



**NETWORK CONNECTION STANDARD
(Distribution Code)**

Requirements for connecting to the distribution system of
WEL Networks
February 2024

WEL Networks Ltd
114 Maui Street, Te Rapa
PO BOX 925, Hamilton, New Zealand

Website: <http://www.wel.co.nz>
Telephone: 0800 800 935

IMPORTANT

This network connection standard is a working document.

It may be subject to change from time to time to reflect industry changes and changes to comply with legislation and good industry practice.

Such changes may take place without prior notice to users of this standard. However, changes are recorded.

As a user of the WEL network it is your responsibility to ensure that you possess the most up to date version (the version of this document is shown on the next page).

Copies of this network connection standard can be downloaded from the WEL website: www.wel.co.nz or may be obtained from WEL by contacting us on 0800 800 935 option 4

REVISION RECORD

Doc. Code	Doc. Title	Issue No.	Description of Changes	Approval	
				Signature	Date
NCS	Network Connection Standard	Rev0	Original issue	J van Brink	1 May 2009
NCS	Network Connection Standard	Rev1	Clarifications to metering sections	J van Brink	13 Aug 2009
NCS	Network Connection Standard	Rev3	General update to reflect changes in the industry and associated standards	Tas Scott	19 May 2014
NCS	Network Connection Standard	Rev3.1	Amendments to 2.7 – Connection of Streetlight circuits	Paul Goslett	6 Oct 2014
NCS	Network Connection Standard	Rev3.2	Update of metering requirements for New Connections	Paul Blue	29 Mar 2016
NCS	Network Connection Standard	Rev3.3	Clarify of metering requirement for Distributed Generation	Paul Blue	31 Jul 2017
NCS	Network Connection Standard	Rev3.4	Section5 Meter box size requirement further elaborated based on public feedback	Paul Blue	8 Aug 2017
NCS	Network Connection Standard	Rev 3.5	Section 2.3 added requirement for an incoming CB on a main switchboard for connections above 160A	Mat O'Neill	8 Apr 2020
NCS	Network Connection Standard	Rev 3.6	Section 2.4 updated that provision for service mains will be developers' responsibility. Section 2.6 WEL's smart box requirements for DG sites updated. Section 2.7 street light fusing requirement updated. Section 4.4 power factor requirement updated. Contact methods and other general updates at various places. Section 4.3 fault level consideration updated.	Mat O'Neill	8 Dec 2020
NCS	Network Connection Standard	Rev 3.7	Added Section 2.5.1 detailing the treatment of hard tapped connections.	Mat O'Neill	12 Sep 2022
NCS	Network Connection Standard	Rev 3.8	Clarified requirements around unbalanced loads (Section 4.4).	Mat O'Neill	22 Aug 2023
NCS	Network Connection Standard	Rev 3.9	Updated Section 7.2 to clarify the Collection of metering information.	Mat O'Neill	27 Oct 2023
NCS	Network Connection Standard	Rev 3.10	Updated Section 2.5 connection upgrade requirements and Section 2.6 detailing smart box requirements for DG sites.	Mat O'Neill	12 Feb 2024

CONTENTS

1	GENERAL	6
1.1	Introduction.....	6
1.2	Scope.....	6
1.3	Status of this Standard.....	6
2	NEW CONNECTIONS	7
2.1	Introduction.....	7
2.2	Ownership Boundary Responsibilities.....	7
2.3	Arranging a New Connection.....	9
2.4	Arranging for electrical reticulation in a new subdivision.....	9
2.5	Upgrading (and downgrading) Existing Connections.....	10
2.5.1	Hard tapped connections.....	10
2.6	Connection of Distributed Generation.....	10
2.7	Connection of Streetlight Circuits.....	11
3	NETWORK DESIGN AND CONSTRUCTION	12
3.1	General.....	12
3.2	Network Extensions Built for WEL.....	12
3.3	Connecting Subdivisions to WEL’s Network.....	13
3.4	Design standards and technical specifications.....	13
3.5	Ownership of Existing Poles and Lines.....	13
4	ELECTRICAL INSTALLATIONS	13
4.1	Access and Easements.....	14
4.2	Electrical Protection.....	14
4.3	Fault Level Considerations.....	15
4.4	Interfering with the Operation of WEL’s Network or Other Installations.....	15
4.5	WEL Owned Substations on Connected User Premises.....	16
4.6	Relocation or Removal of WEL’s Plant or Equipment.....	16
4.7	High Voltage Installation Owners.....	17
4.8	Reconnection of Existing Premises.....	17
4.9	Demolition or Removal of Existing Premises.....	17
4.10	Final Meter Reading of Existing Premises.....	17
4.11	Temporary Disconnection for Safety Reasons.....	17
4.12	Trees.....	17
4.13	Hazards.....	18
5	METERING EQUIPMENT	18
6	SERVICE LEVELS	19
6.1	Security of Supply.....	19
6.2	Quality of Supply.....	19
7	NETWORK OPERATION	21
7.1	Connected User Service.....	21
7.2	Provision of Information.....	21
7.3	Planned Interruptions.....	22
7.4	Disconnections.....	22
7.5	Unplanned Interruptions.....	22
7.6	Emergency load shedding.....	22

7.7	Civil emergencies.....	23
8	LOAD MANAGEMENT.....	23
8.1	Introduction.....	23
8.2	Connected Users’ Responsibilities	23
8.3	WEL Networks’ Responsibilities	24
9	DEFINITION OF TERMS	24

1 GENERAL

1.1 Introduction

This Network Connection Standard summarises the requirements which must be complied with by anyone connecting equipment to the WEL Networks distribution system and also provides guidance on how we manage our electricity network. It is relevant to all stakeholders in WEL Networks business (hereafter referred to as WEL) including electricity retailers, users, developers, contractors, consultants and shareholders.

1.2 Scope

This document covers standards for connections, network design and construction, connected user installations, metering equipment, service levels, network operation and load management.

For the definition of terms refer to Section 9 – Definitions of terms.

While this standard contains some specific details on technical matters, it serves as a guide to other documentation on WEL standard practices, procedures and policies.

All of these are available from the WEL website www.wel.co.nz or by contacting us on 0800 800 935 option 4.

1.3 Status of this Standard

This standard substantially sets out WEL's current procedures and practices, which may be modified or amended at our discretion, subject to WEL at all times meeting all necessary legislative and regulatory obligations. When this standard is modified or updated, unless stated otherwise, any new requirements are effective from the date of issue and apply to any new connections or other modifications from this date onwards. Users of this standard should ensure that they have the current issue.

