Northpower Electricity Network Standard

Supply Options for Low Voltage Customers

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Table of Contents

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Document Purpose

This standard details Northpower Networks requirements for electricity supplies to common low voltage customers

1. Introduction

This document summarises Northpower's approach to supplies for common low voltage reticulation and includes technical details on electricity metering.

The document is intended to provide a basis for Northpower personnel quoting for developers. It may also be sent to developers directly to provide information on the options available.

Note that the document is applicable to connections within the Northpower network area. Personnel designing for other network areas must obtain the design parameters applicable to those networks.

2. References

Reference	Details
ENS 01.06.024	EEA Metering Safety – Good Practice Guide
ENS 02.01.030	Design and As Built Plans with Service Connections
ENS 03.01.015	Fusing Policies
ENS 03.01.035	Subdivision Design Guide
ENS 03.02.025	Transformers – Transformer Selection
ENS 05.02.020	Unmetered Electricity Supplies
ENS 05.02.035	Supply Options for Collective Residential Developments
ENS 05.01.010	New Service Connections
ENS 05.02.037	Network Requirements for Installation and Inspection of Builders Temporary Supplies
ENS 13.01.010	CBD – Distribution Substation Demand
AS/NZS 3000	Electrical Wiring Regulations

3. Supply Options

3.1. Residential, Urban and Rural - Standard Design

Underground reticulation

This shall be designed so that two phases are available at the boundary of each lot, including those serviced by spur cables along access ways and rights-of-way. In general, reticulation will be 3 phase with one fuse per lot at the pillar services, plus allowance for a second fuse to be fitted only when required. In underground areas, construction plans shall show the phase allocated for the first connection and the phase for the second if required.

Overhead Reticulation

The load shall be balanced across the three phases by connecting service lines to sequential phases. The Developer may request the reticulation to be designed to a higher capacity.

The service to a "standard" dwelling will generally be single phase except where there is a long service line and an additional phase is required to reduce the voltage drop. Large dwellings (load in terms of electrical load) will generally be two phases.

When individual consumers request greater capacity, diversity of the original design LV network can be considered.

Where there is only a single customer to be connected to a transformer the customer's phasing should match the transformer phasing. For details refer to *Section 6 Typical Phasing and Fusing Requirements for New Connections*.

3.2. Urban Commercial

Underground reticulation shall be designed so that three phases are available at the boundary of each lot. Generally the minimum capacity of 60A without diversity. In regard to the design of commercial and industrial parks, where the load of individual lots are not known, the design should be based on 300 kVA transformers. (Note: 300 kVA transformers can be easily upgraded to 500 kVA as they have the same footprint). In regard to LV feeders there should be a minimum of 4 feeders for each distribution substation (or the provision for at least 4 feeders). The LV feeders should be based on 185 mm^2 AL size conductor.

3.3. Industrial

There are three options for industrial reticulation.

- Option 1: Size as per commercial. This will be generally more applicable to light industrial zones and small scale industrial development.
- Option 2: Design capacity to be specified by the developer, but should be no smaller than Option 1.
- Option 3: Install suitable ducting and have locations where distribution transformers and switchgear can be installed. i.e. provision made for an electricity supply. A suitably wide road berm can be considered as a future location for distribution transformers and switchgear. A no-supply encumbrance will need to be registered against the title if it is part of a subdivision.

This approach would be suitable where the electricity requirements are not known at the time. The scale of the development is significant as the electricity requirements of industrial consumers can vary widely.

3.4. Heavy Industrial

This should be designed to developer's or consumer's specific requirements.

3.5. Rural Industrial

Generally the supply will be three phase for most situations, e.g. dairy shed, large pumps etc. Extra light industrial installations single phase if required. "Extra light" generally refers to small pumps, and implement sheds with minimum electrical load. LV fuse will be sized to suit the situation.

4. Connection Details

4.1. Streetlighting

Streetlighting is to be generally to NZS6701 and to the satisfaction of the District Council. Control of the streetlight is to be achieved by a Ripple Relay (supplied at cost by Northpower). Individual fusing for streetlights shall be provided where the neutral is common to the 400V network. This fusing shall be at the nearest pillar in the case of underground reticulation.

