



Planning Code

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Planning Code

PC.1 Introduction

This Code sets out the roles and responsibilities of OETC, PWP and Users regarding the data to be exchanged and the procedures to be followed between parties for the development of the Transmission System, the preparation of the Five Year Statement and to facilitate Users in the planning and development of their own Systems. The development of the Total System includes reinforcements/extensions to the Transmission System and Connections to New Capacity and to new supply requests. The planning processes shall be carried out annually, covering the succeeding five Operational Years and should provide sufficient lead times to facilitate;

- any necessary planning or consent work; and
- detailed engineering design/construction work to be completed by OETC and existing or potential Users of the Total System.

Operational planning to optimise plant and equipment Outages to ensure a secure and efficient System is covered in the Operating Code OC2, Operational Planning.

Security and reliability issues are covered in the Connection Conditions and in the Operating Codes OC2 and OC3.

PC.2 Objective

The objectives of the Planning Code are to define the roles and responsibilities of OETC, PWP and Users to enable;

- the exchange of information and interaction between OETC, PWP and Users concerning any proposed development of User Systems that are to be Directly Connected to the Transmission System, or that may impact on the performance of the Transmission System;
- any proposed development by a User that may impact on the performance of the Transmission System to be carried out in a manner that will allow OETC to meet its obligations as defined in the Transmission Licence;
- the supply of information to allow PWP and OETC to undertake their planning duties as set down in their Licences and the Sector Law; and
- the supply of information to allow PWP to meet its Licence requirements to plan adequate Capacity to meet forecast Demand and the Generation Security Planning Standard.



PC.3 Scope

In addition to OETC and PWP, the Planning Code applies to the following Users;

- Power Producers;
- Licensed Distributors;
- Licensed Suppliers;
- Directly Connected Consumers;
- International Interconnected Parties;
- Internally Interconnected Parties; and
- RAEC if Connected to the Total System.

PC.4 Planning Procedures

PC.4.1 Planning Overview

Development of the Transmission System, involving its reinforcement or extension, may arise for a number of reasons including, but not limited to;

- (a) a development on a User System already Connected to the Transmission System;
- (b) the introduction of a new Connection Site or the modification of an existing Connection Site between a User System and the Transmission System; and
- (c) the cumulative effect of a number of such developments referred to in (a) and (b) by one or more Users.

Accordingly, the reinforcement or extension of the Transmission System may involve work;

- (a) at a substation at a Connection Site where User's Plant is Connected to the Transmission System;
- (b) on transmission lines or other facilities which join that Connection Site to the remainder of the Transmission System; and
- (c) on transmission lines or other Plant at or between locations remote from that Connection Site.

OETC's Licence requires it to produce an annual statement (The Five Year Statement) setting out for each of the five succeeding Operational Years, guidance to PWP and other Users to assess the opportunities for Connecting to and using the Transmission System.

Appendix A shows an information flow chart and timetable for the planning process.

PC.4.2 Data requirements

PC.4.2.1 Planning Data

For the purposes of the Planning Code, data is considered in two parts, Standard Planning Data and Detailed Planning Data.

PC.4.2.2 Standard Planning Data

Standard Planning Data covers basic Demand data from Licensed Suppliers and Licensed Distributors and basic Genset data from Power Producers that allows OETC to carry out Load flow and short circuit studies to determine any requirements to reinforce the



Transmission System and allow preliminary assessment of the need for stability studies. These data requirements are given in Appendix B.

PC.4.2.3 Detailed Planning Data

Detailed Planning Data covers additional data to allow detailed stability studies to be carried out as necessary. These data requirements are given in Appendix C.

PC.4.2.4 Planning Data Quality Levels

When evaluating proposed Connections, data is considered at three levels;

a) Preliminary Project Planning Data

At the time the User applies for a Connection Agreement but before an offer is made and accepted by the applicant User, the data relating to the proposed User development will be considered as Preliminary Project Planning Data. These data will be treated as confidential within the scope of the provisions relating to confidentiality in the Connection Agreement.

