may be substantially delayed while the TSO reestablishes the **Transmission System** from a restored island or part of the **Total System**. The **Distributor** will re-appraise its priorities in these situations and restore supplies in accordance with its **Grid Code** and/or licence/concession obligations.

#### 4.4. FAILURE OF EQUIPMENTS OF THE TRANSMISSION LICENSEE

4.4.1. In all cases that failures exists on lines or **Equipments** of the **Transmission Licensee** that origin, or may origin, an Incident in the **Distribution System**, the **Distributor** shall immediately contact the **System Operator** and/or the person authorized for such purpose at the substations of the **Transmission Licensee** and assess the probable time period needed for restoration and/or probable restriction on load drawl from the affected substation. The **Distributor** may exercise **Demand** Control as necessary.

### 4.5. DISTRIBUTION SYSTEM FAILURE

- 4.5.1. If a part of the **Distribution System** to which a **Generator Connected to Distribution** is connected becomes isolated from the **Distribution System**, the **Distributor** shall decide if it is desirable for the **Generator Connected to Distribution** to continue operating.
- 4.5.2. If no facilities exist for the subsequent resynchronization with the rest of the **Distribution System**, the **Distributor** shall issue an instruction to the **Generator Connected to Distribution** to disconnect its **Generating Unit** to enable the Island Grid to be reconnected to the rest of the **Distribution System**.



### 5. SECTION: DEMAND CONTROL

### 5.1. OBJECTIVE AND SCOPE

- 5.1.1. The objective of this section is to establish procedures to enable the **Distributor**, following an instruction of **System Operator**, to achieve a reduction in **Demand** in order to avoid a Breakdown or Overloading of any part of the **Total System** in a manner that does not unduly discriminate against or unduly prefer anyone or group of **Users**.
- 5.1.2. This section applies to the **Distributors** and to **Users**, which in this section means **Generators** Connected at Distribution, and **Users** connected to the **Distribution System**.
- 5.1.3. The term "**Demand** Control" is used to describe any or all of these methods of achieving a **Demand** Reduction:
  - (a) Voluntary User Demand Management initiated by Distributor;
  - (b) Automatic under frequency load shedding;
  - (c) User Demand reduction including Voltage Reduction.
  - (d) Emergency manual User Demand reduction.

#### 5.2. METHODS OF DEMAND CONTROL

- 5.2.1. Where instructed by the **System Operator**, temporary load shedding shall be carried out to maintain the load generation balance. This may also be necessary due to lack of generation, loss of any circuit, equipment or any other operational contingency.
- 5.2.2. User Demand may be disconnected automatically at selected location in accordance with the requirements of the Grid Code, in the event of a sudden fall in frequency. Such an arrangement shall be carefully co-ordinate as part of an overall scheme and may take into account any operational requirements or essential load.
- 5.2.3. The **Distributor** shall estimate loads that may be shed in discrete blocks at each **Connection Point** to the **Transmission System** in consultation with the **Users** as required and submit the information to the **System Operator**. The **Users** shall cooperate with the **Distributors** in this regard.
- 5.2.4. Automatic disconnection by under voltage relay may be used to discriminately disconnect load at either 132 kV or **MV** in order to maintain voltage within acceptable limits, in order as to avoid widespread shedding. Deliberate reduction of voltage may be used to achieve a temporary reduction in load **Demand**.
- 5.2.5. In the event of a sustained period of shortfall, due to any constraint in the **Transmission System** and/or **Distribution System**, then planned rotational load shedding may be used to share the available power among affected **Users**.
- 5.2.6. In addition, **Generators** Connected to Distribution may wish to disconnect, automatically or manually, their **Plant** from the **System** to which it is connected at certain frequency



levels. Any such disconnection will be agreed with the **Distributor** or the **System Operator**, as required, in accordance with the Distribution Planning and Connection Code.

#### 5.3. IMPLEMENTATION OF DEMAND CONTROL

- 5.3.1. Deliberate reduction in **System** frequency may also be used to achieve a temporary reduction in load **Demand** in accordance with the **Grid Code**. Emergency manual load shedding may be also carried out on the **Distribution System** if so instructed by the **System Operator**.
- 5.3.2. Where **Demand** Control is exercised by the **Distributor** on instruction or request from the **System Operator** in order to safeguard the **System** Security, then the **Distributor** is required to respond to these requests promptly but shall liaise with and inform other **Users** so far as is reasonable practicable.
- 5.3.3. Where **Demand** Control is exercised by the **Distributor**, either instructed by the **System Operator** or in order to safeguard the **Distribution System**, the **Distributor** shall liaise with and inform **Users** accordingly as far as is reasonably practicable.
- 5.3.4. Detailed load shedding procedures shall be established by the **Distributor** and a detail procedure shall be furnished to the **System Operators** and persons in charge of downstream substations of the **Distributor**, where such load shedding has to be carried out. Where automatic load shedding will be carried out using under frequency relays the circuits involved and the amount of load to be interrupted, complete with corresponding relay settings, shall be submitted to the **System Operator** and persons in charge of downstream substations of the Licensee as necessary.
- 5.3.5. In the event of load shedding under the **Distributor**'s planned load shedding rotas, the public shall be promptly notified of such **Distributor**'s arrangements through the media or on a web site. Large **Users** with contract **Demands** of [1 MW] and above and essential services such as hospital, public water works etc. shall be notified also by telephone.
- 5.3.6. Once an automatic or manual disconnection, either due to low frequency or voltage problems, has taken place, it shall not be reconnected until the **Distributor** instructs to do so in accordance with this Code. Each **Distributor** shall abide by the instructions of the **System Operator** with regard to reconnection without delay.
- 5.3.7. All the Standards and Procedures related with the **Load** Shedding, including automatic load shedding, load shedding exemption policies, rotational load shedding and **User**'s communications should be contained and documented in a Distribution **Load** Shedding Plan. **Distributors** shall permanently maintain and update this document, which should be submitted to the **EMRC** for revision and approval, if instructed to do so.



#### 6. **SECTION:** OPERATIONAL **LIAISON**

#### 6.1. INTRODUCTION

- 6.1.1. This section sets out the requirements for the exchange of information in relation to **Operations** and/or Incidents on the **Distribution System** or the **System** 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 **System** of any other **User**.
- 6.1.2. This **Section** applies to the **Distributor** and to **Users**, which in this **Section** means:
  - (a) Any other **Distributor** connected to the **Distribution System**
  - (b) **MV Users**
  - (c) Generators Connected to Distribution at LV and rated above 50kW.

#### 6.2. **PROCEDURES**

- 6.2.1. The **Distributor** and each **User** connected to its **Distribution System** will nominate officers and agree communication channels to make effective the exchange of information required by this **Section**. Communication should, as far as practicable, be direct between the **User** and the operator of the **Distribution System** to which that **User** is connected. However, this does not preclude communication with the **User**'s nominated representative.
- 6.2.2. Any communication from the **Distributor** and the **User** utilizing the agreed communication channels, including telephone communications, should be considered to be acknowledge by the **User** pursuant to **DOC** 3.3 (Outage Schedule)
- 6.2.3. If the **Distributor** decides that a back up or alternative route of communication and/or emergency communication is necessary for the safe operation of the **Distribution System**, the additional means of communication shall be agreed between the **Distributor** and the **User**.
- 6.2.4. A list of duly authorized personnel and their telephone numbers shall be exchanged between the **Distributor** and the **User** so that control activities can be efficiently coordinated. The **Distributor** and the **User** shall maintain 24-hour availability for these duly authorized personnel when necessary.
- 6.2.5. In the case of an **Operation** on the **System** of a **User** connected to the **Distribution System**, which will have or may have an Operational Effect on the **Distribution System**, the **User** will notify the **Distributor** in accordance with the procedures established in this **Section**.
- 6.2.6. In the case of an **Operation** on the **Distribution System** or on receipt of notification of an **Operation** on the **Transmission System**, which will have or may, in the opinion of the **Distributor**, have an Operational Effect on the **System** of a **User** connected to the **Distribution System**, the **Distributor** will notify the **User**.



- 6.2.7. An **Operation** may be caused by another **Operation** or an Incident on another's **System** and in that situation the information to be notified is different from that where the **Operation** arose independently of any other **Operation** or Incident. Whilst in no way limiting the general requirement to notify in advance, the following are examples of situations where, in as much as they may have or have had an effect on the **Operation** of the **Distribution System** or another **System**, notification will be required of:
  - (a) The implementation of a **Schedule Outage** of lines and/or **Equipments** which has been arranged pursuant to **DOC Section** 3 (Operational Planning);
  - (b) The **Operation** of any Circuit Breaker or Isolator or any sequence or combination of the two including any temporary over-stressing, **System** parallels, or **Generating Unit** synchronising; and
  - (c) Voltage control.

### 6.3. FORM OF NOTIFICATION AND TIMING

- 6.3.1. The notification (other than in relation to the information which the **Distributor** is merely passing on from a **User**) will be of sufficient detail to enable the recipient of the notification reasonably to consider and assess the implications and consequences arising from the **Operation** on the **Distribution System** and will include the name of the individual reporting the **Operation** on behalf of the **Distributor**. The recipient may ask questions to clarify the notification.
- 6.3.2. A notification by the **Distributor** of an **Operation** which has been caused by another **Operation** (the "First **Operation**") or by an Incident on a **User**'s **System**, will describe the **Operation** and will contain the information which the **Distributor** has been given in relation to the First **Operation** or that Incident by the **User**.
- 6.3.3. Where a **User** is reporting an **Operation** or an Incident which itself has been caused by an Incident or scheduled or planned action affecting (but not on) its **System** the notification to the **Distributor** will contain the information which the **User** has been given by the person connected to its **System** in relation to that Incident or scheduled or planned action (which the **User** must require, contractually or otherwise the person connected to its **System** to give it) and the **Distributor** may pass on the information contained in the notification.
- 6.3.4. A notification by the **Distributor** of an **Operation** under this **Section** which has been caused by an **Operation** or an Incident on the **Transmission System**, may describe the **Operation** on the **Distribution System** and will contain the information which the **Distributor** has been given in relation to the **Operation** or an Incident on the **Transmission System** by the **System Operator**. The notification (other than in relation to the information which the **Distributor** is merely passing on from the **System Operator**) will be of sufficient detail to enable the recipient of the notification to consider and assess the implications and consequences arising from the **Operation** on the **Distributor** system and will include the name of the individual reporting the **Operation** on behalf of the **Distributor**. The recipient may ask questions to clarify the notification.
- 6.3.5. A notification under this **Section** will be given as far in advance as practicable and in any Incident shall be given in sufficient time as will reasonably allow the recipient to consider



and assess the implications and risks arising. The notification will be dictated to the recipient who shall record it and on completion shall repeat the notification in full to the sender and check that it has been accurately recorded.

