

The Saudi Arabian Distribution Code

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Prepared by:
Saudi Electricity company (SEC)



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Forward

This is the first issue of the Saudi Arabian Distribution Code. Such work has been accomplished by extensive efforts from Saudi Electricity Company (“SEC”) and was subjected to thorough technical and legal reviews by internationally renowned consultants including ESBI of Ireland and CMS Cameron McKenna of UK as well as a number of major Saudi stakeholders and the Electricity & Co-Generation Regulatory Authority (“ECRA”).

The Distribution Code is designed to indicate the procedures for both planning and operational purposes and covers both normal and exceptional circumstances. It is however a live working document. It will be, from time to time, subject to change and/or revision to reflect stages of development of the regulatory framework of the industry and changes to comply with legislation and good industry practice. The proposals for change will be received by the Distribution Code Review Panel (“DCRP”). The rules and responsibilities of the DCRP are described in chapter DGC6. Upon receipt of such proposals for change, the DCRP will carry out the necessary process as appropriate to study these proposals and officially prepare a report of recommendations to ECRA for its approval. The DCRP is a stakeholders representation panel and its members are outlined in chapter DGC6.3 of the Distribution Code.

As a User of this Distribution Code, it is your responsibility to ensure that you possess the most up to date issue. Issues of the Distribution Code can be downloaded from ECRA’s web site **www.ecra.gov.sa**.

This Preface is provided to Users and to prospective Users for their information only and does not constitute a part of the Distribution Code.

Preface

The Saudi Arabia Distribution Code has been developed to define the rules and regulations for various participants for accessing and using the Distribution System. The objective is to establish the obligations of the distribution service providers (DSP's) and other system Users- TSP, Embedded Generators, other distribution service providers and Customers – for accessing and using the Distribution System, more specifically to:

- (i) define obligations, responsibilities, and accountabilities of all the parties for ensuring open, transparent, non-discriminatory, and economic access and use of the system while maintaining its safe, reliable and efficient operation;
- (ii) define minimum technical requirements for the participants; and
- (iii) Set out the information exchange obligations of the participants.

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PART 1: INTRODUCTION

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- 1.2 Structure of the Distribution Code
- 1.3 Structure of the Electricity Supply Industry
- 1.4 Users of the Distribution System

1.1 Purpose of the Distribution Code

The Distribution Code specifies the technical aspects of the working relationship between the DSP(s) and all Users of the Distribution system which are necessary to ensure a stable, reliable and economical electrical Distribution system and to enable the DSP(s) to fulfil their obligations specified in the Saudi Arabian Grid Code (SAGC).

The relationship between all Users, the Grid Code and the Distribution Code is shown diagrammatically in Figure 1.1.

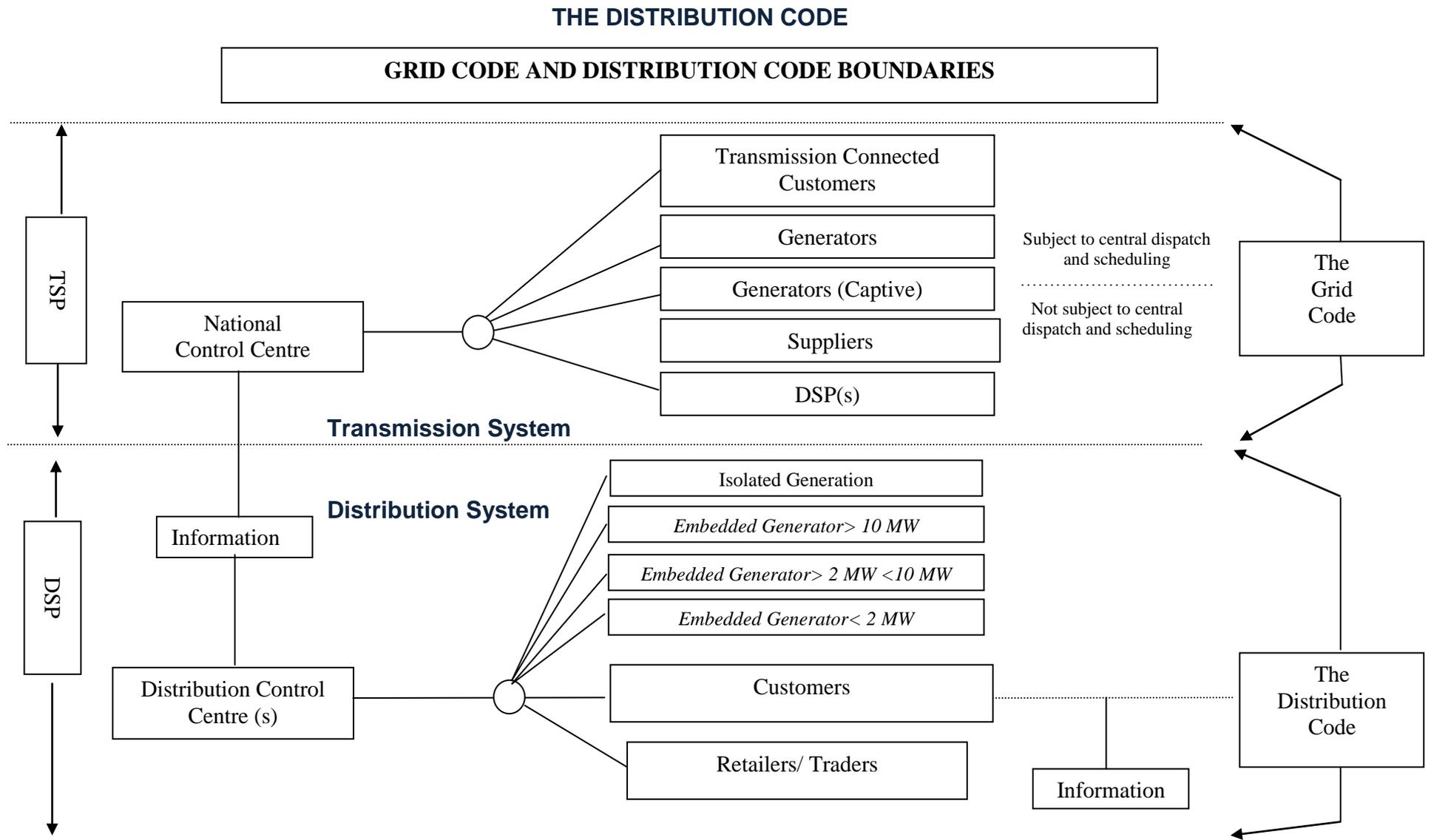


Figure 1.1

1.2 Structure of Distribution Code

The Distribution Code is in seven parts, as follows:

Part 1: Introduction

This outlines the purpose of the Code, its relationship with the Saudi Arabian Grid Code (SAGC), the structure of the electricity supply industry, and how the various parts of the Code are relevant to the different Users of the Distribution system.

Part 2: General Conditions

This presents provisions which are of general application to all parts of the Code.

Part 3: Planning

This specifies the technical and design criteria and the procedures to be employed in the planning and development of the Distribution system.

Part 4: Connection Conditions

These define the minimum standards for methods of connection to the Distribution System.

Part 5: Operation

This part addresses various operational issues including load forecasting, planning outages, reporting of operational changes and events, safety matters and procedures for dealing with emergencies.

Part 6: Definitions

Part 7: References

This lists other documentation which is referred to in the Code.

1.3 Structure of the Electricity Supply Industry

The Electricity Supply Industry comprises the following entities:

- (a) The Transmission Service Provider (TSP) owns and operates the Transmission System. The Transmission System transports the electricity, generated by Generating Units, to the Distribution System, through which most Customers will be supplied. Some Generating Plant is connected directly to the Distribution System and is referred to as Embedded Generation.
- (b) The Distribution Service Provider (DSP(s)) is responsible for operating and maintaining secure, reliable and efficient electricity Distribution System. The Distribution System transports electricity from the Transmission System or from Embedded Generating Units to the final Customer.
- (c) Retailers supply electricity to Customers. For this purpose, Retailers will be entitled to use both the Transmission System and the Distribution System for the transport of electricity from Generating Units to Customers.
- (d) Traders supply electricity to other licensees and/ or eligible Customers. For this purpose, Traders will be entitled to use both the Transmission System and the Distribution System for the transport of electricity from Generating Units to those licensees or eligible Customers
- (e) Generators generate electricity which is fed onto the Transmission or Distribution Systems. Generating Units are classified according to their voltage, output power and whether or not they are subject to Central Dispatch by the TSP.
- (f) Customers may purchase electricity from the DSP(s), Traders or Retailers. Some Customers have their own generating Plant for supplying all or part of their own needs. These are referred to as Customers with CHP or Customers with Auto-Production.
- (g) ECRA was established to regulate the new Electricity Industry.

1.4 Use of the Distribution System

Use of the Distribution System may involve any of the following transactions:

- (a) Any connection at entry to or exit from the Distribution System, which is called an interface point. An entry point is the connection between the Distribution System and the Transmission System or an Isolated/ Embedded Generating Plant. An exit point is the connection between the Distribution System and the Customer's premises.
- (b) Use of the Distribution System to transport electricity between entry and exit points.
- (c) Construction of a Connection Point.
- (d) Work and/or operation associated with equipment at the interface with the Distribution System.

Users connected to the Distribution System shall comply with the relevant sections of the Distribution Code. The categories of Users of the Distribution System are described in Table 1 and the sections of the Code that apply to each User are shown in Table 2. Users shall also comply with the requirements of relevant legislation, which from time to time comes into force.

There are a number of technical documents annexed to the Distribution Code. Users are bound to comply with the requirements of these documents as appropriate to their circumstances. Users shall also be required to enter into technical and other agreements. Customers and Generator Embedded Generators shall be required to have Connection Agreements with the DSP(s) and Retailers/ Traders shall be required to enter into Use of System Agreements with the DSP(s) or the TSP as the case may be.

CATEGORIES OF USERS OF THE DISTRIBUTION SYSTEM	
A1	Embedded Generator > 10 MW
A2	Embedded Generator > 2 MW < 10 MW
A3	Embedded Generator < 2 MW
A4	Customers with CHP or Customers with Auto-production
A5	Customers with stand-by Generators
B1	Major Customers connected at High Voltage
B2	Customers connected at Medium Voltage
B3	Industrial and commercial Customers connected at Low Voltage
B4	Domestic Customers
C	Retailers/ Traders
D	The Distribution Service Provider (DSP(s))

Table 1

SECTIONS OF THE DISTRIBUTION CODE APPLYING TO PARTICULAR CATEGORIES OF USERS OF THE DISTRIBUTION SYSTEM											
CATEGORY OF USERS											
D Code Ref	A1	A2	A3	A4	A5	B1	B2	B3	B4	C	D
DGC	D	D	D	D	D	D	D	D	D	D	D
DPC1	R	R	R	R	R	R	R	R	R	R	R
DPC2	D	D	D	D	R	R	R	R	R	R	D
DPC3	R	R	R	R	R	R	R	R	R	R	R
DCC1	R	R	R	R	R	R	R	R	R	R	R
DCC2	R	R	R	R	R	R	R	R	R	R	R
DCC3	R	R	R	R	R	R	R	R	R	R	R
DCC4	D	D	D	D		D	D	D	D	R	D
DCC5	D	D	D	D		D	D	R	R	R	D
DCC6	D	D	D	D		D	D	D	D	R	D
DOC1		D				D	D				D
DOC2		D	D	D		D					D
DOC5	R	R	D	R	R	R	R	R	R		D
DOC7	D	D	D	R		D					D
DOC8	D	D	D	R		D					D

Table 2

Not Applicable

D Applicable with specific obligations

R Relevant for information but no specific obligations

Note (1): Customers represented in Categories A4 and A5 must comply with the Code sections relevant to that category and additionally to the relevant sections of the category of Customer to which they belong.

PART 2: GENERAL CONDITIONS

Contents

DGC1	Introduction
DGC2	Scope
DGC3	Implementation
DGC4	Unforeseen Circumstances
DGC5	Hierarchy
DGC6	Distribution Code Review Panel
DGC7	Communications between DSP(s) and Users
DGC8	Emergency Situations
DGC9	Derogations
DGC10	Confidentiality
DGC11	Force Majeure
DGC12	Disputes and Dispute Resolution Procedures

DGC1: Introduction

While each part of the Distribution Code presents the rules and provisions relating specifically to that part, the Distribution General Conditions (DGC) presents provisions which are of general application to all parts of the Distribution Code.

DGC2: Scope

The General Conditions apply to all Users of the Distribution System.

DGC3: Implementation

DGC3.1 The Distribution Service Provider Licence imposes a duty upon DSP(s) to implement and enforce the Distribution Code. In order to do this DSP(s) may need access across boundaries, services, and facilities from Users or to issue instructions to Users, for example to isolate or disconnect Plant or apparatus. It is considered that these cases will be exceptional and it is not, therefore, possible to envisage precisely or comprehensively what DSP(s) might reasonably require in order to carry out its duty.

DGC3.2 All Users are required to abide by the Distribution Code and also to provide the DSP(s) rights of access, services and facilities and to comply with such instructions as may be reasonably required to implement and enforce the Distribution Code.