Preliminary Project Planning Data will normally only contain the Standard Planning Data unless the Detailed Planning Data is required in advance of the normal timescale to enable OETC to carry out additional detailed system studies.

b) Committed Project Planning Data

Once the offer for a Connection Agreement is accepted, the data relating to the User development already submitted as Preliminary Project Planning Data, and the subsequent data required by OETC which may be all or part of the data contained in Appendix C, will become Committed Project Planning Data. These data, together with the other data held by OETC relating to the Transmission System will form the background against which new applications by any User will be considered and against which planning of the Transmission System will be undertaken.

c) Connected Planning Data

When any estimated values assumed for planning purposes are confirmed or replaced by validated actual values. These data are then termed Connected Planning Data.

PC.4.3 Data Timing

To enable the Five Year Statement to be prepared, each User is required to submit to OETC the Standard Planning Data and the Detailed Planning Data as listed in Appendices B and C. These data should be submitted before the end of September each year and should cover each of the five succeeding Operational Years (and in certain instances, the current Operational Years also). The timetable is shown in Appendix A.

Where, from the date of one submission to another, there is no change in the data (or in some of the data) to be submitted, a User may submit a written statement stating that there has been no change from the data (or in some of the data) submitted previously and only detail the changes to data.

By end October of each Operational Year PWP shall provide OETC with a forecast Demand for Total System for the five succeeding Operational Years.

PC.4.4 System Data

To enable Users to assess their Systems in relation to short circuit currents OETC will provide short circuit infeeds under maximum Capacity conditions for each Connection Point. OETC will make available to any User on request, the system data as listed in Appendix D.



The data will be available at the end of December each year and will cover the two succeeding years.

PC.4.5 The Five Year Statement

OETC shall, in accordance with the Transmission and Despatch License, prepare a statement, on an annual basis, in a form approved by the Regulatory Authority, showing, in respect of each of the five succeeding Operational Years, circuit Capacity, forecast power flows and Loading on each part of the Transmission System and fault levels for each transmission node, together with;

- (a) information on the status of Transmission Capacity and the anticipated future requirements of Transmission Capacity, including (a) new Load and (b) new Capacity;
- (b) a commentary prepared by OETC indicating its views as to those parts of the Transmission System most suited to new Connections, including for new Capacity;
- (c) information on what constraints are foreseen;
- (d) information relating to progress made with current investments;
- (e) information contained in Appendix D1; and
- (f) such other matters as shall be specified in directions issued by the Regulatory Authority.

The Five Year Statement will be produced and issued by the end of March each year.



PC.5 Applications for Connection

OETC will provide to PWP by the end of March details of suitable locations for the Connection of new Capacity together with estimate costs of Connection (including System reinforcement) for each Connection option

This Planning Code applies to all proposed developments on User Systems.

Users and prospective Users of the Transmission System will be able to assess opportunities for Connecting to, and using, the Transmission System, through;

- OETC's Five Year Statement;
- OETC's annual report; and
- published Transmission Use of System Charges.

PC.5.1 Application for Connection

Users wishing to establish a new Connection Site or modify an existing Connection Site shall make an application to OETC for a Connection Agreement. The application shall include;

- a description (termed the User development) of the Plant to be Connected to the Transmission System or the modification relating to User Plant already Connected to the Transmission System;
- the relevant Standard Planning Data listed in Appendix B; and
- the desired completion date of the proposed User development.

Appendix A – A3 summarises the time scales for the actions relating to an application for a Connection. OETC will make an offer of a Connection Agreement within 9 weeks of receiving an adequately completed application by a User.

Any offer of a Connection Agreement made by OETC will state that the applicant User must accept within the period stated in the offer that will be at least 14 weeks, after which the offer automatically lapses. Acceptance of the offer commits the OETC works relating to that User development and binds both parties to the terms of the offer.

Within 4 weeks of acceptance of the offer, or such longer period that OETC may agree, the User shall supply the Detailed Planning Data pertaining to the User development as listed in Appendix C.

PC.5.2 Complex Connections

The magnitude and complexity of any Transmission System extension or reinforcement will vary according to the nature, location and timing of the proposed User development and it may be necessary for OETC to carry out additional, more extensive system studies (than are normally required) to evaluate more fully the impact of the proposed User development on the Transmission System.