## 6.4. REQUIREMENT TO NOTIFY INCIDENTS

- 6.4.1. In the case of an Incident on the **System** of a **User** connected to the **Distribution System**, which has had or may have had an Operational Effect on the **Distribution System** or on the **Transmission System**, the **User** will notify the **Distributor** as soon as practicable.
- 6.4.2. In the case of an Incident on the **Distribution System** or on receipt of notification of an Incident on the **Transmission System**, which will have or may, in the opinion of the **Distributor**, have an Operational Effect on the **System** of a **User** connected to the **Distribution System**, the **Distributor** will notify the **User** in accordance with this **Section**. This does not preclude any **User** asking the **Distributor**, to whose **System** he is connected, for information regarding the Incident which has affected the **User**'s **System**.
- 6.4.3. An Incident may be caused by (or exacerbated by) another Incident or by an **Operation** on another's **System** and in that situation the information to be notified is different from that where the Incident arose independently of any other Incident or **Operation**.
- 6.4.4. The following are examples of situations where notification will be required if they have an Operational Effect:
  - (a) The actuation of any alarm or indication of any abnormal operating condition;
  - (b) Adverse weather conditions being experienced;
  - (c) Breakdown of, or faults on, or temporary changes in the capabilities of, **Plant** and/or **Equipment** including Protection; and
  - (d) Increased risk of inadvertent Protection **Operation**.
- 6.4.5. A notification of an Incident which has arisen independently of any Incident or of an **Operation**, will describe the Incident (although it need not state the cause of the Incident) and subject to that will be of sufficient detail to enable the recipient of the notification to consider and assess the implications and risks arising. The recipient may ask questions to clarify the notification.
- 6.4.6. A notification by the **Distributor** of an Incident which has been caused by (or exacerbated by) another Incident (the "first Incident") or by an **Operation** on a **User**'s **System** will describe the Incident and will contain the information which the **Distributor** has been given in relation to the first Incident or that **Operation** by the **User**. The notification (other than in relation to the information which the **Distributor** is merely passing on from a **User**) will be of sufficient detail to enable the recipient of the notification reasonably to consider and assess the implications and risks arising from the Incident on the **Distributor**. The recipient may ask questions to clarify the notification.



- 6.4.7. Where a User is reporting an Incident or an **Operation** which itself has been caused by (or exacerbated by) an Incident or scheduled or planned action affecting (but not on) its **System** the notification to the **Distributor** will contain the information which the User has been given by the person connected to its **System** in relation to that Incident or scheduled or planned action (which the User must require the person connected to its **System** to give to it) and the **Distributor** may pass on the information contained in the notification.
- 6.4.8. Except in an emergency situation the notification will be dictated to the recipient who shall record it and on completion shall repeat the notification in full to the sender and check that it has been accurately recorded.
- 6.4.9. Where an Incident has been reported to the **Distributor** by a **Generator Connected to Distribution** relating to a **Generating Unit** and in order for the **Generator** to assess the implication of the Incident on its **System** more accurately, it may ask the **Distributor** for details of the Fault Levels on in feeds from the **Distribution System** to that **Generating Unit** at the time of the Incident, and the **Distributor** will, as soon as reasonably practicable, give the **Generator** that information provided that the **Distributor** has that information.
- 6.4.10. Where a part of a **Distribution System** is, by agreement, under the control of the **System Operator** then the requirements and provisions of the **Grid Code** shall apply to that situation as if that **Distribution System** was the **Transmission System**.

### 6.5. SIGNIFICANT INCIDENTS

- 6.5.1. Where an Incident on the **Distribution System** or the **System** of a **User** has had or may have had a significant effect on the **System** of any of the others, the Incident shall be reported in writing to the owner of the **System** affected in accordance with the provisions of **DOC** 6.3. This incident will be termed a "Significant Incident".
- 6.5.2. Where a **Distributor** notifies a **User** of an Incident, which the **User** considers has had or may have a significant effect on that **User**'s **System**, that **User** will require the **Distributor** to report that Incident in writing and will notify the **Distributor** accordingly. Such an Incident will also be termed a "Significant Incident".
- 6.5.3. A Significant Incident will include Incidents which result in, or may result in, the following:
  - (a) **Operation** of **Apparatus** either manually or automatically;
  - (b) Voltage outside statutory limits;
  - (c) **System** frequency outside statutory limit, or
  - (d) **System** Stability failure.



# 7. SECTION: OPERATIONAL INCIDENT REPORTING AND INFORMATION SUPPLY

## 7.1. INTRODUCTION

7.1.1. This **Section** sets out the requirements for reporting in writing those Incidents termed "Significant Incidents" which were initially reported verbally and those statutory specified Incidents to be reported under the request of the **EMRC**. It also provides for the joint investigation of Significant Incidents by the **Users** involved.

#### 7.2. INCIDENT REPORTING

- 7.2.1. If and subsequently has been determined by the **Distributor** to be a Significant Incident, a written report will be given to the **Distributor** by the **User** in accordance with this **Section**. The **Distributor** will not pass this report on to other affected **Users** but may use the information contained therein in preparing a report to a **User** in relation to a Significant Incident on the **Distribution System** which has been caused by (or exacerbated by) the Significant Incident on the **User System**.
- 7.2.2. In the case of an Incident which has been reported verbally to the **User** and subsequently has been determined by the **User** to be a Significant Incident, a written report will be given to the **User** by the **Distributor** in accordance with this **Section**.
- 7.2.3. A report will be in writing and shall be sent to the **Distributor** or **User**, containing written confirmation of the verbal notification given under **DOC** 6 together with more details relating to the Significant Incident, although it need not state the cause of the Incident. The report should, as a minimum, contain following matters, which is not intended to be exhaustive.
  - (a) Date and time of Significant Incident;
  - (b) Location;
  - (c) **Apparatus** involved;
  - (d) Brief description of Significant Incident;
  - (e) Duration of incident;
  - (f) Estimated date and time of return to normal service, and
  - (g) Details of any **Demand** Control undertaken.
  - (h) In case of **Generators** Connected to Distribution, effects on generation including, where appropriate:
    - (i) generation interrupted;
    - (ii) frequency response achieved;
    - (iii) MVAr performance achieved; and



7.2.4. The recipient may raise questions to clarify the notification, and the giver of the notification will, in so far as it is able, answer any questions raised.

## 7.3. JOINT INVESTIGATION INTO SIGNIFICANT INCIDENTS

- 7.3.1. Where a Significant Incident has been declared and a report submitted either party or parties may request in writing that a joint investigation be carried out.
- 7.3.2. The composition of such an investigation panel will be appropriate to the Incident to be investigated and agreed by all parties involved.
- 7.3.3. Where there has been a series of Significant Incidents (that is to say, where a Significant Incident has caused or exacerbated another Significant Incident) the parties involved may agree that the joint investigation should include some or all of those Significant Incidents.
- 7.3.4. A joint investigation will only take place where all parties affected by a Significant Incident agree to it. The form and rules of the procedure for, and all matters relating to the joint investigation will be agreed at the time of a joint investigation and in the absence of agreement the joint investigation will take place.
- 7.3.5. Any joint investigation occurs only when both parties agree. It shall form part of any dispute resolution procedure.

## 7.4. **REPORT TO THE EMRC**

- 7.4.1. The **Distributor** shall submit a written report to the **EMRC** detailing all the information, findings, and recommendations regarding the **Distribution System** Incident. The following minimum information shall be included in the written report following the joint investigation of the Significant Incident:
  - (a) Time and date of the Significant Incident;
  - (b) Location of the Significant Incident;
  - (c) **Equipment** directly involved and not merely affected by the Event;
  - (d) Description of the Significant Incident; and
  - (e) **Demand** (in MW) and generation (in MW) interrupted and the duration of the **Interruption**.

The **EMRC** shall have the right to request any information and explanations that it reasonably sees fit about any incident, significant incident or event.



## 8. SECTION: SAFETY COORDINATION

#### 8.1. INTRODUCTION

- 8.1.1. This Distribution Operating Code specifies the **Safety Management System** criteria to be applied by the **Distributor** and **Users** for the co-ordination, establishment and maintenance of necessary Safety Precautions when work or testing is to be carried out on **Plant** and/or **Apparatus** of the **Distributor** or a **User** and where for this to be done safely, isolation, earthing, and/or some other precautions of the other's **System** is needed. This Distribution Operating Code does not apply to the situation where Safety Precautions need to be agreed solely between **Users**.
- 8.1.2. This Distribution Operating Code does not seek to impose a particular set of Safety Rules on the **Distributor** and **Users**. The Safety Rules to be adopted and used by the **Distributor** and each **User** shall be those chosen by each.

### 8.2. OBJECTIVES

8.2.1. To lay down requirements with a view to ensuring safety of facilities and persons working at or across Operational and Ownership Boundaries between the **Distribution System** and **Users' Systems**..

## 8.3. SCOPE

- 8.3.1. This Distribution Operating Code specifies the **Safety Management System** criteria to be applied by the **Distributor** and all **Users** of the **Distribution System** at or across an **Operational Boundary**, **Users** for the purposes of this Distribution Operating Code being:
  - (a) Medium Voltage Users.
  - (b) Generators Connected to Distribution.
  - (c) Other **Distributors** connected to the **Distribution System**.
  - (d) Any other party reasonably specified by the **Distributor** including **Users** with un-metered supply and those connected at **LV**.

#### **8.4.** OPERATIONAL **SAFETY**

#### **Approved Safety Management Systems;**

- 8.4.1. At each site or location where an **Operational Boundary** exists, a **Safety Management System** specifying the principles and procedures to be applied so as to ensure the health and safety of all who are liable to be working or testing on the **Distribution System**, or on **Plant** and **Apparatus** connected to it, will be established by the **Distributor** and **Users**. For interfaces involving **MV Systems** this shall include the provision for **Control Person**(s), a system of documentation and the establishment of Safety Precautions.
- 8.4.2. **Safety Management System** must include the provision for written authorisation of personnel concerned with the control, **Operation**, work or testing of **Plant** and **Apparatus**



forming part of, or connected to, the **Distribution System**. Each individual Authorization shall indicate the class of **Operation** and/or work permitted and the section of the **System** to which the authorization applies.