DGC4: Unforeseen Circumstances

- DGC4.1 If circumstances arise which the provisions of the Distribution Code have not foreseen, DSP(s) shall, to the extent reasonably practicable in the circumstances, consult promptly and in good faith with affected Users in an effort to reach agreement as to what should be done. If agreement cannot be reached in the time available DSP(s) shall determine what is to be done.
- DGC4.2 Whenever DSP(s) makes a determination, it shall have regard, wherever possible to the views expressed by Users, and in any event, to what is reasonable in all the circumstances.
- DGC4.3 Each User shall comply with all instructions given to it by DSP(s) following such a determination, provided that the instructions are consistent with the then current technical parameters of the particular User's System registered under the Distribution Code. The DSP(s) shall promptly refer all such unforeseen circumstances and any such determination to the Distribution Code Review Panel (DCRP) in accordance with DGC6.2.

DGC5: Hierarchy

- DGC5.1 In the event of any conflict between the provisions of any direction of ECRA on the one hand and the provisions of the Distribution Code on the other, the provisions of ECRA's direction shall prevail.
- DGC5.2 In the event of any conflict between the provisions of the Distribution Code and any contract, agreement or arrangement between DSP(s) and a User, the provisions of the Distribution Code shall prevail unless the Distribution Code expressly provides otherwise.
- DGC5.3 In the event of any conflict between the provisions of the Distribution Code and the Transmission Code relating to system operation, the provisions of the Transmission Code shall prevail [unless the Distribution Code expressly provides otherwise.]

DGC6: Distribution Code Review Panel

- DGC6.1 The DSP(s) shall establish and maintain the DCRP, which shall be a standing body, to carry out the functions referred to in DGC6.2.
- DGC6.2 The Panel shall

- (a) keep the Distribution Code and its working under review,
- (b) review all suggestions for amendments to the Distribution Code which ECRA or any User may submit to a DSP for consideration by the Panel from time to time,
- (c) recommend to ECRA amendments to the Distribution Code that the Panel feels are necessary or desirable and the reasons for the recommendation,
- (d) issue guidance in relation to the Distribution Code and its implementation, performance and interpretation when asked to do so by any User,
- (e) consider what changes are necessary to the Distribution Code arising out of any unforeseen circumstances referred to it by DSP(s) under DGC4,
- (f) consider the affect of proposed changes on the Transmission Code,
- (g) publish recommendations as to amendments to the Distribution Code that a DSP or the DCRP feels are necessary or desirable and the reasons for the recommendations, and
- (h) Produce an annual report of the activities of the DCRP.

DGC6.3 The Panel shall consist of

- (a) chairperson and two persons appointed by, and representing DSP(s),
- (b) one person appointed by and representing ECRA,
- (c) one person representing the TSP,
- (d) one person representing Generators with Embedded generation,
- (e) one person representing Major Customers,
- (f) one person representing suppliers, and
- (g) one representative of the SASO

If any of the above parties fails to appoint its representative (ECRA) shall appoint one on its behalf.

Each of the above shall be appointed pursuant to the rules issued pursuant to DGC6.4.

DGC6.4 The Panel shall establish and comply at all times with its own rules and procedures relating to the conduct of its business, such rules and procedures to be known as the Constitution and Rules of the Panel, which shall be approved by ECRA.

The DSP shall consult all Users liable to be affected in relation to all proposed amendments to the Distribution Code and shall submit all proposed amendments to the Distribution Code to the DCRP for discussion prior to such consultation.

Unless an amendment is urgently required, ECRA will not amend the Distribution Code until all affected Users have been given a reasonable opportunity to make representations to ECRA concerning the amendment, and those representations have been taken into account.

ECRA will notify all DSP's and all affected Users of any amendment that ECRA makes to the Distribution Code.

DGC6.6 DCRP shall, from time to time or at the behest of ECRA having regard to the recommendations of the Panel, submit a revised Distribution Code to ECRA for approval.

DGC7: Communications between DSP(s) and Users

DGC7.1 Unless otherwise specified in the Distribution Code the methods of operational communication and data transfer shall be agreed between DSP(s) and Users from time to time.

DGC8: Emergency Situations

DGC8.1 Users should note that the provisions of the Distribution Code may be suspended, in whole or in part, pursuant to any directions given and/or orders made by ECRA in emergency situations, pursuant to provisions of the Electricity Law issued by Royal Decree No. M/56.

DGC9: Derogations

DGC9.1 If a User finds that they are, or will be, unable to comply with any provision of the Distribution Code, then they shall without delay report such non-compliance to DCRP and shall, subject to the provisions of DGC9.2 make such reasonable efforts as are required to remedy such non-compliance as soon as reasonably practicable.

DGC9.2 Where the non-compliance is

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

or

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

and the User believes either that it would be unreasonable (including cost and technical considerations) to require it to remedy such non-compliance or that it should be granted an extended period to remedy such non-compliance it shall promptly submit to DCRP a request for a derogation from such provision in accordance with the requirements of DGC9.3 and shall provide DSP(s) with a copy of such application.

DGC9.3 A request for derogation from any provision of the Distribution Code shall contain the following:

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

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

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

- (d) the reason for the non-compliance; and
- (e) the date by which compliance will be achieved (if remedy of the non-compliance is possible) subject to DGC9.2 (b)

A standard Distribution Code Derogation Application form is included in Annex 2.

DGC9.4 If DSP(s) finds that they are, or will be, unable to comply with any provision of the Distribution Code, then they shall, subject to the remaining provisions of DGC9 make such reasonable efforts as are required to remedy such non-compliance as soon as reasonably practicable.

DGC9.5 In the case where DSP(s) requests derogation, DSP(s) shall submit the information set out in DGC9.3 to DCRP.

DGC9.6 On receipt of any request for derogation, DCRP shall promptly consider such request and discuss the potential outcomes of such request with ECRA. Following such discussion, DCRP shall recommend to ECRA such derogation, provided that DCRP considers that the grounds for the derogation are reasonable.

DCRP will not recommend to ECRA such derogation if

- (a) It would, or it is likely that it would, have a material adverse impact on the security and stability of the Distribution System, or
- (b) It would result in ECRA imposing unreasonable costs on the operation of the Distribution System or Transmission System or on other Users.

In its consideration of a derogation request by a User, DCRP may contact the relevant User and/or DSP(s) to obtain clarification of the request or to discuss changes to the request.

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

- (a) the issue number and the date of the Distribution Code provision against which the derogation applies;
- (b) identification of the provision with which the derogation applies;

- (c) identification of the Plant and/or apparatus in respect of which a derogation applies, and, if relevant, the nature and extent to which the derogation applies including alternate compliance provision;
- (d) the reason for the non-compliance requiring derogation; and
- (e) the date by which the derogation ends if compliance will be achieved, or by which such derogation expires.

DGC9.7 To the extent of any derogation granted in accordance with this DGC9, DSP(s) and/or the User (as the case may be) shall be relieved from its obligation to comply with the applicable provision of the Distribution Code and shall not be liable for failure to so comply but shall comply with any alternate provision as set forth in the derogation. Should a derogation not be granted, then the User will be required to comply with the applicable provision of the Distribution Code and will be liable for failure to so comply.

DGC9.8 DCRP shall

- (a) keep a register of all derogations which have been granted, identifying the name of the person in respect of whom the derogation has been granted, the relevant provision of the Distribution Code and the period of the derogation, and
- (b) on request from any User, provide a copy of such register of derogations to such User.

DGC9.9 Where a material change in circumstance has occurred, a review of any existing derogations, and any derogations under consideration, may be initiated by DCRP at the request of ECRA, DSP(s), or Users.

DGC10: Confidentiality

DGC10.1 The Distribution Code contains procedures under which the DSP(s) will receive information from Users relating to the intentions of such Users. The DSP shall not, except in pursuance of specific requirements of the Distribution Code, disclose such information to any User or other person without the prior written consent of the provider of the information, subject to the requirements of the Distribution Licence.

DGC11: Force Majeure

DGC11.1 If a DSP or User would breach the terms of the Distribution Code due to an event outside the reasonable control of the DSP or User (a “Force Majeure Event”), then those obligations under the Distribution Code that are affected by the Force Majeure Event are suspended as long as the Force Majeure Event continues.

DGC11.2 The DSP or the User must give the other party prompt notice of the Force Majeure Event including full details, an estimate of likely duration, the obligations affected by it and the steps taken to remove overcome or mitigate its effects.

[DGC12: Disputes and Dispute Resolution Procedure

DGC12.1 any dispute that arises from time to time regarding how the Distribution Code is being administered and interpreted shall be resolved following the Dispute Resolution Procedure as set out in DGC12.2.

DGC12.2 The Distribution Code Dispute Resolution Process shall be in accordance with complaints handling procedure submitted by DSP under Implementing Regulations (Article 29)]

PART 3: PLANNING

Contents

DPC 1	Introduction
DPC2	Design Standards
DPC3	Transfer of Planning Data

DPC1: Introduction

- DPC1.1 Part 3: Planning specifies the technical and design criteria and the procedures to be complied with by DSP(s) 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.
- DPC1.2 The Users' requirements may necessitate the reinforcement of, or an extension to, the Distribution System and for reinforcement of, or extension to, the relevant Transmission/Distribution interface capacity, such work being identified by DSP(s) or TSP as appropriate.
- DPC1.3 The time required for the planning and development of the Distribution System and any consequential requirement of the interface with the Transmission System, will depend on the type and extent of the necessary reinforcement and/or extension work, the time required for obtaining planning permission and right of way, including any associated hearings, and the degree of complexity in undertaking the new work while maintaining satisfactory security and quality of supply.
- DPC1.4 Reference is made in Part 3 to DSP(s) supplying information or advice to Users. For avoidance of doubt, unless the context otherwise requires, such information or advice shall be provided by DSP(s) as soon as practical following a request by the User (whether during the application for connection process or otherwise).

DPC2: Design Standards

DPC2.1 Frequency

The Frequency of supply is outside the control of DSP(s); however the standard Frequency range is as follows:

The Transmission System Frequency is nominally 60Hz and shall normally be controlled within the limits of 59.9Hz to 60.1Hz.

The system Frequency could rise to 62.5 Hz or fall to 57.0 Hz in exceptional circumstances. Design of Generators' Plant and apparatus must enable operation of that Plant and apparatus within that range in accordance with the following:

Below nominal Frequency(Hz)	Above nominal Frequency(Hz)	Operation requirement
58.8 -60.0	60.0 -60.5	continuous
57.5 -58.7	60.6-61.5	For period of 30 minutes
57.0- 57.4	61.6-62.5	For period of 30 seconds

Users should ensure their equipment is designed or protected for these exceptional circumstances.

DPC2.2 Voltages

The voltages listed in Table DPC2.1 shall be used as standard service voltages at the interfaces with power Customers. The service voltage shall be maintained within the range defined by the indicated lowest and highest values, under steady state and normal system conditions and over the full loading range of the system.

Where two voltages are listed e.g. 220/127V the lower value refers to the phase to neutral voltages. All other values are phase-to-phase voltages.

Existing, but non-standard, voltages are listed in Table DPC2.2.

Nominal Voltage	Lowest Voltage	Highest Voltage
220/127V	209/120V	231/134V
380/220V	360/209V	400/231V
13.8kV	13.1kV	14.5kV
33kV	31.4kV	34.7kV
69kv	65.5kv	72.5kv

Table DPC2.1: Standard Service Voltages

Nominal Voltage	Lowest Voltage	Highest Voltage
11kV	10.45kV	11.55kV
34.5kV	32.78kV	36.23kV

Table DPC2.2: Existing, But Non-Standard, Voltages

DPC2.3 Harmonics

The level of Harmonics in the power system shall comply with the limits set out in Table DPC2.3, on a continuous basis.

Nominal Voltage	Total Harmonic Voltage Distortion %	Individual Harmonic Voltage Distortion (%)	
		Odd	Even
127-380V	5.0	4.0 for N <14	2.0
		1.5 for N >14	
13.8kV	4.0	3.0	1.75
33kV	3.0	2.0	1.0

Table DPC2.3: Maximum Continuous Harmonic Levels

Note:

N is the harmonic order, or multiple of the fundamental Frequency. Voltage distortion is expressed as a percentage of the fundamental voltage.

The indicated values refer to maximum continuous levels.

DPC2.4 Power Factor

Each Customer shall maintain a Power Factor of not less than 0.85 lagging at the interface with DSP(s). No Customer shall present a leading Power Factor to the DSP(s) system.

DPC2.5 Phase Unbalance

Under normal system conditions the three phase voltages shall be balanced at MV, and higher voltages in the system, such that the negative phase sequence voltage does not exceed 2% of the positive phase sequence voltage.

Customers with a dedicated transformer or those supplied at 13.8kV or a higher voltage shall balance their loads, such that the load phase unbalance at the Customer interface meets the above criterion. All other Customers shall balance their loads over the three phases to the greatest degree possible. The DSP(s) shall then balance these loads, within the power system, to meet the above criterion.

DPC2.6 Voltage Stability

Voltage Dips

For non-repetitive voltage variation, or voltage dips, such as those associated with motor-starting, welding equipment or power system switching, the voltage variation shall not exceed 7% of the fundamental nominal voltage under normal circumstances. Such variations shall not occur more frequently than 3 times per day.

