Service and Installation Rules 2024

(NP018)

PowerWater

Contents

1. Purpose

The Service and Installation Rules (Rules) set out the technical requirements for customers connecting electricity installations, and general conditions of supply to Power and Water Corporation's (Power and Water) electricity networks.

These Rules combines the original Installation Rules (NP003) and Services Rules (NP007) into a single document (Services and Installation Rules NP018)

These Rules should be read in conjunction with the Electricity Meter Manual.

Reference should also be made to the Power Networks Network Technical Code and Planning Criteria.

2. Scope

These Rules apply to customers connected to, or intending to connect, to Power and Water's electricity network. These Rules also cover the supply of electricity to installations in urban, rural and remote areas. Different conditions may apply to installations located in remote or undeveloped areas. The customer will be informed accordingly when an application for supply is made.

3. Installation rules

All new connections or alterations to existing connections on the network will be completed by Power and Water. Works must not proceed until written confirmation is provided by Power and Water and received by the electrical contractor. Any non-compliant installations will be rectified at the electrical contractor's cost. The relevant connection process must be followed.

3.1 Connection application forms

a. The connection application forms are designed to provide advice on proposed work on new installations, or alterations and additions to existing installations on Power and Water's electricity network. It is required where:
    1. A new service and/or meter is requested, or
    2. An alteration to a service is requested in urban, rural and remote areas where the requirements exceed that of a Basic Connection Service as detailed in Power Networks Connection Policy, or
    3. An unmetered connection is requested.
b. The connection application must be submitted via email[1] to Power and Water prior to work commencing.
c. The connection application must be lodged prior to any works being undertaken. It must not be submitted with the Certificate of Compliance (CoC) after the work is completed.

[1] Applications are to be emailed to Power and Water: PowerConnections.PWC@Powerwater.com.au

d. The connection application form must be legibly completed and show full details. Failure to provide necessary details, including street address, lot number and section number where appropriate, will result in the application being returned to the contractor for further information.
e. The connection application must include the calculated maximum demand as per AS/NZS 3000 (Wiring Rules). Where the demand exceeds 50 kVA (70 amps per phase) detailed calculations must be submitted upon request from Power and Water, including appropriate drawings.
f. The contractor is to note that Power and Water requires a minimum of 12 weeks' notice when extension or augmentation of the system is required. Depending on the capacity of the existing system, load increments exceeding 20 kVA in an urban area or 5 kVA in rural and remote areas may require augmentation.
g. Power and Water requires a connection application form for each separately metered portion of an installation. e.g., a block of five units, shops or sheds requires five application forms.
h. The contractor should note that where there is a significant load increase, the customer may be required to contribute towards the cost of upgrading the distribution network in accordance with Power and Water's Customer Connections Service Policy.

3.2 Accreditation

Power and Water require that installers of all embedded generation systems hold a current NT Electrical Work Licence, as well as current design and install accreditation with the Clean Energy Council (CEC). All electrical equipment installed must be CEC approved as outlined on the CEC website.

3.3 Connection point to Power and Water's electricity network

Note: Figures associated with this section presents the property boundary at a fence line is for indication purposes only, the location of property boundary lines for properties are associated with the legal boundary lines detailed on land titles.

3.3.1 New connection – One pillar per two lots

Power and Water reserves the right to determine the location of the point of connection for each new service. In any new underground (UG) residential subdivision, low voltage servicing (One-pillar-per-two-lots) design shall be applied, located at the property boundary.

For underground service, a connection involves a service line from a Power and Water substation to a point of supply in a Power and Water pillar located on the customer's property. The point of connection is at the pillar. The customer is then responsible for the consumer's mains from the pillar to the meter box. This is shown in Figure 1 below.

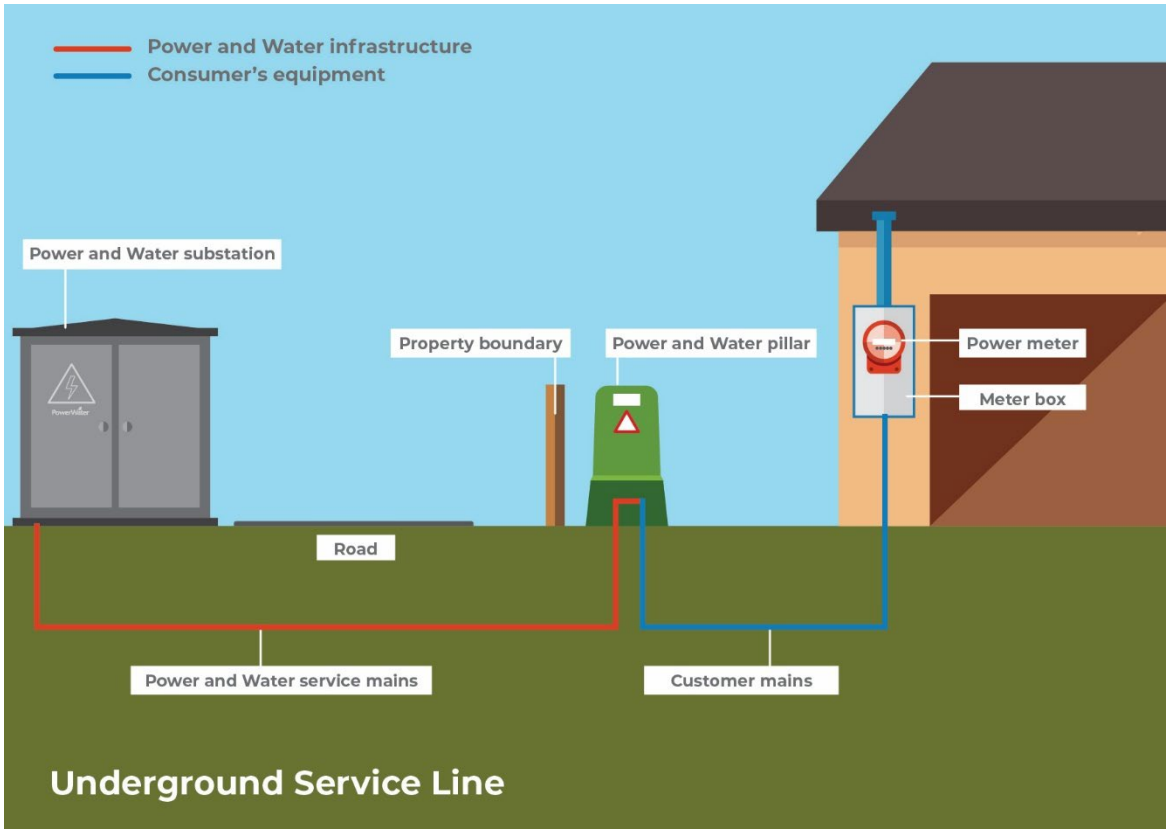

Figure 1: New connection typical underground connection.

3.3.2 New connection – Overhead

For an overhead service, a connection involves a service line from a Power and Water pole (Point of Supply) to a point of connection at a mains connection box (MCB) on the customers dwelling. The customer is responsible for the consumer's mains from the MCB to the meter box. This connection is shown in Figure 2 below.

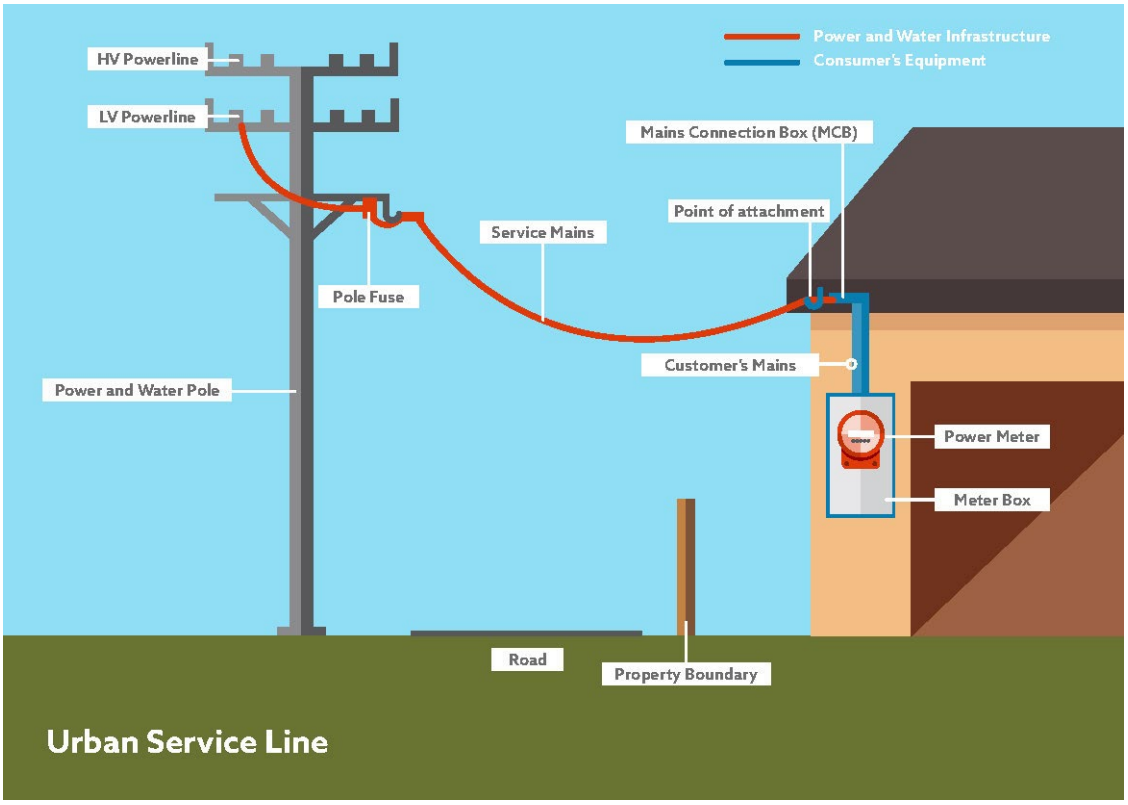

Figure 2: Typical overhead connection

For rural overhead service, a connection involves a service line from a Power and Water pole (Point of Supply) to a point of connection at a mains connection box (MCB) on the customer's service pole. The customer meter pole may require an A-Frame pole when the LV service is larger than 16mm^2 twisted service (e.g. 95mm^2 Aerial Bundled Cable (ABC)). Liaise with Power and Water Customer Connections for advice. The customer is responsible for the customer service pole, customer service line from the MCB to the meter box and to the dwelling switchboard. This connection is shown in Figure 3 below.