Where OETC judges that such additional more detailed analysis is required, OETC will indicate to the User the areas that require more detailed analysis and the cost of additional studies necessary. User shall state whether or not it wishes OETC to undertake the work necessary to proceed and confirm that the User is prepared to pay for this additional work. The Regulatory Authority may consent to a timescale longer than the 14 weeks normally allowed on application from either OETC or the User.



PC.6 Data Confidentiality

Committed Project Planning Data and Connected Planning Data, together with the other data held by OETC relating to the Transmission System, will form the background against which new applications by any User will be considered and against which planning of the Transmission System will be undertaken. Accordingly, data will not be treated as confidential to the extent that OETC;

- is obliged to use it in the preparation of the Five Year Statement;
- is obliged to use it when considering and/or advising on applications by other Users if the data is relevant to that other application; and
- is obliged to use it for OETC operational planning purposes.

All other data will be treated as confidential.

PC.7 Planning Standards

In the planning and development of the Transmission System, OETC shall apply the Transmission Security Standards as determined in accordance with Condition 28 of Transmission License.

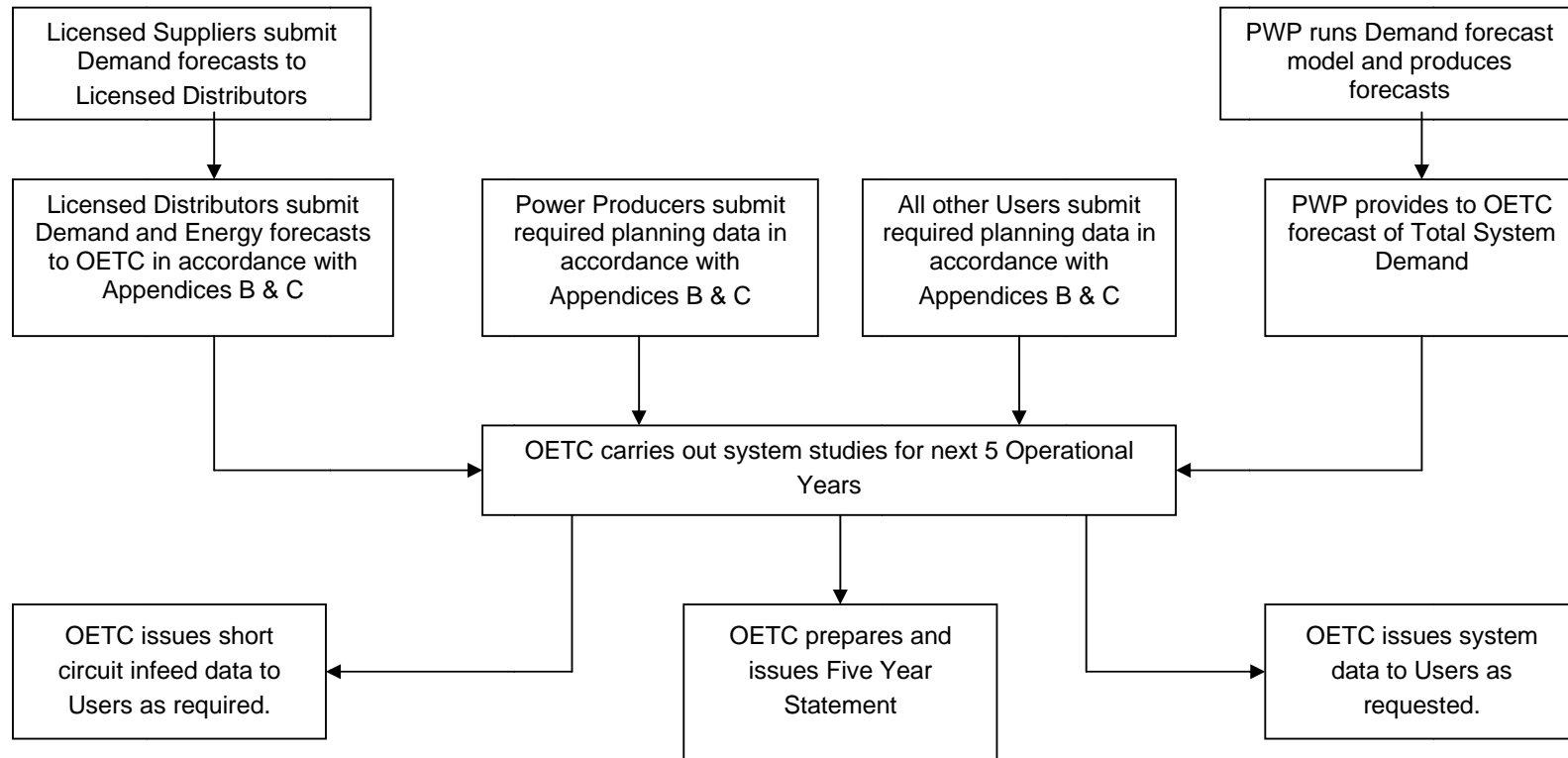


Appendix A Transmission Planning Procedures

A.1 Transmission Planning Flow Chart

Note: The flow chart is a summary only and reference should be made to the Planning Code for full details

Data will be submitted for each of the next five Operational Years





A.2 TIMETABLE FOR MAIN ACTIONS FOR TRANSMISSION PLANNING & FIVE YEAR STATEMENT

(Note that following data are summaries only and reference should be made to Planning Code for full details.)

Year 0	Data to be provided for Operational Years 1, 2, 3, 4 & 5
By end September	Each User to provide data to OETC as listed in Appendices B & C of the Planning Code.
By end October	PWP provide to OETC forecast of Total System demand for each of the five Operational Years.
By end December	OETC provides to Users short circuit infeeds at each Connection Point under maximum Capacity conditions to enable them to assess their networks in relation to short circuit currents.
	OETC will make available to any User, on request, the System data as listed in Appendix D.