Application

No Customer shall connect equipment to the power system, which causes voltage fluctuation at the Customer interface in excess of these requirements. The DSP(s) shall ensure that the power supply, at each Customer's interface, conforms to these requirements.

DPC2.7 Earthing Requirements

1. Separation of LV Neutral and MV Grounds.
LV neutral ground and any grounds associated with MV equipment / system (e.g. MV metal work, cable screen, etc.) shall always be kept separate. Primary neutral (if available) shall not be bonded to secondary neutral.
1. Separation between LV neutral ground and MV equipment / system ground shall be achieved by grounding LV neutral points which are remote from MV grounds. Minimum distance between any part of MV ground system and nearest LV neutral ground shall be 4 meters.
2. Recommended ground resistance limits for different installations should be as under:

System GROUND	5 ohms
ALL distribution substation	5 ohms
Surge arresters	5 ohms
LV distribution panel	10 ohms

3. LV metering Installations
It shall be essential for the Customer to provide grounding at his interface. The Customer shall bring the ground wire to the grounding terminals provided in the meter box. The ground wire of the Customer shall be connected to the ground terminal inside the meter box. The ground terminal shall be short linked with the neutral.

For more than one KWH -meters at one location, four KWH-meters shall be connected to one ground rod. In case of additional KWH-meters at the premises, additional ground rods shall be provided.

4. Ground mounted MV equipment

The equipment covered are RMU, MV switches etc, when separated from Transformer and Bulk Customer Indoor Switchgear. All metal work shall be bonded together and to the substation metalwork grounding system. Each continuous piece of metal that could form part of the path of a ground fault current shall be bonded to its neighbors so that continuity of grounding circuit does not depend on mechanical connections between components.

Licensed Distributors shall advise on the method of Earthing of the Distribution System, for example, whether it is connected solidly to Earth or through impedance. The specification of associated apparatus and Plant of the Distribution System User shall meet the voltages that will be imposed on the apparatus and Plant as a result of the method of Earthing.

Notwithstanding the above, the DSP(s) shall provide a complete separate Earthing code to define the Earthing requirements for safe use of the system. This code shall constitute an integral part of the Distribution code.

Distribution System Users shall take precautions to limit the occurrence and effects of circulating currents in respect of the neutral points connected with Earth where there is more than one source of electricity.

DPC2.8 Security of Supply

DPC2.8.1 The Security Standard for the Distribution System is as follows:

Security of supply (also known as continuity) is evaluated in terms of four indices, as follows:

(1) System Average Interruption Frequency Index (SAIFI)

$$\text{SAIFI} = \frac{\text{Total Customer Interruptions}}{\text{Total Connected Customers}}$$

- Measured in interruptions per 100 connected Customer years

(2) System Average Interruption Duration Index (SAIDI)

$$\text{SAIDI} = \frac{\text{Total Customer Hours of Interruptions}}{\text{Total Connected Customers}}$$

- Measured in Customer hours of interruptions per connected Customer year

(3) Customer Average Interruption Duration Index (CAIDI)

$$\text{CAIDI} = \frac{\text{SAIDI}}{\text{SAIFI}}$$

- Measured in hours of interruption

(4) Index of Reliability (IR) "Average system availability Index" (ASAI)

$$\text{IR (ASAI)} = \frac{8760 \text{ Hours/Year} - \text{SAIDI}}{8760 \text{ Hours/Year}} \times 100$$

(Expressed as a percentage)

The DSP(s) will have to comply with the security of supply standards limits as published by ECRA from time to time.

DPC2.8.2 DSP(s) shall use reasonable endeavours to maintain a supply from the system. This cannot be ensured, since faults, planned maintenance and new works outages and other circumstances outside DSP(s) control can cause interruptions. On such occasions, DSP(s) shall use reasonable endeavours to restore the supply or connection as soon as practicable but shall be under no liability for any direct or indirect damage or associated loss incurred by the User.

DPC2.8.3 Restoration times for different outage types are as follows:

Fault Outages: DSP(s) shall endeavour to restore access to the system as soon as practically possible taking into consideration the KPI set values approved by ECRA

Planned Outages: DSP(s) shall give five days' notice to relevant Users of planned supply interruptions. In some situations – to facilitate emergency

repairs or local outages affecting a small number of Customers – shorter notice may be given.

Supply Curtailments: In some circumstances, it may be necessary to request Customers to reduce load or to use standby supplies where appropriate. In these situations DSP(s) shall endeavour to maintain access to the System. In extreme cases where this may not be possible DSP(s) shall endeavour to provide two days' notice to the Users.

Load Shedding: In extreme situations there may be generation shortages and load shedding may be required. In these circumstances DSP(s) shall notify Customers if possible but as this is an emergency situation it may not be possible to do so. DSP(s) shall prepare a Load Shedding Criterion and submit it to ECRA for approval. This criterion shall detail the methodology for selection of load(s) to be shed.

DPC2.8.4 DSP(s) may disconnect Users under certain circumstances. These circumstances shall include:

- (a) Where the Customer's installation or use of electricity is such as to interfere with the satisfactory operation of the Distribution or Transmission system or to cause disturbance to other Customers.
- (b) Where DSP(s) considers that the Customer's installation is in a dangerous condition.
- (c) Where alterations, repairs, renewal or maintenance of the Distribution System or DSP(s) assets or means of connection require the de-energisation of the Connection Point.
- (d) Where a Customer extends supply for use by another party whom DSP(s) considers to be a separate Customer.
- (e) In any other circumstances in which discretion is necessary or appropriate to enable DSP(s) to comply with the Distribution Code and/or to operate the Distribution System in accordance with Good Industry Practice or is required by any law, direction, rule or regulation having the force of law.

DPC3: Transfer of Planning Data

DPC3.1 Planning information to be provided by Users.

DPC3.1.1 Users of the Distribution System shall provide sufficient planning data/ information as can reasonably be expected to be made available, when requested by DSP(s) from time to time to enable DSP(s) to comply with the requirements under its Distribution Licence.

DPC3.1.2 Users of the Distribution System shall provide planning data for specific future time periods updated annually as necessary and including projected Demand requirements, anticipated changes in maximum Demand, or generating capacity, as appropriate. The data and timescales over which the data is required are given in Distribution Operating Code 1 (DOC1).

DPC 3.1.3 In addition to periodic updates of planning information, a User shall give adequate notice of any significant change to their system or operating regime to enable DSP(s) to prepare its development plans and implement any necessary system modifications. In the event of unplanned changes in a User's System or operating regime a User shall notify DSP(s) as soon as is practically possible to ensure any necessary measures can be implemented.

DPC3.1.4 Users shall also provide details of reactive compensation Plant directly or indirectly connected to the Distribution System other than at Low Voltage, including its rating and operational control.

DPC3.1.5 Users may be required to provide DSP(s) with detailed data relating to the interface between their System and that of the Distribution System covering circuit parameters, switchgear and Protection arrangements of equipment directly connected to or affecting the Distribution System to enable DSP(s) to assess any implications associated with these points of connection.

DPC3.2 Information to be exchanged.

DPC3.2.1 On the request of a User, DSP(s) shall provide such information as may be reasonably required on the design and other characteristics of the Distribution System.

DPC3.2.2 Where DSP(s) proposes to make certain modifications to its system or where it has received information from a User under DPC4.1 above, which may impact on other User installations then DSP(s) will notify Users of the proposal, subject to any constraint of confidentiality or timing.

DPC3.2.3 DSP(s) shall provide information on request to Users regarding the local network conditions to enable them to determine their Protection requirements.

DPC3.2.4 Where the User's installation is connected to the bus bars of the Distribution System, sufficient details may need to be exchanged with respect to User/ DSP(s) Ownership Boundary to enable an assessment to be made of transient over voltage effects. The request for information may be initiated by either DSP(s) or the User.

DPC3.2.5 Information may be exchanged between DSP(s) and the User on fault in feed levels at the feeding bus bar or point of connection to the Distribution System as appropriate, in the form of

- Three phase and single phase to earth short circuit in feed.
- The X/R ratio under three phase fault conditions.

DPC3.2.6 Information shall be exchanged between DSP(s) and User on Demand Transfer Capability where the same Demand can be supplied from alternate User points of supply. This shall include the proportion of Demand normally fed from each point of supply and the arrangements (manual or automatic) for transfer under planned/fault outage conditions.

DPC3.3 Planning Studies

DPC3.3.1 In order to facilitate connections to the Distribution System DSP(s) shall prepare on request a study showing the implications of a connection at a particular point on the system.

DPC3.3.2 Under the terms of the Distribution Licence a reasonable charge (as submitted by DSP(s) and approved by ECRA) may be levied by DSP(s) for the planning study.

DPC3.3.3 A User or potential Users shall provide DSP(s) with information regarding the proposed facility including load details, interface arrangements, proposed Connection Point and import/export requirements.

DPC3.3.4 The studies shall normally be prepared within 28 days after the date of receipt of the information or the agreement of the person making the request to pay the cost of the study, whichever is the longer. In the case of Generators and Major Customers seeking connection, depending on the nature and complexity of the request, this period may extend up to 100 days or a further 28 days from the receipt of planning information from the TSP whichever is the greater.

DPC3.3.5 Details of the procedures for application for connection to the Distribution System are contained in [CUSTOMER SERVICE MANUAL] as prepared by DSP(s) and approved by ECRA.

DPC3.3.6 Where such information is available DSP(s) shall provide on request a statement of present and future circuit capacities, forecast power flows and loadings on part or parts of the Distribution System specified in the request and shall include Fault Levels at each Distribution node covered by the request. DSP(s) may levy a charge for the provision of this statement as approved by ECRA on account of the reasonable costs incurred by DSP(s) in preparing this statement. The statement shall be prepared within 28 days after the date of receipt of the information or the agreement of the person making the request to pay the cost of the statement, whichever is the longer. In the case of Generators and Major Customers seeking connection this period may extend up to 100 days depending on the nature and complexity of the request.

DPC3.3.7 The dates given in this DPC3.3 are target dates only and do not constitute a legal commitment. DSP(s) shall however use reasonable endeavours to abide by them.

PART 4: CONNECTION CONDITIONS

Contents

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DCC1: Introduction

DCC1.1 It is necessary to require certain minimum technical, design and operational criteria to be met by Users' Plant and apparatus in order to maintain, insofar as is permitted by Good Industry Practice, stable and secure operation of the Distribution System for the benefit of all Users and for the Protection of the Distribution System and Users' Plant and apparatus directly connected to the Distribution System.

DCC1.2 The Connection Conditions define the minimum standards for the method of connection to the Distribution System and the technical, design and operational standards to which Users connecting to the Distribution System shall comply.

DCC1.3 The Connection Conditions specify the technical arrangements required at the Ownership Boundary between the Distribution System and the installation of the User and are applicable to all voltage levels covered by the Distribution Code.

DCC1.4 The Connection Conditions specify the information to be provided by Users to ensure that adequate provision can be made by DSP(s) for new connections or increases in existing load. It also applies to Generators who operate in parallel with the Distribution System, where a connection is required.

Prospective Users shall provide to DSP(s) in good time all the details set out in this section.

DCC1.5 In conjunction with the Connection Conditions, there are Connection Agreements, which are bilateral agreements between DSP(s) and each User, and which contain the detail specific to each User's connection to and use of the Distribution System. The Connection Agreement requires the User and DSP(s) to comply with the terms of the Distribution Code.

DCC2: Information Required for Connection

DCC2.1 For connections at Low Voltage it is possible in most cases to assess whether a proposed connection is acceptable, and to determine the necessary supply arrangements, from analysis of the following data:

- (a) Maximum kVA requirements.
- (b) Type and electrical loading of equipment to be connected, such as number and size of motors, cookers, showers, air conditioning, space and water electrical heating loads and nature of Disturbing Loads e.g. welding equipment.
- (c) The date when connection is required.
- (d) Plan covered area and location

If a preliminary examination of this data indicates that more detailed information is reasonably required then it shall be provided to DSP(s) upon request.

DCC2.2 Information Requirements and timeframes for quotation and connection are provided in [Customer service manual] as prepared by DSP(s) and approved by ECRA. Copies of this manual are available on request from DSP(s).

DCC2.3 For connections at distribution level the provisions of DCC2.1 also apply. Additionally, the following information may be required:

- (a) All Types of Demand
 - (i) Maximum Active Power requirements.
 - (ii) Maximum and Minimum Reactive Power requirements.
 - (iii) Type of load and control arrangements (e.g. type of motor start, controlled rectifier or large motor drives).
 - (iv) Maximum load on each phase.
 - (v) Maximum harmonic currents that may be imposed on the Distribution System.
 - (vi) Details of cyclic load variations or fluctuating loads (as below).

(b) Disturbing Loads

Comprehensive schedule of installed new equipment including details of Disturbing Loads. These are loads which have the potential to introduce Harmonics, Flicker or unbalance to the system. This could adversely affect the supply quality to other Customers. Disturbing loads could be non-linear loads, power converters/regulators and loads with a widely fluctuating Demand. The type of load information required for motive power loads, welding equipment, harmonic producing/non linear loads and generating equipment can be obtained from DSP(s) on request.