If you intend to rely on the terms of this standard and incur expenditure you should first check with WEL that it is appropriate to do so in your particular circumstance.

This standard does not of itself create any legal obligations between WEL and any other party except to the extent that any other agreements require compliance with this standard by WEL, the electricity retailer or the connected user.

Connected users, in their contracts with electricity retailers, are also required to comply with certain provisions of this standard. This is necessary for safety reasons and for the efficient operation of our network.

Enquires in relation to this network connection standard should be directed to:

GM Asset Management

WEL Networks Ltd

114 Maui Street, Te Rapa

PO BOX 925, Hamilton, New Zealand

Telephone: +64 7 850 3100

2 NEW CONNECTIONS

2.1 Introduction

Before connecting any new home or business to the electricity network, WEL must be satisfied that the connection can be made safely, without adversely affecting the delivery of electricity to other connected users.

All new connections to our network or increases in load beyond an existing agreement or increases to existing mains fuse/protection devices are made at our discretion. There must be sufficient capacity and a suitable configuration available.

The steps in the connection process are set out in this document, which covers the process for permanent connections, as well as temporary connections for construction purposes.

The installation and livening of a connection must be carried out by an approved contractor who is authorised by WEL.

2.2 Ownership Boundary Responsibilities

As defined in Section 3 of the Electricity Act 1992 the point at which the "Works" owned and operated by WEL stops and the "Electrical Installation" owned by the electricity consumer commences is called the point of supply (POS).

Where the voltage at the consumer's POS is other than standard low voltage (400V/230V) (i.e. 11 kV or 33kV), the POS is defined in a specific agreement between WEL and the customer. Although generally all assets and fittings on the distribution network side of the POS belong to WEL, while those on the customer's side belong to the customer, there are some exceptions i.e.:

- WEL will own and maintain certain equipment on a connected user's premise, including a Smart Box and/or load control relays. The connection equipment at the POS location shall comply with WEL's Design and Construction standards and shall incorporate a means to allow WEL to disconnect a user.
- For High Voltage connections between the WEL distribution system and the connected user's system the POS will be subject to specific written agreement between the two parties. Note the normal connection arrangement where transformers owned by WEL are located on private property is for the POS to be located at the LV output of the transformer.

The POS for LV service "Mains" is defined as follows:

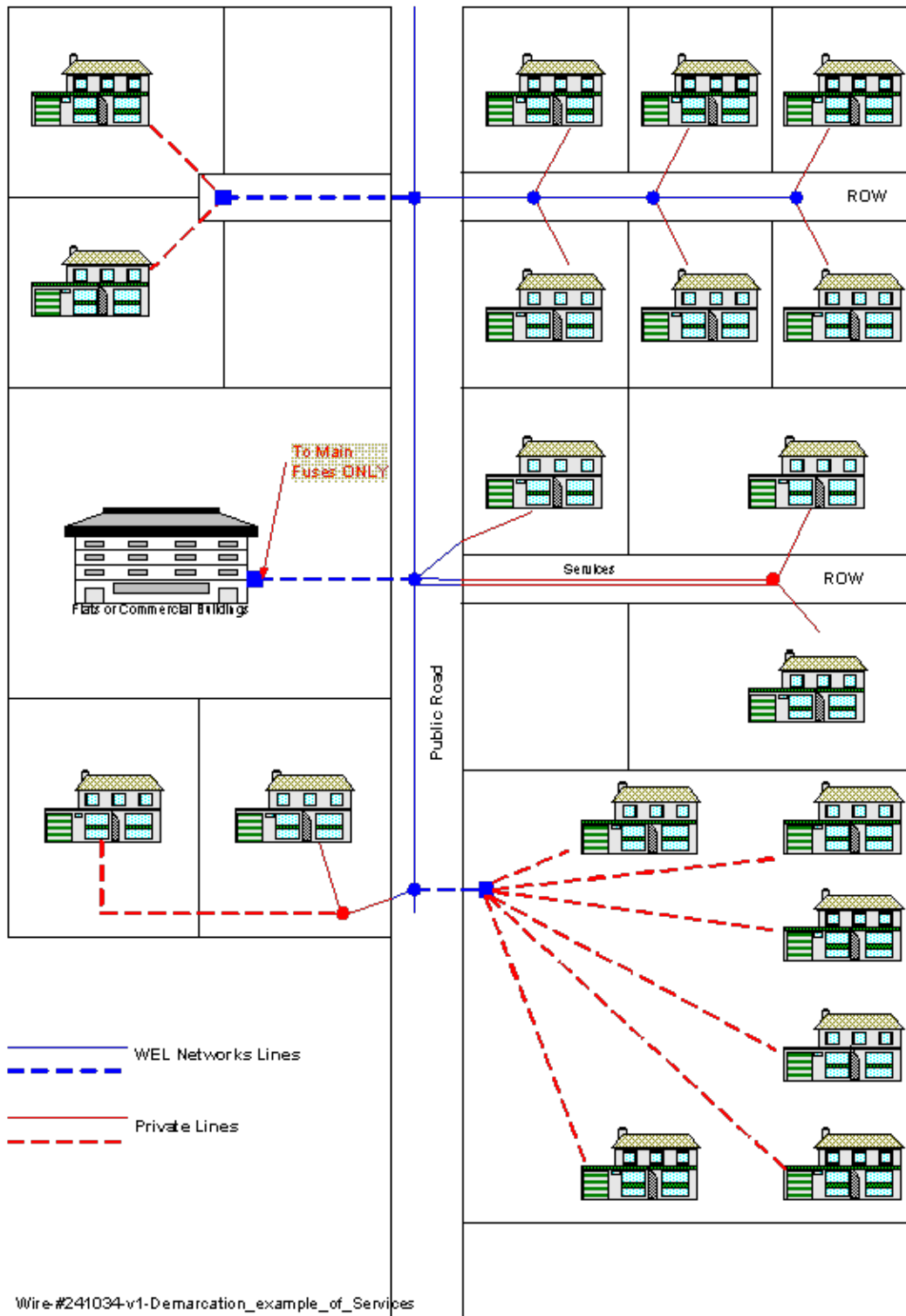
1. The primary defining feature is the last LV fuse before the service "Mains" enters a building.
2. Where the fuse is in the road reserve or other public area, the point at which ownership changes from WEL to private is at the property boundary of the customer, whether it is an overhead or underground service.
3. Where the LV fuse is located inside a private property the ownership transition is at the fuse and the pole or pillar where the fuse owned by WEL is mounted.

The above is defined in the diagram below for various cases.