By end March	OETC provides the Five Year Statement to PWP, Power Producers and makes available to potential Power Producers
	OETC to provide to PWP details of suitable locations for Connection of new Capacity together with estimate costs of Connection (including System reinforcement) for each Connection option
	OETC to provide to PWP a statement on the adequacy of the OETC network to meet the System Demand and Capacity requirements from considerations of power flows and voltage control. The statement will detail any needs for reinforcement of the network.

**A.3 TIMESCALE CHART FOR APPLICATIONS FOR CONNECTION**

Time intervals		Action
Start	T = 0	User applies for new Connection or modification to an existing Connection
Offer	T + 9 weeks	OETC to make an offer of a Connection Agreement
Accept	T + 14 weeks (minimum)	User must accept offer or offer lapses
Data	Accept time + 4 weeks	User shall supply the Detailed Planning Data pertaining to the User development as listed in Appendix C

Appendix B Standard Planning Data

B.1 Demand and Active Energy Data

B.1.1 Introduction

Each User that is Directly Connected to the Transmission System and has Demand shall provide OETC with the Demand data. Data shall be supplied for each of the next five Operational Years by;

- each Licensed Distributor/Licensed Supplier in relation to Demand and Active Energy requirements on its Distribution System;
- each Directly Connected Consumer in relation to its Demand and Active Energy requirements; and
- each Power Producer in relation to the Demand of each Production Facility Directly Connected to the Transmission System.

The data provided should be that remaining after any deductions considered appropriate by the User to take account of the output profile of all Embedded non-CDGensets

B.1.2 User Total System Demand (Active Power) and Active Energy

(i) System Demand (Active Power)

Forecast hourly Demand (Active Power) (MW) profiles for each User System (summed over all Connection Points from the Transmission System for each User System) shall be provided for;

- (a) the day of maximum Demand on each User System giving the values of Demand (Active Power) that could be imposed on the Transmission System;
- (b) the day, that will be specified by OETC, of the forecast maximum Demand (Active Power) on the Transmission System; and
- (c) the day, that will be specified by OETC, of the forecast minimum Demand (Active Power) on the Transmission System.