8.4.3. The **Distributor** and every **User** shall at all times have nominated a person or persons to be responsible for the co-ordination of safety pursuant to this Distribution Operating Code, those persons being referred to in this Distribution Operating Code as **Control Persons**. (Under the conditions of the **Distributor**'s Safety Rules a **Control Person** may either be at the **Distributor**'s Distribution Control Centre or be a person authorised in accordance with **DOC** 8.4.4, who is at the site or location of the **Operational Boundary**).

## **Nomination of Control Persons:**

8.4.4. The **Distributor** and each **User** shall at all times have nominated a **Control Person** or **Control Persons** responsible for co-ordination of **Safety from the System** pursuant to this Distribution Operating Code. **Control Persons** and persons concerned with the carrying out of Safety Precautions and work on or testing of **Plant** and **Apparatus** forming part of, or connected to, the **Distribution System** shall have a written authorisation designating their role in implementing the **Safety Management System**.

## System of Documentation,

- 8.4.5. A system of documentation shall be maintained by the **Distributor** and the appropriate **Users** which will record the inter-system Safety Precautions taken when:-
  - (a) Work and/or testing is to be carried out on **MV Plant** and/or **Apparatus** across the **Operational Boundary**.
  - (b) Isolation and/or earthing of the other's **System** is required.
- 8.4.6. Where relevant, copies of the **Safety Management Systems** and related documentation shall be exchanged between the **Distributor** and **Users** for each **Operational Boundary**.
- 8.4.7. The **Distributor** and **Users** shall maintain a suitable system of documentation which records all relevant operational events that have taken place on the **Distribution System** or any other **System** connected to it and the co-ordination of relevant Safety Precautions for work.
- 8.4.8. All documentation relevant to the **Operation** of the **Distribution System**, and Safety Precautions taken for work or tests, shall be held by the **Distributor** and the appropriate **User** for a period of not less than six months.

### **Safety Precautions**

- 8.4.9. The establishment of Safety Precautions involves:
  - (a) The isolation from the remainder of the **System** of **Plant** and/or **Apparatus**, including from **Low Voltage** in feeds, either by an Isolating Device in the isolating position and immobilized and locked or by other means of rendering the **Plant** or **Apparatus** Isolated, and/or


(b) The earthing by way of providing a connection between a conductor and earth by using an earthing device which is applied and where reasonably practicable, immobilized and locked, the extent of the Safety Precautions required being determined pursuant to this Distribution Operating Code.

## 8.5. ENVIRONMENTAL SAFETY

- 8.5.1. Site Safety and Security Arrangements shall be made by the **Distributor** and **Users** to ensure site safety and security.
- 8.5.2. Suitable arrangements shall be agreed between the **Distributor** and the relevant **Users** to provide free and unrestricted access to the **Distributor**'s **Plant** and **Apparatus** at substations or similar by the **Distributor**'s personnel or their designated representatives at all times.
- 8.5.3. Site Specific Hazards; Suitable arrangements shall be made by the **Distributor** and/or the relevant **Users** to ensure that personnel are warned by an appropriate means of hazards specific to any site, before entering any area of the site. This shall include hazards that may be temporary or permanent. Where these risks include contamination or similar, suitable decontamination facilities and procedures shall be provided.

## 8.6. INFORMATION FLOW AND CO-ORDINATION

- 8.6.1. Schedules of Responsibility: The **Distributor** and **Users** shall jointly agree and set down in writing schedules specifying the responsibilities for **System** Control of **Equipment**. These shall ensure that only one party is responsible for any item of **Plant** or **Apparatus** at any one time.
- 8.6.2. Pursuant to the Distribution Planning and Connection Code, **Site Responsibility Schedules** specifying the responsibilities for ownership, operation and maintenance shall be jointly agreed by the **Distributor** and the appropriate **User**(s) for each site or location where an **Operational Boundary** or joint responsibility exists. This will include **Operation** Diagrams illustrating sufficient information for **Control Persons** to carry out their duties which shall be exchanged by the **Distributor** and the appropriate **User**.
- 8.6.3. A copy of the **Site Responsibility Schedules** and **Operation** Diagrams shall be retained by the **Distributor** and the appropriate **User**(s). **Site Responsibility Schedules** and **Operation** Diagrams shall be maintained by the **Distributor** and the appropriate **User**(s) and exchanged as necessary to ensure that they reflect the current agreements.
- 8.6.4. Outage Co-ordination: For those Users connected at MV and having firm supply connections (provided by more than one circuit) and where the User so requests to the **Distributor**, these schedules shall identify those specified **Distributor** circuits on which Planned Outages by the **Distributor** shall be notified to the User. These specified circuits will be those where the **Distributor** and the User have agreed that during outages of the specified circuits the User can introduce measures to manage critical processes or safety aspects. These specified circuits will usually operate at the voltage level at which the supply is provided and will have a significant effect on the security level of the User's



supply. Those **Users** connected at **MV** and not having firm supply connections (provided by more than one circuit) may seek to obtain outage planning information through arrangements with the **Distributor**.

## **Communications:**

- 8.6.5. Where the **Distributor** reasonably specifies the need, suitable communication systems shall be established between the **Distributor** and other **Users** to ensure the control function is carried out in a safe and secure manner. Where the **Distributor** reasonably decides a back up or alternative routing of communication is necessary to provide for the safe and secure **Operation** of the **Distribution System** the means shall be agreed with the appropriate **Users**. Schedules of telephone numbers/call signs shall be exchanged by the **Distributor** and appropriate **User** to enable control activities to be efficiently co-ordinated.
- 8.6.6. The **Distributor** and appropriate **Users** will establish 24-hour availability of personnel with suitable authorisation where the joint operational requirements demand it.

## Procedures

- 8.6.7. Pursuant to this Distribution Operating Code the **Control Person** and/or Authorised Persons for each of the **Distributor** and a **User** relating to the place where Safety Precautions are required will contact each other to coordinate the Safety Precautions, and the **Control Person** requesting Safety Precautions shall be referred to as the "Requesting **Control Person**" and the **Control Person** being requested and implementing the Safety Precautions shall be referred to as the "Implementing **Control Person**".
- 8.6.8. Procedures shall be maintained by the **Distributor** and the appropriate **Users** which clearly specify the responsibility for **System** Control of **Plant** and **Apparatus** and these shall ensure that only one **Control Person** is responsible for any item of **Plant** and **Apparatus** at any one time. The operational procedures shall be in accordance with the **Safety Management System** agreed between the **Distributor** and the **User**(s).



## 9. SECTION: TESTING, MONITORING AND INVESTIGATION

#### 9.1. INTRODUCTION

9.1.1. In order to properly discharge its responsibilities in respect of safe, secure, reliable and economic operation of the **Distribution System** in accordance with its licence conditions and the **Distribution Performance Standards Code**, the **Distributor** shall organize and carry out monitoring, testing and investigation on the effect of **User's** electrical **Equipments** or electrical installation on the **Distribution System**. The testing and/or monitoring procedures will be specifically related to the technical criteria detailed in this **Distribution Code** as per related to IEC site testing guideline and/or manufactures recommendations.

## 9.2. TESTING REQUIREMENTS

- 9.2.1. The **Distributor** shall, from time to time, test and/or monitor the **Power Quality** at various points on its **Distribution System**, including monitoring the effect of the **User System** on the **Distribution System**.
- 9.2.2. The specific testing and/or monitoring by a **Distributor** may be initiated by the receipt of a complaint relating to power quality in the **Distribution System** and/or in accordance with the provisions of the **Distribution Performance Standards Code**.
- 9.2.3. In certain situations, the **Distributor** may require the testing and/or monitoring to take place at the **Connection Point** of a **User** to be witnessed by a **User** representative.
- 9.2.4. If testing and/or monitoring are required at the **Connection Point**, the **Distributor** shall advise the **User** involved and shall make available the results of such tests to the **User**.
- 9.2.5. Where the User requests, a retest will be carried out and the test witnessed by a User representative. The cost of the retest shall be charged to the User
- 9.2.6. If the User is exporting to or importing from the Distribution System an amount of Active Power or Reactive Power in excess of the value specified in the Connection Agreement the Distributor shall inform the User or if the results of the test show that the User is operating outside the technical parameters stated in this Distribution Code, the User shall be informed accordingly. The User shall rectify the situation within a period agreed with the Distributor.
- 9.2.7. If the User is operating outside the limits specified in this Distribution Code and/or the Connection Agreement, the User shall immediately disconnect the Apparatus causing the problem from its electrical System connected to the Distribution System or otherwise ensure operation within the limits specified in this Distribution Code and/or the Connection Agreement. The restriction shall apply until a new Connection Agreement is in effect and any necessary changes to the Connection Point and/or Distribution System are completed.



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9.2.8. If the User fails to rectify the situation or fails to comply with any notification in writing from the **Distributor**, the **Distributor** may disconnect the User from the **Distribution System**, in accordance with the **Connection Agreement**.



#### **10. SECTION: SYSTEM TESTS**

#### **10.1. SYSTEM TEST REQUIREMENTS**

- 10.1.1. **System** Test, which involves the simulation of conditions or the controlled application of unusual or extreme conditions that may have an impact on the **Distribution System** or the **User System**, shall be carried out in a manner that shall not endanger any personnel or the general public
- 10.1.2. Precautions shall be taken to avoid unexpected outages, and/or damage to **Equipment**, the **Distribution System**, and the **System** of the **Users** when undertaking a **System** Test on the **Distribution System** or the **User System**.
- 10.1.3. Where the **System** Test may have an impact on the **Transmission System**, the **Grid Code** shall apply.