If there are cases that are not covered, then WEL will determine them on a case by case basis.

WEL does not record the detailed location of customer owned "service main" cables or overhead line fittings.

Demarcation For Service Ownership



2.3 Arranging a New Connection

WEL no longer provides unmetered temporary connections (also known as “builders’ supplies”).

Before work to establish a new connection to our network can start, WEL needs to be satisfied that the network configuration at the location is suitable and sufficient capacity of electricity is available to supply the new connection.

If there is not sufficient network capacity, the network may need to be upgraded to meet the regulatory standards for quality of electricity to the new connected user or existing nearby connected users. WEL’s Capital Contributions Policy is used to determine the customer contribution required.

Before a permanent connection is constructed and livened the following information must be supplied

- a completed and signed electricity application form supplied to WEL via your Electricity Retailer <https://www.wel.co.nz/get-connected/>
- evidence of compliance with statutory electrical regulations and codes of practice (i.e. an Electrical Certificate of Compliance)
- for residential connections, a meter box as per detail size requirements in Section 5.

New installations that are requested to be Metered and Livened onto the WEL network area, that **DO NOT** comply with the above size requirements, **WILL NOT BE CONNECTED**.

Once our requirements have been met, a retailer has taken responsibility for the connection, and the application form has been processed, approval of the connection capacity will be confirmed in writing and WEL will assign an ICP number. Refer to Section 5 for metering requirements.

Note: Wherever possible connected users should design their installation to take advantage of ripple control. This can result in significant savings in ongoing delivery charges.

For larger or more complex new connections to the network, WEL will discuss any specific requirements with the applicant and may require a specific agreement. More details are available from our web site or by contacting us on 0800 800 935 option 4.

Note that for connections above 110kVA or 160amps, the incoming isolating device to their main switchboard shall be a circuit breaker with correctly coordinated protection.

2.4 Arranging for electrical reticulation in a new subdivision

The initial application can be made by selecting Subdivision or Development. via WEL’s website (<https://www.wel.co.nz/get-connected/>). For new subdivisions WEL will arrange for an appropriate person to discuss the proposal with the applicant.

As part of the subdivision process, WEL constructs and provides electricity supplies to the boundaries of the new subdivided lots. If the access to the new lots will be via a privately owned road (e.g., rights of way, access lots, access ways or anything that will not be vested to the local roading authority) then:

- If there is sufficient berm space to allow the safe installation, maintenance and operation of WEL's asset, WEL can extend its network into the private land under WEL's standard easement terms and conditions. This will be assessed on a case by case basis.
- If there is insufficient berm space, WEL will only provide the Point of Supply at the roadside boundary between the public and private land. The provision for service mains (e.g. ducting

and/or cabling such as service tails) will be the developers' responsibility as part of the subdivision process

2.5 Upgrading (and downgrading) Existing Connections

If the load at an existing connection is to be increased (or decreased) an application must be made for the change in capacity. This ensures the upgraded load does not exceed the capacity available at the POS. It is also necessary to determine if the network has sufficient capacity to supply this additional load within the voltage levels required by regulation. This application may be submitted via WEL's website as used in Section 2.3. A downgraded installation will ensure that surplus network capacity can be utilised by other consumers.

Where the load at an existing connection exceeds the capacity available at the POS resulting in network issues such as blown fusing, and no application to upgrade the connection has been made, WEL may take steps to rectify or mitigate such issue(s) at the connected user's cost.

2.5.1 Hard tapped connections

Where an existing connection is supplied from a hard tapped connection to the low voltage network WEL owns up to the connection point or service fuse.

Where change is required to an existing connection that is hard tapped, to align with current standards, a new pillar is to be installed at the property boundary.

2.6 Connection of Distributed Generation

General

Distributed Generation (DG) means equipment that is used for generating electricity that is connected to a distribution network and capable of exporting energy into the network (even if an actual export seems unlikely). Any generating plant that is intended to be operated while synchronized to the network is deemed to be capable of exporting energy (Generation used for localized or islanded purposes is excluded).

DG examples include solar photovoltaic (PV), battery systems, wind, gas, diesel and biomass. The capacity of DG can vary across a wide range, e.g. from small scale domestic PV system of several kW connected via inverter system, to a large scale commercial wind farm of tens of MW connected via dedicated HV substations.

Installing distributed generation can be complex and has a wide range of implications including safety, network performance and power quality, all of which may require further investment in the network prior to connection.

WEL is supportive of the development of safe and reliable distributed generation within our network. WEL's policies and procedures call for an application to be made to WEL before any connection can be made to the network in accordance with the requirements of Part 6 of the Electricity Industry Participation Code.

Any agreement to connect distributed generation to our network may include costs associated with design, safety and reinforcement of the existing network. If network modifications are required, the

design and schedule for this project work will need to be factored into your installation planning and/or costing.

Specific Metering Requirement for DG connected at LV

As stated in section 5, all installations must allow space for a WEL Smart box to be installed. With respect to DG installations a WEL Smart Box is mandatory and shall be installed at each DG site that is connected at LV for compliance monitoring and network management purposes.

- For Category 1 metering site - WEL will arrange the installation of the Smart Box.
- For Category 2 metering site - the DG owner shall provide the required CT and VT connection and the space required for housing the meter. WEL will arrange the installation of the Smart Box.

The meter board must contain the Smart Box. WEL will cover the Smart Box installation cost excluding any cost related to physical space restrictions (such cost being the responsibility of the distributed generator).

Installation and Protection Requirements

The technical requirements for connecting an inverter based DG up to 200kVA must meet the requirements AS/NZS4777.1 2016 and AS/NZS4777.2 2020.

For other generator types, the distributed generator must be equipped with the appropriate protection elements as required by the “EEA Guide for the Connection of Generating Plant”. Distributed generators must consult WEL with regard to any special arrangements or protection that may be necessary due to the characteristics of the generator and network.

Connection Process

If you are interested in making an application to connect distributed generation, please view our web site for information on the process or contact WEL’s Customer Services team.

2.7 Connection of Streetlight Circuits

All proposed streetlight connection designs must be approved by WEL prior to commencement of construction. WEL will not connect any street light circuits unless the design is first reviewed and approved by WEL. Only WEL has the authority to live street light circuits.

WEL will assume ownership of streetlight circuits up to the point of supply being the fuse base at each street lighting column or where a light fitting is mounted on our poles via an outrigger arm the point of supply will be at the point where the light fitting supply becomes exclusive. Each street light shall be fused at, or immediately next to, its point of supply. For existing street lights that are not fused, fusing shall be retrofitted during any street light work, e.g. light upgrade, replacement, or fault repairs.