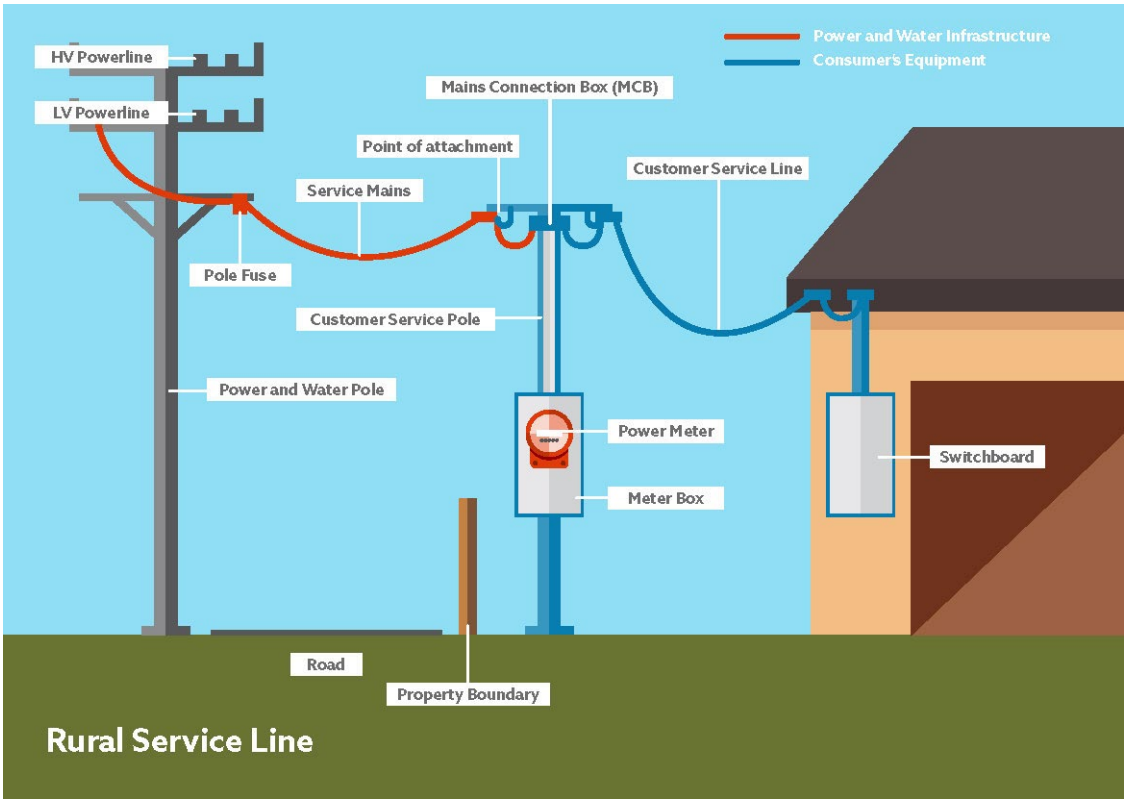

Figure 3: Typical rural service line

3.3.3 Existing connections – One pillar per up to six lots

There are obsolete service connections in the Power and Water system that are not to current Services and Installation Rules requirements.

For a non-typical underground service, a connection involves a service line from a Power and Water substation or pole to a Power and Water pillar and a service line from the pillar to the customers meter box. The Power and Water pillar is not located on the customer's property. The point of supply and point of connection is at the customer's meter box. This is shown in Figure 4 below.

If a fault occurs on an obsolete connection Power and Water will isolate the connection between the pillar and the meter box. Power and Water will test the cable to confirm the fault location. Power and Water will determine how to repair or replace the cable at no cost to the customer.

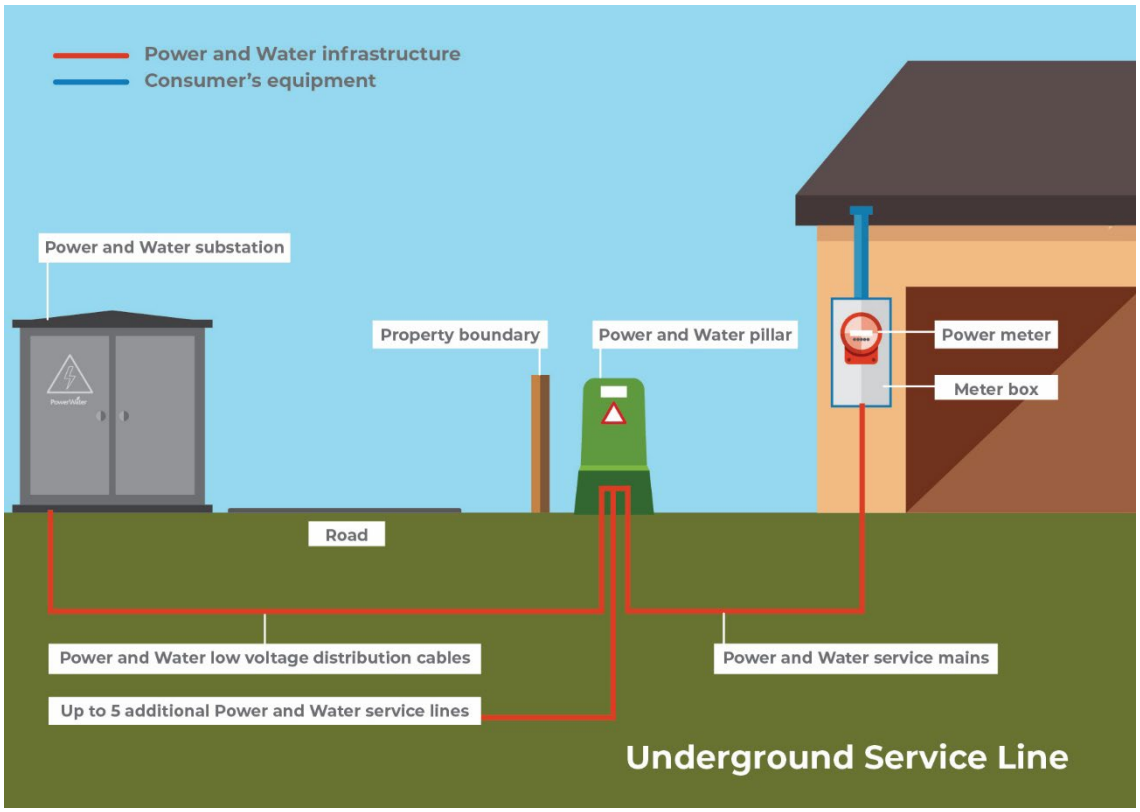

Figure 4: Non-typical underground connection

3.3.4 High voltage connections

For high voltage connections, the point of connection will be agreed between Power and Water and the customer.

3.4 Cable types for unmetered consumer mains

The following arrangement and types of cables are permitted as unmetered consumer mains or rising mains.

a. Neutral screen cables.
b. Armoured cables.
c. Sheathed or unsheathed cables in conduit.
d. Sheathed cables over 35mm^2 unenclosed.
e. M.I.M.S. cables (if fitted with suitable take-off boxes and surge diverters on the cable ends if they emanate from low voltage overhead mains)[2]
f. "Category A" systems (AS/NZS 3000) is to be employed where installed underground
g. Use of any cable specified in Power and Water standard drawings for that type of installation.

Note: The use of aluminium cables is not permitted as unmetered consumer mains or rising mains, unless otherwise approved in writing by Power and Water.

3.5 Joints in consumer mains

Jointing of unmetered consumer mains will only be permitted where joints are made using an acceptable method, and where prior approval from Power and Water is obtained.

Other:

- Overhead consumer mains - joints are not permitted in unmetered aerial consumer mains.
- Alternatives may be discussed with Power and Water.
- Approval for non-standard methods must be obtained in writing from Power and Water.

3.6 Maximum size of insulated service line

Where supply is to be taken from overhead reticulation:

a. Installations with maximum demands up to and including 225 amps per phase may be supplied through:

    1. An insulated overhead service; or
    2. An underground service in accordance with Rule 3.9 of this document

b. For insulated overhead service.

Installations with maximum demands up to and including 100 amps per phase will be supplied through insulated twisted service cable.

1. Installations with maximum demands more than 100 amps per phase and up to 225 amps per phase, will be supplied through ABC.
2. If an ABC service is to be installed, the service attachment point must be of the "closed eye" type - 16mm diameter - large enough to accept a 16mm termination bolt (not an "open hook" type) and installed above the consumer mains Point of Attachment (POA).
3. If an ABC service is to be installed, the termination is to be either a Mains Connection Box (MCB), or a "Goose Neck" type conduit arrangement. Refer to Rule 3.7 (c) and (d) of this document.

[2] Mineral Insulated Metal Sheath cables for fire rating and high temperature applications.

4. When using an ABC service and fitting a MBC, this MCB must be of sufficient size to accept a 50mm^2 aerial service conductor.

c. For installations with maximum demands more than 225 amps per phase, the service cable type will be determined by Power and Water.

3.7 Mains connection boxes

a. Mains Connection Boxes must be installed at the Point of Attachment on all consumer mains up to and including the size 35mm^2.

b. For cables exceeding 35mm^2 alternate means of connection to supply lines must be a matter of discussion with Power and Water.

c. If using an ABC service with a "goose neck" type conduit arrangement, the consumer mains conductors must extend 500mm from the conduit end and be fitted with crimp lugs having an 11mm bolt hole in accordance with Power and Water's Standard Drawing SO4-02-01-19 LV ABC services consumer's end.

d. If an ABC service is to be installed by Power and Water, this mains connection box must be of sufficient size to accept 50mm^2 aerial service conductors [see Rule3.6.b(4)] of this document.

e. Refer to Rule 3.6.b(2) of this document for POA details.

