Appendix C: Glossary

Term	Description
after diversity maximum demand	The peak consumption of energy (averaged over a half-hour period and expressed in Watts) that incorporates the non-simultaneous nature of each point of supply's load peak time.
automatic under frequency load shedding	The automatic disconnection of customers for severe or prolonged under frequency. Implemented on relays installed within the distribution network or at Transpower's substations, customers are currently tripped in two, nominally, 20% groups.
availability	The number of hours per year the network or part thereof is in service. Unavailability is the opposite of availability (for example, the hours per year the network or part thereof is not providing service).
bay (of a station)	That part of a substation or power station where a given circuit's switchgear is located. According to the type of circuit, a substation or power station may include: feeder bays, transformer bays, bus coupler bays, etc.
breaker-and-a-half station	A double-bus substation where, for two circuits, three circuit-breakers are connected in series between the two buses, the circuits being connected on each side of the central circuit-breaker.
bus	The common primary conductor of power from a power source to two or more separate circuits.
bus coupler circuit-breaker	A circuit-breaker located between two busbars that can both be accessed by the same external circuit. The bus coupler circuit-breaker permits the busbars to be connected together or separated under load or fault conditions.
bus section	Part of a bus that can be isolated from another part of the same bus.
cable	One or more insulated conductors forming a transmission circuit above or below ground.
capacitor bank	A number of capacitors connected together in series and/or parallel to form the requisite capacitance and voltage rating for reactive compensation and harmonic filters on the HVAC and HVDC power systems.
charging current (line)	The current taken by a transmission circuit to energise its conductors due to the capacitive effect of the circuit.
circuit (transmission) (cct)	A set of conductors (normally three) plus associated hardware and insulation on a transmission line, which together form a single electrical connection between two or more stations and which, when faulted, is removed automatically from the system (by circuit-breakers) as a single entity.
circuit-breaker	A switching device, capable of making, carrying and breaking currents under normal circuit conditions and also making, carrying for a specified time and breaking currents under specified abnormal conditions, such as those of short circuit.
cogeneration	The use of high-pressure steam from a turbo-generator set for an industrial process. The production of electricity is usually secondary to the requirements of the industrial process.
commissioned	The operational state of equipment that has undergone the commissioning process and is brought under the operational control of a service centre/controller.
committed projects	Refers to actual proposed projects that satisfy a number of criteria indicating that they are extremely likely to proceed in the near future. For example: • land has been acquired for construction of the project • planning consents, construction approvals and licences have been obtained • construction has begun, or a firm commencement date has been set • contracts for supply and construction have been finalised, and • financing arrangements are largely complete.
constraint	A local limitation in the transmission capacity of the grid required to maintain grid security or power quality.
contingency	The uncertainty of an event occurring, and the planning to cover for this. For example, a single contingency could be: a. in relation to transmission, the unplanned tripping of a single item of equipment, or b. in relation to a fall in frequency, the loss of the largest single block of generation in service, or the loss of one HVDC pole.
contingent event	Those events for which, in the reasonable opinion of the system operator, resources can be economically provided to maintain the security of the grid and power quality without the shedding of demand.
continuous rating	The maximum rating to which equipment can be operated continuously.
decommissioned	The status of equipment which is permanently disconnected from the power system,

Term	Description
	made permanently inoperable, and free of any operational identification.
demand	A measure of the rate of consumption of electrical energy.
demand-side management	Initiatives or mechanisms used to control electricity demand. Examples include ripple controls on water heating or contracted shedding of load (demand).
disconnector	A switch that, when in the open position, provides an isolating distance in accordance with specified requirements.
dispatch	The process of : a. pre-dispatch scheduling to allocate active and reactive power generation, including additional ancillary services and reserve, to match expected demand, within the limitations of the grid and equipment b. rescheduling to meet forecast demand, and c. issuing instructions based on the schedule and the real-time conditions to manage resources to meet the actual demand.
distribution (of electricity)	The transfer of electricity between the transmission network and end users through a local network.
distribution line	An electric line that is part of a local network.
double circuit line	A transmission line carrying two circuits.
duplicate protection	A protection scheme for a plant item such that any fault on the plant item can be cleared by two independent sets of relays, either of which is able to operate correctly even if the other fails completely.
electricity distributor	An asset owner whose assets are predominantly for the distribution of electricity to customers.
Electricity Industry Act 2010	The Act setting out the present framework including the Electricity Industry Participation Code.
Electricity Industry Participation Code	The requirements on the electricity industry made pursuant to the Electricity Industry Act 2010.
embedded generators	Smaller power plants connected to a regional electricity line business's distribution network (as opposed to the high voltage transmission network).
end user	An entity connected to the power system for the primary purpose of consuming electricity.
event	A term identifying undesired or untoward operational happenings, principally: a. accidents (resulting in loss) b. near-misses (which, under slightly different circumstances, could have caused loss) to people, process, equipment, material or the environment c. a disturbance to the power system d. a significant change in the state of the grid e. equipment defects, and f. fire or intruder alarm operation.
feeder	A circuit that provides a direct connection to a customer.
firm capacity	Power capacity intended to be available at all times during the period covered by a guaranteed commitment to deliver, even under adverse conditions.
forced outage	The automatic or urgent removal from service of an item of equipment.
frequency (power)	The rate of cyclic change in value of current and voltage, quantified by the international standard term 'Hertz' (Hz).
frequency excursion	A variation of the power system frequency above 50.25 Hz or below 49.75 Hz.
gas turbine (GT)	A heat engine that uses the energy of expanding gases passing through a multi-stage turbine to create rotational power.
generating set	A group of rotating machines transforming mechanical or thermal energy into electricity. Note: for the purposes of the operating codes and the output ratings referred to, the set is taken to include the limitations of the energy source, turbine, generator, cable, set transformer and switchgear. [GOSP glossary - IEC 50 (602-02-01)]
generation	The electrical energy produced by a generator, a generating station or within a power system as a whole. The process of producing electricity.
generator	A person who owns and/or manages one or more generating sets that are physically connected to the grid assets or to a network or to other assets connected to the grid assets.
grid	That part of the New Zealand electricity transmission system, the operation of which is undertaken by the grid operator.
grid asset owner	Transpower New Zealand Limited.