In order to expedite this process, WEL requires all parties wishing to connect streetlights, as well as the associated consultants or contractors, to submit the proposed design and drawings (regardless of the number of lights to be connected). The design will be checked to ensure it meets all WEL’s standards and design specifications. Once the design review is completed WEL will advise of any changes required to meet WEL standards. A revised design must then be submitted to WEL for final acceptance and approval.

In parallel with the submission of the design for verification by WEL, the person wanting to connect the streetlights must complete an application (<https://www.wel.co.nz/get-connected/>) for new supply or increase in load (as per section 2.3) to the nominated retailer who will then confirm to WEL that they accept the change in connection.

Where WEL is completing the electrical design, a street light layout diagram is required with unique streetlight numbers assigned to each streetlight location which can be used for design purposes. Where a design is undertaken by a party other than WEL, the full streetlight design including electrical design and details of lamp fitting loads must be submitted to WEL for approval. Allow a minimum of 15 working days for the turnaround of all applications.

Prior to commencement of construction, WEL must be notified of the project schedule and actual construction dates. This is to enable WEL representatives to undertake site visits to collect GPS coordinates of the newly installed cable and to ensure that the installation complies with WEL standards. Only then will WEL allow the installation to be connected to its network.

The installation shall comply with WEL's Design and Construction Standard (relevant sections of this standard are available on request). New cables that have not yet been connected shall be coiled in a safe manner and location. Please note that all new or modified streetlight information is required to be recorded with the relevant roading authorities' database. WEL reserves the right to request this information for audit purposes.

On completion of the work and prior to livening by WEL, WEL requires the following:

- An approved application for new supply or increase in load.
- Provision of signed Electrical Certificates of Compliance and Records of Inspection.
- Submission of all associated as-built drawings (to be approved by WEL)
- Confirmation of 224c sign off from the appropriate authority. This relates directly to the transfer of ownership of the street light columns and associated future billing.

As-built documentation shall be submitted to WEL in accordance with Section 7.2 "Provision of information" of this document.

Please note that if circuits are connected without proper authorisation, WEL reserves the right to disconnect these circuits.

3 NETWORK DESIGN AND CONSTRUCTION

3.1 General

WEL has detailed and comprehensive standards for design and construction to ensure that the network is safe and conforms to statutory requirements as well as license conditions placed on an owner and operator of an electricity network.

All WEL owned network extensions must comply with our design standards. Where the network extension is to be owned and operated by a party other than WEL, we require sufficient details to ensure the new network is electrically safe to be connected and will not impinge on existing users.

3.2 Network Extensions Built for WEL

Where WEL requires an extension to our network, we will ensure that it will comply with our design and construction standards by rigorous review of the design proposals and subsequent auditing of the construction work.

To ensure consistent work quality, all work is carried out by WEL or WEL approved contractors.

3.3 *Connecting Subdivisions to WEL's Network*

For new subdivision reticulation projects close liaison is required with us during design and construction. This liaison ensures that adequate reinforcement of our network can be executed where necessary in order to supply the subdivision load.

Where the subdivision is to become part of our network, it must be constructed in accordance with our design and construction standards to meet our requirements.

3.4 *Design standards and technical specifications*

WEL's Design and Construction Manual and technical specifications incorporate the latest industry standards and practices and are regularly updated. Distribution of the standards is via "Controlled Copies", which are issued to relevant WEL personnel as well as approved consultants and contractors. At WEL's discretion uncontrolled extracts may be issued as required by the nature of the work.

3.5 *Ownership of Existing Poles and Lines*

The ownership of poles and lines is complex, mostly because of historical reasons.

Poles that carry 33kV lines and/or 11kV distribution lines (and may additionally carry 400V lines) for network purpose are always owned by WEL, irrespective of their location (including private property). Poles on private property that carry 11kV or 400V lines dedicated solely to the owner of that property are generally not owned by WEL. Ownership of 400V poles and lines on a "right-of-way" varies.

WEL and potentially other service providers (e.g. Chorus Ltd) own poles on roadways and rights-of-way. Where there are sets of poles on both sides of the road, generally, WEL owns the poles on the side of the road that carry the main lines. Poles on the opposite side of the road that carry the lines owned by these service providers as well as WEL's lines are generally owned by the other service provider. Any crossarm carrying WEL lines is owned by WEL. WEL will or has entered into an explicit agreement with these service providers governing ownership and maintenance of these poles.

The respective owners have the responsibility for safety and maintenance of their power poles, power lines and associated fittings.

For specific lines, clarification can be obtained by contacting WEL's Customer Services team on 0800 800 935 option 4 or by emailing customer@wel.co.nz.

4 ELECTRICAL INSTALLATIONS

An "electrical installation" is the electrical conductors and fittings which convey electricity within the consumer's side of the POS, excluding appliances. The connected user owns the installation and is responsible for providing and maintaining it. All electrical installations connected to the WEL network shall be electrically safe and comply with AS/NZS3000. See definitions in this standard as well as the Electricity Act 1992 and Electricity (Safety) Regulations 2010 for further clarification.

4.1 Access and Easements

Some parts of WEL's network and associated equipment are located on private property, including equipment such as metering and/or control equipment fitted to the connected user's meter board. WEL's right to have equipment located on private property (other than equipment and metering and control equipment fitted as of right to the meter board as covered under WEL's Distributor Agreement with the Electricity Retailer) may be covered by either an easement or lease agreement. If neither exists, legal rights are governed by sections 22, 23, and 35 of the Electricity Act 1992 for network equipment installed prior to 1 January 1993. The present practice for the installation of new WEL owned network equipment on private property is for an easement to be established to protect the right of WEL for access to operate and maintain the equipment.

In general, WEL requires access to private property on a limited basis for the future maintenance and operation of equipment. Where possible, contact will be made with the occupier to provide reasonable notice prior to entry on to the premises. It is customer's responsibility to advise the specific health and safety requirements and necessary induction (or site supervision) to facilitate WEL's access. However, in an emergency, access may be required at any time without prior contact with the owner. The occupier shall ensure that 24 hour unobstructed access is available, so WEL can access its assets and respond to emergencies without the need to contact any other party.

4.2 Electrical Protection

Electrical protection on each service connection is required to protect personnel and property. Some parameters of protection operation are stipulated in the Electricity Regulations. To ensure correct operation of the equipment, WEL's protection and the connected user's protection must be compatible and correctly co-ordinated.

Safeguarding of WEL's network

Maximum clearance times must be within the limits established by WEL in accordance with protection settings and equipment short circuit ratings.