## **10.2. SYSTEM TEST REQUEST**

- 10.2.1. If a User wishes to undertake a System Test on its System, it shall submit to the Distributor a System Test Request that contains the following:
  - (a) The purpose and nature of the proposed **System** Test;
  - (b) The extent and condition of the **Equipment** involved; and
  - (c) A proposed **System** Test Procedure specifying the switching sequence and the timing of the switching sequence.
- 10.2.2. The **System** Test Proponent shall provide sufficient time for the **Distributor** to plan the proposed **System** Test. The **Distributor** shall determine the time required for each type of **System** Test.
- 10.2.3. The **Distributor** may require additional information before approving the proposed **System** Test if the information contained in the **System** Test Request is insufficient or the proposed **System** Test Procedure cannot ensure the safety of personnel and Reliability of the **Distribution System**.
- 10.2.4. The **Distributor** shall determine and notify other **Users**, other than the **System** Test Proponent, that may be affected by the proposed **System** Test.
- 10.2.5. The **Distributor** may also initiate a **System** Test if it has determined that the **System** Test is necessary to ensure the safety and reliability of the **Distribution System**.

#### **10.3. SYSTEM TEST GROUP**

10.3.1. If the **Distributor** is the **System** Test Proponent, it shall notify all affected **Users** of the proposed **System** Test. If the **Distributor** is not the **System** Test Proponent, it shall notify, within [one (1) month] after the acceptance of a **System** Test Request, the **System** Test Proponent and the affected **Users** of the proposed **System** Test. The notice shall contain the following:



- (a) The purpose and nature of the proposed **System** Test, the extent and condition of the **Equipment** involved, the identity of the **System** Test Proponent, and the affected **Users**;
- (b) An invitation to nominate representatives for the **System** Test Group to be established to coordinate the proposed **System** Test; and
- (c) If the **System** Test involves work or testing on **MV** and **HV Equipment**, the Safety Coordinators and the safety procedure specified in the **Section**: Safety Coordination shall apply.
- 10.3.2. The **Distributor**, the **System** Test Proponent (if it is not the **Distributor**) and the affected **Users** shall nominate their representatives to the **System** Test Group within [one (1) month] after receipt of the notice from the **Distributor**. The **Distributor** may decide to proceed with the proposed **System** Test even if the affected **Users** fail to reply within that period.
- 10.3.3. The **Distributor** shall establish a **System** Test Group and appoint a **System** Test Coordinator, who shall act as chairman of the **System** Test Group. The **System** Test Coordinator may come from the **Distributor** or the **System** Test Proponent.
- 10.3.4. The members of the **System** Test Group shall meet within [one (1) month] after the Test Group is established. The **System** Test Coordinator shall convene the **System** Test Group as often as necessary.
- 10.3.5. The agenda for the meeting of the **System** Test Group shall include the following:
  - (a) The details of the purpose and nature of the proposed **System** Test and other matters included in the **System** Test Request;
  - (b) Evaluation of the **System** Test Procedure as submitted by the **System** Test Proponent and making the necessary modifications to come up with the final **System** Test Procedure;
  - (c) Evaluation of the outages that could be caused to the **Users** (including those which are not represented in the **System** Test Group);
  - (d) The possibility of scheduling simultaneously the proposed System Test with any other test and with Equipment Maintenance which may arise pursuant to the Maintenance Programme requirements of the Distribution System or the System of the Users; and
  - (e) The economic, operational, and risk implications of the proposed **System** Test on the **Distribution System**, the **System** of the other **Users** and the Scheduling and Dispatch of the **Generators** Connected to Distribution.
- 10.3.6. The **Distributor**, the **System** Test Proponent (if it is not the **Distributor**) and the affected **Users** (including those which are not represented in the **System** Test Group) shall provide the **System** Test Group, upon request, with such details as the **System** Test Group reasonably requires carrying out the proposed **System** Test.



## **10.4. SYSTEM TEST PROGRAMME**

- 10.4.1. Within [two (2) months] after the first meeting and at least [one (1) month] prior to the date of the proposed **System** Test, the **System** Test Group shall submit to the **Distributor**, the **System** Test Proponent (if it is not the **Distributor**), and the affected **Users** a proposed **System** Test Program which shall contain the following:
  - (a) Plan for carrying out the **System** Test;
  - (b) **System** Test Procedure to be followed during the test including the manner in which the **System** Test is to be monitored;
  - (c) List of responsible persons, including Safety Coordinators when necessary, who will be involved in carrying out the **System** Test;
  - (d) An allocation of the testing cost among the affected parties; and
  - (e) Such other matters as the **System** Test Group may deem appropriate and necessary and are approved by the management of the affected parties.
- 10.4.2. If the proposed **System** Test Program is acceptable to the **Distributor**, the **System** Test Proponent, and the affected **Users**, the final **System** Test Program shall be constituted and the **System** Test shall proceed accordingly. Otherwise, the **System** Test Group shall revise the **System** Test Program
- 10.4.3. If the **System** Test Group is unable to develop a **System** Test Program or reach a decision in implementing the **System** Test Program, the **Distributor** shall determine whether its is necessary to proceed with the **System** Test to ensure the safety and reliability of the **Distribution System**. In this case, the **Distributor** should communicate this decision to the **EMRC**, asking for proper authorization.
- 10.4.4. The **System** Test Coordinator shall be notified in writing, as soon as practicable, of any proposed revision or amendment to the **System** Test Programme prior to the day of the proposed **System** Test. If the **System** Test Coordinator decides that the proposed revision or amendment is meritorious, he shall notify the **Distributor**, the **System** Test Proponent and the affected **Users** to act accordingly for the inclusion thereof. The **System** Test Programme shall then be carried out with the revisions or amendments if the **System** Test Coordinator received no objections.
- 10.4.5. If **System** conditions are abnormal during the scheduled day for the **System** Test, the **System** Test Coordinator may recommend a postponement of the **System** Test.

## **10.5. SYSTEM TEST REPORT**

- 10.5.1. Within [two (2) months] or a shorter period as the System Test Group may agree after the conclusion of the System Test, the System Test Proponent shall prepare and submit a System Test Report to the Distributor, the affected Users, and the members of the System Test Group. Copy of this report shall be sent to the EMRC for notification.
- 10.5.2. After the submission of **System** Test Report, the **System** Test Group shall be automatically dissolved.



## 11. GENERATING UNITS CAPABILITY TESTS

## **11.1. TEST REQUIREMENTS**

- 11.1.1. Tests shall be conducted on **Generators** Connected to **Distribution**, in accordance with procedures and standards specified by the **Distributor** (or the System Operator if **applicable**), to confirm compliance with the **Distribution** Code and/or the Grid Codefor the following:
  - (a) Capability of **Generating Units** to operate within their registered Generation parameters;
  - (b) Capability of the **Generating Units** to meet the applicable requirements of the **Grid Code** and the **Distribution Code**;
  - (c) Capability to deliver any **Ancillary Services** that the **Generator** has agreed to provide; and
  - (d) Availability of **Generating Units** in accordance with their capability declaration.
- 11.1.2. All tests shall be recorded and witnessed by representatives of the **Distributor**, the **Generator and the System Operator (if applicable)**.
- 11.1.3. The **Generator** shall demonstrate to the **Distributor** (or the **System Operator** if applicable), the fitness for purpose and accuracy of the test instruments to be used in the test.
- 11.1.4. The Distributor (or the System Operator, if applicable) may at any time issue instructions requiring tests to be carried out on any Generating Unit connected to the Distribution System. All tests shall be of sufficient duration and shall be conducted no more than twice a year except when there are reasonable grounds to justify further tests.
- 11.1.5. If a Generating Unit connected to the Distribution System fails the test, the Generator shall correct the deficiency within a period agreed with the Distributor (or the System Operator if applicable) to attain the relevant registered parameters for that Generating Unit.
- 11.1.6. Once the **Generator** achieves the registered parameters of its **Generating Unit** that previously failed the test, it shall immediately notify the **Distributor** (or the **System Operator** if applicable). The **Distributor** (or the **System Operator** if applicable) shall then require the **Generator Connected to Distribution** to conduct a retest in order to demonstrate that the appropriate parameter has already been restored to its registered value.
- 11.1.7. If a dispute arises relating to the failure of a **Generating Unit** to pass a given test, the **Distributor** (or the **System Operator** if applicable), the **Generator Connected to Distribution**, and/or **User** shall seek to resolve the dispute among them.
- 11.1.8. If the dispute cannot be resolved, one or more of the parties may submit the issue to the **EMRC**, unless specified otherwise in the **Connection Agreement** or where a contract, licence or concession excludes such action.

## **11.2. TESTS TO BE PERFORMED**

- 11.2.1. A Generator's production of **Reactive Power** shall be subject to the agreement with the **Distributor** and **Grid Code** compliance (if applicable).
- 11.2.2. The **Reactive Power** test shall demonstrate that the **Generating Unit** meets the registered **Reactive Power** Capability requirements specified in **DPCC** 2 The **Generating Unit** shall pass the test if the measured values are within ±5 percent of the capability as registered with the **System Operator** (if applicable) and the **Distributor**.
- 11.2.3. The Black Start test shall demonstrate that the **Generating Unit** with Black Start capability can implement a Black Start procedure, as specified in **DPCC** 2 or in the **Connection Agreement**. To pass the test, the **Generating Unit** shall start on its own, synchronise and carry load without the need for external power supply.
- 11.2.4. The Declared Data capability test shall demonstrate that the **Generating Unit** can be scheduled and dispatched in accordance with the Declared Data. To pass the test, the **Generating Unit** shall satisfy the ability to achieve the Declared Data.
- 11.2.5. The Dispatch accuracy test shall demonstrate that the **Generating Unit** meets the relevant Generation Scheduling and Dispatch Parameters. The **Generating Unit** shall pass the test if:
  - (a) In the case of synchronisation, the process is achieved within  $\pm 5$  minutes of the registered synchronisation time;
  - (b) In the case of synchronising generation (if registered as a Generation Scheduling and Dispatch Parameters), the synchronising generation achieved is within an error level equivalent to 2.5% of Declared Net Capacity;
  - (c) In the case of meeting ramp rates, the actual ramp rate is within  $\pm 10\%$  of the registered ramp rate;
  - (d) In the case of meeting **Load** reduction rates, the actual **Load** reduction rate is within  $\pm 10\%$  of the registered **Load** reduction rate; and
  - (e) In the case of all other Generation Scheduling and Dispatch Parameters, values are within  $\pm 1.5\%$  of the declared values.
- 11.2.6. The Ancillary Services test, as specified by the Distributor or the System Operator if applicable, shall demonstrate the services in terms of quantity, quality and operational requirements. Generators providing Ancillary Services shall conduct the tests and the Distributor (or the System Operator if applicable) shall have the right to witness the tests.