Term	Description
grid assets	At any time, the plant, transmission lines and other facilities, owned or managed by the grid asset owner, and which are used to interconnect all the points of connection for connected parties.
grid exit point (GXP)	A point of connection where electricity may flow out of the grid.
grid injection point	A point of connection where electricity may flow into the grid.
HVAC	High voltage alternating current.
HVDC	High voltage direct current.
in service	The state of equipment that is connected to a source of energy or may be connected to a source of energy by an operating action.
instantaneous load	The maximum instantaneous current drawn. It consists of continuous, non-continuous and momentary currents.
intertrip	A protection signalling system whereby a signal initiated at one station trips a circuit-breaker at another station.
islanded operation	The condition that arises when a section of the power system is disconnected from and operating independently of the remainder of the power system.
life expectancy	The date where replacement/major refurbishment is necessary.
line [overhead]	A series of structures carrying overhead one or more transmission circuits.
load control	Types of load control include: • automatic under frequency load shedding (see MW reserve of a power system) • interruptible load (see MW reserve of a power system), and • manual load shedding (see manual load shedding).
load shedding	The forced disconnection of load, in stages. This is either manual (see load control) or automatic (see MW reserve [of a power system]).
main protection	Protection equipment (or a system) expected to have priority in initiating either a fault clearance or an action to terminate an abnormal condition in the power system.
manual load shedding	The forced disconnection of load by an operator/controller.
maximum continuous rating (MCR)	The value assigned to an equipment parameter by the manufacturer, and at which the equipment may be operated for an unlimited period without damage.
maximum demand	The peak consumption of energy (averaged over a half-hour period and expressed in watts) recorded during a given time, for example, a day, week, or year.
MegaVoltAmpere (MVA)	1000 kVA. The flow of active power is measured in megaWatts (MW). When compounded with the flow of reactive power, which is measured in Mvar, the resultant is measured in MegaVoltAmperes (MVA).
n-1, "n"	Refers to the planning standard that Transpower generally plans the grid to. The n-1 security level provides supply security to the connected loads under a single credible contingency with all the assets that can reasonably be expected in service. The single credible contingencies that are defined in the Rules are: • a single transmission circuit interruption • the failure or removal from operational service of a single generating unit • an HVDC link single pole interruption • the failure or removal from service of a single bus section • a single interconnecting transformer interruption, and • the failure or removal from service of a single shunt connected reactive component. An ''n" security standard means that any outage will trip load. It is often found in smaller supply areas, where just one transmission circuit or supply transformer provides supply.
nominal rating	The design rating of the equipment or transmission circuit. For equipment, this is often referred to as the 'nameplate rating'.
nominal system frequency	50 Hertz.
non-continuous load	A load that is energised for a portion of the duty cycle greater than one minute. It may be for a set period, and removal may be automatic or by operator action or it may continue to the end of the duty cycle.
normal system conditions	The state of the power system when it is operating in accordance with statutory requirements as regards quality of supply and within basic design and operational parameters.
on-load tap-changer (OLTC)	Equipment fitted to a power transformer by which the voltage ratio between the windings can be varied while the transformer is on-load.