Safeguarding a connected user's installation

The electricity supply to a connected user's installation may be subject to multiple short interruptions caused by switching facilities that may be in use on our network. We will, on request, provide details of auto re-closing or automatic switching facilities, including protection arrangements, so the connected user can take this into account during the design of their installation.

Protection against damage

With certain types of fault protection arrangements on our network one phase of a three phase supply may disconnect. The connected user should therefore ensure equipment such as three phase electric motors are adequately protected, as required by AS/NZS3000, from phase failure, earth faults, surges, overload and over/under voltage.

Discrimination in operating times

Adequate discrimination must be maintained between the operating times of any connected user protection equipment and WEL's equipment. We may request evidence of satisfactory discrimination.

Protection of distributed generators

For protection of the distributed generation see section 2.6.

Protecting sensitive equipment

Modern electronically controlled appliances are much less tolerant of electrical spikes and surges than older appliances. To reduce the impact of fluctuations on sensitive equipment we recommend that connected users install appropriate surge protection devices as recommended by the equipment suppliers. Protection requirements for electrical installations are covered by AS/NZS3000.

Metering equipment

Refer to Section 5.

4.3 Fault Level Considerations

The short circuit rating of connected user fittings at the POS must be not less than the design fault level of our network. Design fault levels are specified in our design standards and are available on request. It is the responsibility of the electrician designing and/or building any electrical installation to determine all applicable characteristics of the electrical supply as required by Section 1.6.2 “Supply characteristics” of AS/NZS3000.

4.4 Interfering with the Operation of WEL’s Network or Other Installations

Connected users must not take any action or use any equipment that materially adversely affects the supply of electricity to another connected user. Any changes required to the network to mitigate interference caused by a connected user will be at his cost. The starting and operation of certain electrical equipment, particularly motors and associated equipment as well as welding sets, may interfere with the quality of the electrical supply. Connected users can arrange and pay to have a totally independent power supply installed for their own requirements.

Some common sources of power quality issues arising from connected user operations include motor starting, welding sets and capacitors.

Motor Starting

Direct on line (DOL) starting of AC motors causes many supply quality issues. Hence AC motors must be fitted with suitable devices (e.g. soft start/VSD) to limit the starting currents except as follows:

Schedule of exemptions to motor starting limiting devices

Type of Motor	Location and Rating		
	Rural	Urban	
		Residential	Non-Residential
Single-phase	not exceeding 0.75 kW	not exceeding 1.5 kW	not exceeding 2.2 kW
3-phase 400V	not exceeding 4.0 kW	not exceeding 4.0 kW	not exceeding 7.5 kW

Welding Sets

Welding equipment can interfere with the voltage to other connected users. To minimize this effect the following applies to welding sets:

- Welders exceeding 5kVA input and up to 10kVA should have a power factor of not less than 0.8pf with a secondary voltage of 30V while operating at full load
- Welders exceeding 10kVA input should have a power factor of not less than 0.8pf with a secondary voltage of 30V while operating at half full load.

If these basic requirements prove to be insufficient and still cause power quality issues, connected users may be requested to take further measures, e.g. have WEL provide a separate supply.

Unbalanced Loads

Connected users with two or three phase supplies are required to design and maintain their installations to balance load across the phases. Where a connected user does not maintain its installation to balance load across the phases and a variance of more than 15kVA or 5% (whichever is larger) exists between phases, WEL may take steps to rectify or mitigate such imbalance at the connected user's cost.

Power Factor of Load and Capacitors

The average power factor of a connected customer's load, measured at the POS as the ratio of the actual kWh to kVAh during any 30 minute period, shall not be less than 0.95 lagging at any time. At any moment, the kVAr shall not exceed 32% of the nominal kVA customer supply capacity.

Power factor correction capacitors may interfere with ripple control signals and/or cause harmonic resonance problems. Connected users must operate capacitors so that they do not interfere with the electricity network or the operation of our ripple control system.

Harmonics

Refer to Section 6.2.

4.5 *WEL Owned Substations on Connected User Premises*

WEL is responsible for the repair and maintenance of substation equipment and buildings that it owns on private property.

Where the substation building is the property of a user, they are required to maintain it in a condition acceptable to WEL to ensure the protection and safety of personnel and equipment. WEL is responsible for the maintenance of their equipment. The user must co-ordinate with us for access to carry out any maintenance of WEL equipment.

Requirements for new substations are as documented in the Design Standards.

4.6 *Relocation or Removal of WEL's Plant or Equipment*

The party requesting the relocation or removal of any WEL plant or equipment from its existing position should contact WEL at the planning stage. Most plant or equipment can be relocated or removed, provided sufficient advance notice is given and all our requirements are met.

The party requesting the relocation will be responsible for all costs associated with moving WEL's plant or equipment.

4.7 High Voltage Installation Owners

Owners and/or operators of High Voltage installations are required to co-ordinate their operating actions with WEL with regard to the connection, operation and modification of their installation and must comply with our operating standard “Networks Outage and Access, Management, Permits and Switching” (NOAMPS) which is available on request. In addition, all personnel physically operating the High Voltage installation must have a current authorisation and must be authorised to carry out this operation.

Where the privately owned HV installation is operated by WEL, a formal Memorandum of Agreement covering network control, operation and emergency maintenance services will be required.

4.8 Reconnection of Existing Premises

Existing connected users must contact an electricity retailer to arrange for reconnection of their premises.

4.9 Demolition or Removal of Existing Premises

Connected users must contact their electricity retailer to arrange for the removal of the connection to their premises. The retailer will ensure that meters and relays are removed, accounts are finalised and will contact WEL to arrange for a permanent disconnection. All WEL owned equipment shall be returned to WEL networks. WEL will disconnect and isolate installations that are to be demolished or relocated.

4.10 Final Meter Reading of Existing Premises

Connected users must contact their electricity retailer to arrange a final meter reading at their premises.

4.11 Temporary Disconnection for Safety Reasons

If requested, WEL will disconnect the supply temporarily for safety reasons. This could include carrying out water blasting, painting, repair of roofing or spouting close to overhead connections to the premise or digging close to underground connections.

Contact us on 0800 800 935 option 3 for further details.

4.12 Trees

Trees near power lines can be a safety hazard. It is the responsibility of the property owner to keep trees on their property clear of power lines. WEL requires owners to ensure that trees and vegetation on their premises are trimmed or cut back in accordance with the Electricity (Hazards from trees) Regulations 2003 to prevent interference with our network equipment and the electricity supply. The owner is liable to WEL for all damage to our network caused by their trees and vegetation.