3.8 Supply to rural and remote customers

a. In rural or remote areas, Power and Water will provide electricity to the first pole (the Consumer's Service Pole) inside the property boundary.

b. The position of this service pole will be decided by Power and Water and a sketch depicting the proposed arrangement must be submitted. Where Power and Water's line is on the same side of the road, the consumer's service pole will be within 20 metres of the property boundary, and where Power and Water's line is on the opposite side of the road, it will be within 1 metre of the property boundary. Where Power and Water's pole is on the opposite side of the road, the consumer's service pole must be of sufficient height to permit Power and Water to install the service cable and maintain 5.5 metres road clearance.
The size of the Consumer Service/Clearance Pole must be in accordance with Power and Water Standard Drawing S01-01-01-39 Poles 9.0 and 10.5m services/clearance and S01-01-01-08 poles line 10.5B & 10.5C & S01-01-01-11 poles line 10.5D for 95mm^2 ABC or above services where a A-Frame pole is required.

c. On this pole, the customer must provide an approved weatherproof box with space for Power and Water's kWh meter and a fully insulated circuit breaker suitable for the maximum demand of the installation in accordance with NP010 Electricity Meter Manual. The installation of any conductors within the box or attached to or run down the pole, must provide double insulation. Note: If this double insulation is to be achieved by shrinking "Heat Shrink" tubing over the cables, then only medium wall may be used, (colour must be black). Thin-walled tubing (which includes all coloured tubing) is not acceptable.

d. Alternatively, the customer must provide an approved weatherproof box with space for Power and Water's kWh meter and the customer's switchboard. Any components required to be earthed must be earthed.

3.9 Underground unmetered consumer mains in overhead areas

a. 1 Unmetered consumer mains installed underground in an overhead area, will only be allowed when an existing Power and Water line pole is in front of the customers property and is on the same side of the street.

2. If the line pole is on the opposite side of the road, the customer may install a service pole inside their boundary, to take the overhead service, and then proceed underground to the metering position.

b. The route of the underground unmetered mains (as described in Rule 3.9(a) above) on the road reserve, must be at right angles to the customer's property boundary, and in a straight line from that boundary to the line pole.
c. Power and Water must be contacted prior to any works proceeding. Works must not proceed until written confirmation is sent by Power and Water and received by the electrical contractor. Any non-compliant underground service installations will be rectified at the electrical contractors cost.
d. Any concrete at the base of the line pole must be cut away to ensure the conduit is flat against the face of the line pole, and then replaced.
e. The conduit must end 0.45m above finished ground level.
f. All underground unmetered mains are to be installed at least 0.9m below finished ground level.
g. Sufficient cable length, conduit, fittings and mechanical protection must be left to allow Power and Water to complete the installation up the pole.
h. Power and Water will provide a connection point for the unmetered service cable to connect on to. The customer will own and maintain the service cable from the point of connection.
i. Power and Water will be responsible for obtaining any Council permits, etc., for the excavation of the road reserve.
j. Power and Water will not own or be responsible for maintenance or repair of such underground, unmetered consumer mains at any time.
k. The customer will require a licenced electrician to provide a CoC for any rectification works completed on the service cable within their property prior to energisation by Power and Water.
l. Any replacement of existing service cables must be of the type approved by Power and Water, as outlined in Rule 3.3 of this document.
m. In overhead areas, parallel cables are generally not permissible as an underground unmetered consumers mains due mainly to terminating difficulties.
n. In the case where larceny is found e.g., a CCTV connected to council streetlight poles and no notification of additional load, the contractor is to notify Power and Water via email at PowerConnections.PWC@Powerwater.com.au

Note: The trench may be self-certified by an approved contractor.

3.10 Standby generators

Standby generating plant may be connected to installations supplied by Power and Water, subject to the following conditions:

a. A sketch of the proposed wiring arrangement is provided with the connection application and permission in writing is obtained for the connection.

b. The installation complies with the Wiring Rules (AS/NZS 3000:2018) and is covered by CoC on completion.
   (The method of connection in commercial and industrial installations should be discussed with Power and Water prior to submitting a connection application form.)
c. A permanently connected change-over switch is installed in all actives in such a way that parallel operation is not possible.

Note: If the change-over switch is automatic, then mechanical as well as electrical interlocking is required.

d. The main neutral conductor must not be switched prior to the Multiple Earth Neutral (MEN) link, as outlined and in accordance with AS3010:2017.
e. If more than 3.6kVA or if three phase standby supply is required, then the generator must be:

- Permanently installed and permanently connected, or
- Temporarily installed and temporarily connected through a permanently installed and permanently connected "Generator Connection Box".

This connection box will contain links, terminals or the like to facilitate the connection of the generator, and a fully automatic fixed setting circuit breaker, sized to protect the cable/s from this connection box to the main switchboard.

Note: Plug-in type connection devices are ***not*** *permitted* as the connection facility for these generators.

Up to 3.6kVA single phase portable generating plant may be used, subject to the following additional conditions.

f. The generating plant is non-polarised, i.e., no pre-wired connection between the output and the generator frame or earthing terminal.
g. A permanently connected 15 Amp input point (similar to a Clipsal caravan input socket) is installed.
h. A 15 Amp circuit breaker is installed.
i. The connections are in accordance with the diagram.

Notes: (1) If the change-over switch has an "off" position between the two "on" positions it may be used as the main switch provided it is labelled correctly.

(2) The change-over switch must be rated in accordance with the maximum demand of the installation connected to it.

(3) There is no restriction on the use of refrigerators and other portable appliances plugged directly into portable generating plant provided they are not connected to the fixed installation.

j. A rooftop photovoltaic system may be installed in parallel with Power and Water's system, if it is installed in accordance with Power and Water's standard Network Connection Agreement for PV installations.
k. An earthing conductor, of sufficient size to carry earth fault current, must be run from the generator frame to the main earth bar at the main switchboard and labelled "Generator Earth". The earthing conductor must be sized in relation to the rated current output of the generator as per AS/NZS 3000-2000 Rule 5.5.1.2, table 5.1.
   Note: that all earthing conductors radiating from the generator must be of this minimum size.
l. A neutral conductor is to be run to the main neutral bar on the main switchboard and connected adjacent to the MEN. point on the bar and labelled "Generator Neutral". The neutral conductor size must be related to the size of the active conductors as per AS/NZS 3000-2000 Rule 3.5.2.

3.11 Arrangements for after hours attendance including weekends

a. Attendance after hours will not normally be available unless it is agreed that attendance during normal business hours is not feasible.
b. The attendance must be agreed to at least five working days in advance.
c. The contractor/customer must sign an 'Acceptance of Charge' form agreeing to the payment of charges.
d. All arrangements are to be made with, and confirmed by, the supervisor of the section involved.
e. Notwithstanding the above, after-hours attendance is conditional upon:

    (1) Availability of personnel

    (2) Advice received as per the above Rule 3.11(b) of this document.

3.12 Underground services in underground residential distribution (URD) subdivisions

a. Power and Water will own and maintain the service cable to the customer's meter box on the customer's property, with the exception of Rule 3.13 of this document.
b. In accordance with Rule 6.2.2 of this document, Power and Water determines the most suitable position for connection to Power and Water's system. The customer is responsible for providing the necessary cables, conduits and pits to this position. This position is referred to as the point of entry.
c. The electrical contractor responsible for the wiring of the installation must install the underground service cable, including any additional cabling required for conversion from single-phase to three-phase.
d. The location of the cable coil point of supply is available from Power and Water.
e. The contractor must dig the trench in a direct line from the meter box to the point of entry. If trenching is required in the road reserve it must be run to a pillar nominated by Power and Water and be carried out generally in accordance with Rule 6 and 7 of this document
f. The contractor must install minimum 50mm heavy duty orange PVC conduit for two wire services and minimum 80mm heavy duty orange PVC conduit for four wire services at 750mm cover depth.
g. The conduit run must have only one 900 sweep bend within the customer's block, immediately below the meter box (no other bends, sets or reductions are permissible). The route of any conduit run within the road reserve must be as directed by Power and Water.
h. The conduit must finish within the meter box, including where installed in a wall cavity.
i. The trench must be back-filled with clean fill.
j. The cable must be drawn into the conduit by the contractor.
k. The electrical contractor must follow standard drawing requirements for underground services.
l. The contractor must install a minimum 16mm^2 tail from each service fuse and the neutral terminal in the meter base, using soft-drawn copper cable. This must be crimped to the incoming service cable within the meter panel. The joint must be insulated using heavy-walled black heat-shrink tubing.
m. In the few cases where the service cables are run in parallel, the active and neutral cables must be terminated in a link similar to Clipsal BPT2.
n. The neutral cable from the link to the meter need not be larger than 4mm^2.
o. The trenching and installation of the cables and conduit must be included on the COC as being part of the electrical contractor's self-inspection responsibilities.
p. The electrical contractor must coordinate with Power and Water regarding the termination and energisation of the cable.

3.13 Underground services in one-pillar-per-two-lot subdivisions

a. The provision of underground services will be in accordance with section 3.12 of these Rules except as follows.
b. Where there is a pillar installed between 2 lots, the contractor is required to provide the underground supply cables (25 mm^2 XLPE Copper, nylon sheath, single-phase or three-phase) to the meter point. These cables will be connected at the pillar on the property boundary by Power and Water and deemed to be consumer mains.

3.14 Consumers' services – Brandt Road and Arnhem Highway

a. Due to 66kV lines along Arnhem Highway in Humpty Doo, overhead low voltage distribution lines generally cannot be constructed on the same side for consumers' services.
b. In such cases Power and Water may provide underground mains from the low voltage reticulation on the opposite side of the road at applicable charges. Charges will be calculated in accordance with Power and Water's Customer Connections Service Policy.
c. All works up to the point of entry on the customers' property boundary will be carried out by Power and Water at applicable charges.
d. A minimum 50mm heavy duty conduit for single phase services and 80mm heavy duty conduit for three phase services must be installed at a minimum depth of 750mm by the customer's contractor from the Point of Entry to the meter box, which must be a maximum of one metre from the property boundary.
e. A steel draw wire must be installed in the conduit.
f. Power and Water will complete the service to the meter box.
g. The Point of Entry and service details must be arranged with Power and Water.

3.15 Design and maximum demand of commercial and industrial complexes (excluding shopping complexes)

a. Each unit must be provided with a three-phase supply.
b. Each unit must be individually metered in accordance with the Electricity Meter Manual.
c. The minimum size of consumer's mains to each unit must be 10mm^2.
d. The maximum demand of each unit must be as calculated in accordance with AS/NZS 3000 Table C.2 or 40A per phase assessed in accordance with Rule 3.15(f) of this document below, whichever is the greater.
e. Each unit's switchboard must be fitted with an automatic circuit breaker main switch appropriately rated for the maximum demand in accordance with AS/NZS 3000 Rule 2.2.2 (d).
f. The maximum demand of the complex must be as calculated in accordance with AS/NZS 3000 Table C.2 where each unit's maximum demand has been calculated in accordance with Table C.2, or in accordance with Table 1 below where each unit's maximum demand has been assessed.