In the case of compensating equipment associated with Disturbing Loads, details and mode of operation to be provided so as to ensure compliance with emission limits specified in DCC4.8.3.

(c) Fluctuating Loads

Duty cycle, including details of cyclic or other variation of Active Power and Reactive Power, in particular:

- (i) the rates of change of Active Power and Reactive Power, both increasing and decreasing;
- (ii) the shortest repetitive time interval between fluctuations in Active Power and Reactive Power; and
- (iii) the magnitude of the largest step changes in Active Power and Reactive Power, both increasing and decreasing.

DCC2.4 In some cases, more detailed information may be required to permit a full assessment of the effect of the User's load on the Distribution System. Such information may include an indication of the pattern of build up of load and a proposed Commissioning programme. This information shall be specifically requested by DSP(s) when necessary and shall be provided by the User within a reasonable time.

DCC2.5 Users shall contact DSP(s) in advance if it is proposed to make any significant change to the connection, electric lines or electric equipment, install or operate any generating equipment or do anything else that could affect the Distribution System or require alterations to connection.

DCC2.6 Users shall provide to DSP(s) any information reasonably required by DSP(s) about the nature, or use by the User, of electrical equipment on the User's premises.

DCC3: Connection Arrangements

DCC3.1 Connection Voltage

DCC3.1.1 During the application for connection process DSP(s) shall, in consultation with the User, specify the voltage level to which a User will be connected in accordance with normal practice for the type of load to be supplied and network characteristics.

DCC3.1.2 Generally, the voltage level will be the minimum nominal voltage in standard use on the System, assessed against

- (a) satisfactory operation of the installation,
- (b) isolation of disturbance from other Customers,
- (c) lifecycle costs, and
- (d) cost of connection

DCC3.1.3 DSP(s) may, on occasion, specify higher connection voltage in order to avoid potential disturbances caused by the User's apparatus to other Users of the Distribution System or for other technical reasons or may agree alternative methods for minimising the effects of Disturbing Loads.

DCC3.2 Information Provided by DSP(s)

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

- (a) nominal voltage at which connection will be made;
- (b) method of connection, extension and/or reinforcement details;
- (c) the normal impedance to source at the point of connection;
- (d) method of Earthing;
- (e) maximum IMPORTED CAPACITY;
- (f) individual Customer limits relating to
 - (i) Harmonic Distortion
 - (ii) Flicker
 - (iii) Phase Unbalance
- (g) expected lead time of providing connection (following formal acceptance of terms for supply); and
- (h) Cost of connection.

DCC3.3 Ownership Boundaries

DCC3.3.1 The point or points at which supply is given or taken between the Distribution System and User's installation shall be agreed between DSP(s) and the User as stipulated in the Connection Agreement between DSP(s) and the User.

DCC3.3.2 For LV supplies DSP(s) responsibility extends up to the Customer's Connection Point, which is normally at DSP(s) main Circuit Breaker as further specified in the Connection Agreement between DSP(s) and the User.

DCC3.3.3 For Medium Voltage supplies the ownership boundaries shall be subject to specific agreement between the parties in each case. Changes in the Boundary arrangements proposed by either party shall be agreed in advance.

DCC3.3.4 All equipment at the Ownership Boundary shall meet the design principles contained in DPC2 and DCC3. Connections for entry to and exit from the Distribution System shall incorporate a means of disconnection of the User's installation by DSP(s).

DCC4: Technical Requirements for Connections

DCC4.1 Connection Standards

DCC4.1.1 A connection to the Distribution System may be by means of an overhead line, an underground cable or a combination of both as detailed in the Connection Agreement between DSP(s) and the User. The network configuration at the Connection Point may take a number of forms suitable to the nature of the load and network arrangements.

DCC4.1.2 All equipment in an installation connected to the Distribution System shall be designed, manufactured, tested and installed in accordance with all applicable statutory obligations and shall conform to the relevant IEC distribution standards current at the time of the connection of the installation to the Distribution System.

DCC4.1.3 If there is no relevant international standard available, and/ or if DSP(s) considers it necessary, DSP(s) may notify Users that supplemental specifications and/or standards shall be complied with, in which case User Plant and apparatus shall so comply.

DCC4.1.4 All equipment in an installation connected to the Distribution System shall be suitable for use at the operating Frequency of the Distribution System and at the voltage and short-circuit rating of the Distribution System as shown in Tables DPC2.1 and DCC4.1 at the Connection Point. DSP(s) may require certification that the equipment has been designed and installed in a satisfactory manner. DSP(s) may also seek evidence that the equipment has been tested for conformity with the standards.

DCC4.1.5 For Users connected at Low Voltage, installations shall comply with the standards as in DCC4.1.2 and DCC4.1.3. Users complying with these rules and regulations shall be deemed to comply with the requirements of the Distribution Code as regards design and safety. DSP(s) may seek evidence that the equipment has been tested for compliance with standards.

DCC4.1.6 Before connecting any User to the Distribution System it will be necessary for DSP(s) to be reasonably satisfied that the User's System complies with the appropriate requirements of the Distribution Code.

DCC4.2 Protection Requirements

DCC4.2.1 Users shall ensure that faults in the User's Plant and apparatus do not unreasonably cause disturbances to the Distribution System or to other Users. Without limiting this obligation, a User shall, prior to connection of the User's installation to the Distribution System, install the Protection equipment specified in DCC4.2.4.

DCC4.2.2 Unless provided against, faults on the Distribution System can cause damage to User's Plant and apparatus through, for example, loss of a phase, over voltage, or under voltage. The User shall take account of the established practices of the particular network to which a connection is to be made, and ensure that Protection installed is compatible with that used by DSP(s). The adequacy of the Protection installed by the User is the User's responsibility.

DCC4.2.3 The User's Protection arrangements at the Ownership Boundary, including types of Equipment and Protection settings, shall be compatible with existing system conditions and the Distribution System Protection practice as specified by DSP(s) at the time of application. In particular

- (a) the maximum clearance times (from fault current inception to arc extinction) shall be within the limits established by DSP(s) in accordance with Protection and equipment short circuit rating policy adopted for the Distribution System;
- (b) in connecting to the Distribution System the User should be aware that fast and slow-speed automatic re-closing is a feature of Power System operation. This is characterised by sudden de/re-energisation of the power supply. Dead times are typically 0.3s, 1s and 10s at Medium Voltage and 3s and 60s on 38kV systems; and
- (c) Users should also be aware that disconnection of one or two phases only of a three phase system may be effected by Distribution Protection arrangements for certain types of faults.

DCC4.2.4 The minimum Protection required for a User installation connected to the Distribution System will vary according to type, size, and method of connection (loop/tail/tee) and Earthing of the User System. It is anticipated that a new connection may require all or some of the following Protection facilities:

- (a) three phase over current;
- (b) earth fault Protection (suited to the local supply system);
- (c) distance;
- (d) inter-tripping; and
- (e) Others.

DCC4.2.5 Where interface Circuit Breakers are used they shall be fitted with relays of a type acceptable to DSP(s). These relays shall have three phases over current elements and one earth fault element and shall have time-current characteristics complying with standard types A, S and C of IEC 244.

Maximum permissible relay settings at the ownership boundary, necessary to provide selectivity any time in the future will be provided by DSP(s). Distribution Protection aims to minimise the impact of faults including voltage dip duration and must not be adversely affected by Customer's Protection limitations.

- (a) In order to ensure satisfactory operation of the Distribution System, Protection systems, operating times, discrimination, and sensitivity at the ownership boundary shall be agreed between DSP(s) and the User during the application for connection process, and may be reviewed from time to time by DSP(s).
- (b) In order to provide against the failure of a Circuit Breaker, or equipment having a similar function, to operate correctly by interrupting fault current on the system, back-up Protection shall normally be provided by operation of other Circuit Breakers or equipment having a similar function.

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

DCC4.2.6 Protection relays shall be commissioned on site by the User who shall ensure that the settings are below the maximum permitted levels. In certain cases DSP(s) may wish to witness these tests and it shall be the responsibility of the User to ensure that sufficient notice is given to DSP(s) in such cases. Users shall ensure that the Protection settings remain below the maximum permitted levels. This may require regular testing of the relays.

DCC4.3 Earthing

DCC4.3.1 Earthing of the part of the User's installation that is connected to the Distribution System shall comply with the requirements of DPC2.7.

DCC4.3.2 The arrangements for connecting the User's installation with earth shall be designed to comply with relevant international and national standards.

DCC4.3.3 The method of Earthing the Distribution System whether, for example, it is connected to earth solidly or through impedance, shall be advised by DSP(s). The specification of associated equipment shall be appropriate to the voltages that will be imposed on the equipment as a result of the method of Earthing.

DCC4.3.4 Where there is more than one source of energy, Users shall take precautions to limit the occurrence and effects of circulating currents in respect of neutral points connected with earth.

DCC4.4 Voltage Regulation and Control

DCC4.4.1 Extensions or connections to the Distribution System shall be designed so that they do not hinder the necessary control of voltage on the Distribution System. Information on the voltage regulation and control arrangements shall be made available by DSP(s) if requested by the User.

DCC4.5 Short-Circuit Levels

DCC4.5.1 The short circuit rating of User's equipment at the Connection Point shall not be less than the design Fault Level of the Distribution System as shown in DCC4.1 below. DSP(s) shall take into account the contribution to Fault Level of the User's connected system and apparatus in the design of its system.

Connection Voltage	Size of Load (kVA)	Short Circuit Level RMS Symmetrical kA
220/127V	≤ 152	21
	>152	45
380/220V	≤500	20
	>500	30
13.8kV	All	21
33kV	All	25
69	All	31.5

Table DCC4.1: Short Circuit Ratings

DCC4.6 Insulation Levels

DCC4.6.1 The basic insulation level (BIL) and power Frequency withstand voltage for medium system voltages are as tabulated below:

System Nominal Voltage (kV RMS)		Altitude above mean sea level	
		UP TO 1000 METERS	ABOVE 1000 METERS
69	BIL (KV peak)	325	350
	Power Frequency withstand voltage(kV RMS)	140	160
33/34.5	BIL (KV peak)	170	200
	Power Frequency withstand voltage(kV RMS)	70	80/75
11/13.8	BIL (KV peak)	95	110
	Power Frequency withstand voltage(kV RMS)	38	50/45

Note: the dry/wet power Frequency withstands voltages are: Dry for one (1) minute and wet for (10) seconds.

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The basic insulation level (BIL) and power Frequency withstand voltage for low system voltages are as tabulated below:

System Nominal Voltage (v)	BIL (KV peak)	Power Frequency withstand voltage(kV RMS)	
		equipment	Panel wiring
227/480 230/400 220/380 127/220	6	3	2

DCC4.7 Capacitive and Inductive Effects

DCC4.7.1 The User shall, when applying to make a connection, provide DSP(s) with information as detailed in DPC3. Details shall be required of any capacitor banks and reactors connected at Medium Voltage, which could affect the Distribution System and which it is proposed to connect if agreed with DSP(s). When requested by DSP(s), details shall also be provided of distributed circuit capacitance and inductance. Sufficient detail is required for the following:

- (a) to verify that controlling equipment of the Distribution System is suitably rated;
- (b) to show that the performance of the Distribution System will not be impaired.

DCC4.8 Voltage Disturbances

DCC4.8.1 Users of the Distribution System must not generate voltage disturbances at a level that would affect other Users. Users should in their own interest select equipment that is capable of functioning satisfactorily in the presence of disturbances at the levels that can be expected, as indicated by IEEE 1159.

DCC4.8.2 It is a condition of connection that equipment connected directly or indirectly to the Distribution System shall conform to the requirements of the Distribution Code as amended from time to time.

DCC4.8.3 Loads and installations shall comply with the emission limits, which are set out in DPC2.3 (Harmonics), DPC2.4 (Power Factor), DPC2.5 (Phase Unbalance) and DPC2.6 (Voltage Stability).

Special conditions for Generators are presented in DCC6.

DCC5: Metering and Telemetry

DCC5.1 The User may be required to provide such voltage, current, Frequency, Active Power and Reactive Power pulses as are considered necessary by DSP(s) to ensure adequate system monitoring. Details will be specified in the User's Connection Agreement.

DCC5.2 Centrally dispatched Generating Units, shall provide signals to the TSP as required by the Saudi Arabian Grid Code (SAGC).

DCC5.3 If it is agreed between the parties that DSP(s) shall control the switchgear on the User's system, DSP(s) shall install the necessary telecontrol outstation. Notwithstanding the above, it shall be the responsibility of the User to provide the necessary control interface for the switchgear of the User which is to be controlled.

DCC5.4 Metering principles applying to certain Users connected to the Distribution System shall be specified in the User's Connection Agreement.

DCC5.5 Specific metering arrangements depend on the load type, size and nature of the installations being connected.

DCC5.6 Specific Arrangements

DCC5.6.1 The specific arrangements for connection, including substation layout requirements, User equipment, and Metering are set out clearly in the Distribution Code and/ or Customer Service Manual as prepared by DSP(s) and approved by ECRA. Users must comply with the provisions of the documents relevant to their installations.