(ii) System Active Energy

Forecast annual Active Energy (MWh) for each User System shall be provided and be subdivided into the following categories of Consumer;

- Residential;
- Commercial;
- Industrial;
- Agriculture and Fisheries;
- Hotels and Tourism;
- Government;
- any other identifiable categories of Consumers; and
- User System losses.

B.1.3 Connection Point Demand (Active and Reactive Power)

Forecast Demand (Active Power) and Power Factor (or Reactive Power) at each Connection Point shall be provided for;



- (a) the day that in the Users opinion, maximum Demand at the Connection Point could be imposed on the Transmission System;
- (b) the day, that will be specified by OETC, of the forecast maximum Demand on the Transmission System; and
- (c) the day, that will be specified by OETC, of the forecast minimum Demand (Active Power) on the Transmission System.

The above Demand data shall be in the form of;

- one set of Demand data where the User System is Connected to the Transmission System via a busbar arrangement which is not normally operated in separate sections; and
- separate sets of Demand data where the User System is Connected to the Transmission System via busbar arrangements which are, or are expected to be, operated in separate sections.

The above Demand data shall;

- be that remaining after any deductions considered appropriate by the User to take account of the output of all Embedded non CDGensets;
- include the net User System reactive Demand but exclude any reactive compensation equipment; and
- be based on average conditions.

B.1.4 General Demand Data

The following information will be required only infrequently and shall be provided when requested by OETC;

- details of any individual Loads which have characteristics significantly different from the typical range of domestic, commercial or industrial Loads, including Loads which may cause flicker in the System;
- the sensitivity of the Demand (Active and Reactive Power) to variation in voltage and frequency at the Connection Point at the time of the peak Demand;
- the average and maximum phase unbalance which the User would expect its Demand to impose on the Transmission System;
- the maximum harmonic content which the User would expect its Demand to impose on the Transmission System; and
- details of all Loads which may cause Demand fluctuations greater than 1MW at the Connection Point.

B.2 Genset Data

B.2.1 Introduction

Each Power Producer or potential Power Producer with CDGensets Directly Connected, or to be Directly Connected, to the Transmission System and/or with existing, or proposed, large Embedded CDGensets, shall provide OETC and PWP with data relating to each CDGenset as specified in B.2.2 and B.2.3.

Each Power Producer or potential Power Producer with small Embedded Gensets shall provide the following information only for each Genset;



- Registered Capacity (MW);
- Available Capacity (MW) on a monthly basis; and
- Name plate data for all equipment.

Data shall be supplied for each of the next five Operational Years.

B.2.2 Production Facility Performance Data

The following data items are required with respect to each CDGenset at each Production Facility;

- Registered Capacity (MW) under reference conditions supported by correction curves showing changes in;
 - Output versus heat rate;
 - heat rate versus ambient air temperature;
- heat rate versus ambient air pressure;
- Available Capacity (MW) on a monthly basis;
- System constrained Capacity (MW) i.e. any known constraint placed on the Capacity of the Embedded CDGenset due to the Distribution System to which it is Connected;
- Minimum Generation (MW);
- Active Power capable of being obtained from CDGensets in excess of their Registered Capacity;
- Generator Performance Chart at the CDGenset stator terminals;
- type of CDGenset, eg steam turbine, gas turbine , cogeneration (specify by type), etc.;
- expected running regime(s) at each Production Facility;
- Minimum time that Genset must be Synchronised to the Transmission System;
- Minimum Shutdown Time; and
- time between start up of different CDGensets at each Production Facility.

B.2.3 Rated Parameters Data

The following information is required also with an application for a Connection Agreement to facilitate an early assessment by OETC of the need for more detailed studies. Any changes to these data should be sent to OETC as part of the planning process.

The Connection Point to the Transmission System expressed in terms of geographical and electrical location and System voltage, supported by diagrams.

For all CDGensets;

- rated MVA;
- rated MW;
- direct axis transient reactance;
- exciter category, for example whether rotating exciter or static exciter;
- Power system stabiliser fitted or not;
- short circuit ratio; and
- inertia constant (alternator plus prime mover) MWsec/MVA.