No. Units	1	2	3	4	5	6	7	8	9	10
MD (amps)	40	60	80	100	120	140	150	160	170	180
Full current rating for one unit, + 50% of units 2 to 6, + 25% of the remainder. (10+ = 10A each).										

Table 1: Unit maximum demand

g. The main switchboard/meter panel must be fitted with an automatic circuit breaker main switch appropriately rated for the maximum demand in accordance with AS/NZS 3000 Rule 2.2.2 (d)
h. The current carrying capacity of the consumer mains for the complex must, when installed in accordance with AS3008.1, exceed the rating of the automatic circuit breaker main switch.
i. Refer to Rule 3.20 – Maximum Demand of this document.

3.16 Metering – Aboriginal communities and permanent camps

a. All new installations in Aboriginal communities must have provision made for metering.
b. Existing installations which are being upgraded with new consumer mains will be required to be fitted out with metering accommodation.
c. Meter boxes:

(1) The meter box must be constructed of galvanised steel sheet, or other approved steel sheet, and must be not less than 1.2mm in thickness.

(2) The door of the meter box must be top hinged only, side hinges are not acceptable.

(3) The door of the meter box must be constructed to prevent its removal from the box without the use of a tool. The preferred method is to prevent the hinges from separating. This is achieved by providing a "TAB" of sheet metal, which requires "bending" to allow this hinge separation.

(4) Only approved meter boxes for these installations can be used.

The approved meter boxes are listed in the Power and Water Electricity Meter Manual.

d. (1) Generally, commercial premises have credit meters (standard meters).

(2) Single phase domestic premises can be fitted with either credit meters or pre-payment meters.

(3) Pre-payment meters are not fitted to three-phase premises.

(4) The type of meter to be fitted is determined by the community.

(5) Each individual community's metering requirements should be discussed with Power and Water.

3.17 Power and Water poles

Contractors must not perform any work on Power and Water poles or mount any customer-related equipment on Power and Water poles except:

a. In accordance with Rule 3.9 of this document, or
b. As authorised by Power and Water.

3.18 Power and Water and NT Government agency coordination

In a number of locations Power and Water Corporation and Northern Territory Government agencies have separate responsibilities in accordance with respective legislation. To ensure that overlap of responsibilities is minimised, the following demarcation will apply:

3.18.1 Mines, quarries, etc.

a. The installing electrical contractor must issue a CoC for the electrical installation work carried out.
b. The Mining and Energy Division will inspect beyond the main isolator including the main switchboard.
c. The installing electrical contractor must arrange Power and Water to inspect the metering provisions and for compliance with Sections 4, 5, 6 and 7 of this document.
d. NT Worksafe (Electrical Safety) will carry out audits and/or inspections as appropriate.

3.18.2 Lifts

a. The installing electrical contractor must issue a CoC for the electrical installation work carried out.
b. NT WorkSafe will audit third party inspectors for conformance with AS/NZS 1735 beyond the main isolator in the lift room.
c. The installing electrical contractor must arrange Power and Water to inspect the metering provisions and for compliance with Sections 4, 5, 6 and 7 of this document
d. NT WorkSafe (Electrical Safety) will carry out audits and/or inspections as appropriate.

3.18.3 Construction sites

a. The installing electrical contractor must issue a CoC for the electrical installation work carried out.
b. NT WorkSafe will inspect the site for compliance with the Northern Territory *Work Health and Safety Act*, including electrical requirements.
c. The installing electrical contractor must arrange Power and Water to inspect the metering provisions and for compliance with Sections 4, 5, 6 and 7 of this document
d. NT WorkSafe (Electrical Safety) will carry out audits and/or inspections as appropriate.

3.19 Automatic fixed setting circuit breakers to satisfy allowed capacity requirements.

As defined in Rule 2.2.2 (d) of AS/NZS 3000, a fully sealed fixed setting auto circuit breaker may be used to limit the maximum demand of an electrical installation.

Excluded from this rule are:

a. Multiple domestic installations, and
b. Commercial and industrial complexes as per Rule 3.15 of this document.

In all other cases, providing the circuit breaker or breakers are fully sealed, fixed setting, auto circuit breakers installed as the main switch or switches in a large installation, then the total current ratings of the settings of these circuit breakers may be used to satisfy allowed capacity requirements.

Notwithstanding the above, all commercial developments involving multi-metering (e.g., shopping centres etc.) must be fitted with an automatic circuit breaker main switch on the main switchboard/meter panel.

3.20 Maximum demand

Maximum demands must be calculated in accordance with AS/NZS 3000 Table C.1 Domestic, and Table C.2 Non-Domestic and Rule 3.15 of this document for commercial and industrial complexes.

Exceptions to the above apply for:

a. Domestic - Air conditioning. For GPOs and socket outlets not exceeding 10 amps and installed for the connection of air conditioning units, load group D, table C.1 must apply, e.g. 75% of connected load.
b. Non-Domestic - Air conditioning. The maximum demand for air conditioning is to be calculated using load group K, table C.2 which provides for maximum demand "by assessment". This assessment must be 100% of connected load.

Details of maximum demand calculation together with Negotiated application form shall be submitted to Power and Water for electricity network upgrade assessment when the requested connection load is equal or more than 100A per phase.

3.21 Point of attachment (POA) for overhead services

In accordance with 6.2.1 of these Rules Power and Water determines the most suitable position for connection to Power and Water's system. The customer is responsible for providing the necessary cables, terminals, supports etc. to this position.

This position is referred to as the Point of Attachment (POA).

The following information indicates where the POA must be located, unless otherwise agreed to by Power and Water, in accordance with Power and Water's Standard Drawing S01-04-01-01 Design data clearances LV overhead services lines.

Note: If any doubt exists or the maximum demand of the installation exceeds 100 amps, the electrical contractor **must** request a service ruling by indicating in the appropriate section of the connection application form. Existing POAs will be reassessed against current Power and Water requirements to ensure they meet compliance.

a. The POA must be located along the principal frontage of a building in such a position that it can be reached by the aerial service cables from Power and Water's line pole located at any position along the front boundary of the property.
b. The POA must be located as close as practicable to the corner of the building near the line pole.
c. The POA must be located no more than 20 metres from the property boundary (see 3.8 of these Rules for POAs in rural areas) when the power line is on the property side of the road only (1m when power line is on the opposites side of the road).
d. The POA must not be higher than 6 metres or lower than 3 metres above finished ground level.
e. A minimum clearance of 2.5 metres must be maintained between the finished ground level and the Mains Connection Box (MCB) or aerial service tails, whichever is the lowest.
f. A minimum clearance of 4.5 metres must be maintained for aerial service cables passing over domestic driveways or areas used by light motor vehicles and 5.5 metres over commercial driveways, areas used by heavy motor vehicles and gazetted roadways. Refer to Power and Water's Standard Drawing S01-04-01-01 Desing data clearance LV overhead service lines.
g. The POA must be installed in accordance with AS/NZS 3000 Section 5.4.

Other factors that must be considered when selecting a POA include:

a. The POA must not be located so that Power and Water's aerial service cable crosses over swimming pools, spas, and the like, passes through established trees or over growing trees, or crosses over another titled property.
b. The POA must not be in a position that cannot be reached by a person standing on a ladder placed on level ground. Safety requirements, and the risk of damage to customer's property, preclude Power and

Water staff from walking across a roof or standing a ladder on a carport, patio, awning, or the like. Power and Water staff must not be required to climb over or through obstacles including locked gates to reach a POA.

c. Raiser or rafter brackets are generally designed for the most direct take-off and must not be subjected to a lateral pull at an angle of more than 30 degrees unless securely braced.

3.22 Number of services

3.22.1 Background

In accordance with Rule 5.2 of this document.

a. The requirement for a single power service on a typically reasonable size allotment is to ensure that electrical workers are not endangered by having multiple points of supply. A worker may go to a main switchboard, open and tag the main circuit breaker, and still find the apparatus they are working on live because it is supplied from another source.
b. Exceptions to this rule include large customers with separate buildings where it is impracticable to supply the load with only one point of supply. In such cases safety measures are put in place to ensure that circuits from multiple substations are not intermixed, all switchboards and final sub-circuits are adequately labelled, and the customer pays all additional costs associated with the additional points of supply.
c. Other exceptions occur on large allotments where there are separate areas of development separated by large distances.

3.22.2 Guidelines

Power and Water may approve additional points of supply where each of the following conditions are complied with, where relevant:

a. Each separate supply is for detached buildings or equipment where clear separation of circuits can be achieved, and the points of supply are separated by at least 100m from a gazetted road.
b. The load is so large and diversified that it cannot economically be distributed from one point of supply. This generally applies to customers over 2MVA.
c. Relocation of the existing point of supply does not allow the whole installation (or the affected portion where there are already multiple points of supply) to be satisfactorily supplied.
d. All costs associated with the additional points of supply including the metering are paid for by the customer as a capital contribution.

Note that each point of supply will be separately billed by the customer's retailer. Generally metering will not be summated.

3.22.3 Safety provisions

To prevent the sources of supply being confused where additional points of supply have been provided, the following precautions must be implemented:

a. Each point of supply must be clearly marked at the main switch and metering point to indicate that other points of supply exist.

b. In the case of commercial installations, diagrams are to be securely fixed adjacent to each main switch, or be available at the complex's management centre. In the latter case a notice must be fixed adjacent to each main switch to the effect that diagrams are available at the management centre.
c. There must be no interconnection within the customer's installation between points of supply.
d. All switchboards must be clearly marked with a logical identification system. All sub-circuits, GPOs, etc., must be marked to indicate the switchboard they are supplied from. These provisions are described in the Wiring Rules.

3.23 Main switch boards with more than one incoming mains LV supply

a. Main switch boards must be designed in such a way that the possibility of two supply sources being supplied at the same time through a bus tie is not possible, the inclusion of a Castell or Kirk trapped key interlocking system is to be designed into the main switch board. The trapped key interlocking system must have a sequence of operations that are either trapped or released in a predetermined order so that a bus tie can only be closed if one supply source fails.
b. The main switch board must be labelled in such a way to clearly explain to the operator the sequence of steps required to close the bus tie or ties.