4.2. Conductors must be Sized to Maintain Adequate Voltage Regulation

As well as considering the current rating, it is important to calculate the voltage-drops under the maximum load to ensure they do not exceed legal limits. The legal requirement is to provide a voltage within 6% of the nominal voltage at the point-of-supply and there is a further allowance of 5% voltage drop from that point to the individual appliances. Load calculations are based on the same diversity formula as for transformer selection.

4.3. ICPs must be Separately Disconnectable

Every supply shall be allocated a separate Installation Control Point (ICP) number. Generally an ICP covers one house or one flat. Provision shall be made for each ICP to be disconnected by removing a fuse link(s), normally located at the pole top or distribution pillar. In cases where a service line supplies more than one ICP, provision shall

be made to disconnect each ICP without affecting supply to any other ICP. This may require a lockable switch or fuses to be installed at the meter station.

For example, in a block of flats, there must be provision to disconnect each individual flat without requiring access to the interior of the flat.

4.4. More line charge options are available to individually metered dwellings

A mix of domestic 24-hour and controlled tariffs is available to individually metered domestic dwellings. The “low-use” pricing option is restricted to individually metered domestic dwellings. This “low-use” option was established in response to a government directive for line companies and electricity retailers to offer a domestic pricing option with a low fixed daily charge to benefit customers with low consumption. Northpower and most of the electricity retailers currently offer a “low-use” pricing option.

Metering points that are not installed at “a place of residence”, as defined in the Electricity Industry Reform Act 1998, will be charged non-domestic line charges. This includes “gate meters”, pumps and all commercial installations.

The full range of Northpower’s line charges is published on www.northpower.com under “Disclosure/ Line Charges”. The metering charges are included as one component of Northpower’s daily line charges.

4.5. Customer is Responsible for the Maintenance of Service Lines

The safety and maintenance of the service line (or cable) beyond each point-of-supply is the customer’s responsibility.

5. Meter Station Installation

5.1. Metered and Non Metered Supplies

Revenue metering equipment should be installed at all premises connected to the Northpower network unless arrangements have been made for a non metered supply.

Non metered supplies should only be utilised where there is a small load (extra light), consumption can be readily determined and special arrangements are made with Northpower and the retailer.

5.2. Meter Station

- Northpower will provide the metering and control equipment, unless special contractual arrangements are made in advance.
- Customers may provide their own check metering. However, the check meter must be clearly marked as 'check meter only'.
- The installation, maintenance and security of the meter station is the responsibility of the customer. Sufficient space is to be available for the required meters.
- In multiple meter installations, the controlled meter shall be positioned to the right (preferred) or below the uncontrolled meters.
- Each meter should be labelled with the appropriate tariff code.
- Each meter station shall be clearly labelled with the Installation Control Point (ICP) or premise number provided by Northpower.
- If a non metered supply is provided, a meter station will not be required. However, the installation shall still be clearly labelled with the ICP or premise number.
- Combined meter stations in multi tenanted buildings shall also have each meter clearly labelled with the flat number or tenant area.
- Once the meter station is EAC (Electricity Authority Certification) certified, a certification label is to be attached to the meter station. Certification is required every 15 years.
- Each installation shall be able to be separately isolated at a point on the supply side of the meters.
- Prepay meters can be used with the approval of the retailer.

5.3. New residential installations

- The meter station shall be outside and easily accessible from the road or access way.
- There shall be no fences, walls, obstructions, vegetation, dangerous animals or other hazards that restrict access to the meter station.
- The meter enclosure shall be weather proof and secure from unauthorised entry and interference.
- The meter station should be positioned to avoid direct sunlight, high ambient temperatures, excessive humidity, vibration, mechanical damage or interference from stock.
- The height of the meter displays should be between 1.4 and 1.8 m above the ground level and able to be easily accessed by a standing person. The bottom of the enclosure should be a minimum of 1.2 m above the ground or floor level.
- The meter station may be mounted in a secure ground mounted cabinet with meter displays below 1.4 m if necessary.
- If the meter station is liable to damage from stock the displays may be up to 2.1 metres above the ground.
- The meters shall be able to be read through a transparent window without having to open the enclosure.
- If there are hazards or entry restrictions on the property, the meter station should be installed on a suitable structure at an accessible location, e.g. the front boundary.