For each Generator transformer;

- rated MVA;
- positive sequence reactance (at maximum and nominal tap);
- type of tap changer; and
- tap range and step size.

B.3 User System Data

B.3.1 Introduction

Each User shall provide OETC with data of its User System which relating to each Connection Site and/or which may have an Operational Effect on the performance of the Transmission System.

All data must include the effect of any third party Connected to its User System.

B.3.2 Single Line Diagram

Each User shall provide OETC with a single line diagram showing all HV equipment and Connections together with equipment ratings and nomenclature for such equipment.

B.3.3 Reactive Compensation Equipment

The following information shall be provided for all reactive compensation equipment Connected to the User System at 11kV and above, other than Power Factor correction equipment associated directly with Consumer Plant;

- type of equipment (e.g. fixed or variable, capacitive or inductive);
- rating or operating range in Mvar;
- operating characteristics or details of any automatic control logic that enable operating characteristics to be determined;
- the Connection Point to the User System in terms of electrical location and System voltage; and
- total harmonic distortion at the Connection Point.

B.3.4 Short Circuit Contribution to Transmission System

All Users, other than Power Producers, that have Genset(s) and/or motor Loads Connected to their Systems shall provide to OETC sufficient data for OETC to model the short circuit infeed to the Transmission System. The User is required to provide data calculated in accordance with Good Industry Practice.

The data should be provided for the condition of maximum infeed from that User System with all Gensets Synchronised and all HV motors Connected to that User System. The User should ensure that the System Connections reflect credible System operating arrangements.

The following data shall be provided;

- symmetrical three-phase short circuit current infeed at the instant of fault;
- symmetrical three-phase short circuit current after the sub-transient fault current contribution has substantially delayed);
- the zero sequence source resistance and reactance values of the User System as seen from the Connection Point, consistent with the maximum infeed above; and
- the positive sequence X/R ratio at an instant of fault.



B.3.5 Demand Transfer Capability

Where the Demand from one User could be supplied from more than one Connection Point, the User may request OETC to take this into account in designing the Connection Site. In these cases the following information must be supplied;

- the alternative Connection Point(s);
- the Demand which may be transferred under the loss of the most critical circuit from or to each alternative Connection Point (to the nearest 1MW/1Mvar); and
- the arrangements for transfer (e.g. manual or automatic) together with the time required to effect transfer.

B.3.6 Switchgear

The following information must be provided for all switchgear (including circuit breakers, switch disconnectors and isolators) on all circuits Connected to the Connection Point including those at Production Facilities;

- rated voltage (kV);
- operating voltage (kV);
- rated current (A);
- rated short-circuit breaking current, 3-phase (kA) and 1-phase (kA);
- rated Load-breaking current, 3-phase (kA) and 1-phase (kA); and
- rated peak short-circuit making current, 3-phase (kA) and 1-phase (kA).

B.3.7 Name Plate Data

Name plate data for all equipment.

B.3.8 Circuit Parameters (for all circuits)

The following data shall be provided for each circuit;

- rated voltage (kV);
- operating voltage (kV);
- positive phase sequence resistance, reactance and susceptance;
- zero phase sequence resistance, reactance and susceptance; and
- circuit rating (A).

For underground cable or overhead line;

- cable size (mm) and length
- conductor size(mm) and length; and
- number of cables/conductors per phase.

B.3.9 Interconnecting Transformers

The following data shall be provided for each transformer between the Transmission System and the User System;

- transformer rating and impedance voltage;
- winding arrangement and vector group; and
- tap changing facilities and tapping range.



Appendix C Detailed Planning Data

Some of the data items below will have been provided previously under Appendix B to facilitate an preliminary assessment by OETC to determine whether detailed stability studies will be required (before an offer of terms for a Connection Agreement can be made). Those data items have been repeated here for completeness and the data need not be resubmitted unless the values, known or estimated, have changed. Data provided under this Appendix must be copied to PWP.

C.1 Genset Data

Each Power Producer or potential Power Producer with CDGensets Directly Connected, or to be Directly Connected, to the Transmission System and/or with existing, or proposed, large Embedded Gensets, shall provide OETC and PWP with data relating to each CDGenset

All Genset data shall be provided at reference site conditions.