## 12. SECTION: SITE AND EQUIPMENT IDENTIFICATION

## 12.1. SITE AND EQUIPMENT IDENTIFICATION REQUIREMENTS

- 12.1.1. The **Distributor** shall develop and establish a standard **System** for Site and **Equipment** Identification to be used in identifying any Site or **Equipment** in all **Electrical Diagrams**, distribution operation instructions, notices, and other documents.
- 12.1.2. The identification for the Site shall include and be unique for each substation and switchyard where a **Connection Point** is located.
- 12.1.3. The identification for **Equipment** shall be unique for each transformer, distribution line, bus, circuit breaker, disconnect switch, grounding switch, capacitor bank, reactor, lightning arrester, and other **MV Equipment** at the **Connection Point**.

## **12.2. SITE AND EQUIPMENT IDENTIFICATION LABEL**

- 12.2.1. The **Distributor** shall develop and establish a standard labelling nomenclature, which specifies the dimension, sizes of characters, and colures of labels, to identify the Sites and **Equipment**.
- 12.2.2. The **Distributor** and the **User** shall be responsible for the provision and installation of a clear and unambiguous label showing the Site and **Equipment** Identification for their respective **System**.



## PART 4: DISTRIBUTION METERING CODE

#### 1. SECTION: INTRODUCTION

#### **1.1. APPLICABILITY**

- 1.1.1. This **Distribution Metering Code** must be applied and used together with:
  - (a) the Distribution Performance Standards Code; and
  - (b) the **NEPCO Metering Code**.

#### **1.2. PURPOSE AND SCOPE**

- 1.2.1. The purpose of this **Distribution Metering Code** (DMC) is to specify the technical and operational criteria, including the procedures to be complied with by the **Distributor**, in carrying out its obligation to provide metering services to **Users** at each Metering Point. It also applies to **Users** in so far as their **Equipment** may affect the **Distribution System**.
- 1.2.2. The **Distribution Metering Code** applies to the following:
  - (a) **Distributors**
  - (b) Users connected to, or seeking connection to, the Distribution System.
- 1.2.3. The **Distributor** shall:
  - (a) Own, install, verify, operate, maintain, inspect and replace all Metering Systems at Metering Points on the Distribution System, except Metering Systems situated at Connection Points to the Transmission System.
  - (b) Ensure that each **Metering System** installed on its **Distribution System** meets the performance, functional and technical requirements set out in this **Distribution Metering Code** and applicable standards listed in **Annex** 2;
  - (c) Ensure that each **Metering System** installed on its **Distribution System** is certified where so required by the **EMRC**, is in working condition and has been tested for accuracy;
  - (d) Retrieve data from each **Metering System** installed on its **Distribution System** for the purposes of billing and settlement;
  - (e) Process data retrieved from each **Metering System** installed on its **Distribution System** for the purposes of billing and settlement; and
  - (f) Shall notify the **EMRC** of all **Metering Systems** where the **Distributor** cannot comply with this Distribution Metering Code and shall seek derogation from the **EMRC**, and the **EMRC** may or may not grant such derogation and may impose any conditions as it reasonably sees fit.



## 2. SECTION: OBLIGATIONS

## 2.1. INSTALLATION AND REPLACEMENT OF METERING EQUIPMENT

- 2.1.1. The installation of Metering **Equipment** shall be in accordance with Part 1 Section 4 of the **Distribution Code**.
- 2.1.2. The **Distributor** may replace Metering **Equipment** for which it is responsible at any time after it has been installed, subject to the provisions of this Distribution Metering Code. The **Distributor** shall notify the **User** in advance of any replacement, unless that replacement is provided as part of **Urgent Metering Services**.
- 2.1.3. The **Distributor** shall:
  - (a) Assign a unique identifier to the Metering System, cross-referenced to the location of the Metering System;
  - (b) Record the date of installation of the **Metering System**;
  - (c) Record the functionality of the **Meter** and the unit of measurement used to measure **Energy** flowing through the **Metering System** or **Maximum Load**, as it corresponds;
  - (d) Record the identification of the ancillary equipment;
  - (e) Record any site-specific loss adjustment factors to be applied;
  - (f) Record redundancy details and sources of check metering data, where required by this Distribution Metering Code, and identification of the meters designated as the main **Meter** and as the check Meter; and
  - (g) Record the initial **Meter** register reading.
  - (h) Ensure that the metering data stored in the **Metering System** is retrieved and, where a meter is removed, shall ensure that a final **Meter** reading is obtained.
- 2.1.4. The **Distributor** shall maintain the following information for each **Metering System**:
  - (a) Location of the Metering System;
  - (b) A record of any malfunction of the **Metering System** including any test results and of repairs made to the **Metering System**; and
  - (c) Documentation of **Meter** testing prior to installation.
- 2.1.5. The **Distributor** shall, on request, make available for each **Metering System** the information listed in DMC **Section** 2.1.3 and 2.1.4 to:
  - (a) The **User** associated with the metering system;
  - (b) The **EMRC**.



## 2.2. STANDARD METERING SYTEMS

- 2.2.1. Each Metering Point shall be situated as close as is reasonably practicable to the relevant **Connection Point**.
- 2.2.2. Prior to the installation of any **Meter** or current transformers and voltage transformers that form part of a **Metering System**, such Metering **Equipment** shall be:
  - (a) Submitted by the **Distributor** to a laboratory that has been accredited by the **EMRC** for testing and certification; or
  - (b) Received by the **Distributor** directly from a manufacturer with a test certificate endorsed by an independent laboratory accredited by the **EMRC**.
- 2.2.3. Copies of all test certificates shall be retained by the **Distributor** whilst the Metering **Equipment** is in use, and for Metering **Equipment** that is no longer in use, for a minimum period of six years after the Metering **Equipment** has been de-commissioned and rendered un-useable or scrapped. The **Distributor** shall produce these certificates upon notice from the **EMRC**.
- 2.2.4. No Metering **Equipment** shall be certified as complying with this **Distribution Metering Code** unless the **Distributor** has received the relevant test certificates from the relevant accredited laboratory or manufacturer.

#### 2.2.5. Standard Medium Voltage Metering Systems:

- (a) Shall contain a **Meter** or more than one Meter, each of which complies with the standards in this **Distribution Metering Code**;
- (b) Shall record Active **Energy** (kWh);
- (c) Shall record Reactive **Energy** (kVArh);
- (d) Shall record **Maximum Load** in the cases the applicable tariffs specifies that; and
- (e) Shall have metering current and voltage transformers that are tested and comply with the standards in Appendix A.
- 2.2.6. The **Distributor** may agree with the **User** the use of more accurate **Meters** or **Metering System** in particular cases of Medium or **Large Connections**.
- 2.2.7. The rated short-time current rating shall not be less than
  - (a) 25kA for 3 seconds for **MV** Metering Points at/ above 6.6kV; or
  - (b) 20kA for 3 seconds for **MV** Metering Points at/above 6.6kV and below.
- 2.2.8. For each circuit, metering voltage transformers of accuracy class 1.0 with 110 volts secondary voltage and 100VA burden per phase for star-star connection or 180VA burden per phase for 'V' connection shall be provided.

#### 2.2.9. Standard Low Voltage Metering Systems:



- (a) Shall contain a Meter or more than one Meter, each of which complies with the standards in this Distribution Metering Code, being either 1-phase, 2-wire or 3-phase, 4-wire type of accuracy class 2.0 and metering current transformers, where applicable, of accuracy class 0.5 with 5 amperes or 1 ampere secondary current and 5VA burden.;
- (b) Shall record Active **Energy** (kWh);
- (c) May record Reactive **Energy** (kVArh);
- (d) Shall record **Maximum Load** in the cases the applicable tariffs specifies that;
- (e) Shall contain, where necessary, metering current transformer(s) provided by the **Distributor** that are tested and comply with the standards in Appendix A; and
- (f) Shall contain a suitable facility (including all necessary pre-wiring), provided by the **Distributor**, in which to house the **Metering System**.
- 2.2.10. The **Distributor** may agree with the **User** the use of more accurate **Meters** or **Metering Systems** in particular cases of Medium or **Large Connections**.

## 2.3. ALTERNATIVES TO STANDARD METERING SYSTEMS

- 2.3.1. Upon the request of a **User**, the **Distributor** may arrange for a **Metering System to install** a check meter, or to contain features or equipment in addition to those specified in this **Distribution Metering Code** provided that:
  - (a) The **User** agrees to pay the full costs of the additional features or equipment, including the costs of installation, operation, maintenance, repairs and replacement; and
  - (b) The additional features or equipment are compatible with the rest of the **Metering System** and do not lead to any degradation of the capability of the **Metering System** that would cause the **Metering System** to fail to meet any standards contained in this **Distribution Metering Code**.

## 2.4. FAULTY METERING EQUIPMENT

- 2.4.1. A **Metering System** shall be considered faulty and not in compliance with this Distribution Metering Code if it is determined that any part of that **Metering System** does not comply with this **Distribution Metering Code**.
- 2.4.2. If a **Metering System** fault occurs, the **Distributor** shall provide **Urgent Metering Services** to repair or replace the **Metering System** as soon as is reasonably practicable and in any event within two working days of the **Distributor** discovering that the fault exists.
- 2.4.3. The **User** shall use Metering **Equipment** in a safe and prudent manner and shall take due care to avoid damage. The **User** shall notify the **Distributor** of any damage to the Metering **Equipment**, however caused.



- 2.4.4. The **Distributor** shall ensure that suitable data is obtained or estimated for the period of time commencing when a **Meter** or Metering **Equipment** becomes faulty until the completion of the repair or replacement.
- 2.4.5. The **Distributor** shall record all relevant **Meter** parameters for a replacement **Meter** in that **Metering System**.