5.4. New commercial installations (including multi dwelling units and cowsheds)

- The meter station should be located outside (refer to residential requirements). However, it may be located inside the building if necessary for metering requirements or unavailability of a suitable outside location.
- Any inside meter station must be easily accessible during working hours. Access to the meter station should not pass through areas that are hazardous, restricted, have safety or hygiene requirements, or pass through areas owned or leased by other parties. The meters should be able to be easily read by a standing person. The meter station should also be secure and protected from damage.
- High rise or multi tenanted buildings should have all the meters located in an accessible central or communal area.

5.5. Existing installations

- The meter station must be accessible.
- Access to the meter station should not pass through hazardous areas.
- The meters should be secure and protected from damage.
- If the meters are inside there will need to be arrangements for access.
- Existing installations should meet the requirements for new installations when they are upgraded.

5.6. Access to Meter Stations

Northpower and the meter readers are required to access the customers meter station for installation, maintenance, auditing or reading. Legal access to the meter station and associated service should be covered in the electricity supply agreement between the electricity retailer and the customer.

Refer to ENS 01.06.024 EEA Metering Safety – Good Practice Guide. This document should be followed for technical details on meter stations.

6. Typical Phasing and Fusing Requirements for New Connections

6.1. Phasing

TRANSFORMER	STANDARD RESIDENTIAL	LARGE RES OR HI VD	EXTRA LIGHT	COMMERCIAL & INDUSTRIAL
15 kVA 1 Phase Paralled (Single phase output)	1	1	1	1
15 kVA 1 Phase Series (Dual phase output)	2	2	1	2
15 kVA 3 Phase Standard	3	3	1	3
30-75 kVA 1 Phase Series (Dual phase output)	1	2	1	2
30kVA and Over 3 Phase Standard	1	2 or 3	1	3

Notes:

- Standard residential dwelling: Average or normal load
- Large residential dwelling: Above average or extra load e.g. spa pool or underfloor heating.
- Extra large dwelling: Depends on consumer's specific requirements.
- High voltage drop (HI VD): Additional phase required to reduce voltage drop for long LV run.
- Extra light: Light load e.g. shed, small pump, cabinet, temporary or caravan supply.
  Not intended as dwelling i.e. no stove or hot water.
  Not intended for future development.
- Commercial and Industrial: Depends on consumer's specific requirements.

Where there is only a single customer is intended to be connected to a transformer the phasing of the customer should match that of the transformer unless the supply is extra light.

Light commercial may be connected single phase if the load is less than or equal to an average house.

Where multiple phases are supplied, the customer's load should be spread as evenly as is practical across the available phases.

3 phase domestic or light commercial may be connected with 2 phases uncontrolled and the 3rd phase controlled if there are cabling constraints between the meter station and switchboard.

Note that pricing options for the Northpower network are independent of the number of phases connected and the fuse rating.

6.2. Fusing

The Northpower service fuses are intended to protect the network and to provide fault protection for the service line and should not be relied on to provide overload protection for the service line or the installation. The installation owner is responsible for providing overload protection (fuse or circuit breaker) for each service line.

Supply	Maximum Current Ratings for Customers
Single Phase Extra Light	30/32A (lower rated fuses may be used to suit requirement)
Single Phase	60/63A (up to 100A for single phase transformers)
Two or Three Phase Whole Current Metering	60/63A to 100A per phase
Three Phase CT Metering	Over 100A per phase

Residential and light commercial customers are generally fused at 60/63A regardless of phasing. Customers connected to transformers 30 kVA and less will generally require lower rated fusing.

Where there is only a single customer is connected to a transformer the fusing of the customer should not exceed the transformer's rated current.