DCC6: Embedded Generator Requirements

DCC6.1 Introduction

DCC6.1.1 Distribution Connection Code 6 (DCC6) is applicable to all existing or prospective Generators, including Customers with CHP, Customers with Auto-production and Generators using renewable or alternative sources of energy that are connected to the Distribution System. Customers with stand-by Generators who are connected to the Distribution System must comply with clause DCC6.9.

DCC6.1.2 In addition to meeting the requirements of DCC6, Embedded Generators shall also comply with the requirements of the General Conditions, the Planning Code, the Connection Conditions and other relevant sections of the Distribution Code. Embedded Generators that are subject to Central Dispatch shall additionally have to comply with the Saudi Arabian Grid Code (SAGC).

DCC6.1.3 If existing generating Plant does not comply with the standards set down in, or cannot comply (for technical or economic or other reasons) with the requirements of this section, the Generator shall seek derogation from the provision from ECRA.

DCC6.1.4 The Generator shall initiate discussions at a sufficiently early stage in design to allow DSP(s) to examine the impact of the Generating Unit(s) on the Distribution System.

DCC6.1.5 DSP(s) may refuse permission for the connection of a Generating Unit at a point on the Distribution System or require revision to design or technical parameters of the generation unit, or impose certain restrictions in order to ensure that security and quality of supply standards as specified in DPC2 are maintained. In such instances, DSP(s) shall provide sufficient supporting information to justify the refusal or the required revisions.

DCC6.2 Specific Rules for Embedded Generators

DCC6.2.1 The integrity of the Distribution System and the security and quality of supply to existing Users shall not fall below standard as a result of Generators operating in parallel (synchronised) with the Distribution System. Conditions for operation shall guarantee the safety of

- members of general public

- personnel
- distribution equipment

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

DCC6.2.2 Generating Units connecting to the Distribution System and operating in parallel with, or which are capable of being operated in parallel with the Distribution System, shall comply with the relevant DSP(s) document. This document sets out the conditions with which Generating Units operating in parallel with the Distribution System shall comply.

DCC6.2.3 Protection conditions and requirements are to protect the Distribution System. The Generator is responsible for Protection of its personnel and equipment and the efficient operation of its Generating Unit.

DCC6.2.4 Where a Generating Unit is to be installed on premises, DSP(s) shall be informed. DSP(s) shall have the right to inspect generating installations to ensure that the requirements are met. In some cases DSP(s) may require a demonstration by operation of the Generator. Such demonstrations shall be by agreement with the User.

DCC6.3 Provision of Information

DCC6.3.1 Information Required from Embedded Generators

Embedded Generators shall provide to DSP(s) information on (a) the Generating Plant and (b) the proposed interface arrangements between the Generating Plant and the Distribution System. The information required by DSP(s) before entering into an agreement to connect any Generating Plant to the Distribution System is shown below.

(a) Generating Plant Data:

- (i) Terminal Volts (kV)
- (ii) Rated kVA
- (iii) Rated kW
- (iv) Maximum Active Power sent out (kW), Reactive Power requirements (kVAR)

- (c) Interface Arrangements
 - (i) The means of synchronisation between DSP(s) and User;
 - (d) Details of arrangements for connecting with earth that part of the Generating Plant directly connected to the Distribution System;
 - (e) The means of connection and disconnection which are to be employed; and
 - (f) Precautions to be taken to ensure the continuance of safe conditions if any earthed neutral point of the Generators System operated at High Voltage become disconnected from earth.

DCC6.3.2 The details of information required will vary depending on the type and size of the Generating Unit or the point at which connection is to be made to the Distribution System. This information shall be provided by the Generator at the reasonable request of DSP(s).

DCC6.3.3 DSP(s) will use the information provided to model the Generating Unit to determine a technically acceptable method of connection. If DSP(s) reasonably concludes that the nature of the proposed connection or changes to an existing connection requires more detailed analysis then further information than that specified in DCC6.3.1 may be required.

DCC6.3.4 Additional information may be required from Embedded Generators larger than 2MW or connected at a voltage level above 13.8kV.

- (a) Technical Data
 - (i) Generating Plant information (impedance per unit on rating)
 - Type of prime mover
 - Rated MVA
 - MW
 - Type of excitation system
 - (ii) Automatic Voltage Regulator (AVR):
A block diagram for the model of the AVR system including the data on the forward and feedback gains, time constants and voltage control limits.

- (iii) Speed Governor and Prime Mover Data:
A block diagram for the model of the Generating Plant governor; detailing the governor fly ball, if applicable, and system control and turbine rating.
 - (iv) Generator Excitation System.
- (b) Capacity and Standby Requirements
- (i) Registered Capacity and minimum generation of each Generating Unit and power station in MW.
 - (ii) Generating unit and power station auxiliary Demand (Active and Reactive Power) in MW and MVAR, at registered capacity conditions.
 - (iii) Generating unit and power station auxiliary Demand (Active and Reactive Power) in MW and MVAR, under minimum generation conditions.

DCC6.3.5 In normal circumstances the information specified above will enable DSP(s) to assess the connection requirements. Occasionally additional information may be required. In such circumstances, the information shall be made available by the Generator, at the reasonable request of DSP(s).

DCC6.4 Information Provided by DSP(s)

DCC6.4.1 DSP(s) shall prepare a statement as per DCC3.2 for Generators applying for connection to the Distribution System.

DCC6.4.2 Where Generator paralleling or power export is intended the following additional information shall be provided including:

- (a) Interface Protection settings
- (b) Equipment, cabling, switchgear, metering requirements
- (c) Substation site and building requirements (dimensions, access, planning permission, Earthing, lighting and heating).

DCC6.5 Technical Requirements

DCC6.5.1 Generating Plant Performance Requirements

- (a) All centrally dispatched Generators shall comply with the relevant sections of the Saudi Arabian Grid Code (SAGC).
- (b) For Embedded Generators not subject to Central Dispatch the electrical parameters to be achieved at the Generating Unit terminal shall be specified by DSP(s) with the offer for connection.
- (c) Protection associated with Embedded Generating Plant shall be required to co-ordinate with the Distribution System Protection regarding:
 - (i) Clearance times for fault currents.
 - (ii) Co-ordination with auto recloser requirements.
 - (iii) Protection settings of the controlling Circuit Breaker.

Protection settings shall not be changed without a written agreement from DSP(s).

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

- (d) For Generators the Total Harmonic Voltage Distortion (THVD) limit is given in Table DCC6.1 below:

Voltage Level	Total Harmonic Voltage Distortion (%)
LV	2.5
MV	2.0
38kV	1.5

Table DCC6.1: Generator Total Harmonic Voltage Distortion Limits

DCC6.6 Islanding

DCC6.6.1 It is conceivable that a part of the Distribution System, to which the Embedded Generators are connected can, during emergency conditions, become detached from the rest of the System. DSP(s) may decide, dependent on local network conditions, if it is desirable for the Embedded Generators to continue to generate onto the islanded Distribution System.

DCC6.6.2 If no facilities exist for the subsequent automatic resynchronisation with the rest of the Distribution System then the Embedded Generators shall under DSP(s) instruction ensure that the Generating Plant is disconnected for resynchronisation.

DCC6.6.3 Under emergency conditions there is an expectation that some generation will continue to operate outside the standard Frequency limits; however, for Embedded Generators connected to the Distribution System it is likely that this could mean connection within an automatic low Frequency load disconnection zone. Consequently, Embedded Generators should ensure that all Protection on Generating Plant should have settings to co-ordinate with those on the low Frequency load disconnection equipment which will be detailed by DSP(s) on request.

DCC6.7 Black Start Capability

DCC6.7.1 Embedded Generators shall notify DSP(s) if its Generating Plant has a restart capability without connection to an external power supply

DCC6.8 Generating Plant Commissioning Tests

DCC6.8.1 Where the Generating Plant requires connection to the Distribution System in advance of the Commissioning date, for the purposes of testing, the Generator shall comply with the requirements of the Connection Agreement. The Generator shall provide DSP(s) with a Commissioning programme, approved by DSP(s) if reasonable in the circumstances, to allow Commissioning Tests to be co-ordinated.

DCC6.9 Standby Generators

DCC6.9.1 Parallel operation with the Distribution System generally is not permitted for standby Generators. Specific agreement of DSP(s) is required for parallel operation.

DCC6.9.2 Customers with standby Generators shall ensure that any part of the installation supplied by the Generating Plant has first been disconnected from the Distribution System and remains disconnected while the Generating Plant is connected to the installation. Methods of changeover and interlocking shall meet these requirements.

DCC6.9.3 Places required to provide standby Generators, as per The Council of Ministers No. 27 and date 15/2/1401 are

- a) The Tow Holy Mosques
- b) Hospitals
- c) Drinking water pumping stations and Sewage pumping stations
- d) Computer Centres
- e) Places of assembly, where more than fifty people are likely to gather, such as public libraries, galleries, museums, closed athletic stadiums, conference and lecture rooms and public halls in large hotels
- f) Cold storage of vaccines, blood banks, refrigerated and frozen food stores
- g) Important buildings like the Council of Ministers and the most important sections of the Ministries of Defence and Interior and Civil Defence operations centres, airports, police stations and the radio and television building and other places determined by the Minister of the Interior
- h) Important Factories determined by the Ministry of Trade and Industry
- i) Any other places determined by the Minister of Trade and Industry after the agreement with Interior Minister

PART 5: OPERATION

Contents

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DOC2	Operational Planning
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DOC4	Operational Communications and Liaison
DOC5	Event Reporting
DOC6	System Tests
DOC7	Monitoring Testing and Investigation
DOC8	Safety Co-Ordination

DOC1: Demand Forecasting

DOC1.1 Introduction

DOC1.1.1 In order for DSP(s) to operate the Distribution System efficiently and to ensure maximum system security and system stability, there is a need for those Users specified in DOC1.2 to provide loading and generation output information to DSP(s).

DOC1.1.2 DOC1; Demand forecasting specifies the information to be provided to DSP(s) by other Users of the Distribution System so that these requirements can be met.

DOC1.1.3 DOC 1; Demand forecasting sets out the Demand forecasting and the generating Plant output information to be provided by Users to enable DSP(s) to operate the Distribution System; and specifies the information to be provided by Users to the DSP(s).

DOC1.1.4 Where Demand data is required from the User, this means the MW Demand of electricity at the Connection Point. DSP(s) may in certain cases specify that the Demand data shall include the MVAR Demand.

DOC1.1.5 The means of providing the information to DSP(s) and its confirmation includes any non-transitory written form, or any other suitable means of electronic transfer which enables the recipient to retain information.

DOC1.2 Scope

DOC1; Demand forecasting applies to the following Users of the Distribution System

- (a) Major Customers connected to the Distribution System and Medium Voltage Customers where DSP(s) considers it appropriate.
- (b) Embedded Generators with Generating Plant over 2MW

DOC1.3 Information Flow and Co-Ordination

DOC1.3.1 DSP(s) shall co-ordinate Demand Forecast information for each Bulk Supply Point to meet the requirement of the Saudi Arabian Grid Code (SAGC). DSP(s) shall aggregate forecast information provided by Users, where appropriate, and provide forecast information to the TSP where Demand, or change in Demand, is greater than 10MW at any Connection Point.

DOC1.3.2 Embedded Generator information for Generating Plant in the Distribution System, which is not subject to Central Dispatch, shall be provided where specified to DSP(s). Customers with CHP and Customers with Auto-production may also be required to supply information.

DOC1.4 Demand Forecast Data

DOC1.4.1 Generating Units greater than 2MW and not subject to Central Dispatch shall provide DSP(s) with information regarding output and planned shutdowns for specified future periods. This shall be provided on an annual basis when requested by DSP(s).

DOC1.4.2 Major Customers shall provide to DSP(s) information regarding Demand and planned shutdowns for specified future periods. This shall be provided on an annual basis when requested by DSP(s).

DOC2: Operational Planning

DOC2.1 Introduction

DOC2.1.1 DOC2; Operational Planning

- (a) sets out the operational planning procedure and typical timetable for the co-ordination of outage requirements for Plant and apparatus to be provided by Users to enable DSP(s) to operate the Distribution System and
- (b) Specifies the information to be provided by Users to DSP(s) to allow it to comply with the Saudi Arabian Grid Code (SAGC).

DOC2.1.2 The means of providing the information to DSP(s) and its confirmation includes any non-transitory written form, or any other suitable means of electronic transfer which enables the recipient to retain information.

DOC2.1.3 In order for the DSP(s) to fulfil the requirements of DOC2 it should be noted that the information set out in the Saudi Arabian Grid Code (SAGC), to be provided by the TSP will form the basis of operational planning under DOC2.

DOC2.2 Scope

DOC2.2.1 DOC2 applies to the following Users of the Distribution System:

- (a) Major Customers connected to the Distribution System where DSP(s) considers it appropriate;
- (b) Embedded Generating Plant connected to the Distribution System;
- (c) Customers with CHP and Customers with Auto-production.

DOC2.3 Provision of Information

DOC2.3.1 Information on Embedded Generating Plant not subject to Central Dispatch (including Customers with CHP and Customers with Auto-production) shall be provided, where specified, directly to DSP(s).