## 2.5. TECHNICAL REQUIREMENTS AND ACCURACY OF METERS

- 2.5.1. The **Distributor** shall ensure that the accuracy of each **Meter** in each <u>*Distributor*</u> System is certified by an accredited **Meter** test laboratory approved by the **EMRC** and meets the applicable accuracy limits.
- 2.5.2. The limits of accuracy for the following classes of **Meters** shall be:
  - (a)  $\pm 0.2\%$  for class 0.2 S static watt-hour meters.
  - (b)  $\pm 0.5\%$  for class 0.5 S static watt-hour meters.
  - (c)  $\pm 0.5\%$  for class 0.5 watt-hour meters.
  - (d)  $\pm 1.0\%$  for class 1.0 watt-hour meters.
  - (e)  $\pm 2.0\%$  for class 2.0 watt-hour meters.
- 2.5.3. The **EMRC** may issue directives with the procedures to be applied to verify the limits of accuracy of **Meters**. These directives could specify that, in cases of sampling testing of more than one meter, a pre-defined percentage of **Meters** shall comply with more stringent accuracy.
- 2.5.4. In the event of non-compliance with the required standards, the **Distributor** shall ensure that the accuracy of any **Meter** in that **Metering System** is restored to comply with the accuracy standards described in **Section** 2.5.2 as soon as is reasonably practicable.
- 2.5.5. The **Distributor** shall maintain certification records and test results relating to the accuracy class and compliance with the relevant standards for the particular type and model of **Meter** in that **Metering System**.
- 2.5.6. The **Distributor** shall maintain records of the information referred to in this section for each **Metering System**, either in use or no longer in use, for at least six years and shall produce these records when required by the **EMRC**.

## 2.6. AUDIT AND INSTALLATION TESTS

2.6.1. The **Distributor** shall ensure that each **Metering System** is inspected according to the minimum frequencies specified in following Table:

Type of Metering System	Frequency	
Medium Voltage	Once every year	
Low Voltage, including prepayment	Once every 3 years	



- 2.6.2. The **Distributor** may, and on the direction of the **EMRC** shall, carry out periodic, random and unannounced inspection and or testing of any **Metering System** and associated data for the purpose of ascertaining whether the **Metering System** complies with the requirements of this **Distribution Metering Code**. The **User** may request the **Distributor** to carry out such inspection and or testing, provided that the **User** pays the cost, unless an error or malfunction not caused by the **User** is discovered. In addition, the **EMRC** may carry out its own unannounced inspection and or test, in which case the **User** shall grant access to the **EMRC**.
- 2.6.3. The **Distributor** shall, as soon as practicable, make the results of any inspection and or tests conducted pursuant to this section available to the requesting party and to the **User** associated with the **Metering System**.

## 2.7. ACCESS TO METERING SYSTEMS

- 2.7.1. The **User** shall grant access to the **Distributor** to enable the **Distributor** to fulfil its obligations under this Distribution Metering Code. This right of access is conditional upon:
  - (a) Where practicable, prior notice by the **Distributor**; and
  - (b) The production of identification by the **Distributor's** staff or contractor.
- 2.7.2. Prior arrangement by the **Distributor** shall not be required in respect of routine **Meter** reading, or periodic, random and unannounced audits required by DMC **Section** 2.6.2, or when the **Distributor** is performing **Urgent Metering Services**.

## 2.8. SECURITY OF METERING SYSTEMS

- 2.8.1. The **Distributor** shall, so far as is reasonably practicable, maintain the security of the metering data stored in or obtained from each **Metering System**.
- 2.8.2. Appropriate seals shall be applied to each **Metering System**. Seals shall be replaced following works requiring the removal of any seals. The **Distributor**'s procedures for the control of seals and sealing pliers shall be subject to approval by the **EMRC**.
- 2.8.3. The **Distributor** shall, so far as is reasonably practicable, ensure that physical access to each **Meter** contained in each **Metering System** is protected by:
  - (a) Sealing all associated links, circuits, data storage and data processing systems;
  - (b) Ensuring that the **Metering System** meets the requirements for the security of **Metering Systems** set out in this Distribution Metering Code.
  - (c) The **Distributor** shall use reasonable endeavours to ensure that all metering data within each **Metering System** is secure.

#### **2.9. METER READING**

2.9.1. The **Distributor** shall schedule a monthly reading for all manually read meters.



- 2.9.2. For kilowatt-hour meters, the **Distributor** shall verify at each **Meter** reading that the **Meter** identification number on the **Meter** matches the **Meter** identification number on the **Meter** reading schedule.
- 2.9.3. The **Distributor** shall record:
  - (a) The **Meter** identification number;
  - (b) The **Meter** reading and read date at the beginning of the **Meter** reading period;
  - (c) The **Meter** reading and read date at the end of the **Meter** reading period;
  - (d) The cumulative Active **Energy** (kWh) recorded during the **Meter** reading period;
  - (e) Where the **User** is billed for **Reactive Energy**, the cumulative **Reactive Energy** (kVArh) recorded during the **Meter** reading period;
  - (f) Where the **User** is billed for maximum **Active Power**, the maximum **Active Power** recorded during the **Meter** reading period;
  - (g) Where the **User** is billed for maximum **Reactive Power**, the maximum **Reactive Power** recorded during the **Meter** reading period; and
  - (h) Details of any **Meter** alarms that were recorded during the period (e.g., system outages, VT failure).

## 2.10. REMOTE METERING EQUIPMENT

- 2.10.1. The **Distributor** shall specify the type of equipment to be used for communication with remote meters.
- 2.10.2. The **Distributor** shall conduct such tests as it deems necessary to verify production or consumption recorded at each Metering Point.

## 2.11. DATA MANAGEMENT

- 2.11.1. The **Distributor** shall:
  - (a) Maintain a metering data registry that contains usage data for each **User** and data required for settlement purposes in respect of each **Metering System**;
  - (b) Validate metering data for each **Metering System**;
  - (c) Estimate usage when **Meter** readings are not available, inaccurate, or otherwise not suitable for settlement purposes;
  - (d) Apply adjustments to metering data to account for system losses and unaccounted for energy;
  - (e) Aggregate metering data for settlement and loss calculation purposes; and
  - (f) Use reasonable endeavours to maintain the security and confidentiality of the metering data.



## 2.12. DATA REGISTRATION

- 2.12.1. The **Distributor** shall establish and maintain a register that contains the following information for each **Metering System**:
  - (a) A unique identifier assigned by the **Distributor** to the **Metering System** crossreferenced to the location of the **Metering System** and cross referenced to the **User's** account;
  - (b) The date of installation of the **Metering System**;
  - (c) The functionality of the **Meter** and the unit of measurement used to measure **Energy** flowing through the **Metering System** (e.g., kWh meter, kVArh meter);
  - (d) Identification of the ancillary equipment;
  - (e) Any site-specific adjustment factors to be applied, including a cross reference to the unique identifier specified in (a) above;
  - (f) The existence of redundancy and sources of check metering data, where required by this Distribution Metering Code, and identification of the meters designated as the main **Meter** and as the check Meter;
  - (g) Data for each **Meter** following completion of the validation and estimation procedures;
  - (h) Billing data for each **Meter** following completion of adjustments for losses and unaccounted for energy; and
  - (i) The data covering a period of not less than twelve months which shall be immediately accessible in electronic form.

## 2.13. DATA VALIDATION AND LOSS ADJUSTMENT FACTORS

- 2.13.1. The **Distributor** shall:
  - (a) Have in place data validation procedures and loss adjustment calculation methodologies approved by the **EMRC**;
  - (b) Where necessary, determine site-specific loss adjustment factors for each **Metering System**;
  - (c) Multiply each valid reading by the appropriate loss adjustment factor to produce loss adjusted production or consumption; and
  - (d) Shall maintain both unadjusted and loss-adjusted values in the metering data registry in respect of each **Metering System**.

## 2.14. METERING DISPUTES

2.14.1. If the **Distributor** receives a complaint about the accuracy of metering data or the calculation of any substitute or estimated metering data from the **User**, the **Distributor** shall investigate the complaint. The investigation shall include a review of all available information, including any information supplied by the **User**. If the **Distributor** determines that there is an inaccuracy due to **Meter** error, malfunction or error in the metering data, the



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**Distributor** shall take appropriate steps to remedy the defect, including repair or replacement of equipment and adjustment of metering data. Appropriate adjustments shall also be made to the **User**'s bill. In the event of a dispute, the dispute shall be settled using the procedure specified in **Section** 2.3 of the **Distribution Code**.



# PART 4: DATA REGISTRATION CODE (DDRC)

## 1. SECTION: DATA REGISTRATION CODE

## **1.1. INTRODUCTION**

- 1.1.1. The various sections of the **Distribution Code** require **Users** to submit data to the **Distributor**.
- 1.1.2. The Distribution Data Registration Code (DDRC) 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.
- 1.1.3. The DDRC 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 DDRC.
- 1.1.4. In the case of a **Generator** seeking a connection to the **Distribution System** then irrespective of the potential arrangements for scheduling and dispatch, discussions on connection will be with the **Distributor** concerned with the connection arrangements.

#### **1.2.** SCOPE

1.2.1. The **Users** to which the DDRC applies are:

#### (a) Generation Connected to Distribution;

- (b) All **Users** with a maximum demand equal to or greater than 4 MVA.
- (c) Any other **Distributor** connected to the host **Distributor**.

#### **1.3. DATA CATEGORIES**

- 1.3.1. The data required by the **Distributor** is divided into two categories, **System** Planning Data (SPD) and Operational Data ("OD").
- 1.3.2. In order to assess the implications for making a connection the **Distributor** will require SPD and OD information, the precise requirements being decided by the **Distributor** and dependant upon the circumstances. Following an agreement to connect the **User** must supply data as requested by the **Distributor** which will be referred to as Registered Data.

#### 1.4. PROCEDURES AND RESPONSIBILITIES

- 1.4.1. Unless otherwise specified or agreed by the **Distributor** each **User** is required to submit data as defined below.
- 1.4.2. It is a requirement of the DDRC that data changes are advised as soon as practicable to the **Distributor** and in any case reviewed annually to ensure continued accuracy or relevance.



The **Distributor** will initiate this review in writing and the **User** will respond in writing. Where possible data will be submitted on standard forms forwarded to the **User** by the **Distributor**.

- 1.4.3. If a **User** wishes to change any data item then this must first be discussed with the **Distributor** concerned in order for the implications to be considered and the change if agreed (such agreement not to be unreasonably withheld), be confirmed by the submission of a revised data form or by verbal means with confirmation by telex or similar if short timescales are involved.
- 1.4.4. From time to time the **Distributor** may change its data requirements, appropriate **Users** will be advised of these changes as they occur and will be provided with a reasonable timescale by which to reply.