For details of fusing refer to ENS 03.01.015 Fusing Policies

7. Metering Wiring Diagrams

This table is to give guidance on the wiring of meter stations for common situations and does not cover high voltage metering.

Table of Metering Diagrams without Distributed Generation

Installation Description	Metering Diagram	Plan No
Single phase metering without controlled Phase	Plan 1	2G228s7
Single phase metering with controlled phase	Plan 2	2G228s8
Installation with 2 or 3 ICP's. 3 phase service and combined meter board.	Plan 3	2G228s9
Installation with more than 3 ICP's. Three phase service and combined meter board.	Plan 4	2G228s10
3 Phase supply with 2 uncontrolled phases and one controlled phase.	Plan 5	2G31s1
2 Phase supply with 2 uncontrolled phases and controlled Phase.	Plan 6	2G31s2
3 Phase supply with one controlled Phase.	Plan 7	2G38s1
3 Phase supply with 3 phase controlled Phases.	Plan 8	2G35s1
Installation with up to 3 ICP's. 3 phase and single phase ICPs with and without controlled phases.	Plan 9	2G228s11
Standard connection for 230/400V, 3 phase 4 wire CT meter installation & test block.	Plan 10	2G228s3
Single phase day/night dual tariff	Plan 11	2G228s12
3 phase day/night dual tariff (school special)	Plan 12	2G228s13
Single phase temporary builders supply	Plan 13	2G228s14
Single phase metering (pre paid controller "esmart") without controlled phase	Plan 14	2G228s16
Single phase metering (pre paid controller "esmart") with controlled phase (ripple receiver)	Plan 15	2G228s17
Single phase metering (pre paid controller "esmart") with controlled phase (with pilot wire and contactor)	Plan 16	2G228s18
Dual single phase metering with controlled phase	Plan 17	2G228s21
Electrical Boundaries	Plan 20	2G228s15

Table of Metering Diagrams with Distributed Generation

Installation Description	Metering Diagram	Plan No
Single phase metering without controlled phase for distributed generation	Plan 1A	2G228s20
Single phase metering with controlled phase for distributed generation	Plan 2A	2G228s19
3 Phase supply with 2 24-hour phases and one controller phase for distributed generation	Plan 5A	2G31s3
2 Phase supply with 2 24-hour phases & one controlled phase for distributed generation	Plan 6A	2G31s4

(Cad path is: k/CAD/Master/Metering/No.)

Typical Equipment Dimensions

Equipment	Length (mm)	Width (mm)	Depth (mm)
Single phase meter – short terminal cover	160	110	60
Single phase meter – long terminal cover	200	110	60
3 phase whole current meter– short terminal cover	160	180	80
3 phase whole current meter– long terminal cover	240	180	80
3 phase CT meter– short terminal cover	200	180	100
3 phase CT meter– long terminal cover	260	180	100
Ripple Receiver	110	160	70
Smart Meters (owned by retailer)	Refer to retailer for dimensions		

Notes:

- The diagrams apply only to Northpower owned metering equipment (includes ripple receiver contactor).
- Northpower will supply a controlled supply to a maximum rating of 20A. If a load greater than 20A is controlled, e.g. spa pool, the customer is required to fit an auxiliary contactor.
- Equipment and wiring must have adequate load and fault ratings.
- The colours used in the diagrams are to distinguish between different phases, neutral and earthing conductors. The colour of the wiring should comply with AS/NZS 3000 Electrical Wiring Regulations rather than the diagrams.
- Approval of non standard arrangements should be referred to Northpower's Network Planning Department.
- * These diagrams apply to new meter stations or meter stations that are being significantly upgraded. Excludes meter replacement. Note: where a ripple receiver or contactor is replaced on a planned basis, an HRC or MCB should be installed, if there is none.
- For "controlled" options refer to Northpower's tariff options.

Glossary of terms

CT: Current Transformer

HRC: High Rupturing Capacity

ICP: Installation Control Point

MCB: Miniature Circuit Breaker

RCD: Residual Current Device