3.24 Main switch board approval compliance

Main switch board for three-phase service above 100 Amps, with low voltage current transformer (CT) metering, must be approved for construction by Power and Water prior to commencing any field work.

Main switch board document submissions must include:

a. Printed A3 sized or electronic PDF copies of appropriate drawings showing all required details of the main switch board, applicable sub-main switch board(s), metering arrangements and suitable low voltage cable sizes.
b. Proposed location of the main switch board within 15 meters from the advised point of supply.
c. In exceptional cases where the proposed location of the main switch board could not be practically installed within 15 meters from the advised point of supply, details of suitable low voltage cable size calculations at full load current, to limit the maximum voltage drop to not exceed 0.5% must be submitted to Power and Water for consideration and approval.
d. In cases where an alternative source of electrical supply such as a stand-by diesel generator or photovoltaic generator would be installed, such facilities must be arranged through suitable interlocking procedures, and proposed arrangements must be approved by Power and Water.

Failure to obtain the approved customer's installation drawings from Power and Water could result in rejection of final connection to the electricity distribution network.

4. Service rules

4.1 Exceptional circumstances

a. In a number of non-critical Rules, it is indicated that Power and Water may waive or modify the stated requirements. Any waive requests are to be addressed in writing to Power and Water, and no action should be taken before receiving written approval.

4.2 Agreement to pay charges

a. Where the customer is required to pay a charge as provided for in 5.3, 5.5, 5.7.2, 6.2.4, and 7.2.2(H) of these Rules, the customer must enter into an agreement with Power and Water, before the work is commenced.

4.3 Failure to comply with these Rules

In the event of the customer failing to comply with the requirements of these Rules, Power and Water may:

a. Disconnect the supply to the premises if it is considered hazardous, and/or
b. Report the matter to the Safety Regulator, who may prosecute the contractor or customer.

Where supply is disconnected, a charge will be made for the reconnection of supply.

4.4 Warning against premature expenditure

a. Adequate notice of the customer's requirements should be given, particularly where the load is relatively large, or the supply is required in a remote location, as considerable time may be necessary for negotiations and construction.
b. Matters which may affect the design of a building project, such as the determination of the position of service equipment, the Point of Attachment for the service line or the point of entry of the underground service cable, and the position of any substation on the premises, should be settled at an early stage.
c. When contemplating the connection of equipment such as described in 7.2.2(G) of these Rules, particular care should be taken to ascertain Power and Water's requirements relating to the prevention of interference with the supply to other customers.

4.5 NT Electrical License requirement for electrical installations

a. The *Electrical Workers and Contractors Act* requires that any electrical wiring work be carried out by a person licensed under that *Act*. Severe penalties may be imposed by the Safety Regulator on unlicensed persons found to be carrying out electrical wiring work.

4.6 Damage to Power and Water's equipment

a. The *Electricity Reform Act* and Regulations prescribe penalties for damaging or interfering with Power and Water's equipment. In addition, a customer may be held liable for damage to Power and Water's equipment installed on his premises (e.g., tree located on customer's land damaging overhead service). Power and Water therefore recommends that the customer insure against the risk of loss or damage.

4.7 Standard quality of supply

a. Power and Water makes power supply available using good industry practice. Because of the nature of an electricity network, it is not possible to warrant any standard of reliability or Australian Standard compliance.

4.8 Alterations to installation

a. No addition or alteration may be made to an installation that increases load by a significant amount, without prior approval of Power and Water. Refer to Section 3 of these Rules for further details.

4.9 Interference with equipment

a. No person may interfere with the service fuses, meters, maximum demand indicators, or any equipment sealed by Power and Water's officers (the *Act* prescribes severe penalties for such interference).
b. In the case where there has been interference with the equipment, the contractor is to notify Power and Water via email at PowerConnections.PWC@Powerwater.com.au. The contractor is to:

    I. Take photos of the meter, meter panel, sub circuits, tampering (wire in hole, magnet, tampering security seals, dial hands, cut internal metering wires, etc.).
    II. Replace the meter.
    III. Send photos to Metering Services (via PowerConnections.PWC@Powerwater.com.au) with brief description: address, NMI, what you were there to do etc.

4.10 Damage to meters or service equipment

a. In the event of Power and Water's meter or service equipment being destroyed, damaged, or lost, the customer is to pay the cost of repairs to Power and Water if required to do so.
b. In cases where more than one customer is supplied from a common service, the cost of repairs, and replacements, may at the discretion of Power and Water, may be divided amongst the customers at the time of its damage, loss or destruction.

4.11 Inspection of meters and other apparatus

a. The customer is to allow an authorised Power and Water employee or representative carrying written authority, access to meters and other apparatus owned by Power and Water at any reasonable time, for:

    (1) The purpose of inspecting, testing, repairing or removing the meters, or other apparatus, or

    (2) For any other purpose connected with the supply of electricity as Power and Water may consider necessary.

b. The customer must disconnect the apparatus during an inspection, test, or repair if requested to do so by Power and Water.

4.12 Interruption of supply - testing, etc.

a. Power and Water reserves the right from to disconnect the supply of electricity without notice if it deems necessary for the purpose of testing, or for any other purposes connected with the efficient working of its network.

4.13 Interruption of supply - interference

a. Where a Power and Water supply cable passes through or under private property, and it is interfered with which interrupts normal supply, Power and Water may refuse to reconnect such supply until the cause of the interference is removed.
b. Power and Water is not required to supply electricity to any premises where the supply cable passes through, under, or over, any other private premises.

4.14 Charge for connection of supply

a. Power and Water will calculate the charge for connection of supply based on the annual Australian Energy Regulator (AER) approved Alternative Control Services (ACS) charges and capital contributions, in alignment with Power and Water's Customer Connections Service Policy.

4.15 Amendment of the Service and Installation Rules

a. Power and Water may at any time vary, amend, or add to these Rules. Power and Water may choose to engage with public consultation via its webpage for any variation, amendment, or addition to these Rules prior to publishing.

5. Supply and related matters

5.1 System of supply

a. The electricity supplied by Power and Water is in the form of alternating current of approximately sinusoidal wave form at a frequency of 50 hertz.

    (1) The nominal supply voltage is 230/400 volts from a three phase, four wire system.

    (2) In some outlying areas the supply is from a single phase 230/460 volts, three wire system.

Supply is also available at high voltage (11kV or 22kV).

b. The neutral conductors of the supply system are connected to the general mass of earth, constituting a multiple earthed neutral (MEN) system as defined in the Wiring Rules.

5.2 Number of services

a. Generally, only one service will be provided to the customer's property[3]. However, Power and Water may permit additional services if it is impractical for the property to be supplied from one service, such as a large premises. In such cases, approval must be agreed in writing from Power and Water prior to work commencing.
b. Any conditions given in relation to segregation or signage must be complied with. Refer also to Section 3.23 of these Rules.

5.3 Special or additional services

a. Where exceptional circumstances warrant, Power and Water may agree to a customer's request for the provision of a special or additional service. If granted, the customer is to pay the cost involved.

5.4 Segregation of supplies

a. Where more than one service is provided, each must supply a separate and clearly defined portion of the premises without intermixture or electrical interconnection of the portions (either directly or by change-over facilities), unless otherwise agreed to by Power and Water. Unless the additional service is provided to supply specific equipment, the whole of the installation in any defined portion of the premises must be supplied from the same service.
b. The customer must affix labels at each main switchboard to define the areas or equipment it supplies, and to indicate the presence and location of other supplies.
c. A label must also be affixed to each distribution board to indicate the main switchboard from which it is supplied.

5.5 Temporary (construction) supplies

a. The customer is to pay the cost of installing and removing a temporary service, mains applicable design and installation of low voltage / high voltage network upgrade works including or substation including and any associated metering in order to satisfy the requested maximum demand of temporary supply.

[3] This may be a single building, or a group of buildings.

b. Scheduled service charges also apply.

(1) The whole or part of the work becomes a permanent part of Power and Water's system of supply, the charge to the customer may be adjusted.

5.6 Sources of alternative supply

a. Where the customer installs an alternative source of electrical supply such as a stand-by generator, facilities for connection of the alternative source to the electrical installation normally supplied from Power and Water's system must not be installed unless the proposed arrangements have been agreed to by Power and Water.
b. Reference should be made to 7.5 of these Rules regarding minimum requirements applicable to the customer's installation.

5.7 Substations on customers' properties

5.7.1 Accommodation

a. To supply large or isolated installations, it may be necessary for Power and Water to install high voltage mains and substation equipment within the premises where the supply is required. This need arises when the anticipated demand of the premises is more than that which can be met from Power and Water's 230/400 volt mains in the vicinity and when the customer takes supply at high voltage.
b. It may be necessary for Power and Water to extend or increase the capacity of its system in order to supply electricity to any premises., Where recommended that such supply can best be given by installing transformers, switchgear, or other equipment on those premises, supply will not be provided unless the customer provides, free of cost to Power and Water, a suitable space in the premises to accommodate the necessary equipment. The space must be enclosed in a manner approved by Power and Water, and the customer must provide satisfactory arrangements for access and tenure.
c. Power and Water reserves the right to use all such equipment for the purpose of supplying other premises. Power and Water also reserves the right to install additional equipment for the purpose of supplying other premises.

5.7.2 Extension of high voltage mains to substations on customer's premises.

a. Power and Water will supply, install, and maintain, the high voltage mains supplying its substation on a customer's premises.
b. A charge will be made in respect of high voltage mains where they extend beyond a point that is nominated by Power and Water.
c. Other charges may apply.

5.7.3 Further information

a. Further information relating to the establishment of substations on customer's premises is available from Power and Water's Customer Connections team.

5.8 Determination of number of phases of alternating supply

a. The number of phases of low voltage supply which will be provided to an installation or separately metered portion of an installation, without incurring a charge in accordance with Clause (5) of 6.2.4, of these Rules, must be as set out in Table 2 below.
b. Power and Water may refuse a request to upgrade from a single-phase connection to a three-phase connection due to network constraints.