Term	Description
outage	The state of an item of equipment when it is not available to perform its intended function. An outage may or may not cause an interruption of supply to customers.
overhead line	A transmission line.
overload	A load greater than the maximum continuous rating.
Overload protection scheme	A type of special protection scheme that prevents loading of assets above their stated capacity
peak demand	See maximum demand.
peak load	The maximum peak load (in amps) that can be expected to be carried within a twelve month period on the circuit or by the equipment/component.
planned outage	A deliberate outage scheduled for maintenance purposes.
power factor	The ratio between active power (expressed in watts, W) and true power (expressed in volt-amperes, VA). Can vary between 1 and 0. A load with a low power factor uses more reactive current than a load with a high power factor for the same amount of useful power transferred.
power flow analysis	Simulation of the actual power system using computer models, so as to analyse the effects of changes to inputs (like demand, supply, and asset ratings), and identify constraints or other issues that might affect security of supply to a region.
power system stability	The capability of a power system to regain a steady state, characterised by the synchronous operation of the generators after a disturbance due, for example, to variation of power or impedance.
power transformer	A transformer that primarily changes voltage and current for the efficient conveyance of electricity over the circuits connected to it.
protection	The equipment provided for detecting abnormal conditions in a power system and then initiating fault clearance or actuating signals or indications.
reactive power	Energy that flows in the power system between alternators, capacitors, SVCs, etc., and inductive and capacitive equipment such as transmission lines and low power factor loads. It is the product of the voltage and out-of-phase components of the alternating current and is measured in vars.
relay	A device designed to produce predetermined changes in one or more electrical output circuits, when certain conditions are fulfilled in the electrical input circuits controlling the device.
reliability	The failure rate. For example, the number of failures per year based on experience over a long time period, say 10 years or more.
resource consent	A consent to use land, air or water granted by the local government under the Resource Management Act. The consent usually imposes limits on that use.
return period	The statistical return period of a weather-related event, load or load effect.
risk based condition replacement	Replacement of existing assets based on risk of failure due to asset condition
runback scheme	An automatic limit on generation or HVDC transfer, which typically would be enabled when there is loss of a particular circuit, transformer, signalling or control system.
security	A term used to describe the ability or capacity of a network to provide service after one or more equipment failures. It can be defined by deterministic planning criteria such as (n), (n-1), (n-2) security contingency. A security contingency of (n-m) at a particular location in the network means that 'm' component failures can be tolerated without loss of service.
short circuit rating	The three second fault rating of equipment.
short term rating	The maximum rating to which equipment can be operated for a specified duration.
single-circuit line	A transmission line carrying one circuit.
spur circuit	A circuit connected to the transmission system at only one point.
stability limit	The critical value of a given system state variable that cannot be exceeded without endangering power system stability. For a power system without a fault, this concept is related to the steady state stability of the system.
steady state stability	A power system stability in which disturbances have only small rates of change and small relative magnitudes.
substation	A building, structure or enclosure incorporating equipment used principally for the control of the transmission or distribution of electricity.
switchgear	A collective term for switches of all types and their associated equipment, including circuit-breakers, disconnectors, and earthing switches.

Term	Description
switchgear group	A circuit-breaker and related disconnectors. The relationship is determined by switchgear numbering.
switching station	A station existing solely for the purpose of transmission rather than supply.
synchronous condenser	A synchronous machine running without mechanical load and supplying or absorbing reactive power to regulate local voltage.
system frequency	At any instant the value of the frequency of the power in the North Island or South Island. See also Hertz, nominal system frequency, and frequency.
system normal	The power system is operating in the normal state when: • generation meets the demand at 50Hz (±0.2 Hz) • voltage requirements are met • grid equipment is operated within design ratings, and • reserve margins and the power system configuration provide an adequate level of operational security.
system operator	The person responsible from time to time for the operation of the grid system. The system operator is Transpower New Zealand Limited.
tee (or T) point	The point at which a branch transmission circuit is solidly and permanently connected to a main circuit, usually without switchgear. See also tee-off.
tee-off	A branch transmission circuit joining a main circuit and that is protected as part of the main circuit.
thermal constraints/limits/ capacities	Refers to the temperature ratings of the assets (lines, generators, transformers) connected to the power system, beyond which the assets cannot securely be operated.
thermal upgrade	The increase in temperature ratings of assets to provide more capacity.
transformer	A static electric device consisting of a winding or two or more coupled windings which transfer power by electromagnetic induction between circuits of the same frequency, usually with changed values of voltage and current.
transient (in)stability	Refers to the response of the power system when it experiences a large disturbance like a line fault or outage of a generator.
transmission	The conveying of bulk electricity from power stations to points of supply (compared with distribution).
transmission circuit	An electrical circuit the primary purpose of which is the transmission of electricity from one geographical location to another.
transmission line	A series of structures carrying one or more transmission circuits overhead.
transmission system	That part of the power system primarily intended for the conveyance of bulk electricity.
voltage	The nominal potential difference between conductors or the nominal potential difference between a conductor and earth, whichever is applicable.
voltage collapse	A sudden and large decrease in the voltage of the electrical system.
voltage (in)stability	Refers to the power system's ability to maintain a satisfactory voltage at all buses for any disturbance, such as a variation in load or an outage of plant.