DOC2.3.2 Centrally Dispatched Generating Units shall comply with the requirements of the Saudi Arabian Grid Code (SAGC). Information shall be provided directly to the TSP.

DOC2.4 Timescales and Data

DOC2.4.1 Detailed implementation of data gathering and timescales shall be determined by DSP(s) and each User. Due recognition shall be given by DSP(s) to voltage levels and capacities of Plant and apparatus when assessing information requirements.

DOC2.4.2 The information may be required for different timescales as may be determined by DSP(s) planning needs.

DOC2.5 Information from Embedded Generators

DOC2.5.1 Information from Embedded Generating Plant greater than 2MW and not subject to Central Dispatch shall include details of Planned Outages for maintenance or other purposes as well as the expected time of return of service.

DOC2.5.2 The Generator shall not synchronise without first obtaining permission from DSP(s) unless prior agreement has been reached with DSP(s).

DOC2.6 Information to Users

DOC2.6.1 DSP(s) shall advise Major Customers or Generators who may be significantly affected by particular outages of Distribution Plant and apparatus, of the likely dates and duration of the outages. If there are objections from Users these shall be considered by DSP(s) and alternative arrangements proposed if possible.

DOC3: Demand Control

DOC3.1 Introduction

DOC3.1.1 DOC3 is concerned with provisions to be made by DSP(s) or Users of the Distribution System, in certain circumstances, to permit reductions in Demand. Reductions would be permitted

- (a) In the event of insufficient Generating Plant and transfers from external interconnections are available to meet Demand;

- (b) To avoid disconnection of Customers; or
- (c) In the event of breakdown and/or operating problems (such as in respect of system Frequency, system voltage levels or system thermal overloads) on any part of the Transmission or Distribution System.

DOC3.1.2 The Demand control procedures ensure that hardship to Users and Customers is minimised and that in so far as is practicable, all parties affected are treated equitably.

DOC3.1.3 DOC3 deals with the following means of reducing Demand:

- (a) automatic low Frequency or voltage Demand disconnection;
- (b) Customer Demand reduction including Voltage Reduction;
- (c) Customer Demand management initiated by Suppliers or other parties, other than following an instruction by DSP(s) or TSP;
- (d) Customer Demand reduction instructed by DSP(s) or TSP; and
- (e) Emergency manual Demand disconnection.

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

DOC3.1.4 Where Demand Control is exercised by DSP(s) or the TSP it shall be done in a manner that in so far as reasonably practicable does not discriminate against any Customer or supplier and shall use reasonable endeavours to ensure that the burden is shared fairly among Customers. Exemptions may apply to vital and priority Customers as defined in the Distribution load shedding criterion/ plan submitted by DSP(s) and approved by ECRA.

DOC3.2 Scope

DOC3.2.1 DOC3 applies to DSP(s) and all Users of the Distribution System.

DOC3.2.2 Implementation of Demand Control by DSP(s) may affect all Customers of Suppliers connected to the Distribution System and where applicable, contractual arrangements between Suppliers and their Customers may need to reflect this.

DOC3.3 Methods of Demand Control

DOC3.3.1 Customer Demand may be disconnected automatically at selected locations in accordance with the requirements of the Saudi Arabian Grid Code, in the event of a sudden fall in Frequency. Such an arrangement shall be carefully co-ordinated as part of an overall scheme and may take into account any operational requirements or essential load.

DOC3.3.2 Automatic disconnection by under voltage relay may be used discriminately to disconnect load at 33kV or 13.8kV in order to maintain voltage within acceptable limits, so as to avoid widespread load shedding.

DOC3.3.3 Deliberate reduction of voltage may be used to achieve a temporary reduction in load Demand.

DOC3.3.4 Deliberate reduction in system Frequency may also be used to achieve a temporary reduction in load Demand in accordance with the Saudi Arabian Grid Code (SAGC).

DOC3.3.5 Emergency manual load shedding may be carried out on the Distribution or Transmission Systems for reasons of shortfall in supply or other reasons.

DOC3.3.6 In the event of a sustained period of shortfall then planned rota load shedding may be used to share the available power among affected Customers.

DOC3.4 Implementation of Demand Control

DOC3.4.1 Where a Demand Control is exercised by DSP(s) in order to safeguard the Distribution System, DSP(s) shall liaise with and inform Users accordingly as far as is practicable.

DOC3.4.2 Where Demand Control is exercised by DSP(s) on instruction or request from the TSP in order to safeguard the total System then DSP(s) is required to respond to these requests promptly but shall liaise with and inform other Users so far as is practicable.

DOC3.4.3 Procedures for load shedding including exemption policies, load shedding rotas and Customer communications are contained in the Distribution load shedding criterion/ plan approved by ECRA.

DOC4: Operational Communications and Liaison

DOC4.1 Introduction

DOC4 sets out the requirements for the exchange of information in relation to Operations and/or Events on the Distribution System or the installation of any User connected to the Distribution System which have had or may have had, or will have or may have an Operational Effect on the Distribution System or the installation of any other User.

DOC4.2 Scope

DOC4 applies to the following Users of the Distribution System:

- (a) Major Customers connected to the Distribution System where DSP(s) considers it appropriate;
- (b) Embedded Generating Plant with a capacity greater than 2MW;
- (c) Customers with CHP and Customers with Auto-production where DSP(s) reasonably considers it appropriate.

DOC4.3 Procedure

DOC4.3.1 DSP(s) and Users connected to the Distribution System shall nominate persons and/or contact locations and agree communication channels for the necessary exchange of information to make effective the exchange of information required by DOC4.

DOC4.3.2 SCADA equipment may be required at a User's site for transmission of information and data to and from the DSP(s). The requirement to provide this information shall normally be included in the relevant Connection Agreement.

DOC4.3.3 Information between DSP(s) and Users shall be exchanged on the reasonable request of either party. The request may follow a specific Operation, or be in accordance with a prior agreement to exchange information on particular types of Event.

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

DOC4.3.4 DSP(s) shall notify the User of any Operation on the Distribution System (or of any Operation on the Transmission System of which it has received notice) which, in the opinion of DSP(s), will have or may have an Operational Effect on the installation of the User.

DOC4.3.5 A User shall notify DSP(s) of any Operation on the installation of that User which will have or may have an Operational Effect on the Distribution System.

DOC4.3.6 A notification under DOC4 shall include the name of the individual reporting the Operation and, although it need not state the cause, shall be in sufficient detail to describe the Operation and to enable the recipient reasonably to know and consider the implications and risks arising there from. The recipient may ask questions to clarify the notification.

DOC4.3.7 A notification under DOC4 shall be given as far in advance as possible to allow the recipient to consider and assess the implications and risks arising.

DOC4.4 Significant Incidents

DOC4.4.1 Where an Event on the Distribution System has had or may have had a significant effect on the User's installation or where an Event in the User's installation has had or may have had a significant effect on the Distribution System, DSP(s), in consultation with the User, shall deem the Event to be a Significant Incident. Significant incidents shall be reported in writing to the affected party in accordance with the provision of DOC5.

DOC4.4.2 Significant Incidents shall include Events which result in, or may result in, the following:

- (a) Voltage outside statutory limits;
- (b) System Frequency outside statutory limits; or
- (c) System stability failure.

DOC5: Event Recording

DOC5.1 Introduction

DOC5.1.1 DOC5 sets the requirements for reporting in writing those Events deemed to be "Significant Incidents" under DOC4.

DOC5.1.2 DOC5 also provides for the joint investigation of Significant Incidents by the Users involved.

DOC5.2 Scope

DOC5.2.1 DOC5 applies to the following Users of the Distribution System:

- a) Major Customers connected to the Distribution System where DSP(s) considers it appropriate;
- b) Embedded Generating Plant with a capacity greater than 2 MW
- c) Customers with CHP and Customers with Auto-production where DSP(s) reasonably considers it appropriate.

DOC5.3 Procedures

DOC5.3.1 DSP(s) and each User specified in DOC5.2.1 shall nominate officers and establish communication channels to ensure the effectiveness of DOC5. Such officers and communication channels may be the same as those established under DOC4.

DOC5.3.2 Communication shall, as far as possible, be direct between the User and DSP(s). This does not, however, preclude communication with the Users nominated representative.

DOC5.3.3 In the case of an Event that has been reported to DSP(s) under DOC4 and subsequently has been determined by DSP(s) to be a Significant Incident, a written report shall be given to DSP(s) by the User in accordance with DOC5.

DOC5.3.4 In the case of an Event that has been reported to the User under DOC4 and subsequently has been determined by DSP(s) to be a Significant Incident, a written report shall be given to the User by DSP(s) in accordance with DOC5.

DOC5.3.5A Report shall be in writing or in electronic form and shall be sent to DSP(s) or User, as the case may be. It shall contain confirmation of the notification given under DOC4 together with more details relating to the Significant Incident including information which has become known relating to the Significant Incident since the notification. The report shall, as a minimum, contain those matters specified in DOC5.

DOC5.3.6A report under DOC5 shall be given as soon as reasonably practical after the notification under DOC4.

DOC5.4 Joint Investigations

DOC5.4.1 Where a Significant Incident has been declared and a report submitted under DOC5 either party or parties may request in writing that a joint investigation be carried out.

DOC5.4.2 The composition of such an investigation panel shall be appropriate to the incident to be investigated and agreed by all parties involved.

DOC5.4.3A joint investigation shall only take place where all parties affected by it agree to it. The form and rules of, and procedures for, and all matters relating to the joint investigation shall be agreed at the time of a joint investigation and in the absence of agreement the joint investigation shall not take place.

DOC5.5 Matters to be Included in a Written Report of a Significant Incident

DOC5.5.1 Matters applicable to DSP(s) and Embedded Generators are as follows:

- (a) date and time of Significant Incident;
- (b) location;
- (c) equipment involved;
- (d) brief description of Significant Incident;
- (e) details of any Demand Control undertaken;
- (f) conclusions and recommendations if applicable

DOC5.5.2 Matters applicable to DSP(s) are as follows:

Effect on Users where appropriate:

- (a) Duration of incident; and
- (b) Estimated date and time of return to normal service.

DOC5.5.3 Matters applicable to Embedded Generators as follows:

- (a) date and time of Significant Incident;
- (b) location;
- (c) equipment involved;
- (d) brief description of Significant Incident;
- (e) details of any Demand Control undertaken;
- (f) conclusions and recommendations if applicable

DOC6: System Tests

DOC6.1 Introduction

DOC6.1.1 DOC6 sets out the responsibilities and procedures for arranging and carrying out System Tests which have or may have an effect on the Systems of DSP(s) or Users. System Tests are those which involve either simulated or the controlled application of irregular, unusual or extreme conditions on the Total System or any part of the Total System, but which do not include Commissioning or re-Commissioning tests or any other tests of a minor nature.

DOC6.2 Scope

DOC6.2.1 DOC6 applies to the following Users of the Distribution System:

- (a) Major Customers connected to the Distribution System where DSP(s) considers it appropriate;
- (b) Embedded Generating Plant with a capacity greater than 2MW;
- (c) Customers with CHP and Customers with Auto-production where DSP(s) reasonably considers it appropriate.

DOC6.3 Procedures

DOC6.3.1 If the System Test is proposed by DSP(s) or the User connected to the Distribution System then the provisions of DOC6 shall apply.

DOC6.3.2 If the system test will or may have an effect on the Transmission System, then the provision of the Saudi Arabian Grid Code shall apply.

DOC6.3.3 System Tests which have a minimal effect on the Distribution System or the systems of others will not be subject to this procedure; minimal effect shall be taken to mean variations in voltage, Frequency and waveform distortion of a value not greater than those figures which are defined in the Distribution Planning Code.

DOC6.3.4 When DSP(s) or a User intends to undertake a System Test which may have significant effect on the System of others normally twelve months notice, or as otherwise agreed by DSP(s), shall be given by the person proposing the System Test (Test Proposer) to DSP(s) and to those Users who may be affected by such a System Test.

DOC6.3.5 The proposal shall be in writing and shall contain details of the nature and purpose of the proposed System Test and shall indicate the extent and situation of the Plant or apparatus involved.

DOC6.3.6 If the information set out in the proposal notice is considered insufficient by the recipient they shall contact the Test Proposer with a written request for further information which shall be supplied as soon as reasonably practicable. DSP(s) shall not be required to do anything under DOC6 until they are satisfied with the details supplied in the proposal or pursuant to a request for further information.

DOC6.3.7 If DSP(s) wishes to undertake a System Test, DSP(s) shall be deemed to have received a proposal of that System Test.

DOC6.3.8 DSP(s) shall have overall co-ordination of the System Test, using the information supplied to it under DOC6 and shall identify in its reasonable estimation, which Users other than the Test Proposer, may be affected by the proposed System Test.

DOC6.3.9 Following receipt of the System Test proposal DSP(s) shall evaluate the impact of the System Test and discuss the proposals with Users identified as being affected.

DOC6.3.10 Within one month of receiving the System Test proposal DSP(s) shall submit a report to the Test Proposer which shall contain:

- (a) proposals for carrying out the System Test (including the manner in which it is to be monitored);
- (b) an allocation of costs between the affected parties, (the general principle being that the Test Proposer will bear the costs); and
- (c) such other matters that DSP(s) consider appropriate; an outline of the procedure to be followed and the proposed test schedule and advice of any costs.