Load Category	Number of Phases
Nominal load not exceeding 80A	Single Phase & Neutral (2 wire)
Nominal load exceeding 80A	Three Phase & Neutral (if available) *
Rating of largest motor exceeds 3.0kW	Three Phase & Neutral (if available)

Table 2: Number of phases of low voltage supply

***Note**: Two phases and neutral may be permitted on individual application.

c. In some areas with 230/460 volt single phase supply, the load must be balanced over both legs of the supply if 230 volt nominal load exceeds 80A.
d. The "nominal load" for the purpose of Table 2 must be calculated on the assumption that all load will be connected line-to-neutral at 230 volts and must exclude polyphase instantaneous water heaters. The calculations must otherwise be in accordance with the method set down in the AS/NZS 3000 Wiring Rules for the calculation or maximum demand in mains and sub – mains (refer to Rule 3.20– Maximum Demand).

5.9 Balancing of installation

a. The loading of an installation, or separately metered portion of an installation, supplied from more than one phase, must be so arranged that at the time of maximum demand of the installation the out-of-balance current must not exceed 25 amperes, or 15% of the most heavily loaded phase, whichever is the greater.

Note: An electrical installation comprising an individual appliance the load of which exceeds 60 amperes is to be balanced over all available phases if it is supplied with electricity by a polyphase supply.

5.10 Supply to leased areas and administrative lots

a. Leased areas and administrative lots created under subdivision for lease in excess of 12 years are still part of the current lot in the Record of Administrative Interests and Information issued by Land Titles Office.
b. Supply to leased areas and administrative lots will be the landowner's responsibility to establish sub-mains supply from the customer's main switchboard with or without new electricity meter from existing power point for supply to the current lot.
c. Where the current lot is significantly large, additional power point of supply would only be considered for administrative lots for lease in excess of 12 years provided that it is separated by at least 100m from a gazetted road as per 3.22.2 (a) of these Rules.

d. Additional power point of supply shall not be considered for administrative lots for lease in excess of 12 years if it is located further inside the current lot and does not have full front boundary facing the gazetted road.

6. Provisions for service equipment

6.1 General requirements

a. The customer is to provide mounting and installation facilities for service equipment in the positions selected by Power and Water. This equipment is supplied and installed by Power and Water and is to remain its property.

6.2 Connection to the premises

a. Power and Water will install the connection between its system and the customer's installation. Power and Water will determine whether the connection will be in the form of aerial service lines (as prescribed in this section) or underground service cables (as prescribed in Section 3 of these Rules).
b. Power and Water will maintain the overhead service line between its system and the customer's premises. A licenced electrician is required to provide a CoC for any rectification works completed on the customer's service line within their property. Any replacement of existing service lines must be of the type approved by Power and Water, as outlined in standard drawing S01-01-07-03 Conductor, overhead services and street light, copper XLPE grade X-90.

6.2.1 Aerial service lines

a. Power and Water will determine the route of the service line and the position of the point of attachment to any building or structure. For basic connections, Power and Water will maintain the aerial service line up to the mains connection box (MCB). For negotiated connection, the customer is to provide, install, and maintain their own service line. The customer must also provide, install, and maintain any support on private land for the service line and must carry out any work, and provide and install any equipment required by Power and Water on such support for the Point of Attachment. Detailed requirements are set out in Power and Water's standard drawings "Vol 1 - Overhead Line Manual", and Section 3 of these Rules.
b. The size of any service post or pole and the design of any bracket, or similar device used to raise the Point of Attachment is to be as determined by Power and at the time of marking the service. Refer to Section 3 of these Rules for details.
c. Power and Water will not accept responsibility for damage to the customer's premises resulting from normal tension in the service line or causes beyond its control.
d. The customer is to be responsible for ensuring that trees and other vegetation growing on private property are kept trimmed to give a minimum clearance of 0.5 metres from any service line or aerial customer's mains, having regard to conditions existing due to strong winds which may cause trees or lines to sway.

6.2.2 Underground service cables in designated underground areas

a. Power and Water will determine the route of the service cable from the Point of Supply to the Point of Entry. The customer is to provide, install and maintain a conduit or set of conduits and service cable, and any associated facilities. Detailed requirements are set out in Power and Water's "Underground Manual, Vol 2".

6.2.3 Connection to service equipment

a. Where the conductors are not stranded copper or they are of a size more than that which can be terminated on Power and Water's equipment, they are to be jointed to stranded copper cables suitable for termination on Power and Water's equipment. Aluminium conductors are not acceptable for termination directly on to Power and Water's equipment.
b. The customer must also provide all inter-connecting wiring for Power and Water's metering and control equipment.
c. A person other than an employee of Power and Water must not make any connection to, or disconnection from, conductors directly connected to Power and Water's supply system, or insert a conductor into any item of Power and Water's service equipment, except as authorised by Power and Water.

6.2.4 Charges applicable

a. The customer may be required to pay additional charges as determined by Power and Water in respect of the installation of service equipment where:

    (1) There is excess of service line or underground service cable due to it being terminated at some point other than that nominated by Power and Water.

    (2) An aerial service line is more than one span or 20 metres in length from the point where it crosses the street alignment of the property. However, where Power and Water requires the customer to install a pole immediately inside the property solely to avoid the service line encroaching over an adjoining property, the portion of the service line on the premises within 20 metres of this pole is installed free of additional charge. In the case of single urban domestic premises, the whole of the first span commencing either at this pole or in the street is installed without additional charge.

    (3) An underground service cable is more than 0.3 metres in length from a point nominated by Power and Water on a street alignment or a property boundary.

    (4) Busbars extend more than one metre from a point nominated by Power and Water at the substation boundary.

    (5) Jointing and/or repair or replacement of customer's mains or underground service cables is necessary on a customer's property.

    (6) The number of phases installed is more than the number determined in accordance with Table 2 refer to Rule 5.8 of this document.

    (7) The service is considered by Power and Water to be temporary or additional.

    (8) The customer is to pay all costs involved in any alteration to the supply arrangements that may be required as a result of failure of the customer to comply with the conditions under which supply is made.

NOTE: Refer to the Power and Water Customer Connections Service Policy for application of non-refundable capital contributions.

6.3 Installations suitable for use of the standard meter box panel

a. For single domestic and other nominated installations, the customer must provide and install a standard panel complying with Power and Water's requirements as detailed in the Electricity Meter Manual.

b. The panel must be mounted in a standard meter box listed in the Electricity Meter Manual.
c. Information concerning drilling of the panel, height limitations, fixing of socket bases, wiring, the space available for the customer's equipment, and detailed requirements are set out in the Electricity Meter Manual. Rule 7.1 of this document deals with the associated facilities to be incorporated in the customer's installation.

7. Customers' installations

7.1 Facilities associated with metering

7.1.1 General

a. In addition to providing and installing a metering panel/s in accordance with Rule 6.3 of this document, the customer must arrange to meet the requirements of Rules 2.7.6, 2.11 and 2.12 of the Electricity Meter Manual.

7.1.2 Meters - rental

a. Power and Water reserves the right to make a rental charge or request a capital contribution for any metering equipment installed at the request of a customer, which exceeds the standard required for metering the customer at the current tariff.

7.2 Limitation on connection and operation of equipment

7.2.1 Rectifiers and other non-linear load

a. Switch mode and rectified power supplies must be installed and operated to comply with the harmonic limits imposed by Australian Standard including, but not limited to, AS/NZS 61000 as follows:

    (1) Part 3.2 – Limits—Limits for harmonic current emissions (equipment input current less than or equal to 16A per phase)

    (2) Part 3.6 – Limits—Assessment of emission limits for distorting loads in MV and HV power systems – Basic EMC publication

7.2.2 Interference with supply to other customers

a. Customer's equipment must be arranged and operated to prevent undue interference with the supply to other customers. Voltage fluctuations at the Point of Common Coupling with other customers must not exceed the limits imposed by Australian Standard AS/NZS 61000 as follows:

    (1) Part 3.3 – Limits—Limitation of voltage fluctuations and flicker in low-voltage power supply systems for equipment with a rated current less than or equal to 16A

    (2) Part 3.5 – Limits—Limitation of voltage fluctuations and flicker in low-voltage power systems for equipment with rated currents greater than 16A

b. If Power and Water deem the customer's equipment to be causing undue interference to the supply to other customers, the customer causing the interference must take corrective action. Approval of the connected apparatus or equipment causing the interference from Power and Water will not exempt the customer from the responsibility to rectify the situation.

c. The customer's equipment or simultaneously switched groupings of equipment will generally be considered acceptable for connection if it complies with Rules 7.2.2(A) to 7.2.2(F) of this document as appropriate.

A. General equipment

a. Equipment other than motors must comply with Table 3.

Arrangement				Limit Applied to Changes of Line Current (amperes)	
Voltage	**Connection**	**No. Phases**	**Switching Arrangement**	**Fluctuating or Intermittent (more than 4 changes per hour)**	**Continuous or Steady (less than 4 changes per hour)**
230	Line-neutral	1		15	25
		2 or 3	Phases NOT switched simultaneously		
		3	All phases switched simultaneously		
400	Line-line	3	All phases switched simultaneously	30	50
	No neutral connection	2		45	

Table 3: Equipment

b. In Table 3 the term "fluctuating or intermittent" means that the input current to the appliance changes in magnitude more than 4 times per hour, as occurs with the operation of welders, heating units controlled by thermostats, or energy regulators and machines such as X-ray units that are repetitively switched.

c. Where an appliance includes a motor that is switched simultaneously with another load component, the total change of line current may exceed the limits shown in Table 3 but must comply with Rule 7.2.2(C) of this document for the starting of a motor of the same continuous rating as the appliance.

B. Storage water heaters

a. Notwithstanding the provisions of Rule 7.2.2(A) of this document, the change of line current caused by switching 230 volt heating units in storage water heaters arranged for single phase or two phase-connection may exceed 15 amperes, but must not exceed 20 amperes.

C. Motors, general

a. Motor installations and any associated starting devices must be designed and operated to comply with either of the following conditions.

I. Fall in voltage

The starting current must not cause a fall in voltage of more than 5% for more than 0.02 seconds when connected to a typical 400/230 volt, three-phase, 50hz supply system which for this purpose must be considered to have the following impedance:

- 0.2 + j0.2 ohms (phase-neutral)
- + j0.l ohms (line impedance per phase)

II. Starting current

The starting current must not exceed:

- 40 amperes in the case of single phase 230 volt motors.
- 33 + (3.3 x k) amperes in the case of the three phase 400 volt motors; where k is the continuous output rating in kilowatts of the largest motor in the installation.