C.1.1 Demand

For each CDGenset which has an associated Genset transformer, the value of the Demand supplied through this transformer when the CDGenset is at Capacity output shall be provided.

Where the Production Facility has Demand in addition to that supplied through the Genset transformer and which is supplied from either the Transmission System or the Power Producer User System, the Power Producer shall supply forecasts for each Production Facility of;

- the maximum Demand that could be imposed on the Transmission System;
- the Demand at the time of the peak Demand on the Transmission System; and
- the Demand at the time of minimum Demand on the Transmission System.

C.1.2 Synchronous Machine and Associated Control System Data

The following CDGenset and Production Facility data should be supplied for each CDGenset;

d) Genset Parameters

1. rated terminal volts (kV);
2. rated MVA;
3. rated MW;
4. Maximum Generation MW;
5. Minimum Generation MW;
6. short circuit ratio;
7. direct axis synchronous reactance;
8. direct axis transient reactance;
9. direct axis sub-transient reactance;
10. direct axis transient time constant;



11. direct axis sub-transient time constant;
12. quadrature axis synchronous reactance;
13. quadrature axis sub-transient reactance;
14. quadrature axis sub-transient time constant;
15. stator time constant;
16. stator leakage reactance;
17. armature winding direct-current resistance;
18. Genset inertia constant (MWsec/MVA);
19. rated field current (amps) at rated MW and Mvar output and at rated terminal voltage; and
20. field current (amps) open circuit stator curve for CDGenset terminal voltages ranging from 50% to 120% of rated value in 10% steps as derived from the manufacturers test certificates.

e) Genset Transformer Parameters

- rated MVA;
- rated voltage ratio;
- winding arrangement and vector group;
- positive sequence resistance and reactance (at max, min and nominal tap);
- zero phase sequence reactance;
- tap changer range and step size; and
- tap changer type: on load or off circuit.

f) Excitation Control System Parameters

Excitation system (including power system stabiliser if fitted) transfer function block diagram showing gains, time constants, limits, rates of change etc of individual elements including details of;

- rated field voltage;
- CDGenset no-load field voltage;
- excitation system positive ceiling voltage;
- excitation system negative ceiling voltage;
- over-excitation limiter; and
- under-excitation limiter.

C.1.3 Governor and Associated Prime Mover Parameters

a) Governor Parameters – All Gensets

Governor system transfer function block diagram showing gains, time constants, limits, rates of change etc of individual elements including details of;

- Filters;
- converters; and



- overall average gain (MW/Hz).

b) Prime Movers Parameters – Steam Turbines Gensets

Prime mover system transfer function block diagram showing gains, time constants, limits, rates of change etc of individual elements and controllers with parameters expressed in terms of the electrical CDGenset rated MW including details of;

- Boilers;
- HP turbine;
- HP turbine power fraction;;
- HP steam extraction range (expressed in terms of the boiler rated output);
- HP steam extraction valves;
- LP turbine;and
- LP turbine power fraction.

c) Prime Mover Parameters – Gas Turbines Gensets

Prime mover system transfer function block diagram showing gains, time constants, limits, rates of change etc of individual elements and controllers including details of;

- inlet guide vanes;
- compressor;
- fuel valve;
- combustion chamber; and
- power turbine.

C.1.4 Production Facility Flexibility Performance

The following data shall be provided for each CDGenset and Production Facility;

- rate of Loading from Cold shutdown (CDGenset and Production Facility);
- rate of Loading from Warm shutdown (CDGenset and Production Facility);
- block Load following synchronising;
- rate of Deloading from normal rated MW;
- regulating range;
- Load rejection capability while still Synchronised and able to supply Load;
- minimum time that Genset must be Synchroised to the Transmission System; and
- Minimum Shut Down Time

C.2 User System Data

C.2.1 Introduction

Each User, whether Connected Directly to the Transmission System through an existing Connection Point or seeking such a Direct Connection, shall provide OETC with data on its User System associated with the Connection Site containing the existing and proposed Connection Points.