## **1.5. DATA TO BE REGISTERED**

- 1.5.1. Schedules 1A, 1B and 1C Generator Connected to Distribution Technical Information.
- 1.5.2. Schedule 2 **Demand** forecasts as described in DOC, time varying output/generation forecasts for the **Users** defined in the scope.
- 1.5.3. Schedule 3 Operational Planning as described in DOC, outage planning information.
- 1.5.4. Schedule 4 System Design Information comprising System technical data.
- 1.5.5. 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.
- 1.5.6. The schedules applicable to each class of **User** are:

Schedule Number:	Title	Applicable to
Schedule 1A	Generating Unit Data	All Generators Connected to Distribution
Schedule s 1B and 1C	Generating Unit Data	All <b>Generator</b> s Connected to Distribution greater than 5 MW
Schedule2	Demand Forecasts	All <b>Generators</b> Connected to Distribution greater than 5 MW;
		Any other <b>Distributor</b> connected to the host <b>Distributor System</b> ;
		All Users whose Demand is greater than 4 MVA



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Schedule3	Operational Planning	<b>Generator</b> s Connected to Distribution whose output is greater than 5MW;
		Any other <b>Distributor</b> connected to the host <b>Distributor System</b> ;
		All <b>Distributor</b> own supplied <b>Users</b> whose <b>Demand</b> is greater than 4 MVA
Schedule4-5	System Design	Generators Connected to Distribution;
	Characteristics	Any other <b>Distributor</b> connected to the host <b>Distributor System</b> ;
		All Users.

# **1.6. SCHEDULES**



# SCHEDULE 1A – GENERATION UNIT DATA FOR ALL GENERATORS CONNECTED TO DISTRIBUTION

Data description	Units	Data category
Terminal Volts	kV	SPD
Rated KVA	kVA	SPD
Rated kW	kW	SPD
Maximum Active Power sent out	kW	SPD
Reactive Power required	kVAr	SPD
Type of <b>Generator</b>	Text	SPD
Type of Prime Mover	Text	SPD
Anticipated Operating Regime	Text	SPD
Fault Level Contribution	MVA	SPD
Method of Voltage Control	Text	SPD
Generator Transformer Details	Text	SPD



## SCHEDULE 1B – Generating Unit Data for All Generators Connected to Distribution Greater than 5MW

Data description		Units	Data category
Rated MW at Registered Capacity for individual units and the Power Station		MW	SPD
Rated MW at Minimum and the Power Station	Generation for individual units	MW	SPD
Auxiliary <b>Demand</b> for i	ndividual units and the Power	MW	SPD
Station at Registered Cap	acity conditions	MVAr	
Auxiliary <b>Demand</b> for i	ndividual units and the Power	MVA	SPD
Station under Minimum C	seneration conditions	MVAr	
Individual Generator Inform	nation		
Rating		MVA	SPD
Generator MW/MVAr Capability Chart		Text	SPD
Inertia Constant		MWsec/MVA	SPD
Stator Resistance		% on MVA	SPD
	Sub-transient	% on MVA	
Direct Axis Reactance	Transient	% on MVA	SPD
	Synchronous	% on MVA	
Overter Aris Desetores	Sub-transient	% on MVA	CDD
Quarter Axis Reactance	Synchronous	% on MVA	
	Direct axis sub-transient	sec	
Time Constants	Direct axis transient	sec	SPD
	Quarter axis sub-transient	sec	]



## SCHEDULE 1C – Generating Unit Data for All Generators Connected to Distribution Greater than 5 MW

Data description		Units	Data category
Zaro Dhaca Saguanga	Resistance	% on MVA	SPD
Zelo r llase Sequence	Reactance	% on MVA	SPD
Nagativa Phasa Saguanga	Resistance	% on MVA	SPD
Negative Phase Sequence	Reactance	% on MVA	SPD
	Resistance	% on MVA	SPD
	Reactance	% on MVA	SPD
	MVA rating	MVA	SPD
Generator Transformer	Tap Arrangement	Text	SPD
	Vector Group	Text	SPD
	Earthing	Text	SPD
Automatic Voltage Regulator		Diagram	SPD
A block diagram for the model of the AVR <b>System</b> including data on the gains forward and feedback time constants and voltage control limits		Text	SPD
Speed governor and prime mover data		Diagram	SPD
A block diagram for the turbine control <b>System</b> and turbine time constants together with the turbine rating and maximum power		Text	SPD



## SCHEDULE 2 – DEMAND FORECASTS

Data description		Units	Time period covered	Update time	Data category	
1	Monthly average <b>Energy</b> demand at the <b>Connection Point</b>	MWh	Year 1	Week 35	OD	
2	Hourly load profile [hourly Active <b>Power</b> and Power Factor]	MWh - MVAr	Year 1	Week 35	OD	
	For typical days,					
3	Expected dispatch of Generation Connected to Distribution (not subject to centralized dispatch)	MW –MVAr	Year 1	Week 35	OD	
	For typical days					
4	Schedules for the operation of Generation Connected to Distribution (not subject to centralized dispatch) whose output is greater than 5MW on a hourly basis	MW Date time	2 weeks to 8 weeks ahead	15:00 hrs each Wednesday	OD	
5	Users, and other Distributors connected to the Distributor System shall notify the Distributor where their operations are likely to result in an aggregate change in Demand at the Connection Point of supply of greater than 5MW of the Demand at that time on an hourly basis.	MW Date Time	2 weeks to 8 weeks ahead	15:00 hrs each Wednesday	OD	
6	Items 4, and 5 above updated.		2 days to 12 days ahead	0900 hrs each Monday	OD	
7	Details of differences greater than 5MW from the schedules of operation of any <b>Generation</b> <b>Connected to Distribution</b> (not subject to centralized dispatch) on an hourly basis submitted under item 4 above.	MW Date Time	0 - 24 hrs ahead	As specified	OD	
8	Details from each User connected to the Distribution System of any change in aggregate Demand at the	MW Date Time	0 - 24 hrs ahead	As specified	OD	



point of surplus of greater than 5		
MW of the <b>Demand</b> .		

#### SCHEDULE 3A – OPERATIONAL PLANNING – LONG TERM – YEARS 1-2

#### GENERATORS CONNECTED TO DISTRIBUTION NOT SUBJECT TO CENTRAL DISPATCH (EMBEDDED GENERATION)

Data description		Units	Time period covered	Update time	Data category
1.	For individual <b>Generating Units</b> the unit number and <b>Generating Plant</b> capacity. Preferred outage dates earliest start date, latest start date.	MW Date	Year 1	Week 2	OD
2.	Generators provide the Distributo	<b>r</b> with estimates	of:		
	a. Output Usable.	MW Date	Year 1	Week 10	OD
	b. Outage programmed.	Date	Year 1	Week 10	OD
3.	<b>Distributor</b> following discussion w	ith <b>Generator</b> p	provide:		
	Details of <b>Generating Plant</b> they may withdraw from service for an outage		Year 1	Week 10	OD
	Update of <b>Generator</b> outage programmed		Year 1	Week 10	OD
4.	<b>Distributor</b> notify each <b>Generator</b> of <b>Output Usable</b> requirements.	MW Date	Year 1	Week 12	OD
5.	Generator provide estimates of Output Usable of each Generating Plant	MW Date	Year 1	Week 41	OD



#### SCHEDULE 3B - OPERATIONAL PLANNING - MEDIUM AND SHORT TERM

#### GENERATORS CONNECTED TO DISTRIBUTION NOT SUBJECT TO CENTRAL DISPATCH (EMBEDDED GENERATION)

Data description	Units	Time period covered	Update time	Data category
For individual <b>Generating Units</b> the unit number and <b>Generating</b> <b>Plant</b> capacity. Duration of outage, earliest start date, latest finishing date.	MW Date	Weeks 9 - 52	Week 2	OD
Output Usable estimates.	MW Date	Weeks 9 - 52	Week 2	OD
<b>Distributor</b> informs <b>Generators</b> of <b>Output Usable</b> requirements.	MW Date	Weeks 9 - 52	Week 4	OD
Generators provide Distributor with Generating Plant Output Usable estimates.	MW Date	Weeks 18 - 52	Week 10	OD
<b>Distributor</b> informs <b>Generators</b> of change to <b>Output Usable</b> requirements.	MW Date	Weeks 18 - 52	Week 12	OD
Generators provide Distributor with Generating Plant Output Usable estimates.	MW Date	Weeks 28 - 52	Week 25	OD
<b>Distributor</b> informs <b>Generators</b> of changes to <b>Output Usable</b> requirements	MW Date	Weeks 31 - 52	Week 27	OD
Generator will provide estimates of Generating Plant Output Usable.	MW Date	Weeks 44 – 52	Week 41	OD
<b>Distributor</b> inform contracted <b>Generators</b> of changes to <b>Output Usable</b> requirements.	MW Date	Weeks 44 - 52	Week 43	OD
As changes occur.		Update of Users proposals agreed in the Medium Term Plan.		