III. Large installations

In large installations supplied exclusively by a customer substation, Power and Water may permit larger motor starting currents than permitted by Rule 7.2.2(C) (ii) above. In such cases Power and Water will provide source impedance for calculation of voltage drop in Rule 7.2.2(C) (i) above and may approve larger starting currents on application.

D. Motors operating lifts

a. Notwithstanding the foregoing, the starting current of a three-phase lift motor must not exceed 200 amperes.

E. Motors operating fire-fighting equipment

a. The starting current of a three-phase motor installation used solely for fire-fighting purposes may exceed the limit allowable under Section 7.2.2(C) but must not exceed 150% thereof.

F. Test methods

a. For the purposes of Rules 7.2.2(C), 7.2.2(D) and 7.2.2(E) of this document the following will apply:

(1) Fall in voltage is to be determined by the oscillographic or any other method considered suitable by Power and Water.

(2) Starting currents are to be determined by the locked rotor method, with 230 or 400 volts, 50 Hz, as appropriate applied to the terminals of the motor installation. In the case of equipment having rotors that cannot conveniently be locked, the current may be measured by other methods considered suitable by Power and Water.

G. Equipment requiring special consideration

a. Power and Water may refuse to permit the connection of equipment in the following categories if it considers that by such connection, the supply to other customers would be adversely affected.

(1) Equipment which would cause excessive fluctuation of voltage on Power and Water's system because of its large or fluctuating demand, e.g., arc furnaces, welding machines, X-ray units, frequently started large motors, etc.

(2) Equipment which would cause excessive distortion of the wave shape of Power and Water's system voltage e.g., rectifiers, frequency converters, load control devices using thyristors or saturable reactors.

b. When contemplating the connection of equipment in these categories, the customer should take particular care to ascertain from Power and Water the conditions under which connection of such equipment will be permitted.

H. Exceptional circumstances

a. Under certain circumstances, Power and Water may agree to the connection of equipment that does not meet the requirements of Rules 7.2.2(A) to 7.2.2(E) or 7.2.2(G) of this document. Cases suitable for

special consideration would include installations where motors are infrequently started, or where the supply system impedance is low, as in the central business district, or where the installation is in proximity to or supplied directly from a substation. Further information regarding this provision is available on request.

b. Where special approval is granted, the customer must not cause any change to the starting conditions, magnitude or frequency of load switching, or the point of connection on Power and Water's system without obtaining the approval of Power and Water. Any approval previously given will be void if any of the foregoing conditions are changed.
c. Where the connection of such an appliance is dependent on Power and Water making an extension to its system, the approval will be conditional upon the customer paying any charge applicable.

7.3 Earthing

a. All installations required to be earthed must conform to the requirements for the MEN System of Earthing as set down in the AS/ NZS 3000 Wiring Rules.

7.4 Protection against damage from short circuit

a. To meet the requirements of the AS/ NZS 3000 Wiring Rules, the installation must be designed to withstand, without damage, the maximum currents that may occur under fault conditions, such as a short circuit.
b. Unless otherwise advised in writing by Power and Water, the maximum (three-phase symmetrical) prospective short circuit current at the customer's terminals where supply is at 230/400 volts from the street mains may be taken as:

    (1) Suburban residential areas - 6,000 amperes

    (2) Commercial and industrial areas – 30,000 amperes

c. Lower values of prospective short circuit current will apply in installations that are remote from a substation or supplied from a substation of small capacity.
d. Higher values of prospective short circuit current may apply where supply is direct from a substation of large capacity. In these cases, and in the case of supply at high voltage, customers will be advised of the value when the application for supply is dealt with.

7.5 Alternate supply sources

a. Where, in accordance with Rule 5.6 of this document, Power and Water agrees to the installation of facilities to enable an installation to be disconnected from Power and Water's system and connected to a private alternative source of supply, such facilities must be arranged by suitable interlocking procedures so that Power and Water's system and service equipment cannot be energised from such alternative source.
b. A notice must be fixed on the main switchboard to show that such facilities exist, their point of control, and the conditions under which they may be operated.

7.6 Power factor

a. The power factor of every installation must be maintained, as far as practicable, at a value not less than 0.9.

b. Power factor correction equipment must be designed and maintained to prevent the power factor of the installation becoming leading.
c. The provision of Rule 7.2.2 of this document should be noted if it is proposed to install capacitors.

7.7 High voltage installations

a. Power and Water will consider to provide 11kV or 22kV depending on current distribution network voltage in the area to customers in a case-by-case basis subject to assessment consideration on:
    - Customer's connected load being more than 4.5MVA (3 x 1.5MVA transformers) at the available low voltage point of supply on one property;
    - Customer having one development over several lots without land consolidation application;
    - Customer having suitable access restrictions or security restrictions on the property;
    - Customer having multiple transformers at various locations over large area of land.
b. High voltage customer shall design, construct, own and maintain an intake station building at an agreed, accessible position close to the front property boundary to house the required incoming and outgoing high voltage switchgear operated by Power and Water. Where it is not practical to establish the intake station building, Power and Water may consider pole-mounted high voltage switchgear in overhead areas for high voltage customers.
c. High voltage customer's owned power assets are from Power and Water 11kV/22kV outgoing point of supply i.e. Isolator switchgear in the case of having intake station or Auto-Recloser in the case of pole-mounted switchgear in overhead areas.
d. High voltage customer's power assets shall comply with all relevant Australian Standards, typically AS 3000 Wiring Rules, AS 2067 Substations and high voltage installations exceeding 1kV a.c.
e. High voltage customer's electricity network installations must not be connected to Power and Water's 11kV/22kV outgoing point of supply before submitting:
    - Signed copy of NT WorksSafe – COC by the electrical contractor; and
    - Signed copy of engineering consultant's certification report that includes specific details of locations, high voltage power assets being installed, inspected and tested in accordance to applicable Australian Standards for the purpose of final connection works.
f. The minimum fault levels for equipment connected to Power and Water's network must be in accordance with the Network Technical Code Clauses 2.8 and 15.4.
g. Protection relays, current transformers, voltage transformers and other protective equipment must have characteristics to suit Power and Water's existing protection system. Similarly, customer's protection device must grade with upstream network protection assets and isolate during the fault without affecting Power and Water's distribution system.
h. A detailed protection report must be submitted to Power and Water with functional description, switchgear configuration, protection single line diagrams, fault levels, protection relay settings, coordination graphs, and other requirements as mandated in the connection agreement.
i. The protection design must comply with IEC 60255, IEC 61000, appropriate Australian Standards and industry best practice.
j. High voltage customer is also responsible for the operation, testing and ongoing maintenance of the high voltage installation in accordance to current Australian Standards practice.

k. High voltage customer must co-ordinate and seek approval from Power and Water before modifying protection settings or schemes on their main incoming circuit breaker protection in the case of having intake station.
l. Facilities must be provided for the disconnection of all high voltage and protection circuits.
m. High voltage customer's internal electricity supply systems must comply with Power and Water's Network Technical Code.
n. High voltage Customers who intend to install or add to a high voltage installation for any additional load connection shall submit a proposal to Power and Water for network capacity assessment and await a reply in writing before proceeding with the ordering of equipment.
o. High voltage customer's electricity operations must be operated to comply with requirements of Power and Water System Controller.
p. All high voltage installations must be regularly maintained in good order, so that it will perform the functions for which it was designed. AS/NZS 2650:2000 "Common specifications for high-voltage switchgear and control gear standards" is relevant in this regard.

7.8 Compliance with Wiring Rules and Service and Installation Rules

a. The *Electricity Reform Act* requires that a person who carries out electrical wiring work must notify Power and Water on the prescribed form of their intention to do so. It also requires a person who has completed such work to advise Power and Water of the completion on the prescribed form.

    (1) The first form is the connections application form which is available on the Power Connections webpage.

    (2) The second form is the COC which is available from the Electricity Safety Regulator

b. On receipt of a CoC, Power and Water may carry out a safety inspection and a test of a new electrical installation. If the inspection and testing show that the installation is not safe, Power and Water may refuse to give supply to the installation, or any addition or alteration made to it.
c. Any existing underground service lines or consumer mains being altered or repaired must undergo verification testing. If found not to comply with AS/NZS 3000, must not be returned to service. This also applies to compliance issues identified during testing conducted as part of fault-finding or cable identification activities.
d. As this inspection is made after the installation has been completed, and is therefore, limited in its scope, neither the inspection, nor the connection of the installation must be deemed as giving assurance of compliance with the Wiring Rules or the Service and Installation Rules.
e. Furthermore, the inspection and connection must not be regarded as implying compliance with any Specification, nor in any way as giving an assurance of quality.

8. Definitions

Where terms or words are not included in the definitions section, refer to our glossary for clarification. The glossary is available in our process improvement and event information management system ProMapp.

Term	Definition
Act	The Electricity Reform Act 2000, and includes Regulations made under the Act.
ABC	Aerial Bundled Cable
AER	Australian Energy Regulator
Capacity	The rated demand applicable to a particular block of land or customer and refers to an average demand over a 15 minute period.
Certificate of Compliance (COC)	A certificate issued by an Electrical Contractor certifying that work on an electrical installation has been carried out in accordance with Australian Standard AS 3000 and the Service and Installation Rules.
CEC	Clean Energy Council
Commercial	A land intended for use by for-profit businesses, such as office complexes, shopping malls, industrial areas, service stations and restaurants. Any area occupied by businesses which sell, rent, trade, or store goods, or which provide a service. Property which has a zoning designation of CB, C, LI, GI or such other commercial zones as may be created by ordinance as defined in the Northern Territory Planning Scheme.
Customer	A person who has made application for or who is supplied electricity.
Electricity Officer	An Electricity Officer appointed under the Act
Existing connection	A point of supply to Power and Waters electricity network which has already been established prior to alteration works being undertaken.
Low Voltage (LV)	Supply at a nominal voltage of 230 volts or 230/460 volts single phase or 230/400 volts two or three phase +10% - 2%. In accordance with changes to the voltage standard brought about by alignment with the international standard, Power and Water is moving towards a standard voltage of 230/460 volts single phase or 230/400 volts two or three phase ± 6%.
MCB	Mains connection box
MEN	Multiple Earth Neutral System complying with the requirements of AS3000.