DOC6.3.11 the proposal report shall be submitted to all those who received a notice under DOC6.3.4.

DOC6.3.12 If the proposal report (or a revised proposal report as agreed between DSP(s) and the Test Proposer) is approved by all recipients, the System Test can proceed.

DOC6.3.13 At least one month prior to the date of the proposed System Test, DSP(s) shall submit to all recipients of the proposal notice a programme which in DOC6 shall be called a Final Test Programme stating the switching sequence and proposed timings, a list of those staff involved in carrying out the System Test (including those responsible for site safety) and such other matters as DSP(s) deem appropriate.

DOC6.3.14 The final test programme shall bind all recipients to act in accordance with the provisions contained within the programme in relation to the proposed System Test.

DOC6.3.15 At the conclusion of the System Test, the Test Proposer shall be responsible for preparing a written report (the "Final Report") of the System Test for submission to DSP(s).

DOC6.3.16 The Final Report shall include a description of the Plant and/or apparatus tested and of the System Test carried out, together with the results, conclusions and recommendations.

DOC6.3.17 Results of tests shall be reported to relevant parties, taking into account confidentiality issues.

DOC6.3.18 all system test procedures shall comply with all applicable legislation.

DOC7: Monitoring Testing and Investigation

DOC7.1 Introduction

DOC7.1.1 In order to discharge its responsibilities in respect of safe, secure and economic operation of the Distribution System and in accordance with its licence conditions DSP(s) shall organise and carry out monitoring, testing and investigation on the effect of Users' electrical apparatus or electrical installation on the Distribution System.

DOC7.2 Scope

DOC7.2.1 DOC7 applies to the following Users of the Distribution System:

- (a) all Embedded Generators
- (b) all Customers who are connected to the Distribution System

DOC7.3 Procedures

DOC7.3.1 DSP(s) shall, from time to time, determine the need to test or monitor the quality of supply at various points on the Distribution System.

DOC7.3.2 The requirements for specific testing and/or monitoring may be initiated by the receipt of specific complaints as to the quality of supply on the Distribution System.

DOC7.3.3 Where testing or monitoring is required at the Connection Point with a User then DSP(s) shall advise the User involved and DSP(s) shall make available the results of such tests to the User.

DOC7.3.4 Where a User is found to be operating outside the technical limits specified in the Distribution Code then the User shall rectify the situation or disconnect the apparatus causing the problem from its electrical system connected to the Distribution System immediately or within such time as agreed with DSP(s).

DOC7.3.5 Continued failure to rectify the situation shall result in the User being disconnected.

DOC7.3.6 DSP(s) shall, from time to time, monitor the affects of the User on the Distribution System.

DOC7.3.7 The monitoring shall normally be related to the amount of Active Power and Reactive Power or Flicker or Harmonics transferred across the Connection Point.

DOC7.3.8 Where the User is exporting or importing Active Power or Reactive Power in an amount causing disturbances, DSP(s) shall inform the User and the User shall restrict the power transfer to within the specified parameters.

DOC7.3.9 DSP(s) may check from time to time that Users are in compliance with agreed Protection requirements and Protection settings.

DOC8: SAFETY CO-ORDINATION

DOC8.1 INTRODUCTION

DOC8.1.1 DOC11 specifies the safety rules and procedures to be applied by the DSP(s) to meet statutory requirements and Distribution Licence conditions and obligations.

DOC8.1.2 Similar safety rules and procedures shall be provided by other Users of the Distribution System when carrying out work or tests at the operational interface with the DSP(s).

DOC8.2 OBJECTIVES

DOC8.2.1 the objectives of safety co-ordination procedures are to lay down the Safety Management criteria to be applied, to ensure safety of persons working on the Distribution System and/ or across operational and ownership boundaries.

DOC8.3 SCOPE

DOC8.3.1 DOC8 specifies the safety rules and procedures that apply to the DSP(s) and the following Users of the Distribution System:

- a) Embedded Generators
- b) Major Customers
- c) Any other party reasonably specified by the DSP(s) including Users connected at Medium or Low Voltage for appropriate sections of DOC8 when necessary
- d) Agents of the DSP(s) or Users working on the Distribution System or at or across operational boundaries.

DOC8.4 Procedures

DOC8.4.1 The Safety Management principles and procedures (Safety Management System) for ensuring the health and safety of all relevant personnel shall be specified by DSP(s) and Users for work on their respective Systems or Plant apparatus connected to them.

DOC8.4.2 There shall be joint agreement by DSP(s) and Users on which Safety Management System is to be used for sites or locations where an operational boundary exists and proper documentation of the safety precautions to be taken shall be maintained.

DOC8.4.3 There shall be written authorisation of personnel who do the work of control, operation, work or testing of Plant apparatus forming part of, or connected to, the Distribution System.

DOC8.4.4 There shall be joint agreement between DSP(s) and Users which specifies responsibility for system or control equipment which shall ensure that only one party is responsible for any item of Plant or apparatus at any one time.

DOC8.4.5 DSP(s) and each User shall at all times have nominated a person or persons responsible for the co-ordination of safety on the respective system.

DOC8.4.6 DSP(s) and each User shall maintain a suitable system of documentation which records all relevant Operational Events that have taken place on the Distribution System or other system connected to it and the co-ordination of relevant safety precautions for work.

DOC8.4.7 System diagrams which show sufficient information for control personnel to carry out their duties shall be exchanged between DSP(s) and User as required.

DOC8.5 Safety at the DSP(s)/User Interface

DOC8.5.1 The following procedures set down the basic safety requirements at the operator and DSP(s) interfaces. These procedures are necessary to ensure the safety of all who may have to work at either side of the interface or on the interface (boundary).

- (a) Written rules for safety working and communicating procedures shall be available and used by all persons who may have to work at or use the facilities provided at the Interface.
- (b) Electrical equipment connected to either side of the interface and interface equipment shall be under the control of a named person at either side.
- (c) Each item of equipment shall be controlled by only one identifiable person at any one time.
- (d) Adequate means of isolation shall be provided at the interface to allow work to be carried out safely at either side of the interface.
- (e) Where necessary to prevent danger adequate facilities for Earthing shall be provided at either side of the interface to allow work to be carried out safely at the interface or at either side of the interface.
- (f) Adequate working space, adequate means of access and egress and, where necessary, adequate lighting shall be provided at all electrical equipment, on or near which work is being done in circumstances which may cause danger.

- (g) All electrical equipment shall be suitably identified where necessary to prevent danger.
- (h) Electrical installations and equipment shall comply with the relevant statutory requirements.

DOC8.6 SAFETY RULES

DOC8.6.1 Operation and Maintenance of the User's equipment shall only be carried out by authorized personnel. Before first Commissioning the Plant, operating procedures shall be agreed with the DSP(s).

DOC8.6.2 Instructions for operating and / or Earthing the User's electrical equipment shall be clearly displayed in the User's Medium and High Voltage switch room.

DOC8.6.3 Safety Procedures for personnel working on or in close proximity to the Distribution System Plant and apparatus shall be governed by the DSP(s).

DOC8.6.4 In the event of a conflict between the provisions of this Code and the provisions of the TSP safety rules, the provisions of the TSP Safety Rules shall take precedence.

PART 6: DEFINITIONS

- DCD1 Active Power
The product of voltage and the in-phase component of alternating current (normally measured in kilowatts (kW) or megawatts (MW)).
- DCD2 Ambient Temperature
The surrounding temperature (in the absence of the equipment) of the immediate environment in which equipment is installed. This temperature normally varies. A derived constant value is taken for the purposes of designing or rating equipment.
- DCD3 AVR
Automatic Voltage Regulator
- DCD4 Back-Up Protection
That Protection system which will open a Circuit Breaker or other fault-current interrupting device in the absence of the current Protection operation of another Protection system
- DCD5 Black Start
The procedure which is necessary for recovery from a total or partial system shutdown
- DCD6 Bulk Supply Point
A point of connection between the Transmission System and the Distribution System or between the Transmission System and a directly connected Customer
- DCD7 Central Dispatch
The Dispatch of Generating Units by the Transmission Service Provider (TSP)
- DCD8 Centrally Dispatched Generating Units
Generating Units subject to Dispatch by the TSP
- DCD9 Circuit Breaker
A mechanical switching device, capable of making, carrying and breaking currents under normal circuit conditions and also of making, carrying for a specified time and breaking currents under specified abnormal circuit conditions, such as those of short circuit

- DCD10 CHP - Combined Heat and Power
The simultaneous production of utilisable heat and electricity from an integrated thermo-dynamic process
- DCD11 Commissioning
The final process of testing part of a system prior to that part of the system being considered suitable for normal use
- DCD12 Connected Load
The sum of the nameplate ratings of all present and future electrical equipment installed by a Customer. Connected load is measured in volt-amperes (VA).
- DCD13 Connection Agreement
An agreement between DSP(s) and each User setting out terms relating to a connection with the Distribution System
- DCD14 Connection Point
The physical point at which User's Plant or apparatus is joined to the Distribution System.
- DCD15 Customer
A User whose premises are connected to the Distribution System for the purpose of obtaining a supply of electricity at that premises
- DCD16 Customer with Auto-Production
A Customer generating electricity for their own use.
- DCD17 Demand
The electric power which is drawn for the system by a Customer, usually expressed in MW, MVA or MVAR.
- DCD18 Demand Load
The maximum load drawn from the power system by a Customer at the Customer's interface (either estimated or measured).
- DCD19 Disconnector
A device which provides in the open position a means of disconnecting apparatus from the Distribution System in accordance with specified requirements

- DCD20** Dispatch
The issue of instructions for Generating Units to achieve specific Active Power and Reactive Power outputs within Registered Data parameters and by stated times.
- DCD21** Distribution Code
This code, required to be prepared by DSP(s) pursuant to condition 14 (Compliance with transmission, distribution and market codes) of the Distribution Licence and approved by ECRA as revised from time to time with the approval of, or by the direction of, ECRA.
- DCD22** Distribution Code Review Panel
The panel with the functions which are set out in DGC6
- DCD23** Distribution Licence
A distribution licence granted under Article 5 and 6 of the Electricity Law promulgated on 20/10/1427 AH (21/11/2006 AD) by Royal Decree M/56 and ECRA Charter dated 17/05/1425 AH (05/07/2004 AD)
- DCD24** Distribution System
The system which consists of electric lines, electric Plant, transformers and switchgear and which is used for conveying electricity to final Customers
- DCD25** Distribution Service Provider (DSP)
The legal entity that is licensed to own and maintain a network on the Distribution System (or has such right by virtue of its historic existence for this purpose)
- DCD26** Distribution Use of System Agreement
The agreement between DSP(s) and Retailers/ Traders for transport of electricity from the Transmission System or Embedded Generators through the Distribution System to Customers
- DCD27** Disturbing Loads
Loads which have the potential to introduce waveform distortion (Harmonics, Flicker) or phase unbalance into the system.

- DCD28 Earthing
The provision of a connection between conductors and earth by means of an Earthing Device.
- DCD29 Earthing Device
A means of providing a connection between a conductor and earth of adequate strength and capability for its intended purpose.
- DCD30 ECRA
Electricity and Co-Generation regulatory Authority.
- DCD31 Effectively Earthed System
A power system in which the neutral is connected to earth either directly or through a neutral resistor.
- DCD32 Embedded
Having a direct electrical connection to the Distribution System.
- DCD33 Embedded Generators
A Generator whose Generating Units are directly connected to the Distribution System and includes Customers with CHP and Customers with Auto-production.
- DCD34 Event
An unscheduled or unplanned (although it may be anticipated) occurrence on or relating to a System including, without limiting that general description, faults, incidents and breakdowns.
- DCD35 Fault Level
Prospective current that would flow into a short circuit at a stated point on the System. It is expressed in kA or in MVA.
- DCD36 Flicker
Periodic fluctuations in voltage, at frequencies below the fundamental Frequency. These are generally expressed as percentage variations, relative to the fundamental voltage.
- DCD37 Frequency
The rate of oscillation of the AC supply. This is generally expressed as a Frequency range, in terms of a nominal Frequency in Hz (cycles per second), with plus and minus percentage limits.

- DCD38 Frequency Response
The automatic adjustment of Active Power output from a Generation Unit(s) in response to Frequency changes.
- DCD39 Fundamental Frequency
The operating or system Frequency of the Power System. Parameters whose Frequency is the same as the fundamental Frequency are referred to as fundamental parameters.
- DCD40 Generating Plant
A power station with one or more Generating Units.
- DCD41 Generating Unit
An apparatus which produces electricity.
- DCD42 Generator
A person who generates electricity.
- DCD43 Good Industry Practice
The standard of practice attained by exercising that degree of skill, diligence, prudence and foresight which would reasonably and ordinarily be expected from a skilled and experienced operator engaged in the same type of undertaking under the same or similar circumstances.
- DCD44 Grid Code
The Saudi Arabian Grid Code
- DCD45 Harmonics
Sinusoidal currents with a Frequency equal to an integer multiple of the fundamental Frequency.
- DCD46 High Voltage
A voltage, used for the supply of electricity, the lower limit of nominal RMS value of which is greater than 100kV.
- DCD47 IEC
International Electrotechnical Commission.