## SCHEDULE 4 – System Design Information

Data	a description	Units	Data category
2.	Reactive Compensation		
	Rating of individual shunt reactors (not associated with cables)	MVAr	DPD
	Details of any automatic control logic such that operating characteristic can by determined.	Text/ Diagrams	DPD
	Point of connection to the <b>System</b>	Diagram	DPD
	Lumped Network susceptance		
	Details of the equivalent lumped network susceptance of the User's System referred back to the connection with the 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's System and any susceptance of the User's System inherent in the active and Reactive Demand	MVAr	DPD
4.	Fault In feeds		
	Maximum and minimum short circuit in feeds into the <b>Distributor System</b>	MVA	DPD
	X/R ratio under maximum and minimum short circuit conditions		DPD
	[Contribution from rotating <b>Plant</b> ]		DPD
	Equivalent network information at the request of the <b>Distributor</b>		DPD
	For User interconnections that operate in parallel with the <b>Distribution System</b> details of the interconnection impedance shall be exchanged between the <b>Distributor</b> and <b>User</b> , including Positive Sequence Resistance Zero Sequence Resistance Positive Sequence Reactance Zero Sequence Reactance	% on 100 % on 100 % on 100 % on 100	DPD
	Susceptance	% on 100	



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	If the impedance in the view of the <b>Distributor</b> is low then more detailed information will be requested.		
5.	Demand Transfer Capability		
	Information shall be exchanged on <b>Demand</b> transfer capability where the same <b>Demand</b> may be supplied from alternative <b>Distributor</b> or <b>User</b> points of supply including the proportion of <b>Demand</b> normally fed from each point of supply.	MW	DPD
	The arrangements for manual/automatic transfer under planned/outage conditions should be provided		DPD
6.	Non Distributor System Data		
	The <b>Distributor</b> will request information on circuit parameters, switchgear and protection arrangements		DPD



# SCHEDULE 5 – LOAD CHARACTERISTICS

Data description	Units	Data category
Types of <b>Demand</b> :		
Maximum Active Power Demand	kW	SPD
Maximum and minimum <b>Reactive Power</b> requirement	kVAr	SPD
Type of load and control arrangements, e.g. variable speed motor type of starter employed	Text	SPD
Maximum load on each phase at the time of maximum <b>Demand</b>	Amps/Phase	DPD
phase unbalance	Amps/Phase at the time	DPD
Maximum harmonic content	% of harmonic number	DPD
Fluctuating Loads:		
Rate of change of active and <b>Reactive Power</b> both increasing and decreasing	kW/sec	DPD
	kVAr/sec	
Shortest repetitive time interval between fluctuation in active and <b>Reactive Power</b>	Sec	DPD
Largest step change in active and <b>Reactive</b> <b>Power</b> both increasing and decreasing.	kW	DPD
	kVAr	



## **ANNEX 1 - DISTRIBUTION CODE STANDARDS**

- 1. JS/945/1993 Jordan Institute for Standards and Metrology Voltage Standards: Voltage **System** for Transmission, Distribution and Utilization.
- 2. Engineering Recommendation G 5/4: Planning levels for harmonic voltage distortion and the connection of non-linear equipment to transmission and **Distribution Systems**.
- 3. Engineering Recommendation P 28: Planning limits for voltage fluctuations caused by industrial, commercial and domestic equipment.
- 4. Engineering Recommendation P 29: Planning limits for voltage unbalance for 132kV and below.
- 5. Engineering Recommendation G 59/1: Recommendation for the connection of private generating **Plant** to the Public Electricity Suppliers' **Distribution Systems**.
- 6. Engineering Recommendation G 75/1: Recommendations for the connection of embedded generating **Plant** to public **Distribution Systems** above 20kV or with outputs over 5MW.
- 7. Engineering Recommendation G 83/1: Recommendations for the Connection Of Small-Scale Embedded Generators (Up To 16 A Per Phase) in Parallel with Public Low-Voltage Distribution Networks.



# **ANNEX 2 - DISTRIBUTION METERING CODE STANDARDS**

prEN 60044-1:1998	Current transformers (IEC 60044-1:1996)
IEC 60044-2	Voltage Transformers
IEC 60044-3	Combined Transformers
IEC 60687	Alternating Current Static Watt-Hour Meters for Active Energy
IEC 61036	(Class 0.2S and 0.5 S)
BS EN 61107	Alternating Current Static Watt-hour Meters for Active Energy
IEC 61268	(Class 1 and 2)
BS EN 62053-11:2003*	Data Exchange for Meter reading – direct local data exchange.

\* These standards are already in use in Jordan.



## ANNEX 3- DEMAND FORECASTS - OPERATIONAL PLANNING PHASE

## (Each Year, by Week 35)

## **Forecast information for:**

- a. Monthly average **Energy** demand at the **Connection Point**
- b. **Load** profile [hourly **Active Power** and Power Factor (or **Reactive Power**)] for a typical working day, non working day (Friday or Holiday) and Saturday.
- c. Hourly Active Power output of Generation Connected to Distribution, not subject to Centralized Dispatch (Embedded Generation) for a typical working day, non working day (Friday or Holiday) and Saturday.

In addition, where the loading or the generation output of a **User** may have a particular impact on the security of the **System**, then the **Distributor** may on request require the following information from a **User**.

a. Active and **Reactive Power Demand** at the time of the peak of the **Distribution System** (or another specific moment the **Distributor** deems suitable), together with forecasts of **Demand** to be met and relieved by **Generation Connected to Distribution** not subject to centralized dispatch and planned **Demand** Control by other **Users**.

This additional information will, where requested by the **Distributor**, be updated throughout the current year (Year 0) in the Programming Phase, the times to be notified by the **Distributor** where this is necessary.



## ANNEX 4- DEMAND FORECASTS - PROGRAMMIMG PHASE

#### (24 hours to 8 weeks ahead inclusive)

The following information shall be provided to the **Distributor**:

- a. Schedules for the operation of Generation Units whose output is greater than [1 MW] on an hourly basis (but which are not subject to Central Dispatch);
- b. **Consumers** and other **Distributor** connected to the **Distribution System** shall notify the **Distributor** where they are likely to result in an aggregated change in **Demand** at the **Connection Point** of supply of greater than 5 MW of the **Demand** at the time on an hourly basis; and
- c. Any other relevant **Demand** forecast information reasonably required by the **Distributor**

The information shall be provided to the **Distributor** in the following timescales

- a. For the period 2 to 8 weeks ahead the information shall be supplied to the **Distributor** by 15:00 hours each Wednesday.
- b. For the period 2 to 13 days ahead the information shall be updated and supplied to the **Distributor** by 09:00 hours each Monday.
- c. The **Distributor** may require the information provided to be updated if it reasonably considers it necessary and to be supplied to the **Distributor** by 08:00 hours each day (or such other time as specified by the **Distributor** from time to time) for the next day (except that it may be for the next 3 days on Thursday and 2 days on Fridays) and may be longer (as specified by the **Distributor** at least one week in advance) to cover holiday periods.



## ANNEX 5– OUTAGE PLANNING

## ANNUAL MAINTENANCE PLAN (YEAR 1)

#### EACH CALENDAR YEAR BY:

- **WEEK 2:** Generators shall provide the **Distributor** with a provisional **Generating Plant** outage programmed for Year 1 specifying the **Generating Unit** and MW concerned, the preferred date for each proposed outage, where applicable earliest start date and latest finishing date.
- WEEK 10: Generators provide the **Distributor** with estimates of **Output Usable** for each **Generating Plant** for Year 1 and its proposed **Generating Unit** outage programmed for Year.
- WEEK 12: The Distributor will, after discussion with the Generator, provide the appropriate Generator with details of Distribution System constraints and potential Distribution System requirements during each week of Year 1 for an outage, together with any suggested changes to its proposed Generating Unit outage programmed.

The **Distributor** will notify each Generator of **Output Usable** requirements for Year 1 weeks 1-52.

**WEEK 28:** Users within the Distributor area will provide the Distributor with details of outages due to take place during the Years 1 which may affect the performance of the Distribution System.

In addition to outage proposals, the programmed shall include Trip Testing, Risks of Trip, and other information where known which may affect the security of the **Distribution System**.

- WEEK 41: Each Generator will provide the **Distributor** with revised estimates of the **Output** Usable of each Generating Plant for Year 1.
- **WEEK 48:** Following consultation with **Users**, the **Distributor** will include their proposals in the Annual Maintenance Plan.


## MEDIUM TERM PROGRAMME (CURRENT MAINTENANCE YEAR DOWN TO PROGRAMMING PHASE)

## EACH CALENDAR YEAR

- WEEK 2: Generators not included in the Annual Maintenance Plan will provide the **Distributor** with a provisional **Generating Plant** outage programmed for the current calendar year specifying the **Generating Plant** and MW concerned, duration of the outage, earliest start date and latest finishing date where applicable. Generators will also provide the **Distributor** with revised estimates of **Generating Plant Output Usable** for weeks 9 52.
- **WEEK 4: Distributor** informs Generators **Output Usable** requirements for weeks 9 52.
- **WEEK 10:** Generators will provide the **Distributor** with estimates of each **Generating Plant Output Usable** for weeks 18 52.
- **WEEK 12:** The **Distributor** will inform Generators of their desired changes to **Output Usable** requirements for weeks 18 52 and will provide details of **Distributor Distribution System** constraints and **Distributor Distribution System** requirements.
- **WEEK 25:** Generators will provide the **Distributor** with estimates of each **Generating Plant Output Usable** for weeks 28 52.
- **WEEK 27:** The **Distributor** will inform Generators of changes to **Output Usable** requirements for weeks 31 52.
- **WEEK 41:** Generators will provide the **Distributor** with estimates of each **Generating Plant Output Usable** for weeks 44 52.
- **WEEK 43:** The **Distributor** will inform Generators of changes to **Output Usable** requirements for weeks 44 52.

An update of **Users** proposals agreed in the Medium Term Plan will be included in the Short Term Programming Phase.



## ANNEX 6: OTHER INTERNATIONAL STANDARDS (NOT PART OF THE DISTRIBUTION METERING CODE)

BS EN 60514:1995	Acceptance inspection of class 2 alternating-current Watthour meters
BS EN 60044-5:2004	Instrument transformers - Capacitor voltage transformers
BS EN 60044-6:1999, IEC 60044-6:1992	Instrument transformers. Requirements for protective current transformers for transient performance
BS EN 60044-7:2000, IEC 60044-7:1999	Instrument transformers. Electronic voltage transformers
BS EN 60044-8:2002	Instrument transformers - Electronic current transformers
IEC 60186	Voltage Transformers
BS EN 60521	Class 0.5, 1 and 2 alternating current watt-hour meters
BS EN 61038: 1993	Specification for time switches for tariff and load control.
BS EN 61358:1996, IEC 61358:1996	Acceptance inspection for direct connected alternating current static watt-hour meters for active energy (classes 1 and 2)
BS EN 62052-11:2003*	Electricity metering equipment (AC). General requirements, tests and test conditions. Metering equipment
BS EN 62053-22:2003	Electricity metering equipment (AC). Particular requirements. Static meters for active energy (classes 0,2 S and 0,5 S)
BS EN 62053-21:2003	Electricity metering equipment (AC). Particular requirements. Static meters for active energy (classes 1 and 2)
BS EN 62053-23:2003	Electricity metering equipment (AC). Particular requirements. Static meters for reactive energy (classes 2 and 3)
BS 7856: 1996	Code of Practice for Design of Alternating Current Watt- Hour <b>Meters</b> for Active <b>Energy</b> (Classes 1 and 2)
BS 7951:2000	Electricity meters. Alternating-current single-phase static



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watt-hour telemeters of accuracy class 1 or 2