If WEL believes that trees or vegetation on a property are either interfering or likely to interfere with our network, we will request (by issuing a Cut Notice) that the owner removes the threat or potential threat. If the work is not completed within the specified time on the Cut Notice, WEL may undertake the required work at the owner’s cost.

Trimming of trees near power lines must be carried out by a qualified person. Details are available from our web site or by contacting us on 0800 800 935 option 4.

4.13 Hazards

Members of the public or connected users who discover any hazards or dangerous situations on or around our network, should contact our fault service on 0800 800 935 option 1

WEL has a brochure on safety this can be downloaded from the WEL web site.

5 METERING EQUIPMENT

Unless otherwise contracted, the quantity of electricity delivered through the POS to the connected user's premises will be measured by metering equipment installed according to the Electricity Industry Participation Code (EIPC).

Metering equipment shall be provided in accordance with the relevant Distributor Agreement and shall be to EIPC standards. All metering equipment installed at connected user premises must comply with EIPC standards in order to qualify for any pricing or commercial incentives WEL offers to connected users.

All New Connections are required to have meters installed that are capable of downloading half hour (HHR) data for revenue purposes.

WEL reserves the right to install a smart box in series with any revenue meters on all installations for network monitoring and management purposes, as well as load control devices (either in the form of separate load control devices or as an integral part of a smart box) and the customer must allow for this installation and provide sufficient space in the meter board to enable this installation.

The connected user shall not interfere with any metering equipment, WEL's Smart Box, or the connections to the metering equipment without the prior written consent of the Metering Equipment Provider, or (in the case of Smart Boxes) WEL, except to the extent that emergency action has to be taken to prevent injury to personnel or damage to property proximate to the metering equipment. Should this happen, the connected user shall inform the relevant Metering Equipment Provider, WEL, and the electricity retailer in writing as soon after as is practicable.

Where we own high voltage switchgear dedicated to supply a specific connected user, an agreement may be required for us to provide measuring transformers (voltage and current transformers) for metering purposes. This equipment must be designed and tested to comply with the connection capacity and the requirements of the EIPCs.

Meter Box Size

The following meter box sizes are required before the connection can proceed.

- Residential
 - For a single phase installation - **minimum** 400x600x225mm deep
 - For a three phase installation - **minimum** 500x650x225mm deep
 - The dimensions above are for the **meter compartment area** only and do not include the areas for any sub-circuit fusing.
 - If there is no sub-circuit fusing, then the above may be regarded as the overall meter box sizes.

- If sub-circuit fusing will be installed, then a larger meter box shall be used to accommodate the extra space required by the sub-circuit fusing.
- Non-residential
 - Actual meter box sizes may vary, thus the following **spare space within the meter box** shall be made available
 - Category 1 metering - A minimum spare space of 250x180x225 deep, for **each meter used by the ICP** that is installed this meter box.
 - Category 2 metering - A minimum spare space of 250x180x225 deep, and space to allow for the installation of a separate set of metering CT, for **each meter used by the ICP** that is installed this meter box.

New installations that are requested to be Metered and Livened onto the WEL's network area, that **DO NOT** comply with the above size requirements, **WILL NOT BE CONNECTED**.

WEL will centrally manage and coordinate load control switching on behalf of electricity retailers and customers. Where the electricity retailer or any other party elects to install metering equipment which includes either ripple relays and/or programmable switching, in addition to or as agreed in place of, WEL's control receivers (including ripple relays and load control receivers fitted to WEL's Smart Box) relays, the electricity retailer or third party will ensure it meets and maintains required functionality and performance levels.

Metering for Distributed Generations

All DG sites shall have import/export meter installed for compliance monitoring purpose.

- A DG that exports with no intention to be paid for its generated electricity ('gifting') will still require an import/export meter.

Refer to Section 2.6 for Specific Metering Requirement for DG connected at LV.

6 SERVICE LEVELS

WEL's targeted delivery service levels are described in the WEL Asset Management Plan (AMP).

The resulting delivery service performance is published in WEL's disclosures, pursuant to the Electricity Distribution Information Disclosure Determination 2012.

Copies of the above documents are available from our website.

The service level topics covered in these documents include:

6.1 Security of Supply

The WEL distribution system is designed to meet the security standards as described in the WEL AMP.

We will attempt to provide continuous supply but cannot guarantee that there will be no interruption to your supply. When an interruption occurs, we will endeavour to minimise the duration.

6.2 Quality of Supply

WEL's network is operated in compliance with the Electricity (Safety) Regulations 2010. We will endeavour to ensure that flicker, voltage sags, voltage surges, spikes and electrical noise, harmonics, inter-

harmonics and other disturbances are controlled within the network to avoid disturbance to connected users' equipment.

Voltage and frequency standards

Voltage and frequency standards are governed by the Electricity (Safety) Regulations 2010, Clause 28 & 29, which require:

The supply of electricity to electrical installations operating at a standard low voltage of 200 volts AC or more, but not exceeding 250 volts AC, to be at the standard low voltage and except for momentary fluctuations, must be kept within 6% of that voltage calculated or measured at the POS.

For WEL's network, the standard nominal low voltage is 230 volts AC between phase and neutral. Hence the limits at the POS are 216.2 volts to 243.8 volts.

The supply of electricity to electrical installations operating at other than standard low voltage to be at a voltage agreed between the electricity retailer and the connected user, and, unless otherwise agreed between the electricity retailer and the connected user, and must be maintained within 6% of the agreed value except for momentary fluctuations calculated or measured at the POSs

The frequency of electricity supplied by any person must be maintained within 1.5% of 50Hz, except for momentary fluctuations. (This requirement may be varied for electrical installations operating at other than standard low voltage, if the electricity supplier and the connected user agree.)

Connected user generated Harmonics

Distortion of the system voltage waveform caused by certain types of equipment may result in annoyance to other connected users of our network or damage to connected apparatus. To limit these effects loads connected to our network shall comply with the following:

- Meet the requirements of Reg. (31) (1) of the Electricity (Safety) Regulations 2010 such that the use of any fittings or electrical appliance will not interfere with the satisfactory supply of electricity to any other Connected user.
- The harmonic content of any load shall be maintained within the limits of the New Zealand Electrical Code of Practice for Harmonic Levels (ECP36:1993) and any subsequent amendments. In general, we require that the equipment complies with the clauses of AS/NZS 61000.3 relevant to the equipment capacity and demonstrate compliance for the connection to the Network by the application of the EEA Power Quality Guide.
- Motor starting shall comply with the Committee Report on Motor Starting Current for AC Motors published by the ESANZ Engineer's Institute (now EEA) February 1982 and subsequent amendments; Copies of this report are available from the EEA.