- DCD48 Isolated
Disconnected from associated equipment by an isolator or adequate physical separation.
- DCD49 kVA
Kilo-Volt ampere.
- DCD50 Low Voltage
A voltage used for the supply of electricity, the upper limit of nominal RMS value of which does not exceed 1kV.
- DCD51 Major Customer
A Customer who is supplied at Medium Voltage whose Load is greater than 1MVA
- DCD52 Medium Voltage
A voltage used for the supply of electricity, the nominal value of which is between 11kV and 36kV.
- DCD53 MVAR
Megavar (1,000,000 Volt Amperes reactive).
- DCD54 MW
Megawatt (1,000,000 Watts).
- DCD55 Normal Operating Frequency
The Frequency at which the system normally operates i.e. 60Hz.
- DCD56 Operation
A scheduled or planned action carried out on a system.
- DCD57 Operational Effect
The effect of any Operation which causes the Transmission System or the Distribution System, or the system of other Users, to operate (or be at a materially increased risk of operating) differently from the way in which they would or may have operated in the absence of such Operation.
- DCD58 Planned Outage
An outage of Generating Plant or of part of the Transmission System or of part of the Distribution System other than a forced outage.

- DCD59 Plant
Fixed and movable items used in the generation and/or supply and/or transmission and/or distribution of electricity other than apparatus.
- DCD60 Power Factor
The ratio of Active Power to apparent power.
- DCD61 Protection
The provisions for detecting abnormal conditions in a System and initiating fault clearance or actuating signals or indications.
- DCD62 Reactive Power
The product of voltage and current and the sine of the phase angle between them which is normally measured in Kilo vars (kVAR) or Mega vars (MVAR).
- DCD63 Retail Business
The business of bulk purchase for the purpose of retail sale of electricity to Consumers or large consumers authorized by a licence.
- DCD64 Safety Management
The procedure adopted by the DSP or a User to ensure the safe operation of its system and the safety of personnel required to work on that system.
- DCD65 Safety Procedures
The procedures which are specified within a Safety Management system.
- DCD66 Significant Incident
An Event which has had or which may have an Operational Effect on the Transmission or Distribution system or on a User's installation.
- DCD67 Step Change in Voltage
A step change is defined as a single, rapid change of the RMS voltage. Distribution System voltage step changes can occur due to switching in and out of capacitors, lines, cables, transformers and other Plant.

- DCD68 System Tests**
Those tests which involve simulating conditions or the controlled application of irregular, unusual or extreme conditions on the Total System or any part of it, but not including routine testing, Commissioning or reCommissioning tests.
- DCD69 Total Harmonic Distortion**
Total harmonic distortion is the aggregate of the harmonic distortions at all harmonic frequencies. This is expressed as the root mean square value of harmonic distortions, at all harmonic frequencies.
- DCD70 Trading Business**
The business of bulk purchase for the purpose of sale of electricity from/ to other Licensees or large Consumers authorized by a licence.
- DCD71 Transmission System**
Reference shall be made to the Saudi Arabian Grid Code (SAGC) for detailed definition.
- DCD72 Transmission Service Provider (TSP)**
The legal entity that is licensed to own and maintain a network on the Transmission System (or has such right by virtue of its historic existence for this purpose).
- DCD73 User**
A term used in various sections of the Distribution Code to refer to the persons using the Distribution System, more particularly identified in each section of the Distribution Code.
- DCD74 Voltage Reduction**
A method to control Demand temporarily by reduction of system voltage.
- DCD75 Voltage Unbalance**
In three-phase networks, the conditions in which the RMS values of the phase voltages, or the angles between consecutive phases, are not equal.

DCD76 Zero Phase Sequence

A set of phases of equal magnitude and zero phase angle, relative to each other. The 3-phase values are thus in phase with each other. The term zero sequence may be applied, in the same sense, to AC voltages and currents.

**SECURITY
AND PLANNING STANDARDS
FOR THE DISTRIBUTION SYSTEM**

(Demand Customers Only)

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1.0 INTRODUCTION

1.1 General

The DSP(s) is required to operate and ensure the maintenance of and develop, as necessary, a safe, secure, reliable, economical and efficient electricity Distribution System.

To this end, this document, “Security and Planning Standards for the Distribution System” has been prepared in accordance with the Distribution Code.

It outlines DSP(s)’s approach to the development of the network, giving details of how the connection of new loads and Embedded Generators to the Distribution System are assessed. It is intended as a guide to Users of the Distribution System and is referred to in the Distribution Code (Reference 2). While this guide refers to Customers’ loads, the same factors will apply, in general, to Generators also. There are however, some specific requirements relating to Generators and these are included under a separate heading. (Section 5).

1.2 Definitions

In general the terms used in this document have the meanings intended in the Distribution Code. As a brief guide, the terms used in this document are defined below:

Term	Definition
Connection Asset	The network erected to connect the Connection Point to the existing Distribution System. The connection asset forms part of the Distribution System and is not shared by other Users.
Continuity or Continuity of Supply	This describes the quality of a supply as it relates to outages, whether caused by faults or planned work. A set of measures are required to describe continuity but, in general, the lower the incidence of outages and the shorter their duration, the higher the continuity.
Distribution System	The electric lines, Plant and switch-gear used to convey electricity to final Customers (excluding Customers connected directly to the Transmission System (grid)).

Disturbing Load	An electrical load that of its nature may affect the quality of electricity supply of other Customers. Examples are welders, large electric motors etc. (See Appendix 1).
Flicker	Voltage fluctuations, caused by a disturbing load (or rapid variations in Generator output), the major effect of which is Flickering of standard (incandescent) light bulbs.
Looped Connection	As described in DPS
Losses	Electrical losses are the difference between the energy entering the Distribution System and that delivered to Customers. Losses are the energy lost in the network due to the heating effect of the electricity passing through it.
Maximum Import Capacity	This is the maximum load that the Customer has contracted with DSP(s).
Normal Feeding	The network configuration under normal conditions and when all distribution Plant is in service. The normal feeding arrangement is typically designed to provide best voltage performance, to minimise network losses and to make optimum use of the capacity of feeding substations.
Security of Connection	The expectation that the Connection Point will remain energised.
Short Circuit Level	The short circuit level is a measure of the 'strength' of the network i.e. the ability to limit the impact of Disturbing Loads and to maintain voltage stability. The size of the Customer switched load relative to the short circuit level determines the magnitude of its impact on the voltage.
Short Circuit Rating	This refers to the short circuit rating of the item

	of Plant concerned.
Standby Feeding	The feeding arrangement when one or more items of network Plant is out of service. The exact feeding arrangement will depend on which items are out of service. As standby feeding is a temporary arrangement, different standards of voltage apply.
Bulk Customer substation	A standard structure owned and operated by DSP(s) containing the distribution equipment necessary to connect a Customer to the Distribution System. Terminal substations are operated at the connection voltage of the Customer i.e. transformation is not required.
Distribution Substation	A standard structure owned and operated by DSP(s) containing one or more transformers, to convert electricity at one standard distribution voltage to a lower standard voltage.

1.3 Aim of Planning

The aim of planning is to ensure that the Distribution System is developed in an orderly and cost effective manner. It is necessary to ensure that there is capacity available to meet new loads as they arise, and to meet ongoing growth requirements. It is also necessary to ensure that new connections are made:

1. in an economic fashion
2. with a view to the possible future needs of the Customer and the network
3. in a way that is technically acceptable

In general the MV networks are planned to a single contingency standard. This means that the system is designed to withstand a single contingency, and any outages experienced for this single contingency are only for such time as is required to transfer load from faulted Plant. In summary, DSP(s) will provide Customer connections which will deliver the required capacity to an acceptable standard as detailed in the Distribution Code and will comply with the Saudi Arabian Grid Code (SAGC) at all points of connection to the Transmission System. A higher standard of installation or a higher security of connection arrangement can be provided at the Customer's request, with the provision that any additional costs will be attributed in full to the Customer.

2.0 DISTRIBUTION SYSTEM

2.1 Standard Configuration

The standard configuration of the Distribution System is illustrated schematically in Figure 1 below.

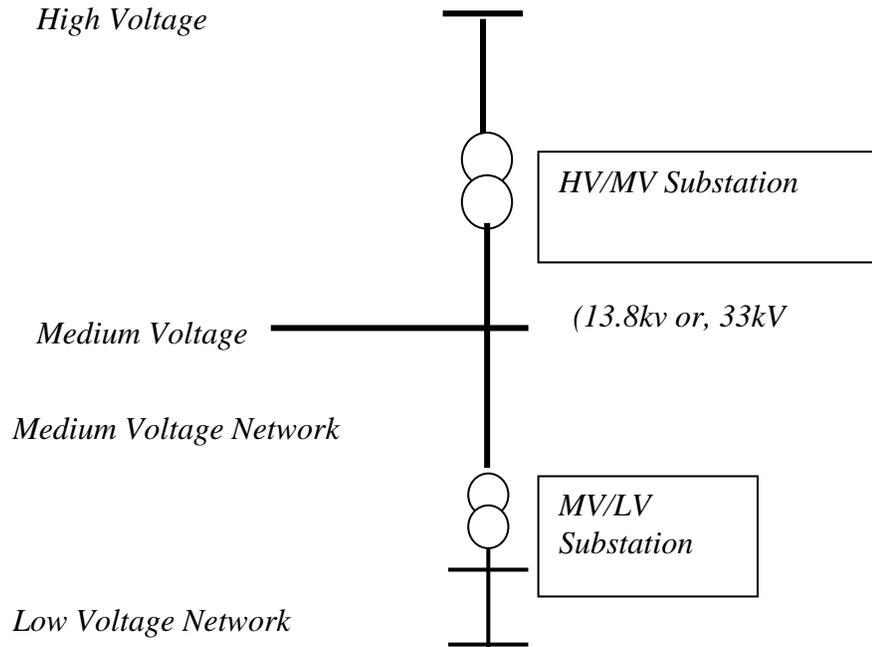


Figure 1: Representation of the Distribution System

2.2 Voltage Levels

There are a number of standard voltages in use on the Distribution System and Customers will be connected at one of these levels. Voltage Levels at which a connection can be provided are as follows:

Voltage Level	Nominal Voltage
Low Voltage (LV)	220/127V (phase-phase/phase-neutral)
	380/220V (phase-phase/phase-neutral)
Medium Voltage (MV)	13.8kV, 33kV ,69kv(standard)
	11kV, 34.5kV (existing but non-standard)

Table 1: Distribution System Nominal Voltages

2.3 Effects of Disturbing Loads

Certain types of equipment such as motors and welders may cause fluctuations in the supply voltage which cause disturbances to the connection of other Customers. Where Customers intend to install any equipment likely to cause supply disturbances, this equipment must be evaluated to assess the likely impact. The limits imposed on Disturbing Loads are specified in the Distribution Code. It may be necessary, depending on the characteristics of the equipment, for a Customer connection to be made using a different network configuration via a higher voltage, a dedicated substation or other method.

3.0 ASSESSMENT OF NEW LOAD

3.1 Application Form

The assessment of the connection for a new load requires details of the load. The details should be provided by completing an application form as in... (See attachment).

3.2 Information Required from Customers

Details of the information required from Demand Customers and Generators seeking connections or extensions to the Distribution System are provided in the Distribution Code. Application forms for connection are available from DSP(s) offices, and are on the DSP(s)'s website. Specifically the following information may be requested, depending on the nature of the load:

3.2.1 Geographical Location

Site location maps and site layout plans in order to determine the location of the proposed load in relation to the existing network and plan cover area

3.2.2 Maximum Import Capacity (MIC)

Maximum Import Capacity (MIC) required, the size and nature of the load, diversity of the load and proposed phasing of the development i.e. the pace at which the load is expected to increase from a specified initial Demand to the full Demand.

3.2.3 Disturbing Loads

Details of any disturbing elements of the load are required such as:

- Large motors - details of starting arrangements for all large motors.
- Disturbing Loads i.e. electric welding, and details of the nature and usage pattern of the disturbing load.
- Harmonics - details of any non-linear equipment likely to produce Harmonics on our system and any filtering arrangements which the Customer may have already in place. The Customer should also provide details of compensation or balancing equipment connected.
- Unbalanced Loads – Where a Customer has a three phase supply, load should be balanced as evenly as possible over the three phases.

- The above is an example of the information which may be requested. Depending of the size and complexity of the load, additional information may also be requested.
- Power Factor – The Power Factor of the Customers load as seen by the network must be 0.85 or higher. No Customer may present a leading Power Factor load to the DSP(s) system.

3.2.4 Multiple Customer Development Versus Single Load

Whether the application is for infrastructure to facilitate connections to multiple end Customers within a development or is for connection of a single Customer.

3.2.5 Specific Requirements

Details of any specific Customer requirements for connection of the load.

3.2.6 Load Coincidence

Customers should note when assessing the Capacity requirements that not all of the equipment will be operating at full load at the same time. The Customer should apply a coincidence factor to each component of the load, as well as to the overall load in order to assess the capacity required. Coincidence factors will vary depending on the nature of the load.

3.3 Need for room substation

As per DSP(s) Customer service manual