Term	Definition
New connection	A new connection to the Power and Water electricity network. For new connections, the point of supply and point of connection is the same.
Point of Attachment (POA)	The point of connection to Power and Water's electricity network where electricity is supplied by an overhead service. • A Point of Attachment of an overhead service on to a building or pole on which a metering panel is fitted. • A point of attachment of an overhead service on to a pole forming part of unmetered aerial consumer mains.
Point of Entry	The point where the underground service cable connects to the consumers meter box.
Point of Connection for URD	For unmetered connections, the junction of the consumer mains and pillar or junction box. The junction of the consumer mains and the pillar or junction box forming part of the unmetered consumer mains, and located on the customer's block.
Point of Supply	The point where Power and Water makes supply available for customers. This point delineates the responsibility between Power and Water and the customers For low voltage supply, this is one of the following: A nominated point on a distribution substation located on the customer's block. A (usually fused) point on a Power and Water pillar located on the customer's block. The underground point of supply is at the pillar or substation for: Commercial and Industrial customers Unit blocks with a body corporate The underground point of supply is at the pillar or property boundary for: Residential customers For high voltage supply, the point of supply will be as agreed between the customer and Power and Water and will generally be at the terminals of a high voltage metering unit located on the customer's block.
Remote Area	Any area of the Power and Water electricity network that is unregulated
Residential	A land used in which housing predominates A land intended for the use of housing designed for people to live in.

Term	Definition
	Property which has a zoning designation of LR, LMR, MR, HR, RR or such other residential zones as may be created by ordinance or a mobile home park as defined in the Northern Territory Planning Scheme.
Rural Area	An area that is not an urban area (see below) and generally refers to blocks predominantly larger than 0.4 hectares that may generally only be developed for rural residential or farming/rural purposes.
Safety Regulator	The Electrical Safety Branch of NT Worksafe.
Service	The low voltage overhead or underground line running from a pole or pillar owned by Power and Water, which crosses the property boundary of the block, and runs to the Point of Entry located on the block.
Service Equipment	All electrical equipment installed in a premises by Power and Water including service lines, cables and busbars, and cabinets, meters, current transformers, filters, auxiliary control equipment, and temporary testing equipment.
Servicing Distance	**Means:** For an overhead service, a distance, not exceeding 40 metres, that permits a service to be run without exceeding the design tension, and while maintaining the required ground clearance as defined in the Standards Manual. Refer also to Section 5.25 of the Overhead Line Manual – Vol 1 S01-04-01-01 For an underground service in a URD area, a distance not exceeding 60 metres from the nearest URD pillar to the point of entry (POE). For an underground service in an overhead area, a distance not exceeding 60 metres from the nearest pole carrying low voltage mains to the meter position.
Urban Area	Generally refers to blocks predominantly less than 0.4 hectares with services and street lighting that may be developed for residential, industrial or commercial purposes.
URD	Underground Residential Area.

Table 4: Definitions

9. Change management and continuous improvement

9.1 Consultation, approval and communication

This Specification must be endorsed by a Responsible Manager and approved by Accountable Executive.

Role/ title	Requirement
Power Engineering	Consult - endorse this document
Senior Manager Network Planning & Design – Power Services	Consult - endorse this document
Executive General Manager Power Services	Responsible - approve this document
Key Stakeholders	Communicate – inform of any changes

Table 5: Consultation, approvals and communication

9.2 Review

The requirements of this specification are mandatory and shall be reviewed and updated periodically for its ongoing effectiveness. This management standard will be reviewed, at a minimum, every three years or in the event of any significant change in our vision, values, long term goals, risk appetite, policy statement business model or organisational structure, or related systems or processes.

9.3 Internal references and related documents

Document title	Record number
Network Technical Code	D2020/131511
Electricity Meter Manual	QDOC2010/136
Basic Connection Application Form	D2020/209380
Negotiated Connection Application Form	D2020/53004
Connection Policy	

Table 6: Internal references and related documents

External references, legislative and regulatory obligations

- National Electricity Rules (Northern Territory) Version 3
- The Electricity Reform Act 2000

9.4 Records management

This specification and all related documents are captured, stored and managed in our Electronic Document and Records Management System (EDMS) and controlled in the Controlled Document Register (EDMS).

9.5 Improvement suggestions

To log an improvement suggestion for this document please contact PowerConnections.PWC@Powerwater.com.au

9.6 Document history

Date of issue	Version	Prepared by	Description of changes
15/07/2020	01	Phacelift	• Change of document template to combine exisiting Service Rules and Installation Rules into one document • Update document to reflect CEC accreditation requirements and current connections process.
18/04/2021	02	Phacelift	• Updated to incorporate internal policy changes and internal review comments from TT
21/05/2021	03	Phacelift	• Amended to incorporate review comments from SDZ
24/05/2021	04	Phacelift	• Updated to incorporate additional review comments from SDZ. • Prepared for consulation with working group.
05/10/2023	05	M. Poole	• Updated based on consultation feedback.

Table 7: Document history

10.Description of updates

Table 8 below, outlines the major changes from NP003 and NP007 to the new combined Services Installation Rules.

Ref	Description of Updates
1	• **Current document reference:** NP003 and NP007 • **New document reference:** Page 2, Seciton 1 • **New document heading:** Purpose • **Update:** Section added – provides overview and intent of the document
2	• **Current document reference:** NP003 and NP007 • **New document reference:** Page 2, Seciton 2 • **New document heading:** Scope • **Update:** Section updated – Clearly defines the scope of the document and any exclusions.
3	• **Current document reference:** NP003 & NP007. • **New document reference:** Page 29-30, Section 8. • **New document heading:** Definition. • **Update:** Section update – to reflect the updated document.
4	• **Current document reference:** NP003. • **New document reference:** Page 5, Section 3.3.1, Figure 1. • **New document heading:** New Connection Overhead. • **Update:** Figure added to show defined ownership.
5	• **Current document reference:** NP003, Section 5.19. • **New document reference:** Page 6, Figure 2. • **New document heading:** New Connection Overhead. • **Update:** Figure added to show defined ownership
6	• **Current document reference:** NP003, Section 5.25, Page 8. • **New document reference:** Page 6, Figure 3. • **New document heading:** Typical Rural Service Line. • **Update:** Figure added to show defined ownership.
7	• **Current document reference:** NP003, Section 5.45, Page 11. • **New document reference:** Page 7, Section 3.3.2, Figure 4. • **New document heading:** Non Typical Underground Connection. • **Update:** Figure added to show defined ownership.
8	• **Current document reference:** NP003, Section 5.23, Page 8. • **New document reference:** Page 8, Section 3.8. • **New document heading:** Mains Connection. • **Update:** Hyperlink added.
9	• **Current document reference:** NP003, Section 5.25, Page 8. • **New document reference:** Page 8-9, Section 3.8. • **New document heading:** Supply to Rural and Remote customers. • **Update:** Hyperlink added for cable sizes and heights x 3.

Ref	Description of Updates
10	• **Current document reference:** NP003, Section 5.45, Page 11. • **New document reference:** Page 11, Section 3.12. • **New document heading:** Underground Services in URD Substations. • **Update:** Added points: (a) Power and Water to own & maintain customers meter box except for rule 3.13; and (b) Power and Water determines most suitable mains connection position in accordance to rule 6.2.2.
11	• **Current document reference:** NP003, Section 5.47, Page 12. • **New document reference:** Removed. • **New document heading:** Underground Services in Nominated Areas of Palmerston. • **Update:** Section removed – Obsolete.
12	• **Current document reference:** NP003, Section 5.61, page 16. • **New document reference:** Page 14, Section 3.21. • **New document heading:** Point of attachment. • **Update:** Hyperlink added.
13	• **Current document reference:** NP003, Section 5.63-1, Page 17. • **New document reference:** Page 15, Section 3.22.1. • **New document heading:** Number of Services – Background. • **Update:** Section updated – Removed 1st paragraph to put ownership onto PWC instead of Manager discretion.
14	• **Current document reference:** NP003, Section 5.63-2, Page 17. • **New document reference:** Page 15, Section 3.22.2. • **New document heading:** Number of Services – Guidelines. • **Update:** Section updated - provides clearer understanding that the customer is responsible for associated costs.
15	• **Current document reference:** N/A. • **New document reference:** Page 16, Section 3.23. • **New document heading:** Main Switch Boards with more than one incoming mains LV supply. • **Update:** Section added – Describes requirements for a potential of 2 incoming mains and the trapped key interlocking system.
16	• **Current document reference:** N/A. • **New document reference:** Page 16, Section 3.24. • **New document heading:** Main Switch Boards approval compliance. • **Update:** Section added – Outlines requirements to get above 100a CT metering.
17	• **Current document reference:** NP007, Section 1.8, Page 4. • **New document reference:** Page 18, Section 4.10. • **New document heading:** Damage to Meters or Service Equipment. • **Update:** Section updated - provides clearer understanding that the customer is responsible to cover costs associated to damaged equipment.
18	• **Current document reference:** NP007, Section 2.2, Page 7. • **New document reference:** Page 19, Section 5.2. • **New document heading:** Number of Services. • **Update:** Section updated – provides clearer understanding Power and Water is responsible.

Ref	Description of Updates
19	• **Current document reference:** NP007, Section 2.7.3, Page 8. • **New document reference:** Page 20, Section 5.7.3. • **New document heading:** Further information. • **Update:** Section updated – Updated contact details.
20	• **Current document reference:** N/A. • **New document reference:** Page 21, Section 5.10. • **New document heading:** Supply to leased areas and administrative lots. • **Update:** Section added – Gives information on responsibilities and requirements.
21	• **Current document reference:** NP007, Section 3.2, Page 9. • **New document reference:** Page 22, Section 6.2. • **New document heading:** Connection to the Premises. • **Update:** Section updated – Clearly defines Power and Water ownership and REC requirements. Hyperlinks added.
22	• **Current document reference:** NP007, Section 4.1.2, Page 11. • **New document reference:** Removed. • **New document heading:** Multi-tenanted Commercial Installation – LV metering. • **Update:** Section removed – Obsolete.
23	• **Current document reference:** NP007, Section 4.7, Page 15. • **New document reference:** Page 27, Section 7.7. • **New document heading:** High Voltage Installations. • **Update:** Section updated – to include customer loads, HV customers and Power and Water requirements. Hyperlink added.

Table 8: Description of updates

11.Further information

If further information is required, please contact:

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Contact

Service and Installation Rules
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PowerWater