For commercial or industrial customers, WEL may request Harmonic analysis to be provided as part of the connection process.

Ripple injection

We operate ripple injection plants for load control and other purposes. The ripple carrier frequencies are 283 Hz. To ensure the correct operation of our mains signalling equipment, the connected user must design and operate any equipment connected to our network so that it does not interfere with the operation of WEL's ripple control system.

Additional superimposed signals

Connected users must not superimpose signals on WEL's network without our prior written agreement, which may be withheld at our discretion. Any equipment that uses the mains for communication must comply with IEC61000-3-8.

7 NETWORK OPERATION

We operate our network in compliance with the Electricity Regulations and in accordance with our Terms of Supply, and good industry practice.

7.1 Connected User Service

Information on connected user services can be found on our web site. This includes sections on services available, WEL contacts and FAQ (Frequently asked Questions)

7.2 Provision of Information

Records

We retain engineering information about our network. This is made available to authorised parties on request, but cannot be disclosed to third parties without written consent from WEL.

Network Location

- Contractors or anyone else who needs to work where underground services are likely to be located, should apply on the beforeUdig website: <http://www.beforeudig.co.nz>
- WEL Networks does offer a service to physically locate our cables. There may be a cost associated with this.

Where 33kV sub-transmission cables are involved, we will mark out the cables and may oversee the work to ensure safety. There may also be a cost associated with this.

As-built records

Contractors installing a new network are required to provide "as-built" records in accordance with our drafting standards which are available on request from our Customer Services team. Contact WEL on 0800 800 935 option 3 for further details. WEL may, at its sole discretion, require that a complete set of as-builts are submitted before an installation is commissioned or connected to the network. Where contractors find an error in any existing WEL as-built documentation the contractor must report the error to WEL, in order for WEL to correct it.

Collection of metering information

Where WEL has a smart box installed at a connection WEL may collect, store, and use metering information generated from the smart box about the electricity connection and its operation, including the nature and quality of the supply of electricity to an ICP. This information may include, but is not limited to, consumption, voltage, temperature, and meter events (faults, outages, etc).

WEL will use the information gathered for the proactive management and operation of the network including purposes such as fault detection, outage management, price determination, asset management, reserve market, and future network build requirements. WEL may also use metering information to investigate and develop possible future services.

WEL will collect, store and use this information in accordance with the WEL Networks Privacy Policy and the Privacy Act 2020.

7.3 *Planned Interruptions*

From time to time WEL may need to interrupt or reduce the delivery to any POS either totally or partially for any period as necessary; usually to carry out repairs, maintenance or alteration to the network.

In the event of an interruption to or reduction of delivery, WEL will:

- Where practical seek agreement with the connected user on the timing of the interruption to or reduction of delivery, with a view to minimising the disturbance to the connected user and as far as reasonably practicable, schedule Planned Service Interruptions to minimise disruption to Consumers.
- Use all reasonable endeavours to notify the connected user in advance of its intentions to interrupt or reduce the delivery. Notice may be by a combination of advertising in local newspapers, radio announcements, letterbox drop, phone or email.
- Use all reasonable endeavours to minimise the period of interruption or reduction to delivery.

7.4 *Disconnections*

If WEL believes there is immediate danger to any person, electrical lines, cables, machinery, equipment or other plant or property, we may, without notice to the connected user, immediately interrupt or reduce delivery either totally or partially for any period we deem necessary to remove the danger.

7.5 *Unplanned Interruptions*

From time to time, events outside our control cause a loss of electricity supply.

WEL will use all reasonable endeavours to restore the supply to connected users. We observe the following restoration priorities which may be altered at our discretion:

- Removal of any life threatening situations.
- Restoration of supply to essential services, specifically:
 - Hospitals
 - Emergency services (ambulance, fire, police)
 - Sewerage
 - Water supplies.

7.6 *Emergency load shedding*

For the safe operation of our network, at times it is essential to carry out load shedding during an abrupt reduction in frequency. This is normally carried out automatically in blocks and it is not possible to isolate individual connected users from any load shedding block (however consideration is given to essential

services in the network configuration). Where connected users have critical loads, they should make provision for their own stand-by generation.

7.7 *Civil emergencies*

We have an obligation to carry out certain civil emergency duties in relation to our network. In such emergency situations the actions of WEL and all parties connected either directly or indirectly to our network will be governed by the procedures laid down in the relevant portions of the Civil Defence Emergency Management Act 2002. In such circumstances WEL may be directed as to the priority for restoration of supply to connected users or groups of connected users. In extreme circumstances WEL may even be directed to disconnect supplies.

8 **LOAD MANAGEMENT**

8.1 *Introduction*

WEL Networks has a load control system to enable it to manage its load to optimise the utilisation of the distribution system and for tariff purposes. Load control will be carried out by the WEL load control systems.

WEL may operate its load control system at any time without notice to the connected users or the electricity retailers.

In order to qualify for any line charges based on load control signals, these signals must be controlled by WEL.

The use of any aggregated load control devices needs to be first agreed with WEL and can only be used in accordance with a Distributor Agreement and Load Control Protocols. In particular, Aggregated Load Control equipment must not interfere with WEL's equipment and because restoration has the potential to damage equipment or disrupt WEL's ability to provide a reliable and quality supply the restoration must be coordinated with WEL.

8.2 *Connected Users' Responsibilities*

Connected users may connect any equipment or plant to the load control system, which shall be permanently wired.

It is the connected user's responsibility to provide:

- Sufficient space on the metering panel for the WEL Smart Box, if needed a WEL load control relay and
- The electricity retailer's metering and associated equipment and
- Any wiring required beyond the meter.

- If the load connected to the load control system is greater than 3kW the load shall be connected through a sealable relay/contactor provided by the connected user and housed in the metering panel.
- Connected users are to ensure that their load connected to the load control system does not interfere with any of WEL's load control signals.
- Prior to installation of any 3rd Party load control device the 3rd party must have entered into an agreement with WEL.

Where power factor correction equipment is to be installed or altered, the effects on the load control signal shall be determined by:

1. Signal tests to be carried out prior to the capacitor bank installation or alteration. These should be done at the metering point.
2. After alterations, repeat tests in 1. There should be little or no change in the test results. If the tests show significant signal drain, then the installation or alteration should be disconnected and the problem remedied

NOTE: Ripple frequency blocker devices should be installed to minimise interference. WEL can provide advice on specific requirements.