C.2.2 User System Layout

Each User shall provide a single line diagram showing both the existing and proposed arrangement(s) of all Load current carrying Plant relating to existing and proposed Connection Points.

The single line diagram shall include;

- busbar layout(s);
- electrical circuitry (ie overhead lines, underground cables, power transformers and similar equipment);
- phasing arrangements;
- Earthing arrangements;
- switching facilities;
- CTs and VTs;
- operating voltages; and
- numbering and nomenclature.

C.2.3 HV Motor Drives

For those Users' Systems that contain HV motors, the User shall provide the following data for each HV motor;

- rated voltage kV;
- rated MVA;
- rated MW;
- full Load current A;
- means of starting and magnitude of starting current;
- motor torque/speed characteristic;
- drive torque/speed characteristic; and
- motor plus drive inertia constant.

C.2.4 Interconnection Transformers

The following data shall be provided for each transformer Connecting the User System to the Transmission System;

- rated MVA;
- rated voltage ratio;
- winding arrangement and vector group;
- positive sequence resistance and reactance (max, min and nominal tap);
- zero sequence reactance;
- tap changer range and step size;
- tap changer type: on Load or off Load;
- Earthing method: direct, resistance or reactance; and
- Transformer cooling arrangements.



C.3 Transient Over-voltage Assessment Data

OETC will need to undertake insulation co-ordination studies and may need to conduct transient overvoltage assessments. OETC may request additional data from Users for this purpose. When requested by OETC, each User shall provide the following data for specified Connection Sites;

- busbar layout including dimensions and geometry together with electrical parameters of any associated current transformers, voltage transformers, wall bushings, and support insulators;
- physical and electrical parameters of lines, cables, transformers, reactors and shunt compensator equipment Connected at that busbar or by lines or cables to that busbar; this information is required for the purpose of calculating surge impedances;
- specification details of all Plant Connected Directly or by lines and cables to the busbar including insulation levels;
- characteristics of overvoltage protection at the busbar and at the termination of lines and cables connected at the busbar;
- for each CDGenset or Production Facility transformer, data concerning transformer construction, i.e., three or five limb cores or single phase units, and operating peak flux density at nominal voltage; and
- any other information that OETC may reasonably request for the purposes of system analysis.

C.4 User Protection Data

The following information is required for all Protection equipment that can trip, inter-trip or close any circuit breaker at a Connection Point or any OETC circuit breaker;

- a full description, including estimated or actual settings, for all Protection systems and relays installed or to be installed on the User System;
- a full description of any auto-reclose facility installed or to be installed on the User System, including type, time delays and initiating functions;
- a full description, including actual or estimated settings, for all relays and Protection systems installed, or to be installed on Gensets, Genset transformers, Production facility transformers and their associated Connections;
- for those CDGensets having (or intended to have) a circuit breaker at the Genset terminal voltage, the clearance times for electrical faults within the CDGenset Protection zone; and
- the most probable fault clearance times for electrical faults on each part of the User System Directly Connected to the Transmission System.



Appendix D Transmission System Data

D.1 System Model

For modelling purposes, OETC, on request, will provide Users and potential Users, with a full listing of submitted and registered data relating to the Transmission System.

D.2 Short Circuit Calculations

To those Users who need to model the Transmission System for the purpose of short circuit calculations, OETC will provide the following System data. It will be calculated in accordance with Good Industry Practice, as an equivalent 220 kV or 132 kV source at the HV point of Connection to the User System.

- symmetrical three-phase short circuit current infeed from the Transmission System at the instant of fault based on sub-transient impedance of CDGensets;
- symmetrical three-phase short circuit current infeed from the Transmission System based on transient impedance of CDGensets, i.e., after the sub-transient fault current contribution has substantially decayed;
- the zero sequence source resistance and reactance values at the Connection Point, consistent with the maximum infeed;
- the pre-fault voltage magnitude at which the maximum fault currents were calculated;
- the positive sequence X/R ratio at the instant of fault;
- appropriate interconnection transformer data, as requested;
- Any other data requested as considered reasonable.