The connected user shall maintain any contactors and all other equipment or plant and wiring in good working order to meet the requirements of the Regulations and Electrical Codes of Practice as may be applicable.

8.3 WEL Networks' Responsibilities

For connected users who elect to take a controlled supply, WEL may provide and install a load control relay in addition to the WEL Smart Box. WEL will maintain the Smart Box and any WEL owned load control relay in good working order.

9 DEFINITION OF TERMS

In this Network Connection Standard any reference to an act, statute, regulation, published act or code of practice shall be construed as a reference to the most recent version or amendment unless specifically agreed to by WEL.

The following terms shall have the following meanings:

Act - the Electricity Act 1992

AMP - Asset Management Plan- a 10 year management plan for WEL's network

Connected user (or user) – a purchaser of electricity (from an electricity retailer) that is delivered over WEL's network

Connection Agreement - an agreement between the retailer and another party for establishing a connection or modification of an existing connection

Delivery - the transportation of electrical energy at 50Hz to the connected user via WEL's network

Delivery services - the provision of line function services

DG Distributed Generation –equipment used for generating electricity at or near the location of use. In the context of this standard the DG equipment would be connected to WEL's distribution network and capable of exporting energy into the network (regardless of whether export occurs). Generating plant that is intended to be operated while synchronized to the network is deemed to be 'capable of exporting energy'.

Distribution network (or network) -, WEL's system for the conveyance of electricity including all fittings comprising that system and which terminates at the user's POS

Distributor Agreement - an agreement for delivery services between WEL and an electricity trader or major customer.

Design Standard - a document issued by WEL that specifies our standard design for an aspect of our network

ECP - an electrical code of practice issued pursuant to the Act

EIPC - Electricity Industry Participation Code

Electricity Authority

Electrical installation -

(a) means—

- i) in relation to a property with a point of supply, all fittings beyond the point of supply that form part of a system that is used to convey electricity to a point of consumption, or used to generate or store electricity; and
- ii) in relation to a property without a point of supply, all fittings that form part of a system that is used to convey electricity to a point of consumption, or used to generate or store electricity; but

(b) does not include any of the following:

- i) an electrical appliance;
- ii) any fittings that are owned or operated by an electricity generator and that are used, designed, or intended for use in or in association with the generation of electricity, or used to convey electricity from a source of generation to distribution or transmission lines;
- iii) any fittings that are used, designed, or intended for use in or in association with the conversion, transformation, or conveyance of electricity by distribution or transmission lines

Electricity trader or electricity retailer - is the party selling or intending to sell electricity to the user

Emergency – In general, an emergency is a situation where there is an unforeseen severe shortage of capacity. This may include actions carried out by WEL to prevent impending loss of supply or impending risk of safety to public or personnel, or damage to equipment.

Fittings - are everything used or designed or intended for use, in or in connection with the conversion, transformation, conveyance or use of electricity

HV - high voltage means a voltage above 1,000 volts, generally 11,000 volts, for supply to connected users

ICP - an Installation Control Point is a point of connection at which a customer installation is connected to a network other than the HV grid and is nominated as the point at which the retailer will be deemed to have supplied electricity to a connected user or generator, and having the attributes defined in the EIPCs.

Installation or connected user's installation - means any fittings owned or used by a connected user (except WEL's equipment) and that form part of a system for conveying electricity from the connected user's POS to where the electricity may be consumed.

Line function services - is as defined in the Act and means the provision and maintenance of fittings for the conveyance of electricity and the operation of such fittings, including the control of voltage and responsibility for losses.

LV - Low voltage, means a voltage of value up to 1,000 volts, generally 230 or 400 volts for supply to connected users.

Major user - the person purchasing the delivery service from WEL at a major user connection.

Major user connection - means a connection to WEL's network where this classification is agreed to by WEL that generally does not require or share the use of the low voltage network for delivery of electricity.

Operating standard - is a document issued by WEL that specifies our standard procedure for operating a part of our network.

POS - point of supply, in relation to a *property*, means the point or points on the boundary of the property at which exclusive fittings enter that property, except that:

- (a) if there are both high voltage lines and a transformer owned by the electricity distributor on the property, the point of supply is the point at which electricity from the transformer enters exclusive fittings; or
- (b) if there are non-exclusive fittings on the property, the point of supply is the point at which those fittings become exclusive fittings; or
- (c) if the exclusive fittings on the property are owned by a consumer that is a tenant or licensee of the owner or occupier of the property, the point of supply is the point at which those exclusive fittings enter the area leased or licensed by the consumer; or
- (d) if there is specific agreement that any other point on the property is the point of supply, the point of supply is the agreed point.

and, in this definition, -

exclusive fittings means fittings used or intended to be used for the purpose of supplying electricity exclusively to that property

high voltage lines means lines conveying electricity at a voltage of 1 000 volts or more
property -

- (a) means the land within the boundary where the electricity is consumed;
- (b) includes the whole of the property, if the property is occupied wholly or partially by tenants or licensees of the owner or occupier;
- (c) includes the whole of any property that has been subdivided under the Unit Titles Act 2010

specific agreement may be an agreement -

- (a) entered into by -

- i. the existing consumer; or
 - ii. any person with a greater interest in the property than the consumer (such as the consumer's landlord); or
 - iii. any Body Corporate under the Unit Titles Act 2010 or the registered proprietor of the land to which the unit plan relates; and
- (a) entered into by the electricity distributor or the electricity retailer; and
 - (b) entered into before or after the date on which this provision comes into force

POS - point of supply, in relation to *street lights* is the fuse base at each street lighting column or, where a light fitting is mounted on our poles via an outrigger arm, the point of supply will be at the point where the light fitting supply becomes exclusive.

Premises or connected user's premises - means the land and buildings owned or occupied by a connected user, and any land over which the connected user has an easement or right to pass electricity.

PV Photovoltaic – in this standard refers to distributed generation through converting sunlight to electrical energy using solar cells made of semiconductor materials.

Smart Box -WEL's network management system that is connected to users and strategic network assets, and is accessible via a two-way communications network, capable of providing near real time information and control of the distribution network and is able to connect to the Distributor's network management control system. Smart Boxes are also fully certified smart meters under EIPC and can provide other parties with register readings and certified half hourly energy consumption data for revenue billing and reconciliation purposes and enable controllability of and information display in the customer's premises.

Technical specification - is a WEL document that specifies technical requirements for plant that is to be connected to our network.

Works -

- (a) means any fittings that are used, or designed or intended for use, in or in connection with the generation, conversion, transformation, or conveyance of electricity; but
- (b) does not include any part of